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Tritium Research Laboratory Cleanup and Transition Project Final Report

A. J. Johnson

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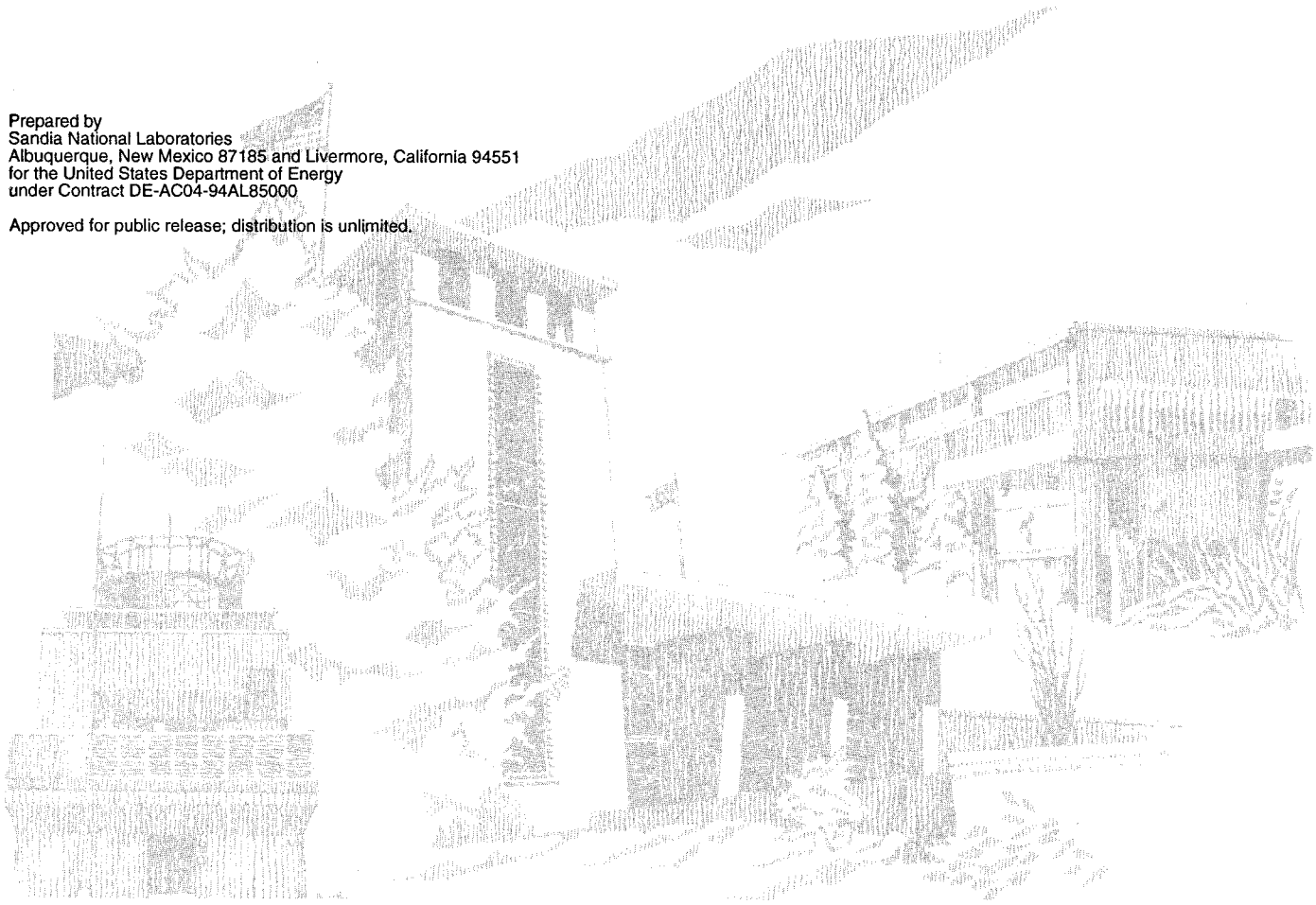

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Tritium Research Laboratory Cleanup and Transition Project Final Report

Alice J. Johnson
Sandia National Laboratories/California

ABSTRACT

This Tritium Research Laboratory Cleanup and Transition Project Final Report provides a high-level summary of this project's multidimensional accomplishments. Throughout this report references are provided for in-depth information concerning the various topical areas. Project related records also offer solutions to many of the technical and or administrative challenges that such a cleanup effort requires. These documents and the experience obtained during this effort are valuable resources to the DOE, which has more than 1200 other process contaminated facilities awaiting cleanup and reapplication or demolition.

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Tritium Resaearch Laboratory Cleanup and Transition Final Project Report

EXECUTIVE SUMMARY

The Tritium Research Laboratory located at Sandia National Laboratories' California site, has been converted to support other Sandia programs. The laboratory, built in 1977, was originally used for conducting experiments with multigram amounts of tritium, a radioactive isotope of hydrogen. During peak operation, the facility handled approximately 200 grams of tritium and was classified as a Category II non-reactor nuclear facility. After a joint decision by Sandia and Department of Energy (DOE) to stop operations, Sandia in cooperation with DOE selected an in-house cleanup (decontamination), equipment removal (decommission) and facility transition (reuse) option rather than a more traditional decontamination, demolition and disposal approach. The TRL has been completely decontaminated and surveyed for final radiological characterization. The cleanup and transition process and results were independently verified by DOE. The facility is now categorized as a general use analytical laboratory and was officially rededicated on October 10, 1996 as the Chemical and Radiation Detection Laboratory (CRDL). Nine of the 15 laboratories are occupied; work is underway to complete the remaining rooms.

Project Highlights

- Throughout the disassembling of the facility's protection and decontamination systems there was continual and substantial decreases in personnel exposures and releases to the environment.
- Equipment with an estimated replacement value of more than $43 million was transferred to other DOE facilities for reuse. Approximately $25 million in disposal fees for more than 30 million pounds (approximately 10 million cubic feet) of low-level radioactive waste was avoided. The project realized an accelerated schedule of 18 months and $5 million savings from the original authorized Sandia plan. The total savings to DOE are estimated in excess of $100 million.
- Compared to traditional approaches used in the nuclear industry, the project was performed in half the time (four versus nine years).
- Cooperation among DOE, the Environmental Protection Agency (EPA), and other key regulatory stakeholders throughout the process facilitated numerous monitoring and release agreements including a model agreement for discontinuing post-operation monitoring.
- A DOE Verification Team reviewed the decontamination results and had no significant issues.
- A modern and high-quality laboratory facility is already in use.
- The TRL Cleanup and Transition Project was recognized with two unprecedented DOE/Albuquerque Operations' and Kirtland Area

Office Achievement Awards (1995 and 1996) and two Sandia President Quality awards (1993 and 1994).

- Documentation of the process and associated project records provide in-depth information concerning the facility's history from it's operations, through the cleanup and transition, to new use.

BACKGROUND

The former Tritium Research Laboratory (TRL), provided a state-of-the-art facility for conducting advanced research and development experiments with multigram amounts of tritium in support of DOE's Office of Defense Programs. Examples of the fundamental research conducted at the TRL include:

- physical and chemical research with tritium and its compounds;
- formulation and fabrication of specific compounds for use in engineering components; and
- the transport and structural properties effects of hydrogen isotopes and helium in metals.

Completed in 1977, the TRL (Building 968, Facility Drawing and description is provided in Appendix A) was the first major tritium facility to apply double containment systems to protect both individuals working in the facility and the environment. In addition to hermetically sealed glove boxes for conducting experiments and vessel storage, the facility operated a centralized, fully automated decontamination and recovery system. As a Category II, non-reactor nuclear facility, the operation of the TRL was highly regulated, environmentally monitored, and subject to significant oversight. The "open-door" operating expense of the facility cost $4 million in 1991. Because these costs were escalating and tritium research could be conducted elsewhere, the decision was made to end 17 years of operations as a nuclear materials site.

To shut-down the TRL, Sandia management in cooperation with DOE opted to pioneer an alternative to the traditional Decontamination, Decommissioning, and Disposal (DD&D) process. The negotiated requirements were to: 1) reduce accountable tritium inventory to zero, and 2) remove all contaminated equipment from the building. These requirements had the following constraints:

a) continue to operate as a non-reactor nuclear facility;

b) do it safely within nuclear facility mandates; and

c) hold budget and schedule.

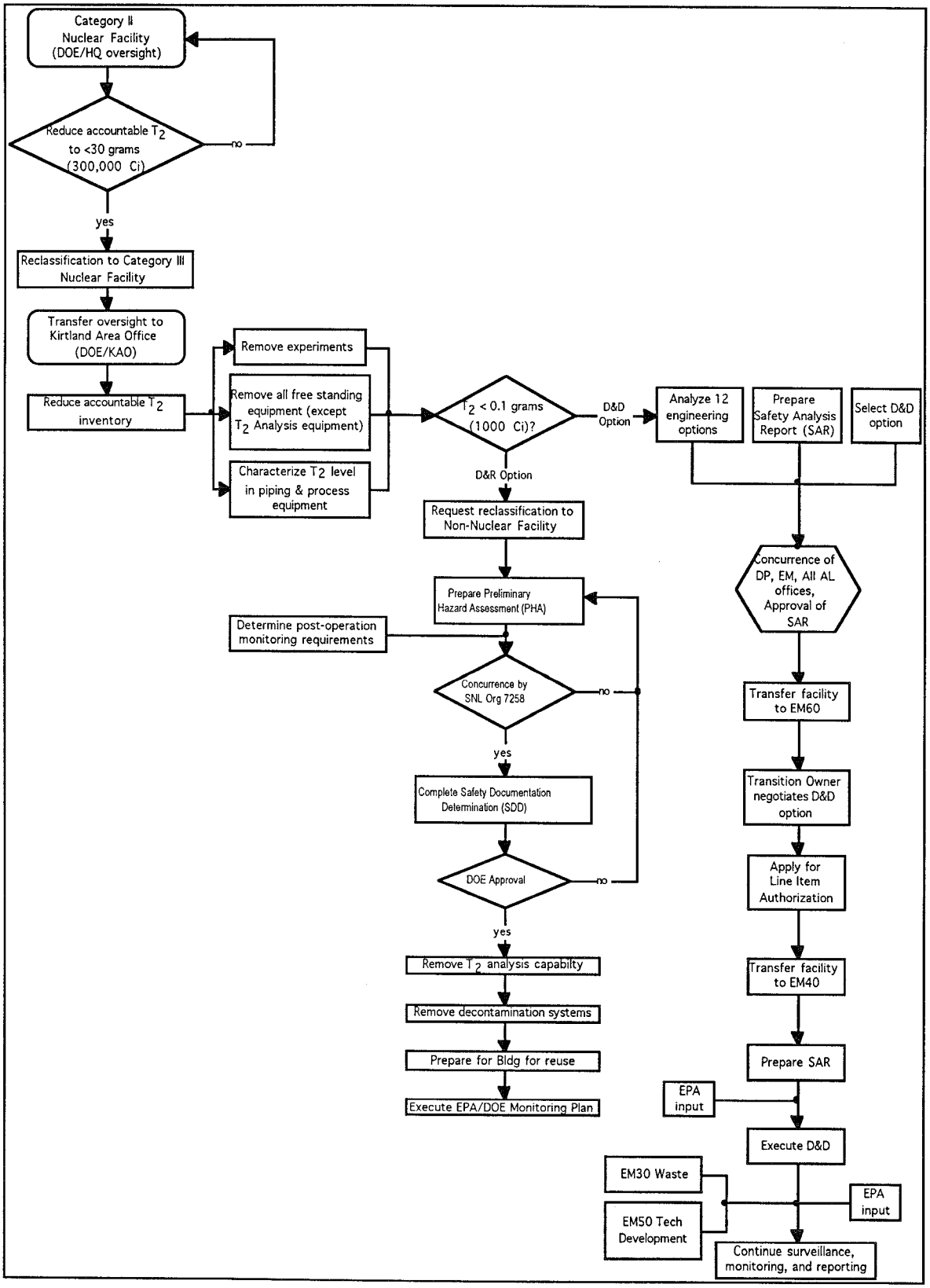

Figure 1. Flow Diagram of C/T *vs* Traditional DD&D Process

PROJECT MANAGMENT AND RECORDS

The primary customer of the project was the SNL/National Security Sector (formerly Defense Programs, DP). A commitment of support and an investment of $21 million dollars was made to cleanup and transition a facility whose mission was no longer viable (a liability) into a general use laboratory (an asset). The work was performed using the NSS project management structure. The project requirements and plans are documented the National Security Sector (NSS) *Project Data Documents* and in the *TRL Transition & Reutilization Plans* (SAND97-8008); execution of the work performed is described in several Sandia SAND Reports. These documents and associated project records[1] provide in-depth information concerning the facility's history from it's operations through the cleanup and transition to new use.

A variety of project management tools were used to implement, assess and continuously improve the process. Using process flow diagrams (example: Figure 1) and Quality Function Deployment (QFD), requirements were defined and used to map activities and tasks; gaps in coverage were identified and overlaps eliminated. Processes were refined by systematically evaluating requirements, developing ways to meet them, and assigning responsibilities. A software program was used to develop and maintain the project plans. Performance metrics included completing the project's milestones on schedule and within the budget. Additional metrics included:

- minimum tritium releases,
- minimum employee radiation doses,
- minimum reportable incidents, and
- maximum amount of equipment recycled.

These measures were tracked and communicated routinely at project review meetings. Additional management tools included: a formal charter, cross-training of staff, trend analysis of maintenance. Best practices were obtained from other DOE tritium facilities and used when appropriate. The process was continuously monitored and assessed by independent audits (Figure 2) for compliance with regulations.

[1] See Appendix C. for topical list. Questions and or interest concerning the TRL documentation records can be directed to SNL/CA ES&H Records Management Center.

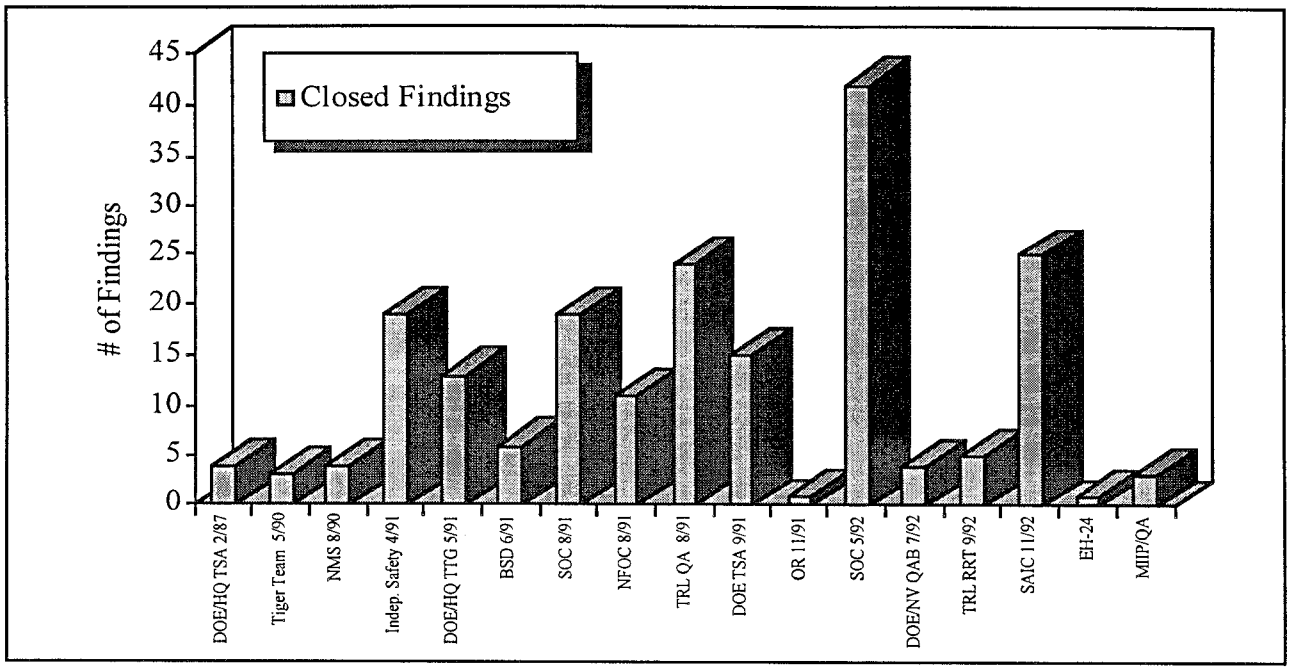

Figure 2. Audit Data

The TRL Department personnel supported the project planning and administration; with the assistance of Sandia environmental, facilities engineering and maintenance departments, the TRL operating staff also performed the job of decontaminating, disassembling, removal, and transfer or disposal of equipment.

Another cornerstone to the success of this project was identifying, involving, and establishing partnerships with other key customers and stakeholders (e.g., DOE, EPA, etc., refer to Table 1) in this pioneering approach. An example includes a model agreement with EPA that allowed for discontinuing post-operational monitoring and surveillance upon demonstrating the facility was no longer radiologically contaminated.

Table 1. Customer/Stakeholder Function Matrix

CUSTOMERS & STAKEHOLDERS	$$	Authority (Approval)	Accountability	Concurrence	Involvement	Interest
CA State Dept of Health Services				X		
CA State EPA Regulators		X		X		
CA State Oversight Group (Agreement in Principle)						X
City of Livermore Authorities (Livermore Water Reclamation Plant)		X		X		
DOE, Nevada Operation Office, Waste Management		X			X	
DOE/Kirtland Area Office		X	X	X	X	X
EPA, Region 9		X		X		
General Public						X
Local Activists						X
Other Tritium Facilities (LANL, LLNL, SRS, etc.)						X
Press						X
Regional Air Quality Board (BAAQMD)		X		X	X	X
SNL, National Security Sector (formerly DP Sector)	X		X	X	X	X
SNL, Risk Management Department				X	X	X
SNL, Strategic Investment	X				X	X
SNL/CA, ES&H, Environmental Dept (Reporting)				X	X	X
SNL/CA, ES&H, Environmental Dept (Waste Management)	X			X	X	X
SNL/CA, ES&H, Health Protection Dept (Radiological)			X	X	X	X
SNL/CA, Maintenance Dept					X	X
SNL/CA, Management		X	X		X	X
SNL/CA, New building occupants			X		X	X
SNL/CA, TRL Dept	X		X	X	X	X

Cost/Benefit

It is estimated that this Cleanup and Transition (C/T) project saved $106.4 million when compared with the traditional Decontamination, Decommission, and Disposal (DD&D) process. This total includes direct savings from cumulative project administrative expenses including the accelerated completion of the project (conservatively 18 months).

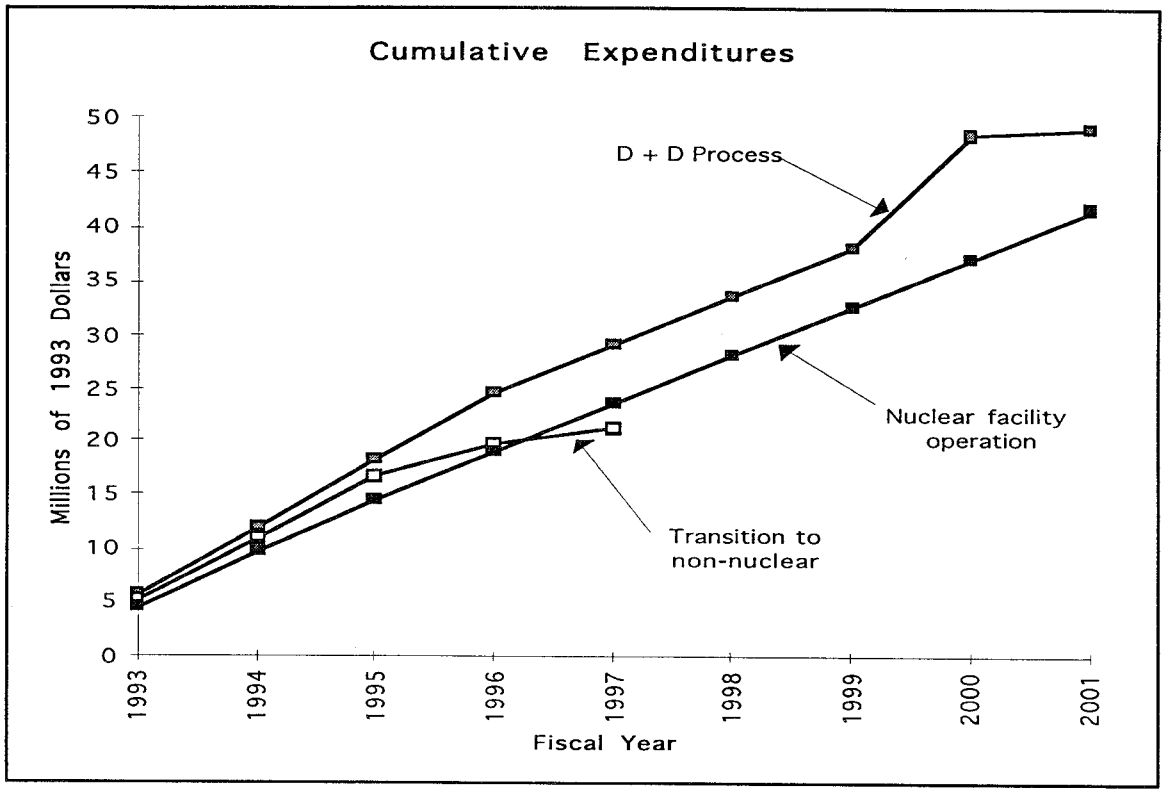

Figure 3. TRL Project Cumulative Expenditure Comparison

Based on a 1992 engineering analysis performed by TRL senior staff, the cumulative expense to perform the traditional DD&D process was $48,550,000[2] and required a minimum of nine years to execute (costs for continued monitoring of an empty radiological contaminated site are not included in this estimate). The cost to execute the C/T process total $21 million and the timeline for actually completing the C/T process was four years (required 56% less time to complete than the DD&D process). In the case of demolition as the selected DD&D option, the replacement of the core building is estimated at $5.2 million (using a construction cost of $325/sq. ft.); depending on priorities and Line Item Authorization approvals, an additional five to ten years would be needed to design and reconstruct the facility. Additional costs avoided include waste disposal costs from reclamation of excess equipment and the equipment replacement cost savings to other DOE facilities (Lawrence Livermore National Laboratory, Savannah River, Los Alamos National Laboratory, Sandia/New Mexico, and Sandia/California). The Table 2 provides a comparison summary for each process which includes estimated savings.

[2] Projected DD&D budget was established in FY92; this total has not been adjusted to include escalation in monitoring and regulatory compliance costs.

Table 2. Process Cost and Schedule Comparison and Saving Summary

Decontamination, Demolition, & Disposal Process Estimated Costs	Cleanup & Transition Process Actual Costs	Cleanup & Transition Process Early Completion Cost Savings	Estimated Savings
D&D $48,550,000 *labor, decontamination, demolition, administration etc.;* *9 years to complete*	C/T $20,880,000 *labor, decontamination, administration, etc.;* *4 years to complete*		$27,670,000
Building Replacement $5,200,000 *5 to 10 years to complete*	Building Replacement $0		$5,200,000
Replacement Value of Equipment $43,500,000	Replacement Value Equipment $0		$43,500,000
Avoided Waste Disposal Costs[3] $24,900,000	Avoided Waste Disposal Costs $0		$24,900,000
		Administration $5,000,000	$5,000,000
Total $122,150,000	Total $20,880,000	Total $5,000,000	Total $106,270,000

Along with cost savings to DOE, the C/T option resulted in non-monetary benefits, such as a zero tritium inventory, stack emission and personnel exposure reductions, a significant reduction of reportable occurrences, and avoidance of more than 30 million pounds of low-level waste. For $21 million (or 16% of the DD&D process costs), SNL/CA reutilized a potential liability and developed a viable cost effective process that could benefit similar facilities faced with DD&D or in transition.

[3] Disposal cost (per meter^3) from INEL-94/0205 Report, "Avoidable Waste Management Costs," January 1995.

RECLASSIFICATION PROCESS DESCRIPTION

Sandia's approach was to continue operating as a non-reactor nuclear facility while systematically reducing the accountable tritium inventory (Figure 4). Because the total tritium inventory, regardless of the number of individual containers, determines a facility's hazard/risk classification category[4], the importance of reducing the tritium inventory is that both risks and operational formality drop proportionally. The first category reclassification milestone was straightforward; when the accountable tritium fell below 30 grams, DOE authorized a reclassification to a Category III non-reactor nuclear facility and administrative oversight responsibility transferred from DOE/Headquarters to the DOE/Kirtland Area Office (KAO). Transition to a low risk facility with a radiological hazard was conceptually more difficult. A consequence of any facility's safety analysis report and operational safety requirements is that safety equipment must remain operational while classified as a Category III facility. The TRL systems, the vacuum effluent recovery systems, (VERS) and gas purification system (GPS) operated throughout the cleanup and final facility transition and by design, could generate "accountable" tritium when processing residuals. To be able to exercise the optional process to decontaminate and reuse the facility (as shown in Figure 1), we had to prove to the DOE that all accountable tritium <u>and</u> recoverable residuals were well below the 0.1 gram (1000 curies) level.

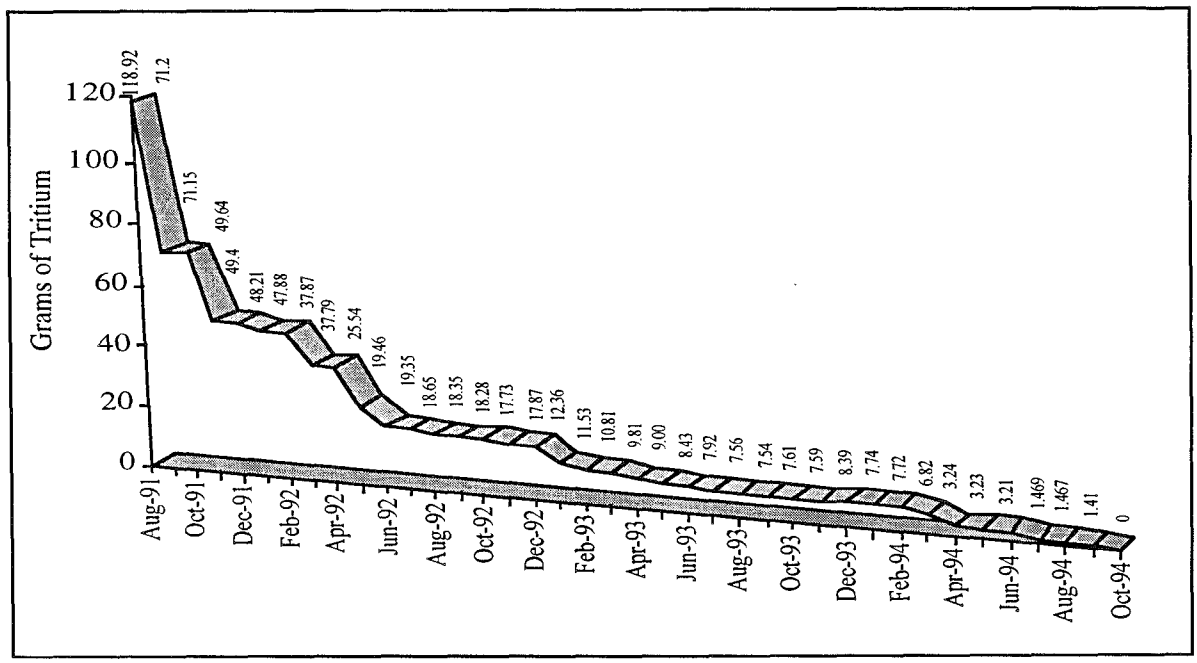

Figure 4. Tritium Inventory Reduction

[4] Per DOE-STD-1027, Category I is reserved for nuclear reactors, facilities with tritium inventories greater than 30 grams (300,000 curies) are classified as Category II non-reactor nuclear facilities, and facilities with inventories below 30 grams but greater than .1 gram (1000 curies) are considered Category III non-reactor nuclear facilities.

SNL Risk Assessment Department was assigned the responsibility to verify the tritium inventory reduction by conducting a physical audit of the facility's status (July 1994). An engineering analysis of the quantities of tritium that could be trapped in the remaining processing equipment together with extensive radiological surveys, determined that a maximum of 237 curies remained in the building systems. The analysis and results were subsequently presented for discussion and independent review by the DOE Tritium Focus Group Meeting, October 1994. The consensus of this DOE tritium facility operators group was that the analysis and calculations were conservative and thus recommended the shutdown and removal of the remaining equipment. During the final equipment removal, the single pass ventilation system remained operational and was the single route of tritium egress from the building. The cumulative unrecoverable tritium released to the environment from the remaining equipment as measured by the stack monitors was less than 100 curies. Following the final shipment of accountable tritium, the required safety documentation[5] was sent to DOE/KAO. In November 1994, DOE reclassified the TRL a non-nuclear low hazard facility.

DOE Reclassification Verification Review

DOE deemed it prudent to review the decontamination/reclassification results (September 1996). The verification activities included documentation review, a facility tour, and personnel interviews. The documentation review covered necessary records for documenting that decontamination was completed according to requirements. This included the facility and environment characterization method and results, and the qualifications of personnel conducting the characterization. The facility tour included physical descriptions of systems (either in place or removed), sample locations, analysis laboratory, and areas of residual contamination. Interviews with personnel covered health physics qualifications and details of decontamination documentation.

The validation was initiated to provide closure to a finding (RM-2) issued by DOE/HQ EH-24 and documented in their Routine Environmental Audit of March, 1994. The finding indicates that *"Given on-going activities at TRL, SNL/CA has not conducted radiological characterization which addresses DOE's potential liability related to future uses."* SNL addressed the finding by issuing a formal *Radiological Characterization Plan* for TRL (SAND95-8216/May 1995) and subsequent *Radiological Characterization and Final Facility Status* (SAND96-8004/August 1996). The plan and radiological characterization were performed in-house with the exception of minor radioanalytical activities on concrete core samples conducted by an outside vender. The Verification Team did not identify any significant issues on how the radiological characterization was conducted and documented.

The TRL reclassification process documentation and DOE Verification Report are available in the Sandia Report, SAND97-8003 *"Tritium Research Laboratory Reclassification Report,"* January 1997. Additional information, including references to the TRL safety documentation (e.g., Preliminary Hazard Assessments, Safety Determination Documents, Safe Operation Procedures and Operation Procedures), is provided in this report.

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[5] Reclassification safety documentation and remaining Tritium Quantity Analysis is included in SAND97-8003, "Tritium Research Laboratory Reclassification Report," January 1997.

ES&H HEALTH PROTECTION AND ENVIRONMENTAL OPERATIONS

Operation of a non-reactor nuclear facility is highly regulated, environmentally monitored and subjected to significant oversight. During the course of decontamination and decommissioning and characterization operations, three experienced and highly trained members of the SNL/ES&H Health Protection radiological staff[6] supported and provided independent oversight of the cleanup and transition activities. Environmental monitoring (air and water), waste handling, packaging and waste shipments were supported and conducted by the SNL/ES&H Environmental Operations Department; the *SNL/CA Site Annual Environmental Reports* provides detailed conduct of operations information concerning the TRL facility's permitting, continuous monitoring, on and off site geographic sampling, and waste minimization/generation. The ES&H Records Management Center maintains the documents associated with environmental and health protection activities.

TRL Radiological Control Philosophy

The general radiological operating philosophy at the TRL was to continuously maintain all areas of the facility contamination free from both surface contamination and airborne contamination. If there happened to be an inadvertent contamination, it was immediately cleaned-up and surveyed to verify adequate measures had been employed. The TRL always maintained this standard throughout it operating history, and this philosophy allowed complete access to the facility without the use of personnel protective equipment (PPE). The radiological analysis and trend analysis which was performed and documented in the *Health Physics Quarterly Reports* (File # HP215.02 in the ES&H Records Center) verify the success of this program.

Quality Assurance

Radiological sample analysis and preparation was performed per existing Health Physics (HP) procedures. The effectiveness of the program was demonstrated by participating in an inter-laboratory Quality Assurance Program, the use of vendor calibrated samples and sources to calibrate equipment at the required intervals, and the use of National Institute of Science and Technology (NIST) traceable standards. Radiological instrumentation calibration records for survey instruments are maintained for each instrument and are filed as part of the site's quality assurance documentation (File #HP202.01 in the ES&H Records Center).

TRL Radiological Characterization Plan & Final Facility Status Report

SAND95-8216, *"TRL Radiological Characterization Plan,"* provides specific information for how the assessment of the radiological conditions of Building 968, and the support equipment would be conducted. The report also provides historical information on the operations conducted in each laboratory in the building. SAND96-8004, *"Radiological*

[6] Specific information regarding training and or HP radiological staff qualifications can be directed to the SNL/CA Health & Safety Department Manager.

Characterization and Final Facility Status Report Tritium Research Laboratory," contains specific radiological characterization information on the Building 968 complex. The report provides the detailed radiological soil characterization, radiological and chemical characterization of the waste water collection tanks including all drains, and a radiological characterization of the ventilation system. Information verifying remediation work and the absence of tritium contamination is contained in this report.

All aspects of the final radiological survey were presented to the Department of Energy for their independent review and following a site visit and briefing with staff, they found no findings that required a corrective action. However, DOE requested that the following information be included in this report as supplementary information and clarification to SAND96-8004, *"Final Tritium Research Laboratory Facility Status Report."*

Supplementary Information Final Facility Status Report

Characterization Survey: The radiological characterization survey was performed in a systematic mode moving from one laboratory to another. The general procedure for the survey was:

- perform instrumentation checks and calibrations as required;
- review the previous days activities and take action as appropriate;
- perform a walk-through of the facility including the auxiliary buildings;
- verify the operation of the environmental stack monitoring system;
- check the levels in the waste water hold-up system and sample and release as required;
- verify adequate supplies and materials are on-hand for the days' activities (order as necessary); and
- isolate the area to be surveyed and perform the survey.

All radiological surveys using portable instrumentation was performed per existing procedures as referenced in SAND96-8004. The swipe surveys were analyzed per the existing procedure utilizing the following criteria for area coverage. In order to provide the most complete coverage of areas and maintain the area within the DOE Order 5400.5, the Health Protection staff performed a dry cotton swab test. The cotton swab covered an area of approximately 1/2 cm, and to cover the required 100 cm^2 a straight line a distance of 200 cm^2. Using this method allowed for the swab to pass over each floor tile in every laboratory increasing the confidence of the survey.

Occurrences: There were two noteworthy occurrences that were inadvertently omitted in the *Radiological Characterization and Final Facility Status Report Tritium Research Laboratory,* SAND96-8004. For detailed descriptions of these events see Occurrence Report Numbers: ALO-KO-SNL-TRL-1992-0001 & 1992-0002.

Tritium Release May 28, 1992: There was a 4 Curie (0.4 milligram) tritium release to the stack from a High Temperature Vacuum Furnace (HTVF) apparatus, located in a high velocity hood. Although a release occurred to the environment, no personnel exposure was involved. ALO-KO-SNL-TRL-1992-0001.

Tritium Release June 1, 1992: There was a 36 Curie (3.6 milligram) tritium release to the stack from the Sandia Thermal Outgassing Experiment (STOX), located in a high velocity hood. Although a release occurred to the environment, no personnel exposure was involved. ALO-KO-SNL-TRL-1992-0002.

Building 968 TRL Ceiling Surveys: All areas of the TRL ceilings were surveyed for radioactive contamination. The concrete structure of the building was surveyed along with all areas above the false ceiling during the scoping survey. There were no areas or items found to be contaminated during this process and it is documented in SAND96-8004. For the final characterization, all data referenced for the ceiling was performed on the false ceiling section of the facility.

SAND96-8004 Errata: On page 28 of this SAND Report under the heading of Scoping Survey: Report of Findings, there is an error in the unit reference. The third line indicates an activity of < 1k dpm/cm^2 and it should read < 1k dpm/100 cm^2.

Final Radiological Material Management Area Disestablishment (RMMA): On November 5, 1996, the final RMMA located in the HVAH in Laboratory 121 was disestablished using existing procedures. The RMMA was maintained to support operations associated with the assessment of environmental releases from the stack effluent.

Environmental Operations

A significant accomplishment of this project was the integration of environmental operations into the day-to-day operations at the TRL. These efforts were successful in both minimizing waste generation, personnel exposures, and environmental releases. The many innovative decontamination (e.g., humidification, etc.) and waste packaging techniques (e.g., use of special oversized containers) are documented in SAND97-8004, *"Characterization, Minimization and Disposal of Radioactive, Hazardous, and Mixed Waste During Cleanup and Transition of the Tritium Research Laboratory (TRL) at Sandia National Laboratories/California (SNL/CA),"* December 1996; other topical areas include the waste generator training, waste certification practices, waste quality assurance procedures, and audit information.

Calculations of the low-level radioactive waste avoided exceeds 30 million pounds or 9,753,600 ft^3 in landfill space; this total would have required 762 trucks (8 ft x 8 ft x 25 ft) to transport to the disposal site. Accounting for equipment reused at other DOE sites and taking a credit for avoided burial costs—the total taxpayer savings from these efforts alone is over $68 million. Several non-monetary benefits were also the results of careful planning throughout this project. First, the tritium inventory reached zero grams. Second, the emissions and personnel exposures during the decontamination process were minimized by using oversized shipping containers to eliminate cutting contaminated materials. As shown in Figures 5 and 6, personnel exposures were significantly less than Federal or DOE allowable limits and environmental releases were well below the annual amounts released during "normal" operations; in fact, environmental releases decreased as the cleanup and transition activities progressed. Yet a third notable distinction was that the facility had no reportable occurrences during the final removal of the processing equipment (January 1995 - May 1996).

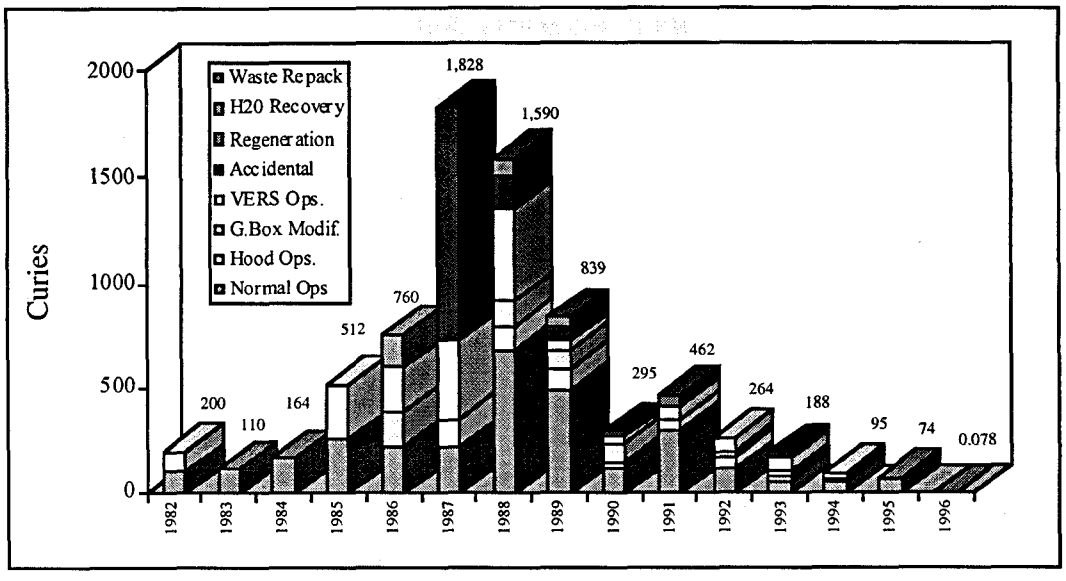


Figure 5. Environmental Release Data 1982-1996

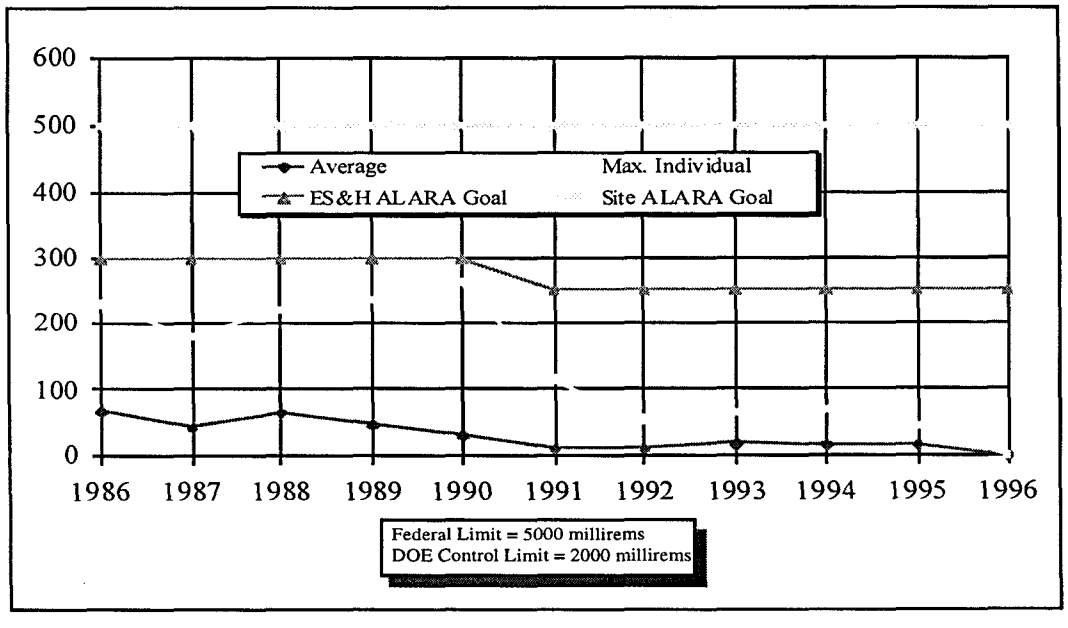


Figure 6. Personnel Exposures Data 1986-1996

In June, 1995 DOE and EPA established the conditions for post operational emission monitoring at the TRL. This unprecedented agreement between the DOE and US EPA, California EPA, and the city of Livermore was negotiated by the SNL ES&H Environmental Operations Department. The agreement specified post-operational stack monitoring for one year (October 1995 - September 1996) and provided for discontinuing the stack monitoring if the emissions level was less than 7 Curies[7].

[7] The criteria and supporting data for discontinuation of stack monitoring is included as Appendix D.

Monitoring data during the post-operations period (0.078 curies) demonstrated that no further active stack monitoring was necessary and EPA, DOE, etc., has formally approved the discontinuation effective October 10, 1996. (Figure 5, provides data for all stack release quantities.) Normal environmental monitoring of the ground, discharge water, and air will continue; this is performed routinely to provide data for the *SNL/CA Site Annual Environmental Report*.

REUITILIZATION

A product of the TRL Cleanup and Transition Project is a modern and high quality facility. SNL/CA's rapidly growing Advanced Detection Technologies (ADT), which includes applications ranging from materials protection and custody to nonproliferation, applied for and received Strategic Investment Funding to occupy Building 968. The investment of strategic initiative funds accelerated the facility's occupancy schedule and the timing of this support alleviated the non-beneficial operating expenses for an empty building. By identifying the ADT effort as an important and viable facility reuse application prior to completing the transition project, both time and money usage was optimized by aligning the remaining building transition tasks with the new user requirements funded by the strategic investment funds. Besides ensuring timely completion of all remaining TRL C/T Project requirements, this coordinated approach serves as a model of *converting a liability to an asset*. The building was officially rededicated on October 10, 1996 as the Chemical and Radiation Detection Laboratory (CRDL). Nine of the fifteen laboratory rooms were completed prior to the rededication. Work is presently underway to complete the occupancy of the remaining laboratories during calendar year 1997. A facility description and drawing is provided in Appendix E.

CONCLUSIONS

A former Department of Energy non-reactor nuclear facility has been transformed into a general purpose laboratory. This transition project supports and integrates Sandia's goal of compliance with ES&H requirements to its strategic thrusts by developing a methodology for converting an unneeded facility (liability) to new uses (asset). Compared to the DD&D options, the process saved at least five years and in excess of $100 million in direct and indirect costs. Additional information that provides in-depth information and approaches to the many technical and administrative challenges that such a cleanup effort requires is readily available within the numerous topical reports and project records that have been discussed throughout this report. These documents and the experience obtained during this effort are valuable resources to the DOE , which has more than 1200[8] other process contaminated facilities awaiting cleanup and reapplication or demolition.

[8] Estimated process contaminated facilities was based on 1995 DOE Environmental Management (EM40) survey.

ACKNOWLEDGMENTS

The successful completion of this pioneering project resulted from teamwork among a number of organizations and the knowledge and skills of many dedicated individuals. The majority of the work was performed by members of SNL's TRL, ES&H, Facilities, and Maintenance Departments. Providing front-line leadership and management of the day-to-day work was TRL Transition Department Manager and Project Manager Jim Bartel. ES&H specialists Toff Garcia, Tom Gorman, and David Brekke were instrumental in maintaining an exemplary safety record and facility reclassification.

A critical element to the success of any project is funding to perform the work. SNL's National Security Sector was committed and demonstrated their support throughout the project. Key decision makers included: SNL/Vice President Roger Hagengruber, Jim Ney, Jerry Allen, Program Managers Charlotte Acken and Patrick Chavez. Sandia Executive Vice President, formerly California Site Vice President John Crawford and Executive Staff Director, former TRL Facility Manager Ron Detry championed this effort from start to finish.

The aggressive support of the DOE at all levels, Headquarters, Albuquerque Operation Office, and the Kirtland Area Office, was also a cornerstone to success. Among those at DOE assisting in the definition and execution of work was the former and Acting (respectively) Kirtland Area Office Managers, Kathy Carlson, and Mike Zamorski, as well as the former and current (respectively) California Facilities Representatives John Retelle and Jason Oakley.

REFERENCES

1. Idaho National Engineering Laboratory Report INEL-94/0205, *"Avoidable Waste Management Costs,"* January 1995, Karen Hsu, et. al.

2. Sandia Report SAND78-2041, *"The Tritium Research Laboratory,"* November 1978, P. D. Gildea.

3. Sandia Report SAND81-8234, *"The Tritium Research Laboratory Safety Analysis Report,"* August 1981, D. A. Wright.

4. Sandia Report SAND94-8236, *"Tritium Research Laboratory Experiment Relocation,"* August 1994, Dan Folk.

5. Sandia Report SAND95-8216, *"Radiological Characterization Plan for the Tritium Research Laboratory Sandia National Laboratories/California,"* May 1995, T. B. Garcia.

6. Sandia Report SAND96-8004, *"Final Tritium Research Laboratory Facility Status Report,"* August 1996, T. B. Garcia and T. P. Gorman.

7. Sandia Report SAND96-8005, *"Accountable Tritium Inventory Reduction,"* June 1996, V. Pestañas.

8. Sandia Report SAND97-8003, *"Tritium Research Laboratory Reclassification Report,"* (January 1997), A. J. Johnson.

9. Sandia Report SAND97-8004, *"Characterization, Minimization and Disposal of Radioactive, Hazardous, and Mixed Waste During Cleanup and Transition of the Tritium Research Laboratory (TRL) at Sandia National Laboratories/California (SNL/CA),"* December 1996, T. B. Garcia and T. P. Gorman.

10. Video, *"Transitioning from the TRL to the CDRL,"* CA-V-97:21, February 1997, Available from Sandia Public Information Office.

11. ES&H Records Management Center: Sandia/California Site Annual Environmental Reports, Health Protection Quarterly Reports, etc.

12. SAND97-8008, *"TRL Cleanup, Transition and Reutilization Project Requirements and Plans,"* March 1997, J. Bartel, A. J. Johnson, W. Wall.

APPENDIX A

TRL (1977-1994) BUILDING 968 FACILITY

Building 968 Facility Description and Complex Drawing

Building 968 has 15 separate labs totaling approximately 15,500 square feet. In 1986, these labs were seismicly upgraded to withstand an 8.0 magnitude earthquake. Adjacent to Building 968 is a 5000-square-foot office building (Building 967) and a 2500-square-foot technical support and maintenance building (Building 969). Recent changes in the fencing perimeter separated the compound from the classified area, therefore, allowing uncleared personnel to work unescorted within the area (similar to the Combustion Research Facility). The following provides descriptions of the standard utilities supporting the building, which remain operational.

- Building Ventilation System: The building ventilation system consists of two exhaust fans (approximately 55,000 scfm each), a supply fan, heating and cooling coils, duct work, and a system of manual and automatic dampers with Barrington controls for directing air flow through the building. The original building design used the ceiling space as a supply air plenum. This system is a once-through system with an air exchange rate of 6/hour. The air is released through a 100-foot stack.

- Waste Water Effluent System: The waste drainage system consists of two under floor drainage systems. The main system collects liquid effluent from the floor drains, sinks, and restroom showers in two holding tanks (2300 gallon each) located in a below-ground level pit. The second system, which includes the toilets and urinals, drains into the sanitary sewer.

- Chilled Water System: The chilled water system is a centrifugal-type water chiller (220 ton-capacity), operating in conjunction with an open-type cooling tower to provide chilled water for cooling coils in the building air supply fan inlet. The chilled water system can also be used for cooling lab equipment.

- Emergency Power System: The emergency power system includes an uninterruptable 50-kVA power source (battery power) and an emergency 300-kVA back-up generator (diesel) providing continuous power to both the building systems and laboratory equipment.

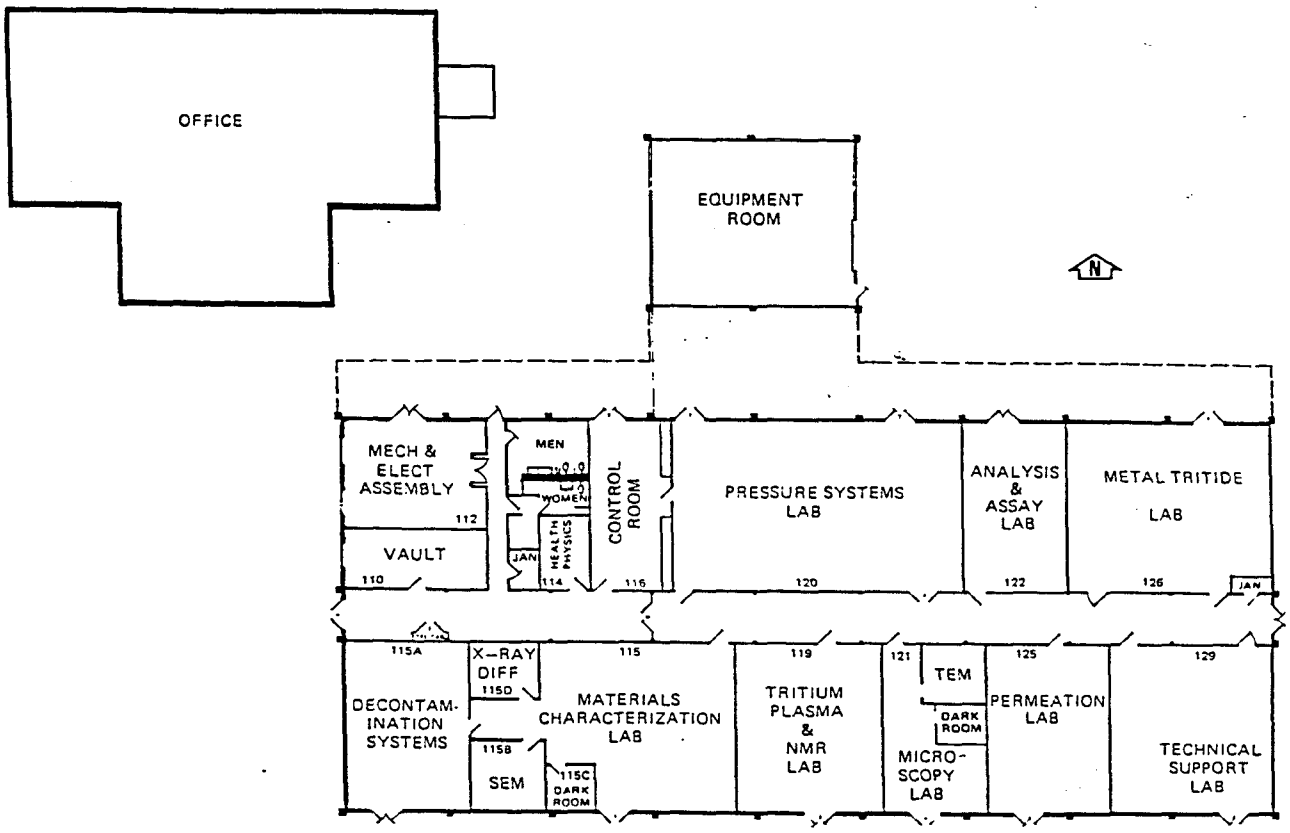
In addition, the building is supported with:

- Compressed Air (100scfm)
- Automatic Sprinkler System For Fire Protection
- Emergency Eye Washes and Showers
- Gaseous And Liquid Nitrogen System
- Domestic Water System
- Public Address System

- Building Fire and Emergence Evacuation Alarms
- Restrooms, Lockers, and Showers

APPENDIX A

TRL (1977-1994) BUILDING 968 FACILITY



The **TRITIUM RESEARCH LABORATORY** enables **Sandia National Laboratories, Livermore** to conduct a diverse range of experimentation using gram amounts of tritium. It offers facilities for research in:

The Physics and Chemistry of Tritium and its Compounds
Radiation Effects Caused by Tritium
Effects on Structural Properties of Materials
Transport Properties of Tritium
Safe Handling Techniques for Tritium

The laboratory has the following characteristics:

AREA: Gross—15,000 sq. ft. Net—11,000 sq. ft.
NEW OFFICE ADDITION: Gross—4,400 sq. ft. Net—4,000 sq. ft.
COST for construction and equipment: Total—$12 M

Anticipated addition in FY86: Cost $19.1 M; Gross sq. ft. 10,950.
The **Tritium Research Laboratory** was authorized in the AEC contingency budget of FY72. Construction was completed in September of 1975. Equipment installation was completed in June 1976. Facility became operational in September 1977.

APPENDIX B

TRL DEPARTMENT/PROJECT MANAGERS (1977-1997)

TRL Department Managers

1977 - 1985	Patrick Gildea
1985 - 1990	Don Putz
1990 - 1992	Will Bolton
1992 - 1995	Jim Bartel
1996 - 1997	Don Putz

TRL Clean-up and Transition Project Managers

1992 - 1995	Jim Bartel
1996 - 1997	Alice Johnson

APPENDIX C

TRL RECORDS MANAGEMENT SUBJECT LISTING

Questions and or interest concerning the TRL documentation records can be directed to the SNL/CA ES&H Records Management Center.

TRL RECORDS MANAGEMENT SUBJECT LISTING
Project Files (i.e., Project Plans, Project Description Documents, Budget documents, internal correspondence, and Clean-up and Transition meeting minutes)
Technical Publications (SAND Reports)
DOE Correspondence
Audits Findings and Close-out Approvals
Internal Operation Guidance and Quality Assurance
Incident Reports
Operational Logs (e.g., VERS/GPS processing records, alarm log)
Safety Reviews
Waste Shipments
Non-nuclear Material Accountability (accountable property)
Nuclear Materials Accountability
Equipment Disposition (transfer or waste)
Personnel Dosimetry
Health Physics Monitoring
Environmental Monitoring
Facility Drawings
Purchase Requisitions

APPENDIX D

PICTORIAL DOCUMENTATION AND VIDEO TAPES OF TRL CLEANUP AND TRANSITION

6 pages

Sandia National Laboratories
Livermore, California 94551-0969

date: November 15, 1996

to: Don Putz, 8346 MS9671

Val Pestañas

from: Val Pestañas, 8346 MS9671

subject: Pictorial Documentation and Video Tapes of TRL Clean-up and Transition Process

This memo is to inform you that task ID number 99 (Provide Pictorial Documentation of TRL Cleanup and Transition) as stated in the TRL Transition Plan (8/26/96), was completed on October 15, 1996. Completion of this task includes the completion of tasks numbers 102, 103 and 104.

The pictorial documentation is organized into two blue binders entitled:

(1) Tritium Research Laboratory 1991 - 1995
(2) August 1, 1995, Low-Level Radioactive Waste Shipment

Attached to this memo is a Table of Contents for each binder to illustrate how the photographs are organized, including a description of each photograph. These binders are now part of the Inactive Records currently stored in the Briefing Room of Building 967.

Also attached to this memo is a list of Video Tapes which document the different aspects of the clean up and transition process. The list provides the video tape title, video tape serial number, and a brief description of the contents. The master video tapes are stored at the Video Productions Lab in Building 913, Room 166. Copies are currently stored in the Briefing Room of Building 967.

Concurrence with task closure:

D W Putz

D. W. Putz, Manager, Dept. 8346

11/18/96

Date

Copy to:

(0190A)	J. G. Oakley, DOE/KAO
MS 0471	P.F. Chavez, 5135
MS 9671	TRL Transition Project Plan File
MS 9671	C. Laguer, 2286
MS 9671	8346 Personnel
MS 9671	T. B. Garcia, 8421
MS 9671	T. P. Gorman, 8421
MS 9671	D.W. Putz, 8346
MS 9671	V. V. Pestañas, 8346

TABLE OF CONTENTS
(Binder 1: Tritium Research Laboratory 1991 - 1995)

Section Title	Photo No.	Brief Description
TRL Complex	TRLC 1	Aerial view of 967, 968, 969
	TRLC 2	Building 967 North Side
	TRLC 3	Building 968 West Side
	TRLC 4	Building 968 North Side
TRL in Operation	TRLO 1	Building 968 Hallway Manifold
	TRLO 2	Vacuum Effluent Recovery System (VERS), Room 115A
	TRLO 3	Water Recovery System, Room 115A
	TRLO 4	Monitoring Room, 116
	TRLO 5	Tritium Plasma Experiment, Room 119
	TRLO 6	High Pressure Pumping Station, Room 120
	TRLO 7	Assay Station Glovebox, Room 120
	TRLO 8	Utility Glovebox #5, Room 120
	TRLO 9	Disassembly Glovebox, Room 120
	TRLO 10	VG MM3001 Mass Spectrometer, Room 122
	TRLO 11-13	Component Development Lab, Room 126
TRL Clean-up	TRLCU 1	VERS room 115A - Pumps removed
	TRLCU 2	Packaging Gloveboxes Room 120
	TRLCU 3	Room 120 showing the High Pressure Station GB & Utility Glovebox #5
	TRLCU 4	Room 120 almost empty except for Utility GB5 & crates awaiting shipment
	TRLCU 5	Packaging equipment from room 122.
	TRLCU 6	Packaging Low Level Waste for Disposal, room 115
968 Lab Rooms	968LR 1	Monitoring Room 116
	968LR 2	Laboratory Room 120
	968LR 3	Laboratory Room 122
	968LR 4	Laboratory Room 125
	968LR 5	Laboratory Room 126

Section Title	Photo No.	Brief Description
Property Reapplication	PR 1-7	Boxed Lab Equipment - For shipment to Los Alamos Nat'l. Laboratory
Tritiated Water Waste Packaging	TWWP 1-10	Packaging Tritiated Water for Low-Level Waste Disposal
	TWWP 11	DOT-approved 7A Waste Container

TABLE OF CONTENTS
(Binder No. 2: August 1, 1995, Low-Level Radioactive Waste Shipment)

Section Title	Photo No.	Brief Description
Bigge Crane Co.	BC 1	Bigge Crane shown parked outside SE fence of TRL Complex
	BC 2	Bigge Crane Co. Weight Certification & Calibration
GPS Dryer Skid	DS 1	GPS dryer skid awaiting transfer onto adjacent oversized 7A waste container
	DS 2	Work planning session - TRL Staff & Bigge Staff
	DS 3	Work planning session - TRL Staff (Giovacchini, Garcia, Smith)
	DS 4	After planning session
	DS 5	Laguer attaching eye bolt fixture to oversized 7a container (for lifting)
	DS 6	Oversized 7a Waste Container Cover
	DS 7	Attaching lifting rope to eyebolt of waste container
	DS 8	Bigge staff attaching eyebolt to waste container cover
	DS 9-10	Bigge staff attaching rope to eyebolt
	DS 11	Bigge staff guiding ropes as crane operator prepares to lift load
	DS 12	Bigge Crane operator removing container cover to load dryer skid
	DS 13	Bigge Crane co. to do the dryer skid loading
	DS 14	Verifying internal container measurements (Giovacchini, Bigge, Garcia)
	DS 15	Preparing GPS dryer skid for loading onto waste container
	DS 16	GPS dryer skid being loaded into waste disposal container
	DS 17	GPS dryer skid almost loaded into waste disposal container
	DS 18	Final steps in loading the GPS dryer skid
	DS 19	Almost loaded
	DS 20	Putting waste container cover back
	DS 21-22	Bigge staff guiding container cover
	DS 23	Bigge staff removing lifting rope from eyebolts
	DS 24	Securing container cover to base
	DS 25	Bigge staff lifting and transferring waste container to flatbed truck
	DS 26-27	Bigge staff guiding container to flatbed truck
	DS 28	Full view of Bigge crane lifting the waste container
	DS 29	HP (Gorman) surveying flatbed truck surface
	DS 30	Final loading of waste container on to truck
	DS 31	Adjusting final fit of waste container on to truck

Section Title	Photo No.	Brief Description
VERS Holding Tanks	HT 1	Two VERS 200 cu. ft. tanks in bldg. 968 roof
	HT 2	One VERS 10 cu. ft. holding tank being cut from bldg. 968 roof
	HT 3	VERS tank being taken down from bldg. 968 roof by Bigge Crane Co.
	HT 4	VERS 200 cu. ft. holding tank on the ground (shows size rel. to person)
	HT 5	Two VERS 200 cu. ft. holding tanks on the ground
	HT 6	Two VERS 200 cu. ft. holding tanks awaiting packaging
	HT 7-8	VERS 10 cu. ft. tank being loaded into oversized waste container
Shipping/Waste Containers	WC 1	Lifting and loading additional waste containers
	WC 2	Loading on flatbed truck
	WC 3	Bigge staff attaching lifting cables to waste container
	WC 4	Bigge staff adjusting the lifting cable
	WC 5	Bigge staff guiding waste container to flatbed truck
	WC 6	Waste container lifted by crane operator
	WC 7-12	More shots of waste container being transferred on to flatbed truck
	WC 13-14	TRL and Bigge staff taking a break from loading waste containers
	WC 15	Bigge staff cahecking waste container fit on flatbed truck
	WC 16	Sandia staff awaiting completion of loading
	WC 17	Truck driver strapping waste container to flatbed truck
	WC 18	Bud from video lab videotaping the event
	WC 19-20	Loading more waste shipping containers
	WC 21	Problems with third truck sent by Tri-state motors
	WC 22	Photo of third truck showing bed almost touching the ground w/o any load
	WC 23	Bud from video lab shown documenting the truck's unacceptable condition
	WC 24	TRL staff consulting with the boss (Bartel)
Waste Shipment Team	WST 1	Gwen Varroza, Sarah O'Connor, Grace Miranda, Val Pestañas & Paula Painter
	WST 2	Sarah O'Connor, Grace Miranda, Jim Smith, Gerry Giovacchini
	WST 3	Paula Painter, Tom Gorman, Jim Smith, Gerry Giovacchini, Herman Armijo, and ES&H person

LIST OF VIDEO TAPES: TRL CLEAN-UP AND TRANSITION

Tape Title	Tape Serial No.	Content Description
TRL Sandia/CA Tritium Research Lab.	CA-V-94:46	Description of the TRL Facility
The Tritium Research Lab	CA-V-93:06	Description of TRL Facility and Capabilities
Training, Safe Work Permits and Emergency Drill	CA-V-97:08	Health Physics training; emergency drill
The Tritium-Use Air Supplied Suit	CA-V-93:02	Health Physics bubble suit training
Disassembly/Dismantling of Gloveboxes and Equipment; Cutting GPS/VERS lines and Duct Cleaning	CA-V-97:07	Disassembly of gloveboxes in labs 120,129. Pipe cutting in bldg. 968 hallway; GPS out of lab 115, duct cleaning in various rooms
The Packaging of Tritiated Waste Water Solidified in Clay	CA-V-94:07	Step-by-step procedure in handling and packaging waste water for disposal to Nevada Test Site
The Packaging of Low-Level Radioactive Waste from the Sandia/CA TRL	CA-V-94:17	Step-by-step procedure in preparing and packaging low level radioactive waste

APPENDIX E

TRL STACK MONITORING DISCONTINUATION SUMMARY AND DOCUMENTATION

Post Operational Period (October 1, 1995 - September 30, 1996) Results

Maximum Allowed in EPA Agreement	Post Operations Emissions Released	DOE Allowable	Emissions as a Percentage
0.001 mrem Annual Effective Dose Equivalent (AEDE) @ site boundary	1.4×10^{-5} mrem (AEDE)	100 mrem/year (AEDE) above background	1.4 % of EPA Agreement *or* 0.00001% of DOE Allowable
7 Ci (calculated from max allowed @ site boundary)	0.078 Ci (78 millicuries)		

Comparison Information

Occupational Radiation[9] (ADE)	Natural Radiation Sources[10] (ADE)	Man-Made Radiation Sources[11] (ADE)	Avg US (AEDE) Radiation dose
44 rmem/yr Avg DOE worker 70 rmem/yr Medical Personnel 120 rmem/yr Construction worker 700 mrem/yr Nuclear power plant 1,000 rmem/yr Airline crew	28 mrem/yr from sun 28 mrem/yr from earth's crust 39 mrem/yr from sources in body 200 mrem/yr from Radon	54 mrem/yr Medical radiation 10 mrem/yr Consumer Products <3 mrem/yr Industrial uses	360 mrem/yr from natural sources

Attached Documentation (pages 38 - 85)

[1] Exposure to radiation by Occupation from SNL/RAD 102 Training Workbook, Feb. 1994, page 9
[2] Information taken from SNL/RAD-210 Workbook, Mar 1995, pages 2-7
[3] Information taken from SNL/RAD-210 Workbook, Mar 1995, pages 2-8

Sandia National Laboratories
Operated for the U.S. Department of Energy by
Sandia Corporation

Livermore, California 94551-0969

date: October 28, 1996

to: Thomas O. Hunter, Site Manager

from: James J. Bartel, Environmental Operations
Department Manager

subject: Discontinuation of TRL Stack Monitoring

Attached is official approval from DOE/Al/KAO to terminate stack monitoring at the former Tritium Research Laboratory. The monitor was turned off October 10, 1996, at 1100 hours. A copy of this memo is retained in the ES&H Record Center

cc: with enclosure

MS 0455	Patrick F. Chavez, 5604
MS 1037	A. Bendure, 7523
MS 9671	D. W. Putz, Attn: A.J. Johnson, 8346
MS 9401	R. C. Wayne, 8400
MS 9221	D. A. Wright, 8421
MS 9221	P. Painter, 8418
MS 9221	R. Holland, 8418

bcc:
D. W. Putz, 8346
C. Laguer, 8346

Attachment 1

Exceptional Service in the National Interest

SF 1325.8

United States Government | Department of Energy

memorandum

Albuquerque Operations Office
Kirtland Area Office

DATE: OCT 09 1996

REPLY TO: KAO

SUBJECT: Discontinuing Monitoring Activities for the Tritium Research Laboratory at Sandia National Laboratories, California

TO: J. Bartel, 8418, MS 9221

Attached is a letter from the Environmental Protection Agency, Region IX, stating that the stack emissions monitoring of the Tritium Research Laboratory (TRL) may be discontinued, and the annual National Emission Standards for Hazardous Air Pollutants (NESHAPs) reporting requirements under 40 CFR 61, Subpart H, are no longer required. This memorandum is to officially notify Sandia National Laboratories that the Department of Energy is no longer requiring monitoring activities associated with the TRL as required by 40 CFR 61, Subpart H, and that stack monitoring at the TRL may be discontinued. If you have any questions regarding this information, please contact Susan Lacy of my staff at (505) 845-5542.

Michael J. Zamorski
Acting Area Manager

Attachment

cc w/attachment:
C. Soden, AL, EPD
K. Duval, EH-232
K. Griffith, KAO
J. Oakley, KAO
D. Brekke, 8418, MS 9221

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

October 8, 1996

Michael J. Zamorski
Acting Area Manager
Kirtland Area Office
Department of Energy
P.O. Box 5400
Albuquerque, New Mexico 87115

Dear Mr. Zamorski:

After reviewing the Final NESHAPs Monitoring Report for the SNL/California Tritium Research Laboratory, October 1996, enclosed with your letter of October 3, 1996, we have determined that it fulfills condition (2) set forth in our letter of June 13, 1995 to George K. Laskar (enclosed):

> "Once the air pathway dose becomes less than 0.001 mrem AEDE, emissions monitoring may be discontinued and NESHAP reporting may be discontinued following a final submittal providing that documentation."

The report documents that monitoring of stack emissions from the decommissioned and decontaminated Tritium Research Laboratory result in a modeled dose to the public of 1.4×10^{-5} mrem effective dose equivalent and therefore fulfills the criteria above. You may, therefore, discontinue stack emissions monitoring of this facility and we will no longer require the annual NESHAP reporting which was required in accordance with 40 CFR, Part 61, Subpart H.

Please contact Shelly Rosenblum at (415) 744-1047 if you have any questions.

Sincerely,

David P. Howekamp
Director
Air & Toxics Division

Enclosure

C:\NESHAP\SANDIA.DOC

Attachment 3 w/
attachments: 3-1

Printed on Recycled Paper

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

JUN 13 1995

George K. Laskar
Assistant Area Manager
Environment, Safety and Health
Department of Energy
P.O. Box 5400
Albuquerque, NM 87185-5400

Dear Mr. Laskar:

Thank you for your letter of May 30, 1995 transmitting the Proposed NESHAP Monitoring Plan for the SNL/California Tritium Research Laboratory (TRL) (February, 1995). This proposal (attached) describes the plan for emissions monitoring following shut-down of the TRL. We have reviewed this proposal and concur. Specifically, we agree with the following points:

1. If the emissions from the facility as determined by post-operational monitoring, produce an offsite AEDE from the air pathway less than 0.1 mrem but greater than 0.001 mrem, then periodic tritium emission monitoring will be performed as described in the plan.

2. Once the air pathway dose becomes less than 0.001 mrem AEDE, emissions monitoring may be discontinued and NESHAP reporting may be discontinued following a final submittal providing that documentation.

Please contact me at (415) 744-1048 or Shelly Rosenblum at (415) 744-1047 if you have any questions.

Sincerely,

Michael S. Bandrowski, Director
Office of Radiation & Indoor Air
A-1-1

attachment

Printed on Recycled Paper

Lee Johnson

Sandia National Laboratories

P. O. Box 969
Livermore, CA 94551-0969

October 2, 1996

George K. Laskar
U.S. Department of Energy
Kirtland Area Office
P.O. Box 5400
Albuquerque, NM 87185-5400

Subject: Transition of SNL/California Tritium Research Laboratory

Dear Mr. Laskar:

Enclosed please find the report summarizing the post-operational monitoring for the transition of the Tritium Research Laboratory (Building 968) at Sandia National Laboratories/California. This covers the environmental activities for the period of October 1, 1995 to September 30, 1996.

The former Tritium Research Laboratory was the only emission source at SNL/California subject to the Radionuclide NESHAPs Rule. The mission of that facility has been terminated and the cleanup completed. Overall, the previous year of monitoring verifies that the facility posses negligible risk to the public.

The radiological assessment was prepared according to the requirements of the Environmental Protection Agency's National Emission Standards for Hazardous Air Pollutants (NESHAPs), 40 CFR 61.93. The maximum potential radiological dose to a resident in an unrestricted location resulting from Building 968 emissions during this one-year period was 1.4×10^{-5} mrem effective dose equivalent. This is approximately 0.0001% of the NESHAPs standard for DOE facilities, and well below the criteria agreed upon by EPA Region IX to discontinue monitoring. A copy of the Clean Air Act compliance assessment generated by the CAP88 code is included as an attached.

We request that KAO make an official petition to EPA Region IX to release the former Tritium Research Laboratory from the requirements of 40 CFR 61, Subpart H. This report also needs to be transmitted to State and local authorities. The appropriate people are Jeff Wong of the California Department of Health Services, Environmental Management Branch; and Darren Greenwood of the City of Livermore Water Reclamation Plant.

Exceptional Service in the National Interest

Thank you for your ongoing assistance in this matter. If you have any questions, please contact Dave Brekke at (510) 294-2233.

Sincerely,

Jim Bartel, Manager
Environmental Operations Department

DDBrekke:8418

cc:
S. Lacy, DOE/AL/KAO
K. Surano, LLNL L-621
7575 S. Hwang
8421 D. Wright
8418 D. Brekke
11300 B. Krauss

w/out attachment:
8400 R. Wayne
8346 D. Putz
5135 P. Chavez

Final NESHAPs Monitoring Report for the SNL/California Tritium Research Laboratory

Environmental Operations Department
Sandia National Laboratories/California

October 1996

Background

Sandia Corporation is a prime contractor to the Department of Energy (DOE) operating Sandia National Laboratories (SNL), a facility engaged in a wide range of research and development in the national interest. The SNL/California site is located 65 km east of San Francisco, and approximately 5 km east of the City of Livermore. The site covers 1.7 km^2 (413 acres), of which 0.9 km^2 (213 acres) are developed.

The Tritium Research Laboratory (TRL) was designed as a modern research facility to safely handle tritium in support of the DOE weapons complex. Tritium operations began in November 1976, with full operational status being reached in late 1978. Pursuant to 40 CFR 61, Subpart H, "*National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities,*" SNL/California has always continuously monitored airborne effluents from the facility. In addition, as required by DOE order, liquid effluents and the surrounding environment are routinely monitored for tritium.

In September 1993, DOE approved SNL/California's plan to curtail tritium research at the TRL, and tritium experimentation ceased that year. Removal of the available tritium inventory was completed in October 1994. Subsequent cleanup of the TRL was completed in 1995, and the post-operational monitoring phase commenced on September 30, 1995[1].

In June 1995, DOE Kirtland Area Office received concurrence from the Environmental Protection Agency (EPA) Regional Office IX of its *Proposed NESHAPs Monitoring Plan for the SNL/California Tritium Research Laboratory* (Attachment I)[2]. This plan established the process to demonstrate effective cleanup of the former TRL and the criteria to discontinue NESHAPs monitoring at the facility. The plan called for one year of post-operational monitoring. This included continuously monitoring stack emissions and maintaining the environmental surveillance program. EPA concurred that once the air pathway dose to an off-site maximally exposed individual (MEI) was less than 0.001 mrem annual effective dose equivalent (AEDE), NESHAPs monitoring and reporting could be terminated. This dose equates to a total release of 7 Ci from the stack in a year period.

This report documents the results of the post-operational monitoring and the radiological dose assessment to support DOE's request to cease compliance activities under 40 CFR 61, Subpart H.

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[1] Data on the cleanup of the TRL can be found in *Radiological Characterization and Final Facility Status Report Tritium Research Laboratory*, SAND96-8004, August 1996.

[2] Letter from Michael Brandrowski of US EPA Region IX to George Laskar of DOE dated June 13, 1995.

Monitoring Systems[3]

Effluent Monitoring

Stack Monitoring. Continuous monitoring of the effluent from the TRL stack (the only point of airborne discharge at the TRL) has been ongoing since operations began. A sample of the stack gas is passed through an ethylene glycol bubbler which collects tritiated water vapor. The effluent from this bubbler is then passed through a precious metal catalyst (to convert tritium gas to tritiated water), and then passed through another ethylene glycol bubbler. This system allows for discrimination between tritiated water and tritium gas emissions.

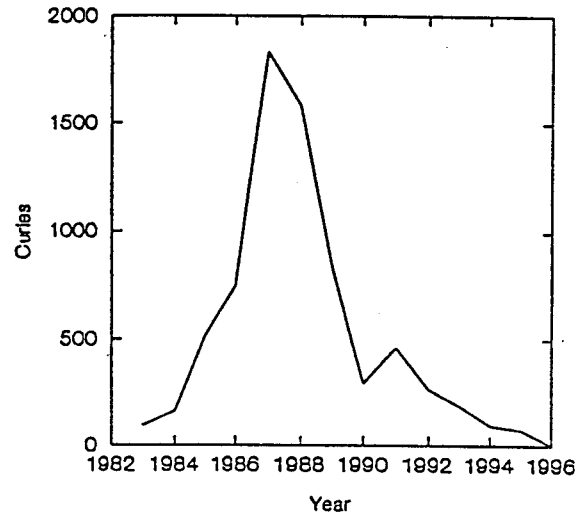

Fig. 1. Tritium Emissions, 1983-1996

The total discharge of tritium to the atmosphere from Building 968 during the one-year period was 0.1 Ci. Attachment II, Table 1 shows the stack tritium sampling data for the post-operational monitoring period. Figure 1 shows the stack emissions from 1983 through the end of the post-operational monitoring period. These data clearly show that stack emissions of tritium have approached zero.

Liquid Effluent Monitoring. All non-sanitary liquid effluents from the TRL are routed to two stainless steel retention tanks. During the operational years of the TRL, the contents of the tanks were analyzed for tritium by liquid scintillation to assure compliance with Federal, State, and DOE limits before the tank contents were released to the sanitary sewer. In November 1995, as part of the radiological characterization, all the building drain lines were flushed to measure the level of residual tritium. Figure 2 summarizes the data from the drain flushing. This shows that liquid effluent from all eleven drain lines dropped below Federal and State public

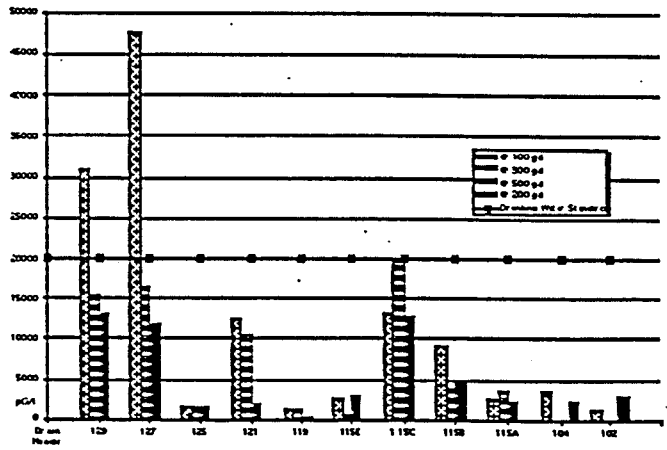

Fig. 2. Tritium Concentrations in Drain Flush Water

[3] For more detail on the monitoring systems, see the *Environmental Monitoring Plan* SAND93-8011, February 1994.

Drinking Water Standards for tritium (20,000 pCi/L).

Tritium samples are also collected weekly at the site's sanitary sewer outfall. During calendar year 1995, tritium concentrations were typically below the limit of detection[4].

Environmental Surveillance

Ambient Air Tritium Monitoring. As part of the routine environmental surveillance program, SNL/California and Lawrence Livermore National Laboratory have maintained an ambient air tritium monitoring network. Six tritium samplers are maintained on the SNL/California site, and one sampler is maintained at a background location approximately 15 km in the least prevalent wind direction. Tritiated water is collected on silica gel, then boiled off as an azeotrope with toluene, which is then counted by liquid scintillation. Data from the ambient air monitoring samplers are included in Attachment II, Table 2. Data for location ATS-03 are plotted in Figure 3. This location was chosen for graphing since in the past, it showed the highest ambient tritium concentrations. The graph clearly shows the drop in ambient tritium concentrations since the cessation of tritium operations. For calendar year 1996 to date, ambient tritium concentrations have been below, or very close to, the detection limit.

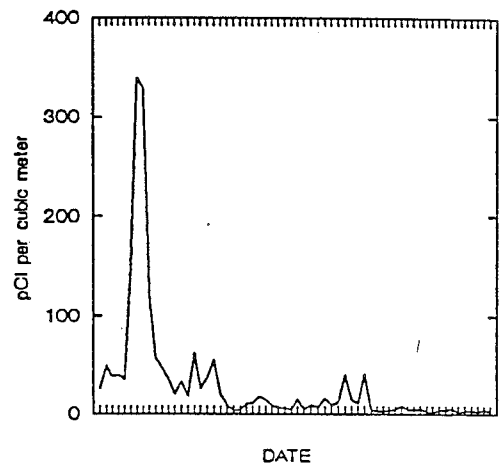

Fig. 3. Tritium Concentrations at ATS-03, January 1994 - July 1996

Soil Characterization. In support of the cleanup of the TRL, SNL/California performed a special soil survey of tritium concentrations in the vicinity of the SNL/California site. Surface soil samples from 21 locations were analyzed for residual tritium. Surface soil was collected from a one square meter area after removing all of the surface vegetation, then scraping the surface until approximately 0.5 kg of soil had been obtained. Samples were collected from areas with the highest potential for tritium deposition (i.e., close in to the facility, predominant downwind direction, and arroyo).

Overall, this survey concluded that there was no radiological contamination to the surface environment from operations at Building 968. Nineteen of the 21 locations sampled were below the laboratory's analytical detection limit, and the remaining two were very close to the detection limit. The maximum potential radiation dose was calculated (using the RESRAD code) based on the highest measured tritium concentration in soil. This assessment assumed worst-case condition, i.e., the site was immediately released for unrestricted public use. The maximum dose from one year of continuous occupation was 2.8×10^{-3} mrem. This highest location was 0.009% of the acceptable soil limit based on the DOE methodology.

[4] These data are contained in the *Annual Site Environmental Report for 1995*, SAND96-8007, July 1996.

Dose Assessment

At the conclusion of the one-year post-operational monitoring period, the radiological impact to the public from the former TRL was evaluated. The potential radiation dose was calculated for a hypothetical individual residing off-site and receiving the maximum dose from all exposure routes.

The CAP88-PC, version 1.0, code was used to model the radiological dose to the maximally exposed individual in a publicly accessible location. In summary, this assessment included the following:

- EPA-approved dose conversion factors and weighting factors;
- CAP88-PC default factors for atmospheric transport and dosimetry;
- Source term based on TRL stack monitoring data;
- All tritium discharged to the atmosphere was assumed to be in the oxidized chemical form (HTO);
- In calculating the ingestion dose, a conservative fraction of the food consumed was assumed to be produced from within the assessment area;
- Site-specific meteorology data (from the SNL/California meteorological tower);
- Momentum-dominated plume rise;
- An occupancy of 24 hours/day, 365 days/year; and
- A receptor located approximately 1100 m predominantly downwind of the TRL.

The dose to the MEI from October 1, 1995 to September 30, 1996 was 1.4×10^{-5} mrem (1.4×10^{-7} mSv). This is approximately 0.0001% of the Clean Air Act NESHAPs standard for the air pathway. Furthermore, this dose is well below the limit of 0.001 mrem stated by EPA to allow termination of NESHAPs monitoring.

A copy of the CAP88-PC printout containing the details of this assessment is provided in Attachment III of this report.

Conclusions

The effluent monitoring data discussed above indicate that tritium emissions from the TRL have been reduced to essentially zero (i.e., background levels). In addition, the environmental surveillance data indicate that tritium in the environs of the SNL/California site have been reduced to very low levels. These levels can be attributed to natural background, or the small amount of tritium emitted from Lawrence Livermore National Laboratory.

As shown in the dose assessment, the AEDE from SNL/California tritium emissions was well below the 0.001 mrem level at which EPA concurred that NESHAP monitoring would no longer be required. It also should be noted that there are no other sources at the SNL/California site which discharge radioactive materials to the environment. SNL/California no longer performs any radiological operations which have the potential to have an adverse impact on members of the public.

At this time, it is requested that EPA formally release DOE's Building 968 (formerly the Tritium Research Laboratory) from Radionuclide NESHAPs requirements under 40 CFR 61, Subpart H.

ATTACHMENT I

Proposed NESHAPs Monitoring Plan for the Tritium Research Laboratory

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

JUN 13 1995

George K. Laskar
Assistant Area Manager
Environment, Safety and Health
Department of Energy
P.O. Box 5400
Albuquerque, NM 87185-5400

Dear Mr. Laskar:

Thank you for your letter of May 30, 1995 transmitting the Proposed NESHAP Monitoring Plan for the SNL/California Tritium Research Laboratory (TRL) (February, 1995). This proposal (attached) describes the plan for emissions monitoring following shut-down of the TRL. We have reviewed this proposal and concur. Specifically, we agree with the following points:

1. If the emissions from the facility as determined by post-operational monitoring, produce an offsite AEDE from the air pathway less than 0.1 mrem but greater than 0.001 mrem, then periodic tritium emission monitoring will be performed as described in the plan.

2. Once the air pathway dose becomes less than 0.001 mrem AEDE, emissions monitoring may be discontinued and NESHAP reporting may be discontinued following a final submittal providing that documentation.

Please contact me at (415) 744-1048 or Shelly Rosenblum at (415) 744-1047 if you have any questions.

Sincerely,

Michael S. Bandrowski, Director
Office of Radiation & Indoor Air
A-1-1

attachment

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PROPOSED NESHAPS MONITORING PLAN FOR THE SNL/CALIFORNIA TRITIUM RESEARCH LABORATORY

Environmental Operations Department
Sandia National Laboratories/California

February 1995

This plan presents a strategy for compliance with the emission monitoring requirements of 40 CFR 61, Subpart H following the transition of the Tritium Research Laboratory at Sandia National Laboratories/California (SNL/CA).

Background

SNL is a research and development facility operated by Sandia Corporation for the US Department of Energy (DOE). Tritium is the only radionuclide routinely discharged to the atmosphere in measurable quantities from site operations. Essentially all tritium effluent originates from activities at the Tritium Research Laboratory (TRL), Building 968. Consequently, this facility is subject to Clean Air Act Radionuclide NESHAPs Rule, 40 CFR 61.

In September 1993, the DOE approved SNL/CA's plan to curtail tritium research at the California site; tritium experimentation ceased that same year. The removal of the available tritium inventory was completed October 1994. Shortly thereafter, the DOE reclassified the facility to a non-nuclear, low-hazard facility. Currently, efforts are underway to clean up residual tritium and characterize the radiological condition of the facility. In its present state, there is no potential for a release of tritium that could impact the public nor the general population of the site.

It is planned that the remaining contaminated equipment (principally the Vacuum Effluent Recovery System and the Gas Purification System) will be removed by the summer of 1995. This will eliminate any remaining source term within Building 968. However, due to the existence of a small amount of residual tritium, it will remain a radiological facility. Building 968 is a viable laboratory and will remain within DOE's institutional control; i.e., the facility will not be released for unrestricted use and will not have general public access.

NESHAPs Compliance

The TRL is subject to the National Emission Standards for Hazardous Air Pollutants (NESHAPs) Rule for Radionuclides, 40 CFR 61, specifically Subpart H for DOE facilities. Pursuant to Section 61.93(4)(i), continuous emission monitoring is required for a source that results in a projected annual radiological dose to a member of the public in excess of 0.1 mrem. The TRL has always maintained a continuous stack monitoring system that conforms to measurement methods outlined in Appendix B and ANSIN 13.1.

The stack monitoring system collects and analyzes a representative sample of the TRL gaseous effluent prior to being released to the atmosphere. The extraction manifold

comprises six sampling ports spaced across the diameter of the stack and is located approximately 50 feet up from the base of the stack. The sample line is routed down the inside wall of the stack to prevent condensation. The sample is passed through two ionization chambers providing real-time monitoring for tritium and then through a series of ethylene glycol bubblers. The bubblers serve as a integrative sampler to determine total tritium release. The bubbler array is capable of discriminating between the two primary forms of tritium: HT and HTO.

Tritium emissions to the environment have steadily decreased since the operations at the facility were terminated. In calendar year 1993, the total tritium discharge via the stack was 188 Ci, which resulted in a radiation dose to the MEI of 0.026 mrem EDE. This assessment was made using the EPA approved computer model CAP-88. Furthermore, it was conservatively assumed that all the tritium was in the more hazardous oxide chemical form and a 100% occupancy time at the nearest off-site resident. In 1994, the total tritium discharge to the atmosphere was 95 Ci. Even though the emissions from the TRL have been well below the 0.1 mrem threshold for the past three years, SNL/CA has maintained continuous stack monitoring.

To maintain continuity and completeness, SNL/CA plans to continue the radiological environmental surveillance program throughout the cleanup and transition process. This will include evaluation of all critical pathways and will provide direct measurements of the radiological condition of the surrounding environment.

Post Operational Monitoring Plan

The operational monitoring program supporting the TRL will terminate with the completion of the cleanup phase. SNL/CA will conduct post operational monitoring to verify the effectiveness of the facility cleanup and evaluate long term trends. The results of the post operational monitoring will provide the technical basis for defining future radiological monitoring at the TRL.

SNL/CA will maintain the current effluent monitoring and environmental surveillance system for one year following the completion of facility cleanup. This post operational monitoring will consist of the following:

1. Stack Effluent Monitoring: The facility will maintain the continuous integrating stack sampling system with the ethylene glycol bubblers. This data will be used to assess the impacts to local populations.

2. Wastewater Monitoring: All wastewater generated in Building 968 (excluding the sanitary systems) is collected and retained by two 2,500 gallon holding tanks. Each batch will be sampled and analyzed for tritium prior to discharge. This procedure will continue until the tritium concentration drops below the Federal and State public drinking water standard (20,000 pCi/L), after which time the tanks will be spot checked on a periodic basis.

3. Environmental Surveillance: The full radiological environmental surveillance network will be maintained to provide direct measurements of impacts on the local environment. This surveillance will evaluate any build-up in the environment and establish baseline information following cessation of tritium activities. Routine tritium measurements will continue to be made in ambient air, sanitary sewer effluent, storm water runoff.

Future NESHAPs Monitoring

The post operational monitoring data will serve as the technical basis for defining future radiological monitoring at the TRL. The extent of future monitoring will be based on the annual effective dose equivalent (AEDE) to a member of the general public. SNL/CA proposes following graded approach be used.

1. Periodic Confirmatory Monitoring

If the emissions from the facility produce an offsite AEDE from the air pathway that is less than 0.1 mrem but greater than 0.001 mrem, then periodic tritium emission monitoring will be performed. This will consist of semiannually sampling the stack effluent during a typical work cycle continuously for one week. Periodic measurements of tritium surface contamination within the building will be performed by the Health Physics Group.

In addition, the Environmental Operations Department at SNL/CA will continue to monitor ambient air, sanitary sewer effluent, and storm water runoff for the presence of tritium, as currently documented in the site Environmental Monitoring Plan. These surveillance activities also will denote the presence of any diffuse sources of tritium.

2. No Emission Monitoring

Once the air pathway dose becomes less than 0.001 mrem AEDE, SNL/CA will discontinue emission monitoring at the former TRL. At this point, DOE will no longer submit an annual NESHAPs compliance report to EPA for the SNL/CA facility.

Due to the history of tritium work performed at SNL/CA, certain elements of the radiological environmental surveillance program will be continued. SNL shall continue to monitor tritium levels at the site sanitary sewer outfall and in storm water runoff. In addition, both Lawrence Livermore National Laboratory and the California Department of Health Services (Agreement in Principle Program) will continue radiological monitoring in the Livermore area. This will provide additional independent assurance.

To ensure future compliance with the Radionuclide NESHAPs Rule, SNL/CA will continue to verify the inventory and use of radionuclides. If circumstances change such that a potential to emit radionuclides exists, SNL/CA will comply with all applicable requirements established in 40 CFR 61 Subpart H.

At the conclusion of post operational monitoring, the results will be summarized in a report and transmitted to EPA by the DOE. At that time, a plan for future monitoring will be presented. In summary, if emissions from the facility pose a maximum off-site impact of less than 0.001 mrem, DOE will request approval to discontinue further NESHAPs monitoring and reporting.

PROPOSED FUTURE NESHAPS MONITORING FOR BUILDING 968

Sandia National Laboratories/California

February 1995

I. Continuous Stack Emission Monitoring

Criteria:
- MEI: AEDE $\geq$ 0.1 mrem
- Throughout Facility Clean-up and Transition
- One Year Following Transition (i.e., post operational monitoring)

Monitoring System:
- Maintain Existing Stack Monitoring System
  (continuous integrated sampling with ethylene glycol bubblers; real-time monitoring with ionization chambers only until source term is removed)
- Maintain Wastewater Collection System
  (sample each batch prior to discharge while tank concentration exceed 20,000 pCi/L; spot check after tritium concentration drops below DWS)
- Maintain Environmental Monitoring System
  (ambient air tritium sampling network, sanitary sewer and storm water runoff sampling for tritium)

II. Periodic Confirmatory Monitoring

Criteria:
- MEI: 0.001 mrem < AEDE < 0.1 mrem

Monitoring System:
- Semiannually Sample Stack During a Typical Work Cycle Continuously for One Week
- Perform Periodic Health Physics Surface Contamination Surveys

III. No Emission Monitoring

Criteria:
- MEI: AEDE $\leq$ 0.001 mrem

(Discontinue annual NESHAPs Reporting)

ATTACHMENT II

Post-Operational

Monitoring Data

Table 1. Building 968 Tritium Emissions for the Post-Operational Monitoring Period

Date	Curies
Sep. 1995	0.024
Oct. 1995	0.000
Nov. 1995	0.000
Dec. 1995	0.000
Jan. 1996	0.028
Feb. 1996	0.010
Mar. 1996	0.008
Apr. 1996	0.008
Jun. 1996	0.009
Jul. 1996	0.014
Aug. 1996	0.001
Sep. 1996	0

Table 2. Ambient Air Tritium Monitoring Data

Location	Sample Number[5]	Parameter	Result	Error	Units	Qualifier[6]
ATS-01	ATS-01-090795	Tritium	4		pCi/m3	U
ATS-01	ATS-01-092195	Tritium	2		pCi/m3	U
ATS-01	ATS-08-092195	Tritium	2		pCi/m3	U
ATS-01	ATS-01-100595	Tritium	4		pCi/m3	U
ATS-01	ATS-01-101995	Tritium	3		pCi/m3	U
ATS-01	ATS-01-110295	Tritium	3		pCi/m3	U
ATS-01	ATS-01-111695	Tritium	4		pCi/m3	U
ATS-01	ATS-01-010496	Tritium	4		pCi/m3	U
ATS-01	ATS-01-011896	Tritium	8		pCi/m3	U
ATS-01	ATS-01-020196	Tritium	5		pCi/m3	U
ATS-01	ATS-01-021596	Tritium	-0.11	3.6	pCi/m3	U
ATS-01	ATS-08-021596	Tritium	-1.7	2.4	pCi/m3	U
ATS-01	ATS-01-022996	Tritium	-0.091	2.5	pCi/m3	U
ATS-01	ATS-01-031496	Tritium	-0.52	1.1	pCi/m3	U
ATS-01	ATS-01-032896	Tritium	0.26	0.86	pCi/m3	U
ATS-01	ATS-01-041296	Tritium	2.3	1.2	pCi/m3	J
ATS-01	ATS-01-042596	Tritium	-0.71	3.3	pCi/m3	U
ATS-01	ATS-01-050996	Tritium	-0.89	1.7	pCi/m3	U
ATS-01	ATS-01-052396	Tritium	1.5	3.0	pCi/m3	U
ATS-01	ATS-01-060696	Tritium	1.8	2.0	pCi/m3	U
ATS-01	ATS-01-062096	Tritium	0.99	1.4	pCi/m3	U
ATS-01	ATS-01-070396	Tritium	1.2	1.8	pCi/m3	U
ATS-01	ATS-01-071796	Tritium	-0.80	4.1	pCi/m3	U
ATS-02	ATS-02-090795	Tritium	3		pCi/m3	U
ATS-02	ATS-02-092195	Tritium	3.7	1.3	pCi/m3	
ATS-02	ATS-02-100595	Tritium	4		pCi/m3	U
ATS-02	ATS-02-101995	Tritium	3		pCi/m3	U

[5] The last six digits of the sample number indicate the date the sample was collected.
[6] The qualifier "U" indicates that the tritium activity was below the analytical detection limit. The qualifier "J" indicates that the tritium activity was above the detection limit, but below the reporting limit.

Location	Sample Number	Parameter	Result	Error	Units	Qualifier
ATS-02	ATS-02-110295	Tritium	3		pCi/m3	U
ATS-02	ATS-02-111695	Tritium	3		pCi/m3	U
ATS-02	ATS-02-113095	Tritium	4		pCi/m3	U
ATS-02	ATS-02-121495	Tritium	7		pCi/m3	U
ATS-02	ATS-08-121495	Tritium	7		pCi/m3	U
ATS-02	ATS-08-010596	Tritium	6.6	2.0	pCi/m3	
ATS-02	ATS-02-010496	Tritium	5		pCi/m3	U
ATS-02	ATS-02-011896	Tritium	4		pCi/m3	U
ATS-02	ATS-02-020196	Tritium	5		pCi/m3	U
ATS-02	ATS-02-021596	Tritium	0.12	3.9	pCi/m3	U
ATS-02	ATS-02-022996	Tritium	3.0	3.4	pCi/m3	U
ATS-02	ATS-02-031496	Tritium	-1.2	1.1	pCi/m3	U
ATS-02	ATS-02-032896	Tritium	1.3	0.75	pCi/m3	J
ATS-02	ATS-08-032896	Tritium	2.1	1.6	pCi/m3	U
ATS-02	ATS-02-041296	Tritium	2.2	1.1	pCi/m3	J
ATS-02	ATS-02-042596	Tritium	0.74	2.6	pCi/m3	U
ATS-02	ATS-02-050996	Tritium	0.56	1.1	pCi/m3	U
ATS-02	ATS-02-052396	Tritium	0.54	2.5	pCi/m3	U
ATS-02	ATS-02-060696	Tritium	1.6	2.1	pCi/m3	U
ATS-02	ATS-02-062096	Tritium	2.3	1.3	pCi/m3	J
ATS-02	ATS-02-070396	Tritium	2.2	1.8	pCi/m3	U
ATS-02	ATS-02-071796	Tritium	-1.1	1.8	pCi/m3	U
ATS-03	ATS-03-090795	Tritium	11	2.6	pCi/m3	
ATS-03	ATS-03-092195	Tritium	42	2.3	pCi/m3	
ATS-03	ATS-03-100595	Tritium	4		pCi/m3	U
ATS-03	ATS-03-101995	Tritium	3		pCi/m3	U
ATS-03	ATS-03-110295	Tritium	3		pCi/m3	U
ATS-03	ATS-03-111695	Tritium	3.4	2.1	pCi/m3	
ATS-03	ATS-03-113095	Tritium	5		pCi/m3	U
ATS-03	ATS-08-113095	Tritium	4		pCi/m3	U
ATS-03	ATS-03-121495	Tritium	9		pCi/m3	U
ATS-03	ATS-03-010496	Tritium	4		pCi/m3	U
ATS-03	ATS-03-011896	Tritium	4		pCi/m3	U
ATS-03	ATS-03-020196	Tritium	5		pCi/m3	U
ATS-03	ATS-03-021596	Tritium	2.3	3.1	pCi/m3	U
ATS-03	ATS-03-031496	Tritium	0.92	1.1	pCi/m3	U
ATS-03	ATS-08-031496	Tritium	1.5	1.2	pCi/m3	U
ATS-03	ATS-03-032896	Tritium	3.9	0.86	pCi/m3	J
ATS-03	ATS-03-041296	Tritium	3.4	1.1	pCi/m3	J
ATS-03	ATS-03-042596	Tritium	5.4	4.3	pCi/m3	U
ATS-03	ATS-03-050996	Tritium	1.3	1.9	pCi/m3	U
ATS-03	ATS-03-052396	Tritium	3.5	3.4	pCi/m3	U
ATS-03	ATS-03-060696	Tritium	3.0	2.3	pCi/m3	U
ATS-03	ATS-03-062096	Tritium	2.2	1.5	pCi/m3	J
ATS-03	ATS-03-070396	Tritium	3.9	2.0	pCi/m3	J
ATS-03	ATS-03-071796	Tritium	2.6	2.2	pCi/m3	U
ATS-04	ATS-04-090795	Tritium	4		pCi/m3	U
ATS-04	ATS-04-092195	Tritium	2		pCi/m3	U
ATS-04	ATS-04-100595	Tritium	3		pCi/m3	U

Location	Sample Number	Parameter	Result	Error	Units	Qualifier
ATS-04	ATS-04-101995	Tritium	3		pCi/m3	U
ATS-04	ATS-04-110295	Tritium	3		pCi/m3	U
ATS-04	ATS-04-111695	Tritium	3		pCi/m3	U
ATS-04	ATS-08-111695	Tritium	3		pCi/m3	U
ATS-04	ATS-04-113095	Tritium	4		pCi/m3	U
ATS-04	ATS-04-121495	Tritium	7		pCi/m3	U
ATS-04	ATS-04-010496	Tritium	4		pCi/m3	U
ATS-04	ATS-04-011896	Tritium	4		pCi/m3	U
ATS-04	ATS-04-020196	Tritium	5		pCi/m3	U
ATS-04	ATS-04-021596	Tritium	1.7	3.9	pCi/m3	U
ATS-04	ATS-04-022996	Tritium	0.56	2.6	pCi/m3	U
ATS-04	ATS-08-022996	Tritium	0.60	3.3	pCi/m3	U
ATS-04	ATS-04-031496	Tritium	-0.40	0.92	pCi/m3	U
ATS-04	ATS-04-032896	Tritium	2.2	0.81	pCi/m3	J
ATS-04	ATS-04-041296	Tritium	1.0	0.84	pCi/m3	J
ATS-04	ATS-04-042596	Tritium	0.77	3.1	pCi/m3	U
ATS-04	ATS-04-050996	Tritium	-0.059	1.7	pCi/m3	U
ATS-04	ATS-04-052396	Tritium	-0.85	2.8	pCi/m3	U
ATS-04	ATS-08-052396	Tritium	-0.30	2.7	pCi/m3	U
ATS-04	ATS-04-060696	Tritium	1.8	2.1	pCi/m3	U
ATS-04	ATS-04-062096	Tritium	0.13	1.3	pCi/m3	U
ATS-04	ATS-04-070396	Tritium	2.0	1.8	pCi/m3	U
ATS-04	ATS-04-071796	Tritium	-2.0	2.2	pCi/m3	U
ATS-05	ATS-05-090795	Tritium	4		pCi/m3	U
ATS-05	ATS-08-090795	Tritium	4		pCi/m3	U
ATS-05	ATS-05-092195	Tritium	2		pCi/m3	U
ATS-05	ATS-05-100595	Tritium	4		pCi/m3	U
ATS-05	ATS-05-110295	Tritium	3		pCi/m3	U
ATS-05	ATS-05-111695	Tritium	3		pCi/m3	U
ATS-05	ATS-05-121495	Tritium	8		pCi/m3	U
ATS-05	ATS-05-010496	Tritium	4		pCi/m3	U
ATS-05	ATS-05-020196	Tritium	6		pCi/m3	U
ATS-05	ATS-05-021596	Tritium	-1.4	3.7	pCi/m3	U
ATS-05	ATS-05-022996	Tritium	3.4	3.5	pCi/m3	U
ATS-05	ATS-05-031496	Tritium	-1.4	1.5	pCi/m3	U
ATS-05	ATS-05-032896	Tritium	-0.32	1.6	pCi/m3	U
ATS-05	ATS-05-041296	Tritium	0.97	0.98	pCi/m3	U
ATS-05	ATS-08-041296	Tritium	1.6	0.96	pCi/m3	U
ATS-05	ATS-05-042596	Tritium	1.3	3.1	pCi/m3	U
ATS-05	ATS-05-050996	Tritium	0.12	1.8	pCi/m3	U
ATS-05	ATS-05-052396	Tritium	-1.4	3.3	pCi/m3	U
ATS-05	ATS-05-060696	Tritium	2.6	2.1	pCi/m3	U
ATS-05	ATS-08-060696	Tritium	2.0	2.1	pCi/m3	U
ATS-05	ATS-05-062096	Tritium	1.3	1.4	pCi/m3	U
ATS-05	ATS-05-070396	Tritium	2.2	1.9	pCi/m3	U
ATS-05	ATS-05-071796	Tritium	-0.13	2.1	pCi/m3	U
ATS-06	ATS-06-090795	Tritium	4		pCi/m3	U
ATS-06	ATS-06-092195	Tritium	3		pCi/m3	U
ATS-06	ATS-06-100595	Tritium	7		pCi/m3	U

Location	Sample Number	Parameter	Result	Error	Units	Qualifier
ATS-06	ATS-08-100595	Tritium	4		pCi/m3	U
ATS-06	ATS-06-101995	Tritium	2		pCi/m3	U
ATS-06	ATS-06-111695	Tritium	6		pCi/m3	U
ATS-06	ATS-06-113095	Tritium	5		pCi/m3	U
ATS-06	ATS-06-121495	Tritium	9		pCi/m3	U
ATS-06	ATS-06-010496	Tritium	5		pCi/m3	U
ATS-06	ATS-06-011896	Tritium	6		pCi/m3	U
ATS-06	ATS-06-020196	Tritium	7		pCi/m3	U
ATS-06	ATS-08-020196	Tritium	5		pCi/m3	U
ATS-06	ATS-06-021596	Tritium	-0.11	3.3	pCi/m3	U
ATS-06	ATS-06-022996	Tritium	2.9	3.2	pCi/m3	U
ATS-06	ATS-06-031496	Tritium	0.53	0.90	pCi/m3	U
ATS-06	ATS-06-032896	Tritium	2.5	1.7	pCi/m3	U
ATS-06	ATS-06-041296	Tritium	2.8	1.0	pCi/m3	J
ATS-06	ATS-06-042596	Tritium	1.8	3.4	pCi/m3	U
ATS-06	ATS-08-042596	Tritium	2.2	3.6	pCi/m3	U
ATS-06	ATS-06-050996	Tritium	0.19	1.8	pCi/m3	U
ATS-06	ATS-06-052396	Tritium	0.44	3.0	pCi/m3	U
ATS-06	ATS-06-060696	Tritium	0.074	2.0	pCi/m3	U
ATS-06	ATS-06-062096	Tritium	1.6	1.4	pCi/m3	U
ATS-06	ATS-06-070396	Tritium	2.2	2.1	pCi/m3	U
ATS-06	ATS-06-071796	Tritium	0.39	2.1	pCi/m3	U
ATS-07	ATS-07-090795	Tritium	4		pCi/m3	U
ATS-07	ATS-07-092195	Tritium	3		pCi/m3	U
ATS-07	ATS-07-100595	Tritium	5		pCi/m3	U
ATS-07	ATS-07-101995	Tritium	4		pCi/m3	U
ATS-07	ATS-07-110295	Tritium	4		pCi/m3	U
ATS-07	ATS-07-111695	Tritium	4		pCi/m3	U
ATS-07	ATS-07-121495	Tritium	20		pCi/m3	U
ATS-07	ATS-07-010496	Tritium	4		pCi/m3	U
ATS-07	ATS-07-011896	Tritium	4		pCi/m3	U
ATS-07	ATS-07-020196	Tritium	5		pCi/m3	U
ATS-07	ATS-07-021596	Tritium	-4.9	3.5	pCi/m3	U
ATS-07	ATS-07-022996	Tritium	-0.48	2.6	pCi/m3	U
ATS-07	ATS-07-031496	Tritium	-0.60	1.3	pCi/m3	U
ATS-07	ATS-07-032896	Tritium	-0.91	1.3	pCi/m3	U
ATS-07	ATS-07-041296	Tritium	0.092	0.84	pCi/m3	U
ATS-07	ATS-07-042596	Tritium	-0.82	2.8	pCi/m3	U
ATS-07	ATS-07-050996	Tritium	-3.7	1.7	pCi/m3	U
ATS-07	ATS-07-052396	Tritium	-3.1	2.9	pCi/m3	U
ATS-07	ATS-07-060696	Tritium	-0.39	2.0	pCi/m3	U
ATS-07	ATS-07-062096	Tritium	0.89	1.7	pCi/m3	U
ATS-07	ATS-07-070396	Tritium	0.76	2.6	pCi/m3	U
ATS-07	ATS-07-071796	Tritium	-0.40	2.5	pCi/m3	U

ATTACHMENT III

Dose Assessment

CAP88 Printout

C A P 8 8 - P C

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S Y N O P S I S R E P O R T

Non-Radon Individual Assessment
Sep 16, 1996 1:16 pm

Facility: Sandia National Laboratories
Address: 7011 East Ave.
City: Livermore
State: CA Zip: 94550

Effective Dose Equivalent
(mrem/year)

1.39E-05

At This Location: 1100 Meters Northeast
Source Category: Tritium Research Laboratory
Source Type: Stack
Emission Year: 1996

Comments: NESHAPs Radiological Dose Assessment for the Close-out of the Tritium Research Laboratory

Dataset Name: Sandia96.TRL
Dataset Date: Sep 16, 1996 1:16 pm
Wind File: WNDFILES\SAND95.WND

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 1100 Meters Northeast
Lifetime Fatal Cancer Risk: 3.79E-10

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Dose Equivalent (mrem/y)
GONADS	1.33E-05
BREAST	1.33E-05
R MAR	1.32E-05
LUNGS	1.33E-05
THYROID	1.32E-05
ENDOST	1.05E-05
RMNDR	1.58E-05
EFFEC	1.39E-05

RADIONUCLIDE EMISSIONS DURING THE YEAR 1996

Nuclide	Class	Size	Source #1 Ci/y	TOTAL Ci/y
H-3	*	0.00	1.0E-01	1.0E-01

SITE INFORMATION

Temperature: 15 degrees C
Precipitation: 33 cm/y
Mixing Height: 700 m

SOURCE INFORMATION

Source Number:	1
Stack Height (m):	30.00
Diameter (m):	1.40
Plume Rise Momentum (m/s): (Exit Velocity)	1.50E+00

AGRICULTURAL DATA

	Vegetable	Milk	Meat
Fraction Home Produced:	0.076	0.000	0.008
Fraction From Assessment Area:	0.200	0.800	0.200
Fraction Imported:	0.724	0.200	0.792

Food Arrays were not generated for this run.
Default Values used.

DISTANCES USED FOR MAXIMUM INDIVIDUAL ASSESSMENT

1100

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Version 1.00

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G E N E R A L D A T A

Non-Radon Individual Assessment
Sep 16, 1996 1:16 pm

Facility: Sandia National Laboratories
Address: 7011 East Ave.
City: Livermore
State: CA Zip: 94550

Source Category: Tritium Research Laboratory
Source Type: Stack
Emission Year: 1996

Comments: NESHAPs Radiological Dose Assessment for the Close-out of the Tritium Research Laboratory

Dataset Name: Sandia96.TRL
Dataset Date: Sep 16, 1996 1:16 pm
Wind File: WNDFILES\SAND95.WND

VALUES FOR RADIONUCLIDE-DEPENDENT PARAMETERS

Nuclide	Clearance Class	Particle Size (microns)	Scavenging Coefficient (per second)	Dry Deposition Velocity (m/s)
H-3	*	0.0	0.00E+00	0.00E+00

VALUES FOR RADIONUCLIDE-DEPENDENT PARAMETERS

	DECAY CONSTANT (PER DAY)			TRANSFER COEFFICIENT	
Nuclide	Radio-active (1)	Surface	Water	Milk (2)	Meat (3)
H-3	0.00E+00	5.48E-05	0.00E+00	0.00E+00	0.00E+00

FOOTNOTES:
(1) Effective radioactive decay constant in plume; set to zero if less than 1.0E-2

(2) Fraction of animal's daily intake of nuclide which appears in each L of milk (days/L)

(3) Fraction of animal's daily intake of nuclide which appears in each kg of meat (days/kg)

VALUES FOR RADIONUCLIDE-DEPENDENT PARAMETERS

	CONCENTRATION UPTAKE FACTOR		GI UPTAKE FRACTION	
Nuclide	Forage (1)	Edible (2)	Inhalation	Ingestion
H-3	0.00E+00	0.00E+00	9.50E-01	9.50E-01

FOOTNOTES: (1) Concentration factor for uptake of nuclide from soil for pasture and forage (in pCi/kg dry weight per pCi/kg dry soil)

(2) Concentration factor for uptake of nuclide from soil by edible parts of crops (in pCi/kg wet weight per pCi/kg dry soil)

H-3 DOSE CONVERSION FACTOR FOR WATER INGESTION (rem-cc/pCi-y): 5.70E-02

VALUES FOR RADIONUCLIDE-INDEPENDENT PARAMnimal feed-milk-man (day)

Time from slaughter to consumption (day)	2.00E+01
WEATHERING	
Removal rate constant for physical loss (per hr)	2.90E-03
CROP EXPOSURE DURATION	
Pasture grass (hr)	7.20E+02
Crops/leafy vegetables (hr)	1.44E+03
AGRICULTURAL PRODUCTIVITY	
Grass-cow-milk-man pathway (kg/sq m)	2.80E-01
Produce/leafy veg for human consumption (kg/sq m)	7.16E-01
FALLOUT INTERCEPTION FRACTIONS	
Vegetables	2.00E-01
Pasture	5.70E-01
GRAZING PARAMETERS	
Fraction of year animals graze on pasture	4.00E-01
Fraction of daily feed that is pasture grass when animal grazes on pasture	4.30E-01

VALUES FOR RADIONUCLIDE-INDEPENDENT PARAMETERS

ANIMAL FEED CONSUMPTION FACTORS	
Contaminated feed/forage (kg/day, dry weight)	1.56E+01
DAIRY PRODUCTIVITY	
Milk production of cow (L/day)	1.10E+01
MEAT ANIMAL SLAUGHTER PARAMETERS	
Muscle mass of animal at slaughter (kg)	2.00E+02
Fraction of herd slaughtered (per day)	3.81E-03
DECONTAMINATION	
Fraction of radioactivity retained after washing for leafy vegetables and produce	5.00E-01
FRACTIONS GROWN IN GARDEN OF INTEREST	
Produce ingested	1.00E+00
Leafy vegetables ingested	1.00E+00
INGESTION RATIOS:	
IMMEDIATE SURROUNDING AREA/TOTAL WITHIN AREA	
Vegetables	2.75E-01
Meat	3.85E-02
Milk	0.00E+00
MINIMUM INGESTION FRACTIONS FROM OUTSIDE AREA (Minimum fractions of food types from outside area listed below are actual fixed values.)	
Vegetables	7.24E-01
Meat	7.92E-01
Milk	2.00E-01

HUMAN FOOD UTILIZATION FACTORS	
Produce ingestion (kg/y)	1.76E+02
Milk ingestion (L/y)	1.12E+02
Meat ingestion (kg/y)	8.50E+01
Leafy vegetable ingestion (kg/y)	1.80E+01
SWIMMING PARAMETERS	
Fraction of time spent swimming	0.00E+00
Dilution factor for water (cm)	1.00E+00

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Version 1.00

Clean Air Act Assessment Package - 1988

W E A T H E R D A T A

Non-Radon Individual Assessment
Sep 16, 1996 1:16 pm

Facility: Sandia National Laboratories
Address: 7011 East Ave.
City: Livermore
State: CA Zip: 94550

Source Category: Tritium Research Laboratory
Source Type: Stack
Emission Year: 1996

Comments: NESHAPs Radiological Dose Assessment for the Close-out of the Tritium Research Laboratory

Dataset Name: Sandia96.TRL
Dataset Date: Sep 16, 1996 1:16 pm
Wind File: WNDFILES\SAND95.WND

HARMONIC AVERAGE WIND SPEEDS (WIND TOWARDS)

Dir	Pasquill Stability Class A	B	C	D	E	F	G	Wind Frequency
N	0.702	1.535	3.440	2.396	1.616	0.866	0.812	0.045
NNW	0.732	1.519	2.622	2.206	1.146	0.917	0.783	0.038
NW	0.996	2.694	1.728	1.514	1.460	0.931	0.850	0.071
WNW	0.839	0.921	1.719	1.215	1.096	0.930	0.814	0.083
W	0.868	0.812	1.038	0.958	0.803	0.745	0.727	0.051
WSW	0.873	1.124	1.291	1.529	1.014	0.740	0.710	0.037
SW	1.005	2.445	2.319	2.738	1.121	1.085	0.673	0.050
SSW	1.211	1.988	3.056	2.794	1.537	0.779	0.793	0.036
S	1.229	2.005	3.315	2.745	1.805	1.150	0.881	0.026
SSE	1.106	1.327	2.064	4.292	0.846	1.312	0.675	0.017
SE	0.997	1.743	1.717	2.364	0.915	1.053	0.740	0.015
ESE	1.163	1.782	2.527	3.413	1.930	0.740	0.658	0.027
E	1.276	1.891	2.920	3.387	2.176	0.939	0.734	0.093
ENE	1.192	2.296	3.241	3.168	1.941	1.053	0.790	0.162
NE	0.925	1.576	3.386	3.434	1.886	0.886	0.770	0.181
NNE	0.792	1.405	2.134	2.774	1.668	1.025	0.754	0.068

ARITHMETIC AVERAGE WIND SPEEDS (WIND TOWARDS)

Dir	Pasquill Stability Class A	B	C	D	E	F	G
N	0.719	2.150	3.842	3.623	2.032	1.103	0.938
NNW	0.910	1.675	3.600	3.372	1.435	1.121	0.930
NW	1.221	2.840	2.683	2.002	1.909	1.153	1.002

WNW	0.967	1.100	2.350	1.728	1.402	1.138	0.950
W	1.062	1.127	1.586	1.433	1.018	0.902	0.827
WSW	1.091	1.244	2.112	2.444	1.537	0.896	0.787
SW	1.278	2.662	2.922	3.304	1.385	1.408	0.727
SSW	1.679	2.486	3.409	3.147	1.900	1.150	0.914
S	1.586	2.416	3.690	3.562	2.250	1.233	0.964
SSE	1.338	1.865	3.065	4.945	1.133	1.467	0.700
SE	1.249	2.129	2.183	3.225	1.229	1.250	0.938
ESE	1.436	2.256	3.132	4.056	2.388	0.922	0.729
E	1.629	2.326	3.559	4.178	2.911	1.300	0.820
ENE	1.524	2.687	3.670	4.072	2.642	1.259	0.927
NE	1.060	2.163	4.019	4.335	2.516	1.062	0.865
NNE	0.915	1.756	2.757	3.795	2.243	1.246	0.910

FREQUENCIES OF STABILITY CLASSES (WIND TOWARDS)

	Pasquill Stability Class						
Dir	A	B	C	D	E	F	G
N	0.0427	0.0053	0.0320	0.4160	0.1733	0.0907	0.2400
NNW	0.0322	0.0129	0.0289	0.3312	0.1768	0.0932	0.3248
NW	0.0408	0.0085	0.0102	0.2891	0.2993	0.1122	0.2398
WNW	0.0347	0.0072	0.0145	0.3719	0.2851	0.0941	0.1925
W	0.0619	0.0262	0.0167	0.2833	0.2452	0.1095	0.2571
WSW	0.1151	0.0296	0.0559	0.3520	0.1316	0.0855	0.2303
SW	0.1111	0.0773	0.2246	0.4034	0.0652	0.0290	0.0894
SSW	0.2761	0.1717	0.3165	0.1077	0.0202	0.0135	0.0943
S	0.3458	0.2103	0.2383	0.0981	0.0280	0.0140	0.0654
SSE	0.4507	0.1620	0.1197	0.0775	0.0211	0.0423	0.1268
SE	0.5952	0.1349	0.0476	0.0317	0.0556	0.0317	0.1032
ESE	0.4425	0.1416	0.0841	0.1814	0.0354	0.0398	0.0752
E	0.2057	0.1397	0.1721	0.3182	0.0944	0.0246	0.0453
ENE	0.0590	0.0620	0.1755	0.4892	0.1538	0.0217	0.0388
NE	0.0233	0.0126	0.0705	0.6727	0.1530	0.0266	0.0413
NNE	0.0479	0.0160	0.0248	0.5337	0.1879	0.0656	0.1241
TOT	0.1057	0.0549	0.1000	0.4105	0.1579	0.0518	0.1194

ADDITIONAL WEATHER INFORMATION

Average Air Temperature:	15.0 degrees C
	288.2 K
Precipitation:	33.0 cm/y
Lid Height:	700 meters
Surface Roughness Length:	0.010 meters
Height Of Wind Measurements:	10.0 meters

Average Wind Speed: 1.235 m/s

Vertical Temperature Gradients:

STABILITY E	0.073 k/m
STABILITY F	0.109 k/m
STABILITY G	0.146 k/m

C A P 8 8 - P C

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Clean Air Act Assessment Package - 1988

D O S E A N D R I S K E Q U I V A L E N T S U M M A R I E S

Non-Radon Individual Assessment
Sep 16, 1996 1:16 pm

Facility: Sandia National Laboratories
Address: 7011 East Ave.
City: Livermore
State: CA Zip: 94550

Source Category: Tritium Research Laboratory
Source Type: Stack
Emission Year: 1996

Comments: NESHAPs Radiological Dose Assessment for the Close-out of the Tritium Research Laboratory

Dataset Name: Sandia96.TRL
Dataset Date: Sep 16, 1996 1:16 pm
Wind File: WNDFILES\SAND95.WND

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y) TR#1TRT009TRE

GONADS	1.33E-05
BREAST	1.33E-05
R MAR	1.32E-05
LUNGS	1.33E-05
THYROID	1.32E-05
ENDOST	1.05E-05
RMNDR	1.58E-05
EFFEC	1.39E-05

PATHWAY EFFECTIVE DOSE EQUIVALENT SUMMARY

Pathway	Selected Individual (mrem/y)
INGESTION	7.77E-06
INHALATION	6.16E-06
AIR IMMERSION	0.00E+00
GROUND SURFACE	0.00E+00
INTERNAL	1.39E-05
EXTERNAL	0.00E+00
TOTAL	1.39E-05

NUCLIDE EFFECTIVE DOSE EQUIVALENT SUMMARY

Nuclide	Selected Individual (mrem/y)
H-3	1.39E-05
TOTAL	1.39E-05

CANCER RISK SUMMARY

Cancer	Selected Individual Total Lifetime Fatal Cancer Risk
LEUKEMIA	4.18E-11
BONE	1.85E-12
THYROID	6.01E-12
BREAST	5.20E-11
LUNG	6.61E-11
STOMACH	5.02E-11
BOWEL	2.73E-11
LIVER	4.63E-11
PANCREAS	3.15E-11
URINARY	1.72E-11
OTHER	3.85E-11
TOTAL	3.79E-10

PATHWAY RISK SUMMARY

Pathway	Selected Individual Total Lifetime Fatal Cancer Risk
INGESTION	2.10E-10
INHALATION	1.69E-10
AIR IMMERSION	0.00E+00
GROUND SURFACE	0.00E+00
INTERNAL	3.79E-10
EXTERNAL	0.00E+00

TOTAL	3.79E-10

NUCLIDE RISK SUMMARY

Nuclide	Selected Individual Total Lifetime Fatal Cancer Risk
H-3	3.79E-10
TOTAL	3.79E-10

INDIVIDUAL EFFECTIVE DOSE EQUIVALENT RATE (mrem/y)
(All Radionuclides and Pathways)

	Distance (m)
Direction	1100
N	8.0E-06
NNW	7.7E-06
NW	1.0E-05
WNW	1.3E-05
W	1.1E-05
WSW	8.2E-06
SW	8.1E-06
SSW	6.9E-06
S	6.6E-06
SSE	6.4E-06
SE	6.5E-06
ESE	6.8E-06
E	9.2E-06
ENE	1.3E-05
NE	1.4E-05
NNE	9.3E-06

INDIVIDUAL LIFETIME RISK (deaths)
(All Radionuclides and Pathways)

	Distance (m)
Direction	1100
N	2.2E-10
NNW	2.1E-10
NW	2.8E-10
WNW	3.5E-10
W	2.9E-10
WSW	2.2E-10
SW	2.2E-10
SSW	1.9E-10
S	1.8E-10
SSE	1.7E-10
SE	1.7E-10
ESE	1.8E-10
E	2.5E-10
ENE	3.5E-10
NE	3.8E-10
NNE	2.5E-10

Sandia National Laboratories
Operated for the U.S. Department of Energy by
Sandia Corporation

Livermore, California 94551-0969

date: September 30, 1996

to: James J. Bartel, 8418

from: Toff B. Garcia, 8421

subject: TRL Environmental Stack Monitoring Results

The final environmental stack release total for the post-operational tritium monitoring of the former TRL was 78 millicuries. The post-operational tritium monitoring period was from January 11, 1996 to September 30, 1996. During the period of time from October 1, 1995 to January 11, 1996, the ventilation system was secured for repairs and renovation and no monitoring was performed.

It is important to note that the average release for the first six months of CY 1996 was ~425 μCi/day. This was mainly do to the process of remediating affected building ventilation system ducting. Following this period, the average release for the remainder of the monitoring period was ~ 1.2 μCi/day. The data clearly indicates that we have successfully meet the required criteria for termination of environmental stack monitoring. If for some unseen reason should continued monitoring be required beyond October 1996, we will need to have the stack monitoring flow meters recalibrated. Additionally, I will continue to perform stack monitoring until I am officially notified by you that I can shutdown the system.

I would like to thank you for the opportunity to be involved with the TRL project. I feel that I have completed an important and thoroughly successful project from start to finish from which I can be extremely proud.

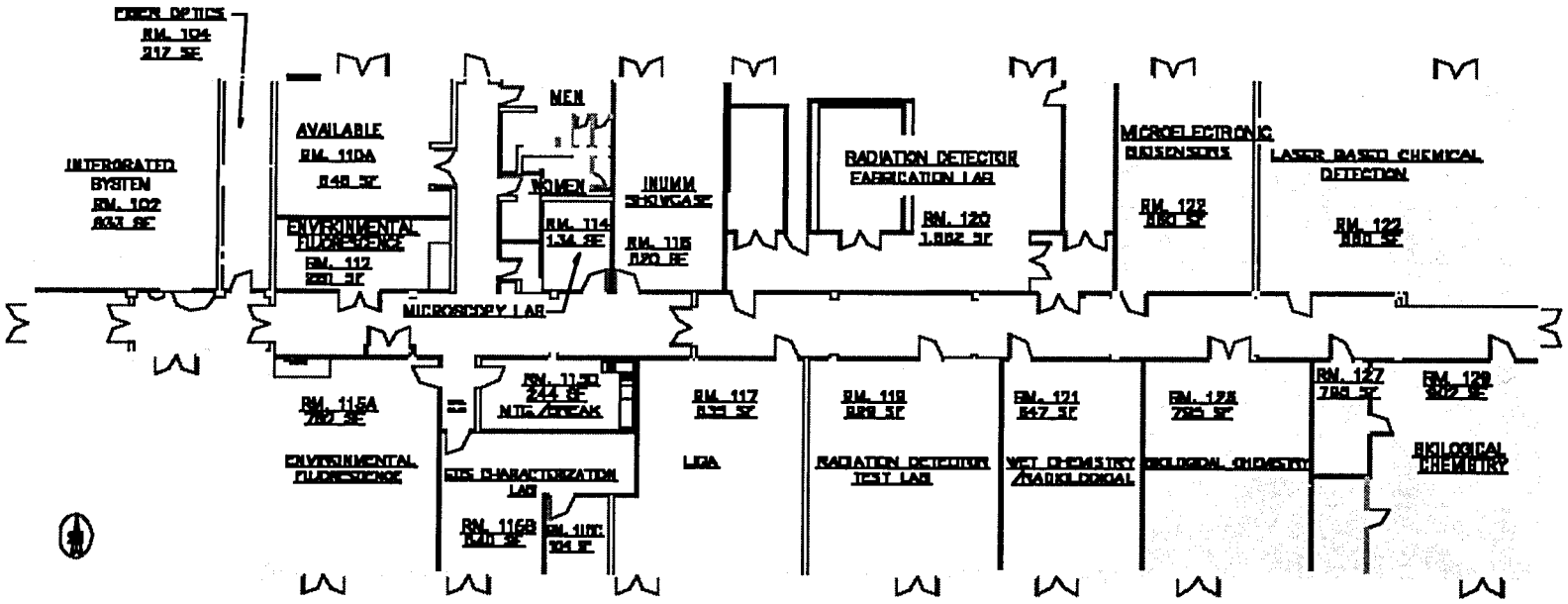
cc:
D. A. Wright 8421
D. Brekke 8418
D. Putz 8346
A. Johnson 8346

APPENDIX F

PRESENT (1996) BUILDING 968 FACILITY DESCRIPTION & DRAWING

ROOM	LABORATORY PROJECT DESCRIPTION
115A	Remote Sensor Development Laboratory : This laboratory will support the development of new standoff and point chemical sensors. Two programs that will use this laboratory take advantage of new infrared technologies to make chemical measurements that have not been possible before. An ultimate goal of this work is to generate hand-held sensors that are capable of precisely identifying and measuring broad classes of gas phase chemicals for applications such as counterproliferation and pollution monitoring.
112	Environmental Fluorescence Laboratory: This laboratory is a facility for characterizing fluorescence signatures from chemicals and man-made and environmental materials. It is equipped to precisely (and absolutely) measure the absorption and emission spectra of these materials and also the time response of these properties. It is also equipped to measure changes in these properties that occur as a function of environmental effects such as humidity, atmospheric composition, and exposure to sunlight.
114	Microscopy Laboratory: The radiation sensor team will analyze surfaces of detector-grade crystals and thin films deposited on these crystals.
116	Electronic Circuit Design Analysis Laboratory: This room will provide support for analysis of electronic circuit design using a Computer workstation.
119	Radiation Detector Testing Laboratory: Planned projects include the development of new solid state radiation detector systems. These detector systems include devices capable of counting, imaging and performing energy spectroscopy on gamma-rays, neutrons and charged particles. In addition to developing radiation detector systems, the laboratory will also be used for detailed analysis of the behavior of semiconductor detectors with the goal of improving the performance of future devices.
122	Microelectronic Biosensors Laboratory: Project activities include development of enzyme biochemistry and enzyme attachment chemistry, systems engineering, systems integration, bench scale test capabilities to produce bioFET microelectronic biosensor devices.
120	Semiconductor fabrication Laboratory: The semiconductor fabrication laboratory at the CRDL capabilities are for producing new and novel types of radiation detectors. The semiconductor fabrication laboratory has facilities capable of sectioning, slicing, and polishing semiconductor materials and a class 1000 clean room with laminar flow wet stations, full photolithography support and inspection stations. Furnace areas allow for diffusion processes, annealing processes and some forms of crystal growth. The laboratory is also equipped with thin film coating equipment, a dual filament evaporator, a RF/DC sputter system and a parylene coater.
125 127 129	Analytical, Synthetic, & Biochemistry Chemistry Laboratory: Activities involve the analysis of various organic environmental toxins, the detection of chemical and non-infectious biological warfare agents, sequencing and sizing

	of DNA, and the analysis of energetic materials. Research activities are directed toward the detection and analysis of minute quantities of chemical and biochemical compounds.
126	Laser Based Chemical Detection Laboratory: The project goal is to develop a new generation of chemical sensors that support a wide range of US security missions in defense, energy and environment. This approach is to develop chemical analysis instrumentation/devices that will provide very high sensitivity and selectivity because much of the chemical information we wish to obtain is typically hidden complex chemical mixtures. We combine this with the use of laser spectroscopy and mass spectrometry to achieve high detection sensitivity; current projects involve environmental analysis, DNA sequencing/sizing and material aging studies.



B-968 CHEMICAL AND RADIATION DETECTION LABORATORY

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