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NEVADA TEST SITE
AREA 25

RADIOLOGICAL SURVEY AND CLEANUP PROJECT
1974-1983
A FINAL REPORT

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JANUARY 1984

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

PREPARED FOR THE
U.S. DEPARTMENT OF ENERGY
NEVADA OPERATIONS OFFICE
UNDER CONTRACT DE-AC08-84NV10327

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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.

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AREA 25
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JANUARY 1984

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ABSTRACT

This report describes radiological survey, decontamination and decommissioning 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 alpha and beta plus gamma radiation 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 and was completed in 1983 with the completion of the final radiological survey.

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SUMMARY

For approximately eleven years after beginning tests, the Nuclear Rocket Development Station (NRDS) in what is now known as Area 25 of the Nevada Test Site (NTS) was heavily 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-1950s, program research and development through 1965, and Nuclear Engine for Rocket Vehicle Application (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 Department of Energy (DOE).

An initial radiological survey of the area was conducted in 1974 in order to prepare a proposal for site decontamination. 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.

DOE funding for decontamination began in 1977, for decontamination of Engine Test Stand One (ETS-1), Test Cell complexes "A" and "C", the Radioactive Material Storage Facility (RMSF), and Reactor Maintenance and Disassembly (R-MAD) complex, the remote calibration facility, the central support compound,

and support services facilities. Approximately 350,000 cubic feet of radioactive material were removed for buried disposal in radioactive waste management sites at the NTS. In 1983, a final area survey was completed with the following conditions still in effect:

1. Area 25 remains under DOE control;
2. E-MAD and Engineering Test Laboratories (ETL), currently in use, were not part of decontamination effort; and
3. That certain fixed items require posting as restricted areas with limitation of access, electrical or mechanical connection, or physical removal, and with continued radiological surveillance.

Funding allocations for these radiological survey and decontamination operations by the DOE for FY-1978 were \$390,000, for FY-1979, \$305,000, for FY-1980, \$185,000, for FY-1981, \$220,000, for FY-1982, \$210,000, and for FY-1983, \$314,000 (Figure 1).

HISTORY

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 of AEC-NASA (SNPO), to develop a nuclear powered rocket. The agreement set down terms and conditions to establish a developmental test area designated as the

FIGURE 1. AREA 25 DECONTAMINATION AND SURVEY FUNDING

Nuclear Rocket Development Station (NRDS) to conduct ground tests of reactors, engines, and engine stagings.

From among several potential sites studied, a portion of the NTS encompassing about 318,000 acres (currently known as Area 25) was selected (Figure 2).

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-A', KIWI-A3, and KIWI-B1A reactors with gaseous hydrogen cooling (Figure 3).

Tests of various reactors resulted in 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 west of Test Cell "C". To gather data, the reactor was deliberately destroyed by means of a fast excursion. A full-power run on a PHOEBUS 1A engine was interrupted by severe core damage caused by inadequate cooling.

Over a period of years beginning in the mid-1950s, a substantial and highly sophisticated array of testing facilities (Figure 4) was constructed in the

FIGURE 2. NUCLEAR ROCKET DEVELOPMENT STATION (NRDS) ENVIRONS

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

FIGURE 4. AREA 25 FACILITY LOCATIONS

Jackass Flats area of the NTS to develop space vehicle propulsion capability, with a primary emphasis in a nuclear rocket program that included a Nuclear Engine for Rocket Vehicle Application.

NRDS Programs 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 Space Nuclear Systems Office. A preliminary radiological survey was deemed essential as a first operation preparatory to redirection of facilities and areas to other activity.

Area 25 Preliminary Radiological Survey, 1973-74. A preliminary radiological survey in 1973 was conducted by REEC Co 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 radiation contamination levels at many locations, and to establish areas for control of contaminated materials. The survey, conducted from November 1973 through January 1974, identified residual radiation levels at a number of locations that ranged to thousands of mR/h (50,000 mR/h noted on reactor nozzles).

Activated or 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. Areas and facilities surveyed included the CP blue building, the EG&G technical laboratory 3126, technical operations 3129, control point

cafeteria, sleeping quarters and Radsafe trailers, the LANL warehouse, the Medical and H-8 buildings, the A & E and reproduction buildings, the technical facility 4215 and trailers, metal bins, and transportainers nearby, the radiation laboratory and radiography building, the gas station and trailers in that area, warehouse 1 and 2, the fire station, and the calibration facility. Shops and rooms of the ETS-1, the administrative and control buildings, warehouse and storage yard of the Test Cell "C" compound, the storage shed and storage area, Dewar and instrument repair shop, reactor shed and liquid nitrogen room of Test Cell "A" were surveyed. A listing of radioactive or contaminated items, the open-shield GM survey instrument readings obtained from them, and the dispositions into radioactive material storage areas or contamination 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-window beta-gamma survey instrument), and removable contamination (as measured by swipes taken on location) exceeded 1000 disintegrations per minute per 100 cm², (dpm/100 cm²), the area was designated as a RESTRICTED area. RESTRICTED areas were posted as radiation exclusion areas (RADEX areas). Access to RESTRICTED areas required anti-contamination clothing and self-reading dosimeters, and escort by REECO monitoring personnel. Facilities and areas designated RESTRICTED at the time were:

- A radiation storage area outside the secured main compound at ETS-1;

- A storage shed outside the security fence at Test Cell "C";
- The R-MAD compound, that included the R-MAD building, the tube storage trailer, the radioactive material storage area in the east wing of the warehouse building, the decontamination facility, an area on the railroad tracks east of the R-MAD building, the junior hot cell building, the 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 1000 dpm/100cm² beta plus gamma, were designated LIMITED ACCESS. Monitoring support was not required and walkthrough inspection was permitted. Classed as LIMITED ACCESS areas were:

- The main warehouse at Test Cell "C"--also the warehouse storage yard, all test-pad pipes, and a generator room;
- The Test Cell "A" compound, including the equipment testing facility building 3124, all test-pad pipes, a 36-foot hydrogen Dewar, a liquid nitrogen room and penthouse; and
- The pad area at ETS-1.

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

The 1973 preliminary 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.

Area 25 Land Area Survey, 1976. A detailed REECo/ESD radiation survey of Area 25 was begun in 1976. The survey included the complete railroad track system, the 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. Beyond this survey, a resurvey of a number of facilities with known activated or contaminated areas, LIMITED ACCESS areas and verifiable UNRESTRICTED ACCESS areas was initiated.

Some ground surveys were conducted in January and early February, 1976. Small-scale gridded survey maps were made of the site west and north of Test Cell "C". Radiation monitors staked the site at 20-foot intervals for approximately 400 feet north and 400 feet south of the track, and recorded radiation exposure rate measurements within the gridded sections. Where high exposure rates (caused by previously scattered chunks of fuel embedded in the soil) justified local effort, detail maps were made for future use in decontamination and disposal operations.

OBJECTIVE OF THE SURVEY AND CLEANUP PROJECT

The Area 25 radiological survey and cleanup was performed by REECo/ESD under Contract No. EY-C-08-0410. Project objectives were made assuming that Area 25 will remain under DOE control, 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 any 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.

NRDS Facilities Descriptions

1. The RMSF. The RMSF (Figure 4) is a twenty-acre area, nearly equidistant from the E-MAD facility, Test Cell "C", and ETS-1. It is enclosed by a cyclone fence with quartz perimeter lighting. The single-track railroad that connects facilities carries one branch through a single main gate into the storage area, from which, within the area, extend seven spurs. Two spurs terminate into 595-square-foot area bunkers. The facility was used to store a wide variety of radioactively contaminated items (Figure 5).
2. The R-MAD Compound. The R-MAD Compound comprised, in addition to the R-MAD building complex itself, a decontamination facility, a radioactive materials storage site, warehousing space, a pad, a test-car assembly and test facility, and a hot-cell and laboratory sample test area.

The decontamination area (2,500 square feet), accessible to the railroad, was primarily used to decontaminate disassembly tooling and test car hardware.

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

FIGURE 5. PHOEBUS 2 REACTOR IN RMSF

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 that provided 2,400 square feet of dust-free space for storing disassembly tooling, an additional static test bay for gaseous and hydraulic tests on test-cart piping, and component paint shop.

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

The R-MAD building had been used for KIWI reactor assembly, and for remote disassembly and remote inspection of the reactor after test (Figure 6). Assembly and disassembly of the advanced PHOEBUS reactors had also been performed in the R-MAD building. The building contained an assembly bay with a clean room, and a disassembly bay. Overall dimensions of the building are 250 by 140 feet, 63 feet high with 61,290 square feet of floor space.

The assembly bay, shop and office area has 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

FIGURE 6. R-MAD BUILDING

clean room, assembly bay, and supporting shop areas, a core and fuel storage vault, and a tool crib.

The disassembly bay, hot bays, and hot cells are of concrete construction. The concrete walls are 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/test car disassembly in the lower bay.

3. Test Cell "A". Test Cell "A" was designed and built for testing nuclear reactors. The Test Cell "A" facility consisted of a concrete test cell building (4,456 square feet), a helium compressor station, a liquid hydrogen filling station, a tank-farm building and a pressure reducing station (Figure 7). Extensive rehabilitation would be required to restore the original test configuration.

Radioactive contamination of Test Cell "A" was limited to the distribution building 3109, equipment testing facility 3124, pad area, and small areas where valves measured 15 mR/h open shield.

An environmental sample-handling laboratory used in support of the Nevada Applied Ecology Group (NAEG), had been established at Test Cell "A". Used by various NAEG contractors, it consisted of four rooms - for office and record functions, for equipment and supplies, for dilution and cleanup, and a large area for receiving and sample storage, drying and

FIGURE 7. TEST CELL "A"

ashing ovens, freezing and weighing functions - in preparation and handling of radioactive environmental samples for study. The laboratory contained a reverse-osmosis radioactive waste-water cleanup system.

4. Test Cell "C". This facility was designed to supplant Test Cell "A" in testing nuclear reactors. Structures include a concrete test pad (12,760 square feet), a cryogenic evaluation laboratory (1,764 square feet), a motor-drive building (3,204 square feet), an operations building (5,373 square feet), and a maintenance/machine-shop/supply building (9,600 square feet) (Figure 8).

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

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

5. The Reactor Control Point Area. The remote control point required for support and control in reactor testing programs included a control building, a technical operations building, a technical services building, an administration building, a weather station, a vehicle service station, a warehouse, a cafeteria, and several smaller (temporary) shop buildings.

FIGURE 8. TEST CELL "C"

The reactor control point area lay in the vicinity of a central support area, a complex of approximately fifteen buildings housing technical, medical, warehousing, and other support for the entire program. Foremost of this group was the administration and engineering (A and E) building, a two-story, steel-frame structure with pre-cast concrete siding, of 55,300 square feet floor space. Several buildings of permanent (metal) construction form part of the complex--two warehouses, 14,000 square feet each, a 10,500 square-foot maintenance shop, two other, 2,000 square-foot buildings, eight concrete-slab and masonry-block construction facilities.

6. 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 a test stand connected to a control point building by a 1,150-foot, shielded, underground tunnel (Figure 9).

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, the tunnel opened into fifteen operational rooms, tunnel and associated rooms having a combined floor area of approximately 25,000 square feet.

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 10).

FIGURE 9. ETS-1

FIGURE 10. ETS-1 DURING CONSTRUCTION SHOWING CONCRETE RADIATION SHADOW SHIELD

AREA 25 RADIOLOGICAL SURVEY AND CLEANUP, 1978 TO COMPLETION

The project was started in FY 1978 by conducting a comprehensive survey of Area 25 to complete the delineation of radioactivity on and in equipment, facilities, and land areas. In addition to the survey, gross radiological hazards were corrected in FY 1978 to provide a radiologically-safe working environment.

The RMSF. A radiation survey of the RMSF was begun in November 1977. A PHOEBUS reactor nozzle, among the most highly activated and contaminated items at RMSF, was moved, for buried disposal, to the NTS Area 5 Radioactive Waste Management Site (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. Contact swipes obtained remotely at thirteen-foot distance indicated 800 and 500 mR/h. The operations permit involved REEC/ESD standard procedures and required a REEC Health Physicist to supervise the movement and disposal operations over a preplanned and specified route of travel.

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

A radiation survey of all surface items, bunkers and land areas encompassing the railroad track spurs within the RMSF, was accomplished. Swipe samples, taken for all items surveyed, were counted for removable alpha and beta plus gamma contamination. All surface-stored equipment showing activated or removeable contamination levels exceeding 20 dpm/100 cm² beta plus gamma were removed to the Area 5 or Area 3 RWMS.

By the end of January 1978, a significant portion of the contaminated materials at the RMSF had been removed to an RWMS (Appendix B). Some 68 loads (143.18 tons) had been processed. Four railcars already at RMSF and three others brought over from the R-MAD compound required dismantling of superstructure, an operation completed in May, 1978. The railcars, stripped of superstructure that was sent to buried disposal, were held in the inner enclosure at RMSF. Nine lots of material were held apart at RMSF for one project. Approximately 7,000 manhours were expended in this effort.

R-MAD Compound. Survey of the R-MAD compound began with a walk-through inspection by DOE, REECo and 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 other items were returned to the users for reuse. The procedure for the survey of the R-MAD compound involved E-520 and PIC-6A portable instrument surveys, and (alcohol) swipe surveys of the floors, walls, and representative items. Swipe locations were to be marked, and swipes counted for removable alpha, beta plus gamma contamination.

Cleanup operations at the R-MAD consolidated waste storage site began with a radiological survey of all surface-stored items, and a sorting of clean from contaminated materials. Clean materials were to be returned to the NTS usage system, or into excessing channels for sale to the public. The area surveyed and decontaminated included a ten-acre contaminated waste storage area at R-MAD, a 2,650 square-foot decontamination facility, a 2,400 square-foot storage area, and some 10,000 square feet of warehousing, in addition to the R-MAD building. A maximum removable contamination level of 1,600,000 dpm/100 cm² beta plus gamma was observed. All contaminated (or activated) equipment was categorized into thirty-three lots (Appendix C) and removed to NTS Area 3 RWMS for buried disposal. Removal of contaminated material and equipment from the R-MAD compound was completed by April 28, 1978. This included removal of two 27.5-ton, and two 15-ton reactor shields, which were subsequently buried in Area 3 RWMS. Cumulative disposal through April 1978 constituted 186 loads (4,159 cubic yards).

The R-MAD radiation survey progressed as follows:

R-MAD Building	February 27 - June 24, 1978
R-MAD Warehouse	March 16 - June 20, 1978
R-MAD Compound	June 5 - 15, 1978
R-MAD Grounds	June 16 - 23, 1978

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". Radiation levels were found to vary generally from 0.1 to 20 mR/h, open shield, rising to levels as high as 50

mR/h open shield. Generally, swipeable contamination was found to be less than 200 dpm/100 cm² beta plus gamma, and less than 30 dpm/100 cm² alpha. Maximum levels of swipeable contamination observed in areas other than known radiation areas were, respectively, 2000 dpm/100 cm² beta plus gamma and 3000 dpm/100 cm² alpha. The exposure rate throughout areas other than known radiation areas was less than one mR/h open shield.

Survey of the hot cells began on March 30, 1978, with personnel in full anti-contamination clothing and respiratory protection. Air samplers were collected while personnel were working in the area, to determine levels of airborne contamination. Airborne radioactive contamination levels of 3.5×10^{-13} μ Ci/cc beta plus gamma and 4.9×10^{-13} μ Ci/cc alpha were observed on an air sample collected over a two-day period (April 4-6, 1978). 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 main hot bay (Rooms 123 and 202), air samples were collected over an interval from May 22-24, 1978. Airborne radioactive contamination levels of 3.8×10^{-12} μ Ci/cc beta plus gamma and 1.0×10^{-13} μ Ci/cc alpha were observed for one sampling period, 1.2×10^{-11} μ Ci/cc beta plus gamma and 2.8×10^{-13} μ Ci/cc alpha for the other sampling period.

Exposure rates in the hot cells (Rooms 126, 127, 132, 133, 134, 143, 144, 145, 146, 147, 148, and 149) and in the hot bay (Rooms 123 and 202) were 1 to 10 mR/h open shield (generally below two mR/h open shield). Removable beta plus gamma contamination levels were generally between 1,000 and 22,000 dpm/100

cm², with a maximum 300,000 dpm/100 cm². Removable alpha contamination levels were generally less than 100 dpm/100 cm².

Radiation surveys of the R-MAD building and compounds were essentially completed by June 1978. A total of 6,228 swipe samples were obtained. The highest removable contamination level for both alpha and beta plus gamma contamination was found on a vacuum cleaner in building 3126 hot bay (1,600,000 dpm/100 cm² beta plus gamma; 10,600 dpm/100 cm² alpha). The highest exposure rate observed was 7 R/h (in the R-MAD hot bay on second floor equipment, and in the decontamination building hot bay).

The R-MAD contaminated waste removal progressed as follows:

<u>1978</u>	<u>Tons</u>
January	143
February	188
March	130
April	191
May	91

Decontamination of the R-MAD building was started in early October 1978 and proceeded throughout 1979 into 1980. In October 1978, the REEC/ESD operation was moved from the ETL into 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. Preliminary decontamination of hallways by the office was also completed in October, as was the basement

area, and by the end of November, ten rooms, two hallways, and one of the foyer areas were decontaminated to less than 20 dpm/100 cm². Four tons of material was removed from the building for shipment to buried disposal, and a detailed survey was made of all equipment in the assembly bay. Two leaded glass windows were removed from hot cells in December for use in Los Alamos, and twelve additional rooms were decontaminated. Decontamination of Rooms 104, 105, 106, 139, 155, 156, and Rooms 207 through 217 was also completed in December. The first floor of the Paint, Test, Storage Building 3140 was also decontaminated. Another ton of contaminated waste was sent to buried disposal, and 300 pounds sent to the decontamination pad for compaction before burial. In November, 2,700 swipe samples were counted and in December, 2,262 swipe samples were counted.

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 noncontaminated 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 scrabblor 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 contact.

By June 1979, decontamination of R-MAD building rooms was estimated to be 75-percent complete. In the first six months of the year, 10,927 swipe samples had been taken and 45 tons of contaminated materials and equipment had been shipped to the NTS Area 3 RWMS for buried disposal. All contaminated equipment and material had been removed from Room 202 (the upper disassembly bay).

Work on decontamination of the upper disassembly bay was completed by the end of August. Work in the hot cells (Rooms 132, 133, 134, 144, 145, 146, 147, 148, and 149), begun in July, continued into September. Three truckloads of contaminated material were removed for burial and another for compaction before burial, in July. Another five truckloads of contaminated materials, 20 tons, were hauled to the Area 3 RWMS for burial in August. Some 2,216 swipe samples were taken and analyzed in July. In August, 2,244 swipe samples were taken, which raised the number of swipe samples taken from the R-MAD building to 17,649. Final cleanup and survey in airlock areas, upper stairways and hallway, hot cell areas, lower disassembly bay and basement areas completed R-MAD building area decontamination in September 1979. (Nearly a year later, in September 1980, floors of the upper and lower disassembly bays of R-MAD building 3110 were epoxy-painted to fix residual contamination, and signs posted to indicate contaminated areas in the building or the compound. R-MAD basement rooms 6 and 7 were locked off and posted as warning areas.)

AREA 25 SURVEY AND CLEANUP

NO.	MILESTONE	FY 1980												FY 1981			
		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	1Q	2Q	3Q	4Q
1	Clean up contaminated material around the R-MAD Compound, decontaminate Building 311 (Warehouse) and begin decontamination of the paint test and storage Building 3140.	■	■	■	■												
2	Complete the decontamination of Building 3140, including the removal of contaminated equipment, and begin decontamination of Building 3126 (Decon Pad).				■	■	■	■									
3	Complete the decontamination of Building 3126 and the Beetle Shed.							■	■	■	■						
4	Complete the decontamination of the Junior Hot Cell, complete the decontamination or disposal of equipment from within the R-MAD Compound and complete the cleanup of small areas of contaminated soil within the R-MAD Compound.										■	■	■				
5	Decontaminate Test Cell A pad.													Δ			
6	Decontaminate Test Cell A compound.														Δ		
7	Decontaminate Test Cell C pad and the ETL Reverse Osmosis Room.															Δ	
8	Decontaminate Test Cell C compound and begin the cleanup of approximately 6000 cubic yards of soil from the TNT area. This soil will be disposed of in the U3ax Radioactive Waste Management Site.																Δ

Δ Department-Controlled Milestone

■ Activity Line

FIGURE 11. AREA 25 DECONTAMINATION TASK SCHEDULE FY 1980-81

Task activity planned for FY 1980 (Figure 11) began with cleanup of buildings in the compound. During October 1979, warehouse 3111 was decontaminated. Approximately 13 cubic yards of contaminated material was moved to Area 5 RWMS for burial. About 291 cubic yards of contaminated equipment was removed from building 3140 in December. Decontamination of building 3140 was completed in January 1980, and decontamination of pad 3126, begun in February, was completed five months later. Decontamination of building 3125, was started in February, and was completed by the end of the fiscal quarter. Twenty cubic yards of contaminated material was removed to Area 3 RWMS. Decontamination of the junior hot cell was started in July, and finished by the end of August. Conservatively, 837 cubic yards of equipment and materials were surveyed and released to the salvage yard in July. In August, 1,536 cubic yards of contaminated soil was removed from the R-MAD compound; a smaller amount was also removed in September. Approximately 25 cubic yards of contaminated equipment was removed for buried disposal. In October 1980, those radioactive or contaminated areas within the R-MAD building and compound were secured and posted. The decontamination of the R-MAD building and compound was completed.

Test Cell "A". Preparation for survey of contamination levels at Test Cell "A" began in April 1978. The survey of Test Cell "A" and associated facilities and the compound area started June 26 and was completed July 18, 1978. It included all rooms in the test cell, buildings 3109 and 3109A, 3113 and 3113A, 3115 and 3115A, 3116, the contaminated storage area, the tunnel, reactor pad, and the moveable shed. Exposure rates near contact and at one meter from each item or location were determined by PIC-6A, E520 portable

instrument surveys. Swipe samples were taken from floors, walls, and associated items.

Approximately 934 swipe samples were collected from facilities and equipment. The highest level of removable contamination was located on a railroad track at the reactor pad ($21,500 \text{ dpm}/100\text{cm}^2$ beta plus gamma, $32 \text{ dpm}/100 \text{ cm}^2$ alpha). The maximum exposure rate, 150 mR/h open shield, was observed in an expansion joint of the Dewar area concrete pad (Appendix D). Additionally, a ground survey outside the fenced area, from the fence outward to 1,000 feet at 45-degree intervals, indicated no significant radioactivity.

Cleanup of facilities and removal of activated and contaminated material, equipment and fixtures was planned for the FY 1981 schedule. The decontamination task was estimated to require the removal of approximately 6,075 cubic yards of contaminated and activated material from the pad, and 1,580 cubic yards of material from around the Test Cell "A" compound. Underground tanks were removed in June of 1979, and actual decontamination work was begun in October 1980 with a survey of radiation levels. In December, stripping of the concrete pad with a concrete scrabbler was begun, and was continued through January. In January, accessible, activated metal railroad tracks, braces and light poles were removed. Nineteen cubic yards of contaminated and activated materials that included the surface concrete chips from the pad (26,390 pounds) were transported to the Area 3 RWMS for burial disposal. Further decontamination work on the Test Cell "A" area was suspended during the second week of January, until April, so that Test Cell "C" decontamination could proceed (prompted by potential project use of Test Cell "C" facilities). Cleanup was resumed with the removal of 7 cubic yards

of debris sent to Area 5 RWMS for disposal (16,110 pounds) in April. The removal of 540 lineal feet of railroad track set in reinforced concrete caused a problem where equipment and materials were found to be activated, rather than contamination. A significant cost increase developed in the removal and disposal of these items to the RWMS.

Four profile soil samples were taken in the Test Cell "A" area in May. Decontamination, regarded in May to be 90 percent complete at Test Cell "A", continued with another eight cubic yards (approximately 2.5 tons) of radioactive debris consigned to Area 3 RWMS for disposal. Localized, activated areas in the reactor building area were decontaminated. Outbuildings inside the compound were decontaminated in July. The tunnel was decontaminated in August. 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 therefore restricted with warning signs and barricades in completion of decontamination effort. The final survey at Test Cell "A" was completed in September 1981.

Test Cell "C". Survey of Test Cell "C" began July 11, 1978, with 5,616 swipe samples taken by completion on August 8, 1978. A removable beta plus gamma contamination level of 44,500 dpm/100 cm² were observed on the floor in the pipe area on the east side of the reactor pad. A removable alpha contamination level of 500 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. The Test Cell "C" survey included ten rooms in the test cell,

FIGURE 12. TEST CELL "C" TANK FARM

ten buildings in the complex, eight Dewars, the tank farm (Figure 12), the pipe area, and test cell concrete.

Decontamination of Test Cell "C" was scheduled for the second quarter, FY 1981. Cleanup began on schedule with removal of contaminated tar from expansion joints in the cement. Approximately 19 cubic yards of such material, weighing 5.5 tons was transported to the Area 3 RWMS in January 1981. In February, two loads of debris and equipment, primarily radioactive cement and tar from the Dewar area, 20 cubic yards weighing 5.3 tons were sent to Area 3 for buried disposal, together with an additional three loads of contaminated equipment (22 cubic yards). The cleanup was completed in March 1981, with 40 tons of contaminated debris and equipment hauled to buried disposal from the test cell. (Over 127 cubic yards and 76.6 tons of contaminated were placed into buried disposal from Test Cell "C").

Induced activity was discovered in relatively inaccessible areas, such as the inside of piping and valves. Such areas were posted with warnings of existing hazards.

ETS-1. Survey of ETS-1 began August 9, 1978, and included, beyond the test stand itself, the tunnel facilities, outbuildings, and surrounding concrete areas. A total of 5,885 swipe samples were taken. A maximum exposure rate of 30 mR/h open shield was observed on the center of the north shield. No alpha contamination levels above 20 dpm/100 cm² were found, either at ETS-1 or surrounding environs.

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 700,000 dpm/100 cm². Due to the internal contamination, plywood and plastic coverings were fabricated for all the external openings in the ducts. In August 1979, the exhaust ducts were moved to Area 3 RWMS for disposal, without physical or radiological incident.

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

The TNT Site. Contamination at the TNT site resulted from deposition from a single, planned reactor excursion that left small solid fuel fragments over the terrain. The area was surveyed in July 1978. Fuel element fragments were found imbedded at and near the surface of the wash adjoining the railroad trestle from which the test was conducted.

Survey, staking, and soil sampling began July 25, 1978, and was completed September 29, 1978. A microgrid on 100-foot centers was established for approximately 400 feet north and 400 feet south of the concrete pad on the rail trestle that was the site of the test. Most of the area decontamination involved the removal of small areas of surface soil by hand shovel. Front end loaders and road blading machinery were used to remove two large piles of fuel element debris. Fifty-five surface soil samples were collected in July 1978. In an interval from July 25 through September 7, 206 profile samples were collected from six four-feet 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} $\mu\text{Ci/g}$.

In July 1981, removal of soil (659 cubic yards weighing 770 tons) for burial at the Area 3 RWMS was started. In August, another 1,680 cubic yards of TNT soil was removed for burial. Soil sample and survey results taken in October 1981, indicated that surface contamination had been removed.

AREA 25 FINAL SURVEY, 1983

A final radiological survey of the Area 25 facilities and land areas was completed in 1983. Types and levels of radioactive contamination present after the extensive decontamination effort have been posted with warning signs and barricades. Survey results obtained during the 1983 survey are listed in Appendices F, G, H, I, J and K.

The Area 25 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. The goals and intent of the project were fulfilled with the completion of the final survey in 1983.

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

A-1

ITEM OR LOCATION	mR/h OPEN SHIELD Near Contact	REMOVABLE $\beta + \gamma$ dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²	REMARKS
LASL 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
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

ITEM OR LOCATION	mR/h OPEN SHIELD Near Contact	REMOVABLE $\beta + \gamma$ dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²	REMARKS
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
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

ITEM OR LOCATION	mR/h OPEN SHIELD Near Contact	REMOVABLE $\beta + \gamma$ dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²	REMARKS
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
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

ITEM OR LOCATION	mR/h OPEN SHIELD Near Contact	REMOVABLE $\beta + \gamma$ dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²	REMARKS
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
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

ITEM OR LOCATION	mR/h OPEN SHIELD Near Contact	REMOVABLE $\beta + \gamma$ dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²	REMARKS
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
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

ITEM OR LOCATION	mR/h OPEN SHIELD Near Contact	REMOVABLE $\beta + \gamma$ dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²	REMARKS
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
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

ITEM OR LOCATION	mR/h OPEN SHIELD Near Contact	REMOVABLE $\beta + \gamma$ dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²	REMARKS
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
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

APPENDIX B
RADIOACTIVE MATERIALS STORAGE FACILITY
1978 RADIATION SURVEY

ITEM OR LOCATION	γ mR/h 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.

ITEM OR LOCATION	γ mR/h Contact	3 Feet	REMOVABLE $\beta + \gamma$ dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²	REMARKS
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.
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.

APPENDIX C
R-MAD COMPOUND
1978 RADIATION SURVEY
(MAXIMUM READINGS)

DATE	LOCATION	γ mR/h 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

DATE	LOCATION	γ mR/h Contact	3 Feet	REMOVABLE $\beta + \gamma$ dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²
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
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

DATE	LOCATION	γ mR/h Contact	3 Feet	REMOVABLE $\beta + \gamma$ dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²
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
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

DATE	LOCATION	Contact γ mR/h	3 Feet	REMOVABLE $\beta + \gamma$ dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²
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
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

DATE	LOCATION	γ mR/h Contact	3 Feet	REMOVABLE $\beta + \gamma$ dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²
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
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

DATE	LOCATION	γ mR/h Contact	3 Feet	REMOVABLE $\beta + \gamma$ dpm/100 cm ²	REMOVABLE ALPHA dpm/100 cm ²
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
06/15/78	Bldg. #3140 Paint Shop	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

DATE	LOCATION	γ mR/h		REMOVABLE	REMOVABLE
		Contact	3 Feet	$\beta + \gamma$ dpm/100 cm ²	ALPHA dpm/100 cm ²
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
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

APPENDIX D
AREA 25 DECONTAMINATION AND FINAL SURVEY REPORT
1978 SURVEY RESULTS - TEST CELL "A"

DATE	LOCATION	γ mR/h 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

DATE	LOCATION	γ mR/h		REMOVABLE $\beta + \gamma$	REMOVABLE ALPHA
		Contact	3 Feet	dpm/100 cm ²	dpm/100 cm ²
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

APPENDIX E
1978 SURVEY REPORT ETS-1

DATE	LOCATION	mR/h OPEN SHIELD	MAXIMUM REMOVABLE $\beta + \gamma$ dpm/100 cm ²
08/18/78	Maintenance Area	0.2	24
08/18/78	Supply Room	0.05	27
08/18/78	Warehouse Loft	0.15	-
08/18/78	Warehouse Office	0.05	27
08/21/78	Bldg. #3320 - Compressor Room	0.05	203
08/22/78	Bldg. #3320 - Room A/C	0.7	18
08/22/78	Bldg. #3324 - Compressor Room	0.05	86
08/22/78	Main Entrance - Tunnel	0.05	27
08/22/78	Men's Room	0.05	18
08/22/78	20R 203	0.05	-
08/22/78	20R 1206	0.05	21
08/23/78	Bldg. #3324	0.05	19
08/23/78	Trailer	bkgd	bkgd
08/23/78	Warehouse	0.05	57
08/23/78	Warehouse Yard	0.2	16
08/24/78	Bldg #3320 - Room 20R, 203A	0.05	50
08/24/78	Bldg. #3320 - Room 20R, 203B	0.05	44
08/24/78	Hallway 20R 201	0.05	44
08/24/78	North Stairway to Pipe Area	20	76
08/24/78	Portable Stand	bkgd	6

DATE	LOCATION	mR/h OPEN SHIELD	MAXIMUM REMOVABLE $\beta + \gamma$ dpm/100 cm ²
08/24/78	Tank Farm Area	0.05	36
08/24/78	Test Stand Ground Level	1.3	58
08/24/78	Test Stand South 2nd Level	0.05	27
08/24/78	Test Stand 1st Level	0.05	27
08/25/78	South Stairway Reactor Pad	0.05	51
08/26/78	Portable Stand	0.01	38
08/28/78	Pipe Run from Tank Farm	bkgd	6
08/28/78	Pipe Run - Tank Farm to Test Pad	0.05	44
08/29/78	Pipe Run	bkgd	6
08/29/78	Pipe Run Tank - Fill Station	0.05	51
08/29/78	Tank Farm Area	bkgd	bkgd
08/29/78	Test Stand Level 3 Station	0.05	36
08/30/78	Bldg. #3330 - Room 30R 202	0.05	29
08/30/78	Cable Shed	0.05	16
08/30/78	Dewar U3801	0.04	29
08/30/78	Dewar & Equipment	0.05	32
08/30/78	ETS-1 Trailer	0.05	19
08/30/78	GH ₂ Vessel Control Station	bkgd	6
08/30/78	Pipe Area South of Dewar	0.4	12
08/30/78	Pipe Under Reactor for Pad	0.05	216
08/30/78	Room 30R 203	0.05	42
08/30/78	Room 30S 130	0.05	-
08/30/78	Test Stand Level 2	0.05	26
08/30/78	Test Stand Level 3	0.05	42
08/31/78	Bldg. #3330 - Pump Room Tunnel Facility	0.05	31

DATE	LOCATION	mR/h OPEN SHIELD	MAXIMUM REMOVABLE $\beta + \gamma$ dpm/100 cm ²
08/31/78	Test Stand Level 5	0.05	28
08/31/78	Test Stand Level 7	0.05	47
08/31/78	Test Stand 1st Level	0.05	53
09/01/78	Test Stand Level 6	0.05	38
09/01/78	Test Stand Top Floor	0.05	34
09/01/78	Top of Test Stand	0.05	19
09/07/78	North Shield Test Stand	0.30	127
09/07/78	Reactor from Test Stand	0.07	97
09/07/78	Room 10R 118	0.05	18
09/08/78	Flair Stack North End	0.05	19
09/08/78	Room 10R 119	0.05	29
09/08/78	Room 10R 120	0.05	22
09/08/78	Test Stand Open Room North End	0.05	23
09/11/78	HPSGA Entry	0.05	22
09/11/78	Tunnel Fill Station	0.05	22
09/11/78	U3801 Entry	bkgd	6
09/11/78	30R 100	0.05	25
09/11/78	30R 101	0.05	19
09/12/78	Fill State Entry	0.05	-
09/12/78	Room 10R 113	0.05	29
09/12/78	Room 10S 116	0.05	17
09/12/78	Tunnel CP to Fill Station	0.05	20
09/12/78	Tunnel 10R 107	0.05	17
09/12/78	10R 104 (Stairs)	0.05	-
09/13/78	Hallway 112-115	0.05	-

DATE	LOCATION	mR/h OPEN SHIELD	MAXIMUM REMOVABLE $\beta + \gamma$ dpm/100 cm ²
09/13/78	Room 10R 108	0.05	20
09/13/78	Room 10R 117	0.05	31
09/13/78	10R 106 (Main Room)	0.05	20
09/14/78	Cable Run	bkgd	bkgd
09/14/78	Cable Run Pipe Run	0.05	26
09/14/78	Room 10R 109	0.05	16
09/14/78	Room 10R 110	0.05	35
09/14/78	Room 10R 114	0.05	16
09/14/78	Room 40R 101	0.05	26
09/14/78	Room 40R 102	0.05	29
09/14/78	Tunnel Facility 10R 111	0.05	29
09/14/78	Tunnel Room 10R 101	0.05	26
09/14/78	Tunnel Room 10R 102	0.05	-
09/14/78	Tunnel Room 10R 103	0.05	26
09/14/78	10C 721	0.05	29
09/15/78	North End - Test Stand	0.05	22
09/15/78	North End Tunnel Room B	0.05	25
09/15/78	Room 40R 100	0.05	19
09/15/78	Room 40R 104	0.05	25
09/22/78	20R 200	0.05	21
09/25/78	Room 30R 101	0.05	-
11/16/78	Shield South	0.13	36
12/01/78	Concrete Pad - Test Stand	0.3	10
12/01/78	Diesel Oil Tank	0.05	11
12/01/78	ETS-1 Test Stand	0.03	50

APPENDIX F
1983 FINAL RADIATION SURVEY R-MAD
BUILDING 3110

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

DATE	LOCATION	mR/h OPEN SHIELD	MAXIMUM REMOVABLE $\beta + \gamma$ dpm/100 cm ²
07/19/83	Room 113B	0.05	0
07/19/83	Room 115	0.05	0
07/19/83	Room 129	0.05	0
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

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 γ)	450 (Swipe Sample)
08/02/83	Room 7 (Contact-Door Locked and Signs Posted)	7 (0.5 mR/h γ)	450 (Swipe Sample)
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
08/05/83	Hallway 201 and 220 (South section on floor)	13	0

DATE	LOCATION	mR/h OPEN SHIELD	MAXIMUM REMOVABLE $\beta + \gamma$ dpm/100 cm ²
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 mrad/h)	100 (Swipe Sample)
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
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 γ)	500 (Swipe Sample)

DATE	LOCATION	mR/h OPEN SHIELD	MAXIMUM REMOVABLE $\beta + \gamma$ dpm/100 cm ²
08/22/83	Room 301 (Skid Rollers - Sign with Radiation Levels Posted)	11	0
8/22/83	Room 401	0.05	0

APPENDIX H
1983 FINAL RADIATION SURVEY OF ETS-1

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

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

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 (Swipe Sample)
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

DATE	LOCATION	mR/h OPEN SHIELD	MAXIMUM REMOVABLE $\beta + \gamma$ dpm/100 cm ²
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
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	RMAD Contaminated Waste Dump and Storage Yard Track Area (Fuel Particles)	45 (5 mR/h γ)	0
09/10/83	RMAD Contaminated Waste Dump Surface Area	0.05	0

APPENDIX I
1983 FINAL RADIATION SURVEY OF BUILDING 3101
(REACTOR CONTROL POINT)

DATE	LOCATION	mR/h OPEN SHIELD	MAXIMUM REMOVABLE $\beta + \gamma$ dpm/100 cm ²
10/12/83	Building 3101 Floors	0.05	0
10/12/83	Building 3101 Walls	0.05	0
10/12/83	Building 3101 Equipment	0.05	0

Remainder of Building and Compound at Reactor Control
Point exempt from survey per DOE/NV Security.

APPENDIX J
1983 FINAL RADIATION SURVEY OF TEST CELL "A"

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 γ)	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

DATE	LOCATION	mR/h OPEN SHIELD	MAXIMUM REMOVABLE $\beta + \gamma$ dpm/100 cm ²
06/14/83	Building 3115	0.05	0
06/14/83	Building 3116 Pump Station	0.05	0
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 γ	
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

APPENDIX K
1983 FINAL RADIATION SURVEY OF RMSF

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 γ)	1,167 (Swipe Sample)
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 γ)	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

DATE	LOCATION	mR/h OPEN SHIELD	MAXIMUM REMOVABLE $\beta + \gamma$ dpm/100 cm ²
04/06/83	First Spur South of Main Track Tie #27	0.50	6 (Swipe Sample)
04/06/83	First Spur South of Main Track Tie #19	0.40	0
04/06/83	First Spur South of Main Track Tie #22	0.40	3 (Swipe Sample)
04/06/83	First Spur South of Main Track Tie #23	0.30	3 (Swipe Sample)
04/06/83	First Spur South of Main Track Tie #26	0.30	32 (Swipe Sample)
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 (Swipe Sample)
04/06/83	Second Spur South of Main Track Tie #33	0.20	6 (Swipe Sample)
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 (Swipe Sample)
04/06/83	Third Spur South of Main Track Tie #2	0.15	0
04/11/83	Fuel Cask #270 (Outside)	0.05	8 (Swipe Sample)
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

DATE	LOCATION	mR/h OPEN SHIELD	MAXIMUM REMOVABLE $\beta + \gamma$ dpm/100 cm ²
04/11/83	Fuel Cask #210 (Outside)	0.05	0
04/11/83	Fuel Cask #3 (Inside)	3	200,000 (Contact)
04/11/83	Fuel Cask #30 (Inside)	0.30	0
04/11/83	Fuel Cask #330 (Outside)	0.05	0
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

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