SUMMARY REPORT AMCHITKA DEMOBILIZATION AND RESTORATION ACTIVITIES

JUNE 1974

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UNITED STATES ATOMIC ENERGY COMMISSION
NEVADA OPERATIONS OFFICE

Las Vegas, Nevada

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SUMMARY REPORT
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SUMMARY REPORT

AMCHITKA DEMOBILIZATION AND RESTORATION ACTIVITIES

The Atomic Energy Commission occupied Amchitka Island during the period 1967 through 1973 for the purpose of conducting nuclear underground tests. This summary report is issued to document the condition in which the island was left at the completion of AEC activities; as well as to briefly identify the long term effects monitoring activities that the AEC will perform periodically after 1973.

for Mahlon E. Gates
Manager

SUMMARY REPORT
AMCHITKA DEMOBILIZATION AND RESTORATION ACTIVITIES

I. INTRODUCTION AND HISTORY

A. Supplemental Test Site Program

The Supplemental Test Site (STS) Program was initiated when it became apparent that the Atomic Energy Commission's (AEC) Nevada Test Site (NTS) would not be adequate for certain higher-yield tests needed to support United States defense policy. The primary limitation at the NTS was anticipated ground motion from a high-yield test and its possible adverse effect on structures in nearby communities, including Las Vegas.

Subsequently, a search was begun for a supplemental site that would accommodate a limited number of high-yield tests and on November 18, 1966, the Manager, Nevada Operations Office (NV), established a Site Selection Committee to coordinate the site selection actions. Potential sites were subjected to preliminary safety and technical reviews and Amchitka Island, Alaska, was judged to best satisfy the basic criteria established.

B. Site Description

Amchitka is the southernmost island of the Rat Island Group of the Aleutian Island Chain (see Figure 1). The Rat Island Group is composed of five larger and three smaller islands, all lying within a circle of about 40 miles radius. Amchitka Island is about 40 miles long and from 3 to 5 miles wide, lying between longitudes $178^{\circ}37'E$ and $179^{\circ}29'E$, and latitudes $51^{\circ}21'N$ and $51^{\circ}39'N$.

C. Department of Defense Experiment, Project Long Shot

One Department of Defense (DOD) test was conducted on Amchitka Island (see Figure 1). The Long Shot Event was detonated on October 29, 1965. This experiment was conducted to provide data to the Vela Uniform program which would improve the United States' capability to detect, identify, and locate underground nuclear explosions.

D. Atomic Energy Commission Operations Milrow and Cannikin

The Milrow Event was conducted on October 2, 1969. This event was solely a calibration test to determine the suitability of conducting one or more higher-yield tests on Amchitka.

Figure 1

The Cannikin Event was detonated on November 6, 1971. This test was a vital part of the United States' weapons development program and was the final event prior to demobilization of the Amchitka Island site.

II. OPERATIONS

Whenever possible, AEC construction took advantage of facilities remaining from World War II (WWII) to avoid unnecessary damage to the environment. At the Base Camp, new buildings were constructed on WWII asphalt pavement, usually aircraft hardstands. Existing hangars were rehabilitated and/or modified to provide shops, offices, and indoor storage. WWII paved taxiways became roads and, where possible, WWII roads were improved in lieu of building new roads with better alignments. The WWII Fox Runway became a large storage area for drilling equipment and supplies, and several WWII dumping areas were reused.

A. Camp Construction

A permanent base camp was constructed on a hardstand near the southwest end of Baker Runway to provide housing, feeding, technical support, and recreational facilities for approximately 700 men. The camp consisted of a mess hall, dormitory-type housing facilities, office buildings, warehouse and recreational facilities, fire protection and medical facilities, base exchange, mail room, and laundry facilities. A motor pool, maintenance shops, and POL facilities were also constructed.

A small satellite camp (Northwest Camp, see Figure 2) was erected to supply temporary housing for drilling and construction crews. The camp was later expanded to include CP functions for the Milrow and Cannikin Events.

A water supply for the Base Camp was provided from a spring source 5000 feet north of the camp. It consisted of a holding pond, pressure pumps and chlorination equipment at the source pump house and distribution lines to the Base Camp, easterly to four warehouses and the air terminal. Water for fire protection could be introduced into the system by pumping supplementary water from a natural pond into distribution lines at Base Camp.

A sewage collection system was designed and built, including gathering lines and an aerated sewage lagoon south of the campsite.

Power from the Base Camp facility was provided from a permanent powerhouse containing five 500-kw, diesel engine-generator units.

B. Road Construction

Existing selected roads (WWII construction) in and around the Base Camp area were upgraded by widening, shaping, and culvert installation. The main "Infantry Road" running from Base Camp to Northwest Camp required considerable realignment in mountain areas, resurfacing, and culvert installation.

Figure 2 Northwest Camp Prior to demobilization

Figure 3 Milrow Technical Structure (Postshot)

New roads, such as those to the various drill sites or scientific instrument sites, were constructed as needed and in such a manner as to minimize damage to the tundra.

C. Dock Rehabilitation

The original WWII dock was totally unusable and a rock-filled dock used for Project Long Shot had to be rehabilitated for temporary use. A new dock, a steel piling-timber decked structure, "T" shaped, was built with a 70-foot stem and a 150-foot arm.

D. Runway Rehabilitation

Baker Runway is a WWII, 10,000-foot facility, 7800 feet of which was still usable at the time of AEC occupancy. Repairs were undertaken to provide 9000 feet of usable runway. In addition, runway lighting, approach lighting, GCA radar, and a homing beacon were emplaced.

An air terminal building and a baggage facility were also constructed. The airfield facility includes an auxiliary power-generating system.

E. Communications

During the construction/drilling phase, a single-voice/single-teletype trunk provided the line between Amchitka and the mainland. During the operational buildup, a larger telephone exchange, comcenter, and closed circuit (event monitor) television system were installed. The radio link to the mainland was upgraded to three voice and six teletype channels.

During the peak operational phase for Project Cannikin, the following communications systems were in operation:

1. On-Island Telephone Service

Three dial PBX systems interconnected by microwave links with "hot line" capability.

2. Off-Island Telephone Service

Three HF, full-duplex voice circuits and one full-period teletype circuit were provided. This was a 24-hour-a-day, 7-day-per-week service. Cryptographic protection for teletype messages was also provided.

3. VHF Local Voice Radio

Five half-duplex (repeated) networks were established to permit Island-wide, mobile-to-mobile, and fixed station (base station)-to-mobile voice communication. A VHF simplex

net was established for scientific program communication with Rat, Semisopochnoi, and Amatignak Islands. Air-to-ground and air-to-air nets were also operational.

4. Other Systems

Ship-to-shore radio systems (VHF/UHF) were provided and emergency ship and aircraft frequencies were monitored during the operational period. Other systems such as weather services, PA systems, and closed circuit TV systems were provided as needed.

Amateur radio stations, Station KABO, and a programmed TV station were maintained for personal communications and/or recreation.

F. Drilling Operations

Thirty-seven bore holes were drilled by the DOD or AEC during their occupancy of Amchitka Island. Of these, 19 were drilled by DOD contractors during the Long Shot operation and 18 by AEC contractors during the Milrow and Cannikin operations.

1. Long Shot Site (Expended)

One large-diameter, cased, emplacement hole was drilled at this site. Eighteen small-diameter holes, including six EH holes, eight OH holes, three UDH holes, and one EE hole.

2. Drill Site B (Expended)

One large-diameter, cased, emplacement hole and two small-diameter instrument holes were drilled at this site.

3. Drill Site C (Expended)

One large-diameter, cased, emplacement hole, four small-diameter instrument holes, two small-diameter Hydrologic Test Holes (HTH), and one postshot reentry hole were drilled at this location.

4. Drill Site D (Unexpended)

One large-diameter, uncased, emplacement hole and two small-diameter instrument holes were drilled at this site.

5. Drill Site E (Site Prep Only)

A concrete pad was poured and a 144-inch conductor set to 10 feet at the site, but no large bore hole drilling took place. A small-diameter exploratory hole was drilled to 7495 feet.

6. Drill Site F (Abandoned)

One large-diameter, uncased, emplacement hole was drilled to shallow depth and one deep, small-diameter, exploratory hole was drilled at this location.

7. Other Sites

Drill Sites A and G were located but they were not developed. An access road was built to Drill Site H and preliminary site work was started. There were no drilling operations at Sites A, G, or H.

G. Milrow Event

Technical construction for the Milrow Event consisted of a complex of buildings and structures located in the immediate vicinity of ground zero for the support of downhole operations and stemming. Structures provided included the Green House for assembly of downhole hardware, a coax handling tower, and miscellaneous craft shacks. All structures, except the assembly building complex, were removed from the event site prior to D-day (see Figure 3). A plant to dry stemming materials was built near the Fox Runway. The dry materials were stored in weatherproof Sealdbin containers.

A diagnostic park large enough for 30 trailers was constructed. This required grading and stabilization of about one acre of ground. The work included the provision of adequate power, communications, and other utilities, and the cribbing and stabilization of structures as needed.

All technical structures required for diagnostics and instrumentation were constructed either onsite or offsite.

Fencing for secured areas was erected as needed.

H. Cannikin Event

Technical construction for the Cannikin Event included erection of an approximately 20,000-square-foot, prefabricated building at the ground zero area. This building served to house downhole cable reels racks. Other structures included two each multi-decks and two each long buildings for assembly of device and diagnostic canisters.

Weatherproof containers (Sealdbins) were provided for the dry storage of stemming material. A diagnostic park large enough for 30 trailers was constructed, including required power, communications, and utilities.

Approximately 100 runs of event cabling were required from the diagnostic park to ground zero. The surface runs were approximately 2000 feet in length.

Fencing of all secured areas was provided as needed.

III. ISLAND DEMOBILIZATION

A. Objectives

The objectives for demobilization, cleanup, and restoration of Amchitka Island include the following:

1. To restore disturbed areas on the Island, as much as feasible, to the condition they were in before the AEC use; meaning particularly that AEC-constructed buildings, utility lines, towers, poles, and other objects will be removed (except those remaining from WWII, those requested to be left in place for use of the Bureau of Sport Fisheries and Wildlife (BSF&W), and those required by the AEC to support the personnel of long-term effects programs).
2. To take all reasonable measures to repair existing disturbances to the environment resulting from AEC programs.
3. To prevent future environmental damage, including erosion and pollution.
4. To minimize potential safety and health hazards.
5. To improve the general appearance of those areas which were used during Department of Defense (DOD) and AEC Nuclear Test programs.
6. To improve the general appearance of WWII building sites, which are readily accessible and could be reached without further damage to the terrain.

These objectives were attained by the processes of off-Island transport of equipment and facilities, burning of combustibles, burial of noncombustibles, recontouring, and revegetation of areas disturbed during DOD and AEC occupancy.

B. Campsites

Two campsites were utilized during the testing period. Northwest Camp, at the northwest end of the Island, and Base Camp, at the southeast end.

1. Northwest Camp and CP

This facility was established as a satellite camp to provide temporary housing for drilling and construction crews. It subsequently housed personnel for a Command Post (CP) function and was used as such during the Milrow and Cannikin Events.

Demobilization of this locale included the removal of structures, equipment, stored material, and supplies. The Underground Shelter (CP) was left in an "as-is"

condition with a supply of emergency C rations. It was determined that no recontouring or reseeding was required for this site, except at the helipad and access road. Figure 4 shows Northwest Camp after all facilities (except the underground shelter) had been removed.

2. Base Camp

This facility was constructed as a "permanent" camp and included all the facilities and equipment required to support drilling and mining operations. Facilities were also constructed to house, feed, and provide off-duty recreation for a population of 350-700 men. The camp itself consisted of water, power, and sewage systems, a mess hall, dormitory-type housing facilities, office buildings, warehousing and recreation facilities, base exchange, mail room and laundry facilities, docking facilities, and a 9000-foot runway and air terminal. Figure 5 shows the Base Camp during the active testing phase.

Final demobilization and cleanup of Base Camp occurred during the late spring and summer of 1973. With the exception of those facilities requested by the BSF&W or needed for the Long-Term Monitoring Program (see IV.C), all other AEC structures were razed or removed from the Island. Those structures remaining from WWII occupancy, which could easily be reached, were burned in place. Those structures which could not be reached without additional damage to the environment were left "as is."

All salvable facilities and equipment were crated and removed from the Island. Flammable scrap and trash were burned. Metal scrap was either sold and shipped off-Island or disposed of in a scrap metal dump.

Detailed areas around Base Camp were recontoured and reseeded during the summer months of 1973. Figures 6 through 10 show the present condition of the Base Camp area.

C. Test Sites

Three test sites were fully developed and expended on Amchitka: Long Shot, Milrow in UA-2 at Drill Site B, and Cannikin in UA-1 at Drill Site C. All three of the sites are located in the southern half of the Island.

1. Long Shot Test Site

Figure 11 shows the Long Shot facilities prior to detonation.

Figure 4 Northwest Camp area after demobilization

Figure 5 Main Camp during the testing period

Figure 6 Reseeded area at the 'White House' office

Figure 7 Reseeded areas at the Main Camp

Figure 8 Reseeded areas at the Main Camp

Figure 9 South Hangar

Figure 10 Air Terminal Building

Figure 11 Long Shot area prior to event

Equipment and facilities were removed from the site. Concrete foundations and slabs were left in place. There is a requirement for continued monitoring of surface waters in this area; therefore, mud sumps and pits were not backfilled. All other disturbed areas were backfilled, recontoured, and reseeded. Drill holes were stemmed and abandoned as described in Section III.D. A concrete slab was poured over the Long Shot emplacement hole and a monument with bronze tablets was erected on the site. Figure 12 shows the site area after cleanup. Figure 13 shows the bronze tablet.

2. Milrow Test Site

The facilities constructed for the Milrow Event included the GZ facility, the LASL diagnostic park support structures, two Sandia recording trailer parks, and security fencing.

All buildings, structures, equipment, and cables between the site and RTPs were removed from the site. Concrete foundations and slabs were left in place. Mud sumps and pits were backfilled and recontoured and all disturbed areas were reseeded and fertilized. Information on the methods for plugging, capping, or sealing the Milrow drill holes is covered in Section III.D. A concrete slab was poured over the Milrow emplacement hole and a permanent monument with bronze tablets was erected. Figures 14 and 15 show the present condition of the Milrow site and the bronze tablet.

3. Cannikin Site

The facilities constructed for the Cannikin Event included a complex of buildings and structures for support of down-hole operations and stemming at ground zero. An RTP was built to house approximately 30 trailers. Additional technical structures were built as required (see Figure 16).

All buildings, structures, equipment, and cables were removed from the site. Concrete foundations and slabs, including those constructed for postshot reentry drilling, have been left in place in an "as-in" condition. Mud sumps and pits were all filled in and smoothed over. All disturbed areas around the Cannikin GZ were cleaned up, reseeded, and fertilized. Figure 17 shows the condition of the site after restoration was completed.

D. Drill Hole Sites

Thirty-seven bore holes were drilled by AEC contractors during occupancy of Amchitka Island. Two existing holes, presumably drilled during WWII military occupancy, were also refurbished and used--a total of 39 holes.

Figure 12 Long Shot area after reseeding

Figure 13 Long Shot bronze tablet

Figure 14 Milrow area after cleanup and reseeded

Figure 15 Milrow bronze tablet

Figure 16 Cannikin areas prior to event. Ground Zero (background), cableway and Recording Trailer Park (foreground).

Figure 17 Cannikin Ground Zero area after re-seeding. Cannikin Lake (background).

Abandonment plans for all 39 holes were prepared as part of the demobilization program. Thirty-one bore holes were sealed and abandoned by September, 1973. The eight holes (six AEC and two military holes) which remain may be used as groundwater sampling points in the Long-Term Monitoring Program (see Section IV.C). When the Long-Term Monitoring Program terminates, these eight holes will be abandoned.

The bore hole abandonment plan had four objectives: 1) abandon the holes so that all contamination shall be below ground level; 2) eliminate all potential safety hazards and make it impossible for any human or wildlife to accidentally fall into a hole; 3) abandon the monitoring holes, after they are no longer required, using the minimum amount of equipment and material then available; and 4) abandon the holes in a manner that will allow the holes to be reentered easily, if required.

These objectives were reached by lowering a six-inch thick wooden bridging plug into the open casing to a depth of about ten feet. The plugs were held in place by three each 3/4-inch cables which were secured to the casing. The bridged casing was then backfilled to the surface with concrete or cement. Interior casing strings were cut off to one foot below ground level and a steel plate was welded across the top. Cement was then poured on top of the plate to ground level.

1. Long Shot Drill Site

Nineteen holes were drilled for use in the Long Shot Event. These holes included the Long Shot emplacement hole, six EH holes (EH-1 thru -6), eight observation holes (OH-3 thru -10), three UDH holes (UDH 1, 2, and 8), and one effects evaluation hole (EE-1).

Seventeen of the nineteen holes have been sealed and abandoned. Only OH-10 and UDH-1 remain open for monitoring purposes.

2. Drill Site B

Three holes were drilled at Site B for the Milrow Event: one emplacement hole (UA-2), one exploratory hole (UAE-2), and UA-2-1-2. All three holes were sealed and abandoned in September, 1972.

3. Drill Site C

Eight holes were drilled at Site C in conjunction with the Cannikin activities: one emplacement hole (UA-1), one exploratory hole (UAE-1), three instrument holes (UA-1-DW,

UA-1-GH-1, and UA-1-GH-2), two Hydrologic Test Holes (UA-1-HTH-1 and -2), and one postshot reentry hole (UA-1-P-1). Figure 18 shows preshot view of the Cannikin drill site.

All drill holes were abandoned at this site, with the exception of the two Hydrologic Test Holes retained for the monitoring program. Figure 19 shows the bronze tablet installed over the UA-1 drill hole.

4. Drill Site D

Three holes were drilled at Site D: an emplacement hole (UA-6) and two exploratory holes (UAE-6h and UAE-6c). The emplacement hole and UAE-6h were abandoned in September, 1972. Exploratory hole UAE-6c has been retained for the monitoring program. By mutual agreement with BSF&W, mud pits and drilling mud in pits were left in an "as-is" condition; i.e., they were not removed or emptied. The drill site was cleaned up and restored in 1973, as shown in Figure 20.

5. Drill Site E

Two bore holes were located at this site: UA-7 and UAE-7c. UA-7 received site preparation work only. UAE-7c remains open for use as a monitoring hole. Figure 21 shows Site E after demobilization.

6. Drill Site F

One exploratory and one emplacement hole were drilled at this location: UA-3 and UAE-3. Both holes were abandoned in September, 1972. Figure 22 shows Site F after cleanup and restoration.

E. Communications

Nearly all communications equipment has been removed from Amchitka. Exceptions include the following:

1. At the Longhaul site, a 90-foot wooden antenna pole was left in place with the concurrence of the BSF&W.
2. At Base Camp, a 100-watt radio beacon was left in place for use by reentry teams.
3. At Base Camp, a sloping-V antenna remains for HF radio communications to Elmendorf Air Force Base by reentry teams.

Steel communications towers were removed from: the Base Camp; Mile 8 and Mile 31 locations on the Infantry Road; and the CP area.

Figure 18 Cannikin Ground Zero area prior to the event

Figure 19 Cannikin bronze tablet

Figure 20 Site D mud sump berms after reseeding

Figure 21 Site E after reseeding

Figure 22 Site F after reseeding

Multiple-pair telephone cable was removed by U.S. Navy crews from Adak.

The airstrip's Ground Control Approach (GCA) radar and 1000-watt radio beacon were shipped to the FAA.

The Base Camp's TV station equipment was shipped to Johnston Island.

Most other communications gear, including radio units, telephone exchange, and crypto van, were shipped to the NTS.

F. Off-Island Facilities

Scientific and weather stations were constructed on five additional islands during AEC Amchitka occupancy. These islands were Rat, Amatignak, Semisopochnoi, Kiska, and Little Sitkin.

During May and June, 1973, all equipment and structures were removed from three islands by Navy helicopter and the site cleaned up. Figure 23 shows the installation on Semisopochnoi and Figures 24 and 25 show the equipment being removed. A small amount of equipment was left on Kiska and Little Sitkin (one antenna and one two-wheeled trailer).

G. Disturbed Areas

To facilitate restoration, cleanup, and demobilization of Amchitka, the Island was divided into six areas as shown in Figure 26. Within each of the six areas, those facilities, structures, or construction features needing attention were identified (see Figures 27 to 32).

1. General Items

Methods for demobilization, cleanup, and restoration of areas which occurred generally throughout the Island were as follows:

a. Surface Mud and Water Pipelines

All surface mud and water pipelines along roads and extending to lakes, mud pits, and drill holes were removed and hauled to the metal dump.

b. Off-Road Damage

The repeated use of Sno-Tracs, Juggernauts, and light, off-road equipment resulted in tracks which scarred the tundra.

No action was required, as repair of damage was not feasible. The trails will eventually be obliterated naturally by vegetation.

Figure 23 Scientific equipment at Semisopochnoi Island

Figure 24 Semisopochnoi equipment being removed

Figure 25 U.S. Navy Helicopter removing equipment

AMCHITKA ISLAND, ALASKA DISTURBED AREAS

Figure 26

AMCHITKA ISLAND ALASKA
DISTURBED AREA

AREA-A

LEGEND

- BACK BONE SIGNAL CABLE TERMINATION BLDGS.
- INFANTRY ROAD MILE POST MARKER
- ⬡ LOCATION OF DISTURBED AREAS

Figure 27

Figure 28

Figure 29

Figure 30

Figure 32

c. Survey Markers

- (1) Plastic crosses originally placed to aid in aerial surveys, other temporary survey markers, and range poles were removed and disposed of by burial or burning.
- (2) All bench marks and other permanent survey monuments and markers were left in place, undisturbed.

d. World War II Buildings

- (1) World War II buildings which were not used during Long Shot or AEC activities and which were readily accessible for coverage by manned fire trucks from nearby roads without creating further damage to the terrain were burned in place. Galvanized metal sheets were hauled to the metal dump. All other nonflammable materials were abandoned in place at the building site.
- (2) Buildings to be burned were selected and designated by the BSF&W representative at Amchitka and approved by the AEC Site Manager.
- (3) A manned fire truck stood by at the sites while buildings were being burned.
- (4) Several World War II buildings used during Long Shot and AEC activities which were not salvable were wrecked and the debris burned or buried. The North and South Hangars were enclosed and retained for storage space.

e. Borrow Pits, Spoil, and Crusher Areas

These features were filled or rounded off with a bulldozer and slope angles were improved. Topsoil and organic materials were hauled in and spread and the areas revegetated.

f. Explosive Storage and Disposal Areas

All buildings were removed and the areas cleaned up. No other action was required, as disturbances to the areas were deemed self-restoring.

g. Technical Stations

All equipment and materials were removed from all technical stations. Any remaining pits were filled and the areas cleaned up and revegetated as necessary.

h. Power Lines, Poles, and Substations

- (1) World War II service lines were left in place "as is." Other lines and substations constructed for or used during Long Shot or AEC programs were removed except for surface-laid lines and substations required for Base Camp's remaining facilities.
- (2) Salvable wiring, poles, transformers, and equipment were removed from the Island. Nonsalvable material was burned and left in a designated dump area.

i. Boat Landings

All boat landings were left in "as-is" condition.

j. Harbor Bouys

All harbor bouys and markers were left in place.

k. Miscellaneous Long Shot and AEC Activity Areas

Miscellaneous sites and areas not specifically listed or described were demobilized, cleaned up, and restored in accordance with methods used at the listed sites.

H. Revegetation and Cleanup Program

The University of Alaska Institute of Agricultural Sciences prepared a final revegetation plan for Amchitka Island, including types of grasses used and the necessary compounds and percentages of fertilizers. The following table shows the grass types and application rate.

<u>Seed</u>	<u>Application Rate/Acre</u>
Bering Hair Grass	2.5 lbs.
Boreal Red Fescue	15.0 lbs.
Chewings Fescue	15.0 lbs.
Annual Rye Grass	5.0 lbs.
Fertilizer	
Nitrogen-Phosphate-Potash	90-160-80 lbs.

During June, July, and August, 1973, nearly 190 acres of disturbed ground throughout the Island were reseeded and fertilized. This was in addition to several experimental plots planted in 1971 and 1972.

The reseeding-fertilizing program was carried out using a combination of hand-broadcasting (on rough or rocky ground) and mechanical-spreading equipment. Some areas were treated more than once to ensure successful revegetation.

Cleanup was effected on an Island-wide basis. A program of controlled destruction of WWII buildings was carried out through the selective burning of approximately 400 structures. Of the 120 disturbed areas slated for restoration, all were cleaned and all except two were signed off by BSF&W representatives as acceptable. The two not signed off on were (1) the main metal scrap dump, because materials thereon were not consolidated into one pile, and (2) the dock area, because metal debris left after the Harbor Master Shack and Stevedore Warm-Up Shack were burned, was not moved when the last personnel left the Island. Plans are made to complete this cleanup during the spring of 1974. Signed completion reports for each area are on file at the AEC/NV office.

Overall, the cleanup met or exceeded the requirements of NV0-107.

Results of the revegetation program can be seen by comparing Figure 33 with Figure 34. They show the Cannikin Recording Trailer Park area before and after revegetation. Figure 35 shows new vegetation on the Cannikin cableway. Figure 36 shows the Fox Runway after drilling equipment and materials were removed.

I. Equipment Disposition

All salvable equipment, facilities, and structures not retained for future use were removed, sold, or transferred to other government agencies and shipped off-Island.

Drilling and other contractor-owned facilities, equipment, and materials were crated, boxed, or packaged and hauled off-Island by barge.

Laboratory and other user-owned facilities, equipment, facilities, and samples were prepared for shipment as above and shipped to the User's "Home Base" facility. All core samples on the Island desired by the U.S. Geological Survey were shipped to the USGS, Denver, Colorado.

The remaining equipment and materials, excess to the needs of the AEC, were declared excess or surplus and were offered to other government agencies or buyers. Listed below are the major items excessed, their approximate value, and recipients:

Figure 33 Cannikin Recording Trailer Park
prior to reseeding

Figure 34 Cannikin Recording Trailer Park
after reseeding

Figure 35 Cannikin cableway after reseeding

Figure 36 Fox Runway after drilling equipment removal

<u>Recipient</u>	<u>Material Received</u>	<u>Value</u>
Bureau of Land Management	Pillow Tanks w/Pumping Equipment	\$49,850.00
Native Health Services	Light Mobile, Heavy Construction and Shop Equipment	220,929.00
Federal Aviation Authority	Light Mobile, Office, Shop, Generating Equipment, GCA Radar, and 1000-watt beacon	53,155.65
U.S. Bureau of Sport Fisheries & Wildlife	Office/Latrine Trailers, Office and Household Furniture	178,650.96
U.S. Forest Service	Minor Miscellaneous Equipment	7,476.00
Bureau of Indian Affairs (Located at Kake and the other at Klawock)	Power Plant (2500 KW) complete w/Building and Controls, other Generating Equipment, Shop Tools as well as Light Mobile Equipment. Two Power Plants will be built from the components.	828,781.89
Rural Alaska Community Action Programs	Portable Buildings and Light Mobile Equipment	21,926.00
National Park Service	Construction and Light Mobile Equipment	275,608.75
Alaska Air National Guard	Office Trailers	3,522.00
National Marine Fisheries Services (Pribilofs)	Light Mobile Equipment	89,923.00
Corps of Engineers (Shemya)	200-Man Northwest Camp w/Mess Hall and Construction Equipment	2,755,388.05
USN Artic Research Lab (Point Barrow)	Light Mobile Equipment, Multi-purpose Building w/Theater seats and lighting	353,602.19
USN Petroleum and Oil Shale Reserves (Point Barrow)	Drill Components and Equipment	344,398.52
U.S. Coast Guard (Kodiak)	Heavy and Light Mobile Equipment, Generators, and Motor Pool Equipment.	956,209.84
Aerojet Nuclear	Equipment	166,978.00

<u>Recipient</u>	<u>Materials Received</u>	<u>Value</u>
U.S. Navy (Adak)	160-Man Huskey Camp w/Mess Hall, Shop Equipment, Light Mobile Equipment, Various Steel Buildings, and Office Equipment	1,839,530.34
USAF - Alaska Command (Elmendorf)	Light Mobile Equipment	74,588.65
AEC Nevada Test Site *Includes 116" Chamber @ \$166,511 and Manitowoc Crane @ \$348,753.00	Drilling Components and Equipment as well as miscellaneous Heavy Construction Equipment	1,622,913.00*
USAF - PACAF (South Korea & Hawaii) **Includes \$221,233.00 to PASO	360-Man Camp (Living Quarters w/associated Equipment), Mess Hall Equipment, Cranes	2,109,236.50**
Space & Missile Technical Center (Canton Island)	Generators, Minor Construction Equipment, Refrigerator	58,250.54
General Services Admin.	Misc. supplies and equipment. It is expected that GSA will find Federal Agency and State Agency recipients for all of these items. Any items not so disposed of will be sold to the public.	737,032.20

Although commercial and military aircraft were used to some extent, the majority of the Amchitka excess was shipped out on 24 barge loads between July 25, 1972, and September 5, 1973.

J. Radiation Safety

Concern over possible escape of radioactivity from the events conducted at Amchitka resulted, in part, from leaks from tests at the NTS. Therefore, pre- and postdetonation environmental sampling programs were run for each of the events conducted on the Island. Background environmental radioactivity on Amchitka was found by several independent investigators to be similar qualitatively and quantitatively to that found in arctic regions elsewhere in North America and Scandinavia.

Of the three events detonated at Amchitka, only Long Shot produced a minor seep of activity observable above background near its Surface Ground Zero (SGZ).

1. Long Shot Event

The Long Shot Event was detonated in October, 1965, and the first evidence of seepage appeared in late November and December as traces of radioiodine in a pond 100 m (330 ft) north-northwest of SGZ. Radiokrypton was also found in soil gas and could be stripped from water draining the pad area. The initial breakthrough was therefore within the first month. The amount of seepage was insufficient to be detectable above background anywhere but the immediate SGZ area.

The main activity front reached the surface between December and the next September, and was then observable as tritiated water in ponds as far away as 150 m (500 ft) from SGZ. Today, tritium above background is to be found only in mud pits on the north edge of the SGZ pad, 60 m (200 ft.) away, and in a ditch draining those pits. The highest level ever observed was 5130 tritium units (TU) (16.9 pCi/ml), which is 1/60 the Radiation Concentration Guide for drinking water continuously used by the general public (1000 pCi/ml). The fact that tritium levels remained at about 2000 TU in the mud pit, in spite of seven years of rainfall and outflow, indicates that this pond is still being fed fresh tritium from underground.

In late 1971, a number of shallow holes was drilled in the Long Shot SGZ area to determine the underground distribution of radioactivity. These indicated an increase in tritium content of water with depth down to a zone between 200 and 300 feet deep, then a decrease below that. They also indicated a decrease with distance away from the emplacement hole. Strontium and cesium were not observed. These observations indicate that gaseous activity, mostly tritium and krypton moved at an early time to the top of the chimney (which at Long Shot did not reach the surface to form a subsidence crater). As the chimney filled with water, these gases were pushed ahead upwards, passing through uncompacted material in the upper portion of the stemming, out into the spall zone, where they went into solution. Thence, they continue to diffuse to the surface ponds where they are still being detected.

This condition will be checked as part of the Long-Term Monitoring Program (see IV.A).

2. Milrow Event

Milrow was detonated in October, 1969, and as late as 1973, no radioactivity of any sort above background has been observed. Three factors have contributed to this: 1) the collapse chimney reached the surface, so that any tritium or krypton that may have come to the top of the rising water in the chimney was dissipated at undetectably low

levels; 2) the emplacement hole contained impermeable plugs of epoxy cement preventing the stemming from becoming an escape route, and 3) there was no postshot reentry drilling program.

The Milrow site will be included in the Long-Term Monitoring Program to ensure that no seepage condition develops undetected.

3. Cannikin Event

The Cannikin Event was detonated in November, 1971, and as in the case of Milrow, a subsidence crater developed at SGZ. Epoxy plugs were also inserted in the Cannikin stemming and no detectable release of radioactivity occurred between the time of detonation and the commencement of the reentry program.

For the reentry program, a bore hole was drilled back into the Cannikin chimney and core samples were taken. All core samples brought up were shipped to Livermore, California, for analysis. The basic concept in the planning and conduct of the reentry drillback was the containment of radioactive material, and identification and documentation of any such material contained. All tools were washed down and the wash water reinjected into the chimney. The drilling tools themselves were left in the reentry hole and the hole sealed at the termination of the program.

Careful monitoring of the Cannikin site has detected no residual surface activity as a result of the postshot reentry program.

4. Burial of Radioactive Materials

No radioactive burial, as such, of radioactive material was made on Amchitka Island. Radioactive nuclides resulting from test events are contained in the detonation-formed cavities.

Certain items that contained possible internal tritium contamination were cut into small pieces and placed in the bottom of the Cannikin reentry well cellar. These items were small valves with connecting pipe, a gas monitor chamber, and a sand line lubricator. They were covered with more than four feet of cement when that well was plugged on May 15, 1973. The estimated total amount of tritium contamination was less than 1 μ Ci.

5. Summary

The potential origin of contamination to equipment and scrap material was from postreentry Cannikin drilling.

Procedures employed during this operation controlled or contained all radioactivity. All contaminated items and radioactive samples which left the Island were under controlled conditions, packaged and labeled pursuant to applicable Department of Transportation regulations.

Tritium water continues to be found in ponds at Long Shot SGZ. The results from shallow holes drilled nearby plus the surface radiation history now permit us to attribute this to gaseous radionuclides pushed to the surface by water rising in the chimney.

No radioactivity has been detected by shot time air sampling and gamma detectors or in pre- and postshot biological sampling above the normal background. Milrow and Cannikin did not leak detectably.

Drillback into the Cannikin chimney did not result in residual surface radioactivity, although small amounts of radioactive gases were detected.

Background levels of radioactivity are like those found elsewhere in North America both quantitatively and qualitatively.

IV. LONG-TERM MONITORING PROGRAM

A. Mission

The AEC Nevada Operations Office is responsible for the long-term effects monitoring of the Amchitka Island test site. These long-term programs are designed to ensure public safety and compliance with federal and state laws and regulations. The comprehensive monitoring programs planned for Amchitka Island included investigations and subsequent documentation in the fields of bioenvironment, seismicity, and geology/hydrology. Duration of the individual programs is dependent on the specific effect under surveillance and the overall results of the analysis of Cannikin data.*

1. Bioenvironmental Radiological Monitoring Program

This program is the responsibility of the University of Washington, Laboratory of Radiation Ecology, under the cognizance of the AEC/NV. The objective of this program is to obtain and interpret data on the kinds and amounts of radionuclides in the Amchitka bioenvironment and to differentiate radioactivities which may be of test origin from those originating from worldwide fallout.

2. Bioenvironmental Effects Program

Battelle Memorial Institute, Columbus Laboratories, is the principal investigator for this program under administration by the AEC/NV. The objective of this program is to detect, document, and evaluate short- and long-term bioenvironmental effects caused by AEC's activities on Amchitka.

3. Seismology Monitoring Program

This program was conducted by the National Oceanic and Atmospheric Administration, Earth Resources Laboratory, Earth Sciences Laboratory; the Colorado School of Mines, and the NV staff under the direction of the Scientific Management Center for Seismology.

The object of this program was to record and document seismic and strain data relatable to the experiments conducted on Amchitka and to determine what, if any, effect they had on the local and regional seismic activity.

This program continued as long as operational support was available and terminated with the final demobilization of

*Pertinent details regarding all Long-Term Monitoring Programs may be found in Appendix 3, NVO-107.

the Island in September, 1973. At this point, it was determined that seismic effects of the experiments were minimal with regard to regional activity and an extension of this part of the program was not justified. Although active AEC participation ended at this point, the seismic activity of the region will continue to be monitored by existing seismic networks operated by national and/or international agencies.

4. Hydrologic Monitoring Program

Hydrologic monitoring on- and offshore of Amchitka Island is being carried out by the U.S. Geological Survey under the cognizance of the AEC/NV. For improved efficiency or economy, the USGS may request assistance from other appropriately equipped organizations in acquiring certain samples.

Onshore sampling will include both surface and groundwater sites. Surface water collecting sites will include selected lakes, ponds, springs, streams, shoreline reefs, precipitation stations, ditches, mud pits, and locations of opportunity as outlined in Appendix 3, NVO-107. Subsurface sampling will be taken from the wells discussed in the following section.

B. Drill Holes Remaining for Monitoring Program

Eight bore holes remain open on Amchitka for possible use in the hydrologic monitoring program. Two are military wells drilled during WWII and six were drilled by the AEC. These holes are:

White Alice
Officer's Club Well
UAE-7c
UAE-6h
UA1-HTH-3
UA1-HTH-1
OH-10
UDH-1

1. White Alice Well

This well is apparently of military origin. No records are available.

2. Officer's Club Well

This well is also of apparent military origin for which no records are available.

3. UAE-7c

This 8 5/8-inch cored hole is located at coordinates:

N - 5,713,749.90 meters
E - 636,079.78 meters

It was originally drilled to 7495 feet but was plugged back to 1040 feet and then sidetracked to 6273 feet. (The sidetracked portion was officially designated UAE-7H.)

4. UAE-6H

This 9 7/8-inch uncased hole was drilled to 7000 feet and is located at coordinates:

N - 5,708,921.28 meters
E - 640,506.75 meters

The hole is partially cased; 20-inch casing to 31 feet and 13 3/8-inch casing to 279 feet.

5. UA-1-HTH-1 (Cannikin)

This 9 5/8-inch uncased hole is located at coordinates:

N - 5,705,280.04 meters
E - 646,725.31 meters

This hole was originally drilled to 3458 feet and then backfilled to 1400 feet. It contains 20-inch casing to 23 feet, 10 1/4-inch casing to 264 feet and the remainder is uncased. The casing is damaged or parted at a depth of 95 feet.

6. UA-1-HTH-3

This 9 7/8-inch cased hole is located at coordinates:

N - 5,703,825.90 meters
E - 646,438.79 meters

The hole was drilled to a depth of 168 feet. It contains 13 3/8-inch casing to 22 1/2 feet and 7-inch casing to 158 feet.

7. OH-10

Observation Hole 10 is a 12 1/4 inch, uncased hole located approximately 50 feet south-southeast of the Long Shot emplacement hole. The hole was drilled to 124 feet, contains 9 1/2 feet of 13 3/8-inch surface casing and two strings of perforated 4 1/2-inch casing. One string bottoms at 55 feet and the other at 111 feet. The remainder of the hole is filled with cement.

8. UDH-1

This 12 1/4-inch uncased hole is located approximately 100 feet north-northeast of the Long Shot emplacement hole. The hole was drilled to 331 feet, contains 7 feet of 20-inch casing and three strings of perforated 4 1/2-inch casing. One string bottoms at 106 feet, one at 206 feet, and one at 307 feet. The remainder of the hole is filled with cement.

When these holes are no longer required for the monitoring program, they will be abandoned in accordance with established procedures.

C. Facilities Remaining on Amchitka

The following equipment, facilities, and structures remain on the Island for use by the Long-Term Effects Monitoring Program scientists and Department of Interior personnel.

1. Infantry Road

This is a 20-foot wide crushed aggregate two-lane road with 6 inches of surface course over compacted subgrade with corrugated steel culverts, steel guardrails, and delineators. This road runs from the airstrip and Base Camp to the northwest end of the Island and consists of the original military road ungraded from Base Camp to Site F and extended by new AEC construction from Site F to the CP and Northwest Camp.

2. Main Dock and Berthing Facility

The Main Dock Area is 150 feet long with 12,000 square feet of wharf area constructed of steel piling and wood decking.

The berthing area is 230 feet long with three concrete dolphins on steel pilings with connecting steel catwalks. It should be noted that there are no cranes or heavy trucks on the Island that are necessary to off-load barges.

3. Small Boat Dock

This dock is an 84-foot by 13.5-foot wide one-finger type pier and is constructed of steel with 4-inch wood decking.

4. Harbor Aids

These consist of range markers and buoys marking the channel entrance into Constantine Harbor.

5. POL

There are two separate facilities, one at the head of Constantine Harbor, and the other above the dock. The first has a 756,000-gallon diesel tank and a 105,000-gallon motor gasoline tank, and is equipped with a fill stand. They were supplied from vessels anchored offshore, through hoses supplied by the vessel. The second has a 1,470,000-gallon diesel tank and a 252,000-gallon motor gasoline tank, and also has a fill stand. These tanks were supplied from a vessel tied up at the dock through a pipeline running from the dock to the tanks.

6. North Hangar

This is a rehabilitated WWII aircraft hangar. The structure is wood with steel cord bracing, exterior walls of 3/8-inch plywood, concrete floor and foundation, and built-up roof.

7. South Hangar

This is a rehabilitated WWII aircraft hangar with the same construction as the North Hangar and differs in that the area on the mezzanine and on the first floor under the mezzanine has 1/2-inch gypsum wallboard interior. The mezzanine area, south side, has been used as offices and the main floor used as an equipment repair shop area.

8. Water System

This consists of a 10-foot by 10-foot by 8-foot wood frame building housing electrical pumps and chlorination system located at a spring and collection pond north and west of Baker Runway. Water mains are asbestos cement pipe, 8 inches for firelines and 6 inches for domestic supply.

9. Sewer System

The sewer system consists of asbestos cement piping, 4-inch laterals, 6-inch and 8-inch mains, manholes as required with gravity flow to a sewage lagoon. The sewage lagoon is 125 feet by 288 feet at the bottom with sloping dikes and is lined with a plastic sheet.

10. Electric Power Distribution System

This consists of a main power plant of three 250KW/480V generators complete with controls. Three surface-laid

feeders leave the powerhouse, one going under Baker Runway to the domestic water supply and North Hangar area. One serves the warehouse area, airstrip, and motor pool. The third serves the Base Camp.

11. Airport Facilities

- (a) Baker Runway. Baker Runway is a 150 feet wide by 9000 feet long asphalt-surfaced rehabilitated WWII runway complete with ground level threshold lighting across the end of the runway, and approach lighting (four bars of red lights 87 feet off centerline and 100 feet from end of runway). Baker Runway is also equipped with an ILS approach light system with 15 graduated height, pole-mounted consecutively sequenced flashers at each end.
- (b) Airfield Lighting Vault. This is a 36-foot by 40-foot wooden structure with concrete footings and asphalt floor. This building contains a 250KW backup generator and control gear and airfield lighting regulators and transformers for power supplied from main powerhouse to the terminal and runway lighting systems.
- (c) Passenger Terminal and Control Tower. This is an 84-foot x 40-foot wood construction building with separate rooms for baggage and freight receiving, waiting lobby, two offices, an equipment room and latrine. The control tower is a 14-foot by 16-foot second floor to the terminal building.

12. Dry Storage Building

This is a 21-foot 8-inch x 42-foot steel post and beam frame building with 12-foot eaves and insulated galvanized steel panel walls and roof.

13. Warehouse 6

This is a 96-foot by 210-foot wooden structure of prefabricated 3-inch thick panels nailed to 4-inch by 4-inch stiffeners and bolted to supporting glue-lam columns or beams set on concrete footings and floor slabs. This building is being used to store the majority of materials and equipment left on Amchitka.

14. Warehouse 3

This is a 40-foot by 98-foot wooden building of prefabricated 3-inch thick panels nailed to 4-inch by 4-inch stiffeners which bolt to glue-lam beams or columns and set on concrete footings on an existing WWII asphalt hardstand.

15. Warehouse 2

Identical in construction to Warehouse 3 except it has been modified to include an office area and latrine within the structure.

16. Powerhouse Building

This is a 20-foot x 40-foot steel frame structure with galvanized steel walls and roof and concrete footings and floor. The building contains the three 250KW generators and control panels for the electrical power supply system.

17. Covered Walkway

This is constructed of lumber framing with plywood sheathing for roofs and floors to form 7 feet 10 inches wide by 8 feet 6 inches high walkways with metal corrugated panels opposite plastic corrugated panels for the walls. The covered walkway connects the mess hall and dormitories "C," "D," and "E."

18. Kitchen and Mess Hall

This unit is constructed of prefabricated floor, wall, and roof panels framed from lumber and plywood and assembled at jobsite. The exterior walls and roof are aluminum sheeting over plywood and interior walls are finished in marlite and prefinished lauan. It has concrete footings set on an existing WWII asphalt hardstand.

19. Dormitories "C," "D," and "E"

These are Elder-Oilfield, Inc., units constructed of prefabricated floor, wall, and roof panels framed from lumber and plywood panels assembled at jobsite and set on concrete footings on existing WWII asphalt hardstand.

(a) Dormitory "C." A 36-foot by 147-foot, 6-inch building with 23 rooms and one latrine. It has been utilized as a medical facility.

(b) Dormitory "D." A 36-foot by 157-foot, 4-inch building with 6 rooms equipped for double occupancy and the rest utilized as effects evaluation scientific laboratories.

(c) Dormitory "E." A 36-foot by 157-foot, 4-inch building with 28 rooms equipped for double occupancy and with a latrine.

All remaining buildings and facilities have been left sealed or locked, and have signs at each entrance with the following text:

U.S. Atomic Energy Commission
Facility in Use
Use in Emergency Only

DISTRIBUTION:

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J. L. Liverman, AGM/BER & Safety, HQ
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Asst. Secretary, Fish, Wildlife & Parks, U.S. Dept. of Interior,
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Dir., Bureau of Sport Fisheries & Wildlife, U.S. Dept. of Interior,
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Service, Portland, OR
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Las Vegas, NV
Alaska Cooperative Wildlife Research Unit, College, AK
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J. S. Kirkwood, Battelle Memorial Institute, Columbus, OH
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J. E. Carothers, Lawrence Livermore Laboratory, Livermore, CA
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State University, Pullman, WA
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Knoxville, TN
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Seattle, WA
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T. M. Humphrey, Geology/Hydrology Br., EED, NV