PNL-8934

Letter Report

ANALYSIS OF AREA MONITORING OPTIONS FOR WESTINGHOUSE HANFORD COMPANY

G. J. Vargo
E. E. Hickey
J. S. Durham
S. F. Snyder

October 1993

Prepared for Westinghouse Hanford Company
under U.S. Department of Energy
Contract DE-AC06-76RLO 1830

Pacific Northwest Laboratory
Richland, Washington 99352

MASTER

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

CONTENTS

INTRODUCTION 1

BACKGROUND 3

APPROACH 5

ANALYSIS OF INDUSTRY STANDARDS AND NON-REGULATORY GUIDANCE 7

U.S. NUCLEAR REGULATORY COMMISSION 7

INSTITUTE OF NUCLEAR POWER OPERATIONS 8

AMERICAN NUCLEAR INSURERS 8

SUMMARY OF FINDINGS 11

RECOMMENDATIONS 13

RECOMMENDED AREA MONITORING TO MEET THE INTENT OF RCM 514 14

ADDITIONAL RECOMMENDATIONS TO MEET THE INTENT OF RCM 514 AND 511 14

POTENTIAL THIRD PHASE OF AREA MONITORING DOSIMETRY 15

CONCLUSIONS 17

REFERENCES 19

APPENDIX A - RESULTS OF THE AREA MONITORING QUESTIONNAIRE A.1

APPENDIX B - SUGGESTED DRAFT PROCEDURE FOR THE WHC AREA MONITORING PROGRAM B.1

ATTACHMENT A Attach.1

INTRODUCTION

The Pacific Northwest Laboratory (PNL) was tasked by Westinghouse Hanford Company (WHC) to suggest how WHC should implement the requirements in the U.S. Department of Energy (DOE) *Radiological Control Manual*, or RCM (DOE 1992), and the *Hanford Site Radiological Control Manual*, or HSRCM (RL 1992), concerning the use of area monitoring, as described in Article 514 of both manuals. To accomplish this objective, PNL conducted a survey of various DOE facilities to determine how they were implementing the requirements in the RCM. PNL also studied area monitoring practices at selected commercial facilities licensed by the U.S. Nuclear Regulatory Commission (NRC). A set of recommendations was developed for establishing a WHC area monitoring dosimetry program (hereafter referred to as area monitoring program).

BACKGROUND

In June 1992, the Department of Energy issued DOE N 5480.6, *Radiological Control Manual*, which established practices for conducting radiological control activities at all DOE and DOE-funded sites that manage radiation or radioactive materials. To implement the RCM, each DOE facility was required to develop and approve their own radiological control manual, which described a phased approach to implementing the RCM over a period of time. This document, for the Hanford Site, is called the *Hanford Site Radiological Control Manual*. The HSRCM was issued in December 1992 (RL 1992).

This project relates to Article 514 in the RCM, which discusses establishing and maintaining a comprehensive area monitoring program for minimizing the number of areas requiring the issuance of personnel dosimeters and for verifying that doses next to Radiological Buffer Areas are negligible. Three specific items in this article address the use of area monitoring dosimeters to 1) record and document radiation levels in routinely occupied areas adjacent to areas where radiation or operations with radiation exist, 2) support dosimetry investigations, and 3) supplement the existing monitoring programs in Controlled Areas in the event of an emergency.

The HSRCM states that a comprehensive area monitoring program may minimize the number of areas requiring the issuance of personnel dosimeters and demonstrate that doses to personnel outside these Radiological Buffer Areas are negligible. The three specific items in the HSRCM state that 1) area monitoring dosimeters shall be used to record and document radiation levels in routinely occupied areas adjacent to Radiologically Controlled Areas and Radiological Buffer Areas; 2) area monitoring dosimeters should be used in Radiologically Controlled Areas to supplement existing monitoring programs and to provide data in the event of an emergency; and 3) area monitoring dosimeter results may be used to support dosimetry investigations where personnel express concerns about their work environment and exposure to ionizing radiation.

APPROACH

The approach to performing this study included developing a questionnaire to elicit information from other DOE sites and selected NRC power reactor licensees on how they have implemented, or plan to implement, an area monitoring program. A summary of the results from this questionnaire is provided in Appendix A. The next step of the study was to review WHC facilities and procedures for external dosimetry and, as necessary, to tour the Hanford Site. Once the information from other DOE sites, WHC operations, and the WHC external dosimetry program was reviewed, recommendations for implementing the requirements of the RCM and HSRCM were developed.

The ability to use area monitoring program results to assign personnel doses is dependent on the ability to accurately reconstruct personnel work locations. In some cases, payroll records could be used to document the facilities to which a particular worker was assigned; however, this method is impractical for workers, such as craft services and delivery personnel, who are itinerant on the Hanford Site. PNL staff were unable to complete an evaluation of WHC's ability to reconstruct worker locations over time.

ANALYSIS OF INDUSTRY STANDARDS AND NON-REGULATORY GUIDANCE

Other non-regulatory guidance developed by NRC and industry standards used by the commercial nuclear power industry regarding personnel and area monitoring practices were reviewed. The guidance from three organizations external to DOE appears to be relevant.

U.S. NUCLEAR REGULATORY COMMISSION

In Regulatory Guide 8.2, "Guide for Administrative Practices in Radiation Monitoring" (NRC 1973), NRC endorses the standard of the same title by the American National Standards Institute (ANSI). This standard, ANSI N13.2-1969(R1982), contains general guidance with respect to monitoring programs, but does not provide specific guidance regarding who should be monitored.

The NRC "Standard Review Plan" (NRC 1982) is the document that provides guidance to the NRC staff for reviewing power reactor license applications. Information is provided on the use of thermoluminescent dosimeters (TLDs) for personnel monitoring. Section 12.5, "Operational Radiation Protection Program," states, in part:

> All permanent and temporary plant personnel will be assigned (beta-gamma thermoluminescent dosimeter badges or film badges) to be worn in restricted areas at all times. These badges will be processed (monthly) in accordance with Regulatory Guide 8.3, or more frequently if significant exposures are expected. All personnel assigned (TLD or film badges) are also required to wear (direct or indirect) reading dosimeters when entering the controlled areas. Plant visitors wear self-reading dosimeters or are accompanied by an individual wearing such personnel dosimetry devices.

As defined in 10 CFR 20 (NRC 1992), the term "restricted area" is "an area, access to which is limited by the licensee for the purpose of protecting individuals against undue risks from exposure to radiation or radioactive materials. Restricted area does not include areas used as residential quarters, but separate rooms in a residential building may be set apart as a restricted area."

INSTITUTE OF NUCLEAR POWER OPERATIONS

The Institute of Nuclear Power Operations (INPO) publishes a number of guidance documents on good practices for the operation of nuclear power plants. The current radiological protection guidance document, "Guidelines for Radiological Protection at Nuclear Power Stations,"[a] recommends that each worker entering a Radiologically Controlled Area be provided with a primary dosimeter (e.g., TLD) and a secondary self-indicating dosimeter. This document, however, does not explicitly define the term "worker."

AMERICAN NUCLEAR INSURERS

The American Nuclear Insurers (ANI) has developed and issued "Engineering Inspection Criteria."[b] Section 8 deals with radiological protection. Section 8.4, "External Dosimetry," summarizes guidance from the International Commission on Radiological Protection (ICRP), the National Council on Radiation Protection and Measurements (NCRP), and 10 CFR 20 (NRC 1992):

> ICRP and NCRP recommend and 10 CFR 20 requires that personnel monitoring be performed for each occupationally exposed individual for whom there is a reasonable possibility of exceeding one fourth of the applicable maximum permissible dose. This would correspond to a whole body dose of 312 mrem per quarter. Experience has shown that claims have been filed for alleged bodily injury from radiation exposures slightly above background.
>
> The boundaries of the restricted area, as defined in 10 CFR 20, distinguish that area for controlling occupational and population exposures. Radiation exposures received in the restricted area are occupational exposures. The Pools recommend that exposures to individuals be monitored in the restricted area. Area monitoring may be an acceptable practice for individuals not requiring personnel monitoring devices under 10 CFR 20.202.

On the basis of this guidance, it appears that area monitoring is an acceptable practice. Informal discussions with senior ANI staff having extensive experience in the litigation of radiation injury claims, however, indicate a strong preference for individual monitoring

---

[a] Institute of Nuclear Power Operations, INPO 91-14 (formerly 88-10), Atlanta, 1991.

[b] American Nuclear Insurers, West Hartford, Connecticut, 1984.

because the results of a uniquely assigned dosimeter strengthen any arguments concerning the dose received by a worker.

Some power reactor facilities have used this option to develop area monitoring programs. In one case, the utility analyzed the results of environmental and enclave TLDs placed on site and within the facility, and then implemented a "no loitering" policy for accessible locations on the site that have dose rates in excess of 0.2 mrem/h. This facility analyzed area monitoring data accumulated over a five-year period and assumed a 60-hour-per-week occupancy at each monitoring location.

In addition to this guidance, it is possible that statements contained in safety analysis reports (SARs) for a facility may specify the use of personnel dosimetry for employees who enter the facility. These statements have not been evaluated.

SUMMARY OF FINDINGS

Thirteen sites completed the Area Monitoring Questionnaire (the results are provided in Appendix A). Additional sites supplied information on area monitoring programs but did not complete questionnaires. About half of the sites queried have, or plan to have, an area monitoring program. Of those sites, only one plans to develop an algorithm to use the information for assigning doses; another site uses the data to assign "zero" doses to workers.

A broad spectrum of facilities and operations was surveyed, as demonstrated by the number of monitored workers (from 100 to over 7,000). The wide variety of sources encountered in these facilities include plutonium and other transuranics, tritium, mixed fission products, activated corrosion products, industrial radiography sources, and sealed sources. TLD systems used for external personnel monitors and area monitors include site-specific custom systems, as well as commercially available TLD systems, such as Panasonic and Landauer, with a variety of phosphors, including LiF and $CaSO_4$.

In summary, some form of area monitoring is performed at a number of DOE government-owned contractor-operated (GOCO) and commercial nuclear facilities. Because many of these facilities have radiological operations similar to those at Hanford, a limited area monitoring program targeted at building a database for the Hanford facilities should be appropriate to determine if a larger-scale area monitoring program should be implemented.

RECOMMENDATIONS

The RCM requirement to implement an area dosimetry program appears to have two purposes: 1) to reduce the number of personnel dosimeters issued and 2) to assure that radiation levels are negligible outside Radiologically Controlled Areas and provide additional data on exposure if needed. The rationale for the first purpose, based on RCM Article 511.3, is to eliminate the impression that wearers are being occupationally exposed to radiation and to reduce the costs associated with operating a dosimetry program. In other words, if an individual is not required to be monitored based on the requirements in DOE 5480.11 (DOE 1993) and the RCM, the individual should not be provided with a dosimeter. The second purpose of the area monitoring program, and the one that more sites are using or planning to use when they implement an area monitoring program, is to provide additional verification that areas are adequately posted and to provide any additional information needed to determine exposure.

PNL recommends a phased approach to implementing an area monitoring program that will meet the intent of the requirements in the RCM and the HSRCM, as well as build a strong database to validate any future decisions regarding the assignment of dosimeters to workers. The first phase will be to establish an area monitoring program that will meet the requirement to verify that doses outside Radiologically Controlled Areas are negligible. This phase can also be used to supply additional data during an emergency or to support dosimetry investigations. Once there are data to verify that doses beyond the Radiologically Controlled Areas are negligible, the second phase will begin. To meet the intent of the RCM, this phase will address the method and justification for considering the removal of personnel dosimeters from those individuals who have no expectation of receiving any occupational dose. The DOE Richland Operations Office (RL) has approved the implementation of similar recommendations by the PNL Laboratory Safety Department. A third phase could involve removing dosimeters from individuals who may be exposed to radiation, but at levels below those required to be monitored. This phase would be implemented after sufficient data are obtained to determine doses from area dosimeters, if it is determined that there is an adequate method to track the location of WHC employees.

RECOMMENDED AREA MONITORING TO MEET THE INTENT OF RCM 514

The area monitoring program recommended for WHC is similar to the program implemented by PNL. A draft procedure for establishing the WHC program has been developed (see Appendix B). This procedure includes criteria for determining the type of dosimeter to be used, the facilities to be included in the area monitoring program, and the frequency of dosimeter change-out.

It is recommended that WHC use the following criteria in determining which facilities should be included in the area monitoring program:

- all facilities in the 200 and 300 Areas where employees work at least 8 hours a month

- other facilities that have Radiologically Controlled Areas or current radiological work permits (RWPs) inside the facility

- facilities located within 15 m of a facility that has a Radiologically Controlled Area or current RWP (including facilities belonging to other Hanford Contractors), and outdoor areas that are fenced in and are Radiation Areas, have RWPs, or are otherwise controlled for radiological reasons.

The number of dosimeters required for each facility is based on the number of employees in the facility, as outlined in Appendix B.

ADDITIONAL RECOMMENDATIONS TO MEET THE INTENT OF RCM 514 AND 511

The second phase of the program, the removal of dosimeters from employees that are not occupationally exposed to radiation, can be accomplished in stages. WHC can start by removing dosimeters from individuals working outside the 200 and 300 Areas and in buildings that do not have Radiologically Controlled Areas. It is recommended that individuals who will not be entering Radiologically Controlled Areas during the year not be issued dosimeters. The final decision should be made by the manager of each employee who meets these criteria. If an individual has the potential for entering a Radiation Area, High Radiation Area, or other Radiologically Controlled Area during the course of a year, that individual should be issued a dosimeter.

The second stage of dosimeter removal would begin after a designated time (approximately one year) in facilities where data have been collected from the area monitoring program. For those facilities that have shown the exposure levels to be background, dosimeters can be removed from the individuals meeting the same criteria as given above.

POTENTIAL THIRD PHASE OF AREA MONITORING DOSIMETRY

Once the area monitoring program has been established and data have been collected and trended, WHC may consider using the data to assign personnel doses. PNL recommends that this decision be reevaluated after the area monitoring program is well established and the data are considered valid. It will then be necessary to determine if there is a feasible method for verifying worker location in order to assign dose from an area monitor. Although it is possible to develop an algorithm to model the doses and to design a system for tracking employee location, these activities do not appear to be cost effective.

CONCLUSIONS

Based on the findings of the area monitoring survey and the review of WHC facilities and operations, a reasonable area monitoring program can be established at WHC facilities that should meet the intent of the RCM requirements. The initial program will be used to assure that locations near Radiologically Controlled Areas have negligible doses and to supplement personnel dosimetry and emergency data, if necessary. This program will be similar to the one in place at PNL and other DOE facilities.

Once the program is well established, consideration can be given to removing dosimetry from individuals that have no potential for receiving occupational exposure. Some sites currently have such practices in place, but most sites will continue to badge employees as they have in the past.

None of the sites we surveyed have received confirmation from DOE Headquarters that their implementation of area monitoring and personnel monitoring is adequate to meet RCM requirements. However, establishing an area monitoring program, verifying that it is adequate, and then removing dosimetry from personnel that do not have the potential to receive exposure under normal working conditions should meet the intent of the requirements. WHC may want to evaluate the ability to assign dose from the area dosimeters after the program is in place and data are available that can be compared to workers' personnel dosimetry.

REFERENCES

American National Standards Institute (ANSI). 1982. "Guide for Administrative Practices in Radiation Monitoring." ANSI N13.2-1969(R1982), New York.

U.S. Department of Energy (DOE). 1993. "Radiation Protection for Occupational Workers." DOE Order 5480.11 (1988), Chg. 3 (1993), Washington, D.C.

U.S. Department of Energy (DOE). 1992. *Radiological Control Manual.* DOE/EH-0256T (DOE N 5480.6), Washington, D.C.

U.S. Department of Energy Richland Operations Office (RL). 1992. *Hanford Site Radiological Control Manual.* HSRCM-1, Richland, Washington.

U.S. Nuclear Regulatory Commission (NRC). 1992. "Standards for Protection Against Radiation." *U.S. Code of Federal Regulations*, 10 CFR 20. Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1982. "Standard Review Plan." NRC, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1973. "Guide for Administrative Practices in Radiation Monitoring." NRC, Washington, D.C.

APPENDIX A

RESULTS OF THE AREA MONITORING QUESTIONNAIRE

APPENDIX A

RESULTS OF THE AREA MONITORING QUESTIONNAIRE

Responses to the 10 questions in the Area Monitoring Questionnaire are reported for the 13 sites that filled out a questionnaire.

AREA MONITORING QUESTIONNAIRE

PURPOSE: The purpose of this questionnaire is obtain information from Department of Energy (DOE) Maintenance and Operations Contractors and selected U.S. Nuclear Regulatory Commission licensees to determine their current and future planned use of area monitoring dosimeters. The questionnaire is designed to obtain information on current personnel monitoring systems, including the number of personnel monitored, the criteria for monitoring, the systems used for monitoring, and, specifically, whether an area monitoring program is in place or planned. In addition, the questionnaire will help define the site characteristics that play a part in determining the need for personnel and environmental monitoring.

1. Have you implemented or are you planning to implement the guidance in the DOE Radiological Control Manual (RCM) on establishing a comprehensive area monitoring (AM) program, as stated in Article 514? Briefly explain the implementation of your area monitoring program.

Site A: Sent memo to DOE stating that this action had not been budgeted, so unless DOE sends more money, they will not be able to implement an area monitoring program. The first year they will be able to incorporate it into their budget would be fiscal year 1996.

Have outlined the steps required to set up an AM plan:

- Evaluate requirements and develop criteria.
- Check into equipment needs and costs.
- Reevaluate past procedures.
- Develop software to automate system.

Site B: Currently in the planning stages. Expect their area monitoring program to be larger than personnel monitoring program. AM will be placed adjacent to the Controlled Areas. They expect to create an algorithm that relates the area monitoring dose to the personnel dose (similar to what they currently do for the personnel monitoring program).

Site C: Does not plan to develop an AM program. They do have some "environmental monitoring" at indoor locations that are not normally occupied.

Site D: Has an AM program in place, but it is not used for dose reconstruction. It is used essentially as environmental monitoring of random locations throughout the site. These area monitors are primarily in occupied areas.

Site E: An area monitoring program has been in place for over 40 years.

Site F: Does not currently have a monitoring program; however, they plan to implement a program per the RCM, but only for specific "as needed" locations.

Site G: AM program monitors for β and γ. Thermoluminescent dosimeters (TLDs) are placed on walls inside facilities. The AM program complements/validates ion chamber measurements. It is hoped that AM results can be used to decrease the size of the Radiologically Controlled Areas (RCAs) and support withdrawal of the dosimeters.

Site H: An area monitoring program is in place.

Site I: No plans for an area monitoring program.

Site J: Site area TLD program consists of approximately 100 TLDs. Panasonic 802 badges. Not used for personnel dosimetry; processed monthly; sensitivity is 3 to 5 mrem/month.

Site K: Area monitoring program allows a review of specific dose rates in and around the facility outside the Controlled Area. TLDs are placed in concentric rings.

Site M: This site has for some time had an area monitoring program to provide environmental and onsite monitoring capabilities. The program is used to assess doses to members of the public and to ensure that onsite personnel, who are not required to be monitored, do not exceed doses that would require them to be monitored.

2. If an area monitoring program is in place or planned:

a. What criteria are being used to determine the location and change-out frequency of the area dosimeters?

Site A: Not as part of an AM plan, but as current health physics (HP) procedures, dosimeters are placed in an area:

- when there is an undeclared (or, sometimes, declared) pregnancy
- for verification of ion-chamber survey measurements
- for planning or initial measurement purposes.

Personnel dosimeters: quarterly.

Site B: Placed adjacent to RCAs.

Site C: Regarding environmental monitoring:

TLDs placed at perimeter locations to determine background; placed in the vicinity of x-ray suites. Change-out frequency same as personnel dosimeters (quarterly).

Site D: Randomly determined location to measure ambient level. Quarterly change-out.

Site E: Professional judgment and experience are used to determine areas where trending of dose rates is desired or verification of background radiation levels is needed. The change frequency is quarterly or semi-annually.

Site F: N/A (not applicable).

Site H: Monthly on sealed sources greater than 100 μCi.

Site I: N/A.

Site J: Locations are determined by security fence boundaries, by significant dose contributors, and at offices inside the fence. Frequency is monthly, by discretion.

Site K: Locations described above; monthly change-out.

Site L: Have some area monitors around the perimeter of site, tank farm, and fuel storage pools. There are currently about 250 now. Will reevaluate in the future and reduce the number of badges.

Site M: The environmental TLDs have been placed around the site at 0–2, 2–5, and >5 mile radii. There is at least one TLD in each compass sector of the concentric rings (except for compass sectors off-shore). There are area TLDs at 28 locations within the protected area. These locations include a security fence to determine the fenceline dose, and selected plant locations where the highest area doses are expected. In 1987, an enclave TLD program was initiated to determine doses to personnel from changes in facility operation. The enclave program uses 65 area TLDs. All environmental and area monitoring TLDs are changed on a quarterly basis.

b. How do you use the data to assign personnel doses?

Site A: N/A.

Site B: Algorithm to be developed.

Site C: Not done. Case-by-case, if necessary.

Site D: N/A.

Site E: Not done.

Site H: Only "zero" doses are assigned based on area monitors.

Site I: N/A.

Site J: No personnel doses are assigned by area monitoring. Area monitors are used for assessment of public dose and employee ALARA (as low as reasonably achievable) controls.

Site K: It is unlikely that these would be used to assign any personnel doses. The TLDs outside the Controlled Area support the site radiation protection program; any personnel entry into Controlled Areas requires an individually assigned TLD.

Site L: Not used for assigning doses.

Site M: Personnel doses are not assigned based on area monitoring results. Personnel doses are assigned based on personnel TLD readings and by Self-Indicating Dosimeter (SID) readings.

c. Have you performed studies to determine whether the area dosimeter doses reflect the same doses personnel would have if they wore dosimeters? If so, what were the results?

Site A: N/A.

Site B: Expect the AM neutron dose measurements to be ~30% less than the personnel dosimeter measurements because of lack of body albedo.

Site C: None. But from past measurements: some cement blocks with high natural activity were used in the construction of the plant. Any AM done in this(these) building(s) will indicate higher exposure levels.

Site D: N/A.

Site E: No.

Site F: N/A.

Site H: Yes.

Site I: N/A.

Site J: No.

Site K: All site workers were badged between 1978 and 1983. Area monitoring was implemented in 1983.

Site L: Has not performed studies. May use if a person's personnel dosimeter reads high.

Site M: Has not performed such studies, but is considering placement of personnel TLDs in the same location as area TLDs to provide a comparison.

d. What type of TLD material is used? How many TLDs per card/badge are used and how many cards/badges are used at each location?

Site A: Personnel dosimeters: 4 chips—typically 3 TLD700s (β,γ) and 1 TLD600 (n); for known potential n exposure personnel, 2 TLD700s and 2 TLD600s.

Site B: Li borate (natural Li), enriched Li-6, Li-7 borate, calcium sulfate. Just one badge.

Site C: Personnel dosimeters: 3-chip Landauer β,γ (~100 people), Landauer β,γ, n (~5 people), 1-chip ring badge (~100 people). Environmental TLDs are Al oxide.

Site D: Personnel dosimeters: 4-chip Panasonic 810s and, if there is a potential for n exposure, they use CR39 (polycarbonate film). The area monitors are 4-chip Panasonic 802s.

Site E: Five-element dosimeter using LiF chips. One card is used at each monitoring point.

Site F: N/A.

Site H: Standard badge used by onsite workers.

Site I: N/A.

Site J: Panasonic $LiBO_4$; $CaSO_4$. Four elements, graded shields.

Site K: $CaSO_4$:Dy. The area badge consists of two cards: one card for β/γ; the second card is for $\beta/\gamma/n$ (^{6}Li added); one badge at each location.

Site L: Panasonic 614, 4 chips $CaSo_4$ and LiB. May change area monitors to Harshaw.

Site M: Panasonic TLD packets are used. There are two badges per packet, a UD801 and a UD814. From these packets, the average of the five $CaSO_4$ elements is used to estimate dose.

e. What are the primary radioactive materials of concern at your facilities and what dose rates do you encounter?

Site A: Everything. Neutrons account for ~1/3 to 1/2 of dose. For the last several years, maximum exposure ~1 rem, average ~500 mrem.

Site B: Pu, Am, and depleted uranium (DU). 1992 maximum personnel dose ~1 rem; ~5 people exposed at 0.3 to 1 rem; average ~20 mrem.

Site C: All sources sealed or plated. Exposure sources: linotron, industrial x-ray, x-ray fluorescence and spectroscopy, n-generators (^{3}H targets), β-backscatter sources - $^{90}Sr/Y$, ^{204}Tl, ^{147}Pm (0.03 to 200 mrad/h), ^{63}Ni in chromatograph.

Site D: Wide range—Pu, transuranics, tritium, biomedical sources (^{14}C, ^{32}P, ^{3}H, ^{35}S).

Site E: Mixed fission products with some Pu/Am. Dose rates vary from background to Very High Radiation Areas.

Site F: N/A.

Site H: Sealed ^{60}Co sources. Doses during irradiations can be very high, but not to personnel.

Site I: N/A.

Site J: Fission products, activated corrosion products. Area TLDs see between 5 and 50 mrem/month, depending on location.

Site K: Fission products, activated corrosion products. Dose rates vary from background to Very High Radiation Areas.

Site L: All isotopes from dissolved fuel—Cs and Sr. Have significant amount of beta exposure.

Site M: Fission products, activation products.

f. How do you ensure that you are in compliance with requirements for personnel dosimetry documentation and recordkeeping?

Site B: Use ORACLE-based system.

Site C: Periodic external assessment by a university professor; electronic database; TLDs are tracked.

Site D: Computerized. All positive exposures back to 1950s are computerized, but not all old zero-dose exposures are computerized.

Site E: Appropriate quality assurance (QA) procedures.

Site F: N/A.

Site H: Audits and self-appraisals.

Site I: N/A.

Site J: Since no personnel dose is assigned by area TLDs, documentation requirements are specified in procedures.

Site K: Internal and external audits.

Site M: Personnel are not required to be monitored unless it is likely that they will exceed 10% of the applicable dose limit. Area TLD results are

reviewed and evaluated to ensure that personnel who do not wear TLDs do not receive doses that would require monitoring. Ongoing audits of this program are being conducted to ensure that area monitoring results are properly recorded.

g. How are anomalous personnel badge readings handled?

Site A: If dosimeter is lost or unreadable, the dose is determined on a case-by-case basis. Determine likely dose for that exposure period.

Site B: Determine if TLD damage/misread was the cause, and then reconstruct the likely dose (primarily by interview and past records).

Site C: Investigative threshold is 25 mrem/quarter. Landauer reports doses down to 10 mrem.

Site D: If chips are inconsistent or doses are "high," an investigation is conducted by HP staff.

Site E: Each is evaluated and dispositioned. This disposition is documented.

Site F: N/A.

Site H: Investigate other doses to personnel; 80% of anomalous readings are not site-related.

Site I: N/A.

Site J: N/A.

Site K: Investigate and reconstruct, with surveys, area TLD results to a depth consistent with the magnitude of the exposure.

Site M: If there is a ≥25% variance between TLD and SID results for personnel or off-normal results for environmental or area TLDs, the dosimetry processor evaluates the results. If necessary, an investigation may be carried out by field personnel to resolve anomalies.

h. Do you have any experience with or ideas on the dependability of area dosimetry in the case of radiation exposure litigation?

Site A: None. The practice of badging everyone adequately addresses this potential problem.

Site B: None. One with personnel dosimetry—a man with lung cancer sued and won, even though his cumulative dose was [recorded to be] ~20 mrem. It is expected that more [cases] will crop up in the future as workers retire, because 1) they are no longer tied to the company for their income, and 2) their cancer risk increases with age and they want/need to identify a cause for their cancer.

Site C: None.

Site D: None that went to trial. Periodically, some worker will express an interest in initiating a case. The records are reviewed and discussions are held with the person. So far, they have been able to convince the people that the recorded personnel doses and exposure situation do not provide significant probability of causation.

Site E: No.

Site F: N/A.

Site G: None.

Site H: No.

Site I: N/A.

Site J: No.

Site K: No.

Site L: No known experience using area monitoring data; some with personnel dosimetry.

Site M: No.

3. How is background determined at your site?

Site A: Has a take-home system of dosimetry. In about 1991, they conducted a survey to determine background. Approximately 70 people took dosimeters home as background/home monitors. Measurements averaged ~0.75 mrem/wk. This value [was] used as background by subtracting it from all badges. At first they rounded up to 1 mrem/wk as the background level, but they found too many negative results.

Site B: Have a storage-boarding system. Use the lowest background level measured onsite (usually turns out to be lab building measurement). This number is subtracted from all badges.

Site C: Have control badges. The level recorded by the control badge is subtracted from all personnel readings automatically. There is also a control badge for the environmental TLD system, but this reading is not subtracted from the environmental badges.

Site D: Have control badges in the dosimeter office. The dose measurement is subtracted from all personnel dosimeters.

Site E: By using control TLDs.

Site F:

1 TLDs set aside for each background accumulation.

2. Median values of personnel dosimeters of employees that do not enter Controlled Areas.

3. For specific purposes, site boundary monitoring (both passive and real-time).

Site G: Changed from a "racked" system to a take-home system about a year ago. At that time they reduced the number of people badged. Background determination procedure not well defined. Currently, there is no statistical difference between offsite and perimeter measurements, so perimeter measurement is used as background.

Site H: Control dosimeters are kept in a safe in a low background area.

Site I: Control dosimeters and environmental measurements.

Site J: Subtract dedicated background badges located in TLD lab (away from sources).

Site K: Control badges are used at the TLD storage locations.

Site L: Use site dosimetry. Site is in low background area.

Site M: Background is assumed to be the average of the environmental TLDs located 10 or more miles from the site (8 badges).

4. What are your criteria for requiring individual personnel monitoring devices for:

- **entry onto the site**
- **controlled area entry**
- **radiological buffer area**
- **other?**

Site A: All workers/employees are badged. Visitors are badged if there is a potential for exposure. Radiological Buffer Areas are not currently defined.

Site B: Badge is required for entry into Controlled Areas. Requests for badges are also honored (requests are usually made by those who do not trust "the system").

Site C: Badge required for entry into Controlled Areas; must meet training criteria. Radiological Buffer Areas not currently defined.

Site D: All employees are badged. Visitors are badged if they are going to, or potentially may go to, a building designated as a potential exposure location (~40 of these buildings). All who enter RCAs are badged. Radiological Buffer Areas are not currently officially designated; they are still implementing this. There is a tendency to over-badge, so there have not been any special requests for badges that conflict with current distribution policy.

Site E: Facilities with Radiological Areas are designated as Controlled Areas and require a TLD for entry.

Site F: No monitoring is required for site access only. TLD with visitor orientation, General Employee Radiological Training (GERT), and radiological worker training are required for Controlled Area entries. Radiological Buffer Areas are not used.

Site G: Must be badged if you go into an RCA. All radiological workers have "call cards." If the worker is to go into an RCA, he/she goes to a dosimeter distribution point and enters his/her call card into a machine. The call card indicates the identity and training of the worker. If training is appropriate, a dosimeter will be issued to the person.

Site H: Badges are required in specified areas (Radiation Areas).

Site I: All personnel entering the site are badged.

Site J: Site entry—none; Controlled Area entry—Panasonic 802; Radiological Buffer Area—Panasonic 802 and personnel electronic dosimeter.

Site K: Site entry—none; Controlled Area entry—TLD.

Site M: Requirements for monitoring are based on the areas to be visited on site, the type of work to be performed, and areas in which work will be performed. GET Level I employees are not provided with dosimetry unless they enter the Radiologically Controlled Area. Personnel entering the Controlled Area are provided with a SID and are administratively limited to 25 mrem/quarter. GET Level II personnel are provided with a TLD and are issued a SID for RCA entry. Escorted radiation workers are provided with a SID. Site visitors are not issued badges unless they enter the RCA.

5. How many monitored people do you have at your site? How many have General Employee Radiological Training (GERT)? How many have Radiological Worker I (RWI) or Radiological Worker II (RWII) training? Has your level of monitoring and training changed since the implementation of the RCM? If so, how?

Site A: There are 6,000 to 7,000 [employees] monitored. Everyone receives GERT. There was no RWI training before the RCM. Everyone who got RW training received RWII. Eventually will have about 400 people

with RWI training. Hard to say how many RWIIs they will have because they train so many subcontractors.

Site B: Approximately 5050 are monitored. GERT is not generally available; it is currently taught only in a limited number of classes; ~100 people are GERT-trained. There are ~2000 people with RWI and RWII training. Since implementation of the RCM, ~1000 people dropped from monitoring. GERT training will be generally available in the future.

Site C: Approximately 100 are monitored. No one has GERT; ~130 people have RWI training (a 4-hour class—approved by DOE). No one has RWII training because it is N/A. Their RWI training is much more comprehensive than before. As far as monitoring, they pulled n badges in one area because a detailed survey found there were no n present.

Site D: GERT is given to all employees. Retraining is implemented by a mailed (bi-annually) pamphlet the employee is supposed to read. A total of ~1500 have RWI or RWII training. No changes in the monitoring program resulted from RCM implementation. Training is changing as a result of the RCM, though. The RW training is tending to lean more towards the RWII program, as the budget allows.

Site E: All employees receive GERT. Approximately 2500 employees have received RWI or RWII training. The level of monitoring has not changed since implementation of the RCM. RWII training was expanded.

Site F: Approximately 700 employees receive GERT. Approximately 600 employees receive RWI or RWII training. Monitoring and training programs have not changed since implementation of the RCM. A phased implementation program is in effect.

Site H: In 1992, 1400 employees were badged and received GERT; 300 received RWI, and 50–75 received RWII. Are still implementing the RCM.

Site I: All are badged and receive GERT; 80% receive RWI or RWII training. No change in the level of monitoring.

Site J: Approximately 4000.

Site K: Approximately 450. All monitored workers receive GERT, RWI, and RWII.

Site L: About 3000 with about 1600 permanent badges.

Site M: RWI—approximately 300; RWII—approximately 900.

6. Is there known or suspected environmental contamination at your facility (e.g., soil cribs, trenches, burial grounds) that is a candidate for environmental restoration?

Site A: Yes.

Site B: Yes, all restoration activities.

Site C: No.

Site D: The greatest problem is hazardous waste in groundwater from the days when the site was a Naval Airfield. There are small quantities of tritium in the groundwater under an old evaporation pond and an old waste pit.

Site E: Yes.

Site F: No radioactive environmental contamination, but some hazardous contamination needing environmental restoration (PCBs.)

Site H: No.

Site I: Yes.

Site J: Some slightly contaminated soil from past practices. This has not yet been characterized. To be determined by sampling and dispositioned during decommissioning.

Site K: Some slightly contaminated soil from past practices.

Site L: There is some soil contamination.

Site M: All soil on site is suspected to be contaminated.

7. Are radioactive materials stored outdoors at your site or facility?

If yes, describe the types and activity levels; how close people are to these locations; and if calculations have been made for doses to maximally exposed individuals.

Site A: Solid waste burial grounds contain some mixed waste. Doses are potentially ~ few hundred mrem.

Site B: Not much. Perhaps applicable: some waste is stored in underground tunnels that present an external exposure pathway above-ground.

Site C: N/A.

Site D: Not much at any one time. There is some outdoors in the waste accumulation and waste processing areas before it is moved to its subsequent location.

Site E: Yes.

Site F: Yes. Storage is in secured unoccupied areas. Dose rates from activated metal components are all less than 5 mrem/h at a distance of 1 ft from the surface.

Site H: No.

Site I: Yes. Generally contamination from weapons tests, drilling, and mining. People enter contaminated soil areas, but no dose is expected (based on calculations).

Site J: Yes. Radioactive material areas located within the fence. Dose rate limit is 50 mrem/h on individual containers with impact at area boundary not to exceed 1 mrem/quarter. Calculations and measurements have been made for maximally exposed individuals.

Site K: Yes. Dose rates vary between background and 5 mrem/h.

Site L: Yes. There are stacks of boxed soils, and spent fuel racks covered with steel that are fenced.

Site M: Yes. Outdoor radioactive materials are stored at the facility. Materials may be stored outdoors within several feet of occupied buildings. If the dose rate near these containers exceeds 0.2 mrem/h, the area is posted "No Loitering—Radiation Area Nearby."

8. What is the maximum calculated dose to:

a. a person in the unrestricted areas of the site or facility? How much of this is internal versus external?

b. an offsite individual?

Site A: Most onsite dose is external.

Site B: Most worker dose is internal (primarily Pu in the lungs). Offsite doses are not calculated.

Site C: Most worker dose is external (~10–20 mrem). Internal and offsite doses are not calculated.

Site D: Most worker dose is external; no internal. Offsite doses are internal, primarily from airborne tritium intakes. Offsite maximum exposed individual (MEI) is 0.2 mrem/y.

Site E: Offsite MEI not available; believed to be near zero.

Site F: The maximum calculated dose to a person in unrestricted areas of the site is ~ 10 mrem/y, with internal dose < 1 mrem/y. For an offsite individual, the maximum calculated dose is < 1 mrem/y.

Site H: Background.

Site I: Background.

Site J: The maximum dose outside the Controlled Area is 30 mrem/y; < 1 mrem/y is due to internal.

Site K: The maximum dose is 10 mrem/y external; 3 mrem/y from internal.

Site L: The maximum calculated dose is from external radiation and is less than 100 mrem. Offsite is less than 1 mrem.

Site M: The calculated maximum external dose to a site worker is 44 mrem and 2 mrem for a 40-h/y visitor.

9. Has your contractor legal organization (site or corporate) developed an opinion as to the acceptability of area monitoring in lieu of individual personnel monitoring devices? If yes, explain or obtain copy if possible.

Site A: Under evaluation.

Site B: Decisions made on a case-by-case basis. Management pushes personnel dosimetry. Currently drafting a written policy on who gets dosimeters.

Site C: N/A.

Site D: Legal opinions have been solicited regarding the question of the relative values of AM and personnel dosimetry data. It was advised that AM does not provide an adequate substitute for personnel dosimetry. The cost benefits of scaling down the personnel dosimetry program are not believed to substantiate the loss of hard data and increased dose uncertainty (and thereby increased chance of DOE loss of a litigation case) introduced by an AM program.

Site E: No.

Site F: No. Historically, site management has opposed area monitoring in lieu of personnel monitoring.

Site H: No.

Site I: No.

Site J: No.

Site K: No.

Site L: Considered best to have a dosimeter on everyone.

Site M: Yes, a technical position paper has been prepared.

10. If you do not intend to implement an area monitoring program to replace issuance of personnel dosimeters, what is the basis for that decision? Has DOE approved the decision?

Site A: DOE has been notified of their decision not to implement AM until 1996. DOE has decided not to distribute additional funds to implement an AM program earlier.

Site B: The AM program will be used to provide 1) additional support for dose reconstruction cases, and 2) backup measurements if a personnel badge is lost. They do not intend to pull any badges from anyone as a result of implementing the AM program. DOE has not been formally notified that the purpose of the AM program implemented differs from that stated in the RCM.

Site C: No area monitoring.

Site D: They have stated their practice and policy of issuing personnel dosimeters to employees in a number of implementation plans. They have requested an exemption from the implementation of area monitoring for the purposes of personnel monitoring that DOE has stated in the RCM. They have received no backlash from DOE to this point.

Site E: No significant cost benefit. Substantial reduction in liability protection. Still developing a position paper.

Site F: They intend to implement a program for portions of their facility.

Site H: N/A.

Site I: ?

Site J: N/A.

Site K: Personnel who do not enter Controlled Areas no longer receive TLDs.

Site L: DOE has not formally been notified on the use of area monitors.

Site M: N/A.

REFERENCES

U.S. Department of Energy (DOE). 1992. *Radiological Control Manual.* DOE/EH-0256T (DOE N 5480.6), Washington, D.C.

APPENDIX B

SUGGESTED DRAFT PROCEDURE FOR THE WHC AREA MONITORING PROGRAM

APPENDIX B

SUGGESTED DRAFT PROCEDURE FOR THE WHC AREA MONITORING PROGRAM

TITLE : AREA MONITORING DOSIMETRY PROGRAM

1.0 PURPOSE

This document provides an overview of and general guidance for Westinghouse Hanford Company's (WHC's) Area Monitoring Dosimetry Program (hereafter referred to as area monitoring program). Area monitoring dosimeters are required in certain WHC facilities to record and document that doses adjacent to Radiologically Controlled Areas are negligible.

2.0 SCOPE

This document presents a procedure for establishing an area monitoring program at WHC, including criteria for determining which facilities are to be monitored, the number and location of dosimeters, dosimeter type, the frequency of dosimeter change-out, and the method for evaluating data obtained from the dosimeters.

3.0 DEFINITION

[TBD]

4.0 RESPONSIBILITIES

[To be addressed by WHC]

5.0 REQUIREMENTS OF THE DOE RADIOLOGICAL CONTROL MANUAL AND HANFORD SITE RADIOLOGICAL CONTROL MANUAL

The U.S. Department of Energy's (DOE's) *Radiological Control Manual* (RCM) and the *Hanford Site Radiological Control Manual* (HSRCM) specify area monitoring requirements. Both the RCM (DOE 1992) and the HSRCM (RL 1992) require the establishment and maintenance of a comprehensive area monitoring program to record and document radiation levels in routinely occupied areas adjacent to Radiological Buffer Areas (Radiologically Controlled Areas at the Hanford Site). According to the HSRCM, these data should be used to supplement existing monitoring program data and provide data in the event of an emergency. The HSRCM also states that the dosimeter results may be used to support dosimetry investigations.

5.1 ACCREDITED DOSIMETERS

All record dosimeters used by Occupational Health and Safety (OHS) Dosimetry shall be accredited by the DOE Laboratory Accreditation Program (DOELAP) and issued by the Hanford Site External Dose Program.

5.2 CONTROL OF DOSIMETERS

The Dosimetry and Monitoring Section (D&MS) shall control all record dosimetry in accordance with the procedures of this manual. Such control includes (but is not limited to) placement, change-out, and processing of dosimeters used in the area monitoring program.

5.3 RECORDS

D&MS shall assure that an appropriate dosimetry records system is maintained and, when required, that data and information are available to management.

5.4 REPORTS

The information of exposure per quarter for all area monitoring dosimeters shall be kept for one year and then published in a WHC yearly report of the area monitoring program.

6.0 PROCEDURE

This procedure for establishing an area monitoring program at WHC includes criteria for identifying the facilities that will be monitored, determining dosimeter placement, changing out the dosimeters, and recording and evaluating the dosimeter data.

6.1 CRITERIA FOR DETERMINING WHICH FACILITIES WILL HAVE AREA MONITORING DOSIMETERS

Any WHC facility shall have area monitoring dosimeters installed if any of the following requirements apply:

- All WHC facilities in the 200 and 300 Areas where WHC employees work at least 8 hours a month.

- Any WHC facility that has a current radiological work permit (RWP) assigned to it, or any facility that is within 15 m of a facility that has an operating Radiation Area or Contamination Area associated with it. (This includes facilities that belong to other contractors at Hanford.)

- Outdoor areas (such as tank farms) that are secured and fenced in, and that meet the requirements above. Locations that are not fenced in, or that have no entrance or egress controls, will not be monitored.

6.2 NUMBER AND LOCATION OF AREA MONITORING DOSIMETERS

Each facility is required to have the following number of area monitoring dosimeters, as identified in Section 6.1 of this procedure:

- At least one area monitor dosimeter for each facility that requires area monitoring dosimeters.

- One additional area monitoring dosimeter for every 25 staff members for each facility that does not have a Radiologically Controlled Area or Radiological Buffer Area but requires area monitoring dosimeters.

- One additional area monitoring dosimeter for every 15 staff members for each facility that has a Radiologically Controlled Area or Radiological Buffer Area.

- Additional area monitoring dosimeters where designated by facility health physicists.

The location of the area monitoring dosimeters in each facility shall be determined by facility health physicists and provided in Attachment A of this procedure.

6.3 TECHNICAL DESCRIPTION OF THE AREA MONITORING DOSIMETERS

Area monitoring dosimeters shall be DOELAP-accredited dosimeters. The area dosimeter shall be the Hanford Basic Dosimeter, which is a basic dosimeter comprising a single thermoluminescent dosimeter (TLD) chip intended to monitor dose from penetrating photon radiation only (x-rays or gamma rays).

Other dosimeters may be considered if a commercially available dosimetry system that meets the needs of this program becomes DOELAP accredited.

6.4 CHANGE-OUT FREQUENCY FOR AREA MONITORING DOSIMETERS

Change-out is defined as the removal of the installed area monitoring dosimeter, immediately followed by the replacement of a new, identical area monitoring dosimeter in the same location. The frequency of the change-out is determined as follows:

- All area monitoring dosimeters shall be changed out routinely on a quarterly schedule, with the possibility of semi-annual change-out in the future.

- Area monitoring dosimeters may be changed out in any facility at the written request of the facility manager of that facility, the Radiological Protection Manager, or the Occupational Health and Safety Manager.

NOTE: No area monitoring dosimeter can be changed out without the immediate replacement of a prepared identical area monitoring dosimeter, unless the location of the area monitoring dosimeter is being discontinued.

6.5 CHANGE-OUT PROCEDURE FOR AREA MONITORING DOSIMETERS

The following procedure is to be used for changing out area monitoring dosimeters:

1. Area monitoring dosimeters shall be changed out or installed by assigned WHC staff members who are under the direction of the WHC staff member responsible for maintaining the WHC area monitoring program.

2. The change-out or installation of area monitoring dosimeters shall be performed on a frequency (or for a reason) stated in Section 6.4 of this procedure.

3. Each area monitoring dosimeter shall be identified with a bar-coded label containing the following information:

   - building identification, in the upper left corner
   - location identification, in the upper right corner (i.e., Loc.5)
   - location sequential number, in the lower left corner (i.e., 0,1,2...)
   - system library number ("Axxxx", where A denotes the area monitoring dosimeter, and xxxx is a sequential four-digit number), in the lower right corner.

4. An identification card shall be posted in each location that shall provide the identification number of the area monitoring dosimeter and instructions not to tamper with the area monitoring dosimeter. (See the example in Attachment A.)

5. The WHC staff member responsible for maintaining the WHC area monitoring program shall prepare for change-out of area monitoring dosimeters by:

   - Requesting and procuring the appropriate number of area monitoring dosimeters to be prepared by the Instrumentation and External Dosimetry Section, and preparing a list of the identification number of each area monitoring dosimeter.

- Preparing a list of area monitoring dosimeters to be changed out at that time. The list shall contain the identification number, building number, and room number, as well as space for writing the date of the change-out, the name of the staff member performing the change-out, and comments. A map of each facility shall be provided, showing the location and identification number of each area monitoring dosimeter.

- Noting on the list of area monitors whether each change-out to be performed is a routine change-out, a new location for monitoring, or a location to be discontinued.

6. The WHC staff member responsible for the area monitoring program in a specific facility will receive:

   - Area monitoring dosimeters numbered for each location.

   - A list of area monitoring dosimeters to be changed out, with space for the staff member to enter the date of the change-out and sign to certify the change-out.

   - A map of each facility with area monitoring dosimeters to be changed out, showing the location of each area monitoring dosimeter and its identification number.

   - An assigned date for completing the change-out of the area monitoring dosimeters.

7. Each WHC staff member assigned to change out area monitoring dosimeters shall:

   - Replace each area monitoring dosimeter in the designated location with the appropriately numbered area monitoring dosimeter.

   - Date and sign the change-out form for each area monitoring dosimeter as it is changed out, initially installed, or discontinued.

   - Locate the area monitoring dosimeter in an unobtrusive spot in the designated area in the appropriate facility (preferably above 30 inches from the floor).

- Note on the change-out form any different conditions or any pertinent observations relating to the work (such as tampering, moving, observed excessive heat or water damage).

- Return all changed-out area monitoring dosimeters and the change-out form to the individual responsible for maintaining the WHC area monitoring program. The form and changed-out dosimeters should be returned before the assigned completion date.

8. The individual responsible for maintaining the WHC area monitoring program shall perform the following actions:

   - Receive all changed-out area monitoring dosimeters and change-out forms from assigned PNL staff members.

   - Check that all changed-out area monitoring dosimeters are present and that the change-out forms are completed properly.

   - Investigate any missing area monitoring dosimeters or incorrect information on the change-out forms.

   - Return all changed-out area monitor dosimeters for processing.

9. The individual responsible for maintaining the area monitoring program shall obtain processing results of the changed-out area monitoring dosimeters:

   - The information of exposure from each area monitoring dosimeter shall be combined with the elapsed time (date on to date off) to determine the exposure per quarter value for each area monitoring dosimeter location.

   - The information of exposure per quarter for all area monitoring dosimeters shall be kept for one year, and then it shall be published in a WHC yearly report for the area monitoring program. (This procedure shall also be incorporated into the report.)

   - The WHC yearly report for the area monitoring program shall be distributed to all individuals on a list determined by the Radiological Protection Manager.

- The required number of copies of the WHC yearly report for the area monitoring program shall be sent to archives on the Records Inventory and Disposition Schedule (RIDS) program.

- Any area monitoring dosimeter that provides an exposure exceeding 75 mrem/quarter shall be investigated and documented by the WHC staff member who is responsible for maintaining the area monitoring program.

- If tampering, damage, or different conditions are reported for any area monitoring dosimeters by the WHC staff member who is assigned the change-out of these dosimeters, these dosimeters shall be investigated and the results included in a report to the Radiological Protection Manager.

7.0 REFERENCES

U.S. Department of Energy (DOE). 1992. *Radiological Control Manual.* DOE/EH-0256T (DOE N 5480.6), Washington, D.C.

U.S. Department of Energy Richland Operations Office (RL). 1992. *Hanford Site Radiological Control Manual.* HSRCM-1, Richland, Washington.

ATTACHMENT A

[To be developed by WHC: locations, and maps of locations, of area monitoring dosimeters]

DISTRIBUTION

No. of
Copies

OFFSITE

2 DOE/Office of Scientific and Technical Information

A. Ahmed
Oak Ridge National Laboratory
P.O. Box 2008
Oak Ridge, TN 37831-6290

J. Cowley
MS705
REECo
P.O. Box 98521
Las Vegas, NV 29802

M. Donahue
Kansas City Division
2000 E 95th Street
P.O. Box 419159
Kansas City, MO 64141-6159

J. B. Martin
Battelle Pantex
P.O. Box 30020
Amarillo, TX 79177

D. Myers
Lawrence Livermore National Laboratory
L-384
P.O. Box 5505
Livermore, CA 94550

No. of
Copies

C. Passmore
EG&G Rocky Flats
P.O. Box 464, Bldg. 123
Golden, CO 80420

J. Rowles
EG&G Energy Measurements
Las Vegas, NV 29802

A. Tschaeche
WINCO
Mail Stop 5209
P.O. Box 40009
Idaho Falls, ID 83403

D. Welles
Westinghouse Savannah River Co.
735 E Room B-107
Aiken, SC 29808

ONSITE

DOE Richland Operations Office

D. L. Clark, A5-55

16 Westinghouse Hanford Company

E. Adams, T4-03
D. S. Cunningham, S0-06
W. A. Decker, R3-12
D. J. Foust, G7-40
K. Gray, S5-66

No. of Copies	
	R. E. Heineman, R3-12
	M. E. Hevland, R3-12
	S. R. Johnson, L8-20
	M. Kaviani, X3-60
	T. J. Kelly, S0-06
	P. Linn, T5-57
	B. Lueck, R3-12
	W. C. Mallory, T4-03
	R. M. Rogers, S0-02
	K. Smith, N1-06
	R. Watts, L6-52

No. of Copies	
11	Pacific Northwest Laboratory
	J. S. Durham, K3-55
	J. J. Fix, P7-02
	E. E. Hickey, K3-56
	D. P. Higby, P7-78
	J. R. Houston, A3-60
	S. F. Snyder, K3-54
	P. S. Stansbury, K3-62
	G. J. Vargo, K3-56
	Technical Report Files (2)
	Publishing Coordination

END

DATE
FILMED
5/16/94