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KEWB FACILITIES
DECONTAMINATION AND DISPOSITION
FINAL REPORT

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Rockwell International

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WASTE MANAGEMENT
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KEWB FACILITIES DECONTAMINATION AND DISPOSITION FINAL REPORT

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ABSTRACT

The decontamination and disposition of the KEWB facilities, Buildings 073, 643, 123, and 793, are complete. All of the facility equipment, including reactor enclosure, reactor vessel, fuel handling systems, controls, radioactive waste systems, exhaust systems, electrical services, and protective systems were removed from the site. Buildings 643, 123, and 793 were completely removed, including foundations. The floor and portions of the walls of Building 073 were covered over by final grading. The results of the radiological monitoring and the final survey are presented.

I. INTRODUCTION

The Kinetics Experiment Water Boiler (KEWB) reactor was last operated in 1966. The fuel was drained and the system rinsed in 1968. Radiological surveillance of the area had been performed until the dismantling of the facility was initiated in January 1975. The KEWB facilities were declared excess and the dismantling proceeded as described in the Decontamination and Disposition of Facilities Program Plan, PP-704-990-002.

The KEWB facilities, as shown in Figures 1 and 2, were decontaminated, dismantled, and the site graded to blend with the surrounding terrain. The facilities consisted of the Reactor Test Building 073, the Exhaust Blower Building 643, the Electrical Control Building 793, and the Waste Storage Building 123. The KEWB facility also included a 1000-gal. liquid waste holdup tank, a 1000-gal. reactor cooling water storage tank, and a 300-gal. gaseous waste tank. The tanks and associated piping were located underground near Building 073 (Figure 3).

Buildings 643, 793, and 123 were completely demolished, including removal of concrete footings and pads. All contaminated or activated equipment and materials were removed from Building 073 and sent to the AI Radioactive Materials Disposal Facility (RMDF) for decontamination and disposal for unrestricted use, or packaged for shipment to Beatty, Nevada for burial. The above-grade structures and the roof of Building 073 (Figures 4 and 5) were demolished. The remaining concrete floor and walls were decontaminated to levels which were as low as practicable (ALAP), but in all cases below those levels established as acceptable for future unrestricted use of the site.

This report summarizes the more pertinent decontamination and disposition activities (D&D), discusses special techniques used, and reviews major problems and their resolution.

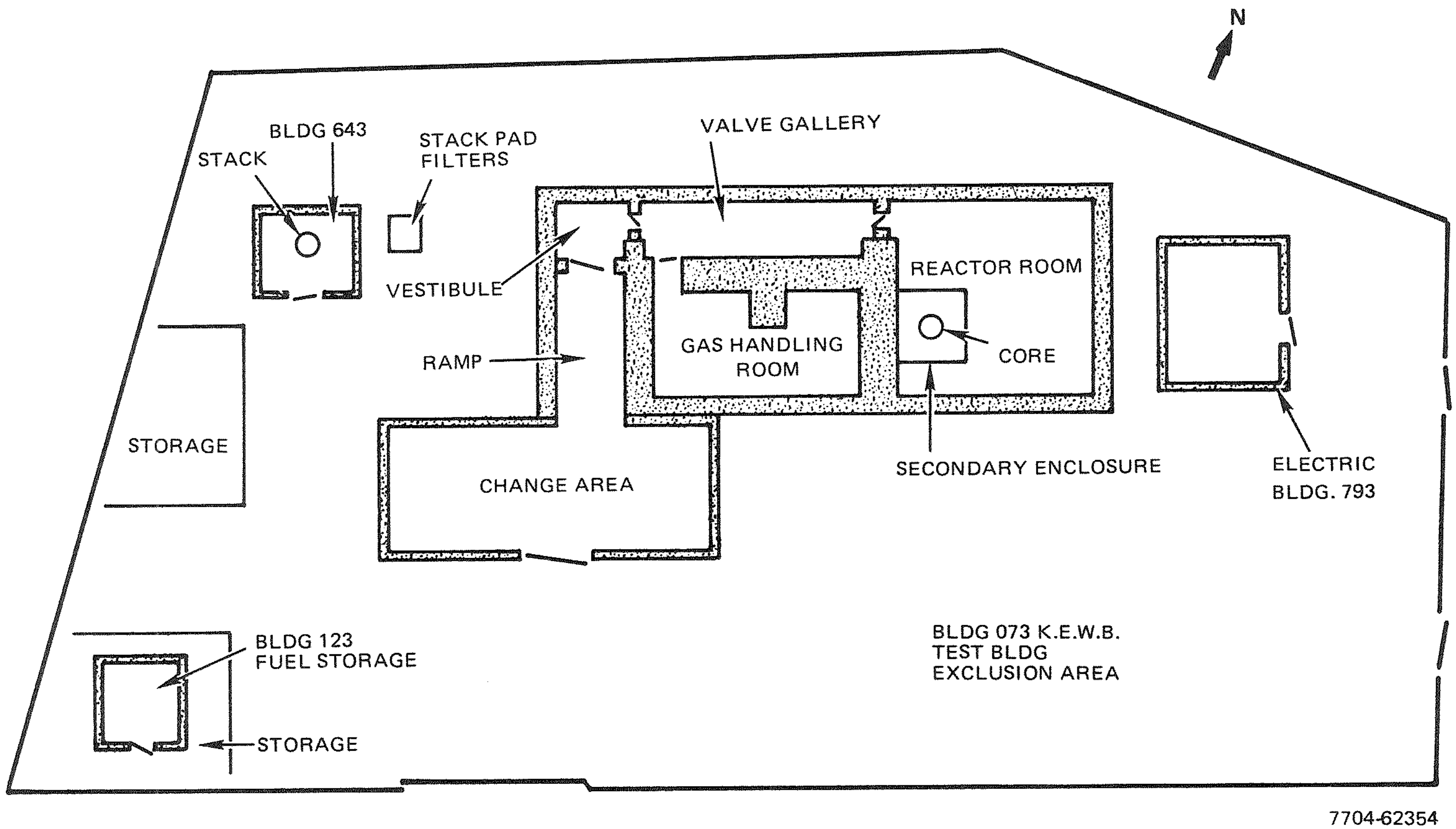

Figure 1. KEWB Facilities

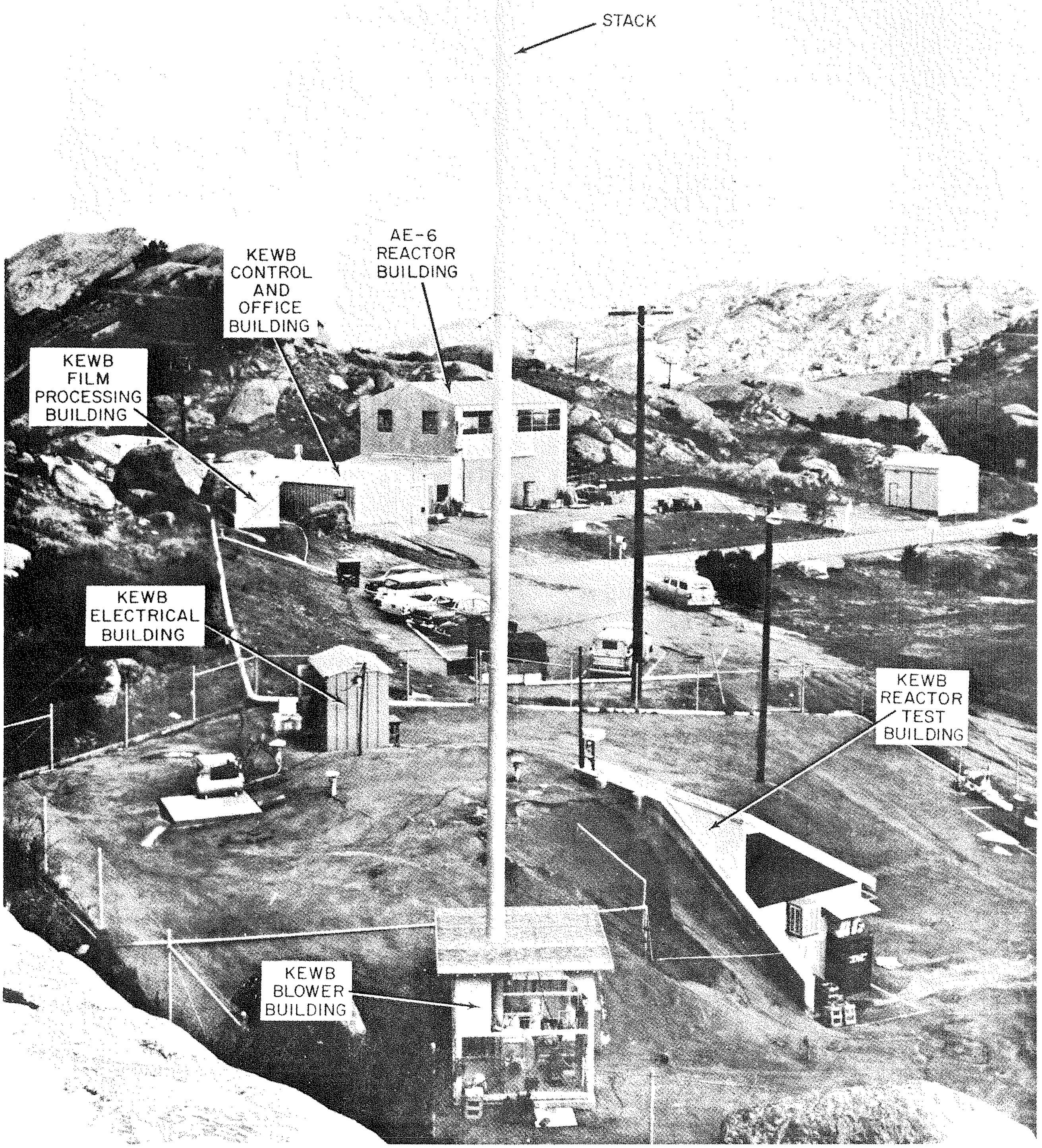

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Figure 2. KEWB Area and Facilities

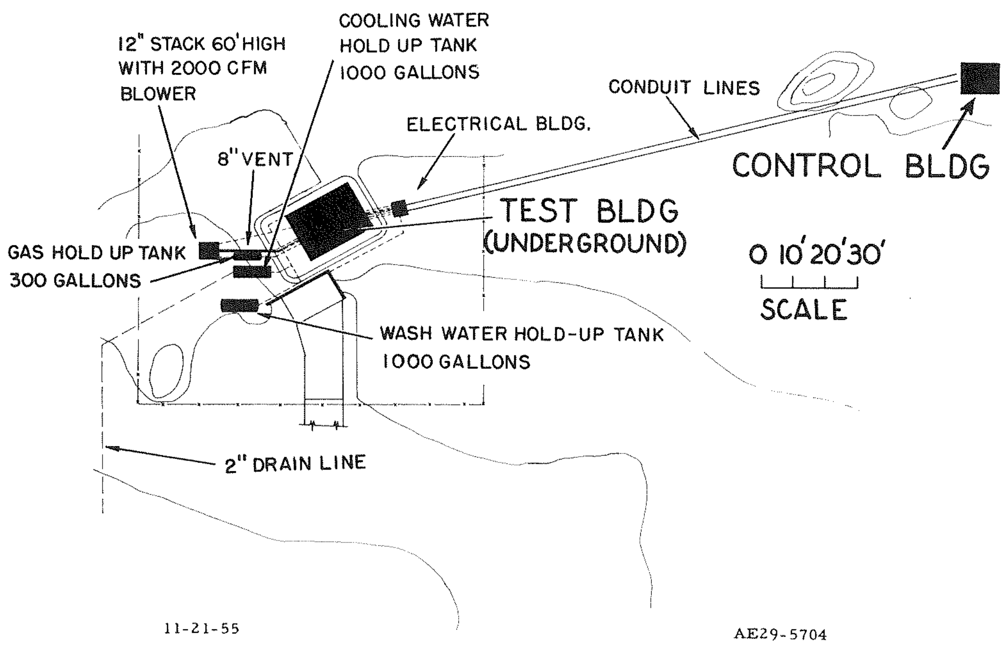

Figure 3. KEWB Support Facilities

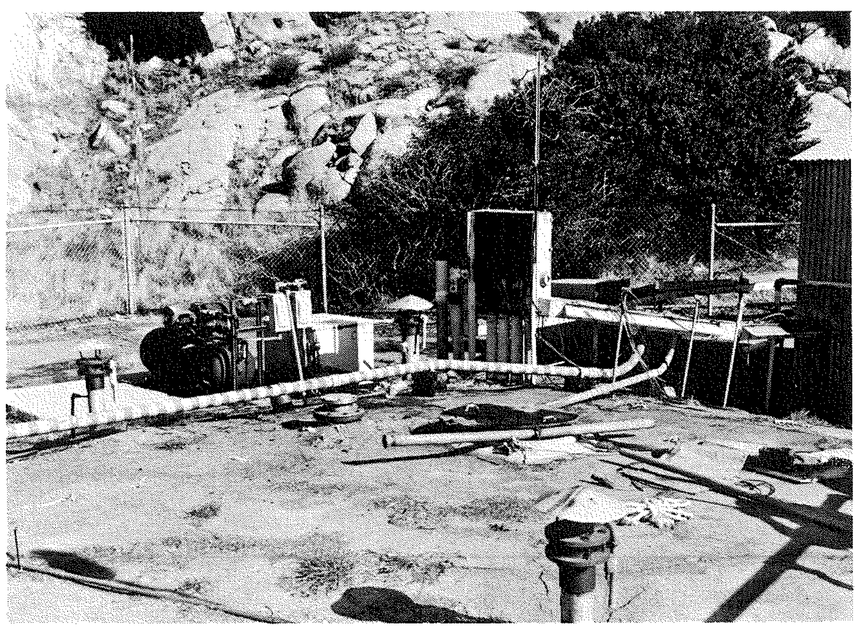

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Figure 4. Building 073 Cover, Vents, Electrical Functions, and Compressor Pad

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Figure 5. Roof of Building 073 Cleared of Cover

II. SUMMARY

Physical dismantling of the KEWB facilities began on January 17, 1975, but was discontinued a week later when the dismantling crew was reassigned to a higher priority D&D effort. The D&D of the KEWB was begun again on April 7, 1975, and was completed on June 27, 1975.

A KEWB Dismantling Plan (Appendix A) which defined the scope of the dismantling effort was prepared. This plan was reviewed and approved by the Isotopes Committee of the AI Nuclear Safeguards Review Panel and subsequently approved by ERDA. A detailed working procedure[1] was then prepared which provided step-by-step delineation of the tasks described in the Dismantling Plan. This procedure was also reviewed, and approved by the Isotopes Committee.

The work was performed by the AI Remote Technology Unit No. 731-540, which consists of personnel trained to work with radioactive materials. Continuous consulting support was provided by a former KEWB operator. Health, Safety and Radiation Services (HSRS), Industrial Engineering, and the Maintenance Department provided assistance as required. A demolition contractor was hired to break up the concrete, dig out the tanks, and backfill and grade the excavation. Health physics surveillance was provided during all activities.

A. PREPARATIONS

The existing personnel change room at the entry to Building 073 was reactivated and resupplied. An HSRS work station, equipped with radiation counting instrumentation, was set up in the Electrical Control Building No. 793. Personnel dosimeters, portable radiation survey instrumentation, breathing apparatus, air samplers, and protective clothing were provided in the change room. Results of radiation and contamination surveys of the KEWB area are shown in Table 4, presented later.

Before beginning the D&D activities, all personnel associated with the dismantling work were briefed by the unit manager on the scope of the work, the radiation hazards expected, and the safety precautions required. A familiarization review of the detailed procedures and the requirements for limiting personnel exposures to levels which are as low as practicable, as described in Reference 2, was also presented by the unit manager.

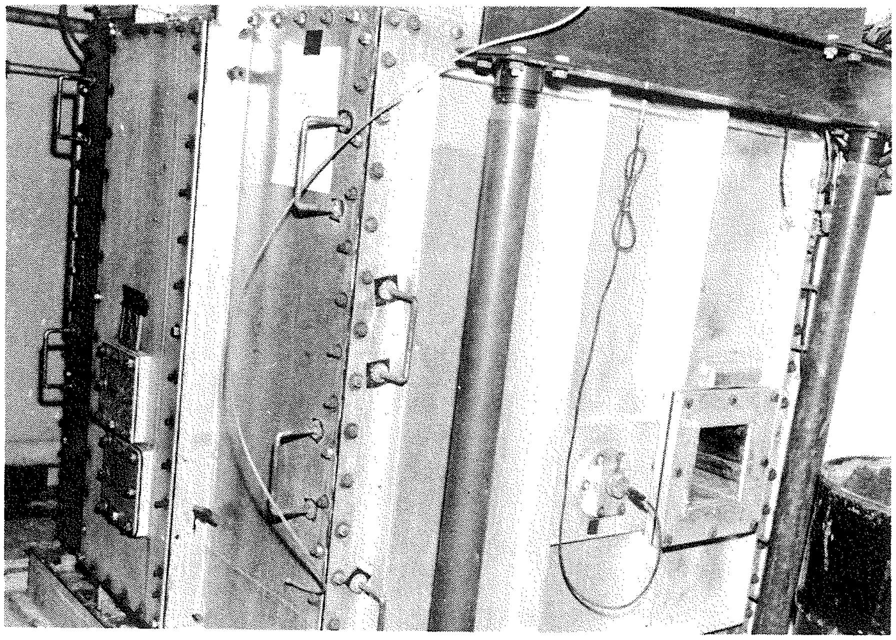

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Figure 6. Reactor Enclosure

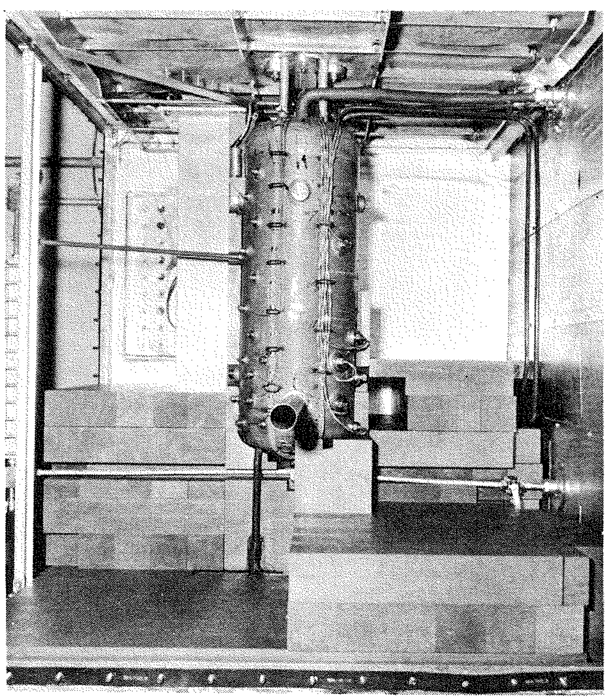

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Figure 7. Reactor Vessel and Graphite Logs

B. PROCEDURES

The Detailed Working Procedures described the work and established the sequence of dismantling steps. Where deviations were necessary, they were noted on the Work Copy of the procedures.

Extraneous equipment and materials such as doors, file cabinets, shelves, racks, benches, and nonuseable protective clothing were removed from Building 073. Electrical power, except for lights, was disconnected by Maintenance. Compressed air lines and the empty wash water storage tank were removed from the valve gallery room.

1. Reactor Room Dismantling

The overhead wiring and cable trays and the hot water heaters were removed, surveyed, and sent to salvage. The control rod drives and controls were removed, surveyed, and placed in containers for shipment to a burial site.

The north and west plates of the reactor enclosure (Figure 6) were unbolted to permit removal of the graphite logs which surrounded the reactor vessel (Figure 7 shows partially disassembled log pile).

A smear survey of the graphite logs indicated removable contamination levels ranging from 100 dpm/100 $cm^2 \beta$ to 30,135 dpm/100 $cm^2 \beta$, and from 20 dpm/100 $cm^2 \alpha$ to 12,000 dpm/100 $cm^2 \alpha$. Radiation levels at the surface of the graphite logs, as measured with a portable instrument, ranged from 10 mR/hr to 150 mR/hr. Six of the graphite logs located directly beneath the reactor vessel on the floor of the enclosure were contaminated with what appeared to be uranium salts. All graphite logs were wrapped in plastic sheet, tagged as radioactive waste, and transferred to the RMDF for final packaging and shipment to Beatty, Nevada for burial. Air samples taken during the graphite log removal indicated airborne contamination levels of 9.9×10^{-12} μCi/ccβ and 1.2×10^{-12} μCi/ccα.

After removal of the logs, all pipe lines to the reactor vessel were crimped to contain any residues and then cut with a saw. A smear survey of the reactor vessel external surface indicated removable beta contamination levels ranging from 360 to 40,555 dpm/100 cm^2. The vessel was spray painted to fix the contamination and then removed, wrapped in plastic (55 gal. bag), and placed in a

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Figure 8. Reactor Location After Enclosure Removal.

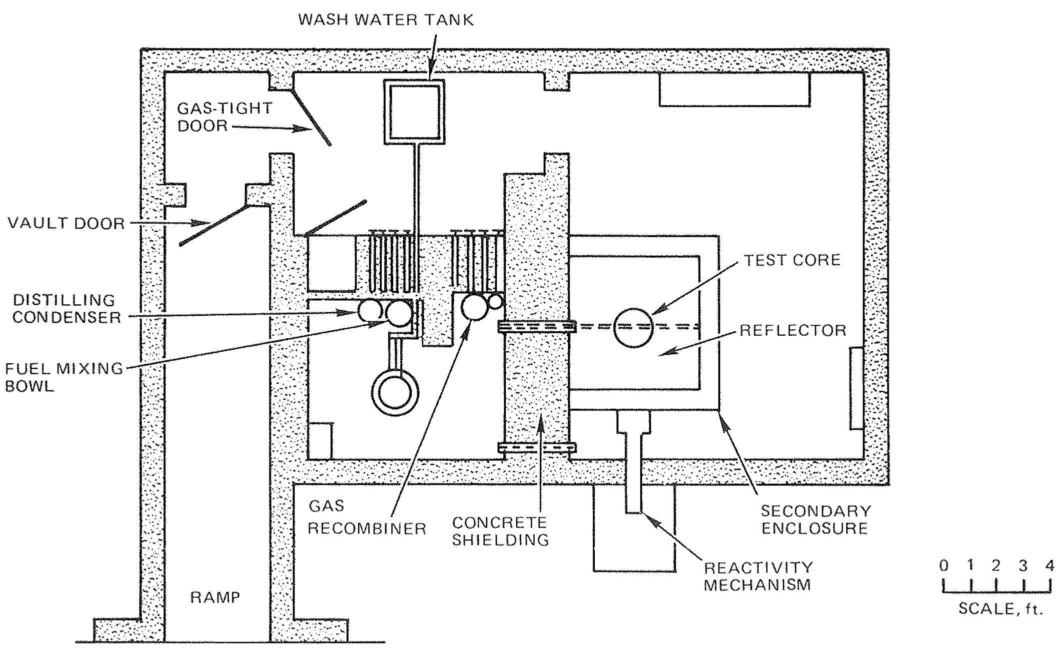

Figure 9. Location of Principal System Components.

shipping container and sent to Beatty, Nevada for burial. A maximum of 300 mR/hr was measured at the surface of the vessel. The maximum radiation dose received by members of the dismantling crew was 20 mrem. Air samples taken during the reactor removal indicated no airborne contamination greater than 1 x $10^{-11} \mu Ci/cm^3 \beta$ or 1 x $10^{-12} \mu Ci/cm^3 \alpha$, which is approximately the level of natural airborne activity at the Santa Susana site.

The remainder of the reactor enclosure was cut out using a welding machine and a carbon rod. Airborne activity observed during this operation was also less than 1 x 10^{-11} $\mu Ci/cc \beta$ and 1 x $10^{-12} \mu Ci/cc \alpha$. Smear surveys of the reactor room floor indicated removable contamination levels of less than 50 dpm/100 $cm^2 \beta$. The reactor enclosure structure was placed in boxes for shipment to Beatty, Nevada for burial. Smear surveys of the concrete pad directly below the reactor, and the concrete wall adjacent to the reactor (see Figure 8) revealed no removable contamination. However, concrete samples from these areas did indicate induced radioactivity. The levels of induced activity observed are shown in Tables 1, 2 and 3. All concrete containing detectable induced activity was subsequently removed, so that ALAP levels became the natural radiation level of the concrete, as established by sampling unirradiated concrete from building walls outside the reactor room.

2. Fuel Handling Room

The Fuel Handling Room contained the process systems for controlling, mixing, monitoring, and storing of the reactor fuel. Valve controls were extended through the 2-ft thick concrete wall to the valve gallery room. Figure 9 shows the location of the principal components of the systems.

Reactor liquids had been drained during the reactor deactivation in 1968. The systems purportedly were empty and dry. However, when cutting through a horizontal line to the gas recombiner, a dark brown liquid spilled out and contaminated the protective and personal clothing of a technician. The contamination, measuring 40 mrad/hr, penetrated the cuff of his pants and his shoes. A survey of his legs and stocking feet revealed that the contamination was confined to his shoes and pants. The pants and shoes were confiscated and treated as radioactive waste.

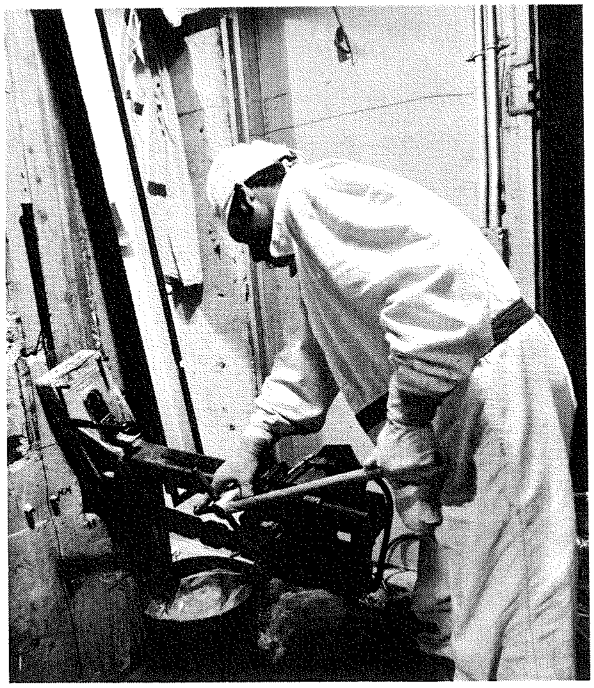

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Figure 10. Contaminated Pipe Removal by Coring

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Figure 11. Pit Liner From Fuel Handling Room

All system components of the Fuel Handling Room were removed, packaged, and shipped to the RMDF for disposal. The walls, ceiling, and floor were lined with sheet metal. The seams in the panels were soldered to form a leak-tight barrier. The walls were smear surveyed and found to be contaminated to levels ranging up to 3×10^6 dpm/100 $cm^2 \beta$, and to 12,357 dpm/100 $cm^2 \alpha$. The walls were decontaminated by foaming, wet vacuuming, and wiping. Although the decontamination was not complete, it was sufficiently effective to allow subsequent removal of the sheet metal room liner without spreading contamination to the bare concrete walls and floor. The sheet metal liner was removed using an impact cutting tool, shears, and pry bars. The liner was placed in boxes for shipment to Beatty, Nevada for burial.

The instrumentation piping passing through the 2-ft-thick concrete wall was highly contaminated. Wet swabs were repeatedly run through the pipe in an attempt to remove the contamination. Enough contamination remained, however, so that removal of the pipes was necessary.

A concrete coring contractor was hired to remove the pipes from the walls. A 2-in. core was drilled over the 3/8-in. to 1/2-in. pipes. Twelve pipes were removed; four were loose enough that they could be driven out using a hammer and a 1/2-in. drill rod. Four of the pipes were not perfectly straight, and as a result, the coring bit cut through the pipe. Water used to cool the bits was collected in a 5-gal. bucket and later transferred to a drum and sent to the RMDF for disposal. Figure 10 shows the coring operation in progress. The coring contractor personnel were outfitted with protective clothing. Restricted Access Area Entry Permit No. 17654 was issued. After completing the core drilling, the contractor's tools were surveyed, cleaned, and released. Removable contamination levels on the tools ranged up to 334 dpm/100 $cm^2 \beta$, before being decontaminated, to less than 30 dpm/100 $cm^2 \beta$.

A fuel storage tank located in a 5-ft deep, 1-ft-diameter pit in the Fuel Handling Room was removed. The pit had a metal liner which was found to be contaminated. Since the inaccessibility of the inner surfaces of the liner made decontamination impractical, the liner was removed by demolishing the floor adjacent to the pit with a Hoe-Ram and lifting the liner out with a crane. Figure 11 shows the liner encased in concrete after removed by the contractor. The liner was transferred to the RMDF for disposal.

C. BUILDING 643, 793, and 123 D&D

A contamination survey of the Exhaust Building 643, and associated equipment indicated that the floor of the exhaust building was contaminated with removable contamination levels of up to 600 dpm/100 $cm^2 \beta$. The exhaust blower and filter plenum were also contaminated and were removed and sent to the RMDF for disposal. After decontaminating the floor by wiping with a caustic solvent, the building was resurveyed and all smear samples indicated contamination of less than 30 dpm/100 $cm^2 \beta$ and less than 5 dpm/100 $cm^2 \alpha$, which was determined to be ALAP. The building was released to the salvage contractor who demolished and removed the remaining structure, including the 60-ft steel exhaust stack.

The Waste Storage Building 123 was surveyed and found free of contamination. Several small casks stored in this facility were sent to the RMDF for future use. The building, concrete pad, and storage pits were later completely demolished and removed. Figure 12 shows the building rubble.

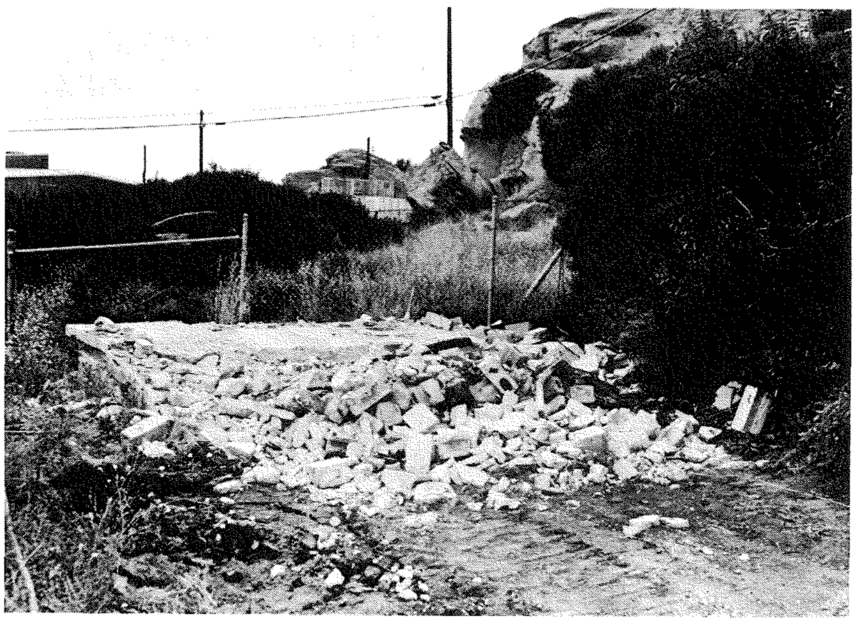

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Figure 12. Waste Storage Building Demolition

The Electrical Building 793, was surveyed and found free of contamination. The underground electrical wiring to and from the building was removed by the salvage contractor after first being disconnected by AI Maintenance. The building was removed from the site by Maintenance and sent to the salvage yard. The concrete pad was later demolished and removed.

D. DEMOLITION CONTRACTOR ACTIVITIES

The final demolition of the KEWB facilities was accomplished by a demolition contractor. The work was defined by Specification No. 303-073-2 and the contract was awarded to the lowest of four bidders. The contracted work entailed removal of the: asphalt paving over the entire KEWB area; concrete foundations for the exhaust and the electrical buildings; concrete pads for the air conditioners, compressor and filter plenum wooden structure at the KEWB entrance; concrete roof over the KEWB; above-grade portions of the retaining wall; three waste holdup tanks (Figure 13) and their associated fill and drain lines; and the waste storage building. A bulldozer was used to remove the asphalt and to do the final grading. A Hoe-Ram (Figures 14 and 15) was used to break in the building roof and to break the concrete walls (Figures 16 and 17).

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Figure 13. Radioactive Waste Holdup Tanks After Excavation

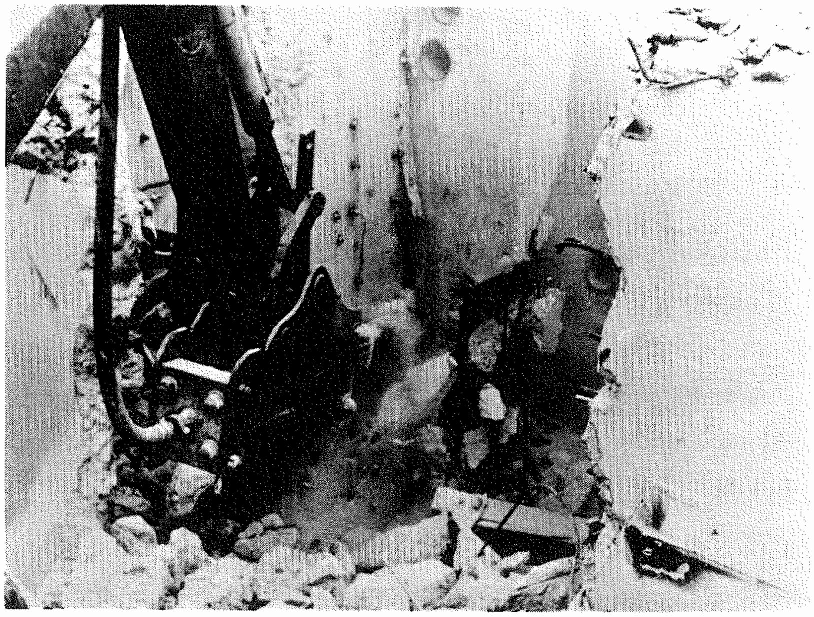

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Figure 14. Hoe-Ram Breaking Concrete

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Figure 15. Hoe-Ram Operation.

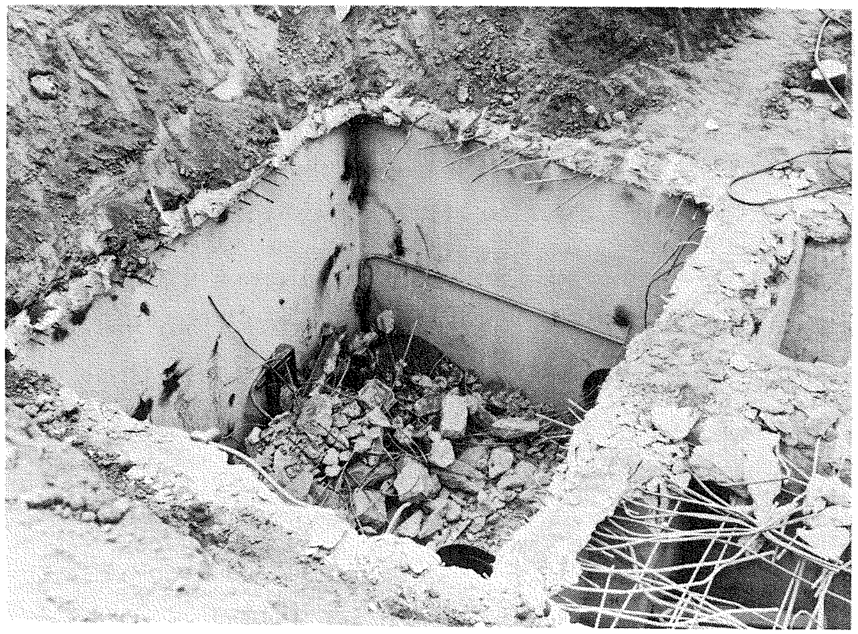

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Figure 16. Demolition of Concrete Roof of Reactor Room

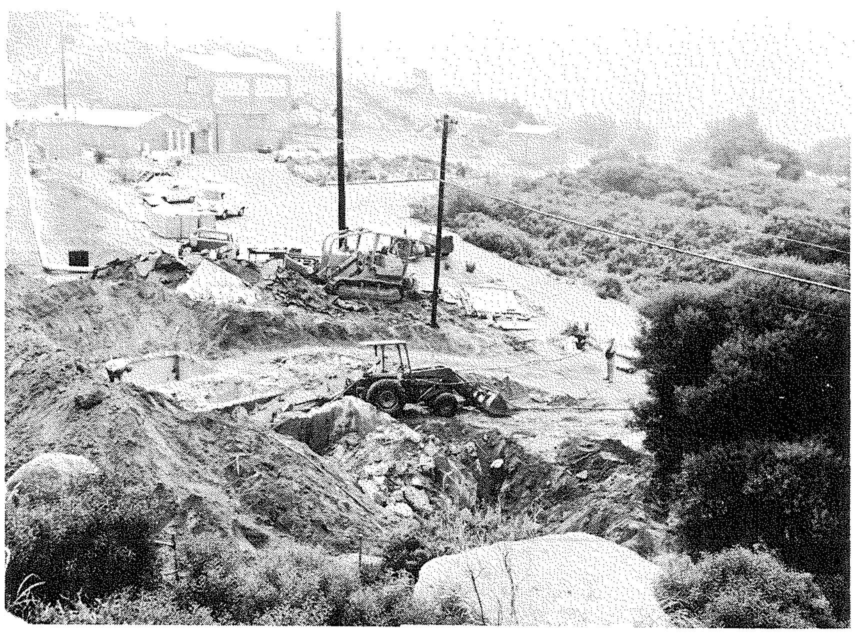

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Figure 17. Demolition Contractor Activities

In addition to the work delineated in the specification, the contractor removed the fuel storage liner, the concrete-imbedded lines running to and from the liner, and portions of the concrete wall and floor in the reactor room.

All contractor activities were subject to the radiological safety requirements established in the Operational Safety Plan. Contractor activities were continually monitored by the on-site Health Physicist.

After the final survey of Building 073 confirmed that contamination levels were within the prescribed limits, the contractor backfilled the Building 073 rooms with the concrete and asphalt rubble and covered the area with soil. Figure 18 shows the final grading. The contractor's equipment was surveyed for contamination, cleaned, and released. The Hoe-Ram joint, jack hammers, air lines and back hoe had contacted activated concrete and consequently required wiping with a solvent to remove this contamination.

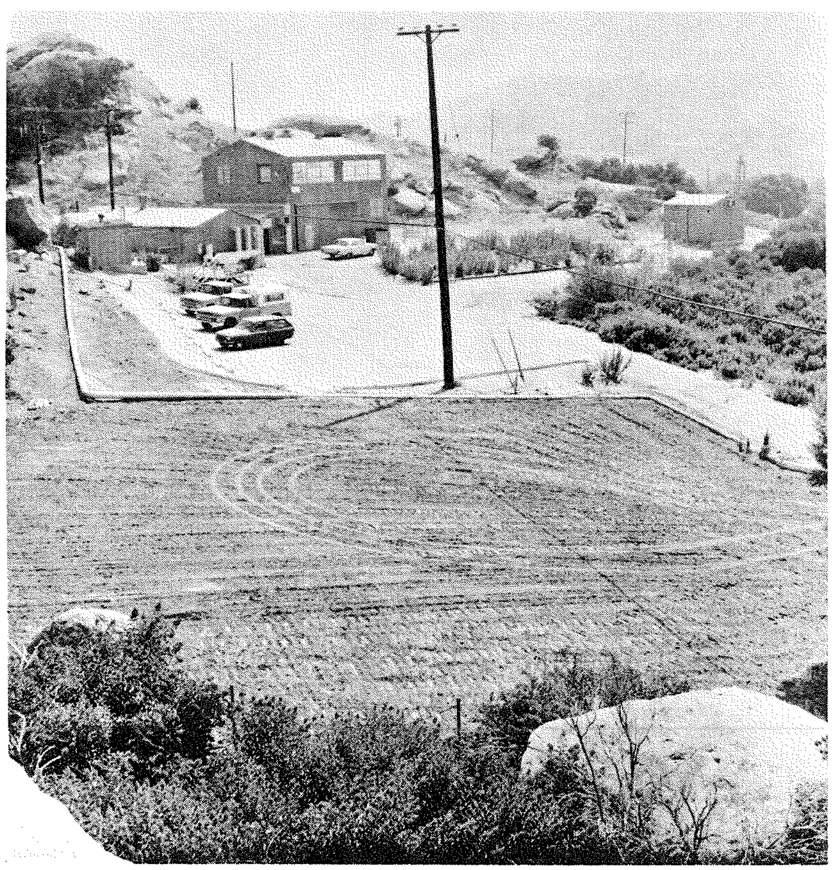

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Figure 18. Final Grading Over KEWB Area

III. RADIOLOGICAL MONITORING

A major activity in the KEWB facility D&D was the radiological monitoring and surveying of the total operations. Smear surveys, portable instrument measurements, air sampler measurements, and measurements of radioactivity concentrations in water, soil, and concrete were made. Considerable quantities of data were taken. The more significant data are presented in this section.

A. CONCRETE ACTIVATION

After removal of the reactor vessel and the enclosure structure, samples of concrete from the walls of the reactor room were collected and analyzed for induced radioactivity. The results are of these analyses are shown in Table 1.

TABLE 1.
RADIOMETRIC SURVEY OF CONCRETE IN KEWB STRUCTURE

Location (Samples chipped from surface)	Results	
	(dpm/gm β, γ)	(pCi/gm β, γ)
Reactor room - north wall NE corner	99	45
Reactor room - north wall SE corner	86	39
West wall of vestibule	65	29
Reactor room - west wall directly behind reactor	763	343
East wall of tunnel to reactor room	47	21
Reactor room - east wall NE corner	137	62
Reactor room - east wall SE corner	98	44
Reactor room floor under reactor assembly	527	237
Reactor room - SE corner	77	34
Reactor room - SW corner	58	26

Two core samples 3/4 in. in diameter and 5-1/4 in. long were taken from the west wall area and from the floor directly beneath the reactor location. The results of the analysis of these samples are shown in Table 2.

TABLE 2.

ANALYSIS OF CONCRETE CORE SAMPLES FROM LOCATIONS NEAREST REACTOR VESSEL

Location	Results	
	(dpm/gm β, γ)	(pCi/gm β, γ)
Concrete sample from floor (surface sample)	1235	556
Concrete sample from floor (deep sample)	325	146
Concrete sample from west wall (surface)	723	325
Concrete sample from west wall (deep)	390	176

The analyses described in Tables 1 and 2 indicated the presence of low-level induced radioactivity in portions of the concrete structure. Since concrete activation was not anticipated, the Plan and the Detailed Procedures did not establish acceptable specific activity levels for activated concrete remaining following D&D efforts. In keeping with ALAP principles, all possibly activated concrete was removed, reducing the radiation level of the site to natural background levels. The removal was accomplished in two steps. First, a vertical recess in the wall 1 ft by 4 ft by ~10 in. deep, and an excavation in the floor directly beneath the reactor position, 18 in. by 18 in. by 10 in. deep, were chipped out with a jack hammer. The concrete debris was collected in 55-gal drums and sent to the RMDF. Analysis results for samples of the concrete collected from the wall recess during the jack hammering are shown in Table 3.

TABLE 3.

ANALYSIS OF CONCRETE SAMPLES DURING CONCRETE REMOVAL

Location	Results	
	(pCi/gm β)	(pCi/gm α)
Concrete dust sample from wall area directly behind reactor, 10 in. deep	58.4	0.350
Concrete dust sample in floor below reactor, 12 in. deep	38.3	0.327
Concrete dust sample in floor directly below reactor, 12 in. deep	64.0	0.337

The levels of concrete activation shown in Figure 3 for the depth and positions indicated, represent approximate natural radioactivity levels in concrete. However, to be certain that all induced radioactivity had been removed, the demolition contractor, using the Hoe-Ram, removed (Figure 19) a 5 ft by 5 ft section of the 2-ft-thick reactor wall, and a 3 ft by 3 ft by 12 in. deep section of the floor. This debris was also collected in 55-gal drums and sent to the RMDF for subsequent shipment to Beatty, Nevada for burial.

B. DECONTAMINATION

Radiological surveys were conducted throughout the D&D activities; data are presented in Tables 4 through 8.

TABLE 4.

SMEAR SURVEY OF KEWB FACILITIES AT BEGINNING OF D&D

Description and Location	Results (max.)	
	(dpm β,γ)	(dpm α/100 cm^2 area)
File cabinets in change room*	163	72
Control rod drive assemblies reactor	30	5
Air conditioner - change room*	30	5
Work bench - change room*	30	5
Door to reactor room	30	5
Door to reactor room passageway	30	5
Floor area - reactor room	50	-
Floor area - valve gallery room	4626	-
Building No. 643 floor	600	-
Building No. 123 floor, walls, pits	30	5
Walls, fuel handling room (65 smears max.)	7.3×10^7	12,357
Through-pipe to reactor room - upper	1,116	15
Through-pipe to reactor room - lower	440,613	1,896

*Non-facility items.

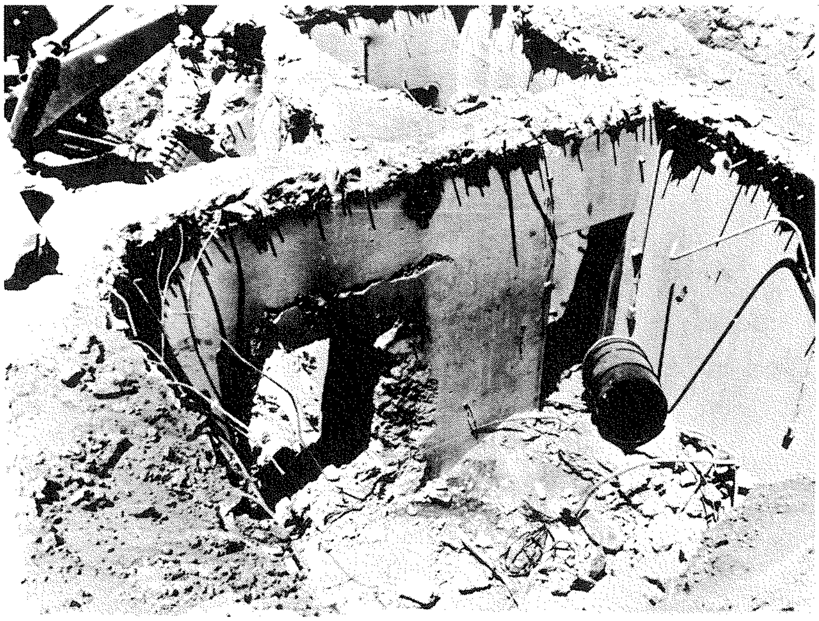

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Figure 19. Activated Concrete Removal From West Wall of Reactor Room

TABLE 5

RADIATION SURVEY OF KEWB AT BEGINNING OF D&D

Description and Location	Results (mR/hr)
Rod drive plate and assembly	1.8
Fuel lines in fuel handling room	4 to 140
Graphite logs	10-150
Reactor Vessel	300
Surface of Secondary Enclosure	10
Gas Recombiner System	70
Electrical conduit and boxes	<0.1

TABLE 6.

SMEAR SURVEYS AFTER INITIAL DECONTAMINATION

Description and Location	Results (dpm β)
Floor area, valve gallery (12 smears)	4,626
Wall area, valve gallery (28 smears)	352
Valve gallery wall recess for instrument	876
Fuel sight glass area	444
Small vestibule (20 smears)	50

TABLE 7.

SMEAR SURVEY AFTER SECOND DECONTAMINATION

Description and Location	Results	
	(dpm β/100 cm^2)	(dpm α/100 cm^2)
Floor area, valve gallery (12 smears)	100	< 20
Wall, valve gallery (128 smears, max.)	1,262	< 20*
Walls of fuel handling room (65 smears)	36,312	< 20†

*20 areas decontaminated further to bring all below 100 dpm/100 cm^2 β
†Sheet metal liner removed and packaged for burial

Before the demolition contractor was brought on site, the floors, walls, and ceiling of the Building 073 rooms were decontaminated by repeated wiping with absorbent pads and solvent until removable contamination levels were determined to be ALAP, but in all cases were less than 20 dpm/100 cm^2α, and 100 dpm/100 cm^2β. After the demolition of the ceiling and west wall of the reactor room, and the removal of the contaminated storage tank pit liner and associated lines, the facility was resurveyed. No surface radiation levels in excess of normal background levels and no removable contamination above 20 dpm/10 cm^2 α or 100 dpm/100 cm^2 β were detected. Therefore, the release to back-fill and final grade the KEWB area was given. A final survey was made using a currently calibrated Eberline Instrument Model, E-510 (0 to 200 mR/hr full scale). A 10 ft by 10 ft grid, was established over the KEWB

TABLE 8.

SOIL SAMPLES KEWB AREA

Description and Location	Results	
	(pCi/gm β)	(pCi/gm α)
Radioactive gas holdup tank	24.6	1.05
Radioactive liquid temporary holdup tank	23.8	0.919
Radioactive liquid storage tank	23.3	1.03
Radioactive gas/liquid tanks excavation area	21.9	0.872
Radioactive gas/liquid tanks excavation area	25.0	0.950
Base of exterior west tunnel wall	24.4	1.21
Northwest corner of T-073	24.9	0.872
Northcenter of T-073	24.6	1.11
Northeast corner of T-073	25.1	0.996
East side of T-073	23.4	0.950
South side of T-073	22.9	0.794
Concrete dust from reactor room floor excavation	47.1	0.506
Fuel storage liner excavation (soil)	22.8	0.65
Fuel storage liner excavation (sandstone)	23.7	0.73
Exterior west wall of tunnel to reactor room	22.0	0.90
Radioactive retention tanks (gas, liquid) area (3 samples, maximum)	22.4	0.73
Facility west perimeter (2 samples maximum)	23.4	0.90
Facility northwest corner - perimeter	21.9	0.39
Facility north perimeter (2 samples maximum)	23.9	0.90
Facility north center perimeter (2 samples maximum)	23.6	0.73
Facility northeast quadrant perimeter (2 samples maximum)	21.9	1.25
Facility east perimeter (2 samples maximum)	23.0	0.90
Facility north perimeter adjacent to tunnel	23.1	0.30

NOTE: The 1974 average radioactivity levels for on-site environmental soil samples were 0.6 pCi/gm α and 25 pCi/gm β.

area and the grid traversed with the instrument 5 in. above the surface. Background radiation levels were observed. These levels of radiation are equivalent to those observed using the same instrument and technique to measure background radioactivity levels in an uncontaminated area removed from the KEWB site.

The objective of the KEWB Dismantling Plan was to complete the dismantling of the KEWB facilities so that all surfaces which remain were decontaminated to levels which were as low as practicable, but in all cases, no greater than those of Table 1 of the Dismantling Plan. A description of the approach utilized for implementing ALAP principles appears in Reference 2.

The radiological surveys conducted and data presented demonstrate that the site is totally free of radioactivity except for normal background. Results of the final radiological surveys were reviewed by the Quality Assurance Program Administrator to enable verification of completion.

IV. RADIOACTIVE WASTE DISPOSAL

Contaminated materials and equipment accumulated from the KEWB facilities dismantling operation were sent to the RMDF at AI. The materials and equipment were transferred to the RMDF in specially constructed boxes or wrapped in plastic sheets and placed on pallets.

After receipt at the RMDF, the radioactive items were decontaminated to levels acceptable for unrestricted use, or packaged for burial, depending upon the levels of radioactivity present and the estimated costs for time and labor.

A total of 3045 ft^3 of radioactive waste from the KEWB was shipped to the Nuclear Engineering Company burial site at Beatty, Nevada. All waste was packaged and shipped according to Department of Transportation requirements.

V. KEWB FACILITIES D&D COSTS

The total costs for KEWB D&D are presented in Table 9. As is apparent, the major costs were for AI and Rocketdyne labor. The Rocketdyne Division of Rockwell International provides maintenance support for AI facilities at the field laboratories. Maintenance services were required mainly for disconnection of utilities such as water, electricity, and air conditioning.

Nuclear Engineering Corporation contracted for burial of the radioactive waste materials. Seaboard Construction Company provided the demolition and excavation services.

TABLE 9.
KEWB FACILITIES D&D COSTS

Total Labor Costs	
AI	$ 78,556
Rocketdyne	3,873
Subcontracted Costs	
Nuclear Engineering Corporation	$ 7,490
Seaboard Construction Company	10,182
Other Costs	
Materials	$ 1,864
Miscellaneous	
a. G&A	5,944
b. Fee	5,025
Total D&D Costs	$112,934

REFERENCES

1. W. K. Majors, "Decontamination and Dismantling Kinetics Experiment Water Boiler Facility of Building 073," DWP-704-990-002, (January 20, 1975)

2. W. F. Heine to R. L. Westby, ERDA-SAN, "Application of 'As Low As Practicable' (ALAP) Principles in the AI D&D Program," AI Letter 75AT4986 (August 13, 1975)

APPENDIX

DISMANTLING PLAN FOR KEWB FACILITY (BLDGS 073, 123 AND 793)

Document No. FDP-704-990-002

Atomics International Division
Rockwell International

SUPPORTING DOCUMENT

NUMBER: FDP-704-990-002
REV LTR/CHG NO.: SEE SUMMARY OF CHG

PROGRAM TITLE: DECONTAMINATION AND DISPOSITION OF FACILITIES PROGRAM

DOCUMENT TYPE: Facilities Dismantling Plan

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DOCUMENT TITLE: Dismantling Plan for KEWB Facility (Bldgs 073, 123 and 793)

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IR&D PROGRAM? YES ☐ NO ☒ IF YES, ENTER TPA NO. ____

APPROVALS   DATE
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ABSTRACT

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FORM 734-C REV. 2-74

Dismantling Plan

KEWB Facility, Buildings 073, 793, 123

I. OBJECTIVE

The Kinetics Experiment Water Boiler (KEWB) facility as shown in Figure 1 and Figure 2 was last operated in 1966. The fuel was drained and the system rinsed in 1968. Because of the elapsed time since shutdown, the radiation levels associated with the reactor components are relatively low. Maximum radiation levels at the surface of the core vessel are estimated to be 200 to 300 mR/hr.

The KEWB facility consists of the reactor test building 073, the exhaust blower building 793, the electrical building, the waste storage building 123, the facility stack and the gaseous and liquid waste holdup tank system.

A. DESCRIPTION OF KEWB FACILITY

1. Reactor Test Building

The reactor test building is an underground concrete structure 15 by 26 by 10 feet high. The outside walls and floor are reinforced concrete 8 inches thick, and the roof is a reinforced concrete slab 1 foot thick. The entire structure is covered with 6 feet of earth for shielding purposes.

The interior of the reactor test building is divided into three rooms: (1) the reactor room that contains the reactor core, graphite reflector, and control rod system; (2) the gas and fuel-handling room, which contains the radiolytic gas recombiner, fuel storage tank and associated plumbing system; (3) the valve gallery that contains the control handles for the valves in the gas and fuel handling system. Concrete shielding walls two feet thick separate the three rooms. A ramp and vestibule entry way lead into the valve gallery. A change and work area, constructed of wood, is at the head of the ramp.

2. Auxiliary Buildings

Ventilation of the reactor building is provided by a 2000-cfm blower that draws air from the building through a bank of absolute filters and discharges it up a disposal stack. Fresh air is admitted into each room by a duct up through the earth covering. Each of these ducts contains a Keystone butterfly valve at its upper end which was closed during operation to seal the building. A similar Keystone valve is located in the exhaust line just ahead of the absolute filter tank. The blower and gas lines are located in Building 793, the exhaust blower building.

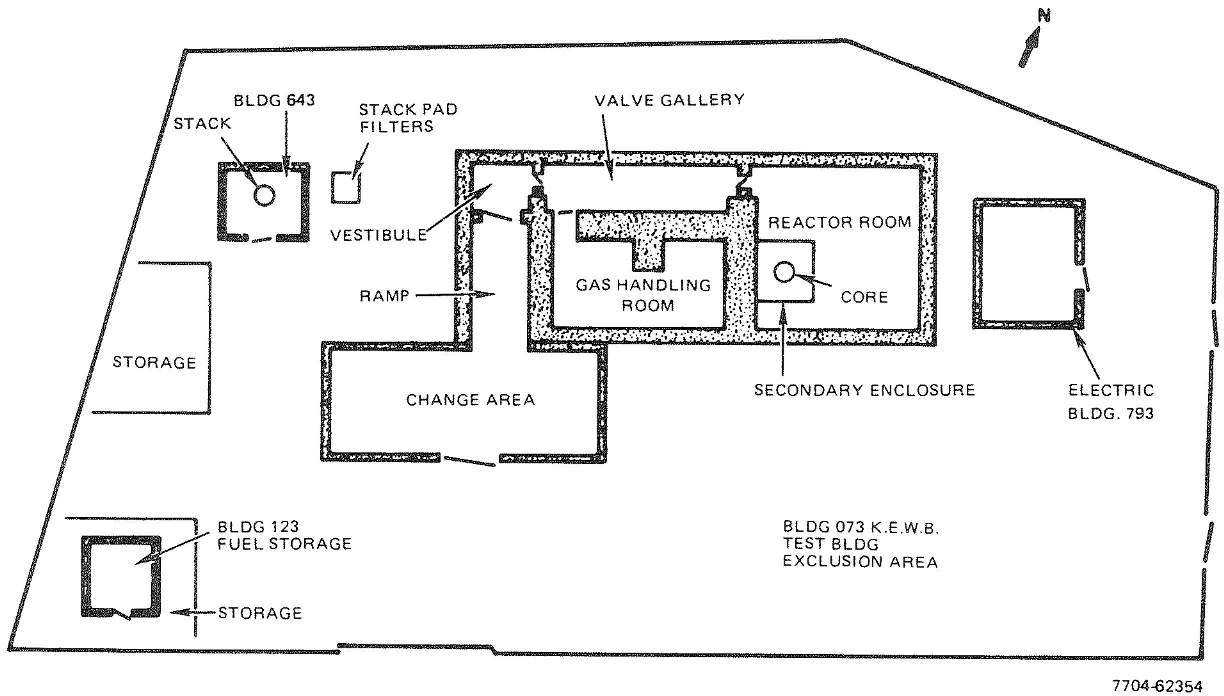


Figure 1. Kinetics Experiment Water Boiler Facility

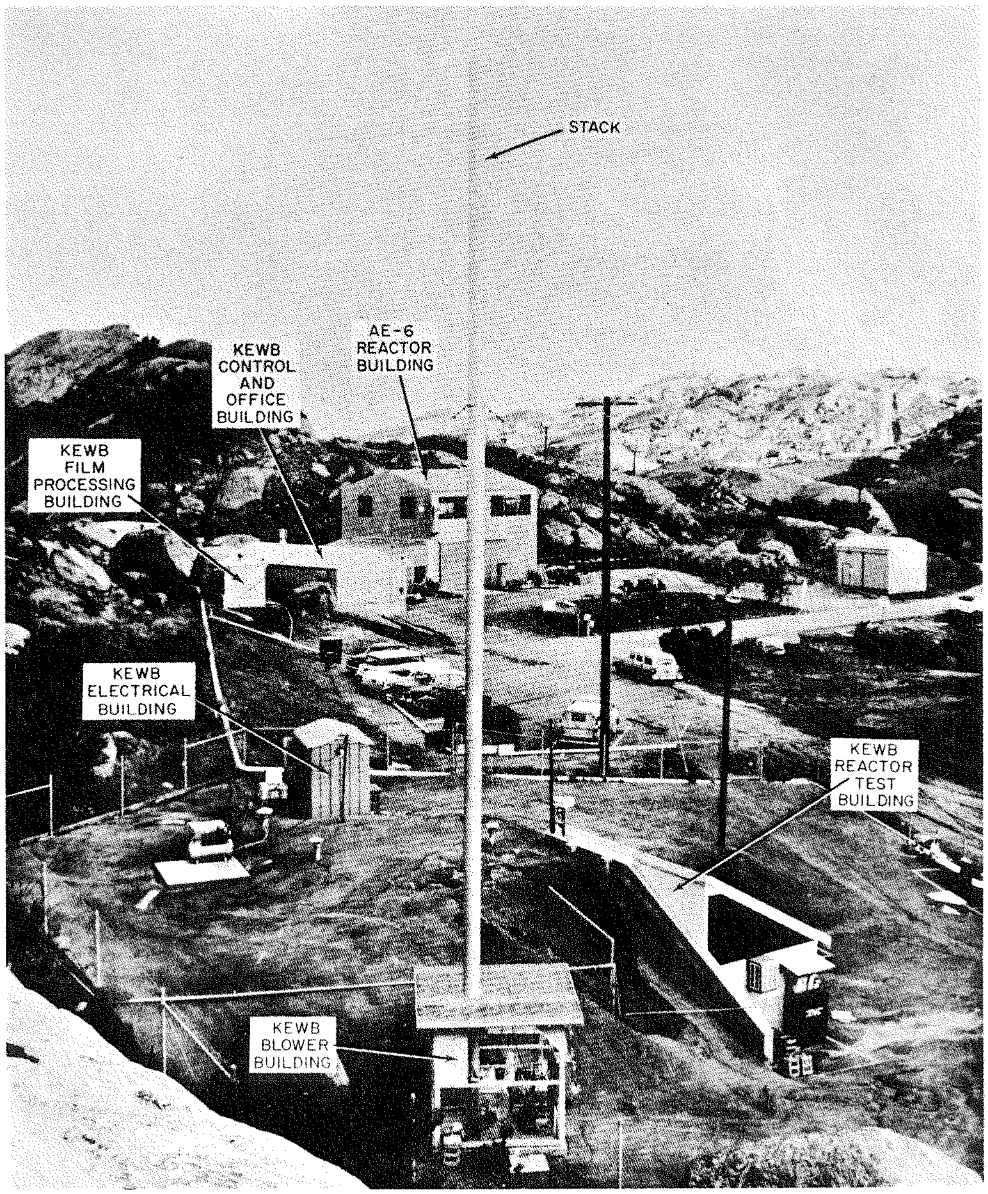


Figure 2 - Photograph of Kinetic Experiment Water Boiler Area and Facilities

The electrical building is located east of the reactor test building. This building contains the electrical panels, air conditioner, and heater. A pit is located in the floor of this building where most of the electrical conduits to the reactor room terminate.

Building 123, a concrete block building, was used for temporary storage of radioactive waste material. Two steel-lined wells 6 feet deep and 2 feet in diameter are located in the concrete floor of this building.

Waste Holdup Tanks

The waste disposal system for the facility consists of three underground tanks and a 60 foot exhaust stack with a 2000 cubic feet per minute blower system.

A 300-gallon collection tank, initially at vacuum, was used to collect gas directly from the reactor system.

A storage tank of 1000-gallon capacity buried beneath floor level and adjacent to the test building retained all liquid waste from the facility. This tank is equipped with pump-out connections for removal of the liquid waste when necessary.

The third underground tank, also of 1000-gallon capacity was originally used to retain the reactor cooling water so that it could be checked for activity before release.

B. DISMANTLING AND DISPOSITION

The reactor building and associated hardware will be decontaminated and all equipment dismantled, packaged and shipped for burial. The reactor building will be collapsed, the liquid wastes system will be removed and the site will be backfilled and restored to natural grade.

All surfaces which remain following completion of dismantling and all material released for unrestricted use will be decontaminated to levels which are as low as practical, but in all cases to levels below those in Table I.

The exhaust blower building 793, the electrical building, the waste storage building 123, the facility stack and the gaseous and liquid waste holdup tank systems will be decontaminated and removed. The area will be backfilled as necessary.

TABLE I

CONTAMINATION LIMITS FOR DECONTAMINATION AND DISPOSITION OF THE KEWB FACILITY

	Total	Removable
Beta-gamma Emitters	0.1 mrad at 1 cm with 7 mg/cm^2 absorber	100 dpm/100 cm^2
Alpha Emitters	100 dpm/100 cm^2	20 dpm/100 cm^2

II. SCOPE OF PLAN

The Dismantling Plan delineates the activities necessary to realize the objectives stated above. These activities have been categorized as follows:

A. Planning, monitoring, and control

B. Radiological survey

C Tooling and support equipment procurement

D. Dismantling and disposal

E. Documentation.

III. PLANNING, MONITORING, AND CONTROL

A schedule listing the detailed tasks and the sequence of performance has been prepared (see Figure 3). The level of manpower requirements for these activities are also shown in Figure 3.

Specific tasks will be initiated and monitored by the Program Office. The work authorizations, work releases, and progress report issuance will generally follow the format and guide lines set out in the Decontamination and Disposition of Facilities Program Plan. Quality Assurance and Health and Safety actions will be governed by the Quality Assurance Plan and the Operational Safety Plan, respectively. The schedule and manpower loading charts and the cost records will serve as the overall criteria to measure progress and accumulated costs.

IV. RADIOLOGICAL SURVEY

An initial radiological survey will be made to determine the extent of contamination present in the reactor test building, the exhaust blower building, the waste storage building, and the waste holdup tank system. An assessment of the probable levels of contamination are as follows:

A. REACTOR BUILDING

1. Reactor Room

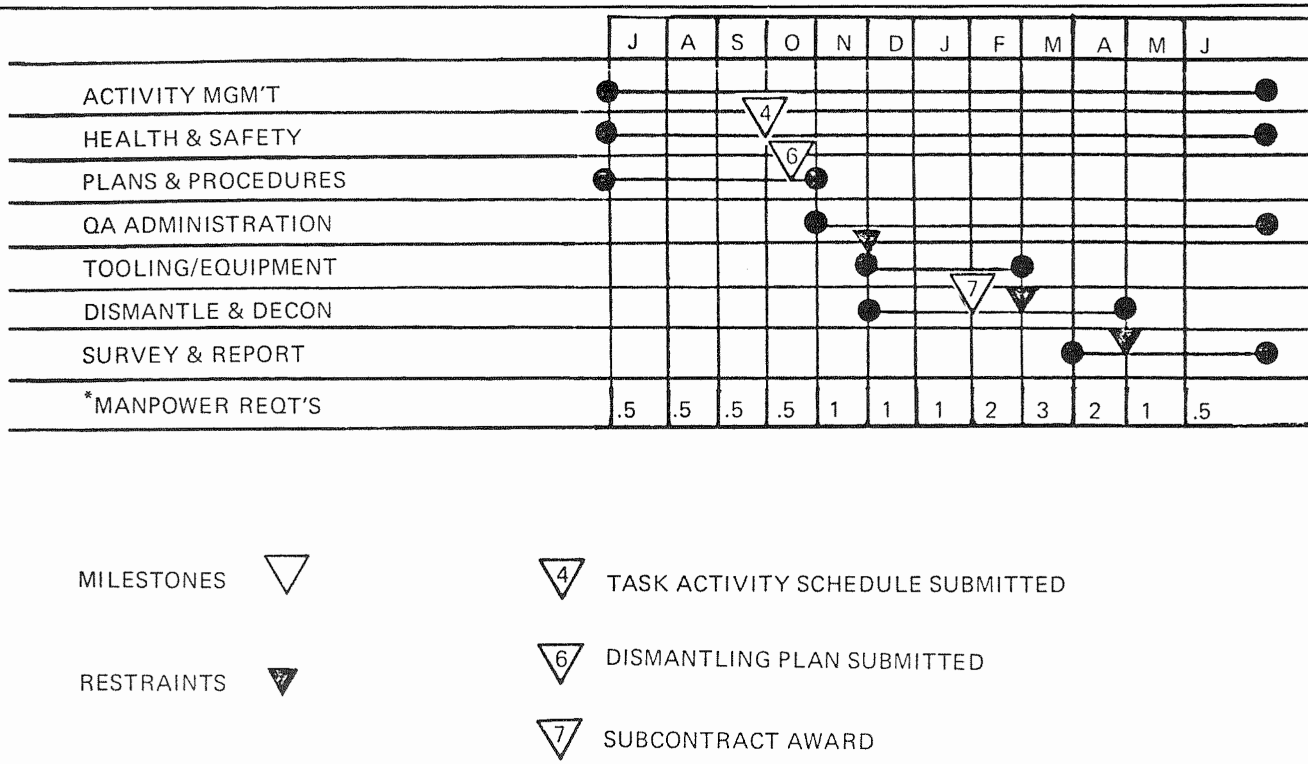
Radiation levels outside the secondary enclosure do not exceed 5 mR/hr except within the exposure ports. From readings taken in the 8 x 8 inch horizontal exposure port, it is estimated that a radiation level of from 200 to 300 mR/hr exists at the surface of the core vessel. The graphite reflector, the control rods, the secondary enclosure, and all parts within the enclosure are assumed to be activated or contaminated from past fuel spills near the core vessel. The control rods and the poison rod will also contain some induced radioactivity.

2. Fuel Handling Room

All gas or fuel piping and equipment in the fuel handling room can be assumed to be contaminated. The floor has low level contamination. The highest radiation level present is about 100 mR/hr at the water trap near the doorway and in one of the pipes near the floor. Radiation levels of 40 mR/hr have been measured at the surface of the recombiner. The radiation levels associated with the main fuel storage tank may be greater than 100 mR/hr when it is removed from its pit in the floor.

3. Valve Gallery

The valve gallery has no appreciable surface contamination except within the fuel and gas handling lines which penetrate the wall from the fuel handling room. Maximum radiation levels of about 2 mR/hr have been measured at the surface of these lines.



* ONLY MANPOWER EXPENDITURES ARE SHOWN. OTHER EXPENDITURES FOR MATERIALS, OUTSIDE SERVICES AND ADMINISTRATIVE COSTS ARE ANTICIPATED BUT NOT DEFINED AT THIS TIME.

Figure 3. Decontamination and Disposition of Facilities Program, Program Activity Network, KEWB Facilities

B. EXHAUST BLOWER BUILDING

The absolute filters and filter bank housing may be slightly contaminated. The vent and gas lines connected to the blower may also be slightly contaminated. The blower and stack are not contaminated.

C. WASTE STORAGE BUILDING

This building contains a few lead pigs and one source barrel with low level internal contamination.

D. HOLDUP TANKS

The cooling water holdup tank is not contaminated. The gas and wash water holdup tanks may be contaminated. Lines connecting these tanks to the reactor building may also be contaminated.

V. TOOLING AND SUPPORT EQUIPMENT PROCUREMENT

No special tooling requirements are anticipated other than those normally used in handling and packaging radioactive waste for burial. Handling equipment, containers and packaging materials will be procured from the Radioactive Materials Disposal Facility (RMDF) at AI.

VI. DISMANTLING AND DISPOSAL

Detailed procedures will be written to guide the dismantling and disposal crews. A brief description of the principal tasks are as follows:

A. PREPARATION FOR DISMANTLING AND DISPOSITION

The health and safety facilities in the reactor building including the change area and the radiological survey station will be renovated as necessary to make ready for use. A radiological survey will be conducted of all KEWB facilities. Health and Safety equipment and instrumentation will be made available. Electrical power to facilities will be progressively disconnected as facilities are removed.

B. REACTOR BUILDING DECONTAMINATION

The general decontamination and dismantling process will begin in the reactor room with the removal of all loose equipment and material, instrument wiring and piping, and instrumentation cable trays. The graphite reflector blocks will then be removed, the coolant and gas lines crimped and cut, portions of the secondary enclosure removed and the reactor core removed. The walls, floor and ceiling will be radiologically surveyed and cleaned to the levels required.

The fuel handling room will be dismantled next. The valves, lines, vacuum system, distilling condenser, liquid traps, fuel mixing chamber, fuel storage tank, recombiner, aspiration pump, compressed air system, gas holdup tank and the wash water system will be removed. Some lines in the concrete floor may be contaminated. These will be excavated. The walls, floors and ceiling will be radiologically surveyed and cleaned to the levels required.

The valve gallery will then be dismantled. All valves, lines manometers, sight gauges, tubing, plastic sheeting, paper, matting, fire detection equipment, lights and electrical panels will be removed. A survey will be conducted and the surfaces cleaned to the level required.

C. ELECTRICAL BUILDING DISMANTLING

Power to the electrical building will be disconnected. All electrical lines to the electrical building will be removed. Telephones, fire detection equipment, heater equipment, and electrical panels will be removed. The building will be unbolted from the foundation and removed to salvage. The foundation will be excavated.

D. WASTE HOLDUP SYSTEM DECONTAMINATION AND DISMANTLING

The waste storage building will be cleaned, power lines removed and the building razed. The filters, filter bank housing, power lines, fire detection equipment, gas lines, vacuum pump and electrical panels will be removed from the exhaust building. The exhaust stack, blower and drive motor will be removed and the building razed.

The three waste tanks: 300 gal gas holdup, 1000 gal cooling water holdup and the 1000 gal wash water storage and the associated piping will be removed.

E. REACTOR BUILDING REMOVAL

The reactor building will be collapsed and removed. The site will be backfilled and graded to natural contour.

F. FINAL SURVEY

A final radiological survey of the area will be performed prior to any back filling and after completion of all work to verify that the decontamination was accomplished to the levels as specified.

VII. DOCUMENTATION

A. PROCEDURES

Detailed procedures will be written to guide the decontamination and dismantling crews. Specific radiological and industrial safety hazards and the means for working with and eliminating these hazards will be identified. The procedures will show that the means will conform to the requirements of the Operational Safety Plan and compliance with these requirements will be monitored by Quality Assurance and Health and Safety. Detailed procedures will be released and controlled by the AI Engineering Data Release System.

B. REPORTING

Progress on the KEWB D&D activities will be reported to AEC San Francisco in the Decontamination and Disposition of Facilities Program monthly report.

C. RECORD INFORMATION

The results of radiological surveys of the areas, materials, and equipment will be recorded and certified. A complete accounting of all radioactivity disposed of by RMDF will be maintained. Photographic coverage of the more significant phases of dismantling will be obtained both in still photos and in motion pictures.

D. FINAL REPORT

The final report will describe the dismantling and decontamination activities. Problem areas and the subsequent solutions will be highlighted. Shipping records showing quantities of material and the level of radioactivity will be included. The report will contain the QA and H&S safety records certifying the reported status of the KEWB area upon completion.