

May 21, 1996

30-16055

MEMORANDUM TO: Carl J. Paperiello, Director  
Office of Nuclear Material Safety  
and Safeguards

FROM: Donald A. Cool, Director [orig. signed by]  
Division of Industrial and  
Medical Nuclear Safety, NMSS

SUBJECT: CONTINGENCY PLANS FOR ADVANCED MEDICAL SYSTEMS (AMS)

We have developed detailed contingency plans for NRC response actions if AMS abandons the site or declares bankruptcy as directed under the AMS Task Action Plan. The contingency plans are attached. These plans were coordinated with DWM, OGC, and Region III and their comments were incorporated as appropriate.

Attachments: As stated

cc w/att: M. Weber, LLDP  
J. Madera, RIII  
M. Zobler, OGC

Contact: Kevin Ramsey, IMOB  
415-7887

**DISTRIBUTION: IMNS-5010**

NRC Central File

IMOB r/f

IMNS r/f

NMSS r/f

JDeCicco

LBykoski

CEstep

**RECORD NOTE - COORDINATED WITH:**

INITIALS:

DIS  
4/17/96

*[Handwritten signature]*  
4/21/96

To receive a copy of this document, indicate in the box:  
"C" = Copy w/o att/encl. "E" = Copy w/att/encl. "N" = No copy

DOCUMENT NAME: G:\IMNS5010.KMR

To receive a copy of this document, indicate in the box: "C" = Copy without attachment/enclosure "E" = Copy with attachment/enclosure "N" = No copy

OFFICE	IMOB	<input checked="" type="checkbox"/> E	IMOB	<input checked="" type="checkbox"/> D: IMNS	<input checked="" type="checkbox"/> D: NMSS
NAME	KRamsey <i>KRM</i>		CHaney	DCool	CPaperiello
DATE	4/17/96		4/21/96	4/21/96	4/ /96

240026

2-2-97VA

66-114

F118

9606250193 XA

Task No. 3 - Develop Contingency Plan to Address Situation  
Where AMS Abandons the Facility

Lead: IMNS/NMSS  
Support: Region III, OGC, DWM, OC

1. Upon discovery that AMS has abandoned the facility, Region III shall immediately dispatch inspectors to the site (if not already there) to verify that the site has been abandoned by AMS, verify that there is no immediate threat to public health and safety, and confirm that adequate short-term controls will be maintained. Request emergency support from other Federal agencies (DOE, EPA, etc.) as necessary.

- a. Confirm that all radioactive materials are secured (including treated water stored onsite) and all safety equipment is operational (radiation monitors, basement sump pump, etc.). Contact the following State and local agencies as appropriate:

City of Cleveland Police Department  
(216) 621-1212

City of Cleveland Fire Department  
(216) 621-1234

Ohio Emergency Management Agency  
(614) 889-7150

- b. Confirm that the security service will continue to provide services, and instruct them to notify NRC (or another custodian we specify) of any alarms. AMS currently uses the following service:

ADT Security Services  
(216) 526-9539.

- c. Confirm that utilities will not be terminated before a custodian is identified.

Electricity: Cleveland Electric Illuminating Co.  
(216) 479-1234

Natural Gas: East Ohio Gas Company  
(216) 361-2345

Water: City of Cleveland Division of Water  
(216) 644-2444 or  
(216) 552-7899

Telephone: Ameritech  
(800) 572-4000

- d. Establish interim custodian for site<sup>1</sup>. First contact the Ohio Emergency Management Agency and determine whether the State wishes to take control of the abandoned site. If so, determine when State personnel will arrive and whether any Federal assistance is required. If the State indicates that they are unable to assume control of the site and requests Federal assistance, RIII should contact IMNS and coordinate a request for DOE to assume control of the abandoned site. This would be similar to requests made under Inspection Manual Chapter 1303, Requesting Emergency Acceptance of Radioactive Material by DOE.
  - e. Confirm that State and local authorities are aware of, and concur with immediate response actions. Consider the need for a press release for rumor control. If appropriate, prepare a press release and coordinate issuance with other agencies.
2. Issue order to licensee requiring that they remain on the site and take steps to start decommissioning the site. Followup with necessary legal actions if licensee does not comply with order.
  3. If AMS petitions for bankruptcy, RIII shall assemble a bankruptcy team with representatives from IMNS, OGC, DWM, and OC. The bankruptcy team shall ensure that the following actions are taken and determine the lead NRC office responsible for subsequent actions as appropriate.
    - a. Make contact with DOJ and request bankruptcy submittals.
    - b. File proofs of claim with Bankruptcy Court for funding to maintain radiological controls, emergency response, remediation, fees, etc.
    - c. Maintain cognizance of Bankruptcy Court proceedings through DOJ.
  4. Drawing on the Letter of Credit.
    - a. If AMS has petitioned for bankruptcy, notify the Bankruptcy Court that we intend to draw on the financial instrument. The court may need to approve this action. Coordinate closely with OGC.

---

<sup>1</sup> In a memorandum from S. Treby, OGC to R. Cunningham, IMNS dated October 12, 1989, OGC stated that a government agency acquiring title or control over abandoned radioactive material would not be a confiscation. Abandonment is defined in case law as the expressed or implied act of leaving or deserting property without hope of recovering it and without intention of returning to it. OGC also stated that a government agency taking control of abandoned property would not be liable for damages if the owner came forward at a later date unless the NRC was negligent in making its finding that the property had been abandoned.

- b. [See step 4.f below.] The lead NRC office (as determined by the bankruptcy team) should contact the individual at the issuing bank (Bank One, Cleveland) who signed the letter of credit, to determine the specific bank procedures needed to be followed to draw on the instrument. In these discussions, the following details should be resolved:
- > Where the transaction is to take place.
  - > Whether the transaction needs to take place in person.
  - > What documents need to be presented (e.g., if originals are needed).
  - > If there are deadlines on when the instrument can be drawn on.
  - > If there are deadlines before which the instrument can not be drawn on.
  - > The form of the sight draft (a bill of exchange or draft payable when presented).
- c. Either Regional Counsel or OGC (as determined by the bankruptcy team) should prepare, in consultation with OGC, RIII, OC, and DWM, the sight draft and the sight draft certification with the exact wording referenced in the letter of credit and in accordance with other letter of credit conditions and bank instructions. The letter of credit number needs to be referenced on the sight draft.
- d. The Regional Administrator, or Deputy Regional Administrator, should sign the sight draft and certify the sight draft certification. The certification should be notarized. If project management responsibilities are transferred to NMSS, the NMSS Office Director, or Deputy Office Director, shall sign and certify these documents.
- e. The appropriate individual should present the sight draft, sight draft certification, and other required documents at the bank in accordance with bank instructions.
- f. As initial discussions are being held with bank, staff from the lead NRC office, in consultation with OGC, OC, DWM, and RIII, should contact the trustee named in the standby trust agreement. The staff should consult with the trustee and determine the method the trustee desires for the transfer of the letter of credit funds. Arrangements for direct transfer of the funds to the trustee account must be made so that the NRC does not directly acquire funds. NRC staff must not accept \* funds, even if instruments are made out to the trustee. NRC staff must never allow the bank to make an instrument payable to NRC or the licensee.



5. Assuming that AMS has abandoned the site and is unavailable to direct remediation, the lead NRC office (as determined by the bankruptcy team) will need to direct the trustee in writing to disburse funds from the trust. It is expected that NRC staff will work with the trustee to prepare a Statement of Work, and solicit bids from at least 3 remediation contractors. (This may not be necessary if DOE or EPA has assumed control of the site.) After reviewing the bids and contractor qualifications, the trustee (in consultation with NRC) should select a contractor and execute a contract for remediation.
6. The remediation contractor should develop a detailed decommissioning plan and cost estimate. If the cost estimate identifies a funding shortfall, the lead NRC licensing office should assess possible legal action against AMS to recover needed decommissioning funds, or possible use of DOE or EPA resources to help remediate site. For example, the trust fund could be used to remediate areas with unsealed material if DOE/EPA resources were used to transfer sealed sources and bulk cobalt-60 to authorized recipients.
7. RIII shall inspect the conduct of the remediation to ensure that the remediation is conducted in accordance with the decommissioning plan and in a manner that protects public health and safety.
8. The lead licensing office shall approve necessary disbursements from standby trust for maintenance of facility and remedial actions. NRC must be notified of all withdrawals from the trust, however written NRC approval is only required for withdrawals that exceed 10 percent of the balance.

Task No. 3A - Contingency Plan to Address Situation Where AMS Declares Bankruptcy, But Does Not Abandon the Facility

1. Upon discovery that AMS has filed for bankruptcy (reportable under 30.34(h)), Region III shall immediately contact AMS and verify that they are continuing to maintain control of the site. A confirmatory action letter or order shall be prepared, if necessary.

NOTE: Refer to contingency plan for abandonment of the facility if AMS is not maintaining control of the site.

2. RIII shall assemble a bankruptcy team with representatives from IMNS, OGC, DWM, and OC. The bankruptcy team shall ensure that the following actions are taken and determine the lead NRC office responsible for subsequent actions as appropriate.
  - a. Make contact with DOJ and request bankruptcy submittals.
  - b. File proofs of claim with Bankruptcy Court for funding to maintain radiological controls and decommission the site.
  - c. Maintain cognizance of Bankruptcy Court proceedings through DOJ.
3. Drawing on the Letter of Credit.
  - a. The lead NRC office (as determined by the bankruptcy team) shall notify the Bankruptcy Court that we intend to draw on the financial instrument. The court may need to approve this action. Coordinate closely with OGC.
  - b. [See step 3.f below.] The lead NRC office (as determined by the bankruptcy team) should contact the individual at the issuing bank (Bank One, Cleveland) who signed the letter of credit, to determine the specific bank procedures needed to be followed to draw on the instrument. In these discussions, the following details should be resolved:
    - > Where the transaction is to take place.
    - > Whether the transaction needs to take place in person.
    - > What documents need to be presented (e.g., if originals are needed).
    - > If there are deadlines on when the instrument can be drawn on.
    - > If there are deadlines before which the instrument can not be drawn on.
    - > The form of the sight draft (a bill of exchange or draft payable when presented).

- c. Either the Regional Counsel or OGC (as determined by the bankruptcy team) should prepare, in consultation with OGC, RIII, OC, and DWM, the sight draft and the sight draft certification with the exact wording referenced in the letter of credit and in accordance with other letter of credit conditions and bank instructions. The letter of credit number needs to be referenced on the sight draft.
  - d. The Regional Administrator, or Deputy Regional Administrator, should sign the sight draft and certify the sight draft certification. The certification should be notarized. If project management responsibilities are transferred to NMSS, the NMSS Office Director, or Deputy Office Director shall sign and certify the documents.
  - e. The appropriate individual should present the sight draft, sight draft certification, and other required documents at the bank in accordance with bank instructions.
  - f. As initial discussions are being held with bank, staff from the lead NRC office, in consultation with OGC, OC, DWM, and RIII, should contact the trustee named in the standby trust agreement. The staff should consult with the trustee and determine the method the trustee desires for the transfer of the letter of credit funds. Arrangements for direct transfer of the funds to the trustee account must be made so that the NRC does not directly acquire funds. NRC staff must not accept funds, even if instruments are made out to the trustee. NRC staff must never allow the bank to make an instrument payable to NRC or the licensee.
4. Disbursing Funds from the Standby Trust Account (assuming that AMS is capable of directing the site remediation)
- a. If AMS has an approved decommissioning plan (work plan, not funding plan), AMS may withdraw funds from the trust if it gives NRC 30-days notice that it intends to make a withdrawal. AMS also must complete, as specified in the standby trust agreement, the Certificate of Events, and the Certificate of Resolution. This includes a copy of NRC's approval of the decommissioning plan and approval to begin decommissioning.
  - b. If AMS does not have an approved decommissioning plan, AMS would still be able to withdraw funds from the trust if it gives NRC 30-days notice, and completes a modified Certificate of Events and Certificate of Resolution. This would include a copy of NRC's approval to commence decommissioning and a statement concerning the terms and conditions of NRC's approval of the continuing

development of the decommissioning plan. NRC staff and AMS should ensure that these modifications are acceptable to the Bankruptcy Judge.

- c. NRC must approve, in writing, all disbursements in excess of ten percent of the amount held in the standby trust.
  - d. The Regional Administrator, or Deputy Regional Administrator, must certify the disbursement approval documents, and ensure that the certifications are notarized. If project management responsibilities are transferred to NMSS, the NMSS Office Director, or Deputy Office Director shall sign and certify the documents.
5. If the cost estimate for the decommissioning plan identifies a funding shortfall, the lead licensing office shall assess possible legal action against AMS to recover needed decommissioning funds, or possible use of DOE or EPA resources to help remediate site. For example, the trust fund could be used to remediate areas with unsealed material if DOE/EPA resources were used to transfer sealed sources and bulk cobalt-60 to authorized recipients.
  6. RIII shall inspect the conduct of the remediation to ensure that the remediation is conducted in accordance with the decommissioning plan and in a manner that protects public health and safety.
  7. The lead licensing office shall approve necessary disbursements from the standby trust for maintenance of facility and remedial actions. NRC must be notified of all withdrawals, however written NRC approval is only required for withdrawals exceeding 10 percent of the balance.



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

J. Madera  
R111

May 22, 1996

Marshall E. Miller  
Presiding Officer  
512 Magnolia  
Frederick, MD 21701

Dr. Harry Foreman  
Special Assistant  
1564 Burton Avenue  
St. Paul, MN 55108

In the Matter of  
ADVANCED MEDICAL SYSTEMS, INC.  
Material License No. 34-19089-01  
Docket No. 30-16055-ML-REN

Dear Administrative Judges:

Pursuant to 10 C.F.R. § 2.1231(c), attached please find the following documents to be included in the hearing file for this proceeding.

59. Letter to David Cesar, Vice President, Advanced Medical Systems, Inc., from John R. Madera, Chief, Nuclear Materials Licensing Branch, U.S. Nuclear Regulatory Commission, re: Conceptual Decommissioning Plan, March 20, 1996.
60. Letter to Mr. J. R. Madera, Chief, Nuclear Materials Licensing Branch, U.S. Nuclear Regulatory Commission from Robert Meschter, RSO, Advanced Medical Systems, Inc., re: Advanced Medical Systems Inc. (License No. 34-19089-01) Emergency Plan, March 21, 1996, with attachment.
61. Letter to Mr. Hubert Miller, Regional Administrator, Region III, U.S. Nuclear Regulatory Commission from Robert Meschter, RSO, Advanced Medical Systems, Inc., re: Strategic Plan (USNRC License No. 34-19089-01), April 8, 1996, with attachment.
62. Letter to Mr. Geoffrey C. Wright, Acting Deputy Director, Division of Nuclear Materials Safety, U.S. Nuclear Regulatory Commission from Robert Meschter, RSO, Advanced Medical Systems, Inc., re: USNRC Inspection Report No. 030-16055/95006(DNMS), April 9, 1996.
63. Letter to Mr. Robert Meschter, Radiation Safety Officer, Advanced Medical Systems, Inc. from Geoffrey C. Wright, Nuclear Materials Safety Branch, U.S. Nuclear Regulatory Commission, re: 60-day extension, April 11, 1996.
64. Letter to Mr. John R. Madera, Chief, Nuclear Materials Licensing Section, U.S. Nuclear Regulatory Commission, re: Conceptual

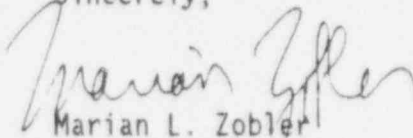
960524501 PR (299)

119  
MAY 24 1996

Decommissioning Plan for Advanced Medical Systems Inc. (License No. 34-19089-01, Control No. 98507, April 12, 1996, plus attachment.

65. Letter to Mr. Robert Meschter, Radiation Safety Officer, Advanced Medical Systems, Inc. from Kevin G. Null, Nuclear Materials Licensing Branch, U.S. Nuclear Regulatory Commission, re: Amendment No. 41 to Material License No. 34-1908089-01, April 16, 1996, plus attachment.
66. Letter to Mr. Hubert Miller, Regional Administrator, Region III, U.S. Nuclear Regulatory Commission from Robert Meschter, RSO, Advanced Medical Systems, Inc., re: Strategic Plan (USNRC License No. 34-19089-01), April 24, 1996, with attachment.

Sincerely,

  
Marian L. Zobler  
Counsel for NRC Staff

Enclosures: As stated

cc w/encl.: Service List



MEMORANDUM TO: John R. Madera, Chief  
Materials Licensing Branch, RIII

June 13, 1996

32-16055

FROM: Josephine M. Piccone, Acting Chief (ORIG. SIGNED BY DSERIG, FOR)  
Operations Branch, IMNS

SUBJECT: REVIEW OF AMS RESPONSES TO COMMENTS ON THEIR EMERGENCY PLAN

We have reviewed the responses and proposed actions submitted by Advanced Medical Systems in reply to your February 28, 1996, deficiency letter. Our assessment of the responses is attached. Most of the proposed actions are adequate, however some additional changes are still needed.

Attachment: As stated

cc: D. Cool  
F. Combs

Contact: Kevin Ramsey, IMOB  
(301) 415-7887

**DISTRIBUTION: IMNS-5317**

Hard copy

IMOB/TAR file  
NRC File Center  
IMNS r/f  
CEstep  
KNull, RIII  
JDeCicco

IMOB r/f w/incoming  
IMAB r/f w/incoming  
PVacca w/incoming  
Originator w/incoming  
~~IMOB r/f~~

E-Mail only

FCostello, RI	JJohansen, RI
MShanbacky, RI	JKinneman, RI
WPasciak, RI	JPelchat, RII
CHosey, RII	JPotter, RII
JMadera, RIII	BJHolt, RIII
BSpitzberg, RIV	LHowell, RIV
BPrange, WCFO	JDeMedico, OE
JLieberman, OE	

Hard copy w/incoming & E-mail

RBellamy, RI  
RScarano, RIV  
FWenslawski, WCFO  
PLOhaus, OSP

210033

DOCUMENT NAME: G:IMNS5317.KMR

To receive a copy of this document, indicate in the box:  
"C"= Copy w/o att/encl. "E" = Copy w/att/encl. "N" = No copy

OFC	IMOB	E	IMOB	E	IMNS
NAME	KRamsey/kf/11	DSerig	DSerig	DSerig	BCob1
DATE	6/10/96	6/11/96	6/11/96	6/11/96	6/13/96

9606210278 960613

IMNS LIC30

9606210278

UCF

9606210278 XA

SEP 19 1996

F120

IMNS REVIEW OF THE MARCH 21, 1996 RESPONSE  
TO NRC COMMENTS ON THE EMERGENCY PLAN FOR  
ADVANCED MEDICAL SYSTEMS

Contact: Kevin Ramsey, IMOB  
(301) 415-7887

Response to Comment 1(a): The proposed actions are adequate.

Response to Comment 1(b): The proposed actions are adequate.

Response to Comment 1(c): The proposed actions are adequate.

Response to Comment 1(d): The proposed actions appear to be adequate, but it is still unclear how ADT will detect a power failure at the facility, or a disruption in telephone services. If ADT monitors the line such that it can promptly detect a loss of contact, a statement to that effect should be added to the plan.

Response to Comment 1(e): In addition to the proposed actions, the plan should contain a commitment to maintain a map showing the restricted areas, or some other warning sign, at each entrance that a first responder may use to enter the facility.

Response to Comment 2: Concerns about technical basis for worst-case earthquake scenario remain unresolved pending receipt and review of AMS response to Inspection Report No. 030-16055/95006.

Response to Comment 3(a): The proposed actions are adequate.

Response to Comment 3(b): The proposed actions are adequate.

Response to Comment 3(c): The proposed actions are adequate.

Response to Comment 3(d): The proposed actions are adequate.

Response to Comment 3(e): The proposed actions are adequate.

Response to Comment 3(f): The proposed actions are adequate for NRC approval, however we believe it would be helpful if the sand shield in the basement and the access manholes on the first floor (as described in Section 1.2.3) were shown in the drawings.

Response to Comment 3(g): If offsite features significant to emergency response (as described in Section 1.2 of Regulatory Guide 3.67) are clearly labeled on the topographical map or an additional map of the site area, the proposed action will be adequate.

Response to Comment 4(a): The proposed actions are adequate.

Response to Comment 4(b): The response is inadequate. With regard to packaged waste and surface contamination, the worst-case scenario must assume that the entire quantity authorized by the license is available for release

unless some justification is provided to explain why it is unreasonable to make that assumption. The actual inventory currently possessed is irrelevant if the license will authorize an increase in that inventory. If the material is stored or used in a manner that would prevent the entire inventory from being involved in accident, that justification must be provided in the plan. With regard to bulk cobalt-60, we accept that containers stored inside portions of the facility with heavy concrete construction are unlikely to be subject to falling debris that could rupture them. However, the movement of the containers outside of those areas still needs to be addressed. If the containers of bulk cobalt-60 will be packaged in Type-B shipping casks or other containers likely to withstand accident conditions (such as those described in 10 CFR 71.73) before being moved into the warehouse or other areas subject to structural damage, the plan should include that information as justification for not including any of the bulk cobalt in the source term available for release. Otherwise, we would expect the worst-case scenario to assume that some containers of bulk cobalt (such as the number of containers typically involved in a shipment) are in an area subject to structural damage when an earthquake or other accident occurs, and that some of these containers (50% would be acceptable) are broken open by falling debris.

With regard to the assumption of a 10-meter release height, we consulted with regional inspection staff familiar with the site. It appears that most of the door and windows through which a plume could be released are on the second floor so we will accept the assumption of a 10-meter release height.

With regard to the calculations used to estimate potential offsite doses, the response acknowledges that the CAP88-PC code models a gradual release of radioactive material over 12 months and estimates doses using several environmental pathways including the food and water pathways. The response states that the CAP88-PC code over-estimates the dose from a fire and no additional analysis is required even though this model has no resemblance to the conditions that would exist during a fire at the facility. This response is unacceptable. We have obtained more conservative dose estimates using the calculations in NUREG-1140. The calculations in NUREG-1140 are based on exposure times and other conditions that would be expected during a fire. These calculations form the technical basis for the emergency plan requirements in 10 CFR Part 30. Use of the same calculations would provide a basis for NRC to find that your accident analysis is adequate, and it would eliminate contentions that it is fortuitous that the CAP88-PC results are close to the NUREG-1140 results. The formula in Section 2.1.3 of NUREG-1140 is not difficult to complete and we would accept the use of the stability class D curves on Figure 1 of the NUREG. We recommend that you use this formula.

Response to Comment 4(c): The proposed actions are adequate.

Response to Comment 4(d): The plan should reflect your response that it is likely that a tornado would impose structural damage to restricted areas that are not of "hardened" construction. The plan should also mention the possibility that some containers may be in these damage prone areas (during shipments, etc.) when a tornado strikes and discuss whether the containers would be expected to withstand accident conditions. See the discussion of comment 4(b).

Response to Comment 5(a): The proposed actions are adequate.

**Response to Comment 5(b):** The revised emergency action levels (EALs) are defined in terms of projected effluents and site boundary exposure rates. It is still unclear how the Emergency Manager will be able to project these conditions in a timely manner. It would be better to define EALs in terms of the quantity of material that would be needed to produce those conditions. The Emergency Manager then would be able to declare an emergency based simply on the location of the emergency and the amount of radioactive material in those areas.

We also note that the proposed revision to Attachment 1 of Appendix D classifies a 20 mR/hr dose rate at the site boundary as an incident and indicates that an emergency will only be declared if the dose rate at the site boundary could exceed 100 mR/hr. These action levels are too high. Part 30 defines an "Alert" as an event that is not expected to require a response by offsite response organizations to protect persons offsite. Part 20 limits the dose to members of the public in unrestricted areas to 2 millirem in any one hour (see 20.1301). Therefore, we would expect offsite organizations to take actions to restrict access to offsite areas exceeding 2 mR/hr. More appropriate action levels should be established.

**Response to Comment 5(c):** The proposed actions are adequate.

**Response to Comment 5(d):** The plan should contain more detailed recommendations for offsite protective actions based on the worst-case accident scenarios defined in the plan. The initial recommendations should define the offsite areas where the protective actions should be implemented. We note that you have not postulated any accidents with projected doses approaching 1 rem so it is unclear why you indicate that evacuations may be recommended. Your emergency classifications and protective action recommendations should be consistent with your accident analysis.

**Response to Comment 5(e):** We believe that 90 minutes is too long for the first update. Sixty (60) minutes would be better.

**Response to Comment 6(a):** The proposed actions are adequate.

**Response to Comment 6(b):** The proposed actions will be adequate if agreement letters are obtained and submitted with the emergency plan.

**Response to Comment 6(c):** The proposed actions are adequate. However, the emergency plan must provide reasonable assurance that a sufficient number of survey meters will be available since the local fire and police departments do not have the capability to perform radiation surveys.

**Response to Comment 6(d):** The Ohio Department of Health needs to be added to Section 4.4 also.

**Response to Comment 6(e):** The proposed actions are adequate.

**Response to Comment 7(a):** The proposed actions are adequate.

**Response to Comment 7(b):** The proposed actions are adequate.

**Response to Comment 7(c):** The proposed actions are adequate.

Response to Comment 7(d): If the licensee will rely on offsite firefighters to conduct search and rescue operations, the plan should include a statement to that affect.

Response to Comment 7(e): Even though the footnote will be deleted, the response doesn't address the question of whether licensee personnel will be able to accompany firefighters during the fire if self-contained breathing apparatus is required to enter the building. If the assistance during fire fighting efforts mentioned in the plan is limited to conducting surveys outside of the building, that should be stated in plan.

Response to Comment 7(f): The proposed actions are adequate.

Response to Comment 7(g): The proposed actions are adequate.

Response to Comment 7(h): The proposed actions are adequate.

Response to Comment 7(i): The proposed actions are adequate.

Response to Comment 7(j): The proposed actions are adequate.

Response to Comment 8(a): The proposed actions are adequate.

Response to Comment 8(b): The proposed actions are adequate.

Response to Comment 8(c): Pencil-type pocket dosimeters that use a thin filament are susceptible to false readings if they are bumped or dropped. Pocket dosimeters are susceptible to environmental conditions also. We believe that more reliable dosimeters should be provided for emergency response personnel.

Response to Comment 8(d): The proposed actions are adequate.

Response to Comment 8(e): The response fails to provide a basis for us to find that there is reasonable assurance that an operable survey meter will be available during an emergency. If the main building is inaccessible, the survey meter in the pump house will be the only one available in the early stages of the response. You have already indicated that local fire and police departments have no survey meters. The fact that this meter will not be used routinely between quarterly checks indicates that a malfunction may not be detected for several months. The plan must provide reasonable assurance that an inoperable survey meter will not prevent response personnel from performing initial assessments. This assurance could be provided by a second survey meter, or more frequent operational checks (weekly would be acceptable).

Response to Comment 9(a): The proposed actions are adequate.

Response to Comment 9(b): The proposed actions are adequate.

Response to Comment 9(c): The proposed actions are adequate.

Response to Comment 9(d): The proposed actions are adequate.

Response to Comment 9(e): Although a statement describing typical calibration intervals and operational check frequencies is preferred, referencing

Radiation Safety Procedure No. RSP-008 is acceptable. A copy of this procedure should be provided for information when the plan is resubmitted.

**Response to Comment 10:** The regulations in 10 CFR 30.35(g) require that records important to decommissioning be retained until the license is terminated. The plan should describe the provisions for ensuring that records of incidents are retained until the license is terminated.

**Response to Comment 11(a):** The proposed actions are adequate.

**Response to Comment 11(b):** The proposed actions are adequate.



*REGIONAL TECHNICAL ASSISTANCE REQUEST FORM*

Date: 3/29/96 E-Mail to: Don Cool (DAC), cc:CLE

From: John R. Madera (JRM4) Chief, Materials Licensing Branch, Region 3

Licensee: Advanced Medical Systems (AMS) License No.: 34-19089-01

Problem/Issue: **AMS Emergency Plan**

Please review the responses submitted by AMS (letter dated March 21, 1996) in reply to our February 28, 1996 deficiency letter. We will send AMS' response letter under separate cover.

We are currently reviewing the responses and await your comments before we generate a third deficiency letter, if necessary. An expeditious review of the responses would be greatly appreciated.

Recommended Action (with revisions):    Approve    or    Reject

Remarks:

Headquarter Reviewer: \_\_\_\_\_

Regional Reviewer: K. Null

Reviewer Code: R2

Reviewer Phone No.: (708)829-9854    FAX No.: (708)515-1259

Request Needed by: 4/12/96

From: Kevin G. Null *KG*  
To: KMR  
Date: 4/2/96 8:50am  
Subject: AMS

Kevin,

I spoke with Region III management about the issue we discussed on the phone this morning. The Region would like you to contact me or Mike Weber once you have done your review of the AMS response to the EP deficiency letter and let us know how it looks overall. For the sake of consistency in the way we have been dealing with AMS all along, if there are issues that can be resolved via a phone call to the licensee we ask that you do not contact them directly by yourself. You can either e-mail the issues to us and we will call the licensee, or we can set up a phone conference between you, us and AMS. If another deficiency letter will be needed we would ask that you provide your comments and we will draft the letter.

Thanks for your assistance in these matters!

Kevin Null

CC: JRM4, MFW1

9606240051 960613

NP 19089-01



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION III  
801 WARRENVILLE ROAD  
LISLE, ILLINOIS 60532-4351

March 29, 1996

96-25  
398538

MEMORANDUM FOR: Donald A. Cool, Director  
Division of Industrial and Medical  
Nuclear Safety, NMSS

FROM: *[Signature]*  
John R. Madera, Chief  
Nuclear Materials Licensing Branch, RIII

SUBJECT: REQUEST FOR TECHNICAL ASSISTANCE IN THE REVIEW OF THE  
REVISED EMERGENCY PLAN FOR ADVANCED MEDICAL SYSTEMS, INC.  
(AMS)

Enclosed for your review is a copy of the responses submitted by AMS in reply to our February 28, 1996 deficiency letter.

We are currently reviewing the responses and await your comments before we generate a third deficiency letter, if necessary. An expeditious review of the enclosed responses would be greatly appreciated.

Attachments: AMS' response letter dated March 21, 1996

CONTACT: Kevin Null  
708-829-9854

9606210280 960613  
NMSS LIC30  
34-19087-01 CF



# Advanced Medical Systems, Inc. 96-25

1020 London Rd.  
Cleveland, Ohio 44110  
216-692-3270

March 21, 1996

Mr. J. R. Madera, Chief  
Nuclear Materials Licensing Section  
United States Nuclear Regulatory Commission  
801 Warrenville Road  
Lisle, Illinois 60523-4351

398538

Re: Advanced Medical Systems Inc. (License No. 34-19089-01) Emergency Plan

Dear Mr. Madera:

Advanced Medical Systems, Inc. (AMS) is in receipt of your letter dated February 28, 1996 wherein comments on Revision 0 of the AMS Emergency Plan were provided. Enclosed are our responses to your comments, along with a description of our proposed follow-up actions.

Once you have approved these responses and follow-up actions, the Emergency Plan will be revised in accordance with our commitments. Revision 1 of the Plan will then be distributed to the USNRC and to those individuals on our "first responders" list. Shortly thereafter the first responders will be trained in the provisions of the Plan, and the first emergency drill will be scheduled.

AMS is operating under the conditions of its existing license until final action is taken on our revised renewal application. Consequently, these responses, and ultimately Revision 1 of the Emergency Plan reflect some discontinuity between procedures that do not exist under the provisions of the current license, and those that are proposed for the renewed license. We are hopeful that timely USNRC action on our revised renewal application will permit us to convert all procedural references in the Emergency Plan to the new Radiation Safety Procedures before Revision 1 of the Plan is ready for distribution.

If I can answer any questions or provide you with additional information, please call me at (216) 692-3270. We are looking forward to timely approval of our Emergency Plan.

Sincerely,

Robert Meschter, RSO

cc: D. Cesar  
D. A. Miller, Esq. - Stavole & Miller  
C. D. Berger, C.H.P. - IEM

RECEIVED

MAR 26 1996

REGION III

96052102921060613  
NMSS LIC30  
34A19089A01  
CF

# **ATTACHMENT** **Solicitation Form for First Responders**

Agency Name	Agency Telephone																											
Agency Address	Agency Contact (name):																											
AMS should call this telephone number during normal business hours in the event of an emergency:	AMS should call this telephone number after normal business hours in the event of an emergency:																											
AMS should relay the following information to our agency in the event of an emergency:																												
Our agency will provide the following services in the event of an emergency (check all that apply): <table border="0"> <tr> <td><input type="checkbox"/> Personnel</td> <td><input type="checkbox"/> Radiation Survey Equipment</td> <td><input type="checkbox"/> Emergency Medical Services</td> </tr> <tr> <td><input type="checkbox"/> Respiratory Protection (agency use)</td> <td><input type="checkbox"/> Respiratory Protection (use by others)</td> <td><input type="checkbox"/> Earthmoving Equipment</td> </tr> <tr> <td><input type="checkbox"/> Site Security</td> <td><input type="checkbox"/> Fire Fighting</td> <td><input type="checkbox"/> Crowd Control</td> </tr> <tr> <td><input type="checkbox"/> Protective Clothing (agency use)</td> <td><input type="checkbox"/> Protective Clothing (use by others)</td> <td><input type="checkbox"/> Analytical Services</td> </tr> <tr> <td><input type="checkbox"/> Evacuation Services (describe) _____</td> <td></td> <td></td> </tr> <tr> <td><input type="checkbox"/> Other (describe) _____</td> <td></td> <td></td> </tr> <tr> <td><input type="checkbox"/> Other (describe) _____</td> <td></td> <td></td> </tr> <tr> <td><input type="checkbox"/> Other (describe) _____</td> <td></td> <td></td> </tr> <tr> <td><input type="checkbox"/> Other (describe) _____</td> <td></td> <td></td> </tr> </table>		<input type="checkbox"/> Personnel	<input type="checkbox"/> Radiation Survey Equipment	<input type="checkbox"/> Emergency Medical Services	<input type="checkbox"/> Respiratory Protection (agency use)	<input type="checkbox"/> Respiratory Protection (use by others)	<input type="checkbox"/> Earthmoving Equipment	<input type="checkbox"/> Site Security	<input type="checkbox"/> Fire Fighting	<input type="checkbox"/> Crowd Control	<input type="checkbox"/> Protective Clothing (agency use)	<input type="checkbox"/> Protective Clothing (use by others)	<input type="checkbox"/> Analytical Services	<input type="checkbox"/> Evacuation Services (describe) _____			<input type="checkbox"/> Other (describe) _____			<input type="checkbox"/> Other (describe) _____			<input type="checkbox"/> Other (describe) _____			<input type="checkbox"/> Other (describe) _____		
<input type="checkbox"/> Personnel	<input type="checkbox"/> Radiation Survey Equipment	<input type="checkbox"/> Emergency Medical Services																										
<input type="checkbox"/> Respiratory Protection (agency use)	<input type="checkbox"/> Respiratory Protection (use by others)	<input type="checkbox"/> Earthmoving Equipment																										
<input type="checkbox"/> Site Security	<input type="checkbox"/> Fire Fighting	<input type="checkbox"/> Crowd Control																										
<input type="checkbox"/> Protective Clothing (agency use)	<input type="checkbox"/> Protective Clothing (use by others)	<input type="checkbox"/> Analytical Services																										
<input type="checkbox"/> Evacuation Services (describe) _____																												
<input type="checkbox"/> Other (describe) _____																												
<input type="checkbox"/> Other (describe) _____																												
<input type="checkbox"/> Other (describe) _____																												
<input type="checkbox"/> Other (describe) _____																												
Describe the authority and responsibility of your agency in the event of an emergency at AMS.																												
Describe your interface with other agencies in the event of an emergency at AMS.																												
Describe your location with respect to the AMS facility at 1020 London Road, Cleveland, Ohio																												
If an emergency occurs at AMS, to whom should the public and the media be referred in order to obtain information about the emergency? (Provide name and telephone number).																												
Agency Commitment: This agency agrees to respond to an emergency at AMS.																												
Agency Representative (Signature)	Agency Representative (Print)																											
Position:	Today's Date:																											
AMS Commitment: Advanced Medical Systems, Inc. agrees to abide by these instructions when requesting the emergency assistance of this agency.																												
AMS Representative (Signature)	AMS Representative (Print)																											
Position: Radiation Safety Officer	Today's Date:																											

Please return your completed form to: Robert Meschter, R. S. O., Advanced Medical Systems, Inc., 1020 London Road, Cleveland, Ohio 44110. A fully-executed copy will be returned to you, at the address shown above, shortly thereafter.

**RESPONSE TO COMMENTS FROM  
U. S. NUCLEAR REGULATORY COMMISSION**

**Agency Comment 1(a):** It appears that the onsite emergency organization is comprised of three individuals during working hours, and the absence of one or more individuals could severely impact the licensee's capability to promptly notify offsite response organizations and coordinate the response to an emergency. The licensee is required by 10 CFR 30.32(i)(3)(vii) to plan the notification and coordination so that unavailability of some personnel will not prevent notification and coordination. The plan should describe how the licensee will compensate for the functions assigned to an absent member of the emergency organization.

**AMS Response:** Concur. AMS recognizes its potential staffing limitations in the event of an Alert or Site Area Emergency. However, due to the low probability of occurrence of these events, and the limited activities that are currently on-going at the London Road facility, a staffing increase is not warranted. Furthermore, Section 2 of the Emergency Plan shows that the radiological impact of accidents such as building fires, earthquakes, tornados, vandalism, floods and events at neighboring industrial facilities is relatively small and in no case requires countermeasures or recovery actions. As a result, personnel demands are likely to be small.

**Action Taken:** Page 4-2, lines 19 will be modified to read: "... dose consequences of the incident. If only one AMS staff member is available to assist the Emergency Manager, that staff member will assume both site access and site surveys responsibilities until additional staff members arrive. If no AMS staff members are available to assist the Emergency Manager, the Emergency Manager will delegate both site access and site surveys responsibilities, to the best of his abilities, to other responders until additional staff members arrive."

OK

Page 4-2, lines 20 through 23 will be modified to read: "The Emergency Manager is responsible for contacting off-site emergency response agencies for assistance if the Plan is activated. If less than three (3) AMS staff members are available to assist, the Emergency Manager will assign the responsibility for notifications to the Vice President. In addition, an environmental ...".

**Agency Comment 1(b):** Section 4.2 of the plan should clearly state the order in which AMS staff members assume the role of Emergency Manager if the Radiation Safety Officer (RSO) is not available.

**AMS Response:** Concur.

**Action Taken:** After line 15 on page 4-1, the following sentence will be added: "In the absence or unavailability of the RSO, the authority for implementing the radiation protection program is delegated to the Alternate Radiation Safety Officer (ARSO)."

The sentences beginning on line 11 of page 4-2, will be changed to read: "In the absence of the RSO, the ARSO can serve as the acting Emergency Manager until the arrival of the RSO. In the absence of the RSO and the ARSO, the remaining AMS staff member can serve as the acting Emergency Manager until the arrival of the RSO or the ARSO. All AMS staff members at the facility during an ..."

OK



Agency Comment 1(c): It is still difficult to determine which personnel are assigned to each of the functional areas specified in Section 4.2.2 of Regulatory Guide 3.67. It would be helpful if these functional responsibilities were all specified in one place such as Figure 7.

AMS Response: Concur.

Action Taken: The position entitled "Emergency Manager" on Figure 7 will be modified to read: "Emergency Manager (Personnel evacuation and accountability; search and rescue operation, communications, personnel decontamination; record keeping). The position entitled "Vice President" will be modified to read: "Vice President (Media Contact). The position entitled "Environmental consultant" will be modified to read "Environmental Consultant (Certified Health Physicist, post event assessment, mobilization of intermediate resources). The position entitled "AMS Staff Member (Site Access and Security)" will be modified to read: "AMS Staff Member (Facility system operation, assist fire control, assist first aid, facility security and access control; facility repair and damage control). The position entitled "AMS Staff Member (Radiation Surveys and Assessments)" will be modified to read: "AMS Staff Member (Radiological survey and assessment, facility decontamination). 012

Agency Comment 1(d): During nonworking hours, it is unclear whether a fire or other emergency situation will be detected promptly if power lines or phone lines are down. The plan should describe how the alarm system signal is transmitted to ADT Security Systems and how ADT would detect a loss of contact with the alarm system. Any difference in the response to a loss of contact versus an alarm signal should also be described also.

AMS Response: Concur. However, because this letter and the AMS Emergency Plan are public documents, a detailed description of the alarm system has the potential to compromise its integrity.

Action Taken: Footnote 22 on page 2-6 will be modified to read: "ADT Security Systems, Inc. provides the monitored alarm system for the facility. In the event of a power failure or disruption in telephone services, ADT contacts the individuals on the AMS call-back list. In the event of a fire or intruder alarm, ADT first places a call to the fire or police department, as applicable, and then contacts the individuals on the AMS call-back list."

Agency Comment 1(e): During nonworking hours, it appears that local fire or police units could arrive before AMS staff and it is unclear whether there are adequate provisions to alert offsite response personnel to radiological hazards if no AMS personnel are there to meet them. The plan should describe arrangements with fire, police and rescue personnel regarding how they will fight fires and respond to alarms if AMS personnel are not present when they arrive at the site. The plan should also describe signs and other provisions to prevent offsite response personnel from unknowingly entering areas with elevated radiation levels.

AMS Response: In Section 7.2 of the Plan (page 7-1), AMS has committed to providing annual radiation safety training for first responders. Included in the training is instruction in emergency procedures and the agency's anticipated role in an emergency. During that training, the first responders will be instructed in how to access the facility in the absence of an AMS representative, the maps that are posted immediately inside both entrances on the east side of the building showing the restricted areas, and how to recognize the postings at the entrance to the restricted areas.

Action Taken: Page 7-1, line 17 will be modified to read: "... procedures, radiation protection guidelines, location of restricted areas, posting/labeling, and the agency's anticipated ..."

Agency Comment (2): Engineers Opinion Report

AMS Response: AMS did not receive the USNRC's Inspection Report No. 030-16055/95006, dated March 12, 1996, in sufficient time to evaluate the information and prepare a response. Thus we wish to defer response to Agency Comment (2) until the report has been reviewed.

Action Taken: None at this time. However, a specific response to Agency Comment (2) will be included in the AMS response to Inspection Report No. 030-16055/95006.

Agency Comment 3(a): Section 1.1 contains a brief description of activities formerly conducted at the site, but there is no description of activities currently authorized or conducted. The plan should describe the current activities.

AMS Response: Concur.

Action Taken: Page 1-1, line 6, will be modified to include the following sentence: "These materials are possessed for the purpose of sale or transfer to an authorized third party; for storage incident to disposal, discharge and/or decommissioning; or for use as shielding for AMS and Picker teletherapy and radiography units. Source manufacturing at the London Road facility ceased in 1987."

OK

Agency Comment 3(b): Section 1.1 and Table 1 describe the amount of licensed material possessed on September 21, 1995. This inventory is subject to change and could increase up to the possession limits stated in the license. The plan should state the total quantity of radioactive material authorized by the license. Typical quantities possessed at one time may be noted also.

AMS Response: Concur.

Action Taken: Page 1-1, line 5 will be modified to read: "... license No. 34-19089-01, AMS is currently licensed to possess 340,000 curies of <sup>60</sup>Co in the form of solid metal or sealed sources, and up to 4,040 kilograms of depleted uranium. As of the date of this report, AMS ..."

OK

Agency Comment 3(c): Section 1.1 states that there are over 60,000 curies of cobalt-60 and 2200 kilograms of depleted uranium in the facility, but it is unclear where this material is typically located. Sections 1.2 through 1.2.12 only identify the location of approximately 34,000 curies of cobalt-60. The typical storage locations for the remaining material authorized by the license should be identified.

AMS Response: There are two storage containers holding a total of 20,000 curies of <sup>60</sup>Co in the form of sealed sources. The contents of these containers, which may be re-located within the restricted area from time to time, were omitted from Revision 0 of the Plan.

Action Taken: Page 1-4, line 11 will be modified to read: "that contains approximately 20,000 curies of <sup>60</sup>Co in a non-dispersible form (e.g., in sealed sources housed in shipping containers),"

OK

approximately 2,100 kilograms of depleted uranium in non-dispersible form, and approximately two (2) millicuries . . ."

**Agency Comment 3(d):** The plan still lacks a detailed site drawing showing the exterior features of the building and property described in Section 1.2 of Regulatory Guide 3.67. A detailed drawing of the exterior features of the site must be provided in addition to the interior floor plans. In addition to detailed information about the license's property, the drawing should show the pump house on Mandalay Avenue, the rail line that runs past the facility, and the nearest residents in each direction.

**AMS Response:** Concur.

**Action Taken:** An exterior drawing that shows the pertinent features of the site, including the pump house on Mandalay Avenue, the rail line that runs past the facility, and the nearest residents in each direction will be included as Figure 8. OK

**Agency Comment 3(e):** The terminology used to describe areas in the facility is still inconsistent. [Examples given.] consistent terminology should be used and all areas discussed in the text should be indicated on the drawings.

**AMS Response:** Concur.

**Action Taken:** Page 1-1, line 16 will be modified to read: "a Hot Cell, a High Level Waste Storage Room, and miscellaneous . . ." Page 1-1, line 18 will be modified to read: "a Clean Equipment Room, and the HEPA Equipment Room. The basement . . ." Page 1-1, line 19 will be modified to read: "contains a Source Garden, waste storage . . ." OK

**Agency Comment 3(f):** Section 1.2.3 states that there is an L-shaped shield of sand-filled vaults on two sides of the source garden in the basement, but the floor plan in Figure 2/Appendix B does not show the shield. Significant safety features such as the sand shield, the emergency generator, fire pull stations, and storage locations of emergency response kits should be shown on the floor plans. The floor plans should also identify where electrical and natural gas services enter the building.

**AMS Response:** The sand-filled shield located on two sides of the Source Garden is an integral part of the structure. The shield itself is no more of a special safety feature than the walls on the remaining two sides of the Source Garden. Therefore, additional detail to show the location of this shield in Figure 2 and Appendix B is not necessary. The fire pull station and the electrical control panel are clearly identified on Appendix B.

**Action Taken:** Page 1-3, line 17 will be modified to read: "Additional shielding for accessible areas of the basement is provided by an L-shaped sand-filled shield at the basement level."

The location of the emergency generator, the emergency response kit and the location where natural gas services enter the building will be identified on Appendix B.

**Agency Comment 3(g):** Section 1.3 states that Figure 5 identifies the facility and its proximity to near-by structures. It states that figure 5 shows the location of schools, hospitals and fire stations also. Figure 5 appears to be a poor quality copy of a street map and neither the licensee's building nor any structures

within 1 mile of the site are clearly identified. Figure 1 does not provide an adequate picture of the area near the site either. The plan should contain a reasonably detailed drawing of the site area as described in Section 1.3 of Regulatory Guide 3.67. The plan should also contain a U. S. Geological Survey topographic map (7.5 minute series).

**AMS Response:** Concur.

**Action Taken:** Figure 5 will be replaced with a USGS topographical map showing structures and buildings within one (1) mile of the AMS site.

**Agency Comment 4(a):** The discussion on page 2-2 refers to guidance issued by the ICRP. This guidance is not directly applicable to facilities in the United States. The guidance applicable to protecting the public in this country is contained in the "Manual of Protective Action Guides and Protection Actions for Nuclear Incidents" issued by the U. S. Environmental Protection Agency. The plan should refer to this guidance regarding offsite protective action recommendations.

**AMS Response:** Concur.

**Action Taken:** The paragraph that begins on line 14 of page 2-2 will be revised to read: "The U. S. Environmental Protection Agency provides guidance on when and how to institute countermeasures and recovery actions in the event of a major radiation accident (USEPA, Office of Radiation Programs, "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents", October, 1991). However, countermeasures and recovery actions themselves involve some risk to the public. Consequently, to ensure that the risk avoided is much greater than the risk of the action, they have set a dose limit below which they recommend that no follow-up action whatsoever be taken. The USEPA protective action guides for early-phase countermeasures (evacuation and sheltering) ranges from 1,000 to 5,000 millirem. Therefore, for the major fire scenario at the AMS site, wherein an off-site individual might receive up to 0.3 millirem, countermeasures or recovery actions for purposes of protecting that individual are not indicated." 014

**Agency Comment 4(b):** We have a number of concerns regarding the analysis in Section 2.1.1 and Appendix C of potential doses from a fire. Appendix C states that the source term for the worst case fire was assumed to be 40.4 curies, but the basis for that number is not provided. This does not appear to be a conservative assumption because the revised AMS license application dated October 30, 1995 requests a possession limit of 50 curies for packaged waste and surface contamination, and there is no explanation why the source term should not include bulk quantities of cobalt-60 from containers ruptured by one of the accidents postulated in Chapter 2 such as a gas line explosion, train derailment, or earthquake.

**AMS Response:** It is clearly stated in Sections 1.2.1 through 1.2.12 of the Plan, and again on Table 1 (page 11-2) that approximately 40 curies of the current radioactive materials inventory at AMS are considered to be potentially dispersible. Therefore, this is the value that was used as input to the dose assessments.

In the October 30, 1995 license amendment application, radioactive materials possession limits in excess of the actual inventory were requested for all material forms (e.g., sealed sources, bulk metal, residual contamination, and packaged waste). Since the purpose of the dose estimates in the Emergency Plan are to arrive at a realistic evaluation of the impact of a major building fire,

AMS maintains that 40 curies of potentially-dispersible material is the appropriate source term for the calculations.

Because the bulk <sup>60</sup>Co and the sealed sources are contained in either hardened storage areas (e.g., the Hot Cell, the Source Garden, source heads or shipping containers), it is not likely that these materials would be released in the event of an explosion, train derailment, or earthquake. This explanation was given on page 2-1, lines 25 through 28, and on page 2-1, lines 1 through 5. It is highly improbable that release quantities of these materials that even approaches those contained in 10 CFR 30.72 would occur. Furthermore, the smallest physical size of these materials (1 mm x 1 mm pellets with a density of over 8 grams per milliliter) are not respirable, and the deposition velocity is not conducive to dispersion. AMS sees no justification for including the bulk quantities and sealed sources in a realistic evaluation of the radiological impacts from a major building fire.

Action Taken: None required.

**Agency Comment 4(b):** In addition, we disagree with the statement in footnote 40 that a 10-meter release height is a conservative assumption. A ground level release with no plume rise would maximize the off-site dose estimate.

**AMS Response:** AMS agrees that a ground-level release with no plume rise would definitely maximize the offsite dose estimate. However, footnote 40 on page 13-8 refers to the means by which the emission source is modeled in the event of a major building fire. In this scenario, airborne radioactive materials would exit the building through doors, windows or the existing ventilation system, which has a 10 meter above-grade stack height. In all cases, the release height is above ground level. Furthermore, thermal rise would ensure an even greater release height before the materials could disperse or diffuse through the atmosphere.

The purpose of the dose estimates in the Emergency Plan are to arrive at a realistic evaluation of the impact of a major building fire. Therefore, AMS maintains that a ground-level release is not realistic under the circumstances and that a release height of 10 meters above the ground is indeed a conservative assumption.

Action Taken: None required.

**Agency Comment 4(b):** We note that the CAP88-PC computer code is not intended to estimate short term doses resulting from an unplanned release during an emergency. [An alternative evaluation is provided.] A more detailed and conservative analysis using more appropriate calculational methods should be provided.

**AMS Response:** AMS acknowledged, in footnote 37 on page 13-7, that the CAP88-PC computer code was designed for assessing annual average exposure rates from routine releases of radioactive materials, as opposed to short-term doses from a "puff" release. However, using the assumptions shown in that footnote, the CAP88-PC code will, indeed, over-estimate the dose.

Like the CAP88-PC code, the NUREG-1140 calculation referenced in Agency Comment 4(b) is based upon a gaussian plume model. However, if the Agency representative who used the NUREG-1140 calculation for Comment 4(b) assumed a ground-level release with no plume rise



and a highly-conservative dispersion category, it is not unreasonable to see a dose estimate that exceeds the CAP88-PC estimate shown on page 13-9.

It is important to note that, in both cases, mathematical models are being used to estimate the potential impact on people. When one considers the limitations of these models in regard to such influences as terrain effects, building wake effects, stability categories, and person-specific exposure factors, the difference between 7.7 millirem from the NUREG-1140 calculation and 0.2 millirem from the CAP88-PC calculation is insignificant. Furthermore, all calculated doses are less than the 10 millirem per year dose limit promulgated by the U. S. Environmental Protection Agency in Title 40, Code of Federal Regulations, Part 61, Subpart I (National Emission Standards for Radionuclide Emissions from Facilities Licensed by the Nuclear Regulatory Commission and Federal Facilities Not Covered by Subpart H). Therefore, additional refinements to the computer model or selection of an alternative model, in light of these negligible calculational differences, is not warranted.

**Action Taken:** None required.

**Agency Comment 4(c):** Section 2.1.2 and Appendix C state that an earthquake could create a 100 millirem/hour dose rate 20 feet beyond the outside wall of the source garden. The plan should state the distance at which the dose rate would drop below 2 millirem/hour and whether that location is in an area accessible to the public. In addition, we attempted to run the Microshield code using the assumptions stated in Appendix C but we could not duplicate the results stated in the plan. The input parameters and assumptions should be described in enough detail to permit us to duplicate and evaluate the calculation.

**AMS Response:** Concur.

**Action Taken:** Page 2-3, line 11, will be modified to read: "the building, 0.1 R per hour at a distance of 20 feet from the wall of the building, and two (2) mR per hour at a distance of 140 feet away from the building at the elevation of the Source Garden. There are no off-site residents at any of these locations. However, they are accessible by members of the general public."

Appendix B . . ." Page 13-9, footnote 46 will be modified to read: "The Microshield code is distributed by Grove Engineering, Inc.. Version 4.10 was used for this assessment. The following were used as input to the code: x-coordinate = distance from receptor to outside wall of the Source Garden (e.g., x = 20 feet); y-coordinate = the mid-point of the height of the Source Garden's active area (e.g., y = 21.9 cm); z-coordinate = the mid-point of the width of the Source Garden's active area (e.g., z = 21.9 cm); the outer concrete wall of the Source Garden is 45.7 centimeters thick with a density of 3.6 grams per ml; and the density of the sources in the Source Garden is 8.8 grams per milliliter."

**Agency Comment 4(d):** Section 2.1.3 states that a tornado would not compromise the structural integrity of restricted areas and references the Engineers Opinion Report issued by Neff & Associates. Although this report states that portion of the building contained within the bunker-type construction would not sustain any appreciable distress, it also states "that it is scientifically certain that a tornado passing over this facility would impose significant structural damage" to other parts of the building. Restricted areas on the second floor and in the warehouse areas of the first floor could be completely demolished by a tornado releasing radioactive materials in those areas. Section 2.1.3 should provide a more accurate description



of the potential damage from a tornado, and postulate the maximum amount of radioactive material that could be in these areas as a result of routine storage, preparation for shipments, or other operations.

AMS Response: Partially concur. It is likely that a tornado passing over the facility would impose structural damage to a variety of restricted areas that are not of "hardened" construction. However, of these areas, only the HEPA Room on the second floor contains any dispersible activity of consequence (e.g., two curies). If one disregards the grossly increased dispersion of this material in a tornado, the maximum dose to the nearest off-site resident would be only a fraction of that associated with the fire scenario, wherein 40 curies could potentially be dispersed. Therefore, AMS maintains that the radiological impact of a tornado would be minimal.

Action Taken: None.

Agency Comment 5(a): Section 3.2 is still inconsistent with the notification requirements in the regulations. Pursuant to 10 CFR 30.32(i)(3)(viii), the plan must contain a clear commitment to notify appropriate offsite response organizations promptly after declaring an Alert or Site Area Emergency (SAE). The plan should not differentiate between these classifications or give the impression that the licensee can needlessly wait a full hour before notifying offsite officials of an Alert declaration. In addition, the plan must clearly state that the licensee shall notify NRC immediately after notification of local and State authorities. Simply stating that NRC will be notified within one hour is not sufficient.

AMS Response: Partially concur. Title 10, Code of Federal Regulations, Section 30.32(I)(3)(viii) states that the licensee shall "also commit to notify the NRC operations center immediately after notification of the appropriate offsite response organizations and not later than one hour after the licensee declares an emergency".

Action Taken: Page 3-3, line 17 will be modified to read: "First responders will be notified promptly (within 15 minutes) after an alert or a site area emergency has been declared. The USNRC Operations Center is notified immediately (within one hour) after notification of the first responders after an. . ."

The following bullet will be added after line 17 on page 3-2 and after line 10 on page 3-3: "Notify USNRC Operations Center".

Agency Comment 5(b): Several of the emergency action levels in Attachment 1 of Appendix D are defined in terms of potential exposure rates or actual exposures. It is unclear how the Emergency Manager will be able to identify these conditions in a timely manner. It is unacceptable to wait for survey results if it will take more than 15 minutes to get them. EALs must be defined in terms of conditions that are apparent within the first few minutes of an emergency. This is especially important during nonworking hours. If an alarm goes off and the condition cannot be verified within 15 minutes, the Emergency Manager should act conservatively by declaring an emergency and initiating notification of offsite response organizations. The EALs should be redefined.

AMS Response: Concur.

Action Taken: Attachment 1 of Appendix D will be revised in its entirety. An attachment to this letter shows the revision.

Agency Comment 5(c): The offsite response organizations listed in Attachment 1 of Appendix D to receive a notification vary depending on the event. Each of the organizations identified as a "first responder" should be notified every time an Alert or Site Area Emergency is declared. In addition, all NRC notifications should be made to the NRC Operations Center. The Operations Center coordinates event reports with regional staff.

AMS Response: Concur.

Action Taken: Attachment 1 will be revised to indicate that an Alert and an Site Area Emergency will require notification of all first responder list as well as the USNRC Operations Center. An attachment to this letter shows the revision.

Agency Comment 5(d): The plan does not establish the initial recommendations for offsite protective actions that will be included in the initial SAE notification to offsite organizations. If an accident has the potential to require road blocks or other protective actions offsite, the licensee should act conservatively and make initial recommendations to offsite officials until the scope of the accident can be verified. This would include recommendations to stop traffic on the rail line or rope off potentially contaminated areas. Protective action recommendations should be addressed in Sections 3.1.4 and 3.3., and Appendix D.

AMS Response: Concur.

Action Taken: Attachment 1 to Appendix D will be revised to include protective action recommendations to off-site responders in the event of a Site Area Emergency. An attachment to this letter shows the revision.

The following will be added after line 10 on page 3-3: "The RSO transmits recommendations for offsite protective actions and the recommended radius of protective action implementation to first responders. If the emergency is due to elevated off-site exposure rates, initial recommendations may include roadblocks, traffic/train access control, or evacuation. If the emergency is due to elevated effluent concentrations, initial recommendations may include respirator usage, roadblocks, sheltering, or evacuation. If the emergency is due to elevated exposure rates and effluent concentrations, initial recommendations may include roadblocks, traffic/train access control, respirator usage, sheltering or evacuation."

Agency Comment 5(e): Section 3.3 should specify the minimum frequency of updates to offsite response organizations after the initial notification. The response to our previous comment states that Section 8.3 was being modified to include the information, but the revision does not include this information.

AMS Response: Concur.

Action Taken: After line 10 on Page 3-4, the following sentence will be added: "To ensure the information has been received by the offsite response organization, and to continuous understanding of the status of the emergency, an update call to each first responder for an Alert or a Site Area Emergency will be placed within 90 minutes of the initial notification. Subsequent updates will be as agreed upon between AMS and the responder during the first update call."

**Agency Comment 6(a):** Section 4.2 states that an environmental consulting firm and a certified health physicist have been retained to assist in all matters relating to radiation safety and environmental issues. Figure 7 shown the environmental consultant as part of the AMS emergency organization and it is unclear what function either of these parties would perform during an emergency. The roles of the environmental consultant and the certified health physicist should be clarified.

**AMS Response:** See response to Agency Comment 1(c), above. As stated in page 4-2, line, 22, the environmental consulting firm, and the Certified Health Physicist who is a member of that firm, provides consultation to AMS, on an as-needed basis, "in all matters relating to radiation safety and environmental issues". The environmental consulting firm can, at the direction of AMS, mobilize additional resources in the form of equipment, personnel and services to support the intermediate and long-term emergency response efforts. However, neither the environmental consulting firm nor the Certified Health Physicist are listed as first responders in the event of an emergency at AMS. OK

**Action Taken:** Page 4-2, line 22 will be modified to read: "Health Physicist have been retained by AMS to assist, on an as-needed basis, in all matters relating to radiation safety and environmental issues. The firm can, at the direction of AMS, mobilize additional resources in the form of equipment, personnel and services to support the emergency response effort."

Figure 7 will be modified as described in the response to Agency Comment 1(c), above.

**Agency Comment 6(b):** The response to our previous comment states that letters from the hospital, fire department and police department will be included in the plan. Section 4.3 states that Appendix E contains letters of agreement from "applicable first responders" listed in Table 2 along with information on the agreed upon means of communication and notification with these agencies. Contrary to these statements, Appendix E only contains letters from the fire department and two State agencies and there is almost no information about methods of communication. Complete documentation that offsite response agencies are aware of, and have agreed to their roles as specified in the plan should be provided.

**AMS Response:** In order to give first responders sufficient time to comply with the AMS request for a letter of agreement to respond, and in order to meet our comment to submit Revision 0 of the Emergency Plan to the USNRC within the agreed-upon date, Appendix E of the Plan (page 13-13) contained a listing of those agencies to whom a solicitation was sent, and the notation that "Letters received to date [emphasis added] are included in this section". A copy of the solicitation letter is attached. Since that time, we have received additional letters of agreement, but their contents were not "as expected".

**Action Taken:** A second solicitation letter is being sent to each first responder. Included will be a form to assist them in providing the required information. A copy of the form is attached to this letter.

Agency Comment 6(c): The response to our previous comment concerning the capabilities of offsite organizations and rumor control arrangements stated that the plan would be modified to address these items. The plan does not include this information. In addition to other capabilities, Section 4.4 should specially address whether local fire or police personnel have the capability to conduct radiation surveys.

AMS Response: The local fire and police personnel do not have the capability for conducting radiation surveys. It is our position that including a list of capabilities that the agency does not have in Section 4.4 is counterproductive.

Action Taken: See response to Agency Comment 6(b).

Agency Comment 6(d): Section 4.4 fails to describe some of the organizations listed in Table 2. A description of the responsibilities and capabilities of each of these organizations should be provided.

AMS Response: Concur.

Action Taken: Section 4.4 of the Plan (page 4-3) will be modified to include the responsibilities of the USNRC Operations Center and the Ohio Emergency Management Agency.

Agency Comment 6(e): In Table 2, the organizations do not appear to be listed in the order they would be called. The NRC Operations Center should be notified immediately after appropriate local and State organizations. Table 2 and Attachments 2 and 3 of Appendix D should be revised to prevent confusion.

AMS Response: Concur.

Action Taken: Table 2 of the Plan and Attachment 3 of Appendix D will be re-ordered to match the order shown in Attachment 2 of Appendix D. Attachment 2 will be ordered as follows: City of Cleveland Fire/Police (911 call), Cleveland Emergency Medical Services, Ohio Environmental Protection Agency; Ohio Emergency Management Agency; USNRC Operations Center, and University Hospital of Cleveland. OK

Agency Comment 7(a): The terms used for accidents are still inconsistent. The plan should establish the terms for accidents in Chapter 2 and these terms should be used consistently throughout the rest of the plan. [Examples given.]

AMS Response: Concur.

Action Taken: Page 5-1, line 13 will be modified to read: "... with personnel. The incident will be characterized as a fire, natural phenomenon (e.g., earthquake, tornado or flood), vandalism, explosion (industrial facility impact or underground gas line explosion), or transportation accident. The Emergency Manager ...". OK

Attachment 1 of Appendix D will be modified to include the following event types only for Alerts or Site Area Emergencies: fire, natural phenomenon, vandalism, explosion and transportation accident.

Agency Comment 7(b): We disagree with the statement in Section 5.3 that no actions can be taken to mitigate the consequences of a tornado or flood. When there is advance warning of severe weather conditions, we would expect the licensee to take reasonable steps to secure the facility and minimize releases. If a tornado warning is issued for the site area, we would expect the licensee to declare an alert and take immediate steps to secure licensed materials especially in the warehouse portions of the facility. Section 5.3 and Appendix D should address the mitigating actions that will be taken if a severe weather warning issued.

AMS Response: Partially concur. Because the majority of the AMS inventory is not readily dispersible (see page 2-1, lines 25 through 28, and on page 2-1, lines 1 through 5), there are no additional actions that can be taken to better secure the materials if advance notice of severe weather conditions is received. Procedure step 5.2.3 in Appendix D describes the actions that shall be taken in the event of a "potential compromise" to health and safety. OK

Action Taken: The following sentence will be added after Page 5-1, line 25: "In the event of advance warning of severe weather conditions or other natural phenomenon, all on-going operations involving the handling of radioactive materials will be terminated and the materials will be stored/secured."

Agency Comment 7(c): Section 5.4.1 states that evacuated personnel will assemble at the designated muster area, however the location of the muster area is not specified and it is not shown on any of the drawings. The location of the muster area should be identified.

AMS Response: Concur.

Action Taken: Page 5-2, line 6 will be modified to read: "... and assemble in the AMS parking lot (west) or the Super Cast Inc. parking lot (east), depending upon the direction of prevailing winds. The ...". OK

Agency Comment 7(d): Section 5.4.1 does not describe provisions for search and rescue operations if the RSO cannot account for all personnel. This issue should be addressed.

AMS Response: Concur.

Action Taken: The following sentence will be added after line 7 on page 5-2: "The RSO will initiate search and rescue operations for individuals that are unaccounted for."

Agency Comment 7(e): Section 5.3 states that licensee staff will assist the fire department by conducting surveys during fire fighting efforts. Footnote 25 on page 5-2 states that in the event of a fire, only self-contained breathing apparatus (SCBA) should be worn, and full- or half-face respirators are not permitted. Section 6.4 states that respirators are maintained in the building and Table 3 indicates that a respirator is maintained at the pump house. Please indicate what types of respirators are maintained in the building and the pump house. SCBAs should be available in the building and the pump house to respond to a fire.

AMS Response: Footnote 25 on page 5-2 was added for information purposes only. This footnote was not intended to imply that AMS maintains SCBA's in its inventory. The Cleveland City Fire Department provides its own SCBAs.

Action Taken: Footnote 25 on page 5-2 will be deleted.

Page 6-2, line 3 will be modified to read: "clothing and a minimum of four (4) particulate respirators (full face, negative pressure).

On Table 3, page 11-4, the item listed as "Respirator" will be modified to read "Respirator (full face, negative pressure).

Agency Comment 7(f): Section 5.5 still does not address informed consent. The plan should describe how the Emergency Manager will verify that a volunteer is aware of the health risks before authorizing emergency exposures exceeding 25 rem.

AMS Response: Concur.

Action Taken: Page 5-<sup>3</sup>~~2~~, line 2 will be modified to read: "dose, and only after informed consent has been given."

Page 7-1, line 17 will be modified to read: "... procedures, radiation protection guidelines, location of restricted areas, posting/labeling, radiation risks, informed consent for lifesaving operations, and the agency's anticipated ..."

Agency Comment 7(g): Issuing dosimeters to firemen is not addressed in section 5.11 of Appendix D. This issue should be addressed in the implementing procedure.

AMS Response: Concur.

Action Taken: The following procedural step will be added after step 5.2.2 in Appendix D: "The RSO shall, as necessary, deploy personnel monitoring devices (pocket ionization chambers and/or thermoluminescent dosimeter badges) to emergency personnel."

Procedural step 5.11.6 will be modified to read: "Upon arrival, firemen shall be cautioned as to where radioactive materials are stored and may be issued personnel monitoring devices."

Procedural step 5.11.8 will be modified to read: "A thorough survey of firemen and their equipment shall be performed and personnel dosimeters, if issued, shall be collected prior to their departure from the controlled area."

Agency Comment 7(h): Section 5.5 states that personnel will be monitored for contamination, but there is no description of the procedure for decontaminating personnel if contamination is found. This issue should be addressed.

AMS Response: Concur.

Action Taken: Page 5-3, line 7 will be modified to read: "... an AMS staff member, and decontaminated, as necessary, pursuant to Radiation Safety Procedure No. RSP-009, "Contamination Control".



Agency Comment 7(i): Section 5.6 states that the Cleveland Emergency Medical Service personnel receive annual training, but it is unclear who conducts this training. In addition, there is no letter of agreement confirming that his organization has agreed to transport contaminated individuals. The training issue should be clarified and a letter of agreement should be provided.

OK if  
letter provided

AMS Response: Section 7.2 (page 7-1, line 15) states that annual training is provided by AMS.

Action Taken: See response to Agency Comment 6(b).

Agency Comment 7(j): Sections 5.6 and 5.7 state that the University Hospital of Cleveland is capable of diagnosing and treating radiation injuries, and has a Radiation Safety Officer who will perform surveys and control contamination. There is no letter of agreement from the hospital verifying its capabilities and confirming its agreement with these statements. A letter of agreement should be provided.

OK if  
letter provided

AMS Response: Concur.

Action Taken: See response to Agency Comment 6(b).

Agency Comment 8(a): Section 6.2 does not describe any communications capability at the alternative command center (the pump house). Both the primary and alternative command center should have a telephone or other means of communicating with offsite organizations.

AMS Response: Both command centers have telephone communications.

OK

Action Taken: Page 6-1, line 8 will be modified to read: "system at the London Road facility and at the alternate Command Center (Pump House) are used for . . ."

Agency Comment 8(b): Section 6.4 states that dosimeters and survey meters are stored in the "instrument calibration room" shown in Figure 3, and that protective clothing and respirators are stored "in the locker room or storage room". There is no instrument calibration room indicated on Figure 3 and the storage location for the protective clothing is too vague. It is unclear whether these locations would be accessible during postulated accidents. Section 6.4 should use terminology that is consistent with the labels on the drawings. It would be helpful if the command center, equipment storage locations, first aid kits, emergency generator and other features related to emergency response were specifically indicated on the drawings.

AMS Response: Concur.

OK if  
provided

Action Taken: See response to Agency Comment 3(f).

The location of the instrument calibration room and the storage location will be noted on Appendix B.

Agency Comment 8(c): Section 6.4 and Table 3 only list pocket dosimeters. While pocket dosimeters are useful for real-time dose assessments, they are not very accurate. The licensee should provide more accurate dosimeters (e.g., film badges or TLDs) that can be used to verify personnel exposures after an emergency is brought under control.

AMS Response: AMS takes exception to this comment. Pocket dosimeters, if calibrated, serviced and used as described in USNRC Regulatory Guide 8.4, "Direct and Indirect-reading Pocket Dosimeters" and ANSI N322, "Inspection and Test specifications for Direct and Indirect Reading Quartz Fiber Pocket Dosimeters", are sufficiently accurate indicators of the deep-dose equivalent incurred by the wearer. Film badges and TLD badges are not necessarily more accurate, although they can, in addition to the deep dose equivalent, provide an indication of the shallow dose equivalent and the eye dose equivalent to the wearer. The fact that they have additional capability does not render them more "accurate".

Action Taken: None required.

Agency Comment 8(d): Table 3 indicates that only one respirator and two pocket dosimeters are maintained at the pump house. This does not appear to be sufficient to equip the licensee's staff and offsite rescue personnel that may need to enter the building. The pump house should contain enough respirators and dosimeters to equip the licensee's emergency staff, and enough additional dosimeters to monitor hose crews, search and rescue teams, or other offsite rescue personnel.

AMS Response: Partially concur. Respirators worn for the purposes of limiting internal doses, must be issued and worn pursuant to the requirements contained in 10 CFR 20.1703(3). Since AMS can only ensure compliance with these requirements for AMS personnel, a single respirator at the Pump House is deemed sufficient for use by AMS personnel. Fire fighting personnel are generally equipped with their own respiratory protection (SCBA) and must meet NIOSH/MSHA specifications for their own program. OK

Action Taken: On Table 3, page 11-4, the Minimum Number of the item listed as "Pocket Dosimeters (0 to 1 R)" will be modified to read "6".

Agency Comment 8(e): Table 3 indicates that only one frisker and one survey meter are maintained at the pump house. We believe that at least one additional survey meter should be provided at this location for backup. The range of the survey meters should be specified also.

AMS Response: Partially concur. The operational status of the frisker and survey meter are checked quarterly as described on page 6-2, line 6. Since the devices are not used routinely between quarterly checks, the probability of failure in the event that the Command Center must be evacuated to the alternate location is considered to be small. It is not practical to equip the alternate Command Center similar to the main facility.

Action Taken: On Table 3, page 11-4, the item listed as "Survey Meter" will be modified to read "Survey Meter (0 to 1 R/hr range)". The item listed as "Frisker" will be modified to read "Frisker (0 to 500,000 cpm range)".

Agency Comment 9(a): Section 7.2 should specifically state that the risks of emergency doses will be covered in the training offsite rescue personnel so they can decide in advance what risks they would be willing to accept during lifesaving operations. Numerical estimates of health risks are provided in the EPA Manual of Protective Action Guides. OK

AMS Response: Concur.

Action Taken: Page 7-1, line 17 will be modified to read: "... procedures, radiation protection guidelines, location of restricted areas, posting/labeling, radiation risks, informed consent for lifesaving operations, and the agency's anticipated ..."

Agency comment 9(b): Section 7.3 should state that the exercise objectives and scenario shall be provided to NRC in advance (typically 60 days) to allow NRC to review and comment on the exercise.

AMS Response: Concur.

Action Taken: The following footnote will be added to the end of the sentence on line : "The objectives of the exercise and a summary of the scenario will have been reviewed by the USNRC prior to implementation." OK

Agency Comment 9(c): Sections 7.4 and 7.5 should specify who is responsible for tracking findings from critiques and audits, and verifying that the findings are closed out.

AMS Response: Concur.

Action Taken: The following sentence will be added after page 7-2, line 9: "The IC will track and ensure closure of critique items." Page 7-2, line 14 will be modified to read: "The audit findings are presented at the next scheduled meeting of the IC, who are responsible for tracking and ensuring closure." OK

Agency Comment 9(d): Section 7.5 states that there will be periodic audits. The plan should state that there will be annual audits.

AMS Response: Concur.

Action Taken: Page 7-2, line 11 will be modified to read: "AMS participates in annual audits of all aspects of its ..." OK

Agency Comment 9(e): Section 7.6 should state that the self-life of protective clothing and other degradable materials shall be tracked and changed out on a regular basis. In addition, provisions for calibration of the stack monitor and testing of the emergency generator should be described.

AMS Response: Partially concur.

Action Taken: Page 7-2, line 20 will be modified to read: "Inoperable, expired or missing equipment are repaired/replaced ..."

The following sentence will be added after line 21 on page 7-2: "The emergency generator and other facility devices are confirmed to be operational during routine surveillance activities described in Radiation Safety Procedure No. RSP-008, "Instrumentation and Surveillance".

**Agency comment 10:** Section 8.1 should specify that records of incidents shall be permanently retained with the licensee's decommissioning records.

**AMS Response:** Partially concur. ISP-37, procedure item 7, describes the provisions for maintaining records generated during an incident. AMS does not distinguish between radiation protection records and "decommissioning records". All are maintained pursuant to RSP-004, "Radiation Protection Records".

**Action Taken:** Page 8-1, line 7 will be modified to read: "... is included in ISP-37 (See Appendix D) and in Radiation Safety Procedure No. RSP-004, "Radiation Protection Records".

**Agency Comment 11(a):** The plan still does not have a list of effective pages that a reader can use to verify his copy is complete and up-to-date. A list of effective pages should be provided.

**AMS Response:** Page 7-1, lines 3 through 5 state that page changes to the Plan will not be made. If changes of significance are necessary, the Plan will be re-issued in its entirety.

**Action Taken:** The total number of pages in the Plan will be included in the Table of Contents. OK

**Agency Comment 11(b):** Although Figures 2,3,4 and 5, and Appendix B have cover pages that are numbered, the actual drawings are not numbered or identified as part of the emergency plan. The drawings can be removed from the plan without creating any gaps in the page numbers. Every page of the plan, including the drawings, must be identified with a page number and a revision number/date.

**AMS Response:** Concur. OK

**Action Taken:** Every page of the plan, including the drawings, will be identified with a page number and a revision number. In addition, the total number of pages in the Plan will be included in the Table of Contents.

# ATTACHMENT Proposed Revision to Attachment 1 of Appendix D

F = Fire; X = Explosion; IJ = Injury; P = Personnel Exposure; SP = Spill; L = Loss/Theft; T = Transportation; NP = Natural Phenomenon; O = Other

Event Type	Mechanism	Action Levels	Class	Notifications	Actions	I/E Report	Critique
Building security compromised	L, IJ, P	Indication of unauthorized entry	Unusual Event	USNRC Region III	RSO secures condition.	No	no
	L, IJ, P	Confirmation of unauthorized entry with potential for intruder exposures in excess of 100 mR	Incident	USNRC Region III City of Cleveland Police Department	Operating staff to a state of readiness; provide off-site authorities with sequence of events	yes	no
	L, IJ, P	Confirmation of theft of less than 0.5 Ci of licensed material	Incident	USNRC Region III City of Cleveland Police Department	Operating staff to a state of readiness; provide off-site authorities with sequence of events; assist in return of materials.	yes	yes
	L, IJ, P	Confirmation of theft of greater than 0.5 Ci of licensed material	Alert	First Responders USNRC Command Center	Operating staff to a state of readiness; provide off-site authorities with sequence of events	yes	yes
Loss of Electric Power	P	Hot cell door in open position with personnel exposures of less than 250 mrad	Unusual Event	Cleveland Public Power	RSO secures condition	no	no
	P	Hot cell door in open position with personnel exposures in excess of 250 mrad	Incident	Cleveland Public Power USNRC Region III	RSO secures condition	yes	no
Minor spill	SP, IJ, T	Unexpected Airborne activity in the building <10 DAC over 24 hours	Incident	None	RSO secures condition	yes	no
	SP, P, T	Unexpected exposure rates in the building < 20 mR/hr	Incident	None	RSO secures condition	yes	no
Major Spill	SP, IJ, P, T, F	Unexpected Airborne activity in the building >10 DAC over 24 hours or exposure rates in the building > 20 mR/hr	Incident	USNRC Region III	Operating staff to state of readiness	yes	no

Event Type	Mechanism	Action Levels	Class	Notifications	Actions	I/E Report	Critique
Minor Release	F, X, L, U, P	Projected effluents > 10x expected	Incident	USNRC Region III	Operating staff to a state of readiness	yes	no
	F, X, L, U, P	Actual or projected site boundary exposure rates > 20 mR/hr	Incident	USNRC Region III	Operating staff to a state of readiness; off-site emergency response agencies to a state of readiness; provide off-site authorities with status reports	yes	no
Major Release	F, X, L, NP, U, P	Potential for effluents > 100x expected	Alert	First Responders  USNRC Operations Center	Man response center; dispatch monitoring personnel; mobilize offsite emergency response personnel; provide public information; provide off-site authorities with status reports	yes	yes
	F, X, L, NP, U, P	Actual or projected effluents > 100x expected	Site Area Emergency	First Responders  USNRC Operations Center	Man response center; dispatch monitoring personnel; mobilize offsite emergency response personnel; recommend protective actions; provide public information; provide off-site authorities with status reports	yes	yes
	F, X, L, NP, U, P	Potential for boundary exposure rates > 100 mrad/hr	Alert	First Responders  USNRC Operations Center	Man response center; dispatch monitoring personnel; mobilize offsite emergency response personnel; provide public information; provide off-site authorities with status reports	yes	yes
	F, X, L, NP, U, P	Actual or projected boundary exposure rates > 100 mrad/hr	Site Area Emergency	First Responders  USNRC Operations Center	Man response center; dispatch monitoring personnel; mobilize offsite emergency response personnel; recommend protective actions; provide public information; provide off-site authorities with status reports	yes	yes



ATTACHMENT  
Solicitation Letter Sent to First Responders

September 12, 1995

FIELD(Name)  
FIELD(Address)

Dear FIELD(Salutation):

In the Emergency Plan for Advanced Medical Systems, Inc. (AMS), your organization is listed as a first responder to certain types of emergencies at the London Road facility. Shortly you will be receiving the revised version of the Emergency Plan for this facility. The Plan will describe the type and radiological impact of potential emergencies at the facility, along with information that will be of assistance to you in the event of an emergency.

Pursuant to regulatory guidance, the plan must also contain letters of agreement with all first responders. Therefore, AMS is soliciting a letter of agreement from your agency. The letter should contain your commitment to support AMS in the event of an emergency, your instructions on how to notify and communicate with you during an emergency, and any other information or instructions that should be considered.

Please forward your letter of agreement to me at the address shown above before September 22, 1995. In the meantime, if you have any questions or if I can provide you with additional information, please call me at (216) 692-3270. Thank you in advance for your assistance.

Sincerely,

Robert Meschter, RSO

July 30, 1996

MEMORANDUM TO: Cynthia D. Pederson, Director  
Division of Nuclear Material Safety, RIII

FROM: Donald A. Cool, Director [orig. signed by LCamper, for]  
Division of Industrial and  
Medical Nuclear Safety, NMSS

SUBJECT: TRANSMITTAL OF SAFETY EVALUATION REPORT (SER): ADVANCED  
MEDICAL SYSTEMS, INC. APPLICATION TO AMEND NRC LICENSE NO.  
34-19089 DATED JULY 1, 1996

This memorandum transmits the SER prepared by this Division in support of the license amendment requested by Advanced Medical Systems in a letter of July 1, 1996 to Region III. The Office of General Counsel has no legal objection to this report and we have also coordinated with the Division of Waste Management in development of the SER. To assure completeness of the hearing file regarding the license renewal, please provide a copy of the license amendment to Marian Zobler.

Attachment: Safety Evaluation Report

CONTACTS: George Pangburn, IMNS  
(301) 415-7266

Catherine Haney, IMNS  
(301) 415-7844

DISTRIBUTION: IMNS-5443

NRC Central File

IMOB r/f

IMNS r/f

NMSS r/f

CEstep

RECORD NOTE - COORDINATED WITH:

*OGC: No legal objection / Sue Lewis 7/26/96*

CLE *C.E.*  
IMNS/NMSS  
07/26/96

DOCUMENT NAME: G:AMSTRANS.GCP

To receive a copy of this document, indicate in the box:

"C" = Copy w/o att/encl. "E" = Copy w/att/encl. "N" = No copy

OFC	IMOB	IMOB	IMNS
NAME	GPangburn/gp/11	JJPiccone	DCool
DATE	7/26/96	7/26/96	7/30/96

OFFICIAL RECORD COPY

070065 9608050235

9/10/96 2A 8/12/96

FILED 19960801

DOCKET NO: 030-16055

LICENSEE: Advanced Medical Systems, Inc.  
Cleveland, Ohio

SUBJECT: SAFETY EVALUATION REPORT: ADVANCED MEDICAL SYSTEMS, INC.,  
APPLICATION TO AMEND NRC LICENSE NO 34-19089-01 DATED JULY  
1, 1996

The purpose of this memorandum is to document the staff's safety review of a license amendment application submitted by Advanced Medical Systems (AMS) in a letter of July 1, 1996. In that letter, AMS requested that NRC amend License No. 34-19089-01 to allow it to implement Tasks 1 and 2 of the Building Recovery Plan which AMS submitted in a letter of June 10, 1996. Task 1 encompasses disposal of all accessible sealed cobalt-60 sources and all canisters of bulk cobalt-60 currently possessed at the licensee's London Road facility at a commercial low-level radioactive waste disposal facility while Task 2 includes disposal of dry solid waste currently stored at the facility.

The effect of these tasks would be to reduce the inventory of cobalt-60 at the licensee's London Road facility by approximately 52,000 curies. In its July 1 letter, AMS also proposed to reduce its standby letter of credit from its current amount of \$1,800,000 to \$940,000 and thereby free up \$860,000 to finance the cost of implementing Tasks 1 and 2. These funds would be used solely for the purpose of funding transfer/disposal of the bulk and sealed sources of cobalt-60 and low-level radioactive waste. AMS also agreed in this letter to submit by August 30, 1996 a revision to the "Conceptual Decommissioning Plan for the London Road Facility" that will reflect the reduced onsite source inventory, and by September 15, 1996, assuming approval of the revised conceptual Decommissioning Plan, a revised Decommissioning Funding Plan that will contain a description of a new decommissioning financial assurance instrument.

#### BACKGROUND

From 1979 to 1989, AMS manufactured cobalt-60 sealed sources for teletherapy and radiography machines at its London Road facility. Since May 1991, the licensee has not been authorized, nor does it now desire, to manufacture sealed sources. License No. 34-19089-01 currently authorizes possession of up to 300,000 curies of cobalt-60. At present, approximately 55,000 curies of cobalt-60 in the form of bulk metal, sealed sources and dry solid waste are onsite at AMS' facility. (Of this inventory, approximately 3,000 curies is located in a storage well behind the hot cell stuck plug and will not be removed as part of Tasks 1 and 2.) This large quantity of cobalt-60 is not needed for the limited operations currently authorized under the AMS license.

On November 29, 1994, AMS submitted an application for license renewal. As part of the license renewal process and in accordance with 10 CFR 30.35 (c)(2) and (e), AMS submitted on January 27, 1995, an executed standby letter of credit in the amount of \$1,800,000, which was supposed to reflect its cost estimate for decommissioning. By letter dated March 30, 1995, NRC informed AMS that AMS had underestimated the cost of decommissioning the facility.

960805 0241

11/10/96

On October 11, 1995, in response to a Demand for Information issued by NRC on September 17, 1995, AMS submitted a Strategic Plan to NRC for review. This plan described a number of tasks needed to assure regulatory compliance as well as streamlined routine operations and assigned priorities of high, medium and low to those tasks, as appropriate. One of the highest priority items in the AMS Strategic Plan is a reduction in the inventory of radioactive materials at the London Road facility.

On October 20, 1995, AMS submitted a "Conceptual Decommissioning Plan for the London Road Facility" to NRC. In this document, AMS estimated decommissioning costs to range between \$913,000 and \$3,300,000 depending on decommissioning methodology. As noted above, AMS' January 27, 1995 standby letter of credit submitted in support of its license renewal application was executed in the amount of \$1,800,000. By letter dated March 20, 1996, NRC requested additional information from AMS regarding its decommissioning plan. NRC has received AMS' response and it is currently under staff review.

On June 10, 1996, AMS requested NRC authorization to proceed on a comprehensive Building Recovery Project (BRP) at the AMS facility. The BRP contained a twelve point scope of work. AMS developed this plan because it is currently facing a number of extenuating regulatory, legal and financial circumstances that are hindering its efforts to remain a viable business entity. Included in that letter was a request that NRC release a portion of the funds that AMS has committed for decommissioning the London Road facility to support the commercial disposal costs. AMS believes that once the project is complete, there will be a significantly-reduced radiological risk at the facility, license commitments will more accurately reflect AMS's on-going operational activities, compliance costs will be lower, and routine personnel exposures will be lower.

As noted above, AMS submitted an amendment request on July 1, 1996 to, among other things, amend License No. 34-19089-01 to approve implementation of Tasks 1 and 2 of the BRP.

## DISCUSSION

Task 1 of the BRP involves stabilization, transfer and disposal of approximately 52,000 curies of cobalt-60. Under Task 1, the licensee and the contractor will stabilize the sources and bulk cobalt-60 (excepting those sources inside the hot cell stuck plug) with a disposal site stabilization agent that has been approved by the State of South Carolina. This stabilization will be performed inside shipping cask liners by AMS and the contractor. AMS has committed to use remote handling capabilities to the greatest possible extent in order to minimize personnel exposures from handling and stabilization of the materials. Once the stabilization agent has cured sufficiently, the cask liner will be loaded by AMS and contractor personnel into a lead-shielded, Type B shipping cask for shipment to the Low-Level Waste (LLW) disposal facility at Barnwell, South Carolina. AMS anticipates that this task will be accomplished in one or two shipments, based upon the size of Type B cask that is used. Under Task 2, approximately 2500

cubic feet of dry solid radioactive waste (containing approximately 25 curies of cobalt-60) will be inventoried by AMS, packaged in appropriate shipping containers by the contractor and shipped for disposal at the Barnwell LLW disposal facility. All onsite operations, including those of the contractor, will be conducted under the AMS license.

NRC's Office of Nuclear Material Safety and Safeguards (NMSS) and Region III have been interested in reducing the radioactive source inventory at the AMS London Road Facility since AMS amended its license in 1991 to limit authorized use of licensed materials to non-manufacturing purposes. The highest priority concern listed in the staff's September 17, 1995 Demand for Information (DFI) was "...removal of large quantities of radioactive material and low-level radioactive waste from the facility...." While AMS' continued possession of 55,000 Curies of cobalt-60 in the form of bulk metal, sealed sources and dry solid waste poses no imminent public health and safety risk, the staff noted in the DFI that continued possession of this material "...serves no useful purpose to AMS and poses avoidable risks to the workers and potential risk to members of the public." Staff believes that reduction in this inventory is consistent with the ALARA philosophy and will allow the licensee to focus on the remaining concerns expressed in the staff's September 17, 1995 DFI and the resultant AMS Strategic Plan.

Interest in decreasing source inventory has been heightened by recent legal and financial circumstances facing AMS that have the potential to hinder AMS' efforts to remain a viable business entity that can continue to provide control over activities at the London Road facility so as to protect public health and safety from radiological hazards. Staff believes that AMS' plan to reduce source inventory is a positive step towards reducing any potential for significant repercussions that could impact public health and safety should AMS cease to be a viable entity.

AMS indicated in its June 10, 1996, letter that approximately 40 curies of radioactive material that is stored onsite at the London Road facility is in a potentially dispersible form. This material consists primarily of dry solid waste, carbon granules and ion exchange resins stored in sealed 55-gallon drums or B-25 (steel) boxes. Given that this material is potentially dispersible, staff is concerned that continued storage of material increases the long-term likelihood that radioactive material may be dispersed into areas outside AMS' control.

The request to reduce the amount of the present financial instrument, and use those funds to dispose of the bulk metal, sealed sources and dry radioactive waste is premised on:

- o The importance of prompt action since the waste broker's proposal will be valid for a limited period of time. If NRC does not proceed expeditiously to approve the licensee's proposal, AMS may not be in a position to initiate the project.
- o The Licensee's operating funds are limited and are not sufficient to pay the costs of preparation, transfer and disposal of the material by the waste broker.



## ENVIRONMENTAL REVIEW

Issuance of this license amendment is covered by the categorical exclusion set forth in 10 CFR 51.22 (c)(14)(xvi) from the requirement to prepare an environmental assessment or environmental impact statement. AMS was previously licensed to manufacture and distribute to specific licensees teletherapy and radiography units containing Cobalt-60 sources. The authorization of that activity is covered under a categorical exclusion set forth in 10 CFR 51.22 (c)(14)(xiii). The activities authorized by this amendment involve quantities and forms of byproduct material similar to those previously authorized and hence are covered by 10 CFR 51.22 (c)(14)(xvi). Transportation of the materials from the AMS facility to the Barnwell LLW disposal facility will be accomplished under a general license pursuant to 10 CFR Part 71 and is not part of this licensing action.

## CONCLUSION

Based on information provided in this safety evaluation and in the licensee's June 10, 1996, and July 1, 1996 letters, staff concludes that License No. 34-19089-01 should be amended to authorize the licensee to proceed with the actions described in its July 1, 1996 amendment request: i.e., implementation of Tasks 1 and 2 of the BRP. Although the onsite operations are to be conducted under the AMS license, this amendment will be conditioned to require that the contractor's radiological health and safety procedures be submitted for NRC review and approval before any work begins. This approval is with the further understanding that any funds remaining, after Tasks 1 and 2 of the BRP have been paid, will be returned to Bank One for the purpose of increasing the value of the letter of credit.

The NRC staff acknowledges that the decommissioning funding instrument that will be in place, if AMS reduces the amount of the letter of credit, will be significantly less than what the staff has estimated the decommissioning costs to be. The NRC staff also notes, however, that by allowing AMS to take action to implement Tasks 1 and 2, the onsite source inventory will be significantly reduced. The licensee is attempting to take advantage of a window of opportunity provided by a waste broker and disposal facility. Staff believes that public health and safety will be served by AMS' proceeding with Tasks 1 and 2, even though implementation of those tasks will entail reduction of the letter of credit, inasmuch as those tasks will result in removal of the great majority of the cobalt-60 inventory at the site. This is with the understanding that AMS has committed in its July 1, 1996, letter to submit a revised Conceptual Decommissioning Plan and cost estimate by August 30, 1996. This staff approval is without prejudice to the final NRC staff decision on the acceptability or adequacy of the current decommissioning cost estimate.





UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

August 2, 1996

MEMORANDUM TO: John Madera, Chief  
Nuclear Materials Licensing, RIII

FROM: Donald A. Cool, Director  
Division of Industrial and  
Medical Nuclear Safety, NMSS

SUBJECT: REQUEST FOR TECHNICAL ASSISTANCE IN THE REVIEW  
OF THE STRUCTURAL INTEGRITY REPORT FROM  
ADVANCED MEDICAL SYSTEMS, INC. (AMS)

I am responding to your request for technical assistance regarding AMS's response dated, June 7, 1996, to USNRC Inspection Report No. 030-16055/95006 (DNMS) that looked at the structural integrity of the London Road facility buildings. The overall assessment of the review is provided below, with specific topics addressed in the attachment. This response has been coordinated with the Division of Waste Management (DWM), NMSS.

To our knowledge, there has not been a definitive statement provided by AMS regarding the additional period of time over which the 1958 building structure must perform its confinement function. Consequently, the actions or inactions proposed by AMS cannot be evaluated with respect to the time function. AMS has proposed no repairs, no maintenance program, and no periodic structural integrity inspections or evaluations, but has proposed a movement monitoring program for select areas of the building on a generally 2-year frequency after the initial program startup. AMS has accepted the fact that there may be localized failures of certain building elements under this philosophy of operation but along with its structural consultant has concluded there will be no loss of confinement of stored radioactive material in the concrete core structure. We agree with this assessment for normal conditions, but do not agree that, based on the current facts, this conclusion is valid for the indefinite future. Therefore, we should re-evaluate the conditions and facts at 10-year intervals, unless new information becomes available to cause a change in these intervals.

Contact: Joseph E. DeCicco, NMSS  
(301) 415-7833

96-75  
F122

**NRC FILE CENTER COPY**

9608060208-960802  
NMSS LIC-80  
120119839101 XA RA

SEP 5 1996

With regard to events impacting the AMS site relative to the emergency plan, such as seismic events and tornados, the AMS structural consultant has provided an assessment of the vulnerabilities of the building based on some very simplified analyses. The conclusion is that a 0.1g ground motion at the site would not cause the loss of confinement of the radioactive materials stored in the concrete core. A severe tornado would likely cause heavy damage to all but the concrete core structure, and the test cell and the radiography room would be vented to the atmosphere. We believe that these are reasonable conclusions.

Attachment: As stated

With regard to events impacting the AMS site relative to the emergency plan, such as seismic events and tornados, the AMS structural consultant has provided an assessment of the vulnerabilities of the building based on some very simplified analyses. The conclusion is that a 0.1g ground motion at the site would not cause the loss of confinement of the radioactive materials stored in the concrete core. A severe tornado would likely cause heavy damage to all but the concrete core structure, and the test cell and the radiography room would be vented to the atmosphere. We believe that these are reasonable conclusions.

Attachment: As stated

**DISTRIBUTION:** (IMNS TAR-5398) August 2, 1996

Hard copy

WRC File Center	IMOB r/f w/incoming
IMNS r/f	IMAB r/f w/incoming
NMSS r/f	CEstep
PVacca w/incoming	RShewmaker, DWM

E-Mail only

FCostello, RI	JJohansen, RI
MShanbacky, RI	JKinneman, RI
WPasciak, RI	JPelchat, RII
CHosey, RII	JPotter, RII
JMadera, RIII	BJHolt, RIII
BSpitzberg, RIV	LHowell, RIV
BPrange, WCFO	JDelMedico, OE
JLieberman, OE	

Hard copy w/incoming & E-mail

RBellamy, RI	DCollins, RII
CPederson, RIII	RScarano, RIV
FWenslawski, WCFO	PLohaus, OSP

\*See previous concurrence

DOCUMENT NAME: G:IMNS5398.JED-- INITIALS: \*GCP 7/22/96 CLE/IMNS 7/29/96

OFC	IMOB*	E	IMOB*	E	IMNS
NAME	JDeCicco/jd/II		JPiccone		DCool, RII
DATE	7/12/96		7/29/96		8/12/96

OFFICIAL RECORD COPY

REVIEW OF ADVANCED MEDICAL SYSTEMS, INC., RESPONSE TO  
INSPECTION REPORT NO. 030-16055/95006

Dated June 7, 1996

1. The Advanced Medical Systems, Inc. (AMS) and its structural consultant have identified additional cracking in the southeast corner of the second floor slab and have an opinion as to the cause of the distress in this area. In addition, they are willing to accept a local collapse in the southeast area of the structure and conclude that if such a local collapse were to occur, it would not compromise the concrete core structure where the radioactive materials are stored. The AMS consultant made no comment regarding the need for repairs. Based on these facts, the licensee has proposed that no repairs be made.

We believe that radioactive materials stored in the concrete core structure will be adequately confined to the concrete core structure that will remain intact after any local adjacent failures in the bearing walls. In addition, we believe there is a high degree of confidence that the core will remain intact for at least a period of 10 years.

2. AMS and its structural consultant have investigated the cracking of the north bay of the east wall and concluded that any associated failure with this distressed area would not result in compromising the concrete core structure that contains the radioactive materials. The consultant made no recommendation for repairs to the existing levels of observed distress unless the subject wall at the second floor level were to fail, leaving the building envelope open to the elements.

We believe that radioactive materials stored in the concrete core structure will be adequately confined to that intact core. We believe there is a high degree of confidence that the core will remain intact for at least a period of 10 years.

3. The AMS consultant found no evidence of structural degradation in the roof decking where there was evidence of corrosion on the underside. AMS has proposed no additional activity relative to the roof decking.

We believe the reroofing completed in 1994 should halt or severely retard the corrosion process related to the roof deck panels, and the panel are acceptable for use during the next 10 years.

4. During the investigation, the AMS consultant was able to determine the source of the fluids above the concrete slab of the second floor and also identified the pathway of the fluid as passing through pipe chases, not the structural concrete floor slab. It was concluded that no degradation had taken place as a result of the fluids.

We accept this additional information and conclusion.

5. AMS states that its structural consultant concluded "that even with no repair or maintenance, the AMS building on London Road is capable of providing protective confinement for its licensed radioactive materials inventory for many years into the future." AMS concluded that a routine inspection program is not required but has elected to provide for a position or location survey to monitor the building movement at several critical locations in the structure. After the initial survey, a recheck will be made in 6 months and then every 2 years thereafter. The AMS radiation protection staff will perform routine inspections in order to identify unusual conditions that may warrant further study if conditions were to change between the intervals of surveys.

We note that the AMS consultant stated that the need to periodically inspect and evaluate the building's ability to perform its intended functions over the utilization period was out of the scope of his review. The AMS consultant indicated that a sound maintenance program can result in the lifetimes of similar type facilities being extended 25 to 30 years; however, the elements of such a maintenance program were not provided in the report, and AMS has stated that no maintenance is necessary in order to assure protective confinement of the licensed radioactive materials inventory for many years into the future.

We would expect that the AMS movement monitoring program will, at a minimum, address the possible additional vertical and horizontal movements associated with the southeast corner distress of the 1958 building, as well as the wall of the 1958 building above the original lobby area. We should observe the periodic results of the monitoring program and reevaluate the condition of the building structure, including the capability of the concrete core structure to continue to function, at the end of a 10-year period.

With regard to events impacting the AMS site relative to the emergency plan, such as seismic events and tornados, the AMS structural consultant has provided an assessment of the vulnerabilities of the building based on some very simplified analyses. The conclusion is that a 0.1g ground motion at the site would not cause the loss of confinement of the radioactive materials stored in the concrete core. A severe tornado would likely cause heavy damage to all but the concrete core structure, and the test cell and the radiography room would be vented to the atmosphere. DWM believes, and IMNS agrees, these are reasonable conclusions.

Attachment: As stated

**DISTRIBUTION: (IMNS TAR-5398)**

**Hard copy**

NRC File Center	IMOB r/f w/incoming
IMNS r/f	IMAB r/f w/incoming
NMSS r/f	CEstep
PVacca w/incoming	RShewmaker, DWM

**E-Mail only**

FCostello, RI	JJohansen, RI
MShanbacky, RI	JKinneman, RI
WPasciak, RI	JPelchat, RII
CHosey, RII	JPotter, RII
JMadera, RIII	BJHolt, RIII
BSpitzberg, RIV	LHowell, RIV
BPrange, WCFO	JDelMedico, OE
JLieberman, OE	

**Hard copy w/incoming & E-mail**

RBellamy, RI	DCollins, RII
CPederson, RIII	RScarano, RIV
FWenslawski, WCFO	PLohaus, OSP

\*See previous concurrence

DOCUMENT NAME: G:IMNS5398.JED-- INITIALS: \*GCP 7/22/96 - CLE/IMNS 07/29/96

OFC	IMOB*		IMOB		IMNS	
NAME	JDeCicco/jd/II		JPiccone		DCool	
DATE	7/12/96		7/12/96		7/12/96	

OFFICIAL RECORD COPY



John Madera

- 2 -

severe tornado would likely cause heavy damage to all but the concrete core structure, and the test cell and the radiography room would be vented to the atmosphere. DWM believes, and IMNS agrees, these are reasonable conclusions.

Attachment: As stated

Contact: Robert E. Shewmaker  
(301) 415-6713

Distribution:

NRC Central File

IMNS r/f

IMOB r/f

NMSS r/f

**DOCUMENT NAME: G:IMNS5398.JED**

To receive a copy of this document, indicate in this box: "C"= Copy without attachment/encl. "E" = Copy with attachment/encl

"N" = No copy

OFC	IMOB	E	IMOB		IMNS	
NAME	JDeCicco		JPiccone		DCool	
DATE	1/1/96		1/1/96		1/1/96	

1/12 OFFICIAL RECORD COPY



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

August 14, 1996

MEMORANDUM TO: John Madera, Chief  
Materials Licensing Branch  
Division of Nuclear Materials Safety, RIII

FROM: Josephine Piccone, Acting Chief  
Operations Branch  
Division of Industrial and Medical Nuclear Safety, NMSS *Josephine Piccone*

SUBJECT: REVIEW OF THE PROPOSED WATER ANALYSIS PROCEDURES RECENTLY  
SUBMITTED BY ADVANCED MEDICAL SYSTEMS (AMS)

We have reviewed the water analysis procedures recently developed by AMS and sent to region III on June 11, 1996. These procedures included RSP-018, Operation of the Gamma Spectrometer, and RSP-019, Assessment of Radioactivity in Water Samples. Both procedures were dated June 11, 1996. Our major concerns with the procedures are discussed below. More detailed comments are provided in the attachment to this memorandum.

1. The bases for the proposed maximum detectable activity (MDA) of 70 pCi/l for water samples and 15 pCi/l for filters are not well developed and justified in the technical basis section of Procedure RSP-019. We suggest that AMS provide a more defensible basis for their choice of MDA. In our letter to them dated May 31, 1996, we suggested that the MDA be based on the capability of a detection system that is state of the art for the application but not necessarily extraordinarily specialized or sophisticated. We recommend that AMS expand their technical basis section to include a detailed description of their measurement systems and their testing of these systems to evaluate their measurement capabilities.
2. The procedures make only brief mention of the quality assurance program to be used for their measuring systems. We suggest that AMS develop a better quality assurance program, and provide a detailed description of that program in the technical basis section. The quality assurance program should extend to any outside analytical laboratories that AMS may use to confirm their results.

Contact: Sami Sherbini  
(301) 415-7902

*F/23*

*9402060379*

AUG 19 1996

3. The procedures do not fully develop the bases for determining whether a sample does or does not show activity. They are still using the MDA as a criterion for this purpose, which is incorrect. They need to develop decision levels, independently of the MDA, to allow this determination to be made. The development of this decision level should be described in detail in the technical basis section.
4. AMS has not resolved the discrepancies that appeared several times between their water analyses and those performed by The Northeast Ohio Regional Sewer District (NEORSO). These discrepancies appear to have been due to differences in sampling protocols.
5. The procedures contain several errors in the manipulation of the data, most notably the error of using the MDA for making field decisions, and the incorrect equations provided in the procedures for calculating the MDA.

Attachment: As stated

## ATTACHMENT

### COMMENTS ON AMS PROCEDURES

#### Procedure RSP-018: Operation of the Gamma Spectrometer

Page 2, 5.1.3:

It is not clear what is meant by "so that the two primary peaks fall in channels 155 and 176." Confirm that the maxima of the Co-60 peaks occur at these channel numbers?

#### Procedure RSP-019: Assessment of Radioactivity in Water

1. Page 3, 5.1.2: It is not clear whether the analysis is to be performed in-house or by a commercial laboratory. It should be clear that the laboratory performing the analyses must participate in a quality assurance/quality control program that is approved by AMS and periodically audited by a recognized group or organization outside the organization that operates the laboratory. Pre-qualification of the laboratory is only part of this ongoing program. A later section (5.4.3) states that samples may be forwarded to a commercial analytical laboratory for confirmatory analysis. Some indication should be provided as to when such an action may be necessary.
2. Page 3, 5.2.1: Sampling these tanks has a history that indicates that different results are obtained from samples taken from various locations within the tank. The differences in the results have not been explained, giving the impression that the mixing used by AMS to date has not been effective, and that there remained stratification of the Co-60 even after prolonged mixing. It is therefore necessary for AMS to do one of two things: either explain the differences in the results obtained in the past, or conduct tests to demonstrate that their proposed method does indeed produce representative samples. Without such data, the results will remain suspect because of unexplained past anomalies.
3. Page 3, 5.2.3: In the note, it is stated that samples may be collected from any location in the tank. In the interest of consistency, we suggest specifying a sampling method at this point.
4. Page 4, 5.4.2: It is not clear where the MDA of 70 pCi/l comes from. In our letter to AMS, we stated that AMS should establish a counting method that is considered typical of current and ordinary state of the art for such an

application. We have not seen any data to show that the licensee has done that. We therefore suggest that the licensee establish their well-shielded counting system, in a low background area, select a reasonably long counting time, and then establish the sensitivities achievable by such a system. We are confident that the MDA will be far lower than the proposed 70 pCi/l. Also, in the equation for MDA, if the time is to be in seconds, the procedure should clearly indicate that the count rate  $B_R$  must also be in counts per second.

The Note at the end of this section is not correct. The MDA will not ensure a 0.05 probability of a Type II error when comparing the sample result to the background result. Suggest removing or rewriting to more accurately reflect the technical meaning of the MDA.

The equation for MDA given in this section, and elsewhere in the procedure, is incorrect. The equation, in the form given, contains the implicit assumption that the sample (or gross) counting time and the background counting time are equal. This is not the case, however, because the background is counted for 8 hours, whereas the samples are counted for times less than 8 hours (See procedure RSP-018 for sample counting times). The equation in the form given will underestimate the MDA.

5. Page 4, 5.5.1: This step requires that all samples less than 100 pCi/l be drawn through a filter, even those that show no activity that is statistically different from background. The licensee should confirm that this is the intent.

Finally, information should be added to the section that indicates that proper procedures performed by trained individuals will be used to ensure that the sample will be drawn correctly through the filter.

6. Page 5, 5.5.3: Although the origin of the 15 pCi/l detection concentration level is mentioned in the technical basis section of the document, adequate technical support for this number is not provided. This information should be provided.

This step, or the remainder of the procedure, does not describe what to do with the results of the analyses on the filter. What criteria are to be used to decide if the filter indicates insoluble activity?

7. Page 6, 5.7.4:

The condition given in 5.7.4.2 is not acceptable. The use of MDA as criterion for deciding if activity significantly different from background was detected is incorrect. The licensee must establish a decision level, independently of the MDA, that will be used to make this determination.

Technical Basis for Water Discharge Criteria

1. Page 7, Second point:

This point contradicts the first point. The first point stresses the regulatory requirement that no insoluble Co-60 may be discharged to the sewer. The second point tries to estimate the amount of insoluble Co-60 that may be discharged to the sewer without causing the ash to exceed 8 pCi/g. The analysis in the second point also neglects to consider the possibility that Co-60 discharged to the sewer as soluble cobalt may still end up in the ash because of a number of reasons, such as precipitation of the "soluble" cobalt during waste treatment, or settling of the "soluble" cobalt that is, in fact, not soluble but very finely dispersed insoluble material. We suggest re-assessment of the second point and possibly deleting.

2. Page 7, Third point:

The drinking water standard is not relevant in this case. It is suggested that it be removed because it does not contribute to the technical basis being developed.

3. Page 8, Second Point from the bottom:

This statement concerning Information Notice (IN) 94-07, that "the standard does not provide guidance on how much gross beta activity indicates an insoluble material," is incorrect. The standard states, on Page 4, that "activity in the suspended solids portion of the effluent greater than that found in similarly processed background water samples would indicate the presence of insoluble radioactive material." In other words, the IN states that any activity that is statistically distinguishable from background indicates the presence of insoluble material. Background in this case is the filter residue from water filtered in the same manner as the sample. The water used to produce the background filter is water obtained locally but that is not contaminated by the licensee's operation.

4. Page 9, First point:

This point is at variance with the data NRC has been getting from both commercial



laboratories that were used by AMS and NEORSD to analyze the water samples from the discharge tanks. The results from these laboratories were routinely reported as having been obtained using equipment capable of measuring 1-2 pCi/l using counting times as low as one to two hours. How can these values be reconciled with the values indicated in this point?

In this connection, AMS has not described the system it intends to use for sample analyses. We suggest including this in the technical basis section. It is necessary to know the system to be used, type and size of detector, counting times, background levels in the counting laboratory, location of laboratory within the AMS facility, shielding for the detector, methods of spectral analysis to be used, type of blank samples, and source of water to serve as the background, and the quality assurance program for the system.



# Advanced Medical Systems, Inc.

1020 London Rd.  
Cleveland, Ohio 44110  
216-692-3270

June 11, 1996

Geoffrey C. Wright  
Acting Deputy Director  
Division of Nuclear Material Safety  
U. S. Nuclear Regulatory Commission  
801 Warrenville Road  
Lisle, Illinois 60532-4351

**Re: Radiation Safety Procedures for USNRC License No. 34-19089**

Dear Mr. Wright:

Advanced Medical Systems, Inc. (AMS) is in receipt of your letter dated May 31, 1996 wherein additional information on AMS Radiation Safety Procedure No. RSP-019, "Assessment of Radioactivity in Water Samples" was solicited. The purpose of this letter is to respond to that request.

As you will recall, the February 8, 1996 versions of RSP-018, "Operation of the Gamma Spectrometer" and RSP-019 were forwarded to Mr. Kevin G. Null in my letter dated February 13, 1996. However, subsequent to that submission, and after telephone conversations with you and others at Region III, AMS revised both procedures significantly. The March 11, 1996 versions were then approved by the AMS Radiation Safety Committee, and implemented shortly thereafter.

Enclosed are copies of the most recent versions of these two procedures, which address the issues raised in your May 31, 1996 letter. If additional information is required, please call me at (216) 692-3270.

Sincerely

Robert Meschter, R.S.O.

cc: D. Cesar (w/o attach.)  
D. Miller, Esq. - Stavole & Miller  
C. D. Berger, C.H.P. - IEM (w/o attach.)  
M. Weber - USNRC Region III

4606210138

JUN 17 1996

# Advanced Medical Systems, Inc.

## OPERATION OF THE GAMMA SPECTROMETER

Procedure: RSP 018

Revision No.: 000

Page: 1 of 20

Date: June 11, 1996

Approved by (Vice President):

Approved by (RSO):

Approved by (RSC Chair):

## TABLE OF CONTENTS

1	PURPOSE .....	2
2	SCOPE .....	2
3	REFERENCES .....	2
4	DEFINITIONS .....	2
5	PROCEDURE .....	2
5.1	Determine Energy Response and Regions of Interest .....	2
5.2	Determination of Water Background .....	3
5.3	Determination of Soil Background .....	3
5.4	Determination of Filter Background .....	4
5.5	Determine Efficiency for Water .....	4
5.6	Determine Efficiency for Soil .....	4
5.7	Determine Efficiency for Filter .....	5
5.8	Data Acquisition and Analysis .....	5
5.9	Confirmatory Analysis for Water or Soil .....	7
6	EXEMPTION PROVISIONS .....	7
7	DOCUMENTATION .....	8
8	ATTACHMENTS .....	8

CONTROLLED COPY NO. : \_\_\_\_\_

9606210272

# RADIATION SAFETY PROCEDURE

Minor Change

Number:

By:

Date: / /

## OPERATION OF THE GAMMA SPECTROMETER

No. RSP-018

Rev. No. 000

Date: 06/11/96

Page: 2 of 20

### 1 PURPOSE

The purpose of this procedure is to provide instruction on the operation of the sodium-iodide-based gamma spectroscopy system at Advanced Medical Systems, Inc. (AMS).

### 2 SCOPE

This procedure applies to the routine operation of the gamma spectroscopy system in use at the London Road facility. Analysis of other than water or soil samples are exempt from the requirements of this RSP.

### 3 REFERENCES

- 3.1 U. S. Nuclear Regulatory Commission License No. 34-19089-01 (as amended).
- 3.2 U. S. Nuclear Regulatory Commission Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment".
- 3.3 American Society of Mechanical Engineers, ASME NQA-1, "Quality Assurance Program Requirements for Nuclear Facilities"
- 3.4 U. S. Nuclear Regulatory Commission, NUREG-1507, "Minimum Detectable concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions - Draft Report for Comment", August, 1995.

### 4 DEFINITIONS

The definition of terms used in this RSP that may not be commonly understood shall be included in RSP-002, "Definitions".

### 5 PROCEDURE

#### 5.1 Determine Energy Response and Regions of Interest

- 5.1.1 Energy response and regions of interest shall be determined daily, immediately prior to acquisition of background data.
- 5.1.2 Place a  $^{60}\text{Co}$  calibration source over the detector.
- 5.1.3 Adjust amplifier gain and/or high voltage so that the two primary photopeaks fall in channels 155 (1.17 MeV peak) and 176 (1.33 MeV).

## RADIATION SAFETY PROCEDURE

Minor Change  
Number:  
By:  
Date: / /

### OPERATION OF THE GAMMA SPECTROMETER

No. RSP-018  
Rev. No. 000  
Date: 06/11/96  
Page: 3 of 20

5.1.4 Acquire data until approximately 4,000 counts appear in Channel 176, then stop data acquisition.

5.1.5 Determine the regions of interest.

5.1.5.1 Place the left cursor to the left of channel 155 at the location where the peak tail intersects the continuum.

5.1.5.2 Place the right cursor to the right of channel 176 at the location where the peak tail intersects the continuum.

5.1.6 Record the left and right channel numbers on Attachment 1

#### 5.2 Determination of Water Background

5.2.1 Background count rates in the regions of interest should be determined at least once per work week, at the end of a shift.

5.2.2 Place a Marinelli Beaker containing deionized water over the detector.

5.2.3 Acquire data for a minimum of 28,800 seconds (eight hours).

5.2.4 Determine the number of counts in the Region (from Attachment 1).

5.2.5 Record the counts in the Region on Attachment 2

5.2.6 Determine  $R_B$  as shown on Attachment 2.

#### 5.3 Determination of Soil Background

5.3.1 Background count rates in the regions of interest should be determined at least once per work week, at the end of a shift.

5.3.2 Place a Marinelli Beaker containing dry, cobalt-free soil collected from the AMS property over the detector.

5.3.3 Acquire data for a minimum of 28,800 seconds (eight hours).

5.3.4 Determine the number of counts in the Region (from Attachment 1).

5.3.5 Record the counts in the Region on Attachment 3

5.3.6 Determine  $R_B$  as shown on Attachment 3.

## RADIATION SAFETY PROCEDURE

Minor Change  
Number:  
By:  
Date: / /

### OPERATION OF THE GAMMA SPECTROMETER

No. RSP-018  
Rev. No. 000  
Date: 06/11/96  
Page: 4 of 20

#### 5.4 Determination of Filter Background

5.4.1 Background count rates in the regions of interest should be determined at least once per work week, at the end of a shift.

5.4.2 Place the filter stand and an unused 90-mm diameter filter over the detector.

5.4.3 Acquire data for a minimum of 28,800 seconds (eight hours).

5.4.4 Determine the number of counts in the Region (from Attachment 1).

5.4.5 Record the counts in the Region on Attachment 4

5.4.6 Determine  $R_B$  as shown on Attachment 4.

#### 5.5 Determine Efficiency for Water

5.5.1 Detection efficiency for water should be determined daily, at the start of each shift.

5.5.2 Place the water-equivalent calibration source (Source No. A3082) over the detector.

5.5.3 Perform decay correction on source activity by:

$$A_{\text{today}} (nCi) = 526.3 \text{ e}^{\frac{0.693 \times t (\text{days since March 1, 1995})}{1923.92}}$$

5.5.4 Record corrected activity on Attachment 5 (Item A).

5.5.5 Acquire data for 600 seconds.

5.5.6 Determine the number of counts in the Region (from Attachment 1).

5.5.7 Record counts on Attachment 5.

5.5.8 Determine  $\epsilon_{\text{water}}$

#### 5.6 Determine Efficiency for Soil

5.6.1 Detection efficiencies for soil should be determined daily, at the start of each shift.

5.6.2 Place the soil-equivalent calibration source (Source No. A3083) over the detector.

5.6.3 Perform decay correction on source activity by:

$$A_{\text{today}} (nCi) = 587.6 \text{ e}^{\frac{0.693 \times t (\text{days since March 1, 1995})}{1923.92}}$$



## RADIATION SAFETY PROCEDURE

Minor Change  
Number:  
By:  
Date: / /

### OPERATION OF THE GAMMA SPECTROMETER

No. RSP-018  
Rev. No. 000  
Date: 06/11/96  
Page: 5 of 20

5.6.4 Record corrected activity on Attachment 6 (Item A).

5.6.5 Acquire data for 600 seconds.

5.6.6 Determine the number of counts in the Region (from Attachment 1).

5.6.7 Record counts on Attachment 6.

5.6.8 Determine  $\epsilon_{\text{soil}}$

#### 5.7 Determine Efficiency for Filter

5.7.1 Detection efficiencies for filters should be determined daily, at the start of each shift.

5.7.2 Place the disk calibration source (Source No. IPL-495-51) over the detector.

5.7.3 Perform decay correction on source activity by:

$$A_{\text{today}} (nCi) = 13.4 e^{\frac{0.693 \times t (\text{days since June 1, 1995})}{1973.92}}$$

5.7.4 Record corrected activity on Attachment 7 (Item A).

5.7.5 Acquire data for 600 seconds.

5.7.6 Determine the number of counts in the Region (from Attachment 1).

5.7.7 Record counts on Attachment 7.

5.7.8 Determine  $\epsilon_{\text{soil}}$

#### 5.8 Data Acquisition and Analysis

5.8.1 Collect a full Marinelli beaker of sample.

5.8.2 Label the sample by S-xxxxxx-yy or W-xxxxxx-yy, where S = Soil, W = Water, xxxxxx = today's date (e.g., 030195 for March 1, 1995), and yy = a unique sequential identifier that repeats at the start of each day (e.g., 01, 02, etc.).

5.8.3 Seal the sample container

5.8.4 If the sample is a soil sample, determine the sample mass in grams.

5.8.4.1 Weigh the empty Marinelli beaker (E)

## RADIATION SAFETY PROCEDURE

Minor Change

Number:

By:

Date: 6/13/96

### OPERATION OF THE GAMMA SPECTROMETER

No. RSP-018

Rev. No. 000

Date: 06/11/96

Page: 6 of 20

- 5.8.4.2 Weigh the full Marinelli beaker (F)
- 5.8.4.3 Calculate the sample mass by F minus E
- 5.8.5 If the sample is a water sample (filtered or unfiltered), the volume is assumed to be "one liter"
- 5.8.6 Confirm that the outside of the sample container (if the sample is soil or water) is free of contamination by smearing the outside of the container and ensuring that the smear count is less than "2x background". (If contaminated, place the container in a thin-walled plastic bag prior to placement on the detector.)
- 5.8.7 As necessary, filter the water sample through a 0.45 micrometer filter pursuant to RSP-019.
- 5.8.8 Place the sample or filter over the detector
- 5.8.9 Acquire data for a minimum of 14,400 seconds (four hours) for water samples or filters and 7,200 seconds (two hours) for soil samples.
- 5.8.10 Determine the number of counts in the Region (from Attachment 1).
- 5.8.11 Record counts on Attachment 8 if the sample is water, Attachment 9 if the sample is soil, or Attachment 10 if the sample is a filter.
- 5.8.12 Determine  $R_s$  using the most recent value of  $R_b$  from Attachment 2 (for water), 3 (for soil) or 4 (for filters), and record on Attachment 8, 9 or 10, as applicable.
- 5.8.13 Determine the Concentration and record on Attachment 8, 9 or 10, as applicable.
- Note: Both negative and positive results should be recorded.
- 5.8.14 Determine the Minimum Detectable Activity and record on Attachment 8, 9 or 10, as applicable.

Note: The Minimum Detectable Activity that will assure a 0.05 probability of a Type II error is determined by solving the following equation:

$$MDA = \frac{4.65 \sqrt{RTK16-13-96} \times \sqrt{B_R \times t_s}}{t_s \times E_{water} \times 0.037}$$

where MDA = the minimum detectable activity (pCi/l),  $B_R$  = the background count rate,  $t_s$  = sample count time,  $E_{water}$  = the detector efficiency for  $^{60}\text{Co}$

^ (sec) RTK16-13-96

## RADIATION SAFETY PROCEDURE

Minor Change  
Number:  
By:  
Date: / /

### OPERATION OF THE GAMMA SPECTROMETER

No. RSP-018  
Rev. No. 000  
Date: 06/11/96  
Page: 7 of 20

using a one-liter Marinelli beaker, and 0.037 is a conversion factor used to convert the results of the calculation into units of "pCi per liter".

5.8.15 Remove and archive the sample.

5.8.16 Confirm that the detector casing is free of contamination by smearing the outside of the casing and ensuring that the smear count is less than "2x background".

#### 5.9 Confirmatory Analysis for Water or Soil

5.9.1 Ensure the lid of the Marinelli beaker is securely closed.

Note: Filtered water samples cannot be forwarded for confirmatory analysis.

5.9.2 Log the sample number and other pertinent information onto a Chain of Custody form (Attachment 11).

5.9.2.1 The analysis to be requested for water samples is "gamma spectroscopy for Cobalt-60, with a nominal LLD of no greater than 35 pCi/l"

5.9.2.2 The analysis to be requested for soil samples is "gamma spectroscopy for Cobalt-60, with a nominal LLD of no greater than 5 pCi/g"

5.9.3 Forward the sample and the Chain of Custody form to a pre-selected analytical laboratory by overnight mail carrier (Federal Express or equivalent)

5.9.4 Maintain a copy of the Chain of Custody form and the airbill as the chain of custody record.

5.9.5 When results for water samples are received, record them on Attachment 8 and retain the Certificates of Analysis.

5.9.6 When the results for soil samples are received, record them on Attachment 9 and retain the Certificates of Analysis.

5.9.7 When the results for filtered water (if applicable) are received, record them on Attachment 10 and retain the Certificates of Analysis.

## 6 EXEMPTION PROVISIONS

Variances and exceptions to the requirements of this procedure shall be permitted pursuant to the written authorization of the RSO and the Radiation Safety Committee.

## RADIATION SAFETY PROCEDURE

---

Minor Change

Number:

By:

Date: / /

### OPERATION OF THE GAMMA SPECTROMETER

No. RSP-018

Rev. No. 000

Date: 06/11/96

Page: 8 of 20

---

## 7 DOCUMENTATION

Records shall be maintained pursuant to RSP-004, "Radiation Protection Records"

## 8 ATTACHMENTS

- 8.1 Attachment 1 - Daily Energy Response and Regions of Interest
  - 8.2 Attachment 2 - Daily Water Background Data
  - 8.3 Attachment 3 - Daily Soil Background Data
  - 8.4 Attachment 4 - Daily Filter Background Data
  - 8.5 Attachment 5 - Efficiency Determination for Water Samples
  - 8.6 Attachment 6 - Efficiency Determination for Soil Samples
  - 8.7 Attachment 7 - Efficiency Determination for Filters
  - 8.8 Attachment 8 - Analysis of Water Samples
  - 8.9 Attachment 9 - Analysis of Soil Samples
  - 8.10 Attachment 10 - Analysis of Filters
  - 8.11 Attachment 11 - Chain of Custody Form
-

# ATTACHMENT I

## DAILY ENERGY RESPONSE AND REGIONS OF INTEREST

[illegible]

Instrument Number \_\_\_\_\_

ATTACHMENT 2  
DAILY WATER BACKGROUND DATA

[illegible]



## Instrument Number \_\_\_\_\_

Instrument Number \_\_\_\_\_

Instrument Number \_\_\_\_\_

ATTACHMENT 4  
DAILY FILTER BACKGROUND DATA

[illegible]

## ATTACHMENT 5

Source Number A3082, Activity of 526.3 nCi at 0300 March 1, 1995

[illegible]

100

## ATTACHMENT 6

source Number A3083, Activity of 587.6 nCi at 0300 March 1, 1995

[illegible]



Instrument Number

## ATTACHMENT 8

### ANALYSIS OF WATER SAMPLES

75-61-9 m28

[illegible]



## ATTACHMENT 9

RT 6-17-96

[illegible]

QTM 6-17-92

[illegible]

## Page 1 of

Page 1 of		
(1) Client Name	(7) Samples Shipment Date	(5) Bill to:
(2) Sample Team Leader	(8) Lab Destination	
(3) Task No.	(9) Lab Contact	
(4) Project Manager	(12) Technical Contact/Phone	(10) Report to:
(6) Purchase Order No.	(13) Carrier/Waybill No.	
(11) Required Report Date		

**ONE CONTAINER PER LINE**

[illegible]

(23) Special Instructions	
(24) Possible Hazard Identification Non hazardous <input type="checkbox"/> Flammable <input type="checkbox"/> Skin Irritant <input type="checkbox"/> Poison B <input type="checkbox"/> Unknown <input type="checkbox"/>	(25) Sample Disposal Return to Client <input type="checkbox"/> Disposal by Lab <input type="checkbox"/> Archive _____ months
(26) Turnaround Time Required:    Normal <input type="checkbox"/> Rush <input type="checkbox"/>	(27) QC Level:    I <input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> Project Specific _____
(28) Relinquished by: (signature, date, time):	Received by: (signature, date, time)
Relinquished by: (signature, date, time):	Received by: (signature, date, time)
Relinquished by: (signature, date, time):	Received by: (signature, date, time)

(See Reverse for Instructions)

## INSTRUCTIONS FOR COMPLETING THIS FORM

1. **Client Name:** Record the name of the client (AMS).
2. **Sample Team Leader:** List the name of the team taking these samples.
3. **Task No.:** Indicate the AMS task number, if applicable.
4. **Project Manager:** Record the project manager's name.
6. **Purchase Order No.:** Non-AMS personnel should use this space to record the purchase order number authorizing the analysis of these samples. AMS and AMS subcontractors should leave this space blank if a project number has been given for billing.
7. **Sample Shipment Date:** Indicate the date these samples are shipped to the laboratory.
8. **Lab Destination:** Indicate the laboratory designated for sample shipment. Do not list more than one lab on this form. Be certain before sending samples that the laboratory you are designating is aware of the shipment and is capable of accepting these sample types and has available capacity.
9. **Lab Contact:** Give the name of the laboratory contact (typically the lab's project manager).
10. **Report to:** Give the name, address and phone number of the person to receive the data report for these samples.
11. **Required Report Date:** Record the date which you and the laboratory contact have determined the results will be reported (include verbal or final report as appropriate).
12. **Technical Contact/Phone:** Indicate the name of the person to be contacted in case of any questions regarding these samples and the phone number where the contact may be reached the day the samples arrive in the laboratory.
13. **Carrier/Waybill Number:** If you are sending the samples by a commercial carrier such as Airborne or Federal Express, record the courier company name and the waybill or airbill number under which these samples will be shipped (Example - Fed-Ex/#513631771).
14. **Sample Number:** List the complete, unique identification number of each sample. These numbers must correspond with the identification numbers on the sample containers and the field sample collection document(s).
15. **Sample Description/Type:** Provide a short physical description of the sample and the sample type such as soil, sediment, sludge, water, wipe, air, concentrated waste or bulk.
16. **Date/Time Collected:** Record date and exact time each sample was collected. Use a 24-hour clock; i.e., 1645 not 4:45 p.m.
17. **Container Type:** Indicate the volume, color and type of the sample container used (Example - 1 gallon amber glass, 1 liter clear plastic, 40 milliliter clear glass).
18. **Sample Volume:** Estimate the amount of sample in the container. For air samples, indicate the volume of air sampled.
19. **Preservative:** Indicate what type of preservative, if any, has been used for the samples (Example - ice to 4°C nitric acid, hydrochloric acid).
20. **Requested Testing Program:** List the analyses to be performed on each sample by method number or quotation number.
23. **Special Instructions:** Use this space to record any special instructions to the lab regarding the processing of these samples.
24. **Possible Hazard Identification:** Indicate all hazard classes associated with the sample(s).
25. **Sample Disposal:** Indicate how the samples should be disposed of following analysis. The lab may charge for packing, additional archiving and disposal.
26. **Turnaround Time Required:** Check "Normal" or "Rush" as determined by the Technical Contact and the Lab Contact. Rush samples are subject to a surcharge.
27. **QC Level:** These should be specific to the analytical laboratory and should not be confused with USEPA Analytical Levels. Project Specific should reference a quotation number or other specifications that have been submitted to the laboratory before beginning work.
28. **Signatures:** When releasing custody of these samples, use the "Relinquished By" space to sign your full legal name, date and time of release. After verifying that all samples are present, the person receiving the samples must sign the "Received By" space to take custody of the samples.

# Advanced Medical Systems, Inc.

## ASSESSMENT OF RADIOACTIVITY IN WATER SAMPLES

Procedure: RSP-019

Revision No.: 000

Page: 1 of 9

Date: June 11, 1996

Approved by (Vice President):

Approved by (RSO):

Approved by (RSC Chair):

### TABLE OF CONTENTS

1	PURPOSE .....	2
2	SCOPE .....	2
3	REFERENCES .....	2
4	DEFINITIONS .....	3
5	PROCEDURE .....	3
5.1	Responsibilities .....	3
5.2	Sample Collection from a Hold-up Tank .....	3
5.3	Sample Collection from a Free-flowing Source .....	4
5.4	Data Acquisition .....	4
5.5	Solubility Determination .....	4
5.6	Confirmatory Analysis .....	5
5.7	Discharge of Water .....	5
6	EXEMPTION PROVISIONS .....	6
7	DOCUMENTATION .....	6
8	ATTACHMENTS .....	6

CONTROLLED COPY NO. : \_\_\_\_\_

9606210274

# RADIATION SAFETY PROCEDURE

Minor Change

Number:

By:

Date: / /

## ASSESSMENT OF RADIOACTIVITY IN WATER SAMPLES

No. RSP-019

Rev. No. 000

Date: 06/11/96

Page: 2 of 9

### 1 PURPOSE

The purpose of this procedure is to provide instruction on collecting and analyzing tanked and free-flowing water samples for the presence of  $^{60}\text{Co}$ , and the criteria for discharge of water into the sanitary sewer system.

### 2 SCOPE

This procedure applies to the routine collection and analysis of water samples at the London Road facility of Advanced Medical Systems, Inc. (AMS).

### 3 REFERENCES

- 3.1 U. S. Nuclear Regulatory Commission Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment".
- 3.2 American Society of Mechanical Engineers, ASME NQA-1, "Quality Assurance Program Requirements for Nuclear Facilities"
- 3.3 U. S. Nuclear Regulatory Commission License No. 34-19089-01 (as amended).
- 3.4 American Public Health Association, Method 7110, "Gross Alpha and Gross Beta Radioactivity (Total, Suspended, and Dissolved)", Standard Methods for the Examination of Water and Wastewater.
- 3.5 U. S. Environmental Protection Agency, Gamma Emitting Radionuclides in Drinking Water, Method 901.1, Prescribed Procedures for Measurement of Radioactivity in Drinking Water, EPA 600/4-30-032.
- 3.6 U. S. Department of Energy, Gamma, Section 4.5.2.3, EML Procedures Manual, HASL-300, Environmental Measurements Laboratory.
- 3.7 U. S. Nuclear Regulatory Commission, NUREG-1507, "Minimum Detectable concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions - Draft Report for Comment", August, 1995.
- 3.8 U. S. Nuclear Regulatory Commission, NRC Information Notice 94-07, "Solubility Criteria for Liquid Effluent Releases to Sanitary Sewerage Under the Revised 10 CFR Part 20".



## RADIATION SAFETY PROCEDURE

Minor Change

Number:

By:

Date: / /

### ASSESSMENT OF RADIOACTIVITY IN WATER SAMPLES

No. RSP-019

Rev. No. 000

Date: 06/11/96

Page: 3 of 9

3.9 U. S. Nuclear Regulatory Commission, Communication from J. A. Grobe (Chief, Nuclear Materials Inspection Section 2) to D. Cesar (Treasurer, Advanced Medical Systems), February 1, 1995.

3.10 Advanced Medical Systems, Inc., RSP-018, "Operation of the Gamma Spectrometer".

## 4 DEFINITIONS

The definition of terms used in this RSP that may not be commonly understood shall be included in RSP-002, "Definitions".

## 5 PROCEDURE

### 5.1 Responsibilities

5.1.1 Sample collection and analysis shall be performed by a radiation surveyor.

5.1.2 The RSO should select and pre-qualify the commercial analytical laboratory used to perform confirmatory analyses.

5.1.3 Water shall be discharged only upon the authorization of the RSO.

### 5.2 Sample Collection from a Hold-up Tank

5.2.1 Two re-circulation pumps (approximately 2,500 gph capacity each), or similar methodology, shall be activated within the hold-up tank staged for discharge.

5.2.2 Re-circulation shall continue for a minimum of two (2) tank volumes prior to sample collection to ensure adequate mixing.

**Note:** For example, if the hold-up tank volume is 3,000 gallons, the re-circulation pumps shall be activated 40 minutes prior to sample collection.

5.2.3 A sample of water shall be collected from the hold-up tank into a clean one-liter Marinelli beaker.

**Note:** Samples may be collected from any location of the hold-up tank.

5.2.4 The location, date and time of sample collection shall be documented.

## RADIATION SAFETY PROCEDURE

Minor Change

Number:

B: *F. Meacham*

Date: *6/11/96*

### ASSESSMENT OF RADIOACTIVITY IN WATER SAMPLES

No. RSP-019

Rev. No. 000

Date: 06/11/96

Page: 4 of 9

- 5.2.5 No additional water shall be added to the hold-up tank after the sample has been collected.
- 5.2.6 The re-circulation pumps, or equivalent agitation device, shall remain in operation until the results of the analysis is received.
- 5.3 Sample Collection from a Free-flowing Source
- 5.3.1 A sample of water shall be collected from within the free-flowing source into a clean one-liter Marinelli beaker.
- 5.3.2 The location, date and time of sample collection shall be documented.
- 5.4 Data Acquisition
- 5.4.1 Water samples shall be analyzed by the methodologies described in RSP-018.
- 5.4.2 Counting conditions shall ensure a nominal detection limit of no greater than 70 pCi per liter using the following equation:
- $$MDA = \frac{3 - \overset{4.65 \text{ RTCL 6-12-96}}{12.86} \times \sqrt{B_R \times t_s}}{t_s \times E_{\text{water}} \times 0.037} \quad (\text{SEC})$$
- where MDA = the minimum detectable activity (pCi/l),  $B_R$  = the count rate from a "background" sample,  $t_s$  = sample count time,  $E_{\text{water}}$  = the detector efficiency for  $^{60}\text{Co}$  using a one-liter Marinelli beaker, and 0.037 is a conversion factor used to convert the results of the calculation into units of "pCi per liter".
- Note:** This calculational methodology will ensure a 0.05 probability of a Type II error when comparing the sample result to the background result.
- 5.4.3 Samples may be forwarded to a commercial analytical laboratory for confirmatory analysis.
- 5.5 Solubility Determination
- 5.5.1 Samples that contain less than 100 pCi/liter of  $^{60}\text{Co}$  shall be drawn (by vacuum pump) through a 0.45 micrometer filter.
- Note:** The entire one (1) liter sample shall be drawn through the filter.
- 5.5.2 The filtered sample shall be re-analyzed pursuant to RSP-018.

# RADIATION SAFETY PROCEDURE

Minor Change

Number:

By: *R. Muschke*

Date: 6/13/96

## ASSESSMENT OF RADIOACTIVITY IN WATER SAMPLES

No. RSP-019

Rev. No. 000

Date: 06/11/96

Page: 5 of 9

- 5.5.3 Counting conditions shall ensure a nominal detection limit of no greater than 15 pCi per liter.

$$MDA = \frac{3 + (4.65 \times \sqrt{B_R \times t_s})}{t_s \times E_{filter} \times 0.037}$$

*Handwritten notes: 4.65 Rm 4 2-17-96*

where MDA = the minimum detectable activity (pCi/l),  $B_R$  = the count rate from a "background" filter,  $t_s$  = sample count time,  $E_{filter}$  = the detector efficiency for  $^{60}\text{Co}$  using a disk source, and 0.037 is a conversion factor used to convert the results of the calculation into units of "pCi per liter".

*Handwritten note: (sec) Rm C-13-76*

Note: This calculational methodology will ensure a 0.05 probability of a Type II error when comparing the sample result to the background result.

### 5.6 Confirmatory Analysis

- 5.6.1 The sample container shall be enclosed inside of two zip-lock baggies, labeled, and a Chain of Custody Form shall be completed as described in RSP-018.

Note: Filtered water samples cannot be forwarded for confirmatory analysis.

- 5.6.2 The sample, with its Chain of Custody form, shall be shipped to the commercial analytical laboratory.

- 5.6.3 The samples shall be analyzed by gamma spectroscopy for Cobalt-60 pursuant to EPA Method 901.1 or HASL-300, with a nominal LLD of no greater than 15 pCi/l.

- 5.6.3.1 Analytical results that are less than the MDA or greater than 100 pCi/liter shall be forwarded to the RSO and no additional analyses are necessary.

- 5.6.3.2 Analytical results that are greater than the MDA but less than 100 pCi/liter shall be analyzed for suspended gross alpha and gross beta radioactivity pursuant to American Public Health Association Method 7110.

- 5.6.4 When results from the analytical laboratory are received, they shall be recorded and retained as described in RSP-018.

### 5.7 Discharge of Water (See Attachment 1 for technical basis)

- 5.7.1 Discharges of sampled water shall not exceed 25,000 gallons in a 24 hour period.

## RADIATION SAFETY PROCEDURE

Minor Change  
Number:  
By:  
Date: / /

### ASSESSMENT OF RADIOACTIVITY IN WATER SAMPLES

No. RSP-019  
Rev. No. 000  
Date: 06/11/96  
Page: 6 of 9

5.7.2 Water that contains greater than 100 pCi/l of  $^{60}\text{Co}$  as determined from the sampling and analysis effort described herein shall not be discharged.

5.7.3 Water than contains no detectable  $^{60}\text{Co}$  activity (e.g., activity above the MDA) may be discharged.

5.7.4 Water that exhibits both of the following may be discharged:

5.7.4.1 Less than 100 pCi/l of  $^{60}\text{Co}$  by direct counting and

5.7.4.2 No detectable  $^{60}\text{Co}$  activity (e.g., activity above the MDA) on a 0.45 micrometer filter after filtration.

## 6 EXEMPTION PROVISIONS

Variances and exceptions to the requirements of this procedure shall be permitted pursuant to the written authorization of the RSO and the RSC.

## 7 DOCUMENTATION

7.1 Records to be maintained shall include:

7.1.1 Forms generated pursuant to RSP-018.

7.1.2 Chain of Custody documentation (forms, airbills, etc.)

7.1.3 Requests for analysis

7.1.4 Certificates of Analysis

7.1.5 Discharge logs/records

7.2 Records shall be maintained pursuant to RSP-004.

## 8 ATTACHMENTS

Attachment 1 - Technical Basis for Water Discharge Criteria

# RADIATION SAFETY PROCEDURE

Minor Change

Number:

By:

Date: / /

## ASSESSMENT OF RADIOACTIVITY IN WATER SAMPLES

No. RSP-019

Rev. No. 000

Date: 06/11/96

Page: 7 of 9

### ATTACHMENT 1 TECHNICAL BASIS FOR WATER DISCHARGE CRITERIA

The objective of the water sampling and discharge program at Advanced Medical Systems, Inc. (AMS) is to ensure compliance with applicable regulations for the discharge of water into the sanitary sewer system, as well as the radiological health and safety of employees and members of the general public. To ensure that these objectives are met, there must be clear instruction on how to interpret the results of sampling and analysis. These instructions were developed such that a maximum of 25,000 gallons of water may be discharged over a single day. Water to be discharged must be sampled and confirmed to contain less than 100 pCi/l of  $^{60}\text{Co}$ . However, any detectable  $^{60}\text{Co}$  in the sample must be deemed "soluble" in water.

These instructions were not selected arbitrarily. Instead, they were based upon analysis of a series of regulatory and technical constraints and requirements. The following is a listing of the pertinent requirement and constraints in regard to gross radioactivity that were considered in developing the water discharge criteria for AMS:

- In Title 10, Code of Federal Regulations, Part 20, the USNRC authorizes discharge of licensed material into the sanitary sewage provided the material is readily soluble (or is readily dispersible biological material) in water, and the concentration of licensed material does not exceed that listed in Table 3 of Appendix B to 10 CFR 20.1001-20.2401. For  $^{60}\text{Co}$ , that concentration is 30,000 pCi/l. Therefore, AMS discharge concentrations must be less than 30,000 pCi/l of soluble  $^{60}\text{Co}$ .
- The USNRC has set a release limit for  $^{60}\text{Co}$  in soils of 8 pCi/g. Therefore, in order to ensure that the waste ash produced at the sewage treatment plant that services AMS remains exempt from regulation, AMS must not discharge insoluble  $^{60}\text{Co}$  in concentrations that exceed 545 pCi/liter. This number was derived from the assumption that every atom of  $^{60}\text{Co}$  discharged from AMS is transported to the ash, that 25,000 gallons of cobalt-bearing waste are discharged per day, and that the sewage treatment plant produces 7.5 tons of ash per day. The following is the calculation that was performed:

$$\text{Discharge Limit (pCi/l)} = \frac{8 \text{ pCi/g}}{\frac{1 \times 10^3 \text{ l}}{\text{day}} \times \frac{1 \text{ day}}{7.5 \text{ ton}} \times \frac{1 \text{ ton}}{1.1 \times 10^4 \text{ grams}}}$$

Therefore, to ensure that there are no adverse radiological impacts on the local sewage treatment plant, and remain consistent with the USNRC's requirements, the discharge concentration from AMS must be less than "X", or 545 pCi/l of  $^{60}\text{Co}$ .

- The USEPA, in Title 40, Code of Federal Regulations, Part 141.16, establishes maximum contaminant levels for radionuclides in drinking water. For  $^{60}\text{Co}$ , that level is based upon assuring that the contaminant does not produce an annual dose equivalent to the total body or any internal organ of more than 4 millirem in a year. This dose limit is equivalent

## RADIATION SAFETY PROCEDURE

Minor Change  
Number:  
By:  
Date: / /

### ASSESSMENT OF RADIOACTIVITY IN WATER SAMPLES

No. RSP-019  
Rev. No. 000  
Date: 06/11/96  
Page: 8 of 9

to a concentration of about 280 pCi/liter. However, no solubility criteria are given in 40 CFR 141.16. Therefore, in order to demonstrate compliance with the drinking water standards, the USNRC's requirements and ensure no adverse impacts on the local sewage treatment plant, the discharge concentration from AMS must be less than 280 pCi/l of soluble  $^{60}\text{Co}$ , even though the discharge will not enter a drinking water supply directly.

- In a United States District Court Order on Consent, the Northeast Ohio Regional Sewer District, who services the AMS facility, entered into a pre-treatment agreement with AMS in regard to radionuclide discharge limits.<sup>1</sup> This agreement stipulates that "water proposed for discharge from the foundation footer drain system that shows the presence of Cobalt 60 in a concentration of 100 picocuries/liter or less, may be discharged".

The following is a listing of the pertinent requirement and constraints in regard to insoluble radioactivity that were considered in developing the water discharge criteria for AMS:

- The USNRC's criteria for solubility are defined in USNRC Information Notice 94-07, "Solubility Criteria for Liquid Effluent Releases to Sanitary Sewerage Under the Revised 10 CFR Part 20". This document lists the acceptable methods for demonstrating compliance with the solubility requirements. One of these is the American Public Health Association (APHA), Method 7110, "Gross Alpha and Gross Beta Radioactivity (Total, Suspended, and Dissolved)", Standard Methods for the Examination of Water and Wastewater.
- APHA Method 7110 contains an analytical procedure for determining the quantity of insoluble gross beta activity in water samples. However, water typically contains significant gross beta activity from isotopes such as uranium and daughters, radium and daughters, thorium and daughters, and  $^{40}\text{K}$ . The standard does not provide guidance on how much gross beta activity indicates an insoluble material.
- The USEPA recognizes the presence of naturally-occurring radioactivity in water. Consequently, 40 CFR 141 indicates that if the average annual concentration of gross beta activity in water is less than 50 pCi/liter, no further analyses are required. Concentrations greater than 50 pCi/l may still be acceptable for a drinking water supply, but isotope-specific analyses are required before the decision is made.

<sup>1</sup> United States District Court, Northern District of Ohio, Eastern Division, Order on Consent, Case No. 1-94 CV 2555, December 22, 1995.



## RADIATION SAFETY PROCEDURE

Minor Change  
Number:  
By:  
Date: / /

### ASSESSMENT OF RADIOACTIVITY IN WATER SAMPLES

No. RSP-019  
Rev. No. 000  
Date: 06/11/96  
Page: 9 of 9

The following is a listing of the pertinent constraints in regard to detection limits that were considered in developing the water discharge criteria for AMS:

- A nominal detection sensitivity for  $^{60}\text{Co}$  in water by the methodology of gamma spectroscopy, when performed at a commercial analytical laboratory, is approximately 20 pCi/liter in a one-hour count time, depending upon the quantity of naturally-occurring radionuclides present in the sample. At AMS, the nominal detection sensitivity for a four-hour count time ranges from 20 to 50 pCi/l, again depending upon the quantity of naturally-occurring radionuclides that are present in the sample.
- A nominal detection sensitivity for  $^{60}\text{Co}$  on a filter by the methodology of gamma spectroscopy, when performed at a commercial analytical laboratory, is approximately five (5) pCi/filter in a one-hour count time, depending upon the quantity of naturally-occurring radionuclides present in the sample. At AMS, the nominal detection sensitivity for a four-hour count time ranges from eight (8) to 15 pCi/l, again depending upon the quantity of naturally-occurring radionuclides that are present in the sample.

In light of the aforementioned requirements and constraints, and to ensure an element of conservatism in its discharge practices, the maximum concentration of  $^{60}\text{Co}$  that may be released into the sewer system or drinking water supplies by AMS is 100 pCi/liter, as determined by gamma spectroscopy. However, any detectable activity (e.g., greater than MDA) must meet the USNRC's criteria for solubility pursuant to APHA Method 7710.

For samples analyzed for solubility at AMS pursuant to RSP-018, "Operation of the Gamma Spectrometer" and RSP-019, "Assessment of Radioactivity in Water Samples", the maximum concentration of insoluble  $^{60}\text{Co}$  activity that might remain undetectable, is approximately 15 pCi/liter. Since discharges at this concentration will clearly impose no radiological impact on the public water supply or the local sewage treatment plant, an AMS discharge of up to 15 pCi/liter of insoluble  $^{60}\text{Co}$ , at total daily volumes of less than 25,000 gallons, is considered to be "below concern".