UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

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THE ADMINISTRATOR

EPA-SAB-07-010

Dr. Jill Lipoti
Science Advisory Board
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Dear Dr. Lipoti:

Thank you for writing and for providing me with the report developed by the RadNet Review Panel of the Science Advisory Board's Radiation Advisory Committee on the *Draft Expansion and Upgrade of the RadNet Air Monitoring Network: Concept and Plan.*

I appreciate the Panel's efforts to complete a comprehensive, technical review of the draft Plan, which presented the details for improving radiological air monitoring on a national scale. I am pleased that the Panel concluded that "the proposed expansions and upgrades significantly enhance the ability of the RadNet monitoring network to meet the mission and objectives of the EPA," and that the Panel "urges the Agency to move forward expeditiously with deployment of the fixed monitors."

Enclosed is a summary of EPA's responses to the Panel's findings and recommendations. I assure you that they are being given thoughtful consideration as we prepare the Agency's Final Plan. Many of your recommendations have already been implemented, and the summary highlights the initiatives and RadNet program changes undertaken since the Panel's December 2005 review meeting.

Sincerely,

Stephen L. Johnson

Enclosure

cc: Charles Ingebretson
Robert Meyers
Elizabeth Cotsworth

INTRODUCTION

Purpose

This document responds to recommendations provided by the Science Advisory Board after its review of the U.S. Environmental Protection Agency's proposals for updating RadNet, the Agency's national radiation monitoring system. In December 2005, the SAB's Radiation Advisory Committee RadNet Review Panel convened at the National Air and Radiation Environmental Laboratory in Montgomery, Alabama, to discuss with staff from National Air and Radiation Environmental Laboratory and from the Radiation and Indoor Environments Laboratory the proposals contained in the document titled *Expansion and Upgrade of the RadNet Air Monitoring Network: Concept and Plan.* NAREL and R&IE are part of EPA's Office of Radiation and Indoor Air, and each lab has its own areas of concern and responsibility for RadNet. The SAB recommendations referred to in this document are based on the SAB final review report dated July 2, 2007.

Background

SAB emphasis for RadNet. While the SAB Panel concluded that "the proposed expansions and upgrades significantly enhance the ability of the RadNet monitoring network to meet the mission and objectives of the EPA," it presented a somewhat different view with respect to the siting, sampling, and deployment of the RadNet monitors than was provided in the initial EPA Draft Plan. The chief difference in emphasis between the SAB Panel's view and that reflected in EPA's proposals is that the SAB Panel sees the value of RadNet during emergencies predominantly as a provider of modeling data. EPA shares that view with the SAB Panel and has been taking appropriate actions to increase RadNet's value regarding modeling data. EPA's actions in support of improved modeling capability during emergencies are in four areas: utilizing geographical coverage as a siting criterion; performing studies to determine locations that will improve value of the data; clarifying the roles of fixed and deployable monitors; and finding effective ways to use RadNet data.

Increased geographical coverage. Subsequent to the SAB Panel's review and informed by the SAB Panel's initial comments, comments from partners and stakeholders, and results of emergency response exercises, EPA modified its plan for location of RadNet monitors to provide improved geographical coverage during initial phases without compromising population coverage. Placement of these initial monitors is responsive to the needs of modelers, in national-scale events, for data to validate and modify modeled plume locations and concentrations. Locations for monitors that are sited later will continue to consider both population and modeling needs, as modified in the Final Plan based on responses to the SAB Panel's recommendations. Based on these additional studies and analyses, there may be additional declustering; a greater separation radius is being evaluated as one way to achieve the objectives.

Improving data for modeling. The SAB Panel proposed a modeling-based method for selecting fixed monitor locations, and EPA is following a similar method to review the proposed siting plan for the remaining locations. In particular, thousands of radioactive release scenarios have now been modeled, and results will be used to determine the likelihood of fixed monitors to

detect releases based upon the initial siting plan. EPA will use the results of this analysis to help determine the appropriate locations for future monitors, while considering the possibility that the total number of monitors that will constitute the final fixed network may vary from estimates. This will ensure that modelers have sufficient data to predict national-scale releases, while still providing major cities with at least one data point for use, such as in public information or for analyzing additional local monitoring needs.

Roles of fixed and deployable monitors. Siting of fixed monitors and deployment of EPA's set of 40 deployable monitors consider local, regional, and national modeling needs; operational security; physical location; and integration with other resources such as state programs and the Interagency Modeling and Atmospheric Assessment Center. EPA agrees with the SAB Panel's assessment of the role of fixed monitors during routine monitoring as providing local as well as national-scale data, and the Final Plan will clarify this. The use of fixed monitor data during an emergency is to provide input to and verification of national scale modeling. The deployable monitors will be retained for rapid emergency use on a local scale near an incident site to ensure their availability for pre-deployment or emergency deployment to one or more sites.

Data usability. Regarding the usability of the data, EPA has been working with the Interagency Modeling and Atmospheric Assessment Center directly on issues associated with the decision matrix based on results from the RadNet monitors (both fixed and deployable monitors). EPA has also been working with communication experts and its stakeholders in developing and reviewing plans to communicate decisions based on RadNet data.

Progress Since the Review

Since the SAB Panel's review meeting in December 2005, EPA has made progress in implementing the RadNet air monitoring program. Forty-five (as of July 25, 2007) of the new fixed monitors are already sited and operating under test conditions; the central database has been established and is receiving pilot data from the installed monitors; and the RadNet Web site is in operational test status. In a number of instances, RadNet implementation activities to date have informed EPA's responses to the SAB Panel's recommendations.

EPA RADNET TEAM DETAILED RESPONSES TO EPA-SAB-07-010

Charge Question #1: ***Are the proposed upgrades and expansion of the RadNet air monitoring network reasonable in meeting the air network's objectives?***

SAB Report 3.1: The SAB Panel recommends more declustering of the fixed monitors to gain greater geographical coverage for interstate-scale monitoring. The SAB Panel further recommends that EPA consider placing some of the deployable monitors temporarily in the locations chosen for the fixed monitors to bridge the time interval until the fixed monitors are purchased and in place.

EPA Response: EPA is performing a series of atmospheric dispersion model runs to help determine optimal siting criteria. EPA's existing siting plan will be evaluated against the results of this modeling study to improve the balance between population and geographical coverage, and results will be presented in the Final Plan. Further, although EPA sited the initial monitors based upon population ranking (as an indicator of risk), subsequent monitors will be sited at locations that also increase the geographical spread of the system.

EPA considered placing deployable monitors in fixed station sites, but has concluded that the deployable monitors should be maintained at two central locations in a state of readiness for their designed role of targeted monitoring following a radiological incident. Before reaching this conclusion, EPA analyzed the advantages of temporarily siting deployable monitors at locations designated to receive fixed monitors in later phases, as well as costs and operational disadvantages. Among other factors, the analysis considered the impact on RadNet's capabilities in the event of a national radiological emergency, including the possibility of multiple events; administrative challenges and costs associated with an interim placement of deployables; the value of more rapid geographical coverage; and early identification of station operators brought about by substitution of deployable monitors for fixed monitors. Pre-existing Environmental Radiation Ambient Monitoring System monitors will remain in operation at other locations during the multi-year siting process.

SAB Report 3.2: Because both the fixed and deployable monitors will be used to provide important information to decision makers, it is imperative that both the similarities and differences between these two monitoring systems be understood and quantified so that interpretation of the data will be of high quality and consistency.

EPA Response: The Final Plan will include more detailed information on the similarities and differences between the fixed and deployable monitors and how that information affects RadNet data. During routine operations, data from the monitors will be available to anyone through a public access Web site that will provide general context for the data to enable informed data interpretation. In addition, EPA plans periodic meetings with Interagency Modeling and Atmospheric Assessment Center modelers and other RadNet partners to assure proper data utilization. In addition, see response to SAB Report 4.5.

SAB Report 3.3 (a): In this section, the SAB Panel is concerned that the configuration of the detector and filter in the fixed monitor may introduce issues about uniformity of particle deposition across the filter, potential contamination of the filter by particle deposition, and sampling biases related to different particle-size regions.

EPA Response: EPA is currently conducting wind tunnel testing on the RadNet fixed monitor. Collection efficiency for various particle sizes will be determined at multiple wind speeds and orientations with respect to the monitor. The tests will also evaluate the effects caused by the geometrical arrangement of the radiation detectors relative to the filter. Results will be incorporated into the RadNet Final Plan, along with a discussion of other issues associated with particle size.

SAB Report 3.3 (b): The currently designed instruments have not been tested for the collection efficiency of airborne particulates as a function of the wind speed and direction at which they arrive at the monitor. The relationship between sampling efficiency and particle size might also be affected and should be tested.

EPA Response: Agreed. See response above to SAB Report 3.3 (a).

SAB Report 3.4 (a): If it is assumed that the near real-time collection of these gamma exposure measurements is an important function of the deployable monitors, then consideration should be given to making similar gamma exposure measurements on the fixed monitors as well.

EPA Response: The fixed and deployable monitors serve different monitoring goals that lead to some technical differences in their design and operation. The fixed monitors are designed to monitor areas distant from the incident location, and the deployable monitors are more likely to be in areas near high levels of surface contamination. Since it is very unlikely that a significant submersion dose or deposition would occur near the fixed monitors, EPA believes it is not cost-effective to add ambient gamma radiation detectors to them. Further, EPA believes that long-distance transport of noble gases at levels that will produce a detectable exposure rate on an ambient gamma radiation detector is unlikely. On the other hand, the deployable monitors, by virtue of their incident-related locations, have potential to detect elevated deposition exposure rates. Thus their near-real-time capability to measure gamma radiation was deemed important – to provide quick warning of increases in radiation exposure.

SAB Report 3.4 (b): While it might be impractical to cross-calibrate each deployable system against a PIC, NAREL should consider cross-calibrating the prototype using a series of different energy gamma emitters, including naturally occurring thorium with its relatively high energy gamma 208Tl decay product and uranium with its lower average energy decay products.

EPA Response: EPA has obtained quality assurance documents from the manufacturer that provide the energy range, energy compensation, and energy calibration information for the Genitron gamma detector on the deployable monitors. Over the energy ranges of interest both a PIC and a Genitron respond within approximately 20 percent of the response for the nuclide against which they were calibrated. Therefore, we believe that cross-calibrating would effectively duplicate what has already been done by the manufacturer and is, therefore, not a cost-effective effort.

SAB Report 3.5: ORIA staff told the SAB Panel that a complicated algorithm is needed to distinguish alpha emissions measured in the fixed monitor from the measurements of alpha emissions of naturally occurring radon (Rn) progeny. It is important that this capability be perfected because other alpha emitters besides 241Am may become important in assessing potential terrorist activities.

EPA Response: Experience with the monitors subsequent to the review has shown that alpha measurement in near-real time is not feasible. An equipment limitation on the detector (a "light

leak") necessitated a solution (thicker window material) that eliminated alpha detection. Although re-engineering the detector in the middle of the implementation process is not feasible, EPA will evaluate alpha detection options after all monitors have been sited. In the meantime, EPA will rely on operators performing screening for alpha and beta emitters after filter collection and performing subsequent laboratory analyses. The Final Plan will include a discussion of the lessons learned that supported the decision to not pursue further near-real-time alpha measurement.

SAB Report 3.6.2: The EPA report should include the nCi value on the filter that corresponds to the selected limit on intake related to the PAG (see part A) for each of the eight radionuclides. The purpose is to confirm that the MDA is suitably lower than specified by the PAG to permit reliable measurement results.

EPA Response: EPA agrees and will include them in the Final Plan.

SAB Report 3.6.3 (a): The calculated MDA values reported in the WSRC report should be inserted into the EPA report with an explanation of the reasons for the much larger EPA-specified MDA values (p.27, para.1), except for 241Am.

EPA Response: EPA agrees and will include the MDA values along with the explanation in the Final Plan.

SAB Report 3.6.3 (b): Before inserting the WSRC data in the EPA report, some improvements in the WSRC report are recommended.

EPA Response: The Final Plan will include a full discussion of the WSRC report issues, including the calculations, the recommended tabulations for regions of interest, and a discussion of apparent errors regarding 137Cs. The SAB Panel's requested information and discussion of issues concerning the 90Sr MDA also will be included.

SAB Report 3.6.3 (c): The implications of the change in the thickness (from thick to thin) of the silicon-detector window reported by EPA staff at the meeting should be discussed in the EPA report.

EPA Response: EPA will include in the Final Plan a full discussion of the implications of the change in the thickness of the silicon detector window. (See also the response to SAB Report 3.5.)

Charge Question #2: ***Is the overall approach for siting monitors appropriate and reasonable given the upgraded and expanded system's objectives?***

SAB Report 4.1 (a): The SAB Panel reiterated the recommendation contained in Charge Question #1 above. In particular, the SAB Panel questioned whether the correct mission of the deployable monitors has been determined.

EPA Response: The mission for the set of 40 deployable monitors is to fill a void between the radiological emergency response teams in the contaminated zones and the fixed RadNet monitors, a planned 180 of which are spread across the nation. These voids are an area of importance since they may initially be uncontaminated, but could become contaminated following transport of contamination subsequent to the immediate dispersion. A discussion of the prioritized roles of the deployable monitors relative to the fixed monitors will be included in the Final Plan. Details about the roles of the deployables can be found in the revised CONOPS Plan (October 2006). (See also response to SAB Report 4.4.5.)

SAB Report 4.1 (b): Therefore the SAB Panel strongly advocates the use of sensitivity analyses in the siting of monitors (both fixed and deployable).

EPA Response: EPA agrees and is conducting sensitivity analyses pertaining to fixed monitoring siting. Sensitivity analyses for siting deployable monitors includes so many potential variables that results may be of limited value. In an emergency, siting decisions for all monitoring assets, including deployable monitors, will be made through a partnership of federal, state, and local leaders with input from dose assessors and environmental modelers. If necessary, deployable monitors can be moved readily following a radiological incident to maximize their effectiveness.

SAB Report 4.1.1 (a): In the SAB Panel's opinion there should be a better balance and interplay between physical deployment schemes and modeling requirements for effective environmental assessment, data interpretation and decision-making. (The SAB Panel provides an example in Section 4.3.1)

EPA Response: EPA agrees with the SAB Panel's recommendation. Although EPA sited the initial monitors by population ranking to quickly address coverage concerns on a risk basis, in November 2006 EPA decided to site subsequent monitors based also on geographical spread. This additional geographical coverage will provide data for interstate-scale modeling as well as information for cities to determine if more local monitoring is needed.

SAB Report 4.1.1 (b): Based on these considerations and the limited resources currently available, the SAB Panel suggests that:

a) More declustering of fixed monitors should be considered initially, particularly in the vicinity of the Los Angeles and New York metropolitan areas. Local and regional meteorological models should be used along with other considerations, to reduce the density and to redistribute fixed monitors.

b) Model sensitivity analyses should be performed on siting configurations and distribution densities so as to meet EPA goals and optimize the placement of fixed monitoring stations in terms of the limited resources available.

EPA Response: EPA agrees with the SAB Panel's recommendation to consider reducing clustering of monitors to improve the ability of RadNet fixed monitors to supply interstate-scale

data to modelers in the event of an emergency. (For more information on declustering and sensitivity analyses, see responses above to SAB Report 3.1 and SAB Report 4.1.)

SAB Report 4.1.2: The SAB Panel recommends that EPA work with partner agencies to clarify issues of chain-of-command and assess whether some deployable monitors could be used to fill coverage and time gaps.

EPA Response: EPA is committed to working with partner agencies (Department of Energy, Federal Radiological Monitoring and Assessment Center, IMAAC, Air Canada, and others) to clarify usage of both fixed and deployable monitors. EPA continues to consult with the Conference of Radiation Control Program Directors on appropriate use of deployable monitors, and its RadNet Task Force currently recommends that the deployable monitors be used as primarily emergency response assets and that the fixed monitors be used to provide geographical modeling coverage. The absence of near-real-time air filter analysis on the deployable monitors (see response to SAB Report 3.1) limits their effectiveness as replacements or stand-ins for the fixed monitors. Therefore, EPA and its partner agencies judge that the deployable monitors would best be retained for their initial purpose of providing targeted monitoring following a radiological incident. (See response to SAB Report 3.1 for discussion on deployables and response to SAB Report 4.0 for other options contained in the CONOPS.)

Charge Question # 2a: ***Is the methodology for determining the locations of the fixed monitors appropriate given the intended uses of the data and the system's objectives?***

SAB Report 4.2: The SAB Panel strongly suggests that the declustering of fixed monitors within high density population areas be more aggressive and involve the use of general model constraints, historical meteorological data, and timely meteorological forecast predictions. To this end the SAB Panel supports the use of sensitivity analyses and confirmatory transport modeling proposed by EPA, in conjunction with Westinghouse Savannah River Company, the US Weather Bureau, IMAAC and/or other partners.

EPA Response: EPA agrees. (See responses to SAB Report 3.1 and SAB Report 4.1 for more detailed information.)

SAB Report 4.2.4: There should be a mechanism established for entities to become full-fledged 'members' of the network. This could include States and/or cities that wish to use their own funding to purchase stations and agree to comply with certain EPA standards.

EPA Response: EPA agrees that there should be a mechanism for states and cities to become "members" of the RadNet fixed monitor network. An initial EPA survey indicated that several states are interested in purchasing a monitor and contributing their data to the RadNet database. EPA plans to detail a formal process for achieving this goal. EPA also performed a cross-comparison study with Health Canada and found that the two systems provide similar data. The Canadian monitoring system is being considered for inclusion in EPA's RadMap, a database identifying monitoring locations and available information from all known radiological monitoring programs in the United State and Canada. Emergency responders will use RadMap to identify other potential sources of monitoring data for inclusion in modeling efforts.

Charge Question #2b: ***Are the criteria for the local siting of the fixed monitors reasonable given the need to address both technical and practical issues?***

SAB Report 4.3: Additionally, siting criteria based on a combination of "population" and "cluster density" – as EPA is proposing – may or may not make sense depending on the answers to two additional considerations: a) Whether or not other fixed and deployable monitoring networks will complement RadNet and provide similar and/or compatible data; and b) What sampling requirements are necessary for the mathematical models to best estimate environmental distributions in space and time. For example, the models may require or be optimally served by more uniform geographic sampling, or conversely, require a non-uniform sampling scheme that is driven by geographic/geologic and meteorological factors (in three dimensions) rather than population or sampling density.

EPA Response: (a) In designing the RadNet air monitoring upgrade, EPA did not rely on the availability or usability of radiological air monitoring data from localized, point-source air monitoring systems across the United States. Modelers may make use of data from such sources only after determining how to correlate the concentration or exposure data from them with the uniform interstate-scale data from RadNet. (b) The balance and interplay between population and geographical coverage is being addressed by the study being performed by the Savannah River National Laboratory. (See also in this document remarks in the Introduction, in response to SAB Report 3.1, and in the *Expansion and Upgrade of the RadNet Air Monitoring Network: Concept and Plan* see the SRNL study proposal in Appendix L (Fixed Monitor Siting Methodology Proposed by Savannah River National Laboratory, 2005).

SAB Report 4.3.3: The SAB Panel suggests that the "two-meter rule" be reviewed in the context of tall buildings or large vertical structures, and, if necessary, amended or redefined.

EPA Response: EPA has developed a monitor installation checklist that addresses appropriate distance for a monitor from a structure that might create air flow interference. The guideline used is to place a monitor relative to a large vertical structure so that the distance from the monitor to the structure is twice the height difference between that structure and the monitor intake.

Charge Question #2c: ***Does the plan provide sufficient flexibility for placing the deployable monitors to accommodate different types of event?***

SAB Report 4.4: A key question is whether or not the monitors can be systematically deployed for "routine" monitoring to supplement the fixed monitors, thereby increasing their utility, and still be as readily deployable in an emergency.

EPA Response: EPA has evaluated carefully the option of using deployable monitors to supplement the fixed monitor network. It is EPA's judgment that, among other concerns, having a large number of deployable monitors sited across the United States would create a logistics/retrieval problem that could compromise the timeliness of the intended incident response function of the deployable monitors.

SAB Report 4.4.2: In view of the possibility that the EPA could be requested to pre-deploy its deployable air monitors, the SAB Panel recommends that the criteria for pre-deployments be clearly addressed and carefully established.

EPA Response: Criteria for pre-deployment and guidance on how requests for deployable stations will be processed are being drafted and will be included in the Final RadNet Plan. Careful attention is being given to coordinating EPA pre-deployment plans and guidance with the National Response Plan chain of command.

SAB Report 4.4.3: The SAB Panel suggests however, that without prior training or experience of volunteer personnel, it is difficult to imagine the success of this enterprise in the context of a national emergency, where potential risks to personal and family safety are to be envisioned. The SAB Panel lacked the information necessary to determine whether or not the numbers of cross-trained key personnel and specifically-trained volunteers will be sufficient to affect a response in the event that the core groups are not available for whatever reasons. The SAB Panel recommends that the approaches EPA proposes to use to identify, credential, and maintain the "volunteer" operators be described and training exercises be implemented.

EPA Response: EPA, originally, shared the SAB Panel's concerns, but experience and accomplishments with EPA's Response Support Corps since the SAB's RadNet review meeting in 2005 have been very successful. Through numerous exercises and conference demonstrations, the plan to train volunteer operators just prior to sending them into the field to deploy monitors has proven to be effective. At present, EPA has a pool of some 500 RSC members; a select group of RSC members have been trained on monitor setup and operation; and field exercises using RSC members have been evaluated as successful. EPA is committed to similar future exercises and to using only RSC personnel who have participated in them for actual emergencies.

Each RSC member is required to take basic training online, attend an orientation, and to participate in an emergency response exercise. Basic training assures that each RSC member is familiar with the Incident Command System. A registration database tracks RSC member information (including contact information), special skills, and deployment experience. If the RSC is activated, members are screened for their appropriateness to the incident in play. More information on EPA's RSC is available at ***http://www.epa.gov/superfund/programs/er/index.htm***.

SAB Report 4.4.4: Plans for storing, deploying and siting the deployable monitors should include sufficient flexibility to effectively respond to simultaneous potential or real radiological events in a timely manner and in the absence of viable infrastructure (e.g., appropriately and adequately trained support personnel, communication equipment, electrical power, transportation routes and modes.)

EPA Response: EPA agrees. See responses to the SAB Panel's recommendation in SAB Report 4.4.2, 4.4.3, and 4.5.

Charge Question #2d: ***Does the plan provide for a practical interplay between the fixed and***

deployable monitors to accommodate different types of events that would utilize them?

SAB Report 4.5: The RadNet siting plan provides flexibility for placing deployable monitors for different types of events; however, the role of the deployable monitors is not entirely clear. These monitors are flexible, well-designed systems, but the various locations in which they will be placed relative to a contaminated plume need better definition. There are also some practical operational issues that need resolving.

While the SAB Panel's view of the expanded and upgraded RadNet Air Network's capabilities to meet EPA objectives is essentially consistent with EPA objectives, the SAB Panel's view of the respective roles of the fixed and deployable monitors is significantly different than that of EPA. The EPA needs to address the following foreseen shortcomings in the RadNet program in the near term: (1) shortage of monitoring stations and (2) scenario dependence of the balance and interplay between fixed and deployable stations.

EPA Response: EPA agrees with the SAB Panel's observations and has updated the Concept of Operations Plan, which now characterizes the purpose and siting of the deployables as follows:

> The deployables were designed to monitor exposure levels and collect air samples for continuous releases, to monitor for delayed contamination releases, and to assist the fixed system in plume detection when transport is distant enough to place a deployable prior to plume arrival. The units are intended to be set up outside the affected area of radiological contamination to continuously monitor for changes in radiation levels.

The CONOPS also addresses additional practical issues, including how and by whom the deployable monitors will be sited, the time needed for their deployment, and their potential mobility during an emergency. The mission of the deployable monitors continues to be provision of additional local data points for modelers and responders and, to a limited extent, to supplement fixed monitors when near-real-time data are not critical. (See also response to SAB Report 4.0.)

EPA is addressing the concern about the size of the monitoring system initially by modifying the order of installations, which will insure improved geographical coverage. Retention of some pre-existing monitors will also help provide coverage. As a general rule, EPA intends to retain the deployable monitors for rapid emergency use. However, in some specific situations, such as a major sporting event, the deployable monitors may be pre-deployed to achieve localized monitoring.

EPA is conducting an internal study of filter media that are currently being used by the RadNet air monitoring stations. The study is concentrating on efficiencies of the filters relative to various particle sizes and their processing during emergencies in order to determine how to ensure data comparability. Results of that study will be evaluated and, as appropriate, incorporated into the operating procedures for the monitors.

Charge Question 3: ***Given that the system will be producing near-real-time data, are the overall proposals for data management appropriate to the system's objectives?***

SAB Report 5.1: The SAB Panel recommends the use of PAGs, not simply MDAs, for definition of trigger levels.

Concerning the interplay between fixed and deployable monitors, EPA proposes, in essence, to treat the data from the two types of monitors in a similar fashion. Yet, the fixed stations do not include exposure rate measurements, and the deployable monitors do not include gamma spectrometry. In addition, the collection filters (for air sampling) are different on the two types of monitors. These differences lead to a number of issues and fundamental questions. a) How will the fixed and deployable data be integrated (e.g., in the context of modeling), especially given the different gamma-ray detectors? b) How will cross-calibration of the systems, considering the use of different air sampling filters, be accomplished? Are there plans to calibrate both systems against each other at the same site? c) Why is exposure rate measured on the deployable, but not on the fixed, monitors? d) What is the purpose of the exposure rate monitoring on the deployable monitors?

EPA Response: EPA agrees that trigger levels should be based on more than just the fluctuations from normal levels. EPA is developing a two-tiered warning system. The first tier, a "caution," will be abnormal variations from normal levels flagged for review by data evaluators during the next normal review date. The second tier, a "warning," will be variations significant enough to warrant immediate data review by evaluators. The second level will be based on calculations linked to the Protective Action Guides for nuclides of concern.

Data from all existing and future monitors will be reviewed to determine local variations in readings, which, in turn, will be used to set parameters to trigger data reviews. Due to variability in local radon/thoron daughter concentrations in air, trigger levels will be set for each monitor after 6-12 months of operation.

The RadNet Web site will include a page describing the differences between the fixed and deployable monitors and a discussion of the implications of these differences with regard to the data produced and how they relate to each other. Responses to the SAB Panel's other issues based on the differences between the fixed and deployable monitors can be found in Section 3.4, which addresses cross-calibration between the fixed and deployable monitors and the inclusion of exposure measurement on the deployable, but not on the fixed monitors.

Charge Question #3a: ***Is the approach and frequency of data collection for the near-real-time data reasonable for routine and emergency conditions?***

SAB Report 5.2: Careful development of decision rules will require much thought and collaboration among all members of the RadNet team and their partner agencies. In developing these rules it is also necessary to balance data information needs against the desire to detect a plume from a monitoring station. It would be tragic to set decision rules for triggering a review at too high a level and to miss the early evidence of an event. The optimization of decision rules should also take into account the number of monitors and their physical locations. This means that the rules would have to change over time as the RadNet system is expanded. There does not appear to be a process in place for deriving optimal decision rules for RadNet.

EPA Response: After full implementation an evaluation of the entire program will be performed. At that time, alternate decision rules based on number and location of monitors will be addressed. (See also discussion of trigger levels in response to SAB Report 5.1 above.)

Charge Question #3b: ***Do the modes of data transmission from the field to the central database include effective and necessary options?***

SAB Report 5.3 (a): Generally, the modes of data transmission appear to be satisfactory. There are a variety of backup systems for communicating data including modem backup to the satellite telemetry. Since all of the systems appear to be based on existing technology, the SAB Panel recommends that ORIA keep abreast of improvements in the technology and utilize them as the systems are deployed.

EPA Response: EPA is investigating ways to improve the cellular communication system for the fixed monitors. One particular improvement, if feasible, will improve reliability and data transfer speed. EPA is committed to a complete review of the program including potential upgrades in equipment and data processing technology every three years. EPA will also back-fit improved technology to operating monitors when possible.

SAB Report 5.3 (b): The evaluation and interpretation of RadNet data also involve other communication links that are critical to the process of providing high-quality information to decision-makers and other stakeholders. The vulnerability of these communication links should also be considered in any evaluation of the RadNet system.

EPA Response: Vulnerability of inbound and outbound communications links has been examined by EPA. EPA uses as many as four separate communications methods (including satellite phones and an option to download to a Personal Digital Assistant and then transmit to another location), with automatic switching of methods if a primary method fails to ensure timely and accurate data transmission from field units to the central database. For outbound data, an approved computer security plan is in effect and data access is being controlled by certificates and passwords. When necessary, EPA can also transmit data directly to key responders. EPA response staff members have access to the Government Emergency Telecommunications Service to override busy lines. Classified phones are available at labs, regions, and headquarters to pass sensitive intelligence information if needed.

SAB Report 5.3 (c): In the SAB Panel's opinion having only one person from each lab responsible for twenty systems is too few. The SAB Panel suggests that having a ratio of four lab experts for twenty systems would be preferable.

EPA Response: Each laboratory currently has two trained individuals who can deploy with the units. Exercises have demonstrated that two persons are adequate to train volunteers to set up monitors. In consideration of EPA's resource limitations, partners and other responders also will be working with the volunteers to provide other support, such as selecting locations for monitors and obtaining permission to locate the monitors at those sites. Phone support from technical experts to volunteers is also available and has been proven effective in exercises.

Charge Question #3c: ***Are the review and evaluation of data efficient and effective considering the decision-making and public information needs during an emergency?***

SAB Report 5.4.1 (a): Therefore the SAB Panel strongly advocates the use of sensitivity analyses in the siting of future monitor stations (fixed and deployable).

EPA Response: EPA agrees. See response to SAB Report 4.1 above.

SAB Report 5.4.1 (b): The SAB Panel notes that standard operating procedures (SOP) should be in place and accompany all the QA/QC plans to ensure that the data are handled reproducibly prior to any release and that information from the system is accurate and reliable. The QA/QC system should be tested over an extended period of time with "dry runs" to determine if the methods can ensure that the equipment is operating correctly at both the fixed and deployable monitors.

EPA Response: Plans for data handling and dissemination are under development; will be completed before the system is considered operational; and will be described in the Final Plan. All RadNet Quality Assurance/Quality Control plans will be evaluated periodically and updated or amended as needed.

SAB Report 5.4.2 (a): The SAB Panel commends EPA for including stakeholders in the Agency's ongoing planning to aid in understanding the requirements and preferences of various "customer" groups such as modelers, decision-makers, and the public and encourages outreach activities.

EPA should also develop, empirically test, and refine, sample informational messages with the aid of social science experts. These messages should address both routine and emergency conditions (such) sample messages should be tested during drills and exercises.

EPA Response: For EPA, the need for clear and effective communications with the public during radiological emergencies was explicitly noted in lessons learned from various emergency response exercises. Consistent with the Agency's efforts in this area, EPA is currently developing a crisis communications guide for use by emergency responders and state and local officials during a radiation emergency. EPA has developed and tested an initial set of messages for routine and emergency conditions, and they will be further refined and evaluated at future exercises and drills. The guide is scheduled to be published by the end of the calendar year. EPA is also developing training programs for emergency responders and state and local officials on communicating effectively during radiation emergencies.

In addition, EPA provides a course on the interpretation of air plume maps. The course contains a segment on the importance of effective messaging when providing emergency information to the public and the media.

SAB Report 5.4.2 (b): The flow of data from the event to the public should follow this line of communication (EPA to IMAAC to FRMAC), so that each Center can add value. The messages the public receives should be consistent and accurate to be useful.

EPA Response: EPA agrees that the data flow to IMAAC and FRMAC during an emergency is vital, and there are additional paths for data sharing. For example, there are partnerships that include the inter-agency Advisory Team for Environment, Food, and Health; the EPA Radiological Emergency Response Teams; and state and local responders. International and multi-state event messages would be developed by the Joint Information Center within the Incident Command System in coordination with the federal/state/local partners. EPA is committed to periodic meetings with IMAAC, and discussions of public messaging will be included routinely on the meeting agendas.

SAB Report 5.4.4: Thus, without much additional information and analysis, the raw data (counts per minute) cannot and must not be used to make even the crudest estimates of risk.

EPA Response: EPA agrees. The Agency only uses the count-per-minute data as a trigger for elevated readings. When the trigger is exceeded, the full gamma spectrum will be downloaded. Any calculations of risk, dose, or determinations of protective actions will be made based upon analysis of the gamma spectrum, not the Region of Interest count rate data. RadNet data are expected to be supplemented by other monitoring data and dispersion models in determining estimates of risk and protection actions.

SAB Report 5.4.5 (a): Information on background radiation and its variability also needs to be communicated to the public relative to the changes measured by RadNet.

EPA Response: The public access internet pages will have explanations for interpreting the data. Drafts have been created with assistance from EPA communication experts will be informed by interaction with our state and federal partners. Spanish language access will also be built into the next version.

SAB Report 5.4.5 (b): Care should be taken to avoid using unprocessed RadNet monitoring data in the estimation of the number of excess cancers that could be expected in future years among a large population potentially exposed to very low doses of radiation. ORIA staff clearly stated that such estimations are not considered to be a responsibility of the RadNet program.

EPA Response: Unprocessed RadNet data will be available only to federal and state radiation professionals. Unprocessed data from RadNet are not sufficient to perform such estimates, since they are only "region of interest" data. In situations where nuclide-specific evaluation and spectrometric results are performed, the data will have undergone processing and extensive review prior to becoming available to personnel outside of EPA.

SAB Report 5.4.6: Social scientists and communications experts must carefully review such statements to be sure that the messages are understandable and accurate.

EPA Response: EPA agrees. RadNet risk communication SOPs and guidelines have been developed and have been reviewed by social scientists and communications experts.

Charge Question #3d: ***Given the selected measurement systems, are the quality assurance and control procedures appropriate for near real-time data?***

SAB Report 5.5: Because the integrity and accuracy of the data measured, gathered, processed and disseminated are essential to the successful mission of the RadNet Air Monitoring Network, a controlled testing and periodic assessment of the overall performance of the system is essential for national security and confidence in the network.

EPA Response: EPA plans to perform testing and assessment of the system annually during the implementation phase as well as when the system is fully operational.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

SEP 12 2007

THE ADMINISTRATOR

EPA-SAB-07-010
Dr. M. Granger Morgan
Science Advisory Board
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Dear Dr. Morgan:

Thank you for writing and for providing me with the recommendations and report developed by the RadNet Review Panel of the Science Advisory Board's Radiation Advisory Committee.

I appreciate the SAB's efforts in convening the Panel and completing a comprehensive, technical review of the *Draft Expansion and Upgrade of the RadNet Air Monitoring Network: Concept and Plan,* which presented the details for improving radiological air monitoring on a national scale. I am pleased that the Panel concluded that "the proposed expansions and upgrades significantly enhance the ability of the RadNet monitoring network to meet the mission and objectives of the EPA," and that the Panel "urges the Agency to move forward expeditiously with deployment of the fixed monitors."

Enclosed is a summary of EPA's responses to the Panel's findings and recommendations. I assure you that they are being given thoughtful consideration as we prepare the Agency's Final Plan. Many of your recommendations have already been implemented, and the summary highlights the initiatives and RadNet program changes undertaken since the Panel's December 2005 review meeting.

Sincerely,

Stephen L. Johnson

Enclosure

cc: Charles Ingebretson
Robert Meyers
Elizabeth Cotsworth

INTRODUCTION

Purpose

This document responds to recommendations provided by the Science Advisory Board after its review of the U.S. Environmental Protection Agency's proposals for updating RadNet, the Agency's national radiation monitoring system. In December 2005, the SAB's Radiation Advisory Committee RadNet Review Panel convened at the National Air and Radiation Environmental Laboratory in Montgomery, Alabama, to discuss with staff from National Air and Radiation Environmental Laboratory and from the Radiation and Indoor Environments Laboratory the proposals contained in the document titled *Expansion and Upgrade of the RadNet Air Monitoring Network: Concept and Plan.* NAREL and R&IE are part of EPA's Office of Radiation and Indoor Air, and each lab has its own areas of concern and responsibility for RadNet. The SAB recommendations referred to in this document are based on the SAB final review report dated July 2, 2007.

Background

SAB emphasis for RadNet. While the SAB Panel concluded that "the proposed expansions and upgrades significantly enhance the ability of the RadNet monitoring network to meet the mission and objectives of the EPA," it presented a somewhat different view with respect to the siting, sampling, and deployment of the RadNet monitors than was provided in the initial EPA Draft Plan. The chief difference in emphasis between the SAB Panel's view and that reflected in EPA's proposals is that the SAB Panel sees the value of RadNet during emergencies predominantly as a provider of modeling data. EPA shares that view with the SAB Panel and has been taking appropriate actions to increase RadNet's value regarding modeling data. EPA's actions in support of improved modeling capability during emergencies are in four areas: utilizing geographical coverage as a siting criterion; performing studies to determine locations that will improve value of the data; clarifying the roles of fixed and deployable monitors; and finding effective ways to use RadNet data.

Increased geographical coverage. Subsequent to the SAB Panel's review and informed by the SAB Panel's initial comments, comments from partners and stakeholders, and results of emergency response exercises, EPA modified its plan for location of RadNet monitors to provide improved geographical coverage during initial phases without compromising population coverage. Placement of these initial monitors is responsive to the needs of modelers, in national-scale events, for data to validate and modify modeled plume locations and concentrations. Locations for monitors that are sited later will continue to consider both population and modeling needs, as modified in the Final Plan based on responses to the SAB Panel's recommendations. Based on these additional studies and analyses, there may be additional declustering; a greater separation radius is being evaluated as one way to achieve the objectives.

Improving data for modeling. The SAB Panel proposed a modeling-based method for selecting fixed monitor locations, and EPA is following a similar method to review the proposed siting plan for the remaining locations. In particular, thousands of radioactive release scenarios have now been modeled, and results will be used to determine the likelihood of fixed monitors to

detect releases based upon the initial siting plan. EPA will use the results of this analysis to help determine the appropriate locations for future monitors, while considering the possibility that the total number of monitors that will constitute the final fixed network may vary from estimates. This will ensure that modelers have sufficient data to predict national-scale releases, while still providing major cities with at least one data point for use, such as in public information or for analyzing additional local monitoring needs.

Roles of fixed and deployable monitors. Siting of fixed monitors and deployment of EPA's set of 40 deployable monitors consider local, regional, and national modeling needs; operational security; physical location; and integration with other resources such as state programs and the Interagency Modeling and Atmospheric Assessment Center. EPA agrees with the SAB Panel's assessment of the role of fixed monitors during routine monitoring as providing local as well as national-scale data, and the Final Plan will clarify this. The use of fixed monitor data during an emergency is to provide input to and verification of national scale modeling. The deployable monitors will be retained for rapid emergency use on a local scale near an incident site to ensure their availability for pre-deployment or emergency deployment to one or more sites.

Data usability. Regarding the usability of the data, EPA has been working with the Interagency Modeling and Atmospheric Assessment Center directly on issues associated with the decision matrix based on results from the RadNet monitors (both fixed and deployable monitors). EPA has also been working with communication experts and its stakeholders in developing and reviewing plans to communicate decisions based on RadNet data.

Progress Since the Review

Since the SAB Panel's review meeting in December 2005, EPA has made progress in implementing the RadNet air monitoring program. Forty-five (as of July 25, 2007) of the new fixed monitors are already sited and operating under test conditions; the central database has been established and is receiving pilot data from the installed monitors; and the RadNet Web site is in operational test status. In a number of instances, RadNet implementation activities to date have informed EPA's responses to the SAB Panel's recommendations.

EPA RADNET TEAM DETAILED RESPONSES TO EPA-SAB-07-010

Charge Question #1: ***Are the proposed upgrades and expansion of the RadNet air monitoring network reasonable in meeting the air network's objectives?***

SAB Report 3.1: The SAB Panel recommends more declustering of the fixed monitors to gain greater geographical coverage for interstate-scale monitoring. The SAB Panel further recommends that EPA consider placing some of the deployable monitors temporarily in the locations chosen for the fixed monitors to bridge the time interval until the fixed monitors are purchased and in place.

EPA Response: EPA is performing a series of atmospheric dispersion model runs to help determine optimal siting criteria. EPA's existing siting plan will be evaluated against the results of this modeling study to improve the balance between population and geographical coverage, and results will be presented in the Final Plan. Further, although EPA sited the initial monitors based upon population ranking (as an indicator of risk), subsequent monitors will be sited at locations that also increase the geographical spread of the system.

EPA considered placing deployable monitors in fixed station sites, but has concluded that the deployable monitors should be maintained at two central locations in a state of readiness for their designed role of targeted monitoring following a radiological incident. Before reaching this conclusion, EPA analyzed the advantages of temporarily siting deployable monitors at locations designated to receive fixed monitors in later phases, as well as costs and operational disadvantages. Among other factors, the analysis considered the impact on RadNet's capabilities in the event of a national radiological emergency, including the possibility of multiple events; administrative challenges and costs associated with an interim placement of deployables; the value of more rapid geographical coverage; and early identification of station operators brought about by substitution of deployable monitors for fixed monitors. Pre-existing Environmental Radiation Ambient Monitoring System monitors will remain in operation at other locations during the multi-year siting process.

SAB Report 3.2: Because both the fixed and deployable monitors will be used to provide important information to decision makers, it is imperative that both the similarities and differences between these two monitoring systems be understood and quantified so that interpretation of the data will be of high quality and consistency.

EPA Response: The Final Plan will include more detailed information on the similarities and differences between the fixed and deployable monitors and how that information affects RadNet data. During routine operations, data from the monitors will be available to anyone through a public access Web site that will provide general context for the data to enable informed data interpretation. In addition, EPA plans periodic meetings with Interagency Modeling and Atmospheric Assessment Center modelers and other RadNet partners to assure proper data utilization. In addition, see response to SAB Report 4.5.

SAB Report 3.3 (a): In this section, the SAB Panel is concerned that the configuration of the detector and filter in the fixed monitor may introduce issues about uniformity of particle deposition across the filter, potential contamination of the filter by particle deposition, and sampling biases related to different particle-size regions.

EPA Response: EPA is currently conducting wind tunnel testing on the RadNet fixed monitor. Collection efficiency for various particle sizes will be determined at multiple wind speeds and orientations with respect to the monitor. The tests will also evaluate the effects caused by the geometrical arrangement of the radiation detectors relative to the filter. Results will be incorporated into the RadNet Final Plan, along with a discussion of other issues associated with particle size.

SAB Report 3.3 (b): The currently designed instruments have not been tested for the collection efficiency of airborne particulates as a function of the wind speed and direction at which they arrive at the monitor. The relationship between sampling efficiency and particle size might also be affected and should be tested.

EPA Response: Agreed. See response above to SAB Report 3.3 (a).

SAB Report 3.4 (a): If it is assumed that the near real-time collection of these gamma exposure measurements is an important function of the deployable monitors, then consideration should be given to making similar gamma exposure measurements on the fixed monitors as well.

EPA Response: The fixed and deployable monitors serve different monitoring goals that lead to some technical differences in their design and operation. The fixed monitors are designed to monitor areas distant from the incident location, and the deployable monitors are more likely to be in areas near high levels of surface contamination. Since it is very unlikely that a significant submersion dose or deposition would occur near the fixed monitors, EPA believes it is not cost-effective to add ambient gamma radiation detectors to them. Further, EPA believes that long-distance transport of noble gases at levels that will produce a detectable exposure rate on an ambient gamma radiation detector is unlikely. On the other hand, the deployable monitors, by virtue of their incident-related locations, have potential to detect elevated deposition exposure rates. Thus their near-real-time capability to measure gamma radiation was deemed important – to provide quick warning of increases in radiation exposure.

SAB Report 3.4 (b): While it might be impractical to cross-calibrate each deployable system against a PIC, NAREL should consider cross-calibrating the prototype using a series of different energy gamma emitters, including naturally occurring thorium with its relatively high energy gamma 208Tl decay product and uranium with its lower average energy decay products.

EPA Response: EPA has obtained quality assurance documents from the manufacturer that provide the energy range, energy compensation, and energy calibration information for the Genitron gamma detector on the deployable monitors. Over the energy ranges of interest both a PIC and a Genitron respond within approximately 20 percent of the response for the nuclide against which they were calibrated. Therefore, we believe that cross-calibrating would effectively duplicate what has already been done by the manufacturer and is, therefore, not a cost-effective effort.

SAB Report 3.5: ORIA staff told the SAB Panel that a complicated algorithm is needed to distinguish alpha emissions measured in the fixed monitor from the measurements of alpha emissions of naturally occurring radon (Rn) progeny. It is important that this capability be perfected because other alpha emitters besides 241Am may become important in assessing potential terrorist activities.

EPA Response: Experience with the monitors subsequent to the review has shown that alpha measurement in near-real time is not feasible. An equipment limitation on the detector (a "light

leak") necessitated a solution (thicker window material) that eliminated alpha detection. Although re-engineering the detector in the middle of the implementation process is not feasible, EPA will evaluate alpha detection options after all monitors have been sited. In the meantime, EPA will rely on operators performing screening for alpha and beta emitters after filter collection and performing subsequent laboratory analyses. The Final Plan will include a discussion of the lessons learned that supported the decision to not pursue further near-real-time alpha measurement.

SAB Report 3.6.2: The EPA report should include the nCi value on the filter that corresponds to the selected limit on intake related to the PAG (see part A) for each of the eight radionuclides. The purpose is to confirm that the MDA is suitably lower than specified by the PAG to permit reliable measurement results.

EPA Response: EPA agrees and will include them in the Final Plan.

SAB Report 3.6.3 (a): The calculated MDA values reported in the WSRC report should be inserted into the EPA report with an explanation of the reasons for the much larger EPA-specified MDA values (p.27, para.1), except for 241Am.

EPA Response: EPA agrees and will include the MDA values along with the explanation in the Final Plan.

SAB Report 3.6.3 (b): Before inserting the WSRC data in the EPA report, some improvements in the WSRC report are recommended.

EPA Response: The Final Plan will include a full discussion of the WSRC report issues, including the calculations, the recommended tabulations for regions of interest, and a discussion of apparent errors regarding 137Cs. The SAB Panel's requested information and discussion of issues concerning the 90Sr MDA also will be included.

SAB Report 3.6.3 (c): The implications of the change in the thickness (from thick to thin) of the silicon-detector window reported by EPA staff at the meeting should be discussed in the EPA report.

EPA Response: EPA will include in the Final Plan a full discussion of the implications of the change in the thickness of the silicon detector window. (See also the response to SAB Report 3.5.)

Charge Question #2: ***Is the overall approach for siting monitors appropriate and reasonable given the upgraded and expanded system's objectives?***

SAB Report 4.1 (a): The SAB Panel reiterated the recommendation contained in Charge Question #1 above. In particular, the SAB Panel questioned whether the correct mission of the deployable monitors has been determined.

EPA Response: The mission for the set of 40 deployable monitors is to fill a void between the radiological emergency response teams in the contaminated zones and the fixed RadNet monitors, a planned 180 of which are spread across the nation. These voids are an area of importance since they may initially be uncontaminated, but could become contaminated following transport of contamination subsequent to the immediate dispersion. A discussion of the prioritized roles of the deployable monitors relative to the fixed monitors will be included in the Final Plan. Details about the roles of the deployables can be found in the revised CONOPS Plan (October 2006). (See also response to SAB Report 4.4.5.)

SAB Report 4.1 (b): Therefore the SAB Panel strongly advocates the use of sensitivity analyses in the siting of monitors (both fixed and deployable).

EPA Response: EPA agrees and is conducting sensitivity analyses pertaining to fixed monitoring siting. Sensitivity analyses for siting deployable monitors includes so many potential variables that results may be of limited value. In an emergency, siting decisions for all monitoring assets, including deployable monitors, will be made through a partnership of federal, state, and local leaders with input from dose assessors and environmental modelers. If necessary, deployable monitors can be moved readily following a radiological incident to maximize their effectiveness.

SAB Report 4.1.1 (a): In the SAB Panel's opinion there should be a better balance and interplay between physical deployment schemes and modeling requirements for effective environmental assessment, data interpretation and decision-making. (The SAB Panel provides an example in Section 4.3.1)

EPA Response: EPA agrees with the SAB Panel's recommendation. Although EPA sited the initial monitors by population ranking to quickly address coverage concerns on a risk basis, in November 2006 EPA decided to site subsequent monitors based also on geographical spread. This additional geographical coverage will provide data for interstate-scale modeling as well as information for cities to determine if more local monitoring is needed.

SAB Report 4.1.1 (b): Based on these considerations and the limited resources currently available, the SAB Panel suggests that:

a) More declustering of fixed monitors should be considered initially, particularly in the vicinity of the Los Angeles and New York metropolitan areas. Local and regional meteorological models should be used along with other considerations, to reduce the density and to redistribute fixed monitors.

b) Model sensitivity analyses should be performed on siting configurations and distribution densities so as to meet EPA goals and optimize the placement of fixed monitoring stations in terms of the limited resources available.

EPA Response: EPA agrees with the SAB Panel's recommendation to consider reducing clustering of monitors to improve the ability of RadNet fixed monitors to supply interstate-scale

data to modelers in the event of an emergency. (For more information on declustering and sensitivity analyses, see responses above to SAB Report 3.1 and SAB Report 4.1.)

SAB Report 4.1.2: The SAB Panel recommends that EPA work with partner agencies to clarify issues of chain-of-command and assess whether some deployable monitors could be used to fill coverage and time gaps.

EPA Response: EPA is committed to working with partner agencies (Department of Energy, Federal Radiological Monitoring and Assessment Center, IMAAC, Air Canada, and others) to clarify usage of both fixed and deployable monitors. EPA continues to consult with the Conference of Radiation Control Program Directors on appropriate use of deployable monitors, and its RadNet Task Force currently recommends that the deployable monitors be used as primarily emergency response assets and that the fixed monitors be used to provide geographical modeling coverage. The absence of near-real-time air filter analysis on the deployable monitors (see response to SAB Report 3.1) limits their effectiveness as replacements or stand-ins for the fixed monitors. Therefore, EPA and its partner agencies judge that the deployable monitors would best be retained for their initial purpose of providing targeted monitoring following a radiological incident. (See response to SAB Report 3.1 for discussion on deployables and response to SAB Report 4.0 for other options contained in the CONOPS.)

Charge Question # 2a: ***Is the methodology for determining the locations of the fixed monitors appropriate given the intended uses of the data and the system's objectives?***

SAB Report 4.2: The SAB Panel strongly suggests that the declustering of fixed monitors within high density population areas be more aggressive and involve the use of general model constraints, historical meteorological data, and timely meteorological forecast predictions. To this end the SAB Panel supports the use of sensitivity analyses and confirmatory transport modeling proposed by EPA, in conjunction with Westinghouse Savannah River Company, the US Weather Bureau, IMAAC and/or other partners.

EPA Response: EPA agrees. (See responses to SAB Report 3.1 and SAB Report 4.1 for more detailed information.)

SAB Report 4.2.4: There should be a mechanism established for entities to become full-fledged 'members' of the network. This could include States and/or cities that wish to use their own funding to purchase stations and agree to comply with certain EPA standards.

EPA Response: EPA agrees that there should be a mechanism for states and cities to become "members" of the RadNet fixed monitor network. An initial EPA survey indicated that several states are interested in purchasing a monitor and contributing their data to the RadNet database. EPA plans to detail a formal process for achieving this goal. EPA also performed a cross-comparison study with Health Canada and found that the two systems provide similar data. The Canadian monitoring system is being considered for inclusion in EPA's RadMap, a database identifying monitoring locations and available information from all known radiological monitoring programs in the United State and Canada. Emergency responders will use RadMap to identify other potential sources of monitoring data for inclusion in modeling efforts.

Charge Question #2b: ***Are the criteria for the local siting of the fixed monitors reasonable given the need to address both technical and practical issues?***

SAB Report 4.3: Additionally, siting criteria based on a combination of "population" and "cluster density" – as EPA is proposing – may or may not make sense depending on the answers to two additional considerations: a) Whether or not other fixed and deployable monitoring networks will complement RadNet and provide similar and/or compatible data; and b) What sampling requirements are necessary for the mathematical models to best estimate environmental distributions in space and time. For example, the models may require or be optimally served by more uniform geographic sampling, or conversely, require a non-uniform sampling scheme that is driven by geographic/geologic and meteorological factors (in three dimensions) rather than population or sampling density.

EPA Response: (a) In designing the RadNet air monitoring upgrade, EPA did not rely on the availability or usability of radiological air monitoring data from localized, point-source air monitoring systems across the United States. Modelers may make use of data from such sources only after determining how to correlate the concentration or exposure data from them with the uniform interstate-scale data from RadNet. (b) The balance and interplay between population and geographical coverage is being addressed by the study being performed by the Savannah River National Laboratory. (See also in this document remarks in the Introduction, in response to SAB Report 3.1, and in the *Expansion and Upgrade of the RadNet Air Monitoring Network: Concept and Plan* see the SRNL study proposal in Appendix L (Fixed Monitor Siting Methodology Proposed by Savannah River National Laboratory, 2005).

SAB Report 4.3.3: The SAB Panel suggests that the "two-meter rule" be reviewed in the context of tall buildings or large vertical structures, and, if necessary, amended or redefined.

EPA Response: EPA has developed a monitor installation checklist that addresses appropriate distance for a monitor from a structure that might create air flow interference. The guideline used is to place a monitor relative to a large vertical structure so that the distance from the monitor to the structure is twice the height difference between that structure and the monitor intake.

Charge Question #2c: ***Does the plan provide sufficient flexibility for placing the deployable monitors to accommodate different types of event?***

SAB Report 4.4: A key question is whether or not the monitors can be systematically deployed for "routine" monitoring to supplement the fixed monitors, thereby increasing their utility, and still be as readily deployable in an emergency.

EPA Response: EPA has evaluated carefully the option of using deployable monitors to supplement the fixed monitor network. It is EPA's judgment that, among other concerns, having a large number of deployable monitors sited across the United States would create a logistics/retrieval problem that could compromise the timeliness of the intended incident response function of the deployable monitors.

SAB Report 4.4.2: In view of the possibility that the EPA could be requested to pre-deploy its deployable air monitors, the SAB Panel recommends that the criteria for pre-deployments be clearly addressed and carefully established.

EPA Response: Criteria for pre-deployment and guidance on how requests for deployable stations will be processed are being drafted and will be included in the Final RadNet Plan. Careful attention is being given to coordinating EPA pre-deployment plans and guidance with the National Response Plan chain of command.

SAB Report 4.4.3: The SAB Panel suggests however, that without prior training or experience of volunteer personnel, it is difficult to imagine the success of this enterprise in the context of a national emergency, where potential risks to personal and family safety are to be envisioned. The SAB Panel lacked the information necessary to determine whether or not the numbers of cross-trained key personnel and specifically-trained volunteers will be sufficient to affect a response in the event that the core groups are not available for whatever reasons. The SAB Panel recommends that the approaches EPA proposes to use to identify, credential, and maintain the "volunteer" operators be described and training exercises be implemented.

EPA Response: EPA, originally, shared the SAB Panel's concerns, but experience and accomplishments with EPA's Response Support Corps since the SAB's RadNet review meeting in 2005 have been very successful. Through numerous exercises and conference demonstrations, the plan to train volunteer operators just prior to sending them into the field to deploy monitors has proven to be effective. At present, EPA has a pool of some 500 RSC members; a select group of RSC members have been trained on monitor setup and operation; and field exercises using RSC members have been evaluated as successful. EPA is committed to similar future exercises and to using only RSC personnel who have participated in them for actual emergencies.

Each RSC member is required to take basic training online, attend an orientation, and to participate in an emergency response exercise. Basic training assures that each RSC member is familiar with the Incident Command System. A registration database tracks RSC member information (including contact information), special skills, and deployment experience. If the RSC is activated, members are screened for their appropriateness to the incident in play. More information on EPA's RSC is available at ***http://www.epa.gov/superfund/programs/er/index.htm***.

SAB Report 4.4.4: Plans for storing, deploying and siting the deployable monitors should include sufficient flexibility to effectively respond to simultaneous potential or real radiological events in a timely manner and in the absence of viable infrastructure (e.g., appropriately and adequately trained support personnel, communication equipment, electrical power, transportation routes and modes.)

EPA Response: EPA agrees. See responses to the SAB Panel's recommendation in SAB Report 4.4.2, 4.4.3, and 4.5.

Charge Question #2d: ***Does the plan provide for a practical interplay between the fixed and***

deployable monitors to accommodate different types of events that would utilize them?

SAB Report 4.5: The RadNet siting plan provides flexibility for placing deployable monitors for different types of events; however, the role of the deployable monitors is not entirely clear. These monitors are flexible, well-designed systems, but the various locations in which they will be placed relative to a contaminated plume need better definition. There are also some practical operational issues that need resolving.

While the SAB Panel's view of the expanded and upgraded RadNet Air Network's capabilities to meet EPA objectives is essentially consistent with EPA objectives, the SAB Panel's view of the respective roles of the fixed and deployable monitors is significantly different than that of EPA. The EPA needs to address the following foreseen shortcomings in the RadNet program in the near term: (1) shortage of monitoring stations and (2) scenario dependence of the balance and interplay between fixed and deployable stations.

EPA Response: EPA agrees with the SAB Panel's observations and has updated the Concept of Operations Plan, which now characterizes the purpose and siting of the deployables as follows:

> The deployables were designed to monitor exposure levels and collect air samples for continuous releases, to monitor for delayed contamination releases, and to assist the fixed system in plume detection when transport is distant enough to place a deployable prior to plume arrival. The units are intended to be set up outside the affected area of radiological contamination to continuously monitor for changes in radiation levels.

The CONOPS also addresses additional practical issues, including how and by whom the deployable monitors will be sited, the time needed for their deployment, and their potential mobility during an emergency. The mission of the deployable monitors continues to be provision of additional local data points for modelers and responders and, to a limited extent, to supplement fixed monitors when near-real-time data are not critical. (See also response to SAB Report 4.0.)

EPA is addressing the concern about the size of the monitoring system initially by modifying the order of installations, which will insure improved geographical coverage. Retention of some pre-existing monitors will also help provide coverage. As a general rule, EPA intends to retain the deployable monitors for rapid emergency use. However, in some specific situations, such as a major sporting event, the deployable monitors may be pre-deployed to achieve localized monitoring.

EPA is conducting an internal study of filter media that are currently being used by the RadNet air monitoring stations. The study is concentrating on efficiencies of the filters relative to various particle sizes and their processing during emergencies in order to determine how to ensure data comparability. Results of that study will be evaluated and, as appropriate, incorporated into the operating procedures for the monitors.

Charge Question 3: ***Given that the system will be producing near-real-time data, are the overall proposals for data management appropriate to the system's objectives?***

SAB Report 5.1: The SAB Panel recommends the use of PAGs, not simply MDAs, for definition of trigger levels.

Concerning the interplay between fixed and deployable monitors, EPA proposes, in essence, to treat the data from the two types of monitors in a similar fashion. Yet, the fixed stations do not include exposure rate measurements, and the deployable monitors do not include gamma spectrometry. In addition, the collection filters (for air sampling) are different on the two types of monitors. These differences lead to a number of issues and fundamental questions. a) How will the fixed and deployable data be integrated (e.g., in the context of modeling), especially given the different gamma-ray detectors? b) How will cross-calibration of the systems, considering the use of different air sampling filters, be accomplished? Are there plans to calibrate both systems against each other at the same site? c) Why is exposure rate measured on the deployable, but not on the fixed, monitors? d) What is the purpose of the exposure rate monitoring on the deployable monitors?

EPA Response: EPA agrees that trigger levels should be based on more than just the fluctuations from normal levels. EPA is developing a two-tiered warning system. The first tier, a "caution," will be abnormal variations from normal levels flagged for review by data evaluators during the next normal review date. The second tier, a "warning," will be variations significant enough to warrant immediate data review by evaluators. The second level will be based on calculations linked to the Protective Action Guides for nuclides of concern.

Data from all existing and future monitors will be reviewed to determine local variations in readings, which, in turn, will be used to set parameters to trigger data reviews. Due to variability in local radon/thoron daughter concentrations in air, trigger levels will be set for each monitor after 6-12 months of operation.

The RadNet Web site will include a page describing the differences between the fixed and deployable monitors and a discussion of the implications of these differences with regard to the data produced and how they relate to each other. Responses to the SAB Panel's other issues based on the differences between the fixed and deployable monitors can be found in Section 3.4, which addresses cross-calibration between the fixed and deployable monitors and the inclusion of exposure measurement on the deployable, but not on the fixed monitors.

<u>Charge Question #3a:</u> ***Is the approach and frequency of data collection for the near-real-time data reasonable for routine and emergency conditions?***

SAB Report 5.2: Careful development of decision rules will require much thought and collaboration among all members of the RadNet team and their partner agencies. In developing these rules it is also necessary to balance data information needs against the desire to detect a plume from a monitoring station. It would be tragic to set decision rules for triggering a review at too high a level and to miss the early evidence of an event. The optimization of decision rules should also take into account the number of monitors and their physical locations. This means that the rules would have to change over time as the RadNet system is expanded. There does not appear to be a process in place for deriving optimal decision rules for RadNet.

EPA Response: After full implementation an evaluation of the entire program will be performed. At that time, alternate decision rules based on number and location of monitors will be addressed. (See also discussion of trigger levels in response to SAB Report 5.1 above.)

Charge Question #3b: ***Do the modes of data transmission from the field to the central database include effective and necessary options?***

SAB Report 5.3 (a): Generally, the modes of data transmission appear to be satisfactory. There are a variety of backup systems for communicating data including modem backup to the satellite telemetry. Since all of the systems appear to be based on existing technology, the SAB Panel recommends that ORIA keep abreast of improvements in the technology and utilize them as the systems are deployed.

EPA Response: EPA is investigating ways to improve the cellular communication system for the fixed monitors. One particular improvement, if feasible, will improve reliability and data transfer speed. EPA is committed to a complete review of the program including potential upgrades in equipment and data processing technology every three years. EPA will also back-fit improved technology to operating monitors when possible.

SAB Report 5.3 (b): The evaluation and interpretation of RadNet data also involve other communication links that are critical to the process of providing high-quality information to decision-makers and other stakeholders. The vulnerability of these communication links should also be considered in any evaluation of the RadNet system.

EPA Response: Vulnerability of inbound and outbound communications links has been examined by EPA. EPA uses as many as four separate communications methods (including satellite phones and an option to download to a Personal Digital Assistant and then transmit to another location), with automatic switching of methods if a primary method fails to ensure timely and accurate data transmission from field units to the central database. For outbound data, an approved computer security plan is in effect and data access is being controlled by certificates and passwords. When necessary, EPA can also transmit data directly to key responders. EPA response staff members have access to the Government Emergency Telecommunications Service to override busy lines. Classified phones are available at labs, regions, and headquarters to pass sensitive intelligence information if needed.

SAB Report 5.3 (c): In the SAB Panel's opinion having only one person from each lab responsible for twenty systems is too few. The SAB Panel suggests that having a ratio of four lab experts for twenty systems would be preferable.

EPA Response: Each laboratory currently has two trained individuals who can deploy with the units. Exercises have demonstrated that two persons are adequate to train volunteers to set up monitors. In consideration of EPA's resource limitations, partners and other responders also will be working with the volunteers to provide other support, such as selecting locations for monitors and obtaining permission to locate the monitors at those sites. Phone support from technical experts to volunteers is also available and has been proven effective in exercises.

Charge Question #3c: *Are the review and evaluation of data efficient and effective considering the decision-making and public information needs during an emergency?*

SAB Report 5.4.1 (a): Therefore the SAB Panel strongly advocates the use of sensitivity analyses in the siting of future monitor stations (fixed and deployable).

EPA Response: EPA agrees. See response to SAB Report 4.1 above.

SAB Report 5.4.1 (b): The SAB Panel notes that standard operating procedures (SOP) should be in place and accompany all the QA/QC plans to ensure that the data are handled reproducibly prior to any release and that information from the system is accurate and reliable. The QA/QC system should be tested over an extended period of time with "dry runs" to determine if the methods can ensure that the equipment is operating correctly at both the fixed and deployable monitors.

EPA Response: Plans for data handling and dissemination are under development; will be completed before the system is considered operational; and will be described in the Final Plan. All RadNet Quality Assurance/Quality Control plans will be evaluated periodically and updated or amended as needed.

SAB Report 5.4.2 (a): The SAB Panel commends EPA for including stakeholders in the Agency's ongoing planning to aid in understanding the requirements and preferences of various "customer" groups such as modelers, decision-makers, and the public and encourages outreach activities.

EPA should also develop, empirically test, and refine, sample informational messages with the aid of social science experts. These messages should address both routine and emergency conditions (such) sample messages should be tested during drills and exercises.

EPA Response: For EPA, the need for clear and effective communications with the public during radiological emergencies was explicitly noted in lessons learned from various emergency response exercises. Consistent with the Agency's efforts in this area, EPA is currently developing a crisis communications guide for use by emergency responders and state and local officials during a radiation emergency. EPA has developed and tested an initial set of messages for routine and emergency conditions, and they will be further refined and evaluated at future exercises and drills. The guide is scheduled to be published by the end of the calendar year. EPA is also developing training programs for emergency responders and state and local officials on communicating effectively during radiation emergencies.

In addition, EPA provides a course on the interpretation of air plume maps. The course contains a segment on the importance of effective messaging when providing emergency information to the public and the media.

SAB Report 5.4.2 (b): The flow of data from the event to the public should follow this line of communication (EPA to IMAAC to FRMAC), so that each Center can add value. The messages the public receives should be consistent and accurate to be useful.

EPA Response: EPA agrees that the data flow to IMAAC and FRMAC during an emergency is vital, and there are additional paths for data sharing. For example, there are partnerships that include the inter-agency Advisory Team for Environment, Food, and Health; the EPA Radiological Emergency Response Teams; and state and local responders. International and multi-state event messages would be developed by the Joint Information Center within the Incident Command System in coordination with the federal/state/local partners. EPA is committed to periodic meetings with IMAAC, and discussions of public messaging will be included routinely on the meeting agendas.

SAB Report 5.4.4: Thus, without much additional information and analysis, the raw data (counts per minute) cannot and must not be used to make even the crudest estimates of risk.

EPA Response: EPA agrees. The Agency only uses the count-per-minute data as a trigger for elevated readings. When the trigger is exceeded, the full gamma spectrum will be downloaded. Any calculations of risk, dose, or determinations of protective actions will be made based upon analysis of the gamma spectrum, not the Region of Interest count rate data. RadNet data are expected to be supplemented by other monitoring data and dispersion models in determining estimates of risk and protection actions.

SAB Report 5.4.5 (a): Information on background radiation and its variability also needs to be communicated to the public relative to the changes measured by RadNet.

EPA Response: The public access internet pages will have explanations for interpreting the data. Drafts have been created with assistance from EPA communication experts will be informed by interaction with our state and federal partners. Spanish language access will also be built into the next version.

SAB Report 5.4.5 (b): Care should be taken to avoid using unprocessed RadNet monitoring data in the estimation of the number of excess cancers that could be expected in future years among a large population potentially exposed to very low doses of radiation. ORIA staff clearly stated that such estimations are not considered to be a responsibility of the RadNet program.

EPA Response: Unprocessed RadNet data will be available only to federal and state radiation professionals. Unprocessed data from RadNet are not sufficient to perform such estimates, since they are only "region of interest" data. In situations where nuclide-specific evaluation and spectrometric results are performed, the data will have undergone processing and extensive review prior to becoming available to personnel outside of EPA.

SAB Report 5.4.6: Social scientists and communications experts must carefully review such statements to be sure that the messages are understandable and accurate.

EPA Response: EPA agrees. RadNet risk communication SOPs and guidelines have been developed and have been reviewed by social scientists and communications experts.

Charge Question #3d: ***Given the selected measurement systems, are the quality assurance and control procedures appropriate for near real-time data?***

SAB Report 5.5: Because the integrity and accuracy of the data measured, gathered, processed and disseminated are essential to the successful mission of the RadNet Air Monitoring Network, a controlled testing and periodic assessment of the overall performance of the system is essential for national security and confidence in the network.

EPA Response: EPA plans to perform testing and assessment of the system annually during the implementation phase as well as when the system is fully operational.