30/11-85 WFB (1)
I - 18964
DA-0728-5
DOE/NV/10327-5
(REVISION 1)

DOE/NV/10327-5
(REVISION 1)

NEVADA TEST SITE
AREA 25

RADIOLOGICAL SURVEY AND CLEANUP PROJECT
1974 - 1983

(A REVISED FINAL REPORT)

BY
M. G. MILLER

DECEMBER 1984

WORK PERFORMED UNDER
CONTRACT NO. DE-AC08-84NV10327

REYNOLDS ELECTRICAL & ENGINEERING CO., INC.
POST OFFICE BOX 14400
LAS VEGAS, NV 89114

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

DISCLAIMER

This report was prepared as an account of work sponsored by the United States Government. Neither the United States government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Printed in the United States of America
Available from:
National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
NTIS price codes
Printed copy: A04
Microfiche copy: A01

Codes are used for pricing all publications. The code is determined by the number of pages in the publication. Information pertaining to the pricing codes can be found in the current issues of the following publications, which are generally available in most libraries: Energy Research Abstracts, (ERA); Government Reports Announcement and Index (GRA and I); Scientific and Technical Abstract Reports (STAR); and publication, NTIS-PR-360 available from (NTIS) at the above address.

NOTICE
PORTIONS OF THIS REPORT ARE ILLEGIBLE.

**It has been reproduced from the best
available copy to permit the broadest
possible availability.**

DOE/NV/10327-5
(REVISION 1)

DOE/NV/10327--5-Rev.1

DE85 004927

NEVADA TEST SITE
AREA 25

RADIOLOGICAL SURVEY AND CLEANUP PROJECT
1974-1983

(A REVISED FINAL REPORT)

December 1984

M. G. Miller

Reynolds Electrical & Engineering Co., Inc.
Post Office Box 14400
Las Vegas, NV 89114

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Prepared for the

U.S. Department of Energy
Nevada Operations Office
Under Contract DE-AC08-84NV10327

MASTER

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

ABSTRACT

This report describes the radiological survey, decontamination and decommissioning (D&D) of the Nevada Test Site (NTS) Area 25 facilities and land areas incorporated in the Nuclear Rocket Development Station (NRDS). Buildings, facilities and support systems used after 1959 for nuclear reactor and engine testing were surveyed for the presence of radioactive contamination. The radiological survey and documentation was performed for the Department of Energy, Nevada Operations Office (DOE/NV) by the Reynolds Electrical and Engineering Co., Inc. (REECo). The cleanup was part of the Surplus Facilities Management Program funded by the Department of Energy's Richland Operations Office.

The radiological survey portion of the project encompassed portable instrument surveys and removable contamination surveys (swipe) for beta plus gamma and alpha radioactive contamination of facilities, equipment and land areas. Soil sampling was also accomplished.

The majority of Area 25 facilities and land areas have been returned to unrestricted use. Remaining radiologically contaminated areas are posted with warning signs and barricades.

The Area 25 Radiological Survey and Cleanup Project, started in 1974 was completed with the final radiological survey in 1983.

CONTENTS

	<u>Page</u>
ABSTRACT	ii
ILLUSTRATIONS	iv
APPENDICES	v
HISTORY	1
The NRDS Mission	1
NRDS Testing	1
NRDS Programs Deceleration, 1973	5
NRDS FACILITIES DESCRIPTIONS	6
The RCP and CSA	6
The RMSF	6
The R-MAD Compound	6
Test Cell "A"	15
Test Cell "C"	19
ETS-1	19
PRELIMINARY RADIOLOGICAL SURVEYS	26
Area 25 Preliminary Radiological Survey, 1973-74	26
Area 25 Land Area Survey, 1976	28
PROJECT SUMMARY	31
Objective of the Survey and Cleanup Project	31
Project Organization	32
Project Operation	34
The RCP and CSA	34
The RMSF	34
The R-MAD Compound	36
Test Cell "A"	41
Test Cell "C"	42
ETS-1	43
Project Cost and Work Schedule	44
Project Waste Management	48
Radiation Exposure	50
FINAL RADIOLOGICAL SURVEY, 1983	51
CONCLUSIONS AND RECOMMENDATIONS	53
GLOSSARY	54
REFERENCES	56

ILLUSTRATIONS

<u>Figure</u>	<u>Page</u>
1. Nuclear Rocket Development Station (NRDS) Environs	2
2. Area 25 Facility Location	3
3. A Reactor in Operation at Test Cell "C"	4
4. Reactor Control Point	7
5. Central Support Area	8
6. Radioactive Materials Storage Facility	9
7. Phoebus 2 Reactor in RMSF	10
8. R-MAD Compound	12
9. R-MAD Building	13
10. R-MAD Building Floor Plans	14
11. Test Cell "A"	16
12. Test Cell "A" Complex	17
13. Test Cell "A" Floor Plan	18
14. Test Cell "C"	20
15. Test Cell "C" Site	21
16. ETS-1	22
17. ETS-1 Area	23
18. ETS-1 During Construction Showing Concrete Radiation Shadow Shield	25
19. TNT Land Radiation Survey	29
20. Project Organization	33
21. Area 25 Decontamination and Survey Funding	45
22. Milestone Schedule Area 25 Decontamination and Survey	46
23. LSA Project Waste	49

HISTORY

Beginning in the mid 1950's, a portion of the Nevada Test Site (NTS), encompassing about 318,000 acres (currently known as Area 25) was selected to develop space vehicle propulsion capability, with primary emphasis in a nuclear rocket program that included the Nuclear Engine for Rocket Vehicle Application (NERVA) operation (Figure 1). A substantial and highly-sophisticated array of testing facilities was constructed in the Jackass Flats portion of Area 25 (Figure 2).

In 1961, The Atomic Energy Commission (AEC) and the National Aeronautics and Space Administration (NASA) signed an agreement that established a joint-agency program management office, the Space Nuclear Propulsion Office (SNPO) of AEC-NASA, to develop a nuclear powered rocket. The agreement set down terms and conditions to establish a developmental test area designated as the Nuclear Rocket Development Station (NRDS) to conduct ground tests of reactors, engines, and engine stagings.

The NRDS Mission. The basic NRDS mission was to provide a center for development work on reactors, engines, and engine stagings to be used in the national space program. It was to provide facilities and ground support for specific engine and staging hardware development as the program progressed.

NRDS Testing. From 1959 through 1961, research through the initial testing stage was done on KIWI, KIWI-A1, KIWI-A3, and KIWI-BIA reactors with gaseous hydrogen cooling (Figure 3). Program research and development continued

FIGURE 1. NUCLEAR ROCKET DEVELOPMENT STATION (NRDS) ENVIRONS

FIGURE 2. AREA 25 FACILITY LOCATIONS

FIGURE 3. A REACTOR IN OPERATION AT TEST CELL "C"

through 1965. Further research encompassed the Nuclear Engine for Rocket Vehicle Application (NERVA) until termination in 1973.

Tests of various reactors resulted in nuclear activation of test cell structures and materials. Other reactor tests caused uranium-based fuel and fission product contamination of test cells, reactor maintenance facilities, and proximate land areas. Some land area contamination resulted from planned safety or experimental tests and demonstrations. A flight safety experiment designated KIWI Transient Nuclear Test (TNT) was conducted on a railroad trestle north-west of Test Cell "C". To gather data, the reactor was deliberately destroyed by means of a fast excursion. A full-power run on the PHOEBUS 1A engine was interrupted when inadequate cooling caused severe core damage.

NRDS Program Deceleration, 1973. In January, 1973, announcements stated that NRDS would terminate all activities ". . . except those necessary for continued safety and the public welfare." On July 1, 1973, the Nevada Operations Office of the DOE assumed both administrative and physical responsibility for NRDS facilities and areas from the joint AEC/NASA SNPO.

NRDS FACILITIES DESCRIPTIONS

The RCP and CSA. The Reactor Control Point (RCP) and Central Support Area (CSA), each contained remote reactor test support facilities. The RCP complex (Figure 4) included the Administration Building, Control Point (Blue) Building, Technical Operations Building, and the Technical Services Building. Other buildings housed a cafeteria, a warehouse, a maintenance facility, and medical facilities. Sleeping quarters and Rad/Safe were housed in trailers. The Central Support Area (Figure 5) was a complex of fifteen buildings. Foremost of this group was the Administration & Engineering (A&E) Building. Permanent buildings housed the Maintenance Shop, Technical Shop, Radiation Services Facility, Radiography & Weld Facility, Radiation Instrument Calibration Facility, a medical facility, vehicle service station, two warehouses, a cafeteria, and a weather station. Other smaller support facilities were housed in trailers.

The RMSF. The Radioactive Material Storage Facility (RMSF) (Figure 6) was a twenty-acre area, nearly equidistant from the E-MAD (Engine Maintenance Assembly and Disassembly) facility, Test Cell "C", and ETS-1 (Engine Test Stand-1). It was enclosed by a cyclone fence with quartz perimeter lighting. The single-track railroad that connected facilities carried one branch through a single main gate into the storage area, then separated into seven spurs. Two spurs terminated into 595-square-foot area bunkers. The facility was used to store a wide variety of radioactively contaminated items (Figure 7).

The R-MAD Compound. The Reactor Maintenance Assembly and Disassembly (R-MAD) Compound comprised, in addition to the R-MAD Building, a decontamination

FIGURE 4. REACTOR CONTROL POINT

FIGURE 5. CENTRAL SUPPORT AREA

FIGURE 6. RADIOACTIVE MATERIALS STORAGE FACILITY

FIGURE 7. PHOEBUS 2 REACTOR IN RMSF

facility, a radioactive materials storage site, a warehousing space, a test car assembly and test facility, and a hot-cell and laboratory sample test area (Figure 8).

The R-MAD Building (Figures 9 and 10) contained an assembly bay, shop and office area, and a disassembly bay. Overall dimensions of the building were 250 by 140 feet, 63 feet high with 61,290 square feet of floor space. The R-MAD Building had been used for KIWI reactor assembly, and for remote disassembly and remote inspection of the reactor after tests. Assembly and disassembly of the advanced PHOEBUS reactors had also been performed in the R-MAD Building. The assembly bay shop and office area had a steel frame with metal siding and a concrete floor, and was used for fabrication of test cars with their associated plumbing and instrumentation. It consisted of a clean room, assembly bay, and supporting shop areas, a core and fuel storage vault, and a tool crib. The disassembly area, hot bays, and hot cells were of concrete construction. The concrete walls were six feet thick. The disassembly area, over sixty feet high, could be divided into upper and lower bays, the upper bay shielded from the lower by a five-foot thick concrete door (750 tons) that allowed personnel entry and emergency servicing of remote operating equipment in the upper bay even during reactor and test car disassembly in the lower bay.

The R-MAD Decontamination Building (2,500 square feet), accessible to the railroad, was primarily used to decontaminate disassembly tooling and test car hardware.

FIGURE 8. R-MAD COMPOUND

FIGURE 9. R-MAD BUILDING

SECOND FLOOR

FIRST FLOOR

BASEMENT FLOOR

FIGURE 10. R-MAD BUILDING FLOOR PLANS

The Radioactive Materials Storage Area was a ten-acre site served by two railroad spurs, one to a trestle with a pit under the trestle and a second depressed section of track for storage of spent fuel on hooded flatcars. Used test cars, other reactor components and spent tooling, and contaminated waste were stored in the area.

Some 10,000 square feet of warehousing was available for staging, inspection, and storage of test car hardware.

Test component tooling was prepared in a 3,000-square-foot building (Storage Test and Paint) that provided 2,400 square feet of dust-free space for storing disassembly tooling, an additional static test bay for gaseous and hydraulic tests and test car piping, and component paint shop.

A small hot-cell (Junior Hot Cell) was used for preparation of samples for radiochemical analysis. Trailers with chemical analysis equipment were parked adjacent to the hot-cell.

Test Cell "A". Test Cell "A" (Figure 11) was designed and built for testing nuclear reactors. The Test Cell "A" facility consisted of the concrete Test Cell Building, Distribution Building, Helium Compressor Station, Liquid Hydrogen Fill Station, Tank Farm Building, Pressure Reducing Station, Shed Drive House, Movable Shed, several camera bunkers and an access tunnel (Figures 12 and 13).

The Test Cell "A" facilities were, generally, in poor or adequate condition.

FIGURE 11. TEST CELL "A"

FIGURE 12. TEST CELL "A" COMPLEX

FIGURE 13. TEST CELL "A" FLOOR PLAN

Test Cell "C". This facility (Figure 14) was designed to supplant Test Cell "A" in testing nuclear reactors. Structures include the Operation Building, Cryogenic Evaluation Laboratory, Motor Drive Building, Pump House and Fill Station Pad, and the Test Cell "C" Building housing a pump room, flow control room and high pressure room. Several liquid hydrogen Dewar tanks and a high pressure gas tank farm comprised the remaining major facilities (Figure 15).

Test Cell "C" buildings were in serviceable condition, distribution systems within the facility were generally intact, with utilities and services available.

Test Cell "C" and environs contained much contaminated and radioactive material. The TNT fallout area north-west of the test cell contained both surface and subsurface contaminated fuel debris.

ETS-1. Unique among Area 25 test facilities, ETS-1 was designed for downward firing of a nuclear reactor engine in a flight-simulated environment. It consisted of the Test Stand and Test Cell Building connected to the Control Point Building by a 1,150-foot, shielded, underground tunnel (Figures 16 and 17). Auxillary structures included liquid hydrogen and oxygen Dewars, high pressure gas tanks, a fill station, and an electrical generator building.

The concrete tunnel at the Test Stand terminated near the exhaust duct vault, which had been constructed below grade and on which the 100-ton aluminum structure had been erected. At the Control Point Building, the tunnel opened into fifteen operational and utility rooms.

FIGURE 14. TEST CELL "C"

FIGURE 15. TEST CELL "C" SITE

FIGURE 16. ETS-1

ETS-1 AREA CODE
DESCRIPTION PLAN

FIGURE 17. ETS-1 AREA

In front of the Test Stand, a concrete radiation shadow shield, three feet thick, forty feet high, and a hundred feet long, was erected (Figure 18).

FIGURE 18. ETS-1 DURING CONSTRUCTION SHOWING
CONCRETE RADIATION SHADOW SHIELD

PRELIMINARY RADIOLOGICAL SURVEYS

Area 25 Preliminary Radiological Survey, 1973-74. A radiological survey was conducted in 1973 by REECo Environmental Sciences Department (ESD) for DOE/NV to assess the scope, nature and location of existing radioactive contamination at the time of assumption of responsibility. It was intended to identify radioactive contamination levels at many locations and to establish control of contaminated materials prior to site D&D. The survey identified residual radiation levels at a number of locations that ranged to thousands of mR/h (5×10^4 mR/h noted on reactor nozzles).

Surveys at the RCP, CSA, R-MAD compound, ETS-1, Test Cell "A", and Test Cell "C" encompassed all buildings, sheds, trailers, auxillary structures such as pipes, tunnels, shields, tanks, miscellaneous items, and equipment. The 1973 survey did not include radioactive waste material storage sites, buried waste lines, leach fields, or land area debris. Survey of waste storage and debris areas was planned for later effort as funding permitted.

During this time, radioactive or radioactively contaminated items with AEC or property numbers were bagged and stored in an R-MAD radioactive material storage area. Items carrying no property number or AEC identifier were labeled "Radioactive Material" and left in place. A listing of radioactive or contaminated items, the open-shield beta-gamma survey instrument readings obtained from them, and the dispositions into radioactive material storage area or contaminated warnings affixed to them are detailed in Appendix A.

The 1973 survey identified residual radiation levels at a number of locations. These areas were delineated. Control locations were identified as RESTRICTED, LIMITED ACCESS, or UNRESTRICTED areas. Where exposure rates exceeded five mR/h open-shield (as measured by an open-shield beta-gamma survey instrument), and removable contamination (as measured by swipes taken on location) exceeded 1,000 disintegrations per minute per 100 square centimeters (dpm/100 cm²) beta plus gamma, the area was designated as a RESTRICTED area. RESTRICTED areas were posted as radiation exclusion (RADEX) areas. Access to RESTRICTED areas required anti-contamination clothing, self-reading dosimeters, and escort by REECo monitoring personnel. Facilities and areas designated RESTRICTED at the time were:

- o A radiation storage area outside the secured main compound at ETS-1;
- o A storage shed outside the security fence at Test Cell "C"; and
- o The R-MAD Compound, that included the R-MAD Building, the Tube Storage Trailer, a radioactive material storage area in the east wing of the warehouse building, the Decontamination Building, an area on the tracks east of the R-MAD Building, the Junior Hot Cell Building, a disposal site, and additional storage areas.

areas where radiation intensities, in general, were from two to five mR/h open-shield and removable contamination levels were less than 1,000 dpm/100

cm² beta plus gamma, were designated LIMITED ACCESS. Monitoring support was not required and walkthrough inspection was permitted. Classified as LIMITED ACCESS areas were:

- o The main warehouse at Test Cell "C", also the warehouse storage yard, all test-pad pipes, and a generator room;
- o The Test Cell "A" complex, including the Equipment Testing Laboratory (ETL) all test-pad pipes, a 36-foot hydrogen Dewar, a liquid nitrogen room and penthouse; and
- o The pad area at ETS-1.

Any areas not specifically designated RESTRICTED or LIMITED ACCESS were UNRESTRICTED. In general, exposure rates did not exceed normal background levels in UNRESTRICTED areas. Property removal was not restricted.

Area 25 Land Area Survey, 1976. A detailed REECO/ESD radiation land survey of Area 25 was begun in 1976. The survey included the complete railroad track system, Test Cell "C" TNT site, areas around the outside fenced compounds at R-MAD and E-MAD buildings, Test Cells "A" and "C", ETS-1, and all contaminated waste dumps and the RMSF. Some land surveys were conducted using a gridded survey map system. Small-scale gridded survey maps were made of the TNT site west and north-west of Test Cell "C" (Figure 19). Radiation monitors staked the site at 20-foot intervals for approximately 400 feet north and 400 feet south of the railroad track, and recorded radiation exposure rate measurements within the gridded sections.

FIGURE 19. TNT LAND RADIATION SURVEY

Where high exposure rates (caused by previously scattered fuel debris embedded in the soil) justified local effort, detail maps were made for future use in decontamination and disposal operations.

PROJECT SUMMARY

Objective of the Survey and Cleanup Project.

For approximately eleven years after beginning tests, the NRDS in what is now known as Area 25 of the NTS was involved in testing related to development of nuclear-powered engines for potential aircraft-rocket use.

A scan of activity would show major site construction in the mid-1950's, program research and development through 1965, and NERVA Project operations through 1973. Then, with severe curtailment of project budget and eventual project termination, administrative control of the area was returned to the DOE.

An initial radiological survey of the area was conducted in FY 1974 in order to prepare a proposal for site decontamination and delineate radioactively contaminated areas and facilities at the NRDS site. The objectives of such efforts were the release of facilities and land areas for later use by the removal of radioactive waste including soil, and as possible, decontamination of facilities to minimize hazards.

The Area 25 radiological survey and cleanup was performed by REEC/ESD under Contract No. EY-C-08-0410. Project objectives were made assuming that Area 25 would remain under DOE control, and that the E-MAD and ETL facilities were currently in use and not considered as part of the project. The systems and very large fixtures to which access could be limited to negate health hazards

were isolated and remain in place. After decontamination, the various areas and facilities could be used for other projects as the need arose.

DOE funding for D&D began in 1977, for the radiological survey and decontamination of the RMSF, R-MAD Compound, Test Cell Complexes "A" and "C", and ETS-1. Only a radiological survey was performed at the Reactor Control Point.

Project Organization.

Decontamination of the various Area 25 NRDS facilities beginning with FY 1978 was divided basically into three phases. Phase One was a comprehensive radiological survey and documentation. Several highly contaminated items were removed to provide a radiologically-safe working environment before proceeding with later decontamination efforts. Phase Two was the actual decontamination and removal of equipment, materials, and contaminated soil to a burial site then conducting a radiological survey to verify decontamination. Phase Three was the final radiological survey. Those areas which could not be decontaminated to acceptable limits were designated with barricades and/or warning signs.

The project was coordinated as depicted in Figure 20. Manpower during the project fluctuated from a low of 2-3 radiation monitors to highs of 20-25 monitor and craft personnel as necessary for major support efforts. Average manpower for the total project was 6-7 personnel.

FIGURE 20. PROJECT ORGANIZATION

Project Operation

The RCP and CSA. The 1978 comprehensive radiological survey of the RCP and CSA area facilities eliminated the necessity for an extensive decontamination process. Except for a few isolated pieces of equipment which were removed to appropriate locations at that time and some isolated spots located on floors and walls which were easily decontaminated, all portable instrument surveys indicated background (0.05 mR/h). The facilities were released for future use.

The RMSF. The DaD project began with a comprehensive radiation survey of the RMSF (Appendix B). The surveys of all surface items, bunkers and land areas encompassing the railroad track spurs within the RMSF were accomplished using E-520 and PIC-6A portable instruments and swipe samples. Swipe samples, taken for all items surveyed, were counted for removable beta plus gamma and alpha contamination. Those items with removable contamination levels exceeding 20 dpm/100 cm² beta plus gamma (general use contamination levels) were removed to the NTS Area 5 or Area 3 Radioactive Waste Management Sites (RWMS).

A PHOEBUS reactor nozzle among the most highly activated and contaminated items at RMSF was removed for burial at the Area 5 RWMS. The center of the nozzle on one end measured 5 R/h, on the other end, 50 R/h. The exterior center of the nozzle indicated 40 R/h. Swipe samples obtained remotely measured 800 mR/h as indicated by portable survey instruments.

The operations permit involved REEC/ESD standard procedures and required a REEC Health Physicist to supervise the movement and disposal operations over a pre-planned and specified route of travel.

The nozzle was lifted remotely onto a truck-bed by a crane, without need for riggers. This minimized exposure to participants in the operation. In the heavily shielded driver's position of the transport vehicle, during the one-hour transit to the RWMS, the exposure rate was approximately 10 mR/h.

Burial was completed in less than three hours after pickup, with the trench covered by four to six feet of clean backfill. The surface near-contact radiation exposure rate above the closed trench was reduced to 0.5 mR/h. The transport vehicle, and all personnel involved, were not contaminated.

D&D proceeded with some 225 cubic yards of the small contaminated materials and items at the RMSF being removed for buried disposal. Four rail cars already at RMSF and three others brought over from R-MAD Compound required dismantling of their superstructures. The rail cars, stripped of superstructures which were sent to buried disposal, were held in the inner enclosure at RMSF for future use. Nine other lots of material were also held apart at RMSF for one project.

Cleanup of the RMSF was completed with the removal of contaminated soil from around the railroad track spurs. A total of 1,900 cubic yards of soil was sent to buried disposal. Several railroad ties were also found contaminated with radioactive material above acceptable limits. Extensive removal of the ties was avoided by chiseling out the contaminated spots.

The R-MAD Compound. Survey of the R-MAD Compound began with a walk-through inspection by DOE, REEC Co and Los Alamos National Laboratory (LANL) personnel to identify items of potential use. A central vacuum unit, six rail cars, three reactor cars, three dump cars, a railroad crane and six concrete plugs were reserved. The three reactor cars were removed to RMSF for superstructure dismantling and eventual buried disposal of the contaminated superstructure. The procedure for survey of the R-MAD Compound involved E-520 and PIC-6A portable instrument surveys, and swipe surveys of the floors, walls, and representative items. Swipe locations were marked, and swipes counted for removable beta plus gamma and alpha contamination.

In addition to the R-MAD Building, the R-MAD Compound areas surveyed for decontamination (Appendix C) included the Decontamination Building, the ten acre Radioactive Materials Storage Area, some 10,000 square feet of warehousing, and the Storage Test and Paint Building. A maximum removable contamination level of 1.6×10^6 dpm/100 cm² beta plus gamma was observed.

Preliminary cleanup operations began at the R-MAD Compound Radioactive Materials Storage Area with a radiological survey of all surface-stored items and a sorting of clean from contaminated materials. Clean materials were returned to the NTS usage system or into excessing channels for sale to the public. All contaminated (or activated) equipment was categorized into thirty-three lots and removed to the Area 3 RWMS for buried disposal. This included two 27.5-ton and two 15-ton reactor shields. Total equipment disposal amounted to some 3,904 cubic yards.

Surveys of the R-MAD Building indicated that about 85 percent of the building was radioactively contaminated. Throughout the building, material was found marked "Radioactive" or "Contaminated". Generally, the lower levels of radioactive contamination were located in the office area with the higher levels observed in the disassembly (hot) bays and the hot cells.

Surveys of the hot cells began with personnel in full anticontamination clothing and respiratory protection. Air samples were collected to determine levels of airborne contamination while personnel were working in the area. Airborne radioactive contamination levels of 3.5×10^{-13} $\mu\text{Ci/cc}$ beta plus gamma and 4.9×10^{-13} $\mu\text{Ci/cc}$ alpha were observed on an air sample collected over a two-day period. With low concentrations of airborne contamination established, the use of full-face respiratory protection was discontinued.

Full-face respiratory protection was not worn during the hot bay survey. In the two main hot bay rooms, air samples collected over two one-day intervals indicated airborne radioactive contamination levels of 3.8×10^{-12} $\mu\text{Ci/cc}$ beta plus gamma and 1.0×10^{-13} $\mu\text{Ci/cc}$ alpha for one sampling period and 1.2×10^{-11} $\mu\text{Ci/cc}$ beta plus gamma and 2.8×10^{-13} $\mu\text{Ci/cc}$ alpha for the other sampling period.

Exposure rates in the hot cells, encompassing some twelve rooms, and the two main hot bay rooms were 1 to 10 mR/h open shield. Removable beta plus gamma levels were generally between 1×10^3 and 2.2×10^4 dpm/100 cm^2 with a maximum of 3×10^5 dpm/100 cm^2 . Removable alpha contamination levels were generally less than 1×10^2 dpm/100 cm^2 .

The highest exposure rate observed during the radiation surveys of the R-MAD Building and Compounds was 7 R/h in the Decontamination Building hot bay and on second floor equipment in the R-MAD Building. The highest removable contamination level for both beta plus gamma and alpha was found on a vacuum cleaner in the Decontamination Building hot bay (1.6×10^6 dpm/100 cm² beta plus gamma, 1.1×10^4 dpm/100 cm² alpha).

D&D of the R-MAD Building began with the office area and hallways located between the assembly and disassembly bays. This allowed the REEC/ESD operation to be moved from the ETL to R-MAD Room 103 to gain stable power for radiation counting equipment. The R-MAD water system was restored and the building air-sampling system was made ready and calibrated to provide additional operational facilities.

Ten rooms, two hallways, and one foyer area surrounding the ESD office were decontaminated to less than 20 dpm/100 cm² beta plus gamma and no detectable alpha. Decontamination operations proceeded with an additional twelve rooms, which constituted assembly bay shop areas, second floor engineering offices and the basement area located only under the hot cells. Thirty-three cubic yards of material were removed from the building for shipment to buried disposal. Two leaded glass windows were removed from hot cells for use in Los Alamos.

It was decided to remove contaminated material from the first floor of the Storage Test and Paint Building #3140 before continuing with the R-MAD Building D&D project. Some 7 cubic yards of contaminated waste were sent to

buried disposal and 300 pounds were compacted at the NTS Area 6 decontamination pad before burial.

Decontamination patterns in the R-MAD Building were well set by the beginning of 1979. Standard decontamination techniques used included: the removal of gear and sorting for release of uncontaminated material into NTS-user supply and storage channels and transport of waste to proper buried disposal; sweeping, vacuuming, mopping with hot soapy water; pressurized water-blasting to dislodge persistent contaminants; removal of floor tiles and the removal of debris; paint removal where paint would seal contamination to a surface; use of caustic cleaner/degreaser where effective; and when necessary, chipping surface concrete for removal (with a standard concrete scrabbler technique).

Cleaning operations were followed consistently by swipe sample surveys to ascertain presence (or absence) of removable contamination. Rooms (or buildings or large fixtures) which could not be decontaminated to acceptable levels were secured or fenced off, and posted with warnings identifying the existence of residual contamination, the type of radiation, and usually, the levels found on surface near contact.

The R-MAD Building decontamination operation encompassed the upper disassembly bay, the hot cell rooms, the airlock areas, upper stairways and hallways, hot cell area, lower disassembly bay, and basement areas. Eventually the floors of the upper and lower disassembly bays were epoxy-painted to fix residual contamination and two basement rooms were blocked off. Signs posted indicated contaminated areas.

A total of 667 cubic yards of contaminated materials were removed from the R-MAD Building for burial at the Area 3 RWMS. Some 17,649 swipe samples were also taken and analyzed during the R-MAD Building project to verify contamination or lack of contamination.

Task activity for FY 1980 began with the final cleanup of the R-MAD Compound support buildings. Principally, Warehouse #3111, the Storage Test and Paint Building, the Beetle Shed, and Junior Hot Cell. All contaminated materials and equipment were sent to a NTS RWMS for buried disposal. Conservatively, 835 cubic yards of equipment and materials were surveyed and released to salvage from the R-MAD Compound. A total of 353 cubic yards of contaminated material and equipment and over 1,535 cubic yards of contaminated soil was shipped to a RWMS during this phase of the operation.

Those radioactive or contaminated areas within the R-MAD Building and Compound which could not be moved or decontaminated were secured and posted. The decontamination operation was completed as funded to that date.

In November 1981, a large volume of contaminated debris was unearthed during soil consolidation efforts. Several locations were found contaminated at depths exceeding those projected by earlier soil sampling. Earth moving equipment and water trucks (used to reduce airborne contaminated dust) were used to consolidate the contaminated soil. Shortage of earth moving equipment operators and truck drivers due to holiday season and vacations taken at the end of the calendar year postponed final soil removal until January 1982. Some 1,500 cubic yards of contaminated soil were removed from the radioactive

materials storage area and replaced with clean fill soil contoured to original surface.

Test Cell "A". The survey of contamination levels at Test Cell "A" Complex proceeded with all the rooms in the Test Cell Building and Distribution Building, a contaminated storage area, the access tunnel, and associated facilities (Appendix D). Exposure rates near-contact and at one meter from each item or location were determined by PIC-6A and E-520 portable instrument surveys. Swipe samples were taken from floors, walls, equipment, and associated items.

The highest level of removable contamination was located on a railroad track at the reactor pad (2.15×10^4 dpm/100 cm² beta plus gamma, 32 dpm/100 cm² alpha). The maximum exposure rate, 150 mR/h open shield, was observed in an expansion joint of the Dewar area concrete pad. Additionally, a land survey outside the fenced area, from the fence outward to 1,000 feet at 45-degree and 100-foot intervals indicated no significant radioactivity.

Accessible activated metal railroad tracks, braces and light poles were easily removed; however, a concrete scrabbler was necessary to strip contaminated concrete.

Contaminated and activated materials which included the surface concrete chips from the pad were transported to the Area 3 RWMS for buried disposal. Decontamination work on the Test Cell "A" area was suspended temporarily in order that Test Cell "C" decontamination could proceed (prompted by potential project use of Test Cell "C" facilities). Cleanup was resumed with a total of 34 cubic yards of radioactive debris consigned to Area 3 or Area 5 RWMS for

disposal. Localized, activated areas in the reactor building area, outbuildings inside the complex, and the tunnel were decontaminated.

During the final survey of the test cell, radioactive contamination was discovered under the roofing material on the main building. Because the roofing material was badly disintegrated, removal would be required prior to use of the facility. Due to funding limitations, access to the roof was restricted with warning signs and barricades to complete the decontamination effort.

Test Cell "C". The Test Cell "C" survey included ten rooms in the Test Cell Building, ten other buildings in the complex, eight Dewars, the tank farm, the pipe area, and test cell concrete (Appendix E). Some 5,616 swipe samples were taken for analysis. A removable beta plus gamma contamination level of 4.45×10^4 dpm/100 cm² was observed on the floor in the pipe area on the east side of the reactor pad. A removable alpha contamination level of 5×10^2 dpm/100 cm² was observed on the concrete pad in the reactor area. A maximum exposure rate of 42 mR/h open shield was observed in the same area.

Decontamination of Test Cell "C" began with the removal of contaminated tar from expansion joints in the cement from the Dewar area. Approximately 39 cubic yards of such material and another 22 cubic yards of contaminated equipment were transported to the Area 3 RWMS for buried disposal. The removal of 540 linear feet of railroad track set in reinforced concrete presented a problem when equipment and materials were found to be activated, rather than contaminated. A significant cost increase developed in the removal and disposal of these items. The cleanup was completed with a total of 127 cubic yards of contaminated debris and equipment removed to buried

disposal from Test Cell "C". Induced activity and internal fission product contamination were discovered in relatively inaccessible areas, such as piping and valves. These areas were posted with warnings of existing hazards.

Contamination at the Test Cell "C" TNT site resulted from deposition from a single, planned reactor excursion that left small solid fuel fragments over the terrain. During the area survey fuel element fragments were found imbedded at and near the surface of the wash (water flow channel) adjoining the railroad trestle from which the test was conducted. Survey, staking, and soil sampling was accomplished with a ground grid survey on 20-foot centers for approximately 400 feet north and 400 feet south of the concrete pad on the rail trestle that was the site of the test. Two hundred soil profile samples were collected from six 4-foot deep sample holes to verify that fuel element debris was restricted to the surface. Soil activity was in the 10^{-5} to 10^{-6} $\mu\text{Ci/g}$ range with the maximum of about 10^{-4} $\mu\text{Ci/g}$.

Most of the land area decontamination involved the removal of small areas of surface soil by hand shovel. Front end loaders and road graders were used to remove two large piles of fuel element debris. Some 2,340 cubic yards of contaminated soil was removed and sent to Area 3 RWMS for burial. Soil samples and survey results indicated that surface contamination had been removed.

ETS-1. Survey of the ETS-1 included beyond the test stand itself, the tunnel facilities, outbuildings, and surrounding concrete areas. A maximum exposure rate of 30 mR/h was observed on the center of the north shield (Appendix F). Swipe surveys for beta plus gamma and alpha did not indicate removable contamination, either at ETS-1 or surrounding environs inside the fence.

Two exhaust ducts (a total weight of more than 75 tons) had been set aside near the fence at ETS-1. A maximum exposure rate of 180 mR/h open shield was observed near contact with the ducts. The ducts were internally contaminated with levels as high as 7×10^5 dpm/100 cm² beta plus gamma. Due to the internal contamination, plywood and plastic coverings were fabricated for all the external openings in the ducts. The exhaust ducts, some 220 cubic yards, were eventually moved to Area 3 RWMS for disposal without physical or radiological incident.

The test stand was, with the exception of the 30 mR/h spot of induced activity on the shield, relatively free of radioactive contamination and activation. Extensive decontamination was not required.

Project Cost and Work Schedule.

DOE funding allocations for the NRDS radiological and decontamination operations were: for FY 1978, \$390,000; FY 1979, \$305,000; FY 1980, \$185,000; FY 1981, \$220,000; FY 1982, \$210,000; and FY 1983, \$314,000 (Figure 21). Basically, the work schedule proceeded as funded (Figure 22). Radiological surveys and decontamination begun in November 1977 were completed by August

FIGURE 21. AREA 25 DECONTAMINATION AND SURVEY FUNDING

FIGURE 22. MILESTONE SCHEDULE - AREA 25 DECONTAMINATION AND SURVEY

▽ Planned Completion

▲ Actual Completion

1978. Funds for FY 1978 also included removing the RMSF Phoebus nozzle and other highly radioactive materials for buried disposal.

The major emphasis for FY 1979 was the removal and disposal of contaminated and clean equipment from the R-MAD Building office, basement, assembly bays, disassembly bays, and hot cells. The two contaminated air ducts at the ETS-1 were also removed for buried disposal. Cleanup and decontamination of the R-MAD Compound were scheduled for FY 1980. Warehouse #3110, the Storage Test and Paint Building, Decontamination Building, Beetle Shed, and Junior Hot Cells were the primary projects.

Funds for FY 1981 were earmarked for cleanup and decontamination of Test Cells "A" and "C" including soil removal at the Test Cell "C" TNT site. Contaminated soil removal continued through FY 1982 and FY 1983 from the R-MAD Compound and the RMSF. A comprehensive radiological survey and final report completed the NRDS operation in FY 1983.

At the Test Cell "C" facility a significant cost increase developed when 540 linear feet of railroad track set in reinforced concrete was found to be activated rather than contaminated. This required removal with concrete scrabbers and disposal of materials and associated equipment to a RWMS. Final soil removal and radiological surveys verifying residual radioactive levels continued into FY 1982.

During the final survey, radioactive contamination was discovered under the roofing material on the Test Cell "A" main building. Due to funding limitations, access to the roof was restricted instead of further decontamination.

At the RMSF, several railroad ties were found contaminated above acceptable limits during the final contaminated soil removal. These were decontaminated to acceptable limits by chiseling out the contaminated spots, thus not requiring removal of the railroad ties.

Work at various facilities was on occasion interrupted for short periods due to experiments at nearby facilities. Access was restricted to the area. Some delays also occurred because of lack of availability of earth moving equipment or operators. However, these interruptions did not appreciably affect the NRDS D&D project.

Project Waste Management.

Approximately 13,000 cubic yards of radioactive and contaminated material were removed for burial in RWMS at the NTS (Figure 23). Some 7,276 cubic yards were contaminated soil from the RMSF, R-MAD Compound, and Test Cell "C" TNT sites. The remaining 5,560 cubic yards included contaminated or activated cement and metal, equipment, waste, and structural components. The RMSF Phoebus nozzle, two 27.5-ton and two 15-ton reactor shields from the R-MAD Compound, and the two air ducts from ETS-1 were some of the largest pieces removed for buried disposal. The bulk of the equipment sent to buried disposal was removed from the R-MAD Radioactive Materials Storage Area. Another 835 cubic yards of clean equipment not indicated in Figure 23 were sent to salvage for sale to the public.

RADIOACTIVE AND CONTAMINATED MATERIALS

CONSIGNED TO NTS RWMS

Location	Soil (yd ³)	Contaminated/Induced Metal/Cement (yd ³)
1. Reactor Control Point	0	0
2. RSMF	1900	255
3. R-MAD Compound		
a. Radiation Materials Storage Area	1500	3904
b. R-MAD Building	-	667
c. Outer buildings and warehouses	1536	353
4. Test Cell "A"		34
5. Test Cell "C"		
a. Complex		127
b. TNT Area	2340	
6. ETS-1	<u>220</u>	
TOTAL	<u>7276</u>	<u>5560</u>

FIGURE 23. LSA PROJECT WASTE

Radiation Exposure.

Radiological dose equivalent commitment data at NTS is not generated as to project. Personnel dosimetry is accumulated monthly using a film badge system with a reporting threshold exposure level of 30 mrem. All exposures 30 mrem or below are reported as zero.

A combination of duty roster and personnel monthly film badge readout were used to ascertain overall dose equivalent commitment for those persons involved with the NRDS cleanup operation. With the exception of five persons involved with the early (a two-month period) removal of the most highly contaminated materials exposure levels were below the 30 mrem threshold. Exposures received by those persons were 250 mrem, 170 mrem, 70 mrem, 55 mrem, and 50 mrem respectively, well within limits for radiation workers.

The radiation exposure to the driver for the one-hour trip transporting the PHOEBUS nozzle to the RWMS was calculated to be 10 mR which is below monthly film badge reporting level. No other exposure levels attributed to the NRDS cleanup operations were reported for the remaining operations. The total personnel exposure was 495 mrem for the entire project.

FINAL RADIOLOGICAL SURVEY, 1983

A final radiological survey of the Area 25 facilities and land areas was completed in 1983. The cleanup project encompassed a number and variety of unique facilities as described in this report. Thousands of swipe samples, soil samples, and portable instrument readings were obtained during the course of the project. Approximately 13,000 cubic yards of radioactive material were removed for buried disposal in Area 3 or Area 5 RWMS at the NTS. Types and levels of radioactive contamination present after the extensive effort have been posted with warning signs and barricades.

The final area survey was completed with the following conditions in effect:

1. Area 25 remains under DOE control;
2. E-MAD and ETL, currently in use, were not part of decontamination effort; and
3. That systems and very large fixtures to which access can be limited to negate any health hazard will be isolated and remain in place. Area 25 would be as radiologically clean as feasible and the various areas and facilities can be used for other projects as the need arises.

Survey results primarily retraced areas that were documented as contaminated after extensive decontamination procedures. The surveys were accomplished

with E-520 beta-gamma portable survey instruments, open shield (some readings are noted as closed shield), and swipe samples for removable beta plus gamma.

The RMSF remains RESTRICTED and continues to be used as a radioactive materials storage area (Appendix G). Test Cell "A" site has been posted with warning signs particularly Test Cell "A" Building roof and inaccessible contaminated areas (Appendix H).

The R-MAD Building (Appendix I) and Compound (Appendix J) have been released for use with the following exceptions:

- o Upper and lower disassembly bays;
- o Hot cells R-MAD Building; and
- o Two basement rooms where hot cell doors were lowered.

Other areas are posted indicating radiation levels, as appropriate. The R-MAD facilities are presently in use. Weekly radiological surveys continue in all work areas. A permanent air sampling system exists in the R-MAD Building which can be activated if removable contamination in excess of 1×10^3 dpm/100 cm^2 beta plus gamma or 1×10^2 dpm/100 cm^2 alpha is detected.

The ETS-1 site is available for use; only the reactor shield needed to be posted (Appendix K). Test Cell "C" (Appendix L) was released for use in 1981 and remains occupied. The RCP and CSA facilities were all released at the time of the 1978 comprehensive radiological survey.

CONCLUSIONS AND RECOMMENDATIONS

The NRDS operation spanned a ten year period from the preliminary radiological survey in 1973-1974, the 1978 comprehensive radiological survey and documentation, decontamination and followup radiological surveys of the various sites and facilities, through 1978 into 1983, to completion of the final radiological survey in 1983. Although records were kept concerning specific decontamination projects, waste management, preliminary and final radiological surveys, and personnel radiological health data, they did not necessarily reflect the specifications of the final reporting scheme. Such information prior to operation start-up would have been valuable in setting up documentation procedures for this particular project. In particular, waste type and volume could have been further segregated. Tonnage per cubic yard of waste or equipment sent to RWMS was not necessarily accurately described.

GLOSSARY

AEC	Atomic Energy Commission
A&E	Architectural and Engineering
Beetle	Manned shielded mobile vehicle
Butler	Metal building
CSA	Control Support Area
D&D	Decommissioning and Decontamination
Dewar	Vacuum liquid gas storage container
DOE/NV	Department of Energy/Nevada
dpm/100 cm ²	Disintegrations per minute per 100 square centimeters
E-MAD	Engine-Maintenance Assembly and Disassembly
ESD	Environmental Sciences Department
ETL	Equipment Test Laboratory
ETS-1	Engine Test Stand-1
LANL	Los Alamos National Laboratory
LSA	Low specific activity
mR/h	Milliroentgen per hour
NAEG	Nevada Applied Ecology Group
NASA	National Aeronautics and Space Administration
NERVA	Nuclear Engine for Rocket Vehicle Application
NRDS	Nuclear Rocket Development Station
NTS	Nevada Test Site
Penthouse	Upper level Test Cell "A" Building
RADEX	Radiation Exclusion
Rad/Safe	Radiation Safety
RCP	Reactor Control Point
REEC	Reynolds Electrical & Engineering Co., Inc.
R-MAD	Reactor-Maintenance Assembly and Disassembly
RMSF	Radioactive Materials Storage Facility

RWMS	Radioactive Waste Management Site
SNPO	Space Nuclear Propulsion Office
TCA	Test Cell "A"
TCC	Test Cell "C"
TNT	Transient Nuclear Test
Users	DOE Contractors

REFERENCES

1. Gnome Site Decontamination and Decommissioning Project - Radiation Contamination Clearance Report, March 28, 1979 - September 23, 1979, DOE/NV/00410-59.
2. NRDS Master Plan 1969-1970, Space Nuclear Propulsion Office.
3. Operational Radioactive Waste Management Plan for the Nevada Test Site, November 1980 NVO-185 (Rev. 2).
4. Surplus Facilities Management Program - Program Plan, Volumes 1, 2 and 3, FY 84-88.
5. Draft American National Standard Control of Radioactive Surface Contamination on Materials, Equipment, and Facilities to be Released for Uncontrolled Use. N13.12, ANSI, Inc., August 1978.
6. REEC0/ESD Standard Procedures.
7. SFMP Program Plan, RL/SFM-82-12, Volume 1.
8. Decontamination and Decommissioning of the Organic Moderated Reactor Experiment Facility (OMRE), September 1980, DE-AC07-761D01570.
9. Decommissioning of the Ames Laboratory Research Reactor, January 1982, W-7405-ENG-82.

APPENDIX A
AREA 25 BUILDINGS AND EQUIPMENT
1973 PRELIMINARY RADIATION SURVEY

ITEM OR LOCATION	mR/h OPEN SHIELD NEAR CONTACT	REMOVABLE BETA + GAMMA dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²	REMARKS
CP Blue Bldg. TV Cameras	6	Below Release Limit*	Below Release Limit	Removed to Whse. #1
CP Blue Bldg. Head Phones	4	Below Release Limit	Below Release Limit	Removed to Whse. #1
Bldg. 3123 Head Phones	2	Below Release Limit	Below Release Limit	Removed to Whse. #1
Bldg. 3123 V-2x Tube	6	Below Release Limit	Below Release Limit	Removed to Whse. #1
Bldg. 3123 3 TV Lens	18	Below Release Limit	Below Release Limit	Removed to Whse. #1
Bldg. 3123 Electric Drill	2	Below Release Limit	Below Release Limit	Removed to Whse. #1
Bldg. 3123 TV Camera	50	Below Release Limit	Below Release Limit	Removed to Whse. #1
Bldg. 3123 Misc. Elec. Equip.	15	Below Release Limit	Below Release Limit	Removed to Whse. #1
Bldg. 3129	Bkgd	Below Release Limit	Below Release Limit	All Materials
Cafeteria	Bkgd	Below Release Limit	Below Release Limit	All Materials
Sleeping Trailers	Bkgd	Below Release Limit	Below Release Limit	All Materials
Radsafe Trailers at CP	Bkgd	Below Release Limit	Below Release Limit	All Materials
LANL Whse. Pipe, Flanges, Etc.	6	Below Release Limit	Below Release Limit	Items Marked and Left in Place
Medical Bldg.	Bkgd	Below Release Limit	Below Release Limit	All Materials
H-8 Bldg.	Bkgd	Below Release Limit	Below Release Limit	All Materials
A & E Bldg.	0.3	Below Release Limit	Below Release Limit	All Materials
Reproduction Bldg.	Bkgd	Below Release Limit	Below Release Limit	All Materials

*Release Limits. Removable alpha - 100 dpm/100 cm² and beta plus gamma - 1,000 dpm/100 cm²

APPENDIX A (continued)

ITEM OR LOCATION	mR/h OPEN SHIELD NEAR CONTACT	REMOVABLE BETA + GAMMA dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²	REMARKS
Medical Bldg. (North of A & E Building)	Bkgd	Below Release Limit	Below Release Limit	All Materials
Bldg. 4215 Steel Plug	0.7	Below Release Limit	Below Release Limit	Tagged for Removal
Bldg. 4215 Solenoid Valve	0.5	Below Release Limit	Below Release Limit	Tagged for Removal
Facilities Outside Bldg. 4215	Bkgd	Below Release Limit	Below Release Limit	All Materials
Radiation Lab. Bldg.	Bkgd	Below Release Limit	Below Release Limit	Radiation Sources Inventoried and Locked in Cabinet
Bldg. 4226	Bkgd	Below Release Limit	Below Release Limit	All Materials
Production Services Bldg.	Bkgd	Below Release Limit	Below Release Limit	All Materials
Labor Support Tool Shed	Bkgd	Below Release Limit	Below Release Limit	All Materials
Radiography Bldg.	Bkgd	Below Release Limit	Below Release Limit	All Materials
Facilities in Vicinity of Bldg 4226	Bkgd	Below Release Limit	Below Release Limit	Paint Trailer and Equip., Paint Locker, Steel Plate Racks, Lamp Storage
Elec. Shop and Equip. Bldg., Head Phones	3	Below Release Limit	Below Release Limit	Bldg. 4226 Area
Gas Station	Bkgd	Below Release Limit	Below Release Limit	All Materials
Trailers in Gas Station Area	Bkgd	Below Release Limit	Below Release Limit	Mobile Lunch, Restroom, Supply Office, and Spare Mobile Trailers
Radsafe Trailer at Jct. of TCA and TCC Roads	Bkgd	Below Release Limit	Below Release Limit	All Materials

*Release Limits Removable alpha - 100 dpm/100 cm² and beta plus gamma - 1,000 dpm/100 cm²

APPENDIX A (continued)

ITEM OR LOCATION	mR/h OPEN SHIELD NEAR CONTACT	REMOVABLE BETA + GAMMA dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²	REMARKS
Warehouse #1 Parker Fittings	2	Below Release Limit	Below Release Limit	_____
Warehouse #2	Bkgd	Below Release Limit	Below Release Limit	All Materials
Calib. Facility	Bkgd	Below Release Limit	Below Release Limit	All Materials. Bldg. used for Source Storage
NRDS Fire Station	Bkgd	Below Release Limit	Below Release Limit	All Materials
Sandia Compound	Bkgd	Below Release Limit	Below Release Limit	All Materials Except Radio- active Source Storage Transportainers
Maintenance Shop	0.4	Below Release Limit	Below Release Limit	All Materials ETS-1
Test Operations Trailer	Bkgd	Below Release Limit	Below Release Limit	All Materials ETS-1
Operations Trailer Group and Latrine Trailer	Bkgd	Below Release Limit	Below Release Limit	All Materials ETS-1
Electronics Shed, Workshop, Storage Area, Mobile Office	Bkgd	Below Release Limit	Below Release Limit	All Materials ETS-1
Rooms #30R201, 20R202, and 30S103	Bkgd	Below Release Limit	Below Release Limit	All Materials ETS-1
Butler Bldg.	Bkgd	Below Release Limit	Below Release Limit	All Materials ETS-1
Transportainers 3P and 2C	0.4	Below Release Limit	Below Release Limit	All Materials ETS-1
Mobile Office Trailer #30	Bkgd	Below Release Limit	Below Release Limit	All Materials ETS-1
Rooms #T-105, 10R101, 10R106	Bkgd	Below Release Limit	Below Release Limit	All Materials ETS-1
Cameras in Tunnel	1	Below Release Limit	Below Release Limit	ETS-1

*Release Limits: Removable alpha - 100 dpm/100 cm² and beta plus gamma - 1,000 dpm/100 cm²

APPENDIX A (continued)

ITEM OR LOCATION	mR/h OPEN SHIELD NEAR CONTACT	REMOVABLE BETA + GAMMA dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²	REMARKS
Nozzles	100-180	Below Release Limit	Below Release Limit	ETS-1
Room #105104	Bkgd	Below Release Limit	Below Release Limit	ETS-1
Generator Bldg.	Bkgd	Below Release Limit	Below Release Limit	ETS-1
Bldg. 30R200	Bkgd	Below Release Limit	Below Release Limit	ETS-1
Metal Bldg. Housing Two Dewars	Bkgd	Below Release Limit	Below Release Limit	ETS-1
Two Metal Reactor shields - Pad Area	6	Below Release Limit	Below Release Limit	ETS-1. Radiation Warning Signs Affixed
Tower	Bkgd	Below Release Limit	Below Release Limit	ETS-1
Admin. Bldg.	Bkgd	Below Release Limit	Below Release Limit	All Materials. Test Cell "C" (TCC)
Control Bldg.	0.1-0.2	Below Release Limit	Below Release Limit	All Materials. TCC
Roof of Control Bldg.	0.5-100	Below Release Limit	Below Release Limit	TCC
Hydrogen Room, Stainless Steel Tubing	1	Below Release Limit	Below Release Limit	TCC. Removed to Radiation Control Area
Warehouse, Misc. Equipment	1.5-50	Below Release Limit	Below Release Limit	TCC. Equipment Removed to Warehouse #1
Warehouse, Tubing Master, Warm Gear Jack	0.7-6	Below Release Limit	Below Release Limit	TCC. Equipment Marked and Left in Place
Transformer Room, Misc. Equipment	0.4-25	Below Release Limit	Below Release Limit	TCC. Equipment Marked and Left in Place
PAN AM Section, Misc. Tools	9	Below Release Limit	Below Release Limit	TCC. Equipment Marked and Left in Place
Generator Room, Misc. Equipment	0.2-45	Below Release Limit	Below Release Limit	TCC. Equipment Marked and Left in Place

*Release Limits: Removable alpha - 100 dpm/100 cm² and beta plus gamma - 1,000 dpm/100 cm²

APPENDIX A (continued)

ITEM OR LOCATION	mR/h OPEN SHIELD NEAR CONTACT	REMOVABLE BETA + GAMMA dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²	REMARKS
Storage Shed (outside security fence), Bucket of Waste and Pump	20-70	Below Release Limit	Below Release Limit	TCC. Equipment Marked and Left in Place
Warehouse Storage Yard	0.5-2	Below Release Limit	Below Release Limit	TCC. Equipment Marked and Left in Place
Bldg. 3109, PA System Speakers	3-30	Below Release Limit	Below Release Limit	Test Cell A (TCA). Equipment Marked and Left in Place or Moved to TCA Radioactive Materials Storage
Compressor Station, Misc. Equipment	1	Below Release Limit	Below Release Limit	Test Cell A (TCA). Equipment Marked and Left in Place or Moved to TCA Radioactive Materials Storage
Bldg. 3124, Misc. Equipment	0.7-100	Below Release Limit	Below Release Limit	Test Cell A (TCA). Equipment Marked and Left in Place or Moved to TCA Radioactive Materials Storage
Plywood Storage Bldg. Outside TCA Area, Misc. Equipment	0.7-6	Below Release Limit	Below Release Limit	Test Cell A (TCA). Equipment Marked and Left in Place or Moved to TCA Radioactive Materials Storage
36 Foot Hydrogen Dewar	1.7-12	Below Release Limit	Below Release Limit	Test Cell A (TCA). Equipment Marked and Left in Place or Moved to TCA Radioactive Materials Storage
Storage Shed North of Bldg. 3109	Bkgd	Below Release Limit	Below Release Limit	Test Cell A (TCA). Equipment Marked and Left in Place or Moved to TCA Radioactive Materials Storage
EG&G Instrument Repair Shop, Misc. Audio Equipment	2-50	Below Release Limit	Below Release Limit	Test Cell A (TCA). Equipment Marked and Left in Place or Moved to TCA Radioactive Materials Storage

*Release Limits Removable alpha - 100 dpm/100 cm² and beta plus gamma - 1,000 dpm/100 cm²

APPENDIX A (continued)

ITEM OR LOCATION	mR/h OPEN SHIELD NEAR CONTACT	REMOVABLE BETA + GAMMA dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²	REMARKS
Testing Storage Area, Misc. Metal Fittings	3	Below Release Limit	Below Release Limit	Test Cell A (TCA). Equipment Marked and Left in Place or Moved to TCA Radioactive Materials Storage
Penthouse, Misc. Pipe	10-15	Below Release Limit	Below Release Limit	TCA. Equipment Marked and Left in Place
Liquid Nitrogen Room	1.5	Below Release Limit	Below Release Limit	TCA
Reactor Shed	10	Below Release Limit	Below Release Limit	TCA
Potato Cellar, Misc. Equipment	2-3	Below Release Limit	Below Release Limit	TCA
Radsafe Trailer #302, Tunnel Head House	Bkgd	Below Release Limit	Below Release Limit	TCA
Bldg. 3115, Six- Foot Long Chain	10	Below Release Limit	Below Release Limit	TCA
Warehouse West Wing, Misc. Equipment	Bkgd-50	Below Release Limit	Below Release Limit	R-MAD. Material Tagged and Placed in Warehouse East Wing
Warehouse East Wing, Misc. Equipment	1-20	Below Release Limit	Below Release Limit	R-MAD. Material Left in Place. Radiation Warning Signs Updated
MSA Lab	Bkgd	Below Release Limit	Below Release Limit	R-MAD
Beetle Bldg.	Bkgd	Below Release Limit	Below Release Limit	R-MAD
J-9-4 Trailer East of R-MAD	Bkgd	Below Release Limit	Below Release Limit	R-MAD
Tube Storage Trailer, Sink, Hot Plates	2-3	750,000 Internal to Sink	Below Release Limit	R-MAD. Equipment Tagged and Left in Place
Chemical Storage Trailer, Lead Storage Containers	3	Below Release Limit	Below Release Limit	R-MAD

*Release Limits: Removable alpha - 100 dpm/100 cm² and beta plus gamma - 1,000 dpm/100 cm²

APPENDIX A (continued)

ITEM OR LOCATION	mR/h OPEN SHIELD NEAR CONTACT	REMOVABLE BETA + GAMMA dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²	REMARKS
North Trailer	Bkgd	Below Release Limit	Below Release Limit	R-MAD
Decon Bldg. Interior, Misc. Equipment	3-100	1,800	Below Release Limit	R-MAD
East Side of Pad Outside Decon Bldg., Misc. Equipment	0.5-60	Below Release Limit	Below Release Limit	R-MAD
Fenced Area North of Decon Bldg., Fuel Casks	100	Below Release Limit	Below Release Limit	R-MAD. Tagged and Left in Place
Transportainer Near Guard Station	Bkgd	Below Release Limit	Below Release Limit	R-MAD
Laundry Room	Bkgd	Below Release Limit	Below Release Limit	R-MAD
Fenced Storage Area West of R-MAD Whse., Misc. Equipment	0.4-50	Below Release Limit	Below Release Limit	R-MAD. Marked and Left in Place
Junior Hot Cell, Inside Hood	2	Below Release Limit	Below Release Limit	R-MAD
Two Reactor Shields on Train Track East of R-MAD	600-1,700	Below Release Limit	Below Release Limit	R-MAD
USAF Transpor- tainer East of Decon Bldg., Waste in Container	10	No Data	No Data	R-MAD. Tagged and Left in Place
Metal Frames Opposite Corner of R-MAD Warehouse	15	No Data	No Data	R-MAD. Tagged and Left in Place
West Side of R-MAD Whse., Misc. Equip.	0.5-0.7	No Data	No Data	R-MAD. Tagged and Left in Place

*Release Limits: Removable alpha - 100 dpm/100 cm² and beta plus gamma - 1,000 dpm/100 cm²

APPENDIX A (continued)

ITEM OR LOCATION	mR/h OPEN SHIELD NEAR CONTACT	REMOVABLE BETA + GAMMA dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²	REMARKS
Unfenced Storage Yard South of R-MAD Whse., Misc. Equipment	0.4-20	Below Release Limit	Below Release Limit	R-MAD. Items Marked and Left in Place
R-MAD Bldg., Misc. Equip. and Locations	0.4-15	No Data	No Data	R-MAD. Items Not Marked
R-MAD Bldg., Misc. Equip.	10-40	No Data	No Data	R-MAD. Equipment Removed to Radioactive Material Storage

*Release Limits: Removable alpha - 100 dpm/100 cm² and beta plus gamma - 1,000 dpm/100 cm²

APPENDIX B
RADIOACTIVE MATERIALS STORAGE FACILITY
1978 RADIATION SURVEY
(MAXIMUM LEVELS)

ITEM OR LOCATION	mR/h OPEN SHIELD NEAR CONTACT	3 FEET	REMOVABLE BETA + GAMMA dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²	REMARKS
Tory Reactor Parts Car	200*	50	37	0	Initial survey on 1/17/78.
Tory Nozzle Car	40	30	48	0	Initial survey on 1/17/78.
NRX-EST on Car #T-2	120	30	28,900	320	Initial survey on 1/17/78.
NRX A-6	5	4	46	0	Initial survey on 1/17/78.
T-4 Car	4	2	28	0	Initial survey on 1/17/78.
Sand Bags	0.2	0.2	43	0	Sandbags were removed 1/20/78 burial in U3ax RWMS.
Culvert South	35	10	54	0	Initial survey on 1/16/78.
Culvert North	30	10	68	0	Initial survey on 1/16/78.
Reactor Stand	0.5	0.2	6	0	Initial survey on 1/16/78.
External Shield	0.1	0.1	31	0	Initial survey on 1/16/78.
Radiation Shield Stand	50	30	320	0	Initial survey on 1/16/78.
Flat Car No. 2	500	80	130	2	Survey prior to disassembly. The nozzle was removed 4/13/78 for burial in U3ax RWMS.
Flat Car No. 2	2	0.07	76	0	Survey after disassembly completed.
Test Vehicle No. 2 with Nozzle	8	5	76	0	Survey prior to disassembly. The vehicle was disassembled, and parts were removed 4/24, 4/28, 5/4, and 5/08/78 to U3ax RWMS for burial.
Test Vehicle No. 2	15	5	22	0	Survey after disassembly completed.
NRX-A6 Vehicle	150	20	66	0	Survey prior to disassembly. The vehicle was disassembled, and parts were removed 4/3 and 4/6/78 to U3ax RWMS for burial.
NRX-A6 Vehicle	30	2	14	0	Survey after disassembly completed.

*Release Limits 0.05 mR/h upper background limit. Removable beta plus gamma and alpha limit - 20 dpm/100 cm²

APPENDIX B (continued)

ITEM OR LOCATION	mR/h OPEN SHIELD NEAR CONTACT	3 FEET	REMOVABLE BETA + GAMMA dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²	REMARKS
NRX-EST Vehicle	600	50	5,220	64	Survey prior to disassembly. The vehicle was disassembled, and parts were removed 4/10 and 4/12/78 to U3ax RWMS for burial.
NRX-EST Vehicle	50	7	277	5	Survey after disassembly completed.
T-6 Vehicle	40	4	50	3	Survey prior to disassembly. The vehicle was disassembled, and parts were removed 4/24/78 to U3ax RWMS for burial.
T-6 Vehicle	40	4	11	0	Survey after disassembly completed.
Tory Support Vehicle	3,000	90	63	30	Survey prior to disassembly 3/10/78. The vehicle was disassembled, and parts were removed 3/10 and 3/14/78 to U3ax RWMS for burial.
Tory Support Vehicle	12	4	49	28	Survey after disassembly completed.
T-4 Vehicle	200	30	35	12	Survey prior to disassembly. The vehicle was disassembled, and parts were removed 4/3/78 to U3ax RWMS for burial.
T-4 Vehicle	200	2	0	0	Survey after disassembly completed.
Railcar PH 2A	400	80	222	0	Survey prior to disassembly. The vehicle was disassembled, and parts were removed 5/4 and 5/8/78 to U3ax RWMS for burial.
Railcar PH 2A	200	10	59	3	Survey after disassembly completed.
Pheobus 1A	500	50	2,120	10	Survey prior to disassembly. The vehicle was disassembled, and parts were removed 5/15/78 to U3ax RWMS for burial.
Pheobus 1A	200	10	232	6	Survey after disassembly completed.

*Release Limits: 0.05 mR/h upper background limit. Removable beta plus gamma and alpha limit - 20 dpm/100 cm²

APPENDIX C
R-MAU COMPOUND
1978 RADIATION SURVEY
(MAXIMUM LEVELS)

DATE	LOCATION	mR/h OPEN SHIELD NEAR CONTACT	3 FEET	REMOVABLE BETA + GAMMA dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²
02/28/78	Room 103A	bkgd*	bkgd	106 floor	25 floor
02/28/78	Room 103	bkgd	bkgd	37 NE floor	8 floor
02/28/78	Room 115	bkgd	bkgd	140 floor	21 misc. item
02/28/78	Room 160	bkgd	bkgd	19 wall	18 floor
03/01/78	Room 103B	bkgd	bkgd	53 floor	17 floor
03/01/78	Room 103C	bkgd	bkgd	53 floor	17 floor
03/02/78	Room 103D	bkgd	bkgd	23 floor	17 floor, wall
03/21/78	Warehouse Bldg. #3111 Office #1	bkgd	bkgd	47	25
03/21/78	Warehouse Bldg. #3111 Office #2	bkgd	bkgd	24	25
03/21/78	Warehouse Bldg. #3111 Stockroom	bkgd	bkgd	43 N. wall	33 wall
03/21/78	Warehouse Bldg. #3111, Room 113A	5	bkgd	24	2.7
03/22/78	Room 124A	bkgd	bkgd	526 floor	17 floor
03/22/78	Room 302	bkgd	bkgd	43 floor	16 floor
03/22/78	Room 401	bkgd	bkgd	34 electrical equipment	12 floor, wall
03/27/78	Room 129	bkgd	bkgd	534 floor	20 floor
03/27/78	Room 130	bkgd	bkgd	560 floor	27 floor
03/27/78	Room 131	0.05	0.05	246 floor	20 floor
03/28/78	Room 142	bkgd	bkgd	227 floor	27 walls, floor
03/28/78	Room 214	bkgd	bkgd	1,430 floor	16 wall
03/28/78	Room 215	bkgd	bkgd	34 floor	3 floor
03/29/78	Room 112	bkgd	bkgd	92 poison rod	5 wall
03/29/78	Room 113A	bkgd	bkgd	822 floor	20 floor
03/29/78	Room 213	bkgd	bkgd	26 floor	16 floor

*Release Limits 0.05 mR/h upper background limit. Removable beta plus gamma and alpha limit - 20 dpm/100 cm²

APPENDIX C (continued)

DATE	LOCATION	mR/h OPEN SHIELD NEAR CONTACT	3 FEET	REMOVABLE BETA + GAMMA dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²
03/29/78	Room 216	2	bkgd	280 floor	16 wall
04/03/78	Room 132	bkgd	bkgd	15,600	110 floor
04/03/78	Room 133	bkgd	bkgd	109,000 electrical box	1,360 electrical box
04/04/78	Room 146	bkgd	bkgd	25,200 floor	128 floor
04/07/78	Room 127	bkgd	bkgd	284,000 chute	2,170 chute
04/14/78	Room 126	200	bkgd	29,600 wall	248 yellow box on turntable
04/14/78	Room 134	100	bkgd	84,300 rail on wall	1,200 rail on wall
04/14/78	Room 147	150	bkgd	82,700 floor	775 wall
04/14/78	Room 149	190	bkgd	52,100 blue stand by entrance	437 blue stand by entrance
04/17/78	Room 144	bkgd	bkgd	21,300 floor	140 floor
04/17/78	Room 145	150	bkgd	145,000	1,780
04/17/78	Room 148	150	bkgd	513,000 HC table	578 drain
04/18/78	Room 207	0.2	bkgd	115 walls	16 floor
04/18/78	Room 207A	3	bkgd	194 floor	5 floor
04/18/78	Room 208	0.3	bkgd	162 drain	16 drain
04/18/78	Room 209	bkgd	bkgd	76 wall	3 wall
04/18/78	Room 211	bkgd	bkgd	76 wall	3 bucket, floor
04/18/78	Room 212	bkgd	bkgd	115 floor	5 floor
04/18/78	Room 217	bkgd	bkgd	65 door	5 towel
04/21/78	Stairs near Rooms 207-217	bkgd	bkgd	61 middle stairs	8 middle stairs
04/24/78	West Hall of Room 1, basement	1	bkgd	92 floor	5 floor
04/25/78	Room 3, basement	1	bkgd	37 shelf	13 shelf

*Release Limits: 0.05 mR/h upper background limit. Removable beta plus gamma and alpha limit - 20 dpm/100 cm²

APPENDIX C (continued)

DATE	LOCATION	mR/h OPEN SHIELD NEAR CONTACT	3 FEET	REMOVABLE BETA + GAMMA dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²
04/25/78	Room 4, basement	bkgd	bkgd	41 wall	bkgd
04/25/78	Room 5, basement	bkgd	bkgd	17 walls, table	3 walls, table
04/25/78	South Hall of Room 1, basement	bkgd	bkgd	68 floor	5 floor
04/26/78	Room 8 basement	bkgd	bkgd	904 floor	3 wall
04/26/78	Room 9 basement	bkgd	bkgd	138 floor	3 floor
04/26/78	West Hall of Room 1, Extension, basement	bkgd	bkgd	34 floor	bkgd
04/26/78	West Stairs, Room 2, basement	bkgd	bkgd	40 floor	bkgd
04/27/78	Room 7 basement	100	8	125,000 floor under transfer room door	648 gray separator
05/01/78	Room 157 - first floor	8	bkgd	65 wall	18 floor
05/01/78	Rooms 158 & 162	bkgd	bkgd	341 equipment	586 equipment
05/02/78	Room 159	10.1	1.5	439 floor	642 equipment
05/11/78	Room 143 & 150	0.2	bkgd	501 floor	9 open hole
05/11/78	Room 151	bkgd	bkgd	679 wall	8 control corridor
05/11/78	Room 152B	2	bkgd	371 floor	10 floor
05/11/78	Room 153	20	0.3	4,940 pass-thru door	8 pass-thru door
05/19/78	Room 6, basement	150	bkgd	168,000 Door #1	1,540 Door #1
05/19/78	Room 140	bkgd	bkgd	123 equipment	3 floor, walls
05/22/78	Room 135	4	bkgd	1,130 manipulator, SE	12 manipulator, SE
05/23/78	Room 155	0.1	bkgd	36 floor	9 floor
05/24/78	Room 136	6	bkgd	241 pressure regulator	739 pressure regulator
05/24/78	Room 154	2	bkgd	698 equipment	2,470 equipment
05/25/78	Room 128	10	bkgd	552 lead brick	0.5 walls, floor

*Release Limits 0.05 mR/h upper background limit. Removable beta plus gamma and alpha limit - 20 dpm/100 cm²

APPENDIX C (continued)

DATE	LOCATION	mR/h OPEN SHIELD	3 FEET	REMOVABLE BETA + GAMMA	REMOVABLE ALPHA
		NEAR CONTACT		dpm/100 cm ²	dpm/100 cm ²
05/25/78	Room 218	1.5	bkgd	645 desk	6 floor
05/25/78	Room 303	0.1	bkgd	33 stairs	3 wall, floor
05/30/78	Hallway near Room 129	3	bkgd	279 floor	10 floor
05/30/78	Room 10 basement	10	bkgd	115 floor	bkgd
05/30/78	Stairs to Room 10 - basement	3	bkgd	71 stairs	bkgd
05/30/78	Stairwell near Room 128	30	bkgd	118 floor	20 stair well
05/31/78	Room 111	2	bkgd	490 floor	10 equipment
05/31/78	Room 114	3	bkgd	99 floor	6 floor
06/01/78	Room 106	10	bkgd	1,620 floor	3 floor, wall, vent duck
06/01/78	Room 110	5	bkgd	223 floor	3 walls
06/01/78	Room 205	20	bkgd	3,600 floor	10 floor
06/02/78	Room 104	bkgd	bkgd	18 floor	10 equipment
06/02/78	Room 105	bkgd	bkgd	36 floor	3 floor
06/05/78	Roof	0.1	bkgd	71	3
06/05/78	Room 124 - East side	9	bkgd	400 floor	16 walls
06/05/78	Room 124	4	bkgd	390 floor	6 walls
06/05/78	Room 141	bkgd	bkgd	25 transference	bkgd
06/05/78	Security Building	0.2	bkgd	12 desk	bkgd
06/06/78	Building #3140	bkgd	bkgd	13,300	189 floor
06/06/78	Room 116 & 120	20	bkgd	1,360 floor	12 floor
06/07/78	Room 101	7	bkgd	75 lifting fixture	22 holding fixture
06/07/78	Room 122	6	bkgd	2,000 floor	3 floor
06/07/78	Room 206A	10	bkgd	612 floor	19 floor

*Release Limits: 0.05 mR/h upper background limit. Removable beta plus gamma and alpha limit - 20 dpm/100 cm²

APPENDIX C (continued)

DATE	LOCATION	mR/h OPEN SHIELD NEAR CONTACT	3 FEET	REMOVABLE BETA + GAMMA dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²
06/07/78	Room 206B	bkgd	bkgd	476 floor	13 floor
06/07/78	Room 206C	1.2	bkgd	238 floor	9 buckshot
06/07/78	Room 206D	bkgd	bkgd	29 light bulb	bkgd
06/08/78	Room 117	10	bkgd	316 floor	16 floor
06/08/78	Room 118	20	bkgd	12,100 floor	13 floor
06/08/78	Room 137	0.3	bkgd	618 floor	374 lathe
06/08/78	Room 163	40	bkgd	238 electrical controls	bkgd
06/09/78	Room 156	3	bkgd	87 floor	3 floor
06/12/78	Room 107	3	bkgd	738 floor	20 floor
06/12/78	Room 108	1	bkgd	2,430 floor	13 floor
06/12/78	Room 109	bkgd	bkgd	5,510 vacuum	446 vacuum
06/12/78	Room 152	5	bkgd	146 floor	3 floor, wall
06/12/78	Rooms 219 & 220	20	bkgd	26,800 floor	112 floor
06/13/78	Building #3125 Beetle Shed	2	bkgd	521 Peewee Box	26 fuel cast
06/13/78	Room 125	5	bkgd	3,230 floor	13 floor
06/13/78	Room 125A	150	bkgd	234,000 air lock	917 air lock
06/13/78	Room 301	15	bkgd	21,800 floor	1,150 floor
06/14/78	Building #3140 Source Room	20	bkgd	2,670 floor	3 floor, table
06/14/78	Room 138	30	bkgd	10,800 equipment	34,200 equipment
06/14/78	Room 201	5	bkgd	38,400 wall	830 wall
06/14/78	Stack	bkgd	bkgd	bkgd	bkgd
06/15/78	Bldg. #3126 - Decon Bldg. Balcony	1.5	bkgd	9,090 floor	44 floor
06/15/78	Bldg. #3126 - Decon Bldg. Shower Room	3	bkgd	680 shelf	27 floor, fan

*Release Limits: 0.05 mR/h upper background limit. Removable beta plus gamma and alpha limit - 20 dpm/100 cm²

APPENDIX C (continued)

DATE	LOCATION	mR/h OPEN SHIELD NEAR CONTACT	3 FEET	REMOVABLE BETA + GAMMA dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²
06/15/78	Bldg. #3140 Storage Test and Paint	3	bkgd	290 control room wall	7 restroom floor
06/15/78	Laborer's Shack	bkgd	bkgd	20 walkway	bkgd
06/15/78	Rooms 203-204	0.5	bkgd	11,400 chair	44 chair
06/16/78	Bldg. #3126 - Decon Bldg. Office	30	bkgd	775 floor	17 bookcase
06/19/78	Bldg. #3126 - Decon Bldg. Boiler Room	5	bkgd	109 floor	13 Tank #1
06/19/78	Bldg. #3126 - Decon Bldg. Stairs	0.1	bkgd	479 slide	7 wall pipe
06/19/78	Bldg. #3126 - Decon Bldg. Walkway	30	bkgd	990 equipment	238 equipment
06/19/78	Bldg. #3126 - Decon Bldg. Hot Bay	7,200	10	1,590,000 vacuum cleaner	10,600 vacuum cleaner
06/19/78	Room 119	5	bkgd	1,380 floor	7 floor
06/19/78	Room 121	5	bkgd	1,080 floor	24 floor
06/20/78	Railroad Spur	-	-	22	bkgd
06/20/78	Warehouse Bldg. #3111, SW side	0.5	bkgd	875 metal	7 shelves, equipment
06/20/78	Warehouse Bldg. #3111 Office #1	bkgd	bkgd	38 chair	bkgd
06/21/78	Warehouse Bldg. #3111 Balcony	bkgd	bkgd	26 iron disks	3 floor
06/21/78	Warehouse Bldg. #3111 Contaminated Room	1.5	bkgd	74 floor	6 floor
06/21/78	Warehouse Bldg. #3111, NW	bkgd	bkgd	30 floor	3 floor
06/21/78	Warehouse Bldg. #3111, Tool Room	bkgd	bkgd	7 wall	bkgd
06/22/78	Warehouse Bldg. #3111, NE	bkgd	bkgd	230 floor	6 floor
06/24/78	Warehouse Bldg. #3111, Dark Room & Office	bkgd	bkgd	42 wall	bkgd
06/26/78	Grounds Survey Outside Bldg. #3140	bkgd	bkgd	19 cask storage	bkgd
06/26/78	Grounds Survey Outside Decon Bldg.	bkgd	bkgd	518 pad drain	6 pad drain
06/26/78	Grounds Survey Outside R-MAD Bldg.	bkgd	bkgd	19 center tracks	3 west entrance
06/26/78	Room 123 - Lower Hot Bay	150	bkgd	118,000	650 wall mount

*Release Limits: 0.05 mR/h upper background limit. Removable beta plus gamma and alpha limit - 20 dpm/100 cm²

APPENDIX C (continued)

DATE	LOCATION	mR/h OPEN SHIELD NEAR CONTACT	3 FEET	REMOVABLE BETA + GAMMA dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²
06/26/78	Room 202 - Upper Hot Bay	160	bkgd	707,000	4,830 wall
06/26/78	Room 202 - Upper Hot Bay Equipment	7,200	bkgd	203,000	2,180 overhead crane
06/27/78	Warehouse Bldg. #3111 Men's Room	bkgd	bkgd	29 floor	bkgd
06/27/78	Warehouse Bldg. #3111 Room 103	bkgd	bkgd	38 floor	bkgd
06/27/78	Warehouse Bldg. #3111 Room 104	bkgd	bkgd	32 floor	3 floor
07/07/78	Junior Hot Cell	150	bkgd	8,720 equipment	77 equipment

*Release Limits: 0.05 mR/h upper background limit. Removable beta plus gamma and alpha limit - 20 dpm/100 cm²

APPENDIX D
TEST CELL "A"
1978 RADIATION SURVEY
(MAXIMUM LEVELS)

DATE	LOCATION	mR/h OPEN SHIELD NEAR CONTACT	3 FEET	REMOVABLE BETA + GAMMA dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²
06/27/78	Building #3109A	bkgd*	bkgd	57 floor	3 floor
06/27/78	Building #3115	0.4	bkgd	38 floor	3 floor
06/27/78	Building #3115A	0.7	bkgd	19 speaker	bkgd
06/28/78	Building #3113-3113A	140	bkgd	59-2nd level RAM control floor room	7-2nd level RAM control floor room
06/28/78	Building 3115-3115A	70	bkgd	76 roof floor	3 roof floor
06/28/78	Dewar Area	150	bkgd	66 pipe	10 southwest concrete
06/28/78	Four Fans Area	12	bkgd	36 near Fan #1	7 fan
06/29/78	Control Room A	2	bkgd	24 floor	4 cabinet
06/29/78	Control Room B	bkgd	bkgd	58 floor	4 wall
06/29/78	Reactor Pad	-	bkgd	21,500 track	32 track
06/29/78	Shed	30	bkgd	34 shed	bkgd
06/29/78	Tunnel	bkgd	bkgd	129 step	4 floor, cable
07/06/78	Bunker	0.5	bkgd	32 floor	bkgd
07/06/78	Control Room Foyer	2	bkgd	48 wall	bkgd
07/06/78	EG&G Instrument Room	20	bkgd	26 floor	3 floor
07/06/78	Generator Room	bkgd	bkgd	19 floor	bkgd
07/06/78	Men's Room	bkgd	bkgd	13 wash basin	3 wall sink
07/06/78	Room 3	1.5	bkgd	45 equipment	3 floor
07/06/78	Women's Room	0.4	bkgd	13 floor	bkgd
07/07/78	Building #3109	10	bkgd	43 floor	bkgd
07/11/78	Contaminated Storage Area - West Yard	13	bkgd	42 light	3 item or pallet #1
07/11/78	East Contaminated Area	130	bkgd	58 lead brick	bkgd

*Release Limits: 0.05 mR/h upper background limit. Removable beta plus gamma and alpha limit - 20 dpm/100 cm²

APPENDIX E
TEST CELL "C"
1978 RADIATION SURVEY
(MAXIMUM LEVELS)

DATE	LOCATION	mR/h OPEN SHIELD NEAR CONTACT	3 FEET	REMOVABLE BETA + GAMMA dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²
07/31/78	Building #3228, West Side	bkgd*	bkgd	50	9
07/14/78	Building #3228, Hallway	bkgd	bkgd	39	3
07/14/78	Building #3228, Tool Crib	12	bkgd	31	6
07/17/78	Building #3228, East Side Warehouse	0.8	bkgd	103	7
07/17/78	Building #3228, Restroom	0.2	bkgd	33	bkgd
07/17/78	Building #3228, Office	0.06	bkgd	bkgd	bkgd
07/18/78	Building #3228, Electrical Shop	0.6	bkgd	26	7
07/18/78	Building #3229, Room 101	bkgd	bkgd	26	7
07/18/78	Building #3229, Room 102	bkgd	bkgd	32	7
07/18/78	Building #3229, Room 103	bkgd	bkgd	68	10
07/18/78	Building #3229, Room 104	bkgd	bkgd	32	3
07/19/78	Building #3229, Rooms 105-106	bkgd	bkgd	23	bkgd
07/19/78	Building #3229, Room 107	bkgd	bkgd	23	bkgd
07/19/78	Building #3229, Room 108	bkgd	bkgd	29	bkgd
07/19/78	Building #3229, Room 109	bkgd	bkgd	32	9
07/19/78	Building #3229, Room 110	bkgd	bkgd	19	bkgd
07/20/78	Building #3229, Room 111	bkgd	bkgd	bkgd	bkgd
07/20/78	Building #3229, Room 112	bkgd	bkgd	29	bkgd
07/20/78	Building #3229, Room 112A	bkgd	bkgd	45	bkgd
07/20/78	Building #3229, Room 113	bkgd	bkgd	19	bkgd
07/20/78	Building #3229, Room 114	bkgd	bkgd	bkgd	bkgd
07/20/78	Building #3229, Room 116	bkgd	bkgd	39	bkgd
07/20/78	Building #3229, Room 117	bkgd	bkgd	26	3

*Release Limits 0.05 mR/h upper background limit. Removable beta plus gamma and alpha limit - 20 dpm/100 cm²

APPENDIX E (continued)

DATE	LOCATION	mR/h OPEN SHIELD	3 FEET	REMOVABLE BETA + GAMMA	REMOVABLE ALPHA
		NEAR CONTACT		dpm/100 cm ²	dpm/100 cm ²
07/21/78	Building #3229, Room 118	bkgd	bkgd	41	3
07/21/78	Building #3229, Room 119	bkgd	bkgd	bkgd	9
07/21/78	Building #3229, Utility Room	bkgd	bkgd	19	bkgd
07/21/78	Building #3229, Hallway	bkgd	bkgd	38	6
07/21/78	Building #3220, Room 1	0.8	bkgd	19	bkgd
07/24/78	Building #3220, Room 2	1.2	bkgd	26	3
07/24/78	Building #3220, Room 3	0.8	bkgd	bkgd	3
07/24/78	Building #3220, Room 4	0.4	bkgd	26	3
07/24/78	Building #3220, Room 4A	0.8	bkgd	32	bkgd
07/25/78	Building #3220, Power Room	7.6	bkgd	26	6
07/25/78	Building #3220, Air Conditioner Room	bkgd	bkgd	23	6
07/25/78	Building #3220, Room 7	1.5	bkgd	bkgd	bkgd
07/25/78	Building #3220, Rooms 7 & 8	1.5	bkgd	32	3
07/25/78	Building #3220, Compressor Room	0.8	bkgd	23	3
07/25/78	Building #3214, Drive Shed	0.2	bkgd	45	3
07/26/78	Building #3205	37.5	bkgd	35	3
07/26/78	Power House	0.2	bkgd	29	bkgd
07/26/78	Building #3230, Motor Drive Building	60.8	bkgd	55	16
07/26/78	Building #3230, Air Intake	37.5	bkgd	23	bkgd
07/26/78	Building #3230, Basement	bkgd	bkgd	42	3
07/27/78	Building #3224, Restroom	0.2	bkgd	32	3
07/27/78	Building #3232	3.8	bkgd	71	10
07/27/78	Building #3211, Reactor Shed	37.5	bkgd	210	bkgd

*Release Limits. 0.05 mR/h upper background limit. Removable beta plus gamma and alpha limit - 20 dpm/100 cm²

APPENDIX E (continued)

DATE	LOCATION	mR/h OPEN SHIELD NEAR CONTACT	3 FEET	REMOVABLE BETA + GAMMA dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²
07/27/78	Building #3210, Belly Plug Room	2.0	bkgd	19	7
07/27/78	Building #3210, Basement Vault	bkgd	bkgd	bkgd	3
07/27/78	Building #3210, Basement Equipment Room	2.3	bkgd	74	10
07/28/78	Building #3210, Flow Control Room	0.9	bkgd	38	6
07/31/78	Building #3210, Basement Elec. Room	3.0	bkgd	11,170	4
07/31/78	Building #3210, South Stairwell	bkgd	bkgd	587	7
07/31/78	Building #3210, North Stairwell	1.4	bkgd	27	4
07/31/78	Building #3210, High Press Room	3.0	bkgd	60	7
08/01/78	Building #3210, Pump Room	3.0	bkgd	88	6
08/01/78	Building #3210, Flow Control Room A	0.9	bkgd	50	6
08/01/78	Building #3210, Penthouse	7.6	bkgd	63	3
08/01/78	Flow Line	bkgd	bkgd	38	bkgd
08/01/78	Dewar 6, 7, 8 Areas	37.5	bkgd	38	3
08/02/78	Dewar 6, 7, 8 Areas	4.0	bkgd	32	6
08/02/78	Tank Farm	12	bkgd	48	3
08/02/78	Pipe Area 3.g Reactor Pad	37.5	bkgd	44,561	3
08/02/78	Dewar 3	37.5	bkgd	32	6
08/03/78	Building #3210, First Level Roof	22.8	bkgd	24	6
08/03/78	Building #3210, Third Level Roof	bkgd	bkgd	58	3
08/04/78	Concrete pad - Dewar 1 & 2	37.5	bkgd	67	6
08/04/78	Pipe Maze Between Buildings 3210 & 3232	25.5	bkgd	3,461	25
08/07/78	Dewar 4 & 5	37.5	bkgd	61	13
08/08/78	Motor Drive Building, Room 17	.3	bkgd	34	3

*Release Limits: 0.05 mR/h upper background limit. Removable beta plus gamma and alpha limit - 20 dpm/100 cm²

APPENDIX E (continued)

DATE	LOCATION	mR/h OPEN SHIELD	3 FEET	REMOVABLE BETA + GAMMA	REMOVABLE ALPHA
		NEAR CONTACT		dpm/100 cm ²	dpm/100 cm ²
08/08/78	Process Water Tank & Heater	0.9	bkgd	31	3
08/09/78	Process Water Tank Ground	---	bkgd	34	3
08/09/78	Propane Storage Area	0.3	bkgd	47	6
08/09/78	Ground Storage Tank	1.1	bkgd	22	3
08/09/78	Evap. Cooling Tower	1.5	bkgd	41	bkgd
08/09/78	Miscellaneous Equip. East of Building 3220	---	bkgd	38	bkgd
08/09/78	Ground Survey Behind Pumphouse	8.0	bkgd	38	3
08/09/78	South Concrete	35.0	bkgd	66	6
08/10/78	Reactor Pad	37.5	bkgd	8,486	504
08/16/78	Dewar 1 & 2 Pipe Area	12	bkgd	48	6

*Release Limits: 0.05 mR/h upper background limit. Removable beta plus gamma and alpha limit - 20 dpm/100 cm²

APPENDIX F
ETS-1 1978 SURVEY REPORT
(MAXIMUM LEVELS)

DATE	LOCATION	mR/h OPEN SHIELD	3 FEET	REMOVABLE BETA + GAMMA	REMOVABLE ALPHA
		NEAR CONTACT		dpm/100 cm ²	dpm/100 cm ²
08/18/78	Maintenance Area	0.2*	bkgd	24	bkgd
08/18/78	Supply Room	0.05	bkgd	27	bkgd
08/18/78	Warehouse Loft	0.15	bkgd	---	bkgd
08/18/78	Warehouse Office	0.05	bkgd	27	bkgd
08/21/78	Building #3320 - Compressor Room	0.05	bkgd	203	6
08/22/78	Building #3320 - Room A/C	0.7	bkgd	18	bkgd
08/22/78	Building #3324 - Compressor Room	0.05	bkgd	86	8
08/22/78	Main Entrance - Tunnel	0.05	bkgd	27	6
08/22/78	Men's Room	0.05	bkgd	18	bkgd
08/22/78	20R 203	0.05	bkgd	---	bkgd
08/22/78	20R 1206	0.05	bkgd	21	bkgd
08/23/78	Building #3324	0.05	bkgd	19	8
08/23/78	Trailer	bkgd	bkgd	bkgd	bkgd
08/23/78	Warehouse	0.05	bkgd	57	8
08/23/78	Warehouse Yard	0.2	bkgd	16	4
08/24/78	Building #3320 - Room 20R, 203A	0.05	bkgd	50	bkgd
08/24/78	Building #3320 - Room 20R, 203B	0.05	bkgd	44	bkgd
08/24/78	Hallway 20R 201	0.05	bkgd	44	bkgd
08/24/78	North Stairway to Pipe Area	20	bkgd	76	4
08/24/78	Portable Stand	bkgd	bkgd	6	bkgd
08/24/78	Tank Farm Area	0.05	bkgd	36	bkgd
08/24/78	Test Stand Ground Level	1.3	bkgd	58	11
08/24/78	Test Stand South 2nd Level	0.05	bkgd	27	bkgd

*Release Limits: 0.05 mR/h upper background limit. Removable beta plus gamma and alpha limit - 20 dpm/100 cm²

APPENDIX F (continued)

DATE	LOCATION	mR/h OPEN SHIELD	3 FEET	REMOVABLE BETA + GAMMA	REMOVABLE ALPHA
		NEAR CONTACT		dpm/100 cm ²	dpm/100 cm ²
08/24/78	Test Stand 1st Level	0.05	bkgd	27	bkgd
08/25/78	South Stairway Reactor Pad	0.05	bkgd	51	8
08/26/78	Portable Stand	0.01	bkgd	38	6
08/28/78	Pipe Run from Tank Farm	bkgd	bkgd	19	6
08/28/78	Pipe Run - Tank Farm to Test Pad	0.05	bkgd	44	bkgd
08/29/78	Pipe Run	bkgd	bkgd	6	bkgd
08/29/78	Pipe Run Tank - Fill Station	0.05	bkgd	51	6
08/29/78	Tank Farm Area	bkgd	bkgd	bkgd	bkgd
08/29/78	Test Stand Level 3 Station	0.05	bkgd	36	6
08/30/78	Building #3330 - Room 30R 202	0.05	bkgd	29	bkgd
08/30/78	Cable Shed	0.05	bkgd	16	bkgd
08/30/78	Dewar U3801	0.04	bkgd	29	bkgd
08/30/78	Dewar & Equipment	0.05	bkgd	32	bkgd
08/30/78	ETS-1 Trailer	0.05	bkgd	19	bkgd
08/30/78	GH ₂ Vessel Control Station	bkgd	bkgd	19	6
08/30/78	Pipe Area South of Dewar	0.4	bkgd	29	12
08/30/78	Pipe Under Reactor for Pad	0.05	bkgd	216	4
08/30/78	Room 30R 203	0.05	bkgd	42	bkgd
08/30/78	Room 30S 130	0.05	bkgd	---	bkgd
08/30/78	Test Stand Level 2	0.05	bkgd	26	bkgd
08/30/78	Test Stand Level 3	0.05	bkgd	42	6
08/31/78	Building #3330 - Pump Room Tunnel Facility	0.05	bkgd	31	6
08/31/78	Test Stand Level 5	0.05	bkgd	28	bkgd

*Release Limits: 0.05 mR/h upper background limit. Removable beta plus gamma and alpha limit - 20 dpm/100 cm²

APPENDIX F (continued)

DATE	LOCATION	mR/h OPEN SHIELD	3 FEET	REMOVABLE BETA + GAMMA	REMOVABLE ALPHA
		NEAR CONTACT		dpm/100 cm ²	dpm/100 cm ²
08/31/78	Test Stand Level 7	0.05	bkgd	47	6
08/31/78	Test Stand 1st Level	0.05	bkgd	53	34
09/01/78	Test Stand Level 6	0.05	bkgd	38	bkgd
09/01/78	Test Stand Top Floor	0.05	bkgd	34	bkgd
09/01/78	Top of Test Stand	0.05	bkgd	19	bkgd
09/07/78	North Shield Test Stand	0.30	bkgd	127	5
09/07/78	Reactor from Test Stand	0.07	bkgd	97	bkgd
09/07/78	Room 10R 118	0.05	bkgd	18	bkgd
09/08/78	Flair Stack North End	0.05	bkgd	19	bkgd
09/08/78	Room 10R 119	0.05	bkgd	29	bkgd
09/08/78	Room 10R 120	0.05	bkgd	22	bkgd
09/08/78	Test Stand Open Room North End	0.05	bkgd	23	bkgd
09/11/78	HPSGA Entry	0.05	bkgd	22	6
09/11/78	Tunnel Fill Station	0.05	bkgd	22	bkgd
09/11/78	U3801 Entry	bkgd	bkgd	---	6
09/11/78	30R 100	0.05	bkgd	25	bkgd
09/11/78	30R 101	0.05	bkgd	19	bkgd
09/12/78	Fill State Entry	0.05	bkgd	---	bkgd
09/12/78	Room 10R 113	0.05	bkgd	29	bkgd
09/12/78	Room 10S 116	0.05	bkgd	17	bkgd
09/12/78	Tunnel CP to Fill Station	0.05	bkgd	20	bkgd
09/12/78	Tunnel 10R 107	0.05	bkgd	17	bkgd
09/12/78	10R 104 (Stairs)	0.05	bkgd	---	bkgd

*Release Limits: 0.05 mR/h upper background limit. Removable beta plus gamma and alpha limit - 20 dpm/100 cm²

APPENDIX F (continued)

DATE	LOCATION	mR/h OPEN SHIELD	3 FEET	REMOVABLE BETA + GAMMA	REMOVABLE ALPHA
		NEAR CONTACT		dpm/100 cm ²	dpm/100 cm ²
09/13/78	Hallway 112-115	0.05	bkgd	---	bkgd
09/13/78	Room 10R 108	0.05	bkgd	20	bkgd
09/13/78	Room 10R 117	0.05	bkgd	31	bkgd
09/13/78	10R 106 (Main Room)	0.05	bkgd	20	bkgd
09/14/78	Cable Run	bkgd	bkgd	bkgd	bkgd
09/14/78	Cable Run Pipe Run	0.05	bkgd	26	bkgd
09/14/78	Room 10R 109	0.05	bkgd	16	bkgd
09/14/78	Room 10R 110	0.05	bkgd	35	bkgd
09/14/78	Room 10R 114	0.05	bkgd	16	bkgd
09/14/78	Room 40R 101	0.05	bkgd	26	bkgd
09/14/78	Room 40R 102	0.05	bkgd	29	bkgd
09/14/78	Tunnel Facility 10R 111	0.05	bkgd	29	bkgd
09/14/78	Tunnel Room 10R 101	0.05	bkgd	26	5
09/14/78	Tunnel Room 10R 102	0.05	bkgd	---	bkgd
09/14/78	Tunnel Room 10R 103	0.05	bkgd	26	bkgd
09/14/78	10C 721	0.05	bkgd	29	bkgd
09/15/78	North End - Test Stand	0.05	bkgd	22	bkgd
09/15/78	North End Tunnel Room B	0.05	bkgd	25	bkgd
09/15/78	Room 40R 100	0.05	bkgd	19	bkgd
09/15/78	Room 40R 104	0.05	bkgd	25	bkgd
09/22/78	20R 200	0.05	bkgd	21	bkgd
09/25/78	Room 30R 101	0.05	bkgd	---	bkgd
11/16/78	Shield South	0.13	bkgd	36	5

*Release Limits: 0.05 mR/h upper background limit. Removable beta plus gamma and alpha limit - 20 dpm/100 cm²

APPENDIX F (continued)

DATE	LOCATION	mR/h OPEN SHIELD	3 FEET	REMOVABLE BETA + GAMMA	REMOVABLE ALPHA
		NEAR CONTACT		dpm/100 cm ²	dpm/100 cm ²
12/01/78	Concrete Pad - Test Stand	0.3	bkgd	10	bkgd
12/01/78	Diesel Oil Tank	0.05	bkgd	11	bkgd
12/01/78	ETS-1 Test Stand	0.03	bkgd	50	5
12/01/78	Test Stand Below Ground	0.03	bkgd	13	10

*Release Limits 0.05 mR/h upper background limit. Removable beta plus gamma and alpha limit - 20 dpm/100 cm²

APPENDIX G
FINAL RADIATION SURVEY OF RMSF, 1983

DATE	LOCATION	mR/h OPEN SHIELD	MAXIMUM REMOVABLE Beta + Gamma dpm/100 cm ²
01/13/83	RMSF Blue Flat Car	0.05	0
01/13/83	RMSF Nuclear Furnace Car	19 (2.5 mR/h gamma)*	1,167
01/13/83	RMSF Railroad Car NRX-A6	6.70	0
01/13/83	RMSF Railroad Car #F-2	1	0
01/13/83	RMSF Railroad Car #F-4	0.05**	0
01/13/83	RMSF Railroad Car #F-7	0.05	0
01/13/83	RMSF Railroad Car #F-8	2	0
01/13/83	RMSF Railroad Car #F-9117922	0.60	0
01/13/83	RMSF Railroad Car #L1	0.05	0
01/13/83	RMSF Railroad Car #T-2	11	0
01/13/83	RMSF Railroad Car #T-4	2	0
01/13/83	RMSF Railroad Car #T-5	1.50	0
01/13/83	RMSF Railroad Car #T-6	25	0
01/13/83	RMSF Railroad Car #1	20 (0.05 mR/h gamma)*	0
01/13/83	RMSF Railroad Car #17920	3	0
01/13/83	RMSF Railroad Car #17921	0.16	0
01/13/83	RMSF Railroad Car #2	0.05	0
01/13/83	RMSF Railroad Car #7-17918	0.05	0
01/13/83	RMSF Test Vehicle #2	0.10	0
04/06/83	First Spur South of Main Track Tie #27	0.50	6
04/06/83	First Spur South of Main Track Tie #19	0.40	0

*Closed Shield - gamma only

**Release Limits: 0.05 mR/h - upper background limit. Removable beta plus gamma - 20 dpm/100 cm²

APPENDIX G (continued)

DATE	LOCATION	mR/h OPEN SHIELD	MAXIMUM REMOVABLE Beta + Gamma dpm/100 cm ²
04/06/83	First Spur South of Main Track Tie #22	0.40	3
04/06/83	First Spur South of Main Track Tie #23	0.30	3
04/06/83	First Spur South of Main Track Tie #26	0.30	32
04/06/83	Ground Surface Near First Spur South of Main Track	0.05	---
04/06/83	Remainder of RMSF Track	0.05	0
04/06/83	Remainder of Second Spur	0.05	0
04/06/83	Remainder of Third Spur	0.05	0
04/06/83	Second Spur South of Main Track Tie #32	0.30	16
04/06/83	Second Spur South of Main Track Tie #33	0.20	6
04/06/83	Second Spur South of Main Track Tie #34	0.08	0
04/06/83	Soil Near Tie #32	0.20	0
04/06/83	Third Spur South of Main Track Tie #1	0.20	6
04/06/83	Third Spur South of Main Track Tie #2	0.15	0
04/11/83	Fuel Cask #270 (Outside)	0.05	8
04/11/83	Fuel Cask #1 (Outside)	0.05	0
04/11/83	Fuel Cask #150 (Outside)	0.05	0
04/11/83	Fuel Cask #2 (Outside)	0.05	0
04/11/83	Fuel Cask #21 (Outside)	0.05	0
04/11/83	Fuel Cask #210 (Outside)	0.05	0
04/11/83	Fuel Cask #3 (Inside)	3	200,000
04/11/83	Fuel Cask #30 (Inside)	0.30	0
04/11/83	Fuel Cask #330 (Outside)	0.05	0

*Closed Shield - gamma only

**Release Limits: 0.05 mR/h - upper background limit. Removable beta plus gamma - 20 dpm/100 cm²

APPENDIX G (continued)

DATE	LOCATION	mR/h OPEN SHIELD	MAXIMUM REMOVABLE Beta + Gamma dpm/100 cm ²
04/11/83	Fuel Cask #4 (Outside)	0.05	0
04/11/83	Fuel Cask #5 (Outside)	0.05	0
04/11/83	Fuel Cask #6 (Outside)	0.05	0
04/11/83	Fuel Cask #7 (Outside)	0.05	0
04/11/83	Fuel Cask #90 (Outside)	0.05	0
04/11/83	Fuel Cask #99 (Outside)	0.05	0
04/11/83	RMSF Surface Near Railroad Tie #32 on Spur #3 South of Main Track Maximum Reading	0.20	0

*Closed Shield - gamma only

**Release Limits: 0.05 mR/h - upper background limit. Removable beta plus gamma - 20 dpm/100 cm²

APPENDIX H
FINAL RADIATION SURVEY OF TEST CELL "A", 1983

DATE	LOCATION	mR/h OPEN SHIELD	MAXIMUM REMOVABLE Beta + Gamma dpm/100 cm ²
06/08/83	Building 3113A Room 3 Port Holes South Hall	0.40	0
06/08/83	Dewar Cement Pad South of Test Cell A	150 (3 mR/h gamma)*	0
06/08/83	EG&G Instrument Room	0.05**	0
06/08/83	Generator Room Floor	0.30	0
06/08/83	Generator Room Pipe	0.40	0
06/08/83	Ground Outside Room 3	0.40	0
06/08/83	Men's Restroom (Floor)	0.15	0
06/08/83	Overhead Pipe West of Room 3	0.80	0
06/08/83	Room 5A of Building 3113	0.05	0
06/08/83	Room 5A (Foyer of Bldg. 3113 Entrance on Floor)	0.40	0
06/08/83	Room 5B of Building 3113	0.05	0
06/08/83	Tunnel	0.05	0
06/08/83	Women's Restroom (At Drain on Floor)	0.15	0
06/13/83	Cement Sheds South of Test Cell A	0.50	0
06/13/83	Pipe North of Test Cell A	1.30	0
06/13/83	Pipe on Dewar Pad	50	0
06/13/83	Reactor Pad Portable Shed	1.50	0
06/13/83	Reactor Pad Tracks	80	0
06/14/83	Building 3109	0.05	0
06/14/83	Building 3115	0.05	0
06/14/83	Building 3116 Pump Station	0.05	0

*Closed Shield - gamma only

**Release Limits: 0.05 mR/h - upper background limit. Removable beta plus
gamma - 20 dpm/100 cm²

APPENDIX H (continued)

DATE	LOCATION	mR/h OPEN SHIELD	MAXIMUM REMOVABLE Beta + Gamma dpm/100 cm ²
06/14/83	Equipment Inside Building 3116	0.05	0
06/14/83	First Level Pipe	3	0
06/14/83	First Level Roof	15	0
06/14/83	Gas Control System Room 11	0.05	0
06/14/83	Gauges Inside Room 11	0.30	0
06/14/83	Penthouse Control Room (Second Level of Building)	1.70	0
06/14/83	Penthouse Roof	1.50	0
06/14/83	Pipe and Fittings (On Pad West of Test Cell A Main Building)	0.70	0
06/14/83	Pipe and Fittings (West Side of Fenced Area Inside Test Cell A Compound)	0.40	0
06/14/83	Room 2 East Wall in Tank	170 (mR/h gamma)	
06/14/83	Room 2 Wall Southeast Corner	1.30	0
06/14/83	Second Level Room 2 Floor	0.90	0
06/14/83	Water Tower	0.05	0
06/21/83	Building 3133 Floor	0.30	0
06/21/83	Bunker Northwest of Building 3113	0.05	0
06/21/83	Dewar Tanks	0.25	0
06/22/83	Contaminated Debris Inside Compound	140	0
06/22/83	Ground Surface Inside Compound (Average)	0.44	0

*Closed Shield - gamma only

**Release Limits: 0.05 mR/h - upper background limit. Removable beta plus gamma - 20 dpm/100 cm²

APPENDIX I
FINAL RADIATION SURVEY R-MAD
BUILDING #3110, 1983

DATE	LOCATION	mR/h OPEN SHIELD	MAXIMUM REMOVABLE Beta + Gamma dpm/100 cm ²
07/18/83	Room 101 Low Bay	0.05*	0
07/18/83	Room 103A	0.05	0
07/18/83	Room 103B	0.05	0
07/18/83	Room 117	0.05	0
07/18/83	Room 118	0.05	0
07/18/83	Room 119A	0.05	0
07/18/83	Room 119B	0.05	0
07/18/83	Room 136 High Bay	0.05	0
07/18/83	Room 137 High Bay	0.05	0
07/18/83	Room 138	0.05	0
07/18/83	Room 207 Low Bay	0.05	0
07/18/83	Room 208 Low Bay	0.05	0
07/18/83	Room 211 Low Bay	0.05	0
07/19/83	Hallway 124 (Contact reading on contaminated material)	0.3	0
07/19/83	Room 102	0.05	0
07/19/83	Room 105	0.05	0
07/19/83	Room 110	0.05	0
07/19/83	Room 112	0.05	0
07/19/83	Room 113A	0.05	0
07/19/83	Room 113B	0.05	0
07/19/83	Room 115	0.05	0
07/19/83	Room 129	0.05	0

*Release Limits: 0.05 mR/h - upper background limit. Removable beta plus gamma - 20 dpm/100 cm²

**Closed Shield - gamma only

APPENDIX I (continued)

DATE	LOCATION	mR/h OPEN SHIELD	MAXIMUM REMOVABLE Beta + Gamma dpm/100 cm ²
07/19/83	Room 130	0.05	0
07/19/83	Room 156	0.05	0
07/19/83	Room 210	0.05	0
07/20/83	Hall 116	0.05	0
07/20/83	Room 114	0.05	0
07/20/83	Room 143	0.05	0
07/20/83	Room 159	0.05	0
07/20/83	Room 209	0.05	0
07/20/83	Stairway to Mezzanine	0.05	0
07/28/83	Basement South Hall No. 1 (Drain beneath hatch, sign and radiation levels posted)	2.10	0
07/28/83	Room 122	0.05	0
07/28/83	Room 125	0.05	0
07/28/83	Room 125A (next to air lock door)	0.40	0
07/28/83	Room 125A (Shower Floor)	0.15	0
07/28/83	Room 128A (Floor at Northwest Door)	0.20	0
07/28/83	Room 131	0.05	0
07/28/83	Room 135 (Steps Northwest of Room)	0.70	0
07/28/83	Room 142	0.05	0
07/28/83	Room 143	0.05	0
07/28/83	Room 150 (at East Door)	0.90	0
07/28/83	Room 151	0.20	0

*Release Limits: 0.05 mR/h - upper background limit. Removable beta plus gamma - 20 dpm/100 cm²

**Closed Shield - gamma only

APPENDIX I (continued)

DATE	LOCATION	mR/h OPEN SHIELD	MAXIMUM REMOVABLE Beta + Gamma dpm/100 cm ²
07/28/83	Room 152	0.05	0
07/28/83	Room 153 (at West Entrance)	0.12	0
07/28/83	Room 163	0.05	0
07/28/83	Room 2	0.05	0
07/28/83	Room 3	0.05	0
08/02/83	Room 10	0.05	0
08/02/83	Room 154	0.05	0
08/02/83	Room 4	0.05	0
08/02/83	Room 5	0.05	0
08/02/83	Room 6 (Contact-Door Locked and Signs Posted)	40 (7 mR/h gamma)**	450
08/02/83	Room 7 (Contact-Door Locked and Signs Posted)	7 (0.5 mR/h gamma)**	450
08/02/83	Room 8	0.05	0
08/02/83	Room 9	0.05	0
08/02/83	West Stairway to Room 8	0.08	0
08/04/83	Room 212	0.05	0
08/04/83	Room 213	0.05	0
08/04/83	Room 214	0.05	0
08/04/83	Room 215	0.05	0
08/04/83	Room 216	0.05	0
08/04/83	Room 217	0.05	0
08/05/83	Electrician's Van	0.05	0

*Release Limits: 0.05 mR/h - upper background limit. Removable beta plus gamma - 20 dpm/100 cm²

**Closed Shield - gamma only

APPENDIX I (continued)

DATE	LOCATION	mR/h OPEN SHIELD	MAXIMUM REMOVABLE Beta + Gamma dpm/100 cm ²
08/05/83	Hallway 201 and 220 (South section on floor)	13	0
08/05/83	North stairs to Hall 201 (Radiation Sign Posted)	0.14	0
08/05/83	Refrigerated Hivac Room	0.05	0
08/05/83	Room 106 (Southeast Corner of Floor)	0.09	0
08/05/83	Room 107	0.05	0
08/05/83	Room 108	0.05	0
08/05/83	Room 109A (South Center Floor)	0.07	0
08/05/83	Room 109 (Beneath air lock door Radiation Sign Posted)	0.12	0
08/05/83	Room 121 (Cable Room Northeast Corner of Building Radiation Sign Posted)	0.08	0
08/05/83	South Stairs to Hall 201	0.07	0
08/05/83	Supply Shack	0.05	0
08/12/83	Room 202 (Contact-sign with Radiation Levels Posted)	30 (15 mR/h gamma)**	100
08/12/83	Room 203	0.05	0
08/12/83	Room 205 East Corridor (Heavy Equipment is stored in South Section of Room)	0.05	0
08/12/83	Room 206, 206A, B and C	0.05	0
08/19/83	Room 218	0.05	0
08/19/83	Room 219	0.05	0
08/19/83	Room 302	0.05	0
08/19/83	Room 303	0.05	0

*Release Limits: 0.05 mR/h - upper background limit. Removable beta plus gamma - 20 dpm/100 cm²

**Closed Shield - gamma only

APPENDIX I (continued)

DATE	LOCATION	mR/h OPEN SHIELD	MAXIMUM REMOVABLE Beta + Gamma dpm/100 cm ²
08/19/83	Stairs to Room 302	0.30	0
08/19/83	Stairs to Room 401	0.05	0
08/22/83	Room 149 and Hot Cells	70 (2 mR/h gamma)**	500
08/22/83	Room 301 (Skid Rollers - Sign with Radiation Levels Posted)	11	0
8/22/83	Room 401	0.05	0

*Release Limits: 0.05 mR/h - upper background limit. Removable beta plus gamma - 20 dpm/100 cm²

**Closed Shield - gamma only

APPENDIX J
FINAL RADIATION SURVEY R-MAD
COMPOUND BUILDINGS AND AREAS, 1983

DATE	LOCATION	mR/h OPEN SHIELD	MAXIMUM REMOVABLE Beta + Gamma dpm/100 cm ²
07/25/83	Building #3112 (Guard Shack)	0.05*	0
07/25/83	Building #3126 (Inside Drain)	8	0
07/25/83	Building #3126 (Outside Drain)	7	0
07/25/83	Building #3140 Machine Shop	0.05	0
07/25/83	Building #3125 Equipment	0.05	0
07/25/83	Building #3125 (Butler Building)	0.05	0
07/25/83	Building #3126 (Near Tracks)	30	0
07/25/83	Building #3140 Electrical Repair Shop	0.05	0
07/25/83	Building #3140 Restroom	0.05	0
07/25/83	Building #3140 Welding Shop	0.05	0
07/25/83	South of Building #3126	10	0
08/09/83	Building #3161 Inside Wall	25	0
08/09/83	Test Cell Floor at West Wall	4	0
08/09/83	Test Cell Floor Drain	1	12
08/09/83	Test Cell Floor Entrance	2	0
08/09/83	Test Cell North Wall	20	0
08/12/83	Building #3111 Northeast Section	0.05	0
08/12/83	Building #3111 Southwest Section	0.05	0
08/12/83	Building #3111 Northwest Section	0.05	0
08/12/83	Building #3111 Southeast Section	0.05	0
08/12/83	Window No. 9 (Stored in Building #3111)	5	0
08/12/83	Window 411351 (Stored in Building and in Crate)	5	0

*Release Limits: 0.05 mR/h - upper background limit. Removable beta plus gamma - 20 dpm/100 cm²

**Closed Shield - gamma only

APPENDIX J (continued)

DATE	LOCATION	mR/h OPEN SHIELD	MAXIMUM REMOVABLE Beta + Gamma dpm/100 cm ²
08/12/83	Window 411352 (Stored in Building and in Crate)	3	0
08/25/83	Building #3119	0.05	0
08/25/83	Building #3119 (Equipment & Material Inside Fenced Area)	0.05	0
08/25/83	Ground Area (Storage Yard)	0.05	0
08/25/83	Hot Bay Window Frame 411343 (Storage Yard)	0.05	0
08/25/83	Hot Bay Window Frame 411344	0.05	0
08/25/83	Hot Bay Window Frame 411345 (Storage Yard)	0.05	0
08/25/83	Hot Bay Window Frame 411346 (Storage Yard)	0.05	0
08/25/83	Hot Bay Window Frame 411347 (Storage Yard)	0.05	0
08/25/83	Hot Bay Window Frame 411349 (Storage Yard)	0.09	0
08/25/83	Hot Bay Window Frame 411350 (Storage Yard)	0.07	100
08/25/83	Other Equipment in Storage Yard	0.05	0
08/25/83	Turntable 182528 (Storage Yard)	19	200
08/26/83	Boeing Trailer 135	0.05	0
08/26/83	Hoist House (and Equipment)	0.05	0
08/26/83	MX Test Tower	0.05	0
08/26/83	T-14 Cover Building	0.05	0
08/26/83	Westinghouse Trailer P623	0.05	0
09/10/83	R-MAD Contaminated Waste Dump and Storage Yard Track Area (Fuel Particles)	45 (5 mR/h gamma)**	
09/10/83	R-MAD Contaminated Waste Dump Surface Area	0.05	0

*Release Limits: 0.05 mR/h - upper background limit. Removable beta plus gamma - 20 dpm/100 cm²

**Closed Shield - gamma only

APPENDIX K
FINAL RADIATION SURVEY OF ETS-1, 1983

DATE	LOCATION	mR/h OPEN SHIELD	MAXIMUM REMOVABLE Beta + Gamma dpm/100 cm ²
09/13/83	Cable in Tunnel	0.05*	0
09/13/83	Cement Test Pad	0.05	0
09/13/83	Dewar Tank	0.05	0
09/13/83	Diesel Tank (21,000 Gallon)	0.05	0
09/13/83	GH ₂ Tanks (3 Each)	0.05	0
09/13/83	Ground Surface at Ground Level	0.05	0
09/13/83	North Stairs (to Below Grade)	0.05	0
09/13/83	Pipe Couplers (1") at Base of Test Pad	0.50	0
09/13/83	Pressure Control Unit 250 Ft. South of Pad	0.20	0
09/13/83	Room 20R 206 (Above Tunnel)	0.05	0
09/13/83	Room 30R 202 (Above Tunnel)	0.05	0
09/13/83	Scrap Metal on Surface of Ground	0.05	0
09/13/83	Shields (on Test Pad)	1.50	0
09/13/83	Tin Building West of Substation	0.05	0
09/13/83	Tunnel	0.05	0
09/13/83	Tunnel Rooms and Equipment	0.05	0
09/13/83	Warehouse South of Compound T325	0.05	0
09/13/83	Test Stand and Stairs	0.05	0
09/14/83	Cement Pad, Walls, and Pipe (Below Reactor Pad)	0.05	0
09/14/83	Pipe, Fitting, and Metal (Outside Compound)	0.05	0

*Release Limits: 0.05 mR/h - upper background limit. Removable beta plus gamma release limits 20 dpm/100 cm²

APPENDIX L
FINAL RADIATION SURVEY OF TEST CELL "C", 1983

DATE	LOCATION	mR/h OPEN SHIELD	MAXIMUM REMOVABLE Beta + Gamma dpm/100 cm ²
07/22/82	Dewar #1 (Pipe and Valves)	0.1*	13
08/16/82	Fittings	---	4
08/31/82	8" Stainless Steel Gate Valve	0.2	4
08/31/82	10" Pressure Relief Valve	0.3	12
12/15/82	Hydraulic Actuators	---	16
08/16/83	Building #40 8478	---	6
09/28/83	Flare Stack	---	4
09/01/83	Building #3230 (Motor Drive Building) (Equipment)	0.3	7
09/02/83	Building #3230 (Floor & Walls)	0.1	9
09/06/83	Building #3220 Pump Room #6	0.1	16
09/06/83	Building #3220 Pump Room #6	0.1	16
09/06/83	Building #3220 Pump Room #6	0.1	6
09/09/83	Building #1 (North Side)	2	3
09/09/83	Building #1 (Inside)	0.7	35
09/09/83	Building #1 (Tanks & Dewars)	50	65
09/09/83	Building #3230, Motor Drive (Floor - Northeast Corner in C Rack)	10	22,880
09/09/83	Building #3232, Cryogenic Evaluation Laboratory (Floor and Walks)	0.3	9
09/23/83	Building #3220 Room #3 (Barrels)	0.1	9
09/23/83	Building #3220 Pump Room #4	0.1	2
09/23/83	Building #3220 Pump Room #5	0.1	0
09/23/83	Building #3220 Pump Room #7	0.1	0

*Release Limits: 0.05 mR/h - upper background limit. Removable beta plus gamma release limits 20 dpm/100 cm²

APPENDIX L (continued)

DATE	LOCATION	mR/h OPEN SHIELD	MAXIMUM REMOVABLE Beta + Gamma dpm/100 cm ²
09/23/83	Building #3220 Pump Room #8	0.1	0
09/23/83	Building #3205 (Floor, Walls & Equip.)	0.1	9
09/27/83	Cement Pad (East)	4	7
09/28/83	Underground Valve (Northeast substation)	14	18,199
09/28/83	Pipe (East of TCC Building)	0.1	6
09/29/83	Building #3210 Room #28 (Walls)	0.5	35
09/29/83	Building #3210 Room #28 (Pipe & Valves)	0.5	10
09/29/83	Shed Rear Berm (Pipe)	1.5	16,145
10/21/83	Valves and Fittings	0.05	8

*Release Limits: 0.05 mR/h - upper background limit. Removable beta plus gamma release limits 20 dpm/100 cm²

APPENDICES

<u>Appendix</u>		<u>Page</u>
A	Area 25 Buildings and Equipment 1973 Preliminary Radiation Survey	A-1
B	Radioactive Materials Storage Facility 1978 Radiation Survey	B-1
C	R-MAD Compound 1978 Radiation Survey	C-1
D	Test Cell "A" 1978 Radiation Survey	D-1
E	Test Cell "C" 1978 Radiation Survey	E-1
F	ETS-1 1978 Radiation Survey	F-1
G	Final Radiation Survey RMSF, 1983	G-1
H	Final Radiation Survey Test Cell "A," 1983	H-1
I	Final Radiation Survey R-MAD Building #3110, 1983 . . .	I-1
J	Final Radiation Survey R-MAD Compound Buildings and Areas, 1983	J-1
K	Final Radiation Survey ETS-1, 1983	K-1
L	Final Radiation Survey Test Cell "C," 1983	L-1

DISTRIBUTION

USDOE/RL (2)
Richland, WA

UNC Nuclear Industries, Inc. (2)
Richland, WA

D. E. Patterson (EP-32, GTN) (2)
OES, DOE/HQ

D. B. LeClaire (DP-12, GTN) (2)

USDOE, TIC (30)
Oak Ridge, TN

T. R. Clark, Manager
DOE/NV

B. W. Church
HPD, DOE/NV

P. K. Fitzsimmons (2)
ROB/HPD, DOE/NV

J. Burrows
ROB/HPD, DOE/NV

D. F. Miller, OPA
DOE/NV

E. W. Adams
SSD, DOE/NV

G. M. Plummer, OPA
DOE/NV

P. J. Mudra, OSD
DOE/NV

R. W. Taft, AMES (2)
DOE/NV

Librarian, DOE/NV (2)

C. F. Costa, EPA/EMSL
Las Vegas, NV

H. F. Mueller, NOAA/WSNSO
Las Vegas, NV

Technical Library, Field Command
Kirtland AFB, NM

Librarian, EG&G (2)
Las Vegas, NV

Technical Information (2)
REECo, Las Vegas, NV