FIGURES

Specialized Radiological Monitoring and Hazard Assessment Capabilities

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COMMUNCIATIONS

Figure 1. FEMA Regions

See also:

Table 1. MERS and MATTS Regional Responsibilities

MERS or MATTS	Area of Responsibility
Maynard, MA MERS Detachment	FEMA Regions I and II
Thomasville, GA MERS Detachment	FEMA Regions III and IV
Denton, TX MERS Detachment	FEMA Regions VI and VII
Bothell, WA MERS Detachment	FEMA Regions IX and X
Denver, CO MERS	FEMA Regions V and VIII
Berryville, VA MATTS	As required

COMMUNCIATIONS

Figure 2. Incident Communications Plan

INCIDENT COMMUNICATIONS PLAN Telephone				1. Incident Name	2. Date/Time Prepared	3. Operational Period Date/Time
4. Communications Plan Concept of Operation						
5. Contact List						
Section & Position	STATE	FEMA	OFA	Name	Phone Number	Cell Phone Number
Incident Facilities						
Command Staff						
General Staff						
Other FCO/SCO Staff						
ICS 205-A FEMA	6. Prepared by Date/Time				7. Reviewed by Date/Time	

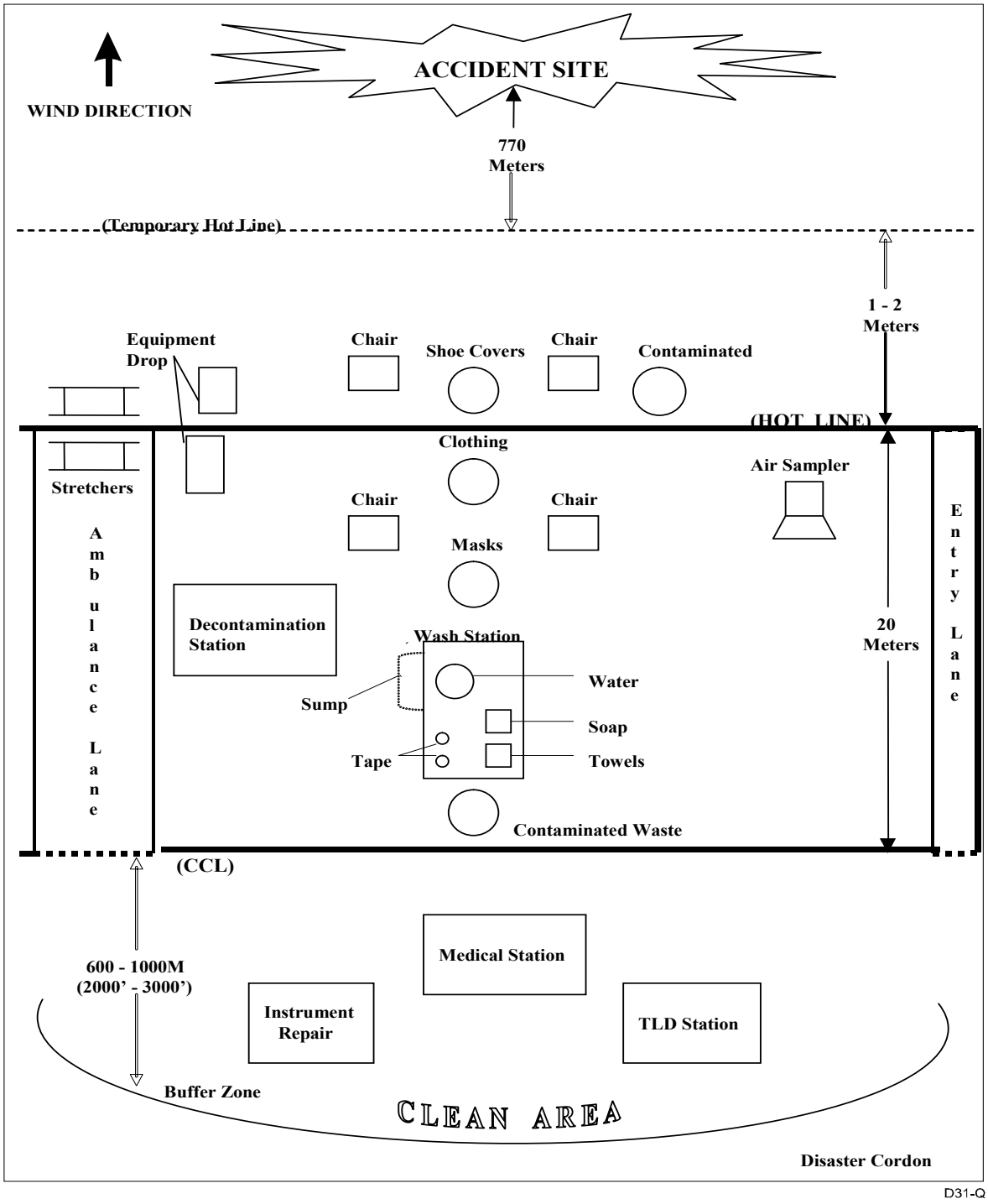
COMMUNCIATIONS

Figure 3. Signal Operating Instruction

Signal Operating Instruction
(Sample Contents)

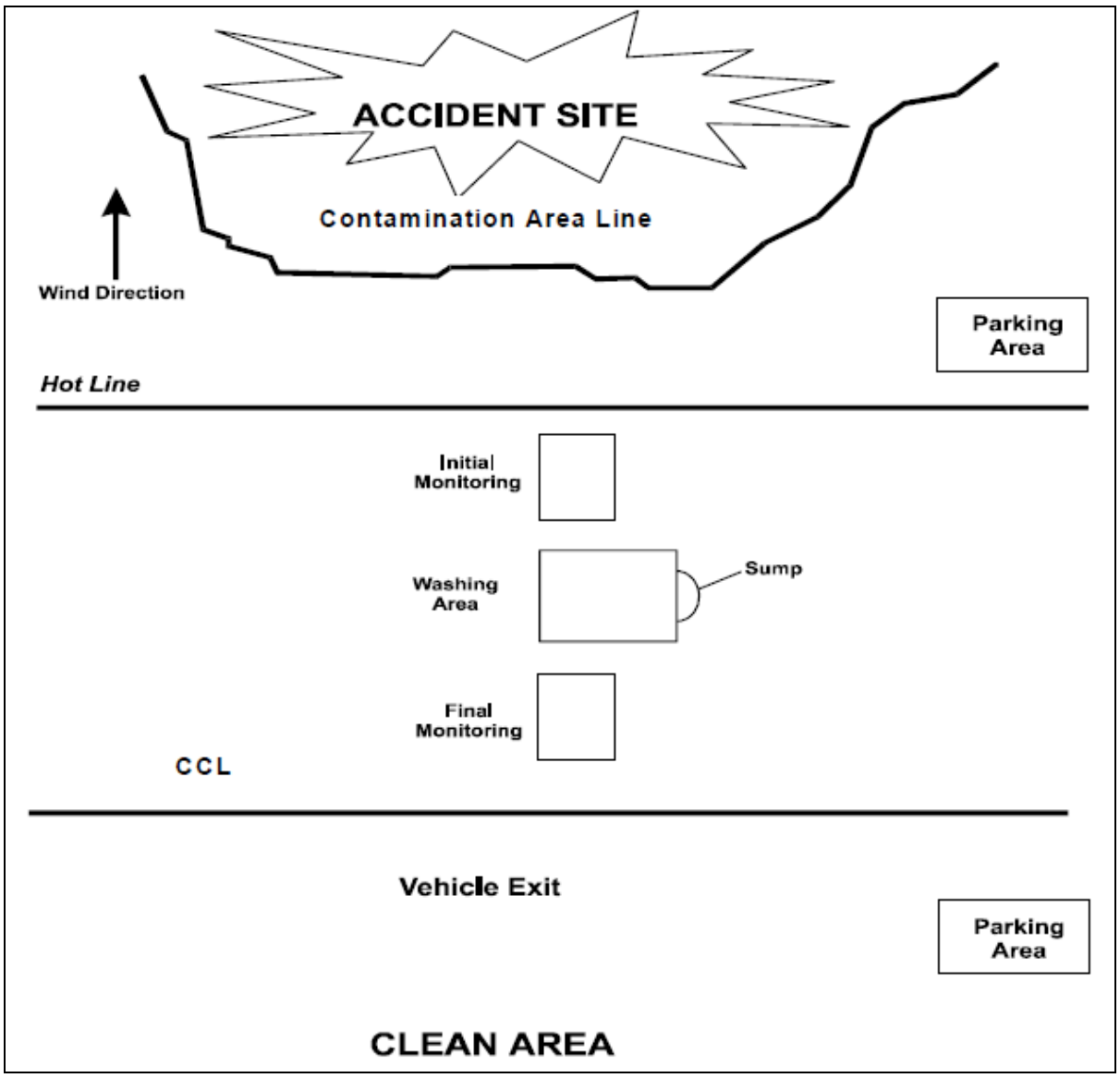
CONTAMINATION CONTROL

Figure 1. Personnel CCS (Example)



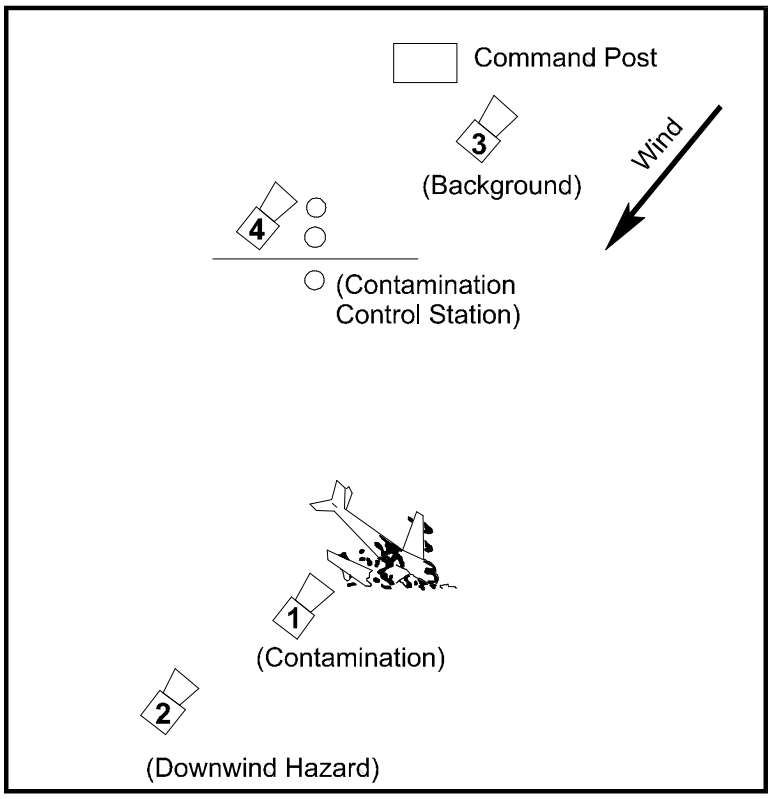
CONTAMINATION CONTROL

Figure 2. Vehicle CCS (Example)



ENVIRONMENTAL SAMPLING

Figure 1. Air Sampler Placement



ENVIRONMENTAL SAMPLING

Figure 2. Equation for Initial Field Evaluation of Air Sampling Data

$$dpm/m^3 = \frac{CPM \times CF}{AFR \times T\ (min)} - \text{Background Reading}$$

where:

CPM = Alpha meter reading on air filter in counts per minute
CF = Conversion factor (3,000 for ADM-300; 4,000 for AN/PDR-56) includes unit conversions, area correction factors, and other constants, assuming use of 8 x 10-inch Whatman #41 filter paper. For 4-inch, (round) filter paper, the conversion factors are 200 and 800 for the AN/PDR-77 and AN/PDR-56, respectively.
AFR = Average Flow Rate of the air sampler in CFM
T = Time in minutes the air sampler was running

ENVIRONMENTAL SAMPLING

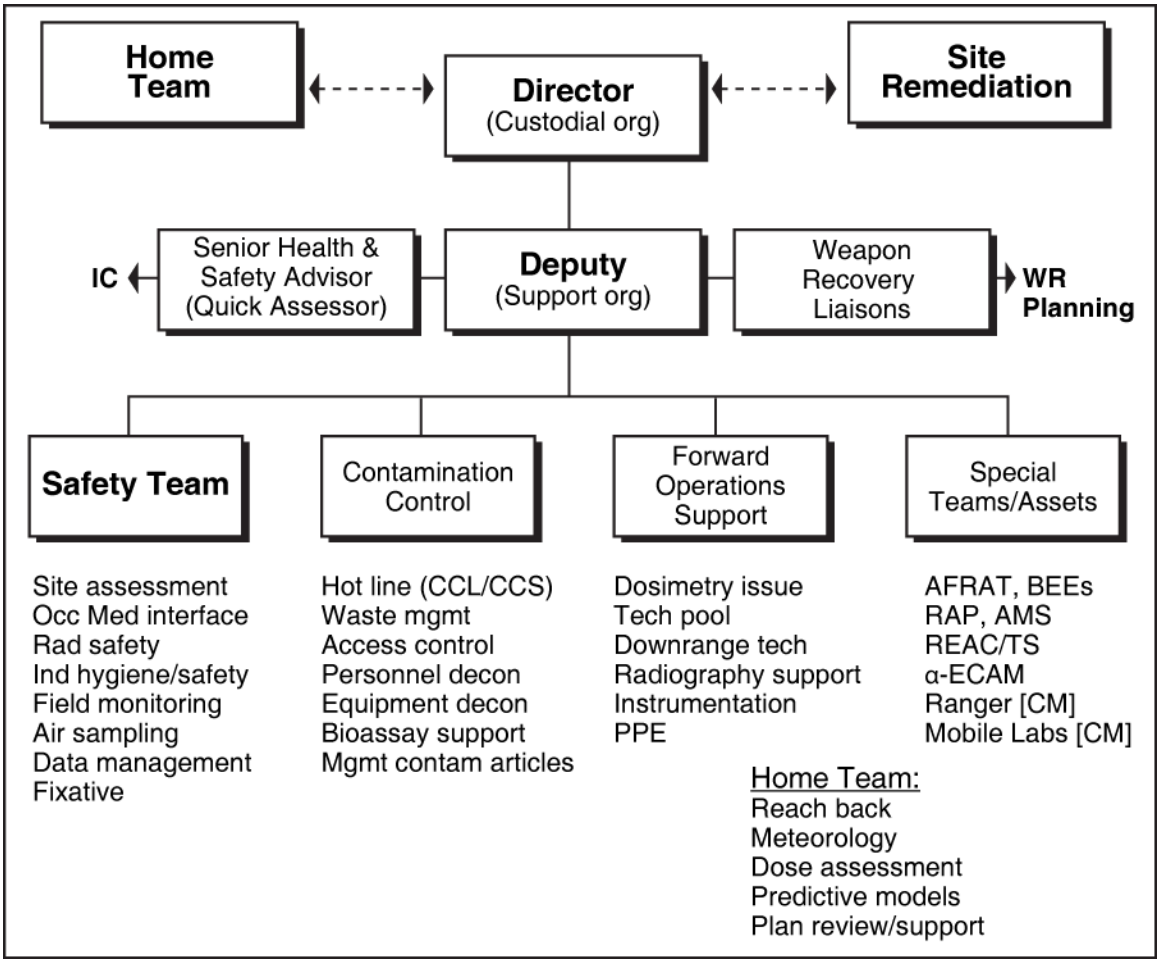
Figure 3. Equation for Field Evaluation of Air Sampling Data

$$dpm/m^3 = \frac{CPM \times A_f}{0.5 \times m^3 \times F \times E_f \times E_c \times A_c}$$

where
- CPM = Alpha meter reading on air filter in counts per minute
- A_f = Area of filter used (any units)
- m^3 = Total volume of sampled air in cubic meters
- F = Alpha absorption factor for filter used (from manufacturer's specifications)
- E_f = Collection efficiency of filter used (from manufacturer's specifications)
- E_c = Efficiency of counting instrument
- A_c = Area of filter actually counted by the instrument (same units as A_f)

HEALTH AND SAFETY

Figure 1. ASHG Functional Diagram



HEALTH AND SAFETY

Figure 2. Inverse Square Law

R2 = R1 X ((D1/D2) squared)

R1 = Dose rate at distance D1 from a point source of gamma.
R2 = Unknown dose rate at distance D2 from a point source of gamma.
D1 = Known distance from point source of gamma where R1 was measured.
D2 = Known distance from point source of gamma for which R2 shall be computed.

HEALTH AND SAFETY

Figure 3. Stay Time

$$T = D/R$$

T = Time of exposure to ionizing radiation expressed in hours or decimal fractions thereof.
R = Dose rate expressed in R/hr or mR/hr, as determined from the beta/gamma instrument.
D = The predetermined maximum yearly cumulative dose:
- 0.5 rem
- 100 mrem: non-occupational (general public)
- 5 rem: occupational dose limit
- 25 rem: to save valuable property
- 100 rem: to save lives
- Other: as decided by the IC consistent with operational considerations.

Note: Working in an area with airborne radioactive materials at a concentration of one DAC, without respiratory protection, results in a Committed Effective Dose Equivalent (CEDE) rate of 2.5 mrem per hour of exposure (which would equate to reaching the 5 rem occupational exposure limit in a 2,000-hour working year).

HEALTH AND SAFETY

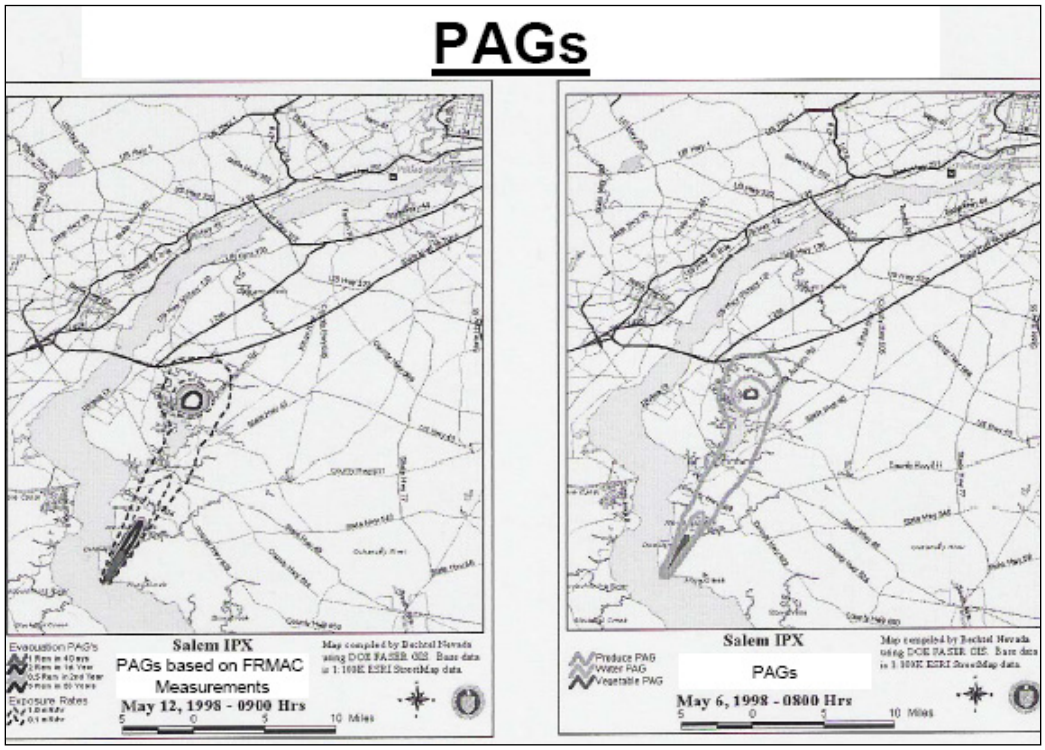
Figure 4. Cumulative Dose

$$D = R(T)$$

D = Cumulative dose received expressed in R or mR.
R = Dose rate expressed in R/hr or mR/hr, as determined from the beta and/or gamma instrument.
T = Time of exposure to ionizing radiation expressed in hours or decimal fractions thereof.

HEALTH AND SAFETY

Figure 5. Aerial Survey Results: PAGs, Evacuation PAGs, and Quarantine Areas



HEALTH AND SAFETY

Figure 6. Sample PAR Form

(Sample PAR)

Protective Action Recommendation

For

Major Accident _____ at (location)

Issued by:

Problem. An accident involving a propane truck and two Safe Secure Trailer (T1 and T2) vehicles carrying _____(type)_____ nuclear weapons occurred at (time, date, and location). The propane truck sideswiped T1 and collided with T2. A fire erupted causing the propane truck to explode. Shortly afterwards, the weapon in T2 experienced a conventional high explosive detonation, resulting in widespread contamination. The T1 vehicle sustained damage and skidded into a ditch, preventing access through its doors to the stored weapon inside.

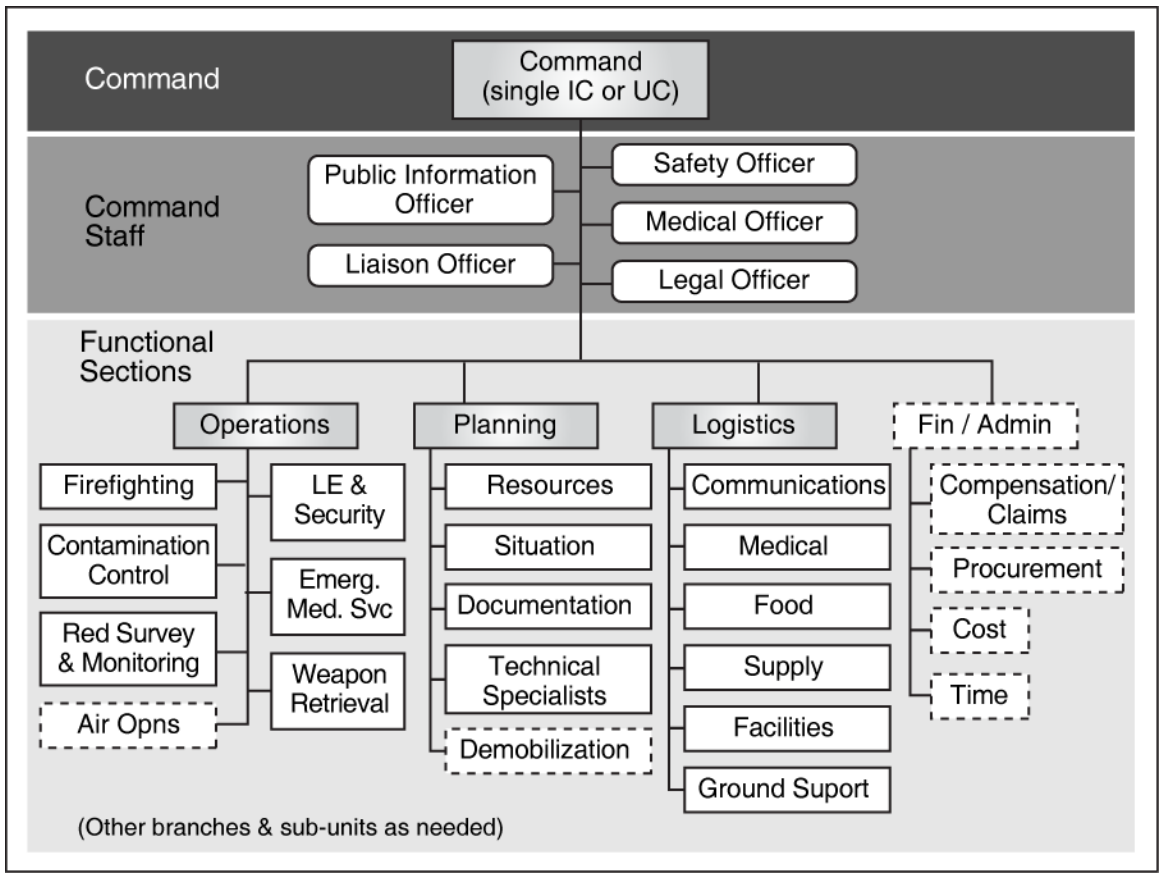
Discussion. Actions to gain access into T1 and remove the weapon have been hampered. It is still possible, though highly improbable, that a second explosion might occur during access and removal of the weapon in T1. In the unlikely event of an explosion, debris might be thrown 2,500 feet with additional contamination released. As a result, an evacuation of (outline the specific area) has been ordered by the (civilian authority office).

Action. With the possibility of an explosion during access and removal operations involving the weapon in T1, the following area shall be evacuated. (Indicate the specific area to be vacated and a schedule indicating evacuation start, completion, verification of evacuation, work start, work completion, and return to the area). All personnel are required to sign in at a specific location(s) during evacuation to help local law enforcement and/or response force personnel verify that all personnel are out of the area before access and removal procedures begin. A holding area, for example, a gymnasium or school, may be a temporary area for evacuees. Also, the evacuees might be released for shopping or other activities outside the area. Once access and removal procedures are completed, the civil authorities shall determine when evacuees may return to their houses and/or businesses, if outside the contaminated area.

Release of this "Protective Action Recommendation" may not precede confirmation of the presence of a nuclear weapon by the IC and should be coordinated with local officials and the IC's Public Affairs Officer before release.

INCIDENT COMMAND SYSTEM FUNCTIONAL APPENDIX

Figure 1. Notional Nuclear Weapon Accident Incident Command

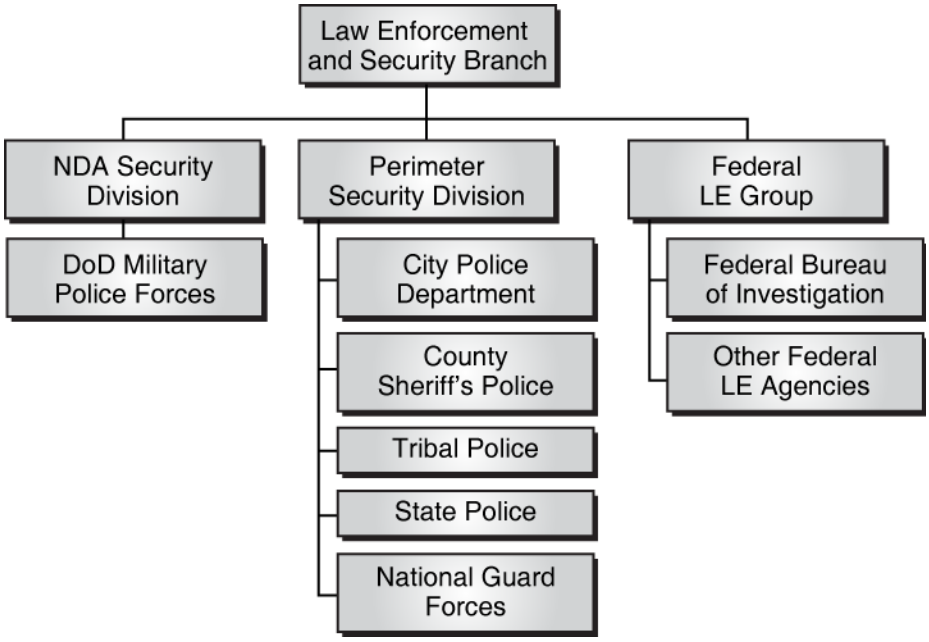


INCIDENT COMMAND SYSTEM FUNCTIONAL APPENDIX

Figure 2. Notional Operations Section Organizational Structure

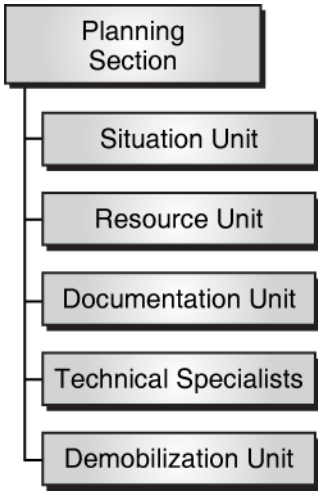
INCIDENT COMMAND SYSTEM FUNCTIONAL APPENDIX

Figure 3. Notional Jurisdictional Divisions



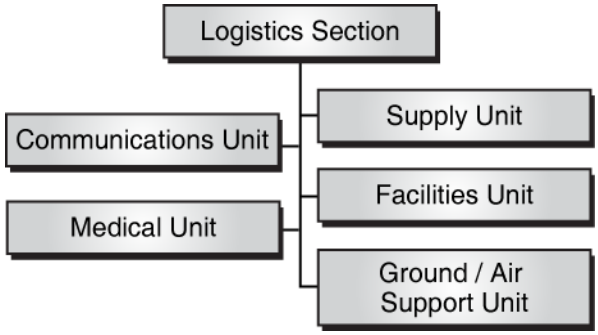
INCIDENT COMMAND SYSTEM FUNCTIONAL APPENDIX

Figure 4. Notional Planning Section Organizational Structure



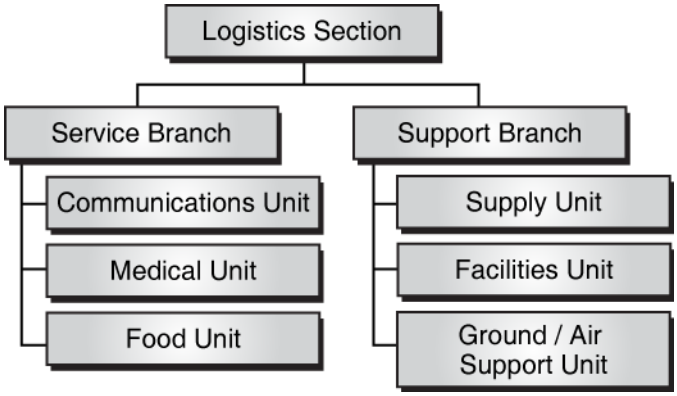
INCIDENT COMMAND SYSTEM FUNCTIONAL APPENDIX

Figure 5. Notional Logistics Section Organizational Structure



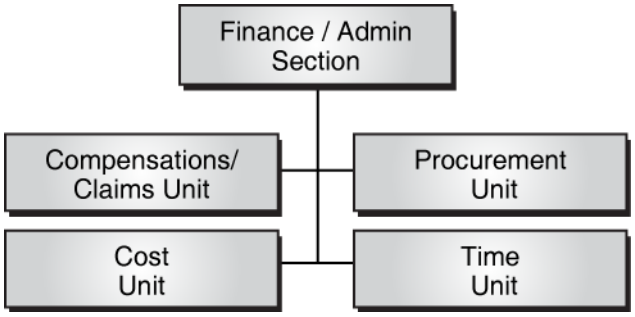
INCIDENT COMMAND SYSTEM FUNCTIONAL APPENDIX

Figure 6. Notional Logistics Section: Two Branch Organizational Structure



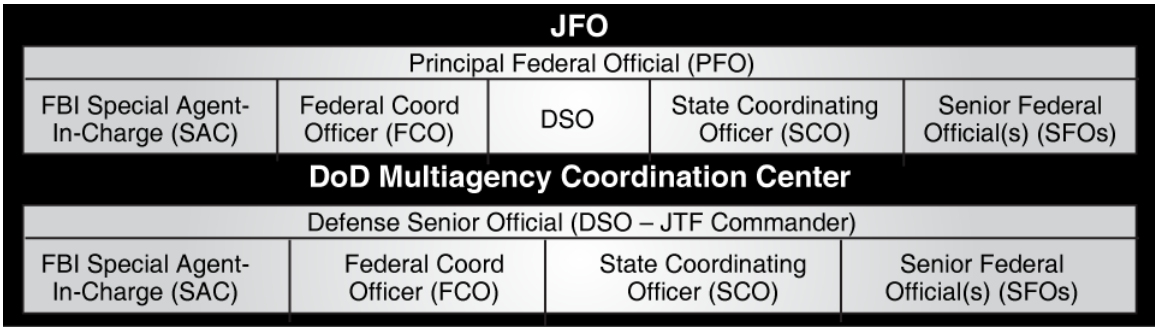
INCIDENT COMMAND SYSTEM FUNCTIONAL APPENDIX

Figure 7. Notional Finance/Administration Section Organizational Structure



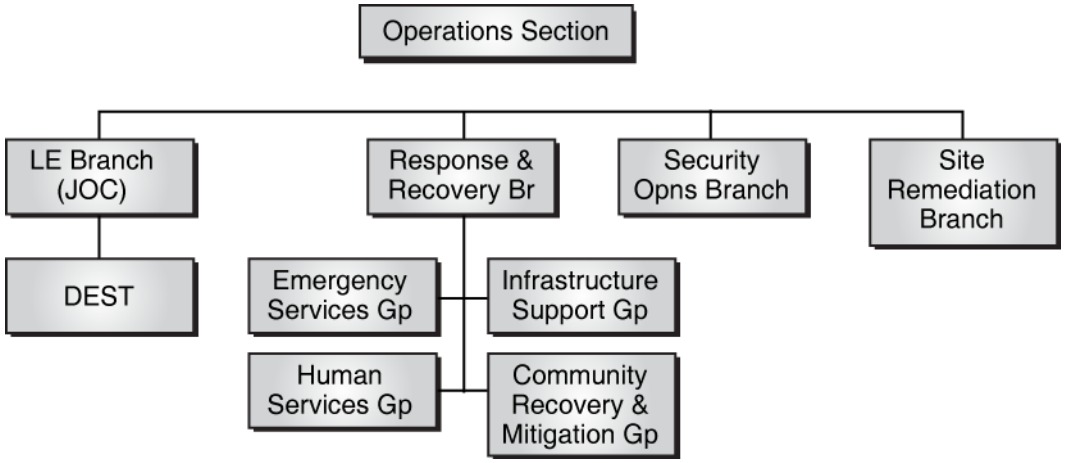
INCIDENT COMMAND SYSTEM FUNCTIONAL APPENDIX

Figure 8. Notional JFO Coordination Group for a Nuclear Weapon Accident or Nuclear Weapon Incident



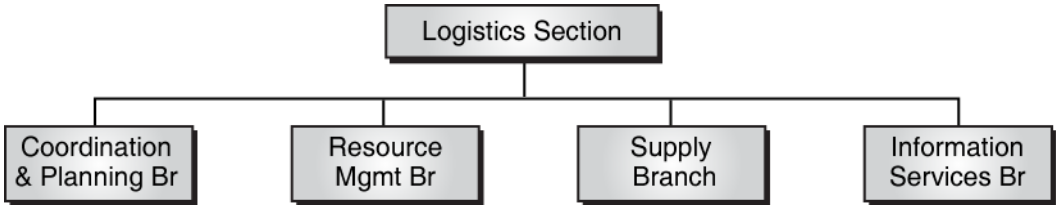
INCIDENT COMMAND SYSTEM FUNCTIONAL APPENDIX

Figure 9. Notional JFO Operations Section Structure



INCIDENT COMMAND SYSTEM FUNCTIONAL APPENDIX

Figure 10. Notional JFO Logistics Section Organizational Structure



INCIDENT COMMAND SYSTEM FUNCTIONAL APPENDIX

TAB A. JFO Incident Action Plan

SITREP #1				
Date/Time (EST)				
Incident Type:				
Location of Incident:				
Time of Incident (EST):				
Incident Site Weather Conditions:	Location	Current	24 hours	48 hours

Threat Levels	
COOP COGCON	
Homeland Security Advisory System (HSAS)	
Maritime Security Level (MARSEC)	
DoD Force Protection Condition (FPCON)	

Threat Assessment and Operational/Investigative Operations	
Intelligence Assessment/Update	
Technical Assessment/Update	
Counter-terror/Law Enforcement Operations Status/Update (non-ESF 13)	

Status of Federal Decisions and National-level Operational Elements	
Presidential Emergency/Disaster Declarations (Stafford Act)	
Principle Federal Official Status	
Joint Field Office Status	

Federal Radiological Monitoring and Assessment Center Status	
Catastrophic Incident Supplement Status	

Current Situation/Summary

Modeling

On-Scene Update	
Official Casualties/Relief Effort	
Fatalities	
Hospitalized	
Injured	
Sheltered	
Extent of Damage	
Destroyed	
Major Damage	
Minor Damage	
Power Outages	

Federal and National Guard Personnel Deployed	
Organization	
USCG	
FEMA Responders	
Federal Law Enforcement (ESF-13)	
National Guard	
US Active Military Duty	
Health and Human Services (ESF-8)	

Federal Assets Deployed	
Asset	
DoD Rotary Wing	
USCG Rotary Wing	
CBP	
Other	
Total Rotary Wing	
DoD Fixed Wing	
USCG Fixed Wing	
CBP Fixed Wing	
Total Fixed Wing	
DoD Ships	
USCG Ships	
Total Ships	

Requests For Assistance/Emergency, Disaster, and Presidential Declarations		
Status of Declarations		
Date	**Declaration**	**Remarks**

Law Enforcement Security Issues (non-ESF operations)		
Borders and Coastal Waters		
Transportation		
Law Enforcement	Federal	
	Regional	
	Local	

Critical Infrastructure Issues/Operational Activities	
Sector Impacts	
Agriculture & Food	
Banking & Finance	
Chemical	
Commercial Facilities	
Commercial Nuclear Reactors, Materials and Waste	

Dams	
Defense Industrial Base	
Drinking Water & Water Treatment	
Emergency Services	
Energy	
Government Facilities	
Information Technology (IT)	
National Monuments and Icons	
Postal & Shipping	
Public Health and Healthcare	
Telecommunications	
Transportation Systems	
Cross-Sector Impacts	

Emergency Response Issues	
Emergency Support Functions (ESF) 1-15 FEMA	
ESF-1 Transportation	**Activated: JFO RRCC NRCC**

ESF-2 Communications	**Activated: JFO RRCC NRCC**

ESF-3 Public Works and Engineering	**Activated: JFO RRCC NRCC**

ESF-4 Firefighting	**Activated: JFO RRCC NRCC**

ESF-5 Emergency Management	**Activated: JFO RRCC NRCC**

ESF-6 Mass Care, Housing and Human Services		**Activated: JFO RRCC NRCC**
Shelter Numbers		
State	**Number of Shelters**	**Remarks**
Total		

ESF-7 Resource Support	**Activated: JFO RRCC NRCC**

ESF-8 Public Health and Medical Services	**Activated: JFO RRCC NRCC**

ESF-9 Urban Search and Rescue	**Activated: JFO RRCC NRCC**

ESF-10 Oil and Hazardous Materials Response	**Activated: JFO RRCC NRCC**

ESF-11 Agriculture and Natural Resources	**Activated: JFO RRCC NRCC**

ESF-12 Energy	**Activated: JFO X RRCC X NRCC X**

ESF-13 Public Safety and Security	**Activated: JFO X RRCC X NRCC X**

FEMA Safety	**Activated: JFO RRCC NRCC**

ESF-14 Long-Term Community Recovery	**Activated: JFO RRCC NRCC**

Mitigation	**Activated: JFO RRCC NRCC**

ESF-15 External Affairs	**Activated: JFO RRCC NRCC**

Emergency Management Assistance Compact (EMAC)

Department of Defense (DoD)

Potential Additional Future Federal Responses Anticipated

Non-Governmental Assets Currently Not Addressed in ESF 6 (Type/Number)

International Issues

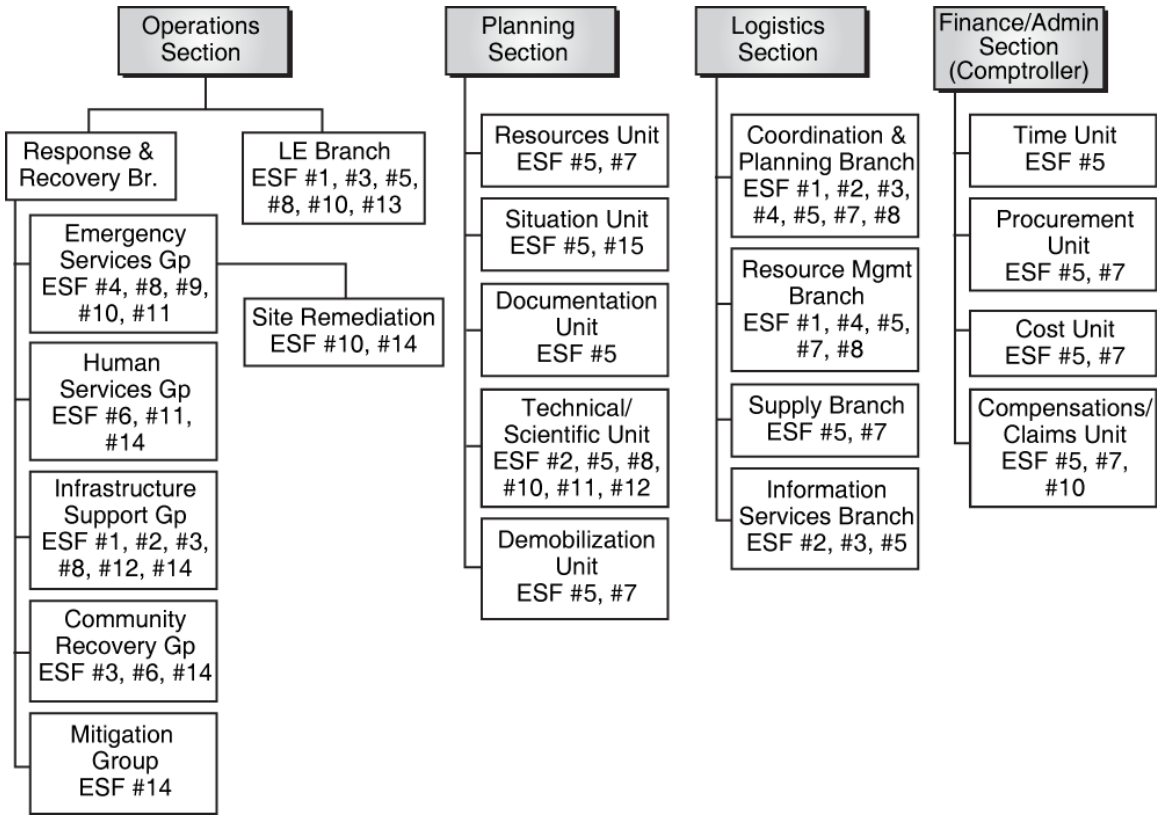
Joint Information Dissemination/Public Affairs Plan and/or Releases

Donations Activities

Additional Remarks

INTER-DOD FUNCTIONAL ANNEX

Figure 1. JFO Sections with Emergency Support Functions



MANAGEMENT OF CONTAMINATED REMAINS

Figure 1. Sample Broken Arrow Human Remains Transport, Autopsy and Mortuary Affairs Special Instructions Form

Special Instructions for the Remains of _____.
(Name, last 4)

These instructions are to accompany the remains and are intended for autopsy and/or mortuary service staff processing and preparing the body for burial.

The remains of _____ are slightly contaminated with radioactive material that emits alpha particles and low energy gamma rays. When following these special instructions, the levels of radiation associated with preparing the remains for burial are safe and will not result in a dose to staff members in excess of 5 mrem ($1/1000^{th}$ of the allowed occupational dose limit).

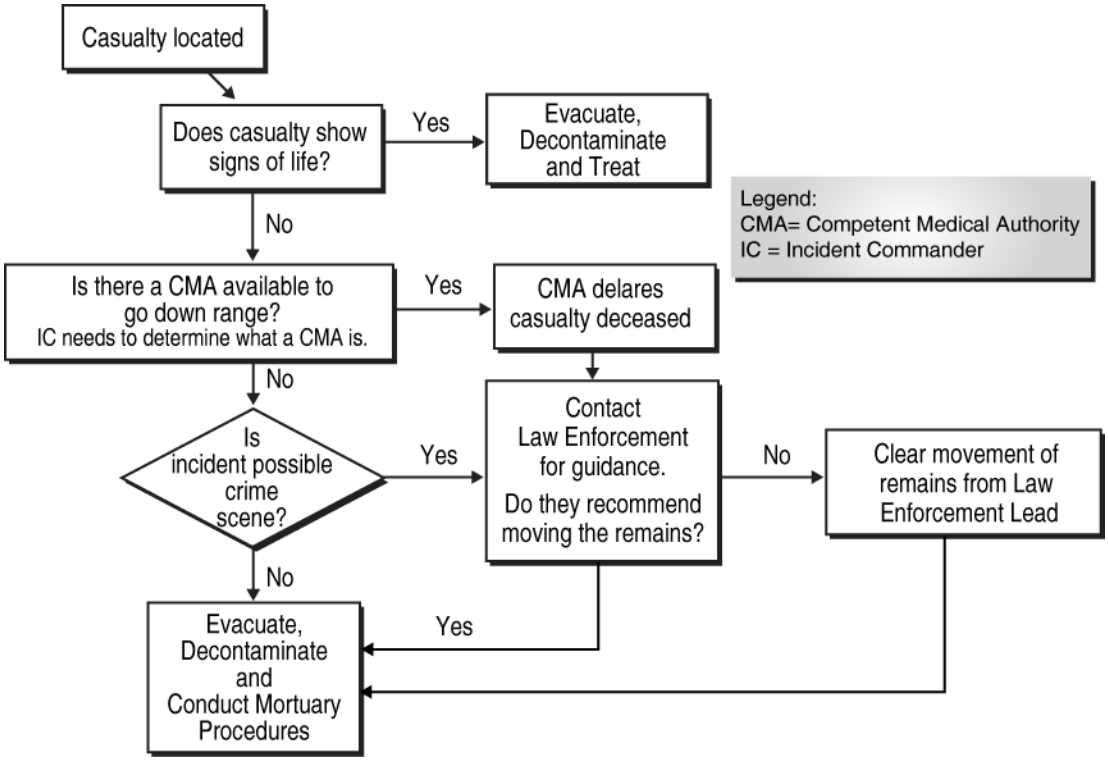
1. Use normal pathogenic protective clothing (e.g., universal precautions) when handling the remains. Additionally, double glove and wear a surgical mask.
2. Use care to remove the deceased clothing so that any dust is not agitated and resuspended into the air. Place the clothing in a plastic bag and seal it. Then double bag the clothing. During embalming and other processing of the remains, be sure to collect all liquid wastes and any solid wastes in autoclave containers and run them through the autoclave process. Likewise, do the same for all runoff associated with washing autopsy tools or related equipment. Mark all bags and containers with a contamination sticker or tag and save them for retrieval by the US Army Rock Island radioactive waste disposal staff/contractors.
3. Take care not to cross contaminate items or surfaces in the laboratory. For example, do not make entries on a computer keyboard without first removing the outer layer of gloves.
4. Double bag the body bags used for transporting the remains to the mortuary facility and mark with a contamination sticker or tag. Likewise, do the same for any gowns, gloves, or other protective clothing used while executing these special instructions.
5. Ensure that no single staff member is in close proximity of the body or collected waste containers for more than a total of 10 hours. Within one meter would be indicative close proximity.
6. Incineration of the remains is not recommended. If incineration is desired, approval from the state health department may be necessary.

While the remains are in DoD custody, radiological specialists from the US Army Radiological Advisory Team at Walter Reed Army Medical Center are available for on site assistance in implementing these instructions. As well, radiological specialists from the Armed Forces Radiobiology Research Institute are also available for assistance.

These special instructions were prepared by COL John Mercier, Ph.D., PE, DABR, Senior Health Physicist, Armed Forces Radiobiology Research Institute, ph. 301-295-1210.

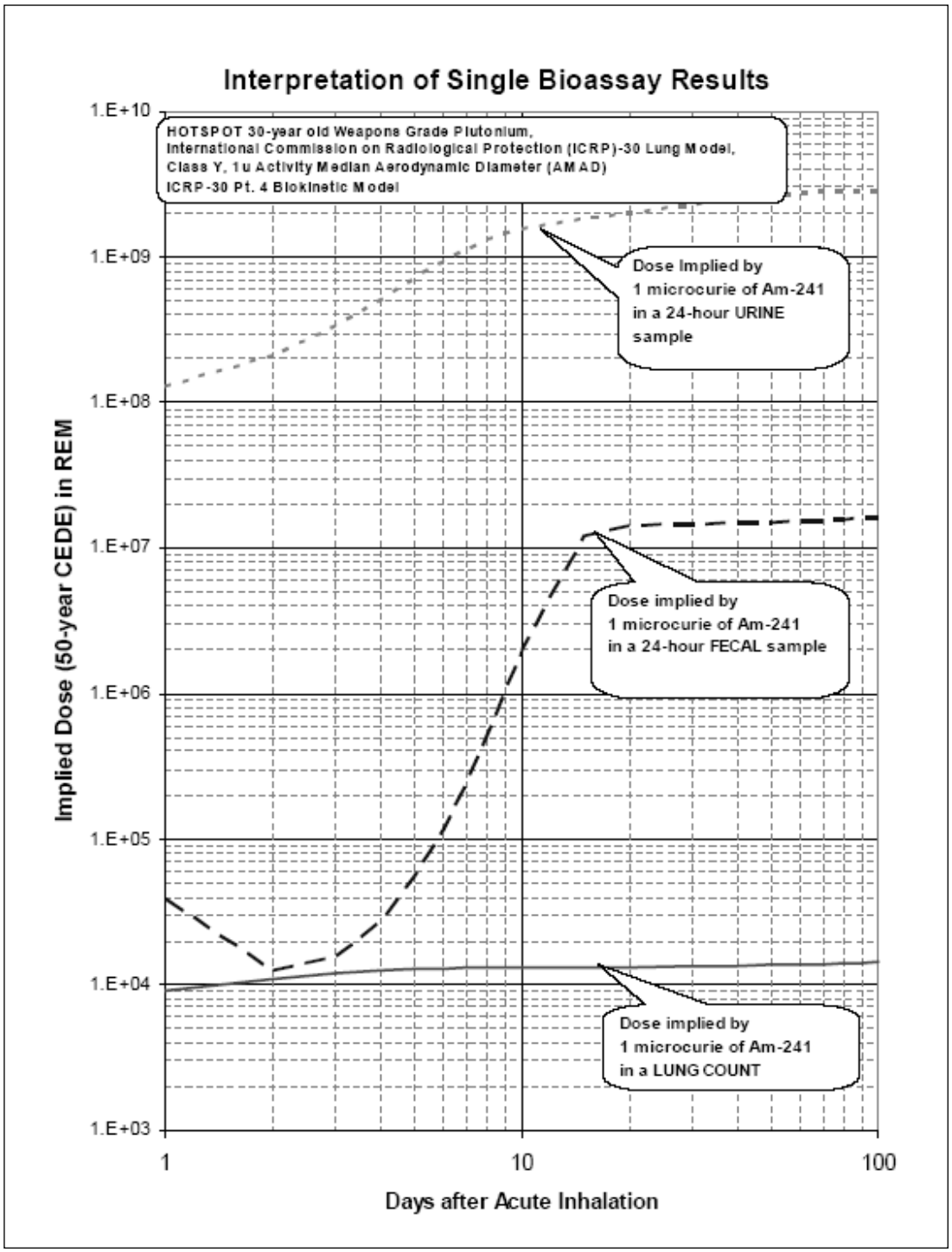
MEDICAL

Figure 1. Contaminated Casualty Flowchart



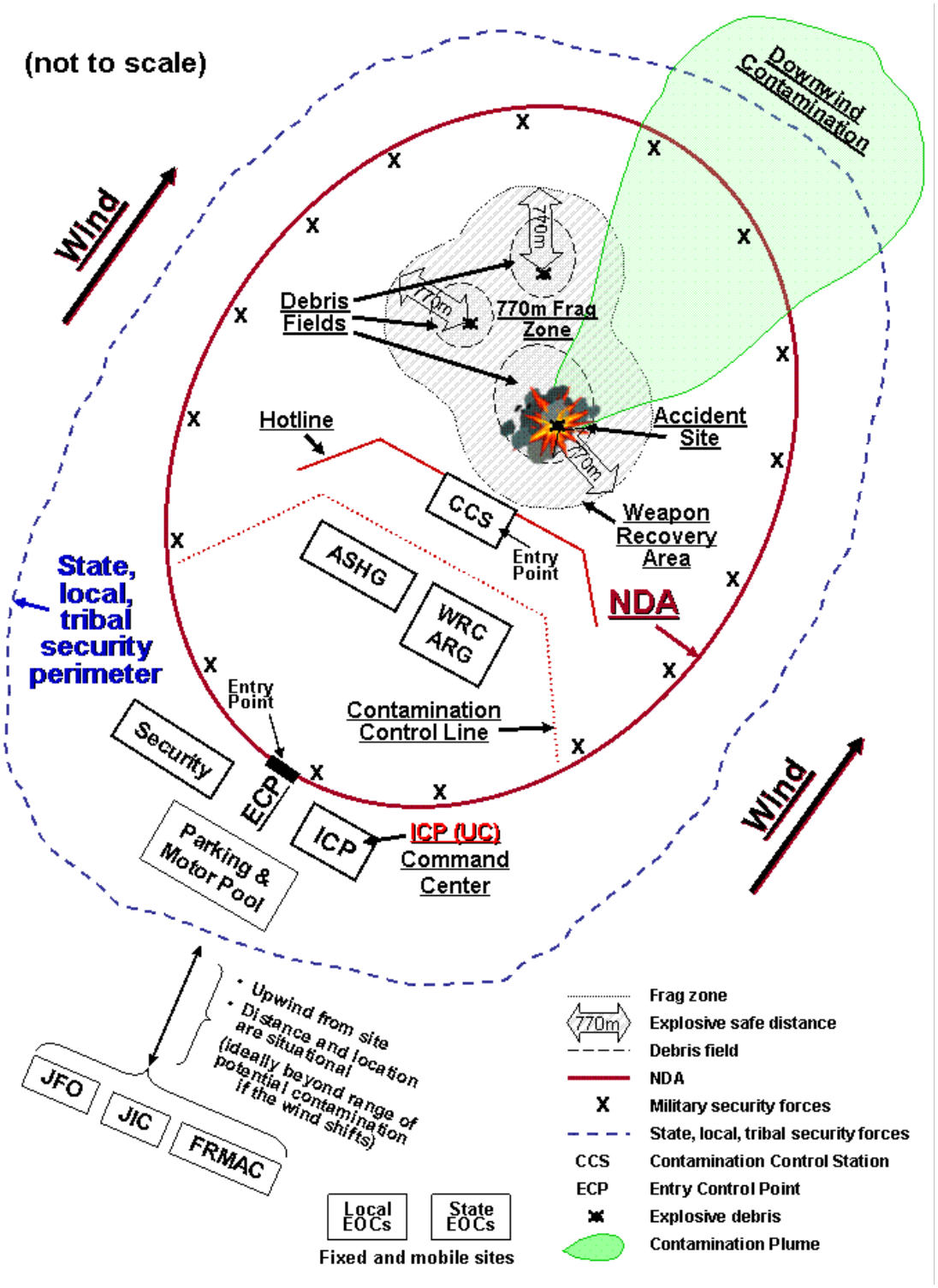
MEDICAL

Figure 2. Estimated 50-Year Committed Effective Dose Equivalent



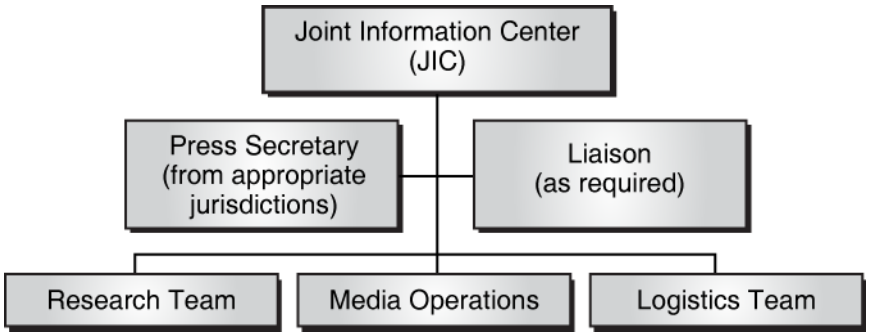
NOTIONAL ACCIDENT SITE

Figure 1. Notional Nuclear Weapon Accident Site



PUBLIC AFFAIRS

Figure 1. Notional Joint Information Center (JIC) Organization



PUBLIC AFFAIRS

Figure 2. Contingency Release Number 1

CONTINGENCY RELEASE NUMBER 1

To the General Public

"When the Public Is Probably in Danger"
(Does confirm)

(Format of sample release to be used when a nuclear accident occurs. Public safety considerations require this announcement because of the likelihood of fire or conventional high-explosive detonation of the weapon. The following statement should be made locally or by appropriate higher authority if no local authority is available.)

An aircraft (other type of transportation) accident occurred (or other circumstances) about (location and time). The accident involved a nuclear weapon that contains conventional explosives and radioactive material. There is no danger of a nuclear detonation, but there is a danger from the conventional explosives that (are burning, may detonate, have detonated). The public is requested to stay out of (indicate the area) (under surveillance by guards) in the interest of safety and to avoid hampering operations at the accident scene. An experienced response team has been ordered to the scene.

(If appropriate, the following WILL be included in the release.) Radioactive material in the form of dust may be scattered because of the accident. The dust poses little risk to health unless taken into the body by breathing or swallowing, although it is unlikely that any person might inhale or swallow an amount that should cause illness. As a precautionary measure, you are asked to stay calm and indoors. Turn off fans, air conditioners, and forced-air heating units that bring in fresh air from the outside. Use them only to re-circulate air already in the building. Eat and drink only canned or packaged foods that have been inside. If you must go outside, cover your nose and mouth and avoid stirring up and breathing any dust. It is important to remember that your movement might cause yourself greater exposure to any radioactive dust, should it be present, and you might possibly spread contamination to others.

(If plutonium is involved) One of the materials involved is plutonium, which is both a toxic and a radiation hazard and a chemical poison if ingested. The radiation given off consists of alpha particles that do not have sufficient energy to penetrate buildings, clothing, or even the outer
skin. Therefore, short-term exposure to contamination outside the body poses a negligible health risk. The precautions mentioned earlier should be carefully followed to prevent inhalation or ingestion.

(If uranium is involved) One of the materials involved is uranium. Uranium, depending on the type, may be a radiological hazard or a chemical health hazard, similar to lead poisoning. Uranium gives off alpha particles that do not penetrate skin and pose no health risk when outside the body.

The public is asked to stay out of the area (under surveillance or closed off by guards) (and if true) until a monitoring team, now en route to the accident site, may survey the ground and determine the exact area affected by the accident. Any fragments found near the scene may be contaminated and should be left in place. If fragments have been picked up, avoid further handling and notify (authorities) for proper recovery and disposition.

Periodic announcements will be made as more information is known. It is expected that these precautionary actions will be modified as more information becomes available. A U.S. (Military Service) team from (name of installation) is en route to (has arrived at) the accident scene.

We have no details yet on civilian or military casualties (or give number only of civilian and military casualties) or property damage.

The cause of the accident is under investigation. Further details will be provided as they become available.

PUBLIC AFFAIRS

Figure 3. Contingency Release Number 2

CONTINGENCY RELEASE NUMBER 2

To notify the general public

"No Radiological Danger to the Public"

(Confirms to reduce public alarm)

(Format of sample release to be used initially when no danger to the public from contamination or blast exists, but when confirming the presence or absence of a nuclear weapon or nuclear components significantly prevents or reduces widespread public alarm that may result from unusual activity at the accident and/or incident site.)

A U.S. (type) aircraft (other type of transportation) carrying HAZMAT, classified cargo, or unarmed nuclear weapon(s) crashed (or other circumstances) at about (location and time).

The public is requested to stay out of the area (add, if true: under surveillance by guards) to prevent any remote possibility of hazard from the accident (or conventional HE detonation) and to avoid hampering removal operations. There is no need for evacuation. (There is no danger of nuclear detonation.)

The cause of the accident is under investigation. Further details will be provided as they become available.

PUBLIC AFFAIRS

Figure 4. Contingency Release Number 3

CONTINGENCY RELEASE NUMBER 3

To notify the general public

"When the Public Is Possibly in Danger"

(Confirms possibility of contamination in a nuclear weapon accident)

(Format of sample release to be used when nuclear weapons or nuclear components have been involved in an accident and the possibility exists for contamination due to fire or explosion, and details are unknown. The release to the general public should only be used after the area has been secured. Release may be modified as shown below depending on audience.)

MINIMUM ANNOUNCEMENT

A U.S. (type) aircraft (other type of transportation) carrying unarmed nuclear weapons or nuclear components crashed (or other circumstances) at (location) at about (time).

The public is asked to stay out of the accident area in the interest of safety due to the possibility of hazard from the accident (or conventional HE detonation) and to avoid hampering recovery operations. (There is no danger of nuclear detonation.)

ADD THE FOLLOWING FOR APPROPRIATE OFFICIALS

Fire, rescue, and other emergency services personnel should approach the area with caution from upwind and be equipped with protective clothing and breathing apparatus. Any local official at the scene of the accident or who has left the site who may provide details on the situation should call this number (_____). Current information from the accident scene will help response personnel respond to the accident and provide additional public safety guidance. If contact with the accident scene is established, determine the following: condition of aircraft and/or vehicle (such as burning, evidence of explosion, or extent of damage); condition of accident site (such as fire or blast damage); or evidence of obvious cargo (such as shapes or containers). Avoid handling any debris at the crash site.

If the aircraft is transporting nuclear weapons containing IHE or weapons overpacked with accident-resistant containers, detonation is much less likely, and the fire should be fought as long as there is a reasonable expectation of saving lives or containing the fire. The weapons, or containers, if exposed, should be cooled with water.

Law enforcement officials should prevent unauthorized personnel from entering the site and picking up fragments of the plane (vehicle) or its cargo. If any fragments have already been picked up, avoid further contact or handling. Notify (authorities) for recovery and proper disposition.

A U.S. (Military Department) team from (name of installation) is en route to (has arrived at) the accident scene.

We have no details yet on civilian or military casualties or property damage.

The cause of the accident is under investigation. Further details will be provided as they become available.

PUBLIC AFFAIRS

Figure 5. Contingency Release Number 4-A

CONTINGENCY RELEASE NUMBER 4-A

"To Notify State and Local Officials
When the Public Is Possibly in Danger"
(Neither confirms nor denies)

(Format of sample release to be used if public safety considerations require notifying State and local officials that hazardous cargo has been involved in an accident, the possibility exists for contamination due to fire or explosion, and details are unknown.)

MINIMUM ANNOUNCEMENT

A U.S. (type) aircraft (other type of transportation) carrying HAZMAT crashed (or other circumstances) about (location) at (time).

Visitors are warned to stay out of the area of the accident in the interest of public safety. Fire, rescue, and other emergency services personnel should approach the area with caution from upwind and be equipped with protective clothing and breathing apparatus. Water should not be directly used on the aircraft unless needed to save property or lives. Any local official at the scene of the accident who may provide details on the situation should make a telephone call to this number (local phone). Current information from the accident scene helps evaluate the accident and provide additional public safety guidance. If contact with the accident scene is established, determine the following: condition of aircraft (burning, evidence of explosion, extent of damage, etc.); condition of accident site (fire, blast, or damage); evidence of obvious cargo (shapes or containers). Determine the need for a public announcement of nuclear weapons involvement based on the responses to the above.

EXPANDED ANNOUNCEMENT

If there is no immediate threat to life, and the fire may not be extinguished immediately (five minutes), the fire should be contained and allowed to burn out. Water as a firefighting agent should be used with caution due to possible adverse reaction with materials involved in the fire.

Law enforcement officials should prevent unauthorized personnel from entering the site and picking up fragments of the plane (vehicle) or its cargo. If any fragments have been picked up already, avoid further contact or handling. Notify (authorities) for recovery and proper disposition.

Military personnel have been deployed (will be deployed) and will arrive (are scheduled to arrive) soon at the site.

PUBLIC AFFAIRS

Figure 6. Contingency Release Number 4-B

CONTINGENCY RELEASE NUMBER 4-B

To Notify the General Public
"When the Public Is Possibly in Danger"
(Neither confirms nor denies)

(Format of sample release to be used if public safety considerations require making a PUBLIC RELEASE that hazardous cargo was involved in an accident, the possibility exists for contamination due to fire or explosion, and details are unknown.)

A U.S. (type) aircraft (other type of transportation) carrying HAZMAT crashed (or other circumstances) about (location) at (time). The public is warned to stay out of the area (under surveillance by guards) in the interest of safety and to aid operations at the accident scene.

A U.S. (Military Service) team from (name of installation) is en route to (has arrived at) the scene of the accident.

We have no details yet on civilian or military injuries or property damage.

Further announcements will be made as more information is known.

IN RESPONSE TO QUERY ONLY

In response to the question, "Are nuclear weapons stored at (name of facility) or (name of facility)?" The official reply is, "It is DoD policy neither to confirm nor deny the presence of nuclear weapons at any particular location."

In response to the question, "Are nuclear weapons aboard a specific surface ship, attack submarine, or naval aircraft?" The official reply is, "It is general U.S. policy not to deploy nuclear weapons aboard surface ships, attack submarines, and naval aircraft. However, we do not discuss the presence or absence of nuclear weapons aboard specific ships, submarines, or aircraft.

PUBLIC AFFAIRS

Figure 7. Fact Sheet 1: Characteristics, Hazards, and Health Considerations of Plutonium

FACT SHEET 1

CHARACTERISTICS, HAZARDS, AND HEALTH CONSIDERATIONS OF PLUTONIUM

(For release to the general public)

The accident at _____(to be filled in)_____ has resulted in the release of the radioactive substance plutonium. Persons who are downwind from the accident may become exposed to this substance by coming into contact with contamination (radioactive material that has coated or fallen on the surfaces of structures, the ground, or objects) from the mishap. Also, very small amounts of plutonium may have been spread by the winds to adjacent areas. Radiological survey teams are monitoring these suspected areas to determine the presence of plutonium and to measure the levels, if present. No immediate danger exists to anyone, and no medical intervention is necessary; however, some actions may help prevent further contamination or reduce its spread to clean areas.

Plutonium, which is abbreviated Pu, is a heavy metal that has a shiny appearance, similar to stainless steel when freshly machined. After exposure to the atmosphere for any period of time, it oxidizes to a dark brown or black appearance. When released from a weapons accident, plutonium may not be readily seen by the naked eye, but in areas close to the accident, its presence may be assumed in dust and dirt on the ground or on flat surfaces, and from ash resulting from the accident fire.

Plutonium is an alpha radiation emitter; that is, it radiologically decays by emitting an alpha particle, a very heavy radioactive particle. Alpha particles do not substantially penetrate materials. Their range in air is only a few inches at most. This means that alpha radiation is not a hazard to people if it stays external to the body. The epidermis, or outer dead layer of the skin, is sufficient protection for exposure to this isotope from sources external to the body. No external hazard exists to people walking through an area contaminated with plutonium. Alpha radiation may, however, represent an internal radiation hazard when plutonium is taken into the body by inhaling contaminated air, eating contaminated food, or getting contamination into a wound or cut. In actuality, contamination from ingestion is unlikely to be a problem, since plutonium is very poorly absorbed through the intestines. Less than 0.02 percent may be absorbed, or 2 of every 10,000 atoms eaten. Absorption through wounds may introduce small amounts of plutonium into the body. Inhaling plutonium particles is the most likely route of internal exposure.

Inhaled plutonium is kept in the lungs in much the same manner that people in a dust storm inhale dust. This “dust” settles in the lungs. Once in the lungs, a low percentage of plutonium may be translocated by the bloodstream to the liver and the bones. This deposition may be prevented by using “chelation” compounds, such as ethylenediamine tetraacetic acid or diethylenetriamine pentaacetic acid (DTPA), which hasten the excretion of plutonium from the body through the urine. The use of these chelating compounds is not without some medical hazard to the individual, since they are IV-administered, and should be performed by a physician who has been in contact with appropriate agencies to coordinate the use of these drugs.

Plutonium in a weapon has a radiological half-life (the length of time it takes for the plutonium to lose one half of its radioactivity) of more than 24,000 years. This long half-life means that its radioactivity does not decrease substantially by nuclear decay or disintegration. Likewise, eliminating plutonium from the body

is also a very slow process. Biological elimination of plutonium may be improved significantly by using the chelating agents mentioned above.

Therefore, until the limits of contamination are determined, the public is advised to follow a few simple guidelines to reduce the spread of contamination, and there will be little, if any, hazard. Stay inside and reduce opening doors and windows. Turn off fans, air-conditioners, and forced air heating units that bring in fresh air from the outside. Use them only to recirculate air already in the building. Children should not play outdoors. Fruits and vegetables grown in the area should not be eaten. Individuals who think they have inhaled some plutonium should not be unduly concerned. The inhalation of plutonium is not an immediate medical emergency. Very sensitive monitoring equipment is being brought into this area to survey the inhabitants of suspected contamination area(s) for inhaled radiation, and once established, this will be made available to those who need it.

PUBLIC AFFAIRS

Figure 8. Fact Sheet 2: Medical Department Fact Sheet on Plutonium

FACT SHEET 2

MEDICAL DEPARTMENT FACT SHEET ON PLUTONIUM

(For Medical Personnel)

Plutonium is a highly reactive element that may exhibit five oxidation states, from three to seven. The principal routes into the body are through inhalation and contaminated wounds; ingestion and contaminated intact skin are unimportant.

Inhalation is probably the most significant route of contamination in a nuclear weapon accident. Retention in the lungs depends on particle size and the chemical form of plutonium involved. Usually, in a weapons accident, plutonium is in the form of an oxide that has a pulmonary retention half-time of up to 1,000 days.

Absorption through wound contamination results in a translocation of some of the material to the skeleton and liver. The majority remains in the vicinity of the wound and may result in the formation of a fibrous nodule within months to years. The possible development of a sarcoma or carcinoma in such nodules is a matter of concern, although there have been no reports of such in the medical literature.

After entry into the body, some of the plutonium is solubilized by the body fluids, including blood, and is redistributed within the body. Ultimately, it is distributed by the blood to the skeleton (45 percent), liver (45 percent), and the other tissues (10 percent). The retention half-times are estimated to be 200 years (whole body), 100 years (skeleton), and 40 years (liver).

All medical treatment for plutonium contamination or inhalation should be coordinated with the appropriate Service Medical Department or with the REAC/TS because of the hazard of the substances involved. DTPA compounds are defined as investigational drugs that require the advice and concurrence of the REAC/TS before administration. The REAC/TS may be contacted at: (423) 576-3131.

Treatment of plutonium-contaminated wounds should involve copious washing and irrigation to try to dislodge the contamination. If possible, washings should be saved for later counting to determine contamination levels. More extensive treatment by excision requires judgment in assessing the area involved, the difficulty of excision, and the total quantity in the wound. Greater than 4 mCi of Pu embedded in a wound should be considered a candidate for such treatment. It is not expected that the physician will need to make this determination, since a specialized team to perform such monitoring may be made available from the Incident Commander or his or her representative. Immediate chelation therapy with DTPA (consult the REAC/TS for protocol) should be accomplished before surgical excision to prevent possible systemic absorption of plutonium. In burn cases, flushing with sterile saline or water removes a great deal of contamination. The remainder is likely to be removed when the eschar sloughs off. DTPA treatment given immediately after wound or burn treatment has been shown to remove up to 96 percent of the remaining plutonium. In the case of inhaled plutonium, the results have been relatively disappointing, since the oxide forms of plutonium are transferred at a relatively slow rate from the lungs into the systemic circulation. Thus, little systemic burden of plutonium is available for chelation in the early period after exposure and there is never a time when a sizable systemic burden is available in the extracellular spaces for effective chelation.

In spite of this, DTPA should be used as soon as possible after significant inhalation exposures, since the oxides may not be the only compound present. Attempts to stimulate phagocytosis and the mucociliary

response, or to use expectorant drugs, have not been successful in animal studies; however, this may not be true in humans.

The only demonstrated useful procedure in enhancing the clearance of insoluble particles, such as plutonium oxides, from the lung is bronchopulmonary lavage. The risk of this procedure versus the risk of future health effects from the estimated lung burden must be very carefully weighed. The use of repeated lavages should remove 25 to 50 percent of the plutonium that should otherwise be kept in the lung. Again, advice should be sought from the Service medical command and the REAC/TS.

PUBLIC AFFAIRS

Figure 9. Fact Sheet 3: Plutonium Fact Sheet

FACT SHEET 3

PLUTONIUM FACT SHEET

(For Operational Commanders)

As Operational Commander, you will be assaulted by many needs at once in determining the actions to be taken in coping with a nuclear weapon accident. You should have had the opportunity to review the preceding fact sheets for the general public and medical personnel. Several facts are important to keep in mind, as general guidance.

By the time you have arrived at the scene, the weapons have usually suffered low order detonations if they are going to do so. This low order detonation produces a cloud of finely dispersed plutonium that falls out over the area downwind, depending on particle size, wind direction and speed, and amount of explosives in the detonation. A very worst case situation is shown on the ARAC plots that are made available to you. The initial ARAC plots show desposition and dose predictions based on the detonation of all weapons involved, using all the available explosives. Desposition resulting from explosive dispersal is significantly larger than that resulting from a fire. The actual scenario should be less, perhaps 10 to 100 times less, based on the actual survey data from the site. Note that plots are predictive in nature, and must be corroborated by actual field measurements.

The cloud deposits its radioactive material over several hours after an explosion or fire, with the largest particles settling out earlier and closer to the accident site and the finest particles being carried further by the wind and taking longer to settle out. In the case of such releases, Protective Action Recommendations to civil authorities for sheltering downwind members of the public in place must be made (and executed) within the several-hour period of plume passage to be effective for reduction of dose from the initial plume. After initial cloud passage, the inhalation of material from the accident is by resuspending the plutonium by operations in the area of cloud passage, such as walking. The DOE may compute a dose equivalent for persons in the area of the initial cloud passage. People exposed in the plume may experience significant intakes of radioactive material through inhalation (with corresponding significant radiation doses). Note that this is only from the cloud passage; doses from resuspension will be significantly less.

The important point is that the ARAC plot usually overestimates the total dispersion of plutonium, and the dose estimate is based only on cloud passage, not later resuspension of the plutonium; therefore, basing your sheltering plans on these numbers may easily result in a significant conservatism.

Sheltering should be recommended for the downwind population, but you must be careful to avoid the impression of extreme hazard from the plutonium. Your sheltering advisory should indicate that there is a contamination hazard and a slight inhalation hazard. Care should be taken not to increase tension over the accident and/or incident. You and your PIO should stress that people should stay indoors as much as possible, keep houses closed to prevent contamination, and follow other ideas, as outlined in the public release.

Usually, the resuspension of plutonium in the original areas of contamination is not significant, except for the area very close to the accident site. To prevent the spread of material in this area, consider spraying with some sort of fixative to prevent resuspension and/or spread of the plutonium. Something as simple as hand sprayers with vegetable oil may be used to bind the plutonium into the soil and/or surface around the

site. A secondary advantage is that this method lowers the airborne hazard for the workers inside the control boundaries and may help the eventual cleanup process move faster. It does, however, mask the plutonium from some alpha detection RADIACs, such as the AN/PDR 56, AN/PDR-77, and the ADM-300 with AP-100 alpha detector. Usually, these types of instruments are used only for monitoring people or material leaving the site, not site contamination surveys.

In dealing with a nuclear weapon accident, some of the concepts that are usually used to handle injuries and/or fatalities on board ship do not hold true, or may be counterproductive. Such an example is keeping the population under tight sheltering requirements or restricting traffic from the contamination area downwind. Any recommendation for the civilian populace will be just that, a recommendation. The military has no authority in the contamination areas unless they are military areas, or are within the NDA. Use the local authorities, and have the FEMA representative assist in this function.

Some concept of the exact magnitude of the risk people experience from the accident may be compared with the risks outlined in the Nuclear Regulatory Guide 8.29 (reference (cb)). The Service, DOE, and/or NNSA health physicists should be consulted to give the best approximation of the public risk; this may be compared with the risks reference (cb).

PUBLIC AFFAIRS

Figure 10. Fact Sheet 4: Characteristics, Hazards, and Health Considerations of Uranium

FACT SHEET 4

CHARACTERISTICS, HAZARDS, AND HEALTH CONSIDERATIONS OF URANIUM

(For Operational Commanders)

Some nuclear weapons may contain uranium. Uranium is a mild to moderately radioactive material that may be hazardous if inhaled in large quantities. In a nuclear weapon accident, the uranium in the warhead of the weapon may get dispersed into the air by fire or explosion of the HE in the weapon. (Keep in mind that this is not a nuclear detonation.) The heat and smoke from the fire or explosion may carry small particles of uranium into the air. As the smoke plume travels downwind, the particles of uranium begin to settle to the ground, leaving a track of contamination on the ground surface and vegetation. Larger particles settle out first, smaller particles may travel much further. The highest levels of uranium contamination will be in the immediate area of the accident. In general, the further away from the accident, the lower the levels of uranium contamination that may be expected.

Uranium is a heavy metal, somewhat like lead. Uranium is a naturally occurring mineral that is mildly radioactive. As found in nature, uranium consists mostly of the isotope U-238, with small quantities of U-235 and extremely small quantities of U-234. This so-called "natural uranium" is only mildly radioactive, emitting alpha and beta radiation and low levels of gamma radiation. The half-life of U-238, the major constituent of natural uranium, is 4.5 billion years. It is likely that uranium released in the circumstances of a weapons accident is in the chemical form of uranium oxide. Natural and depleted uranium are primarily chemical hazards (heavy metal toxins) rather than radiological hazards, even at relatively high exposures. The radiological hazard associated with enriched uranium is higher than for its other forms.

Uranium may be "enriched," that is, the concentration of U-235 may be increased, by many methods. Commercial nuclear reactors use uranium that has been enriched so that the U-235 makes about 5 percent of the total uranium mass (the rest is U-238). Some nuclear weapons use highly enriched uranium (HEU) in which the U-235 makes up more than 90% of the total mass of uranium, though U-234 comprises almost 97% of the total alpha radiation activity. The uranium left over from the enrichment process is called "depleted" uranium because it has only about one-third as much U-235 as natural uranium. Nuclear weapons may contain several types of uranium, from depleted to highly enriched.

Uranium may be a mild to moderate radiation hazard if it is inhaled. Uranium is not particularly hazardous if it stays outside the body. If uranium is inhaled, the lungs and other organs of the body may receive doses of radiation; however, a person must inhale a very large quantity of uranium to get a significant dose of radiation. Even if the uranium was involved in a fire or explosion, it is unlikely that anyone would get a serious radiation dose from inhalation. It is much more likely that dispersal of uranium should create more of a "nuisance" contamination problem.

Compared to plutonium (the major HAZMAT in many nuclear weapons), uranium is not very hazardous. In a nuclear weapon accident in which both plutonium and uranium have been dispersed, the hazard from plutonium is far more serious than that from uranium. Although
uranium emits alpha radiation (that may result in internal radiation doses if taken into the body) very much like plutonium, pound-for-pound, uranium is from 1,000 to 100,000 times less radioactive than plutonium. A person would have to inhale roughly 1,000 to 100,000 times as much uranium mass to get the same dose as they would from plutonium. In addition, uranium does not stay in the body as long as plutonium; therefore, the radiation dose received by the organs is somewhat lower.

Depleted and natural uranium is at least 100 times less radioactive than HEU. It is unlikely that accidents involving dispersal of depleted or natural uranium will result in any significant radiation doses. HEU contamination presents more of a problem than depleted or natural uranium, but is still far less of a problem than plutonium contamination.

If a person is directly exposed to a smoke plume from a fire or explosion involving uranium, he or she may have been exposed to significant levels of airborne uranium. If he or she is in areas where the ground was contaminated, he or she may have been exposed to a much lower level of uranium than was re-suspended into the air. If a person thinks he or she may have been exposed to uranium (as described above) he or she should contact the appropriate Federal or State authorities and let them know. The authorities will arrange for appropriate radiation detection tests to be made. These tests may include collecting urine samples and/or scheduling for a "lung count" examination. Depending on the chemical form of the uranium that has been inhaled, some part of the uranium in the body is excreted in the urine. Urine samples may be analyzed for the presence of uranium. (All people have a low concentration of uranium in their urine from the trace quantities of uranium in the normal diet.) Lung count is a procedure performed by placing very sensitive radiation detectors near a person's chest to look for low-energy X rays emitted by the uranium mixture. Typically, the person reclines on a table or in a chair while the detectors are placed near the chest wall. A lung count is not like an X-ray exam. A lung count is a completely passive exam; the detectors do not emit any radiation, and the person does not receive any radiation dose from the exam. A "quick" screening lung scan may be performed in about 10 or 15 minutes. A more sensitive exam performed at a special "whole body counting" facility typically takes about 45 to 50 minutes.

In general, uranium is more hazardous to children than adults, due to the smaller size and different metabolism of children. To assure that children are adequately protected, PAGs established by the EPA take this increased sensitivity into account.

If uranium stays outside of the body, it is not particularly hazardous. The beta and gamma radiation emitted by uranium is relatively weak, and uranium emits only low levels of this radiation. The intensity of these gamma rays is so low that the measurable radiation field from uranium only extends a few feet away from solid uranium metal. Even high levels of uranium contamination on the ground do not produce any significant external radiation hazards.

PUBLIC AFFAIRS

Figure 11. Fact Sheet 5: Characteristics, Hazards, and Health Considerations of Tritium

FACT SHEET 5

CHARACTERISTICS, HAZARDS, AND
HEALTH CONSIDERATIONS OF TRITIUM

(For Operational Commanders)

Some nuclear weapons have small metal bottles that contain tritium, a radioactive gas. In an accident involving nuclear weapons, it is possible that these gas bottle systems may be damaged, and that some or all of the tritium gas is released into the air. Tritium gas that is released into the air is quickly diluted and dispersed, and is not likely to be a significant hazard, unless there was a fire or explosion at the accident, and then it should only be a hazard to people in the immediate area of the accident.

Tritium is a radioactive form of the element hydrogen. From a chemical standpoint, tritium atoms behave just like hydrogen atoms. Tritium is often stored and used in the form of a gas. Like stable hydrogen, tritium combines readily with many other elements. In a fire, tritium combines spontaneously with oxygen in the air and also replaces ordinary hydrogen in water, forming tritiated water, sometimes called "tritium oxide" or "HTO." It may also replace the stable hydrogen in other hydrogenous material (grease or oil), causing these materials to become radioactive. Metals can react with tritium in two ways: plating, the deposition of a thin film of tritium on the surface of the metal; or hydriding, the chemical combination with the metal. In either case, the surface of the metal becomes contaminated.

Some tritium is produced naturally, by the interaction of cosmic rays in the earth's atmosphere. These cosmic ray interactions produce about 4 million Ci of tritium every year worldwide. This tritium is incorporated into rainwater, resulting in a low, but measurable "background," level of tritium in almost all water. The concentration of tritium in surface water is typically on the order of 10 to 50 picocuries per liter.

Tritium is also produced in nuclear reactors. This manufactured tritium may be separated and purified for a variety of uses. There is no difference between manufactured tritium and tritium that is produced naturally. Tritium is used in nuclear weapons, fusion research, luminous signs and watches, and in biomedical research.

Tritium gas is relatively harmless, since very little of it is absorbed into the body, even if inhaled; however, if there were a fire or explosion at the same time as the tritium was released, some or all of the tritium gas would probably be converted to HTO, which behaves like water vapor. When people are exposed to HTO in the air, some of it is inhaled, and some of it may be absorbed through the skin.

The radiation doses that might be received from exposure to the smoke plume decrease rapidly with distance away from the accident. People who were directly exposed to the smoke plume very close to the accident site (within a few hundred yards) might -- although unlikely -- receive radiation doses greater than the occupational limit of 5 rem. Beyond a few hundred yards, doses should be well below a few rem. Beyond about 1/2 mile, the dose to a person who was directly in the smoke plume is likely to be less than the dose a person receives every year from natural background radiation. The key point to remember is that as distance from the plume increases, radiation dose decreases.

Normal RADIACs cannot detect tritium; specialized portable/laboratory instruments are required. Tritium on surfaces may be detected by rubbing a small piece of filter paper over the surface, and then "counting" the radioactivity on the paper (which is placed in a small vial) in an instrument called a "liquid scintillation counter." Tritium in water or other liquid may be counted by placing a sample of the liquid in a small vial and then counting the vial in the liquid scintillation counter. Tritium in the air may be measured by sampling the air with a "flow-through ionization chamber" instrument, which gives a real time reading of the concentration of tritium in air.

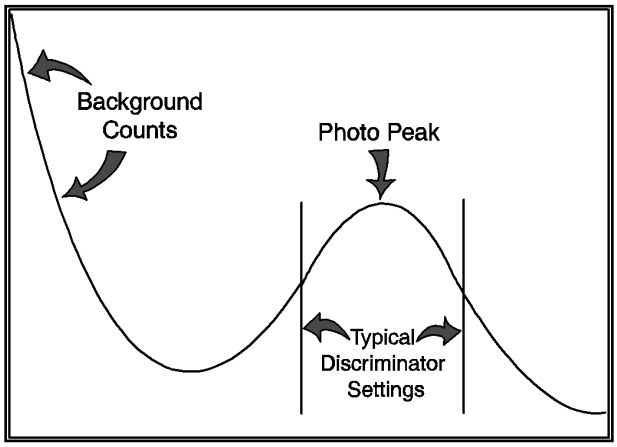
The form of tritium that is most likely to get inside the body is HTO in the form of water vapor (in the air.) Airborne tritium (as HTO vapor) may be inhaled, and may also be absorbed through the skin. When people are exposed to HTO vapor, about 2/3 of the total intake comes from inhalation of the tritium, and about 1/3 comes from absorption of the tritium through the skin. Tritium may also be incorporated into crops, which then may be ingested. Tritium release could be a significant hazard only for personnel close to the accident site.

Once tritium is inside the body, it behaves just like water and is distributed rapidly and uniformly throughout the entire volume of body water, where it may deliver a radiation dose to the soft tissues of the entire body. Tritium is eliminated from the body at the same rate and through the same pathway as water is eliminated from the body, excretion of urine and feces, sweat, and loss through exhalation.

The amount of time required for half of the tritium remaining in the body to be removed from the body is called the "biological half life." Although the physical half-life of tritium is 12.26 years, because tritium in the body behaves just like water, and since the body's water is continually eliminated and replaced, the biological half life of tritium is very short – about 10 days.

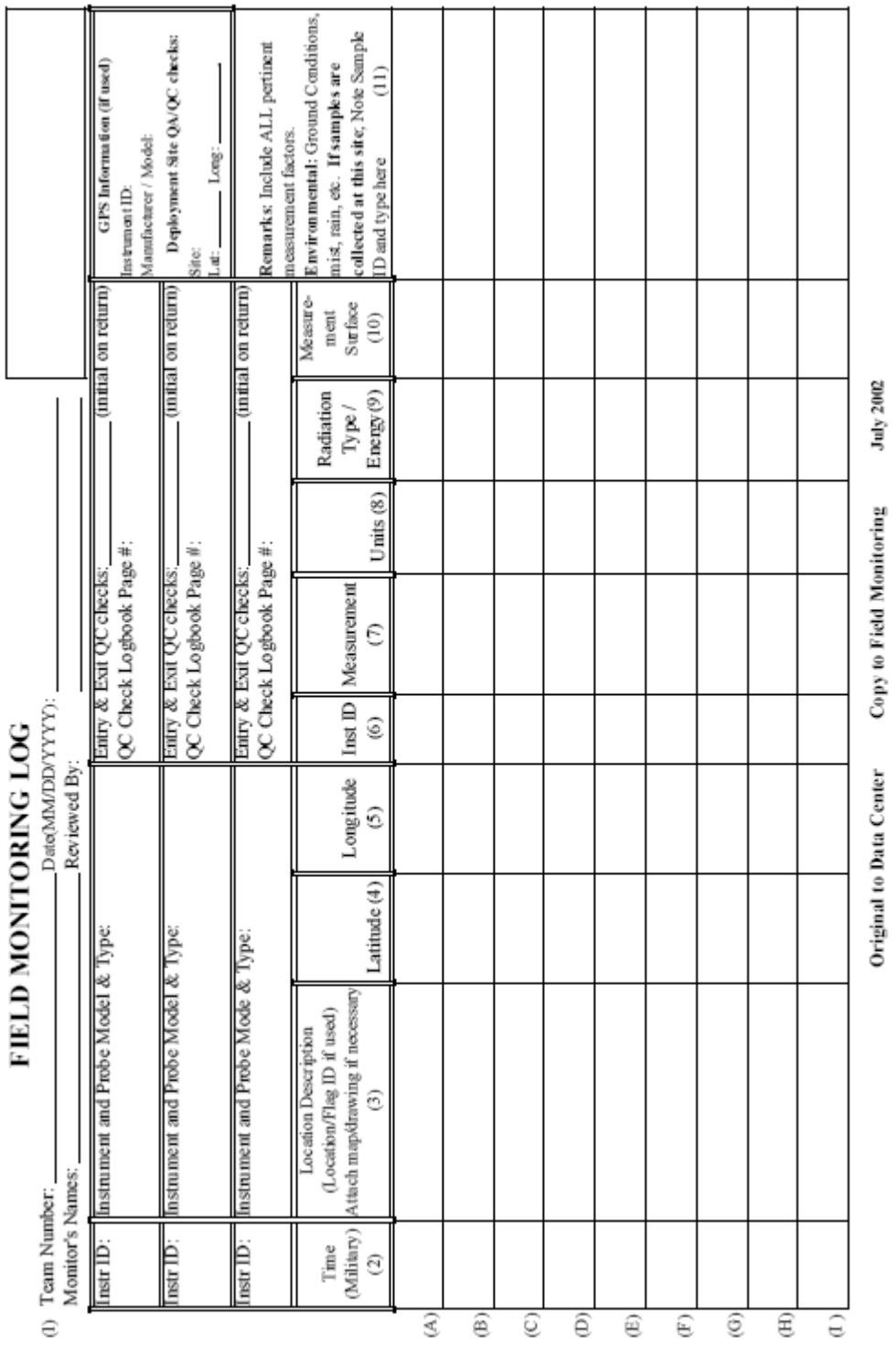
RADIATION DETECTION AND MEASUREMENT

Figure 1. Spectral Plot



RADIOLOGICAL MONITORING, MEASUREMENT, AND CONTROL FORMS

Figure 1. FRMAC Form 1: Field Monitoring Log



FIELD MONITORING LOG

(1) Team Number: _____ Date(MM/DD/YYYY): _____
Monitor's Names: _____ Reviewed By: _____

	Time (Military) (2)	Location Description (Location/Flag ID if used) Attach map/drawing if necessary (3)	Latitude (4)	Longitude (5)	Inst ID (6)	Measurement (7)	Units (8)	Radiation Type / Energy (9)	Measure-ment Surface (10)
Instr ID:		Instrument and Probe Model & Type:			Entry & Exit QC checks: _____ (initial on return) QC Check Logbook Page #:				
Instr ID:		Instrument and Probe Model & Type:			Entry & Exit QC checks: _____ (initial on return) QC Check Logbook Page #:				
Instr ID:		Instrument and Probe Mode & Type:			Entry & Exit QC checks: _____ (initial on return) QC Check Logbook Page #:				
(A)									
(B)									
(C)									
(D)									
(E)									
(F)									
(G)									
(H)									
(I)									

GPS Information (if used)
Instrument ID:
Manufacturer / Model:
Deployment Site QA/QC checks:
Site:
Lat: _____ Long: _____

Remarks: Include ALL pertinent measurement factors.
Environmental: Ground Conditions, mist, rain, etc. If samples are collected at this site; Note Sample ID and type here (11)

Original to Data Center Copy to Field Monitoring July 2002

RADIOLOGICAL MONITORING, MEASUREMENT, AND CONTROL FORMS

Figure 2. FRMAC Form 2: Sample Control Form

SAMPLE CONTROL FORM & CHAIN OF CUSTODY | *"Sample Control Barcode"*

Sampling Information (*to be filled out by the Field Team*)

Collection Team ID: Collector's Name: Org:

Location: ☐ GPS Latitude: _____ Description: _____

Longitude: _____

Collection Date: Collection Time (Military): # of Containers Contact Dose Rate:

Remarks: _____

Sample Type (use only once)

Air
Sampler ID # Type: Filter size & Type:
Date ON: Time ON: Date OFF: Time OFF:
Start Flow: Stop Flow: **OR** Total Volume: Unit:

Milk
☐ Cow ☐ Goat ☐ Other _____ ☐ Stored Feed ☐ Pasture ☐ Other _____
Milking Date: Milking Time: Number of Animals sampled:

Ground
Depth of soil sample: cm Vegetation collected with soil samples? ☐ **Yes** ☐ **No**
Sample surface area: If vegetation in separate container, provide sample #:

Water ☐ Surface ☐ Ground / Well ☐ Portable / Tap ☐ Other:

Other ☐ Vegetation ☐ Feed ☐ Produce ☐ Swipe ☐ Other:
Describe:

Sample Receiving (*to be filled out by sample receiving technician*)

Processing Priority: Dup Sample #: Split Sample #:

Screening Value: ☐ **Contamination Check:** Forms and sample bags surveyed.

Sample Remarks:

Analysis Requested: ☐ **Sample Preparation Required**, send to sample preparation area before laboratory

Laboratory Assignment:

Special Instructions:

Custody Transfer (Signatures)

Relinquished By:	Date	Time	Received By:	Date	Time
Relinquished By:	Date	Time	Received By:	Date	Time
Relinquished By:	Date	Time	Received By:	Date	Time
Relinquished By:	Date	Time	Received By:	Date	Time

Original with Sample Copy to Data Center Copy to Courier September 2002

RADIOLOGICAL MONITORING, MEASUREMENT, AND CONTROL FORMS

Figure 3. FRMAC Form 3: Team, Instrument, and Equipment Information Log

TEAM, INSTRUMENT, & EQUIPMENT INFORMATION LOG

Field Team Supervisor Initials _____

Team Number			
Today's Date		Start Time	
Team Leader (Last, First, M.I.)			
Team Leader Organization			

TEAM MEMBERS

	Name (Last, First, Middle Initials)	Organization
1		
2		
3		
4		
5		

INSTRUMENT AND EQUIPMENT INFORMATION

Instrument / Equipment Number	Instrument / Equipment Type	Instrument / Equipment Number	Instrument / Equipment Type

Cellular Phone		Radio Number
Serial Number	Phone Number	

VEHICLE INFORMATION

License Plate Number	State	License Plate Number	State

This form must be completed and turned in to the Field Team Supervisor prior to field deployment

Original to Date Center **Yellow copy to Field Monitoring Division** **September 2002**

RADIOLOGICAL MONITORING, MEASUREMENT, AND CONTROL FORMS

Figure 4. FRMAC Form 4: Daily Instrument QC Checks Form

DAILY INSTRUMENT QC CHECKS

Event ________ Team # ________

Performed By ________ Reviewed By ________ Page ____ of ____

Instrument Number	Instrument Type	Depart Date/Time DDMMMYYYY 0000 (Military)	QC Check Source Type	Check Source ID #	Check Source Activity	Acceptable Operating Range	Depart Actual Reading	Return Date/Time DDMMMYYYY 0000 (Military)	Return Actual Reading

September 2002

RADIOLOGICAL MONITORING, MEASUREMENT, AND CONTROL FORMS

Figure 5. FRMAC Form 5: Data Acquisition Log

DATA ACQUISITION LOG

Date ____________ Page ________ of ____________

Event ______________________________

Data Acquisition Officer ______________________

Data Entry Operator ______________________ Reviewed By ______________

Entry #	Team # (1)	Time (military) (2)	Location Description (3)	Latitude (4)	Longi-tude (5)	Inst ID (6)	Measure-ment (7)	Units (8)	Radiation Type /Energy (9)	Measure-ment Surface (10)	Remarks If samples are collected at this site; Note Sample ID and type here (11)

Original to Data Center Copy to Field Monitoring September 2002

RADIOLOGICAL MONITORING, MEASUREMENT, AND CONTROL FORMS

Figure 6. FRMAC Form 6: LAM TLDs Form

LOCAL AREA MONITORING (LAM) TLDs

STATION				TLDs				
						Deployed	Retrieved	
#	Description	Latitude	Longitude	Number 1	Number 2	Date/Time Initials	Date/Time Initials	Remarks

CHAIN OF CUSTODY			DATE
Relinquished By:	Received By:		
Relinquished By:	Received By:		
Deployment Transit Control TLD Numbers	1)	2)	
Retrieval Transit Control TLD Numbers	1)	2)	
FOR LABORATORY USE ONLY			
FRMAC-to-Laboratory Transit Control TLD Numbers			

Original to Data Center **Yellow Copy to Field Monitoring** **Pink Copy to Laboratory** September 2002

RADIOLOGICAL MONITORING, MEASUREMENT, AND CONTROL FORMS

Figure 7. FRMAC Form 7: Personnel TLD Data Sheet

PERSONNEL TLD DATA SHEET

Privacy Act Statement: *The information on this form is protected by the Privacy Act of 1974. The purpose of requesting this information is to conduct dose tracking. This information will be used by the U.S. Department of Energy, Nevada Operations Office, its contractors, and the home organization of the participant. Failure to provide this information will result in not receiving a dose assessment or proper dose tracking.*

Personnel TLD Data Sheet

Personnel TLD Data Sheet #
40134

Event	TLD #	Latitude	Longitude	Deployed		Retrieved	
				Date/Time (Military)	Initials	Date/Time (Military)	Initials
Location Describtion:							
Name	Last		First			Middle	
Mailing Address		City		State		Zip Code	
Phone Number (with area code)		Social Security Number *		Date of Birth		Sex	
						M F	

Remarks (Issue/Retrieval): _____

CHAIN OF CUSTODY

Relinquished By: Date/Time (Military)	Received By: Date/Time (Military)	Transit Numbers:
Relinquished By: Date/Time (Military)	Received By: Date/Time (Military)	Transit Numbers:
Relinquished By: Date/Time (Military)	Received By: Date/Time (Military)	Transit Numbers:
Relinquished By: Date/Time (Military)	Received By: Date/Time (Military)	Transit Numbers:

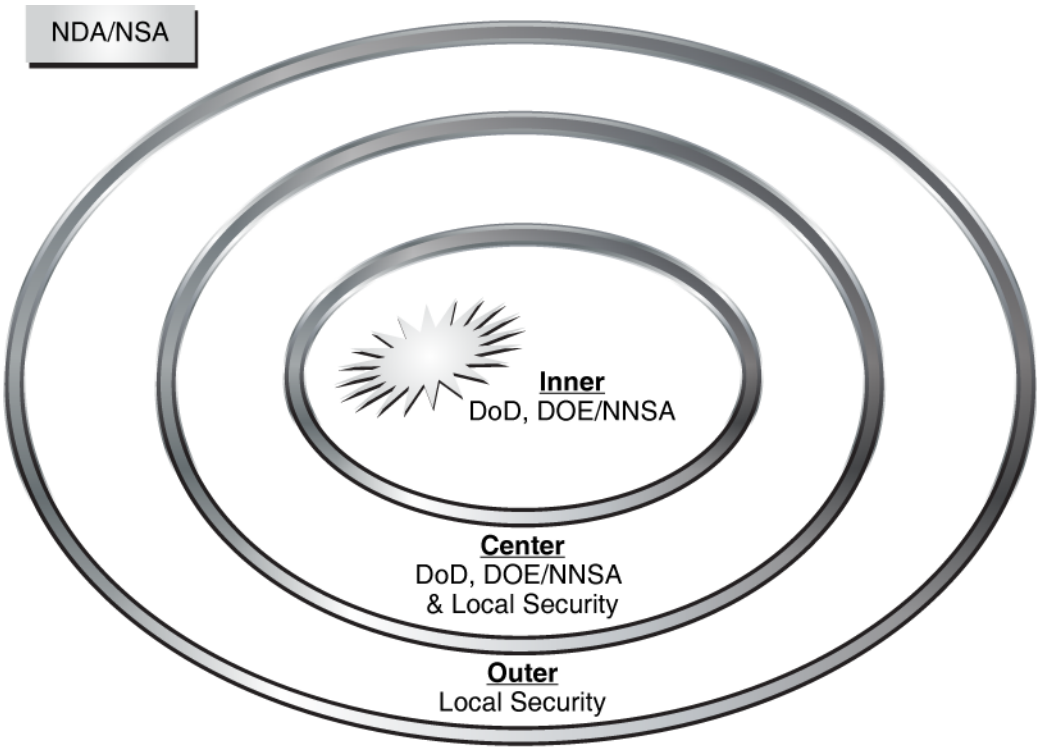
Revision Date July 1998

* SSN Disclaimer: The Health and Safety Group requires that Social Security number information be provided. This information is held in strict confidence; it is not released.

Original to Data Center **Yellow Copy to Health & Safety** **Pink Copy to Individual**

SECURITY

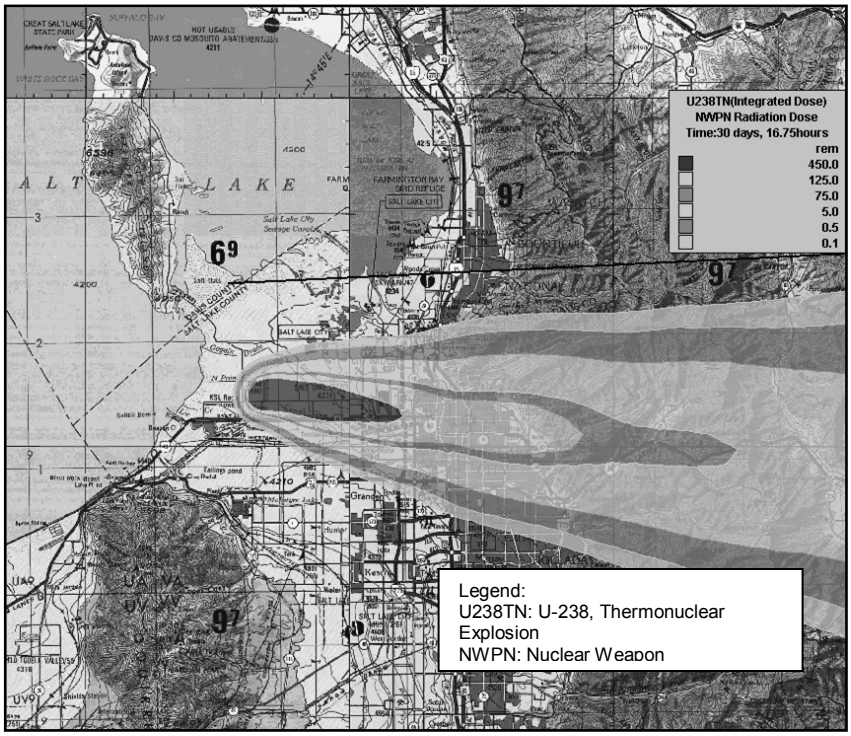
Figure 1. Security Concept



Security Considerations for NDA/NSA Perimeter

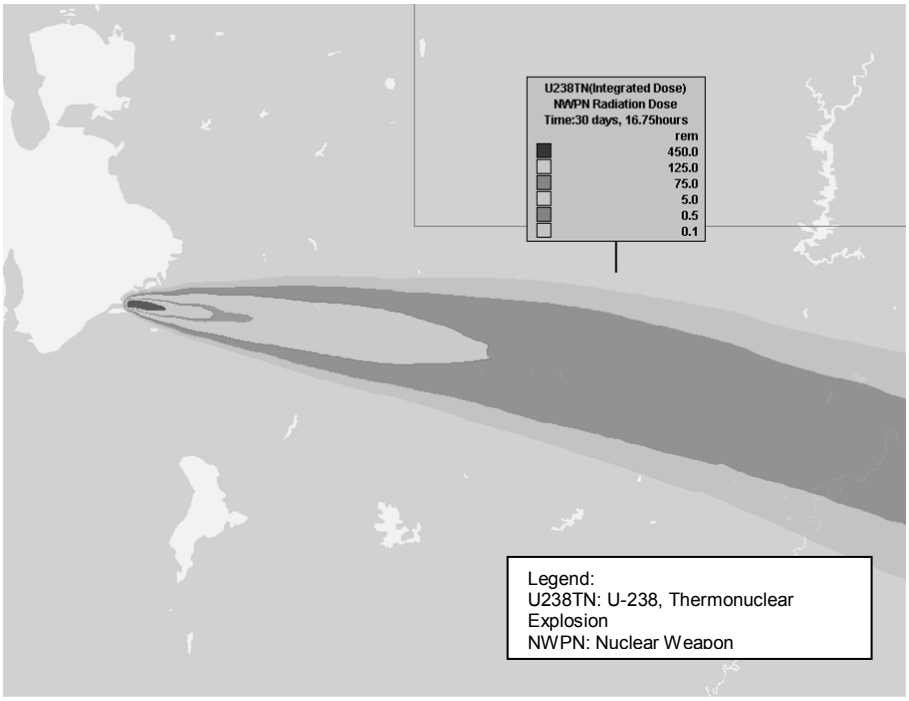
SPECIALIZED RADIOLOGICAL MONITORING AND HAZARD ASSESSMENT CAPABILITIES

Figure 1. HPAC Modeling Prediction: Surface Dose



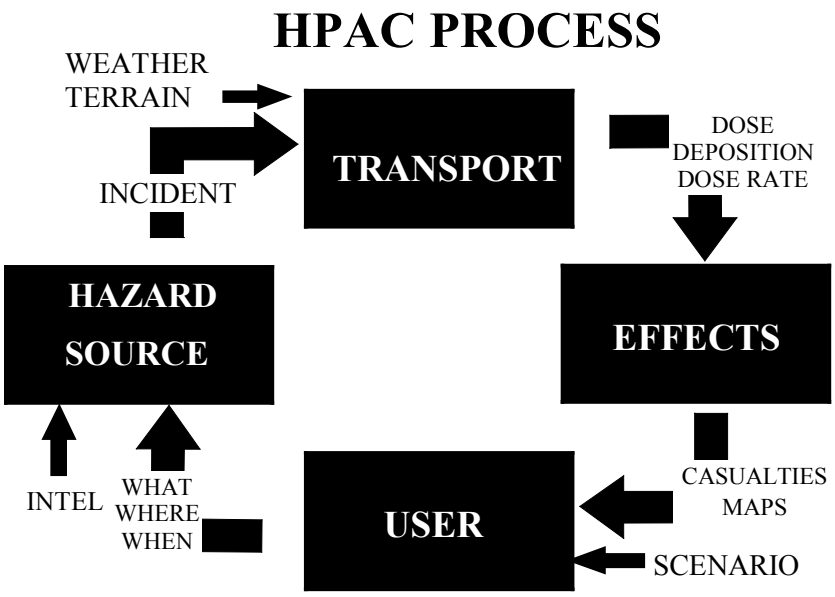
SPECIALIZED RADIOLOGICAL MONITORING AND HAZARD ASSESSMENT CAPABILITIES

Figure 2. HPAC Modeling Prediction: Hazards Area Effects



SPECIALIZED RADIOLOGICAL MONITORING AND HAZARD ASSESSMENT CAPABILITIES

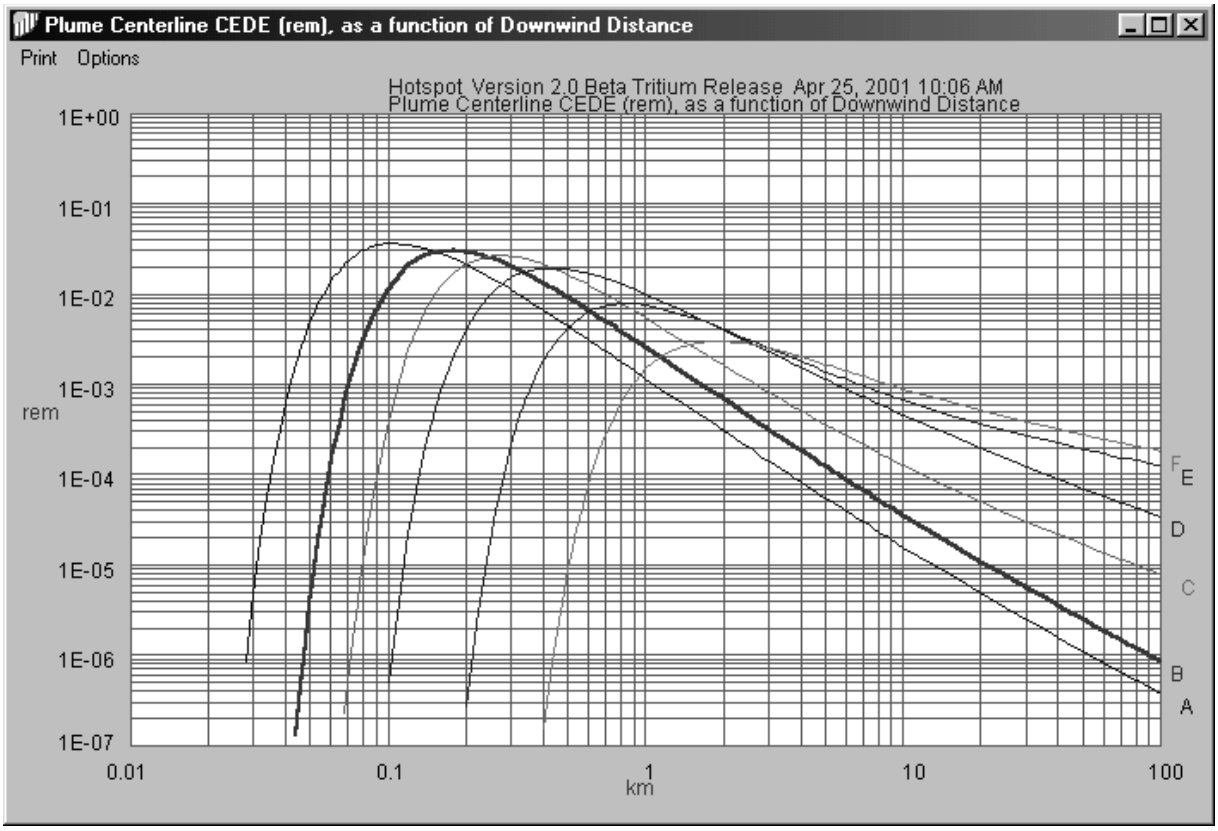
Figure 3. HPAC Process



SPECIALIZED RADIOLOGICAL MONITORING AND HAZARD ASSESSMENT CAPABILITIES

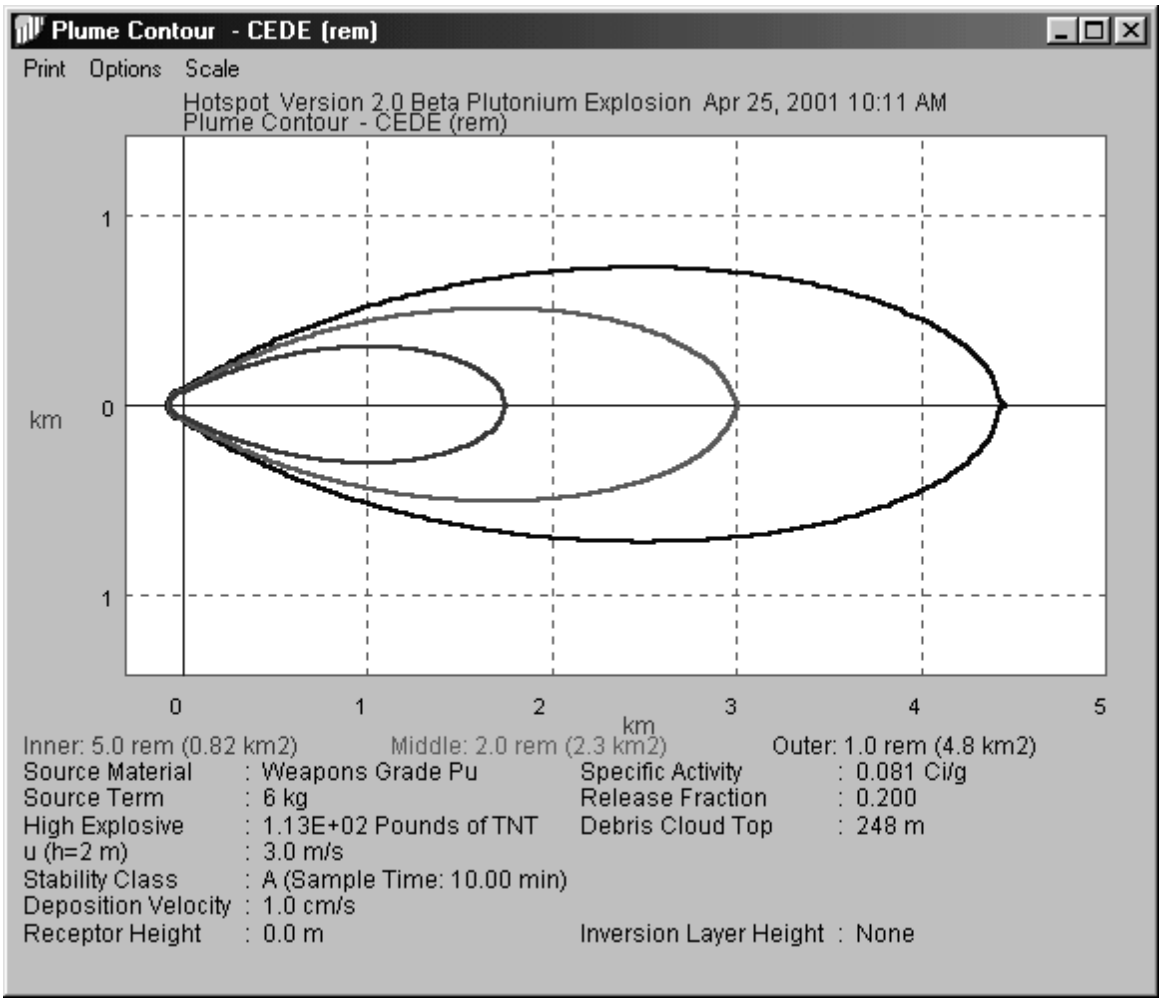
SPECIALIZED RADIOLOGICAL MONITORING AND HAZARD ASSESSMENT CAPABILITIES

Figure 4. Hotspot Downwind Plume Centerline (Stability A-F)



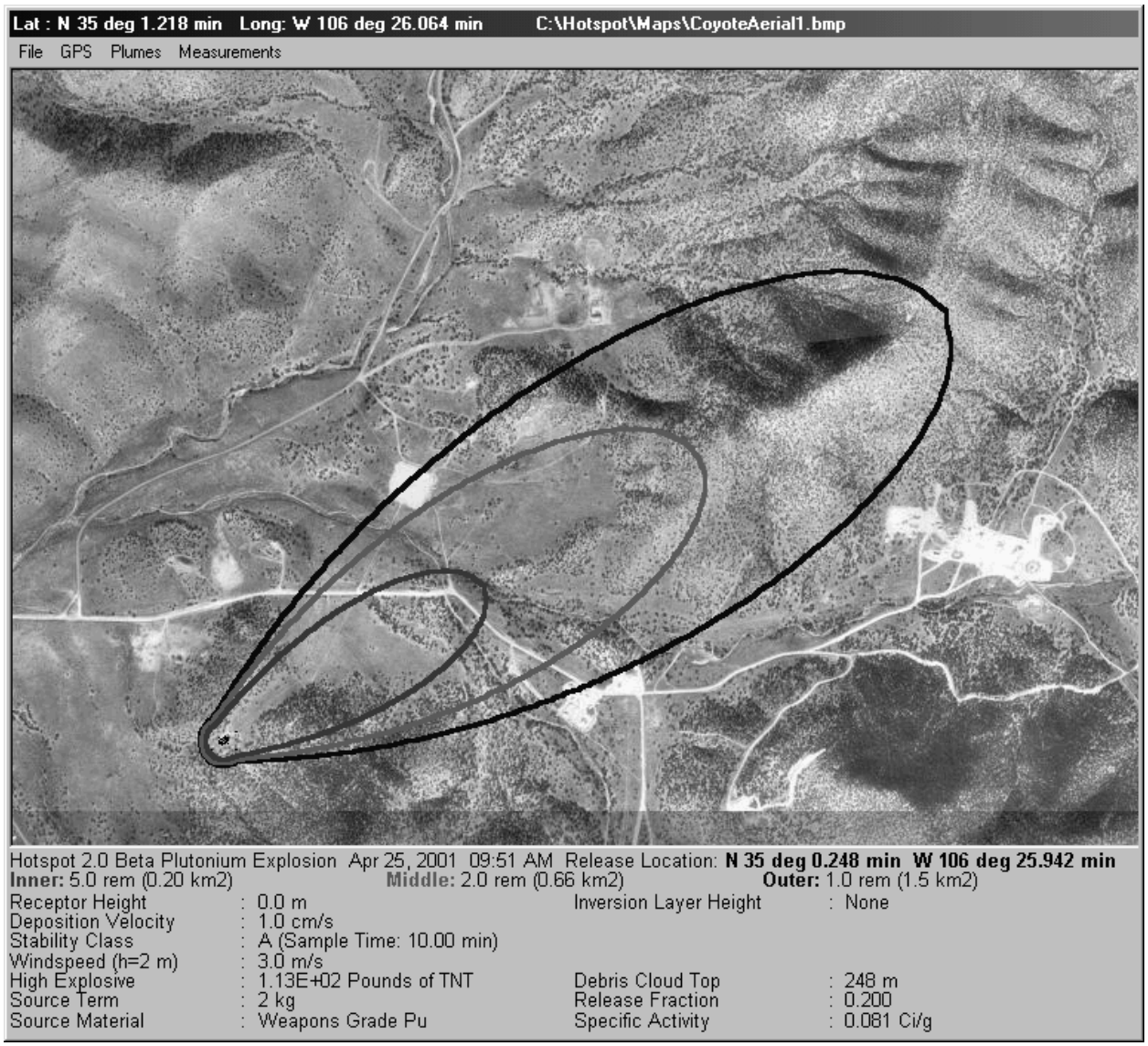
SPECIALIZED RADIOLOGICAL MONITORING AND HAZARD ASSESSMENT CAPABILITIES

Figure 5. Hotspot Plume Contour Plot



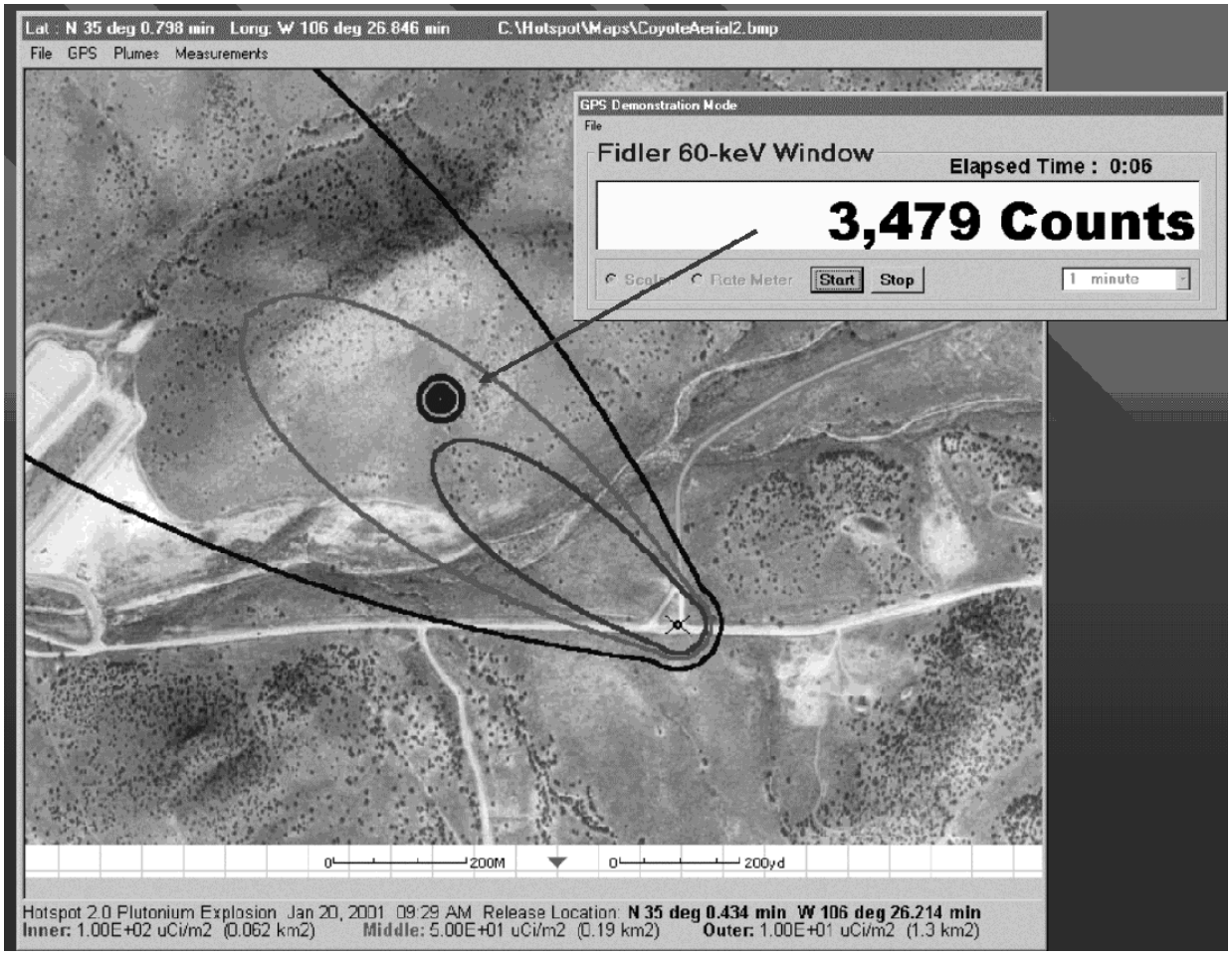
SPECIALIZED RADIOLOGICAL MONITORING AND HAZARD ASSESSMENT CAPABILITIES

Figure 6. Hotspot Plume Contours Displayed on Aerial Photograph



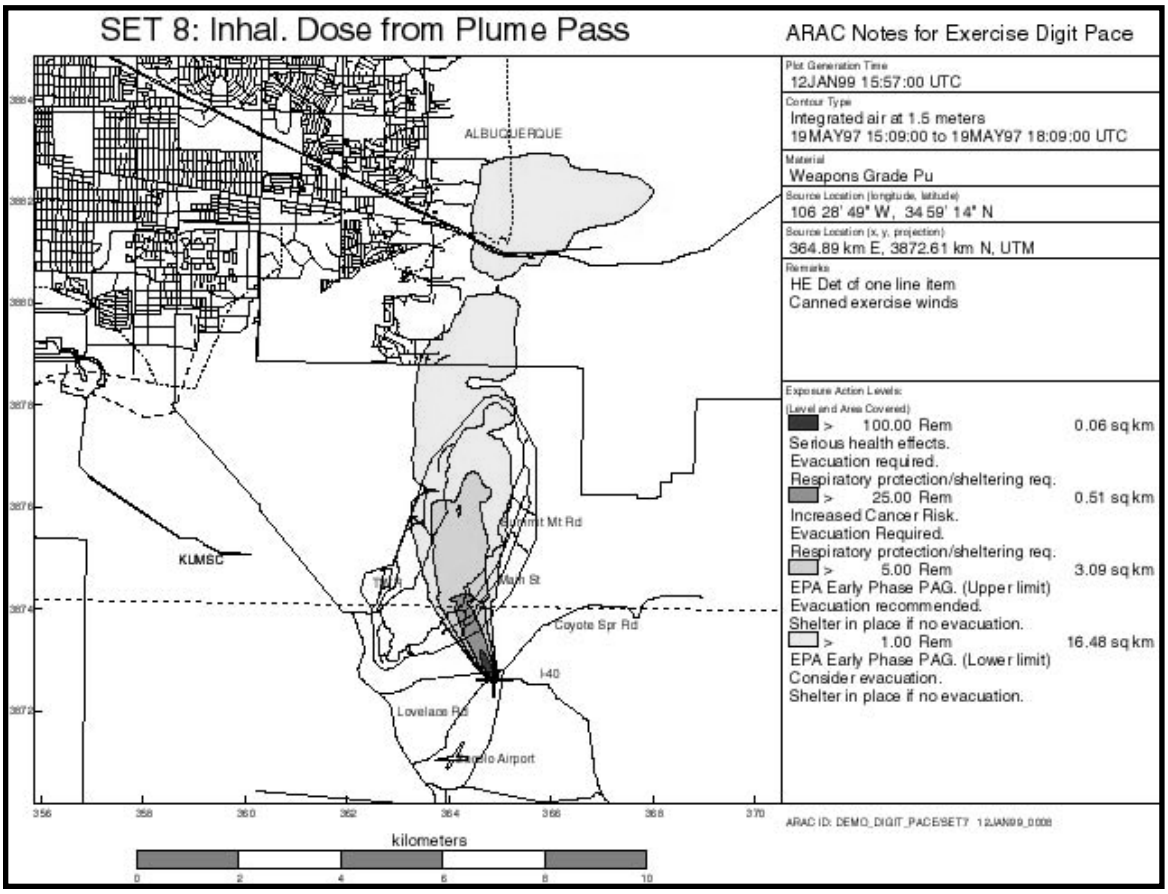
SPECIALIZED RADIOLOGICAL MONITORING AND HAZARD ASSESSMENT CAPABILITIES

Figure 7. Virtual FIDLER Detector for Exercise Support



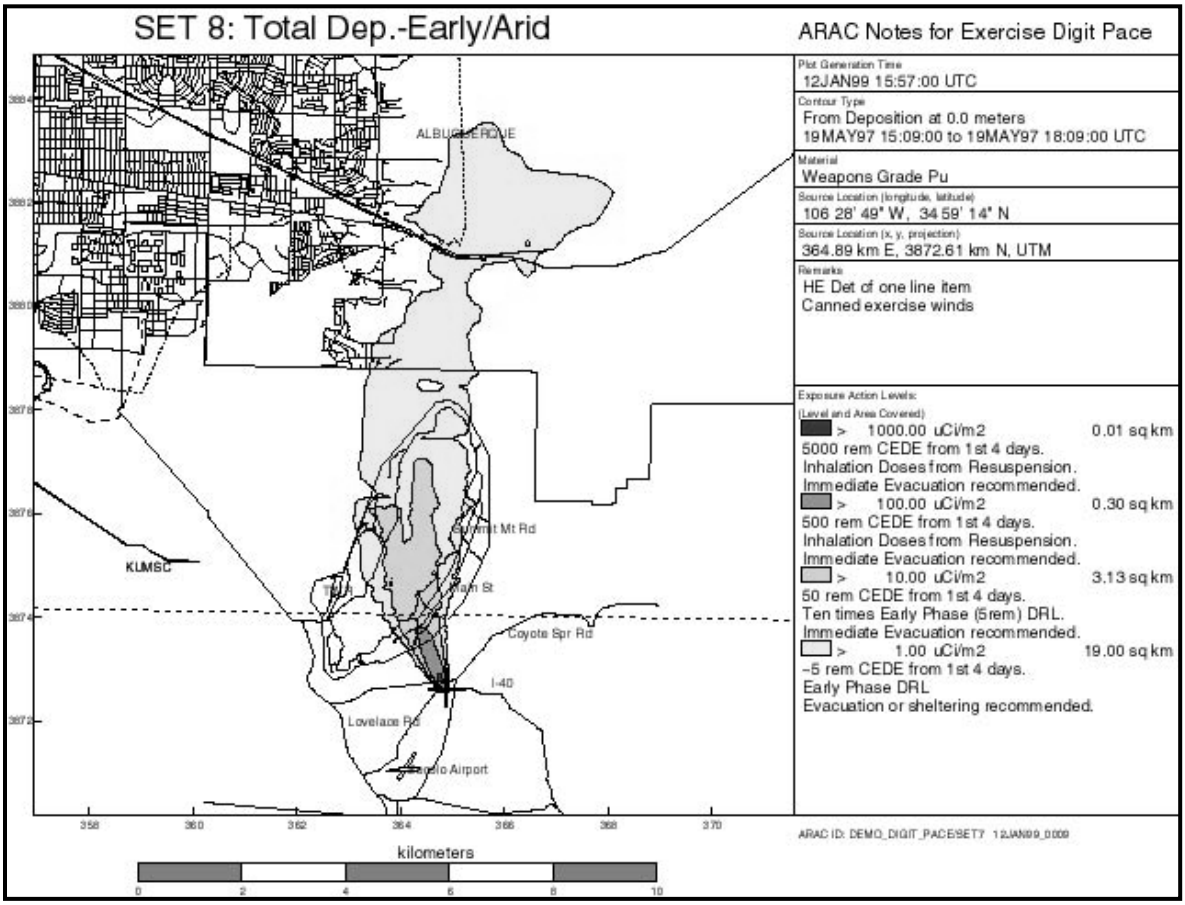
SPECIALIZED RADIOLOGICAL MONITORING AND HAZARD ASSESSMENT CAPABILITIES

Figure 8. ARAC Plot: Lung Dose



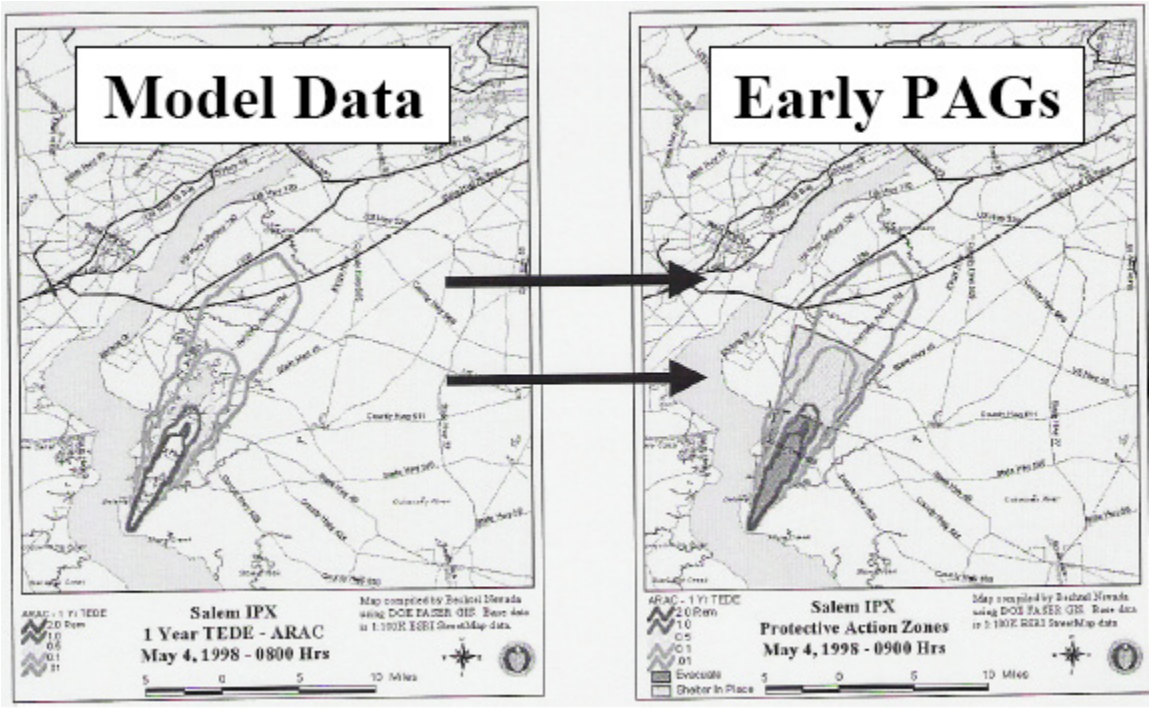
SPECIALIZED RADIOLOGICAL MONITORING AND HAZARD ASSESSMENT CAPABILITIES

Figure 9. ARAC Plot: Deposition



SPECIALIZED RADIOLOGICAL MONITORING AND HAZARD ASSESSMENT CAPABILITIES

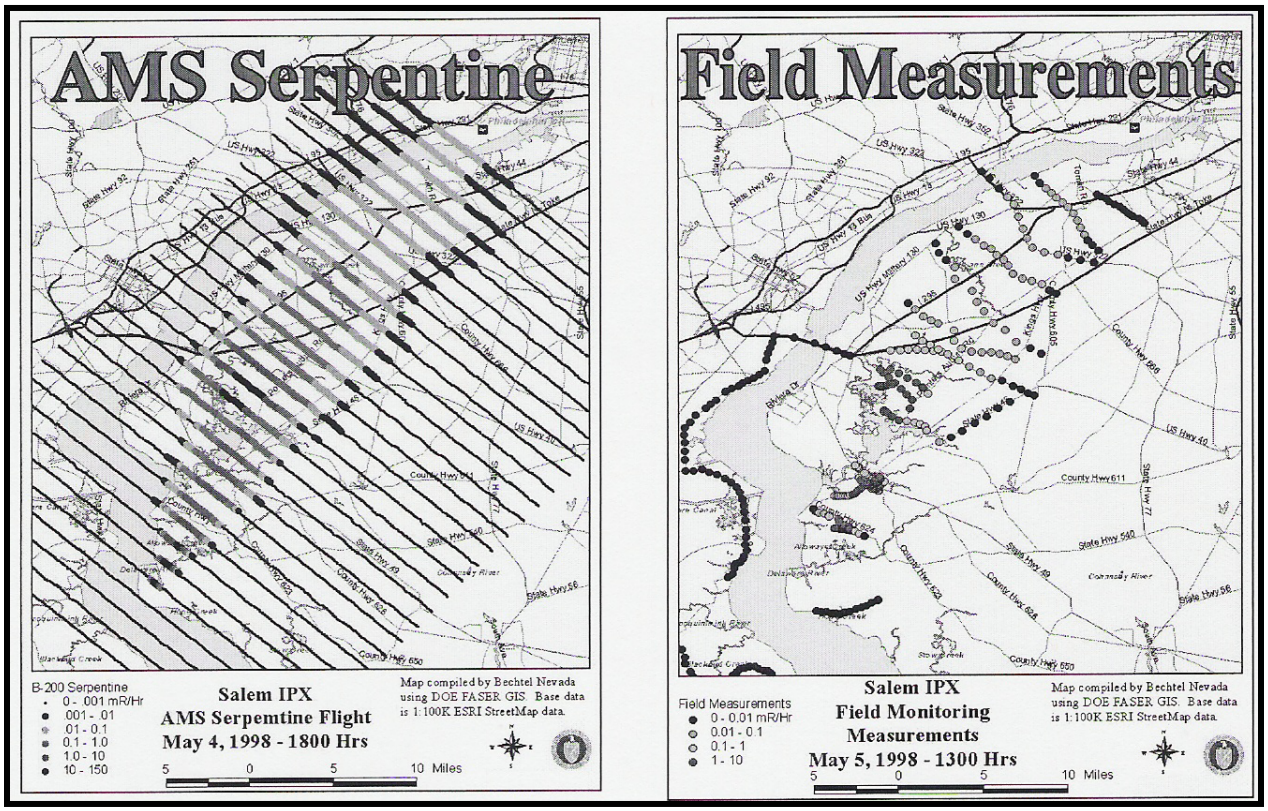
Figure 10. Aerial Survey Results: Early Phase Radiological Data



Legend:
ESRI: Environmental Systems Research Institute
IPX: Ingestion Pathway Exercise
TEDE: Total Effective Dose Equivalent
DOE FASER GIS: DOE Field Analysis System for Emergency Response, Geographic Information System

SPECIALIZED RADIOLOGICAL MONITORING AND HAZARD ASSESSMENT CAPABILITIES

Figure 11. Aerial Survey Results: Radiological Data Measurements, AMS Serpentine, and Field Measurements



SPECIALIZED RADIOLOGICAL MONITORING AND HAZARD ASSESSMENT CAPABILITIES

Figure 12. Aerial Survey Results: Radiological Data Measurements, AMS Contours, and AMS KIWI