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UC-600

Pacific Northwest Laboratory
ALARA Report for Calendar Year 1994

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Pacific Northwest Laboratory
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Summary

This report provides summary results of the Calendar Year (CY) 1994 As Low As Reasonably Achievable (ALARA) Program performance at the Pacific Northwest Laboratory (PNL).[a] This report includes data regarding performance in the area of personnel exposures to radiation, skin contaminations, control of contaminated areas, minimization of radioactive waste, and control of radioactive releases.

In CY 1994:

- The collective total effective dose equivalent to PNL employees during 1994 was 55 person-rem.[b] This dose was 15 percent lower than the projected dose of 65 person-rem. The Field Dosimetry Services of the Radiological Control Department, Technical Support Section, projected that no PNL employee's dose would exceed 2 rem based on dosimeters processed during the year; no worker actually exceeded the projection by the end of CY 1994. The maximum dose to any individual was 1.11 rem.

- There were 34 instances of skin and personal-clothing contamination events for PNL employees during 1994. Eighteen of these contamination events occurred at the 324 Building; eleven occurred at the 325 Building; two occurred in the 327 Building; one occurred in the 326 Building; one occurred in the 3708 Building; and one occurred in the RTL Building.

- PNL facilities contained 12 Airborne Radioactivity Areas, and 60 Contamination Areas and High Contamination Areas. The area of the Airborne Radioactivity Areas was 383 m^2 (4125 ft^2). The area of the Contamination Areas was 5290 m^2 (56,947 ft^2). The area of the High Contamination Areas was 266 m^2 (2863 ft^2).

- PNL disposed of 10.5 m^3 (371 ft^3) of compacted low level waste. Also disposed was 423 m^3 (14,949 ft^3) of noncompacted low level and mixed waste that was not subject to volume reduction. The total radioactivity of the disposed waste was 1217 Ci.

- PNL facilities released 165.2 Ci of noble gas, 3.0E-5 Ci of airborne particulate radioactive material, and 12.2 Ci of tritium to the environment.

Line management set numerous challenging and productive ALARA goals, designed to improve performance for their facilities. Appendix A describes the final status of the 1994 ALARA goals. Appendix B describes the facilities radiological ALARA goals for 1995.

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[a] The Pacific Northwest Laboratory is operated by Battelle Memorial Institute for the U.S. Department of Energy under Contract DE-AC06-76RLO 1830.

[b] The dosimetry records base the collective whole-body dose on dose to compliance-dosimeter-wearing PNL staff onsite only. All other data, discussions, conclusions, etc., in this report include both onsite and offsite information.

Based on previous performance and goals set by the facilities, the ALARA Coordinator has set goals for each relevant performance indicator. Appendix C describes PNL performance indicator goals.

Appendix D describes the details of all PNL skin and personal-clothing contaminations that occurred in 1994.

Appendix E is a summary of changes in administrative control levels at PNL in 1994.

The ALARA program office has set for itself numerous challenging and productive ALARA goals to improve its effectiveness and ensure compliance with 10 CFR 835. Appendix F describes the ALARA program goals for 1995.

The Radiological Control organization tracked comprehensive performance indicators for PNL in 1994. The performance-indicator data represent PNL's data collection phase and a report of actual performance. At this stage of development, the performance-indicator data are being collected to develop a baseline for trending, more meaningful goals, conclusions, and corrective actions. Comprehensive performance indicators for PNL in 1994 can be seen in Appendix G.

Contents

Figures

1.0 Introduction

The concept of maintaining exposures to radiation as low as possible (ALAP) was first introduced formally in 1954 by the National Committee on Radiation Protection. U.S. Department of Energy (DOE) Order 5480.11, "Radiation Protection for Occupational Workers," establishes requirements for DOE contractor ALARA programs and references the *Health Physics Manual of Good Practices for Reducing Radiation Exposures to Levels that are As Low As Reasonably Achievable (ALARA),* which describes possible elements of ALARA programs.

ALARA is a factor considered in all PNL projects. Chapter 1 of the DOE, *Radiological Control Manual*, and G-10 CFR 835/B2 Implementation Guide for use with Title 10, CFR Part 835, provides guidance for PNL's Radiological ALARA Program. PNL trains all radiological workers in ALARA concepts and techniques. The purpose of this report is to summarize and document activities, accomplishments, and results of safety parameters involved in the Radiological ALARA Program during CY 1994.

The Radiological ALARA Program is administered by the PNL ALARA Coordinator of the Radiological Control Department. The line management of research and operational organizations develop ALARA goals; the PNL ALARA Coordinator reviews these goals and tracks their progress throughout the year. The ALARA report displays CY 1994 radiological goals and their status in Appendix A; the CY 1995 radiological goals are in Appendix B. Line management implements the ALARA programs; Radiological Control, Laboratory Safety, and other organizations provide training and support.

2.0 Radiological ALARA Performance

This section describes in detail the performance of the Radiological ALARA Program at PNL. It includes information on radiation doses, skin and personal clothing contaminations, control of contaminated areas, minimization of radioactive waste, and control of radioactive releases. It also includes trends, analysis, and any conclusions derived from these performance categories.

2.1 Radiation Exposure (Total Effective Dose Equivalent)

In CY 1994 staff members at PNL facilities on the Hanford Site who were monitored for compliance with DOE Order 5480.11 (i.e., multipurpose dosimeter wearers) received a total of 55 person-rem. At the beginning of the year, the PNL ALARA Coordinator projected 65 person-rem based on planned activities, primarily those in the 324 and 325 Buildings. The difference between projected and actual dose was 15 percent.

2.2 Exposure Trends

The PNL ALARA Coordinator analyzed the distribution of doses among staff. Figure 1 shows the distribution of doses among the 1989 staff members who were monitored for compliance with DOE Order 5480.11. The average dose for this group during 1994 was 11.7 millirem. The most frequently occurring dose for staff members during 1994 was 0 millirem.

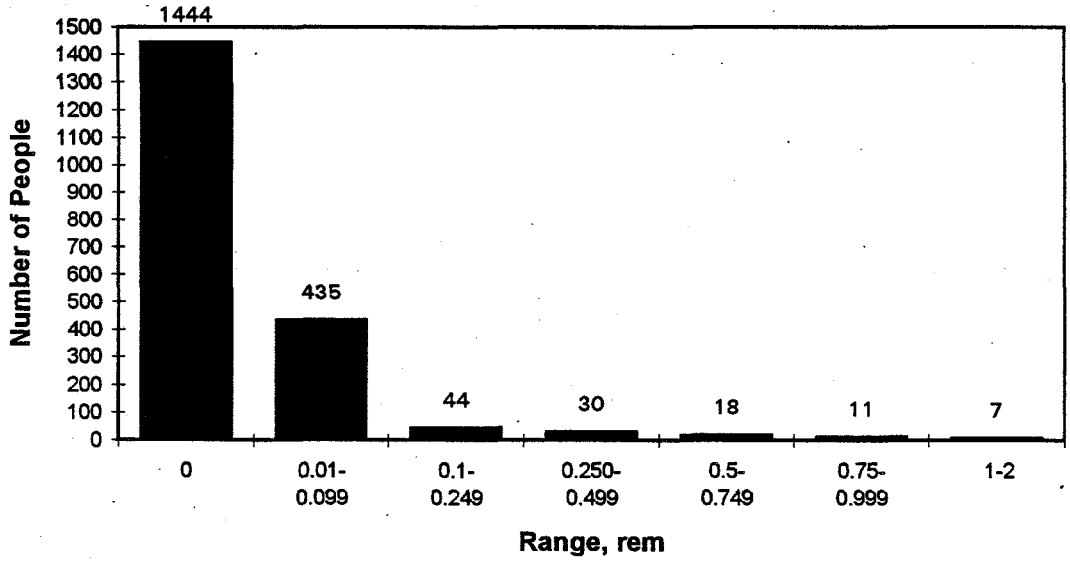

Figure 1. Dose Distribution for CY 1994

Figure 2 shows the yearly trend in collective total effective dose equivalent for PNL. The figure illustrates the correlation of collective dose to the major programs. The peak of 230 person-rem in 1986 was due to the destructive-examination phase of the steam-generator project. The rise in collective dose in 1989 and 1990 was the result of the single-shell tank waste characterization. The majority of the collective dose in 1991 through 1994 is attributed to the 325 Building A Annex clean-out and clean-out activities in the 324 Building B hot cell.

Figure 3 shows the yearly trend in total collective whole-body dose incurred by the four centers or directorates with the highest collective whole-body doses for the last three years. The Facilities and Operations Directorate accounted for 23 person-rem; Nuclear Facilities, formerly Waste Technology, Remote Systems Technology and components of other organizations accounted for 20 person-rem; the Materials and Chemical Sciences accounted for 6 person-rem; the Life Sciences Center accounted for 1.6 person-rem.

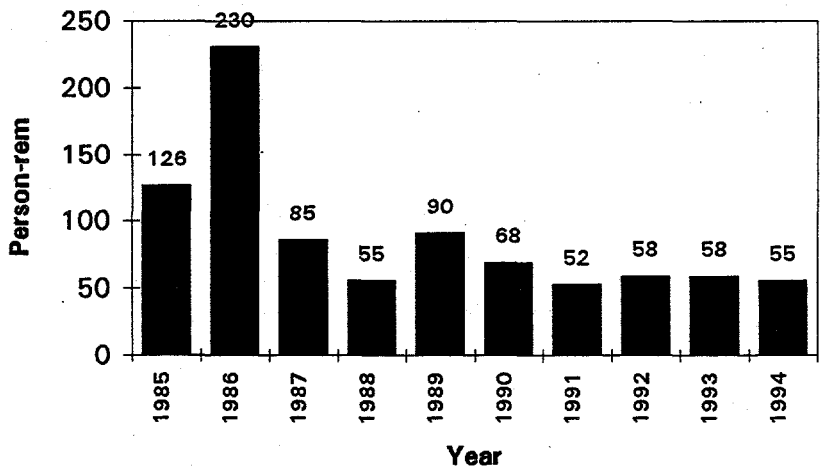

Figure 2. Annual Collective Whole-Body Dose for the Last 10 Years

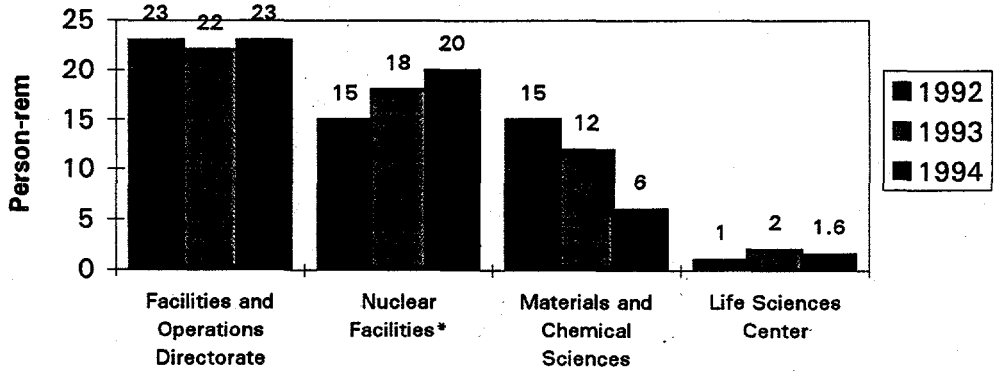

Figure 3. Collective Whole-Body Dose for 1992-1994 for the Four Highest Organizations

Figure 4 shows the distribution of dose among PNL high-dose organizations for 1994. The organization incurring the highest collective dose was Nuclear Facilities, formerly the Process Technology Department of the Waste Technology Center. This organization operates the majority of hot-cell facilities at PNL and incurred 37 percent of the PNL collective dose. The Facilities and Operations Directorate, formally including the Technical Services and Laboratory Safety Departments, received 34 percent of the PNL total. This Facilities and Operations dose resulted from support of the research and facility operations, maintenance and routine activities of the radiological control technicians in support of the hot-cell clean-out activities in the 324 and 325 Buildings. The Materials and Chemical Sciences Center, which includes Chemical Technology Department, the Chemical Sciences Department, and the Materials Sciences Department, received 12 percent of the total. The majority of this dose was incurred by staff who worked in the 324, 325, and 327 Buildings.

Observing the organizations trends of collective dose totals over the years indicates that the collective dose relates directly to the number of projects involving work with radioactive materials. A qualitative analysis of the 1994 overall collective dose totals for PNL has shown typical or expected values when compared with the recent years' totals (after 1986).

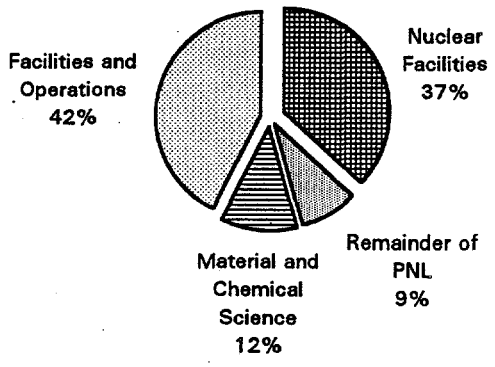

Figure 4. Distribution of Dose Among High-Dose Organizations, 1994

2.3 Skin and Personal-Clothing Contamination

In CY 1994, PNL staff had a total of 35 cases of skin and personal-clothing contaminations. These skin and personal-clothing contaminations are derived from 26 separate occurrences. Figure 5 shows the historical trend of yearly skin and personal-clothing contaminations for the period 1993 and 1994. PNL started tracking personal-clothing contaminations in 1993.

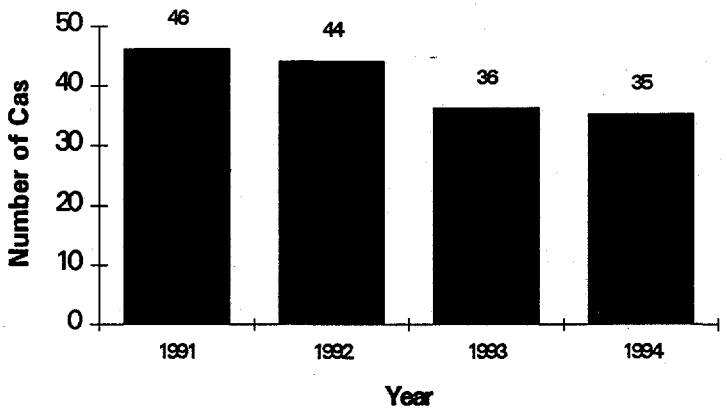

Figure 5. Annual Incidence of Skin and Personal-Clothing Contaminations 1991 and 1994

An analysis of the available data indicates that the rate of the skin contaminations, as well as number of the personal-clothing contaminations, dropped slightly in 1994 as compared to 1993. The root cause for most of the contaminations was not clearly identified or the source of the contamination was unknown. Several contaminations were caused by management problems, such as inadequate administrative controls and policies not adequately defined. There were also several procedure-related problems, such as defective, inadequate, or a lack of procedures. Personnel errors, such as inattention to detail, violations of requirements or procedures, and other human errors account for three of the contaminations. Two of the contaminations were due to inadequate or defective design. The number of entries into Radiologically Controlled Areas in all years was approximately 500,000.

Figure 6 provides a breakdown of skin and personal-clothing contamination cases by facility since 1993. Eighteen of the 1994 cases occurred in the 324 Building; twelve occurred in the 325 Building; two occurred in the 327 Building; and three in other facilities.

2.4 Control of Contaminated Areas

In CY 1994 PNL facilities contained 12 Airborne Radioactivity Areas 60 Contamination Areas and High Contamination Areas. The area of the Airborne Radioactivity Areas is 383 m^2 (4125 ft^2); the area of the Contamination Areas is 5290 m^2 (56,947 ft^2); the area of the High Contamination Areas is 266 m^2 (2863 ft^2). Figures 7 and 8 provide a breakdown of the above two categories by PNL 324, 325, 327, and other facilities. PNL is in the process of developing a baseline of these performance indicators in order to better evaluate performance trends.

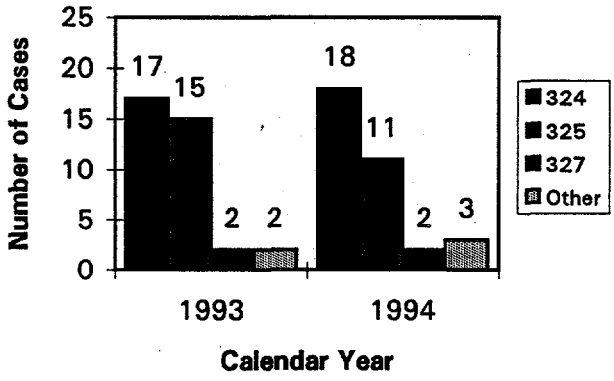

Figure 6. Annual Totals of Skin and Personal-Clothing Contamination Cases by Year and Facility

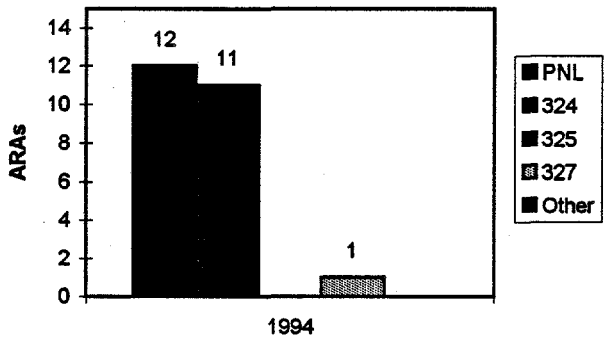

Figure 7. Total Number of Airborne Radioactivity Areas

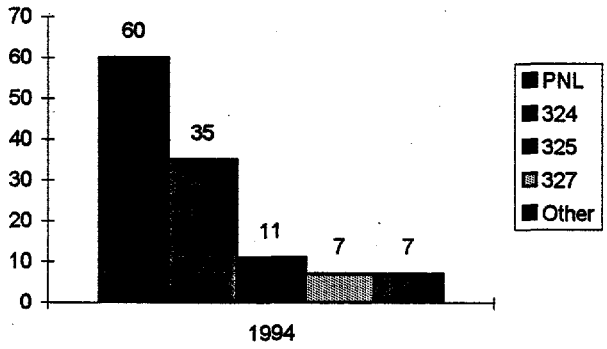

Figure 8. Number of Contamination and High Contamination Areas

2.5 Minimization of Radioactive Waste

In CY 1994, PNL disposed of 371 ft^3 of compacted low level waste. Also disposed of was 423 m^3 (14,949 ft^3) of noncompacted low level and mixed waste that was not subject to volume reduction. The total radioactivity of the disposed waste is 1217 Ci. Figures 9, 10, and 11 provide a breakdown of the above three categories of radioactive releases. PNL is in the process of developing a baseline of these performance indicators in order to better evaluate performance trends.

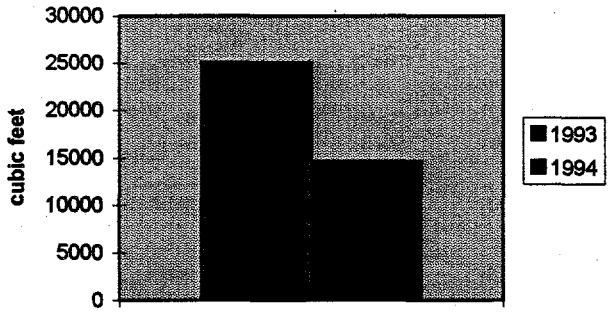

Figure 9. Volume of Radioactive Waste in Cubic Feet

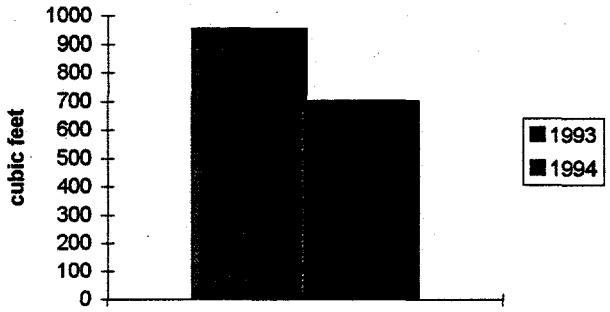

Figure 10. Volume of Radioactive Waste Not Subject to Volume Reduction in Cubic Feet

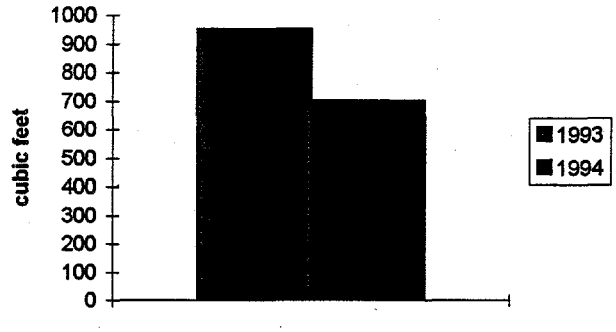

Figure 11. Total Activity of Radioactive Waste

2.6 Control of Radioactive Releases

In CY 1994, PNL facilities released 165.2 Ci of noble gas releases, 3.0E-5 Ci of airborne particulate radioactive releases, and 12.2 Ci of tritium releases to the environment. Figures 12, 13, and 14 provides a breakdown of the above three categories of radioactive releases by PNL 324, 325, 327, and other facilities. PNL is in the process of developing a baseline of these performance indicators in order to better evaluate performance trends.

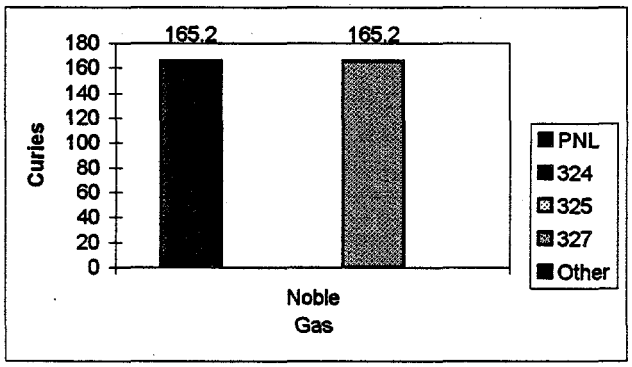

Figure 12. Noble Gas Releases

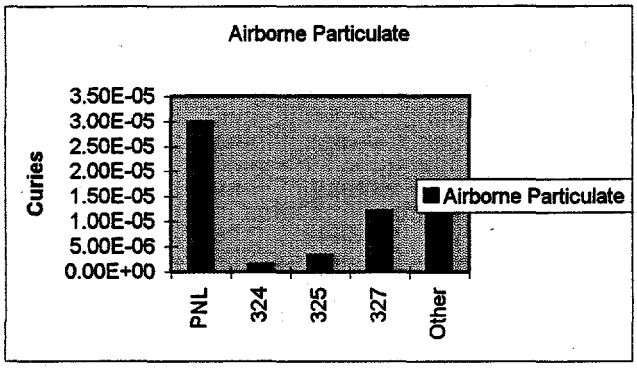

Figure 13. Airborne Particulate Releases

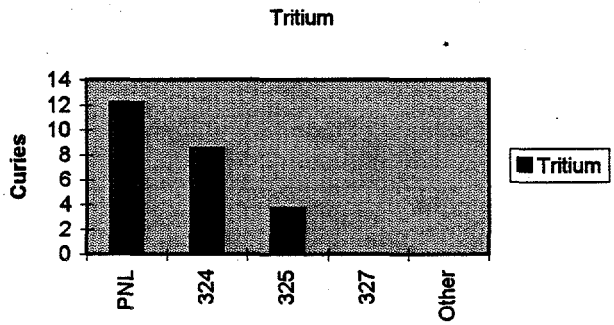

Figure 14. Tritium Releases

3.0 References

U.S. Department of Energy (DOE). 1993. 10 CFR Part 835, "*Occupational Radiation Protection.*"

U.S. Department of Energy (DOE). 1992. *Radiation Protection for Occupational Workers.* DOE Order 5480.11, Washington, D.C.

U.S. Department of Energy (DOE). 1988. *Health Physics Manual of Good Practices for Reducing Radiation Exposure to Levels that are As Low As Reasonably Achievable (ALARA).* PNL-6577, Pacific Northwest Laboratory, Richland, Washington.

U.S. Department of Energy (DOE). 1990. *Radiological Control Manual.* DOE N 5480.6, Washington, D.C.

PNL-MA-26, *PNL Radiological Control Implementing Procedures.* RCP 1.3.01, *Radiological Goals and Reports.*

Appendix A

Status of CY 1994 Facility ALARA Goals

The majority of the CY 1994 Facility ALARA goals were completed although there was a significant number that were not. Seven goals were completed three goals were not. The primary reason for goals not completed is due to the time required for action on engineering requests and design of new systems.

This appendix examines the goals individually, providing the goal number and a statement of the goal. The statement of the goal will be followed by a summary of final progress. The goals are numbered according to the organization responsible for the goal, the building where the work is being done and a sequential number.

Goal Number	Goal Summary and Status
306 Building	
MCSC-306W-94-1	Improve contamination detection capabilities upon exiting from the depleted uranium processing and machining areas through the installation of the intermediate personal survey and clothing change area at or near this work location. This goal will reduce the area of contamination areas by 9.3 m2 (100 ft2) and reduce the machining operations related personnel contamination incidents. Status: Complete. The new change area was completed and activated.
MCSC-306W-94-2	Return of 10,000 kg of depleted uranium to an Army sponsor. This action will allow the 306W Building to become a non-nuclear facility. It will also reduce radiation readings in the building. This goal will reduce the radiation reading on the north wall from 4 mR/h to 2 mR/h. Status: Complete. Shipment of depleted uranium was accomplished.
325 Building	
MCSC-325-94-1	Review Analytical Chemistry Laboratory (radioactive) sample storage locations to eliminate samples that are no longer required, and to consolidate the number of storage areas in ACL space. This goal is expected to reduce radioactive storage locations by one-third and collective dose by 10 percent. Status: Complete. It has been determined that the Centralized Sample Receiving and Preparation Laboratory will provide direct analytical support to the Inorganic and Radiochemistry Group. The majority of incoming samples will be stored in the new lab complex. This centralized operation will help to ensure that the residence time of radioactive samples is kept to a minimum.

Goal Number	Goal Summary and Status
MCSC-325-94-2	Remove and replace HEPA filter on glovebox 38-A, Glovebox Lab (Rm 604). This goal will reduce the whole body dose rate to personnel working at the glovebox. Status: Complete.
324 Building	
ETC-324-94-1	High dose rate waste containers will be shielded using concrete barrier blocks. The containers will be stored in a portion of the waste storage enclosure that was constructed in FY 1993. This goal is expected to reduce staff collective dose by approximately 60 person-mrem/y. Status: Complete
ETC-324-94-2	A waste compactor will be installed in the REC Airlock. It is currently planned to compact all Airlock wastes, such as those generated from cask handling or decontamination operations, into 30-gallon capacity drums. These drums will then be removed from the Airlock into 55-gallon capacity shielded drums. This goal is expected to reduce the collective dose to waste handlers approximately 1 person-rem/y. Status: Not Complete. This goal is behind schedule due to complications involving approval of the Engineering Request (ER) to provide access through the airlock wall for the compactor control wiring. The ER was not approved by the end of the calendar year.
ETC-324-94-3	A new track and dollie system will be designed and fabricated to replace the current system. This goal will result in a collective dose reduction for HCO staff approximately 1.2 person-rem/y. Status: Not Complete. Design of the system has been completed. Best and final offers have been solicited.
ETC-324-94-4	Modify the pendant control on the CHA 30/5-ton overhead bridge crane from a fixed position to a non-fixed (festooned) type. This goal will reduce collective PNL dose by approximately 250 person-mrem/y. Status: Not Complete. The engineering request for this goals completion was submitted in the first quarter.

Goal Number	Goal Summary and Status
ETC-324-94-5	Fabricate and install new step plugs to replace existing contaminated plugs. This goal is expected to reduce contamination incidents in the gallery from an average of 1.5 times per year to 0 times per year. Status: Not Complete. New step plugs have been fabricated and delivered to the building. Installation of the new plugs is planned for Spring 1995, after the B-Cell waste removal campaign is completed. This will minimize penetration dose rates while using the step plugs.
327 Building	
ETC-327-94-1	Reduce the easily dispersable contamination and radiation readings at transfer and equipment ports at F cell. Achievement of this goal will be assessed by performing radiation readings at the transfer and equipment ports prior to material transfers (>5 rem/hr). The expected reduction is from the present >5 rem/hr to < 1 rem/hr. Status: Complete. A great deal of clean up, clean out and decontamination of F cell especially around the access ports and slide plugs, has been accomplished. Dose rates vary at the surface of the plugs depending on location of the fuel samples that we are currently investigating. A survey of the slide block opening with dose rates reveals less than 1 R/hr.
ETC-327-94-2	Reduce the radiation dose rate readings on the top of I cell by evaluating and moving the spent fuel stored in the cell and removing that which is not currently needed to support the on-going spent fuel study. The expected reduction during transfers through the port is from the present >2 rem/hr to < 200 mrem/hr. Status: Complete. A Review of the fuel inventory and storage containers for the fuel for transfer to longer term storage locations has been completed and the fuel has been transferred to storage.

Appendix B

Facility ALARA Goals for CY 1995

Each PNL nuclear facility has developed and submitted the following radiological ALARA goals and associated performance indicators.

324-95-1	A waste compactor will be installed in the REC Airlock. It is currently planned to compact all Airlock wastes, such as those generated from cask handling or decontamination operations, into 30-gallon-capacity drums. These drums will then be removed from the Airlock into 55-gallon-capacity shielded drums. This goal has been carried over from last year. Performance Indicator: This goal is expected to reduce the collective dose to waste handlers approximately 1 rem/y.
324-95-2	A new track and dollie system will be designed and fabricated to replace the current system. This goal has been carried over from last year. Performance Indicator: This goal will result in a collective exposure reduction for HCO staff approximately 1.2 rem/y.
324-95-3	Portions of the REC galleries, all of the SMF galleries, offices, and basement rooms will be decontaminated as practical and reposted as Radiological Buffer Areas. Performance Indicator: Completion of this goal will result in the reduction of contamination areas in the 324 Building by approximately 4000 ft^2. Completion of this goal will also result in a reduction of the probability for skin and personal-clothing contamination events, as well as the minimization of the volume of waste by reducing the amount of protective clothing used in the facility.
325-95-1	The Potential for an Airborne Radioactivity Area being created in Room 603 will be reduced by decontaminating areas where elevated contamination levels have been detected in wire and piping runs which created a restricted access area. Performance Indicator: This goal will result in the reduction of restricted access areas in the 325 Building by 400 ft^2.

325-95-1

The 325 Building will improve contamination control by detailed work planning, enhancing procedures for working in Contamination Areas, reduction of contamination levels in Contamination Areas, and reducing the size of and eliminating Contamination Areas.

Performance Indicator: This goal will result in less than 10 skin and personal-clothing contamination incidents in 1995.

327-95-1

The 327 Building access area to the hot cell canyon will be remodeled to make possible the decontamination and deposting of three offices and a hallway located in a contamination area.

Performance Indicator: Completion of this goal will result in the reduction of contamination areas by over 700 ft^2. Completion of this goal will also result in a reduction of the probability for skin and personal-clothing-contamination incidents, as well as the minimization of the volume of waste by reducing the amount of protective clothing used in the facility.

327-95-2

The 327 Building ventilation equipment room number 3A will be decontaminated.

Performance Indicator: Completion of this goal will result in the reduction of contamination areas by over 60 ft^2. Completion of this goal will also result in a reduction of the probability for skin and personal-clothing-contamination incidents, as well as the minimization of the volume of waste by reducing the amount of protective clothing used in the facility.

327-95-3

The 327 Building ventilation duct work above the facility exhaust fans number 1 and 2 located in the basement equipment room will be decontaminated.

Performance Indicator: Completion of this goal will result in the reduction of contamination areas by over 250 ft^2. Completion of this goal will also result in a reduction of the probability for skin and personal-clothing contamination incidents, as well as the minimization of the volume of waste by reducing the amount of protective clothing used in the facility.

Appendix C

Proposed Performance Indicator Goals for CY 1995 and Proposed Weighting System

This appendix is a spreadsheet that shows each performance indicator listed in Table 1-1 of the DOE Radiological Control Manual. This spreadsheet shows at a glance all performance indicators, the PNL goals related to the performance indicator, and their proposed weighting. The purpose of the weighting is to ensure that PNL's actual performance is viewed and analyzed on a broad spectrum of the indicators rather than one or two select indicators. Basically the system is to apply a weighting factor to each relevant performance indicator. PNL is currently evaluating this revised performance indicator weighting system with the goal to integrate it into PNL's overall appraisal plan. The spreadsheet includes that following data:

PERFORMANCE INDICATORS, DOE Rad Con Manual, Table 1-1

USE, indicates whether the specific indicator is meaningful for PNL to use for weighting

GOAL, the actual PNL goal for the specific indicator

WEIGHT, the weighting factor for the goal (the entire column should equal 1)

ACTUAL 199X, PNL's actual performance for the specific indicator

WEIGHTING CREDIT, calculates weight awarded for actual performance

PERFORMANCE IS XX OF TOTAL, converts the sum of the weighting credit to a percentage of the (.75 would result in 75 percent of maximum performance possible).

PNL Goals, Performance Indicators and Proposed Weighting System 1995

Performance is 100%

Performance Indicators:

	PBI Performance Indicators	Use?	*Goal*	*Weight*	*Actual 1995*	*Weighting Credit*
1	Collective dose in person-rem	Y	70	0.1	0	0.1
2	Unplanned Exposures greater than Administrative Control Level (reportable events)	Y	4	0.2	0	0.2
3	Number of skin and personal clothing contaminations (reportable events)	Y	33	0.2	0	0.2
4	New Confirmed Unplanned Depositions (reportable events)	Y	2	0.1	0	0.1
5	Number of airborne radioactivity events (reportable events)	Y	2	0.1	0	0.1
6	Net Change (reduction) in areas Posted and Controlled as CAs, HCAs and ARAs (> cubic feet)	Y	300	0.1	300	0.1
7	Uncontrolled Release of Radioactive Material (reportable events)	Y	2	0.2	0	0.2
	Non-PBI Performance Indicators					
1	Average Worker Dose (rem)	N	0.25	N/A	0	N/A
2	Maximum Dose to a Worker (rem)	N	1.5	N/A	0	N/A
3	Maximum Neutron Dose to a worker (rem)	N	0.5	N/A	0	N/A
			Total >	1	Total >	1
					Score >	1

Appendix D

Skin and Personal-Clothing Contamination Cases in CY 1994

There were 34 cases of skin and personal-clothing contamination incidents of PNL staff at the Hanford Site in 1994. Of these 34 cases, 18 were in the 324 Building; 11 were in the 325 Building; two were in the 327 Building; one was in the RTL Building; one in the 3708 Building; one was in the 326 Building. The table below lists the skin contaminations in chronological order, including the building where the contamination occurred and a brief description of the event. An occurrence classifier determined the severity and cause of the event according to the guidance given by DOE Order 5000.3A. The occurrence classifiers determined that all skin contaminations in CY 1992 fit the category of "Off-Normal Occurrence." The Off-Normal Occurrence reports describe all skin contaminations in more detail and can be found in the Occurrence Reporting and Processing System (ORPS) database using the occurrence number listed (note: all occurrence numbers have the prefix RL-PNL).

In addition to the 14 skin contamination events, there were 20 events involving personal effects contamination listed.

Date	Occurrence number	Building	Details
1/4/94	325-1994-0001	325	KEH: Personal-effects contamination of shoe of KEH pipefitter after work on hot cell clean-out.
1/4/94	325-1994-0002	325	PNL: Personal-effects contamination on left pant leg of a PNL staff member after moving equipment from the hot-cell area to another room. Protective clothing was worn. Contamination probably occurred during careless undress.
1/13/94	325-1994-0003	325	KEH: Personal-effects contamination of sheetmetal worker's shoe. Found to be contaminated upon exit survey after decontamination work within a High Contamination Area.
2/8/94	324-1994-0002	324	KEH: Personal-effects contamination of laborer's shoe. Source unknown.
2/14/94	325-1994-0004	325	PNL: Personnel skin contamination in Room 146. Source unknown but believed to have occurred from contact with a swinging lid of the disposal bin for the protective clothing.
2/23/94	PNLBOPER-1994-0009	3708	PNL: Personnel skin contamination of radiological worker in 3708 Building. Gloves inadequately taped to lab coat, and careless undress caused contamination.

3/4/94	PNLBOPER-1994-0013	326	KEH: Personal-effects shoe contamination of KEH laborer. Contamination found when surveying out after working in radiation zone in basement.
3/15/94	324-1994-0005	324	PNL: Personnel skin contamination found when exiting controlled area near threshold of the B-Cell airlock door.
3/25/94	324-1994-0006	324	PNL: Personal-effects shoe contamination. Staff became contaminated after performing liquid decontamination in the radiation engineering cells airlock. Left shoe sole near heel found with contamination.
3/30/94	325-1994-0007	325	PNL: Personnel skin contamination found when exiting Room 201 of 325 Building. Contamination was found on left palm, between thumb and index finger. Source was a jack stand on a manipulator cart.
4/6/94	325-1994-0008	325	PNL: Personnel skin contamination in Room 604 of 325 Building. Contamination occurred during changing of HEPA filter. Millwright received contamination to right side of chest. Removed using soap and water.
4/13/94	324-1994-0010	324	PNL: Personnel skin contamination in 324 Building. After performing liquid decontamination, radiation worker was found to have contamination in his hair. Individual was wearing proper protective clothing.
4/14/94	325-1994-0009	325	PNL: Personnel-effects contamination in Room 409 of the 325 Building. Radiological worker was working in a hooded enclosure. Discovered contamination on his gloves. After removing gloves, discovered contamination on hands.
4/14/94	325-1994-0010	325	KEH: Personal-effects contamination discovered on laborer's boot when exiting basement after checking progress of workers.
4/15/94	PNLBOPEM-1994-0002	327	PNL: Personnel skin contamination in the changeroom of the 327 Building. Technician had been working at one of the hot cells in a Radiological Area.
4/19/94	325-1994-0011	325	PNL: Personal-effects contamination of personal clothing. An RCT was working in a "greenhouse" and upon exiting discovered contamination on shirt tail. Was wearing required protective clothing.
4/20/94	325-1994-0012	325	PNL: Personal-effects contamination of clothing resulting from a spill of radioactive liquid which occurred while flushing lines in Room 603. About one quart of contaminated liquid spilled on floor. Workers pant leg was contaminated.
5/27/94	PNLBOPEM-1994-0005	327	PNL: Personnel-effects contamination of clothing; worker detected speck after putting on coveralls. Residual contamination from protective clothing received from laundry believed to be cause.

6/9/94	324-1994-0013	324	VISITOR: A visitors personal clothing was found contaminated on entry to 324 Building. Visitor had not entered any radiological areas; source was outside 324 Building. Discovered by PCM.
7/27/94	324-1994-0016	324	PNL: Six personnel skin contaminations reported on one occurrence: 1) A radiological worker was found to have a speck of contamination on the back of his head. 2) A radiological worker was found to have a speck of contamination on the head above the forehead and right forearm above the wrist. 3) A radiological worker was found to be contaminated on the back of the head in the hair above the neck. 4) A radiological worker who had not been inside the airlock was found to be contaminated on his hair above the forehead. 5) A radiological worker who had been inside the airlock was found to be contaminated on his hair at the back of his head. 6) A radiological worker who had been inside the airlock was found to be contaminated on his right temple area, left temple area, and left ear.
9/8/94	324-1994-0020	324	PNL: Five personal effects contaminations reported on one occurrence: 1) Contamination found on laborer's clothing after leaving Contamination Area (Room 147) for lunch break. Had been moving scaffolding in Room 147 prior to exiting. 2) Contamination found on workers T-shirt during a routine exit survey on a PCM. The radiological worker had been observing work in the cask-handling area and Room 147. 3) Contamination found on the heel of the radiological worker's shoe during a routine survey exit on a PCM. 4) Contamination was detected on a radiological worker's blue coveralls shoe during a routine survey exit on a PCM. 5) Contamination was detected on the left heel of the workers shoe during a routine survey exit on a PCM.
9/23/94	PNLBOPER-1994-0049	RTL	PNL: Personnel skin contamination on the tip of the left index finger of a radiological worker was discovered during exit survey. Believed to have occurred when the staff member removed his glove.
10/26/9	324-1994-0027	324	PNL: Personal-effects contamination on clothing that was detected during an exit survey from radiochemical engineering cell cask-handling area.

11/11/9	325-1994-0025	325	PNL: Personal-effects contamination of clothing. Upon exiting a Radiological Buffer Area, a radiological worker was found to have a speck of contamination on the front of his undershirt.
11/28/9	324-1994-0030	324	PNL: Personal-effects contamination on T-shirt chest discovered during a routine exit survey on a PCM. Believed to be the result of laundry as no removable contamination was found in the area.

Appendix E

Summary of Administrative Control Level Changes

Title 10, Code of Federal Regulations, Part 835/B2, Implementation Guide for Use With 10 CFR 835, "Occupational ALARA Program" suggests that "this annual ALARA report should include the number of individuals exceeding administrative control levels and a summary of the justification for the approval to exceed these levels." The table below provides a synopsis of the 77 authorizations to increase administrative dose-control levels issued in 1994 and the justifications.

Category mrem Number approved	Justification
$500 \leq X < 750$	
16	Support B-Cell clean-out, 324 Building
8	Crafts Specialized Work , 324 Building
6	RCT Support, 324 Building
4	Limited Personnel to Perform Certain Work
2	B-Cell Crane repair, 324 Building
2	RCT Support, 327 Building
1	K-West Basin, N Reactor, Fuel Characterization
1	Repair C-Cell Window, 325A HLRF, 325 Building
$750 \leq X < 1000$	
13	Support B-Cell clean-out, 324 Building
6	B-Cell Crane repair, 324 Building
2	MK 42 Target Shipments, D-Cell Operations, 324 Building
1	Specialized Work, 324 Building
1	TRIGA Test Train Failure Evaluation, T3 Cask Handling
$1000 \leq X < 1500$	
14	Support B-Cell clean-out, 324 Building

Appendix F

ALARA Program Goals for Calendar Year 1995

Goal Number	Goal
APG-95-001	Develop, and Implement a Radiological Work Planning Procedure that will outline a process for development and review of work procedures that contain good ALARA practices.
APG-95-002	Develop and Implement a Radiological Design Review Procedure that will outline a process for development and review of facility design and facility modification that contain good ALARA practices.
APG-95-003	Increase Radiological Engineering Staff to ensure that facilities have ample support in preparation of TWDs and work processes to ensure ALARA principles are incorporated into radiologial work activities.
APG-95-004	Develop and implement a Radiological Engineering training program to ensure that the Engineers responsible for supporting the facilities are fully aware of Current Radiological Control practices and ALARA principles.
APG-95-005	Implement 2 major initiatives that will serve to reduce Radiation Areas and Contamination Areas and increase general ALARA awareness in the facilities. This goal will also help centers in developing meaningful goals in these areas next year.
APG-95-006	ALARA Suggestion Boxes will be installed in each relevant facility to gather ideas that could be used to reduce radiation exposures.
APG-95-007	Assume Responsibility for, Upgrade and Enhance Performance Indicator Report

Appendix G

PNL Radiological ALARA Performance Indicators Data 1994

	ALL PNL: Exposure Control	
a.	Collective dose (person-rem)	54.72
b.	Average worker dose. All / those with measurable dose(mrem)	11.7
c.	Maximum dose to a worker (mrem)	1110
d.	Number of unplanned exposures resulting in doses greater than the administrative control level.	1
e.	Number of dose assessments for lost or damaged dosimeters	193
f.	Maximum neutron dose to a worker (mrem).	140
	Personnel Contamination	
a.	Number of skin / personal-clothing contaminations	35
b.	Number of contaminated wounds	0
c.	Number of facial contaminations	0
	Control of Internal Exposure	
a.	Number of positive bioassays	1
b.	Number of airborne events	0
c.	Number of alarms on airborne monitors (actual / false)	0
d.	Number of Airborne Radioactivity Areas	12
e.	Area of Airborne Radioactivity Areas in ft^2	4125
	Control of Contaminated Areas	
a.	Number of Contamination and High Contamination Areas	60
b.	Area of Contamination Areas in ft^2	56,947
c.	Area of High Contamination Areas in ft^2	2863
d.	Number of spills	0
	Minimization of Radioactive Waste	
a.	Volume of radioactive waste in ft^3	19930.1
b.	Number of ft^3 not subject to volume reduction.	242
c.	Activity of radioactive waste in curies	1044.47

Control of Radioactive Discharges

a.	Activity of noble gas discharges in curies	165.2
b.	Activity of airborne particulate radioactive discharges in curies	3.0E-5
c.	Activity of airborne tritium discharges in curies	12.2

324 BUILDING

Personnel Contamination

a.	Number of skin/personal-clothing contaminations	10 / 10
b.	Number of contaminated wounds	0
c.	Number of facial contaminations	0

Control of Internal Exposure

a.	Number of positive bioassays	0
b.	Number of airborne events	0
c.	Number of alarms on airborne monitors (actual/false)	0 / 0
d.	Number of Airborne Radioactivity Areas	11
e.	Area of Airborne Radioactivity Areas in ft^2	4035

Control of Contaminated Areas

a.	Number of Contamination and High Contamination Areas	35
b.	Area of Contamination Areas in ft^2	21,318
c.	Area of High Contamination Areas in ft^2	2773
d.	Number of spills	0

Minimization of Radioactive Waste

a.	Volume of radioactive waste in ft^3	4996.5
b.	Number of ft^3 not subject to volume reduction	*
c.	Activity of radioactive waste in curies	1014.81

Control of Radioactive Discharges

a.	Activity of noble gas discharges in curies	0
b.	Activity of airborne particulate radioactive discharges in curies	1.6E-6
c.	Activity of airborne tritium discharges in curies	6.7

325 BUILDING

Personnel Contamination

a.	Number of skin/personal-clothing contaminations	3 / 7
b.	Number of contaminated wounds	0
c.	Number of facial contaminations	0

Control of Internal Exposure

a.	Number of positive bioassays	0
b.	Number of airborne events	0
c.	Number of alarms on airborne monitors (actual/false)	0 / 0
d.	Number of Airborne Radioactivity Areas	0
e.	Area of Airborne Radioactivity Areas in ft^2	0

Control of Contaminated Areas

a.	Number of Contamination and High Contamination Areas	11
b.	Area of Contamination Areas in ft^2	11,533
c.	Area of High Contamination Areas in ft^2	0
d.	Number of spills	0

Minimization of Radioactive Waste

a.	Volume of radioactive waste in ft^3	4431
b.	Number of ft^3 not subject to volume reduction	*
c.	Activity of radioactive waste in curies	18

Control of Radioactive Discharges

a.	Activity of noble gas discharges in curies	0
b.	Activity of airborne particulate radioactive discharges in curies	3.3E-6
c.	Activity of airborne tritium discharges in curies	3

327 BUILDING

Personnel Contamination

a.	Number of skin and personal-clothing contaminations	1 / 1
b.	Number of contaminated wounds	0
c.	Number of facial contaminations	0

Control of Internal Exposure

a.	Number of positive bioassays	0
b.	Number of airborne events	0
c.	Number of alarms on airborne monitors (actual/false)	0 / 0
d.	Number of Airborne Radioactivity Areas	1
e.	Area of Airborne Radioactivity Areas in ft^2	90

Control of Contaminated Areas

a.	Number of Contamination and High Contamination Areas	7
b.	Area of Contamination Areas in ft^2	16,524
c.	Area of High Contamination Areas in ft^2	90
d.	Number of spills	0

Minimization of Radioactive Waste

a.	Volume of radioactive waste in ft^3	734.5
b.	Number of ft^3 not subject to volume reduction	*
c.	Activity of radioactive waste in curies	6.26

Control of Radioactive Discharges

a.	Activity of noble gas discharges in curies	165.2
b.	Activity of airborne particulate radioactive discharges in curies	1.2E-5
c.	Activity of airborne tritium discharges in curies	0

OTHER PNL

Personnel Contamination

a.	Number of skin and personal-clothing contaminations	2 / 1
b.	Number of contaminated wounds	0
c.	Number of facial contaminations	0

Control of Internal Exposure

a.	Number of positive bioassays	0
b.	Number of airborne events	0
c.	Number of alarms on airborne monitors (actual/false)	0 / 0
d.	Number of Airborne Radioactivity Areas	0
e.	Area of Airborne Radioactivity Areas in ft^2	0

Control of Contaminated Areas

a.	Number of Contamination and High Contamination Areas	7
b.	Area of Contamination Areas in ft^2	7572
c.	Area of High Contamination Areas in ft^2	0
d.	Number of spills	0

Minimization of Radioactive Waste

a.	Volume of radioactive waste in ft^3	9768.2
b.	Number of ft^3 not subject to volume reduction	*
c.	Activity of radioactive waste in curies	5.11

Control of Radioactive Discharges

a.	Activity of noble gas discharges in curies	0
b.	Activity of airborne particulate radioactive discharges in curies	1.3E-5
c.	Activity of airborne tritium discharges in curies	0

* Data not available by facility.

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