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ERID NO: 55332 DATE RECEIVED: 2/06/97 PROCESSOR: YCA PG COUNT: 31

PRIVILEGED (Y/N): N RECORD CATEGORY: P RECORD PACKAGE NO.: N/A

FILE FOLDER: N/A

CORRECTION (Y/N): N CORRECTED NO.: N/A CORRECTED BY: N/A

AR (Y/N): Y AR DESCRIPTION (D/G): N/A

MISCELLANEOUS: N/A

30862

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55332

memorandum

TO: Albert Dye, ESH-19, MS K490

DATE: December 19, 1996

FROM: Blair Art, ESH-19

MAIL STOP/TELEPHONE: K490/5-0460

SYMBOL: ESH-19:96-0456

SUBJECT: **TA-49 FIDLER SURVEY**

Attached is a copy of the TA-49 FIDLER survey conducted at TA-49 in accordance with the OU 1144 RFI Work Plan.

BA:lc

Cy: HSWS Circ File

FEB 06 1997

1.0 Introduction

1.1 Background

The RFI Workplan for OU 1144 outlines specific needs for a radiological survey of the solid waste management units (SWMUs) at TA-49 to determine the location of hot spots. A Violinist III FIDLER detector was used to perform a radiological survey of the SWMUs at TA-49 to meet these needs. Hot spot determination was made with a 10 pCi/g radioactivity screening level suggested in the RFI Workplan for OU 1144.

The purpose of this radiological survey was to identify hot spot locations for hot spot sampling in addition to phase one sampling efforts. Analytical sampling costs drive the number of samples taken for analysis to be minimized while still accurately characterizing the site. One way to achieve this is by random sampling of grid points over an area. The radiological survey had the added benefit of allowing the sample locations on the grid to be biased towards areas of elevated readings. This benefit has obvious cost savings in analysis for specific applications.

1.2 Description of Study Area

Technical Area-49 occupies Frijoles Mesa at the southern boundary of the Laboratory. TA-49 occupies approximately 1280 acres; its boundaries are defined by TA-15 to the north (the edge of Water Canyon), Bandelier National Monument to the west and south (State Road 4), TA-39 to the east, and TAs -16 and -37 to the north and west. Engineering data are available from the period of peak experimental activity at TA-49 (1959–1961) to the present.

TA-49 has been used from the mid-1940s to the present as a buffer zone for firing sites in adjacent TAs -15 and -39. A period of intense experimental activity at TA-49 took place from late 1959 through mid-1961, during which hydronuclear and related experiments deposited significant amounts of plutonium, uranium, lead, and beryllium in underground shafts. These activities were responsible for almost all of the radioactive and hazardous materials existing at TA-49 at the present time. Much smaller amounts of highly localized contamination, predominantly radionuclides in the near surface at MDA AB and Area 11, also are known to be present at TA-49.

Presently, small portions of the site are used as a training area by the Laboratory's Hazardous Devices Team (HDT), for siting of the Laboratory's Alternate Emergency Operations Center (AEOC), for high-power microwave experimentation by Group AT-9, and for ground-resistance experiments by Group OS-4. One of the Laboratory's meteorological stations also is located at TA-49 (referred to as the Bandelier Meteorological Station). However, other than the use of small amounts of explosives by the HDT during training exercises, current TA-49 activities involve no use of significant quantities of hazardous or radioactive materials.

The preponderance of TA-49 contaminants consists of buried radionuclides, lead and beryllium from underground hydronuclear and related experiments conducted from 1959 to 1961. The experimental areas containing almost all of these residues are managed as MDA AB. Because the buried waste there includes about 40 kg of plutonium, 93 kg of uranium-235, 170 kg of uranium-238, 11 kg of beryllium, and possibly more than 90,000 kg of lead, the TA-49 workplan emphasizes MDA AB. MDA AB is composed of Areas 1, 2, 2A, 2B, 3, 4 and 11. Other areas considered in the radiological survey include Areas 5, 6, 12, 10 as well as the open burning landfill area and the open trenches northwest of Area 6.

Because the TA-49 experiments used limited quantities of SNM (special nuclear materials) (plutonium and uranium-235), sophisticated techniques were required to observe the nuclear reactions. The maximum fission energy release in any experiment was equivalent to only a few tenths of a pound of HE and was insignificant compared to the energy released by detonation of conventional explosives in the experimental assemblies. The experiments were carried out in underground shafts after preliminary experiments with conventional explosives determined the depths and backfilling methods required to ensure that contaminants were not vented to the surface.

The hydronuclear and related experiments were conducted in Areas 1, 2, 2A, 2B, 3, and 4 in backfilled shafts that varied from 31 to 142 ft in depth. Between January 1960 and August 1961, 41 hydronuclear and related calibration, equation of state, and criticality experiments involving SNM were conducted in the experimental areas. Of these experiments, 37 involved either plutonium or plutonium and uranium-235 SNM and 4 involved only uranium-235 as the fissile component. To test containment, other shaft experiments involved larger amounts of HE than were required in the hydronuclear experiments, and sample recovery procedures also were conducted during this period. Some experiments incorporated very small amounts of radioactive tracers, and many experiments with and without SNM used uranium-238

An unusual aspect of the hydronuclear experiments is that the use of SNM required extremely close accounting of the quantities of uranium, plutonium, and beryllium, which are now the primary contaminants at TA-49 (as well as a large but imprecisely known quantity of lead). The quantities and locations of these contaminants are therefore known with an unusually high degree of precision (Stoker and Purtymun 1987, 0204). Explosives used in the hydronuclear experiments consisted largely of TNT, RDX, HMX, and barium nitrate. It is highly likely that the explosives, except for the barium component, were essentially completely converted to innocuous products by the detonations. Based on the detailed historical information available, it is evident that other chemicals were used only in very limited quantities at TA-49, primarily for radiochemistry and photographic purposes, and probably only in Areas 5 and 11 to any significant extent.

Therefore, the substantial contaminant inventories at TA-49 are believed to be confined to the deep underground shafts in Areas 1, 2, 2A, 2B, 3, and 4. Much lower, but above-background, near-surface contamination is known to be present in and near Areas 2 and 11, but the potential for significant contamination in other portions of TA-49 is considered very low.

The physical properties of the tuff and sand backfill appear to have efficiently absorbed the explosive energy released in the hydronuclear experiments and to have confined most materials to within a maximum radius of 10 to 15 ft from the point of detonation at the bottoms of the shafts. The lack of available water in the tuff makes it very unlikely that significant transport of contaminants has occurred from the shafts in the three decades since the experiments were terminated.

1.3 Method of Study

The FIDLER (Field Instrument Detecting Low Energy Radiation) detector is a thin, large surface area NaI (TL) crystal coupled to a photomultiplier tube. The FIDLER detector has a high detection capability for photons in the 11 to 100 keV range, characteristic of TRU, fission products, and uranium. The Violinist III is a small, battery operated 256 channel multichannel analyzer (MCA) with a preprogrammed microprocessor. It has a liquid crystal display that can depict the MCA derived spectra graphically. The Violinist III provides high voltage to the FIDLER's photomultiplier tube and initial pulse amplification. The instrument set must be calibrated to the 11-21 keV and 60 keV photons from a ^{241} Americium source, and three calibration constants must be loaded into the Violinist III memory so that the microprocessor can convert count rates in the two photon regions to the area concentration of americium and plutonium. A separate calibration can be made for cesium and an external algorithm converts count rates in the cesium photon region to area concentration. This separate calibration requires that cesium be counted separately, plutonium and americium can be counted simultaneously. Calibration and performance records can be found in Appendix 1.

A surface soil action level for total uranium of 35 pCi/g (approximately 50 ppm for natural uranium) has been adopted as appropriate for unrestricted site use at numerous sites throughout the United States (NRC 1981, 0717). This soil level was developed from the Nuclear Regulatory Commission (NRC) Branch Technical Position on uranium mill tailings sites and similar action levels for uranium have been developed by DOE for its Formerly Utilized Sites Remedial Action Program (DOE 0723; DOE 1987 0728).

A surface soil action level of about 17 pCi/g for the sum of all TRU constituents was proposed (but not finalized) by EPA in 1977 for unrestricted (i.e., residential) site use (EPA 1977, 0661). Recently issued guidance from EPA implies a soil action level for plutonium-239 of about 39 pCi/g for 10^{-5} lifetime risk for residential use (EPA 1991, 0658). Both of these action levels probably are overly conservative for foreseeable exposure scenarios at TA-49. Indeed, higher values have been proposed or actually used in TRU site cleanups (Healy 1977, 0654; Healy et al. 1979, 0727; EPA 1990, 0694). For example, for cleanup of *Enewetok Island*, a TRU action level of 35 pCi/g was used for a residential use scenario and substantially higher values were used for agricultural and recreational use.

The proposed field investigation will evaluate the spatial heterogeneity and nature of hot spots. A value of 10 pCi/g over the surveyed area was specified by the RFI Workplan for the radioactivity screening level for surface soils for americium-241 and cesium-137. This value is below the most conservative action levels that are likely to be set for the TA-49 Operable Unit, and are well above background levels and detection limits of the radiological survey instrumentation. The value of 10 pCi/g is below the detection limit of the Violinist III FIDLER detector for plutonium-238 suggesting that any value for plutonium would be above the radioactivity screening level. The detection limit for plutonium-238 was calculated to be 22 pCi/g. The radioactivity screening level was used as a criterion for sampling hot spots and for guiding other aspects of the field investigation.

1.4 Approach

MDA AB includes Areas 1, 2, 2A, 2B, 3, 4, and 11. Areas 5, 6, 10, and 12 were also considered in this scope of work. Grids were surveyed covering the areas for the radiological survey. Counts were taken at the nodes of the grids with the Violinist III, the data was then compared to background data collected at TA-49 in an area of no previous Laboratory activity. The background data was collected in an area south of Area 6. If a radiological survey point exceeded three standard deviations of the mean background, it was considered for further investigation. This further investigation could involve adding additional survey locations to the grid and / or comparing the radiological survey data to previous studies. If a data point exceeded the radioactive screening level, the location was considered 'hot' and identified as a point for soil sampling and laboratory analysis.

1.5 Previous Studies

As part of DOE's management of MDAs containing buried radioactive waste, an intensive study of surface soils and vegetation at MDA AB and several other areas of TA-49 was conducted in 1987 (Soholt, 1990, 0698). This survey, referred to as the "A-411 survey", did show areas of surface radiological contamination which appeared to be highly localized and highly discontinuous. The A-411 survey did alert us to areas of potential concern and other areas of little or no concern.

In May of 1994, NIS-6 personnel used Long Range Alpha Detector (LRAD) technology to characterize the extent of alpha contamination on the soil surface in Area 1 and Area 11 (Memo "LRAD soil surface monitoring results at TA-49", NIS6-94:0586JAB). This survey did show one area of possible alpha contamination in Area 11. The results of this survey did indicate an area of potential concern.

2.0 Results

2.1 Background Determination

Two Violinist III FIDLER systems were used during this radiological survey at TA-49 and natural background needed to be determined for each instrument. An area was selected to the south of Area 6, the open burning landfill area, as representative of natural background at TA-49. Fifteen locations were land surveyed and radiological counts were taken at these locations. The instruments are designated V-129 and V-133, ten counts were taken with each instrument at each location. The variance between instruments was significant enough for them to be considered separately. The mean background and the standard deviation of the mean for each instrument was determined.

It is difficult to compare unconditionally to this background due to the counting statistics of the instruments and the potential for variation of the natural background through natural processes and possibly man-made processes (fall-out). Soil samples have been collected for many years from locations around the Laboratory, the Laboratory's perimeter, and the region (P.R. Fresquez, "Radionuclides and Radioactivity in Soils within and around LANL: 1974-1994", LA-UR-95-3671). From this it is evident that many factors play a role in determining background, and those factors can fluctuate from area to area and from year to year. Carefully examining the radiological survey data for a specific area and any historical or analytical information available for that area helps guide decision making for values at or near three standard deviations of the average background. It is important to remember that the potential for added radiation not attributable to background exits any time you exceed three standard deviations of the average background.

2.2 Radioactivity Screening Level Calculation

Results from radiological surveys using the Violinist III FIDLER system are in units of $\mu Ci/m^2$. Conversion to units of pCi/g requires some knowledge or assumptions about the vertical and lateral distribution of the radionuclide in the soil and the attenuation properties of the soil. One approach to this conversion is to consider the total volume of soil which contributes to the emissions measured by the detector at specific energies. This approach requires the linear attenuation coefficient for soil at different energies.

The linear attenuation coefficient, μ at a specific energy can be calculated from the half value layer of the material at that energy. A half value layer, h is the thickness that reduces the intensity by one half. For monoenergetic photons from narrow beam conditions h can be estimated by:

$$h = \ln 2 / \mu$$

Soil measurement of the half value layers and calculation of the linear attenuation coefficient at specific energies is not feasible. Therefore, estimations must be made for the linear attenuation coefficients for soil and soil density. Linear attenuation coefficients are calculated for many materials in The Radiological Health Handbook. To estimate soil, the attenuation coefficients for bone are used. Bone and soil have approximate densities, and so soil density will be assumed to be uniform and equal to bone density.

The next step is to calculate the depth of the soil that impacts the detector. Three calculations were made, the depth that would attenuate at least fifty, ninety and ninety nine percent of the gammas and x-rays at each specific energy. The thickness is given by the equations:

$$x = \ln 0.50 / (\mu / \rho) \text{ @ } 50\%$$
$$x = \ln 0.10 / (\mu / \rho) \text{ @ } 90\%$$
$$x = \ln 0.01 / (\mu / \rho) \text{ @ } 99\%$$

where:

(μ / ρ) = linear attenuation coefficient / density

(μ / ρ) = mass attenuation coefficient

These calculations were made to determine an active depth that was both reasonable and conservative. All of the activity will be assumed to reside in the calculated depth of soil. Americium-241 was used as an example, at fifty percent attenuation, the soil depth was calculated to be 2.7 centimeters. At ninety nine percent attenuation, the soil depth was calculated to be 16.8 centimeters. The ninety percent attenuation calculation is about middle of the road. That calculation results in a soil depth of 8.4 cm. What these calculations illustrate is that 50 % of the activity resides in the top 2.7 cm of soil, 90 % of the activity resides in the top 8.4 cm of soil and 99 % of the activity resides in the top 16.8 cm of soil. Assuming that all of the activity resides in 2.7 cm of soil is not reasonable. Assuming that all of the activity resides in 16.8 cm would not be conservative. The depth of the soil at 90 % attenuation is a reasonable and conservative depth to assume the total volume of activity. Once this thickness is known for each specific energy and the area being a square meter, soil volume can be calculated. Using the estimated density, soil weight can be calculated. Knowing the soil weight that is considered by the detector in a square meter and the screening level of 10 pCi/g the screening level can be calculated in $\mu Ci/m^2$. This value, calculated at each isotopes specific energy, will be the screening level to determine hot spots and subsequent hot spot sampling.

*Table One: Radioactivity Screening Level**

Isotope	Three Standard Deviations of Background ($\mu Ci/m^2$)		Screening Level ($\mu Ci/m^2$)
	V-129	V-133	
Plutonium	0.00	0.00	0.136**
Cesium	1.18	1.30	4.5
Americium	0.77	0.71	1.344

*** 10 pCi/g Radioactive Screening Level**

**** Plutonium LLD 0.3 $\mu Ci/m^2$, 22 pCi/g**

2.3 AREA 5 CONTROL AREA

- SWMU 49-006 (sump)
- SWMU 49-008(a) (surface contamination).

2.3.1 History

Area 5 served as the main control area for the hydronuclear and related experiments conducted at TA-49 from 1959 to 1961. Many experimental support activities also were located in this area.

Several permanent structures and at least 18 easily relocated trailers were used for a variety of functions in Area 5 from late 1959 and mid 1961. Almost all of the surface structures were removed or destroyed between 1961 and 1984.

Extensive interviews have been conducted with personnel directly involved in Area 5 activities during the 1959 to 1961 period of maximum usage. These personnel included the TA-49 site engineering supervisor, experimental test director, radiochemists, and photography staff. Examination of the Zia Engineering Diary, which recorded the engineering work at TA-49 from 1959 to 1961, as well as other archival records has provided additional detail on potential contaminants associated with Area 5 activities. Current descriptions of selected structures, including those known or suspected to have contained hazardous or radioactive materials, are based largely on this information.

During 1960 or 1961, an 8-ft-deep by 6-ft diameter hole in the floor of structure TA-49-8 was used in calibration activities. Encapsulated cobalt-60 and polonium-beryllium radioactive sources probably were used for calibration work in this structure and in adjacent structure TA-49-17. These radioactive sources later were removed from the site. There is no historical or anecdotal reason to suspect that contaminant release resulted from these sources.

Trailer J-11-4 was used as a radiochemistry laboratory from 1959 to 1961. According to interviews with numerous personnel involved with these operations and examination of laboratory notebooks, the radiochemical operations involved sample dissolution with a few liters or less of perchloric, hydrofluoric, and hydrochloric acids. In addition, low levels of radioactivity from solid samples as well as a few liters or less of organic solvents and extractants were involved. Waste chemicals from these operations were collected in bottles for off-site disposal. The radiochemistry laboratory was equipped with a sink and it is conceivable that small quantities of contaminants were discharged through drain lines to soils outside this facility. However, significant discharge of radioactive wastes in Area 5 is very unlikely to have occurred because this would have complicated general Area 5 operations, especially the very low level radiochemical counting operations conducted in support of the hydronuclear experiments.

Lead shields were used in trailers J-11-4 and J-16-8 and perhaps in other Area 5 facilities. Lead bricks also were stored on the north edge of Area 5. A few lead bricks scattered around the surface of Area 5 were noted during a site visit during the summer of 1991 (Eller 1992, 03-0003). Lead bricks and lead sheet were used at TA-49 for shielding during the counting of low-level radioactive samples. Isolated low level soil contamination from weathering of metallic lead is therefore a possibility.

The Zia Engineering diary indicates that in November 1959, two 24-in.-diameter by 40-ft-deep sump holes were drilled in Area 5. Engineering drawings indicate that drainlines were to be run from the J-10-1 phototrailer to a sump located under the scope rack. However, the exact number of sumps drilled and their ultimate use is unknown. The sumps possibly were used to dispose of small volumes of waste chemicals, notably, spent photographic solutions.

Engineering drawings indicated that the underground counting room (structure TA-49-67) was equipped with a concrete sump for drainage collection. It is unknown whether the sump ever collected contaminated liquids. However, the small size of the sump indicates that the volume of collected liquids (if any) was very small.

Activities in Area 5 after 1961 were very limited and probably did not involve significant quantities of hazardous or radioactive materials. Almost all Area 5 structures were removed or destroyed between 1961 and 1984, primarily during routine equipment removal in 1964 and major cleanup campaigns in 1971 and 1984. Other combustible structures were destroyed by the La Mesa forest fire in June 1977. At present, the only surface structures remaining in Area 5 are the DT-5A observation well enclosure (structure TA-49-101) and the concrete pads of the former transformer station (TA-49-14) and the photographic tower. Small amounts of metallic debris (including some lead bricks) remain on the surface in Area 5.

At least some of the debris collected during the 1984 cleanup of Area 5 is believed to have been disposed of in a small existing pit or sump in Area 5 (dimensions less than 10 ft by 10 ft by 10 ft) (Purtymun 1991, 03-0028). Available information, primarily from employee interviews, indicates that this small landfill designated as SWMU 49-005(b), was used solely to dispose of uncontaminated debris from the 1984 cleanup operations (Purtymun 1991, 03-0028; Weston 1991, 03-0015).

2.3.2 Radiological Survey

A forty foot grid was surveyed over Area 5 and a ten foot grid was surveyed over the small landfill as illustrated in Figure 1. Violinist III measurements were taken at each node of the grid. No hot spots were identified in Area 5 and none of the locations exceeded three standard deviations of the average background. These results are consistent with the site history and no further radiological survey was required at Area 5.

Figure 1

AREA FIVE

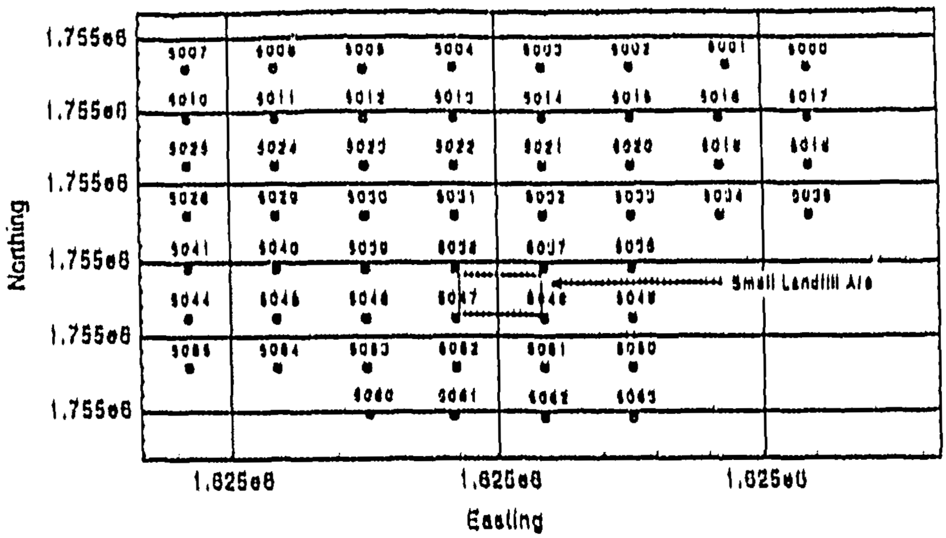
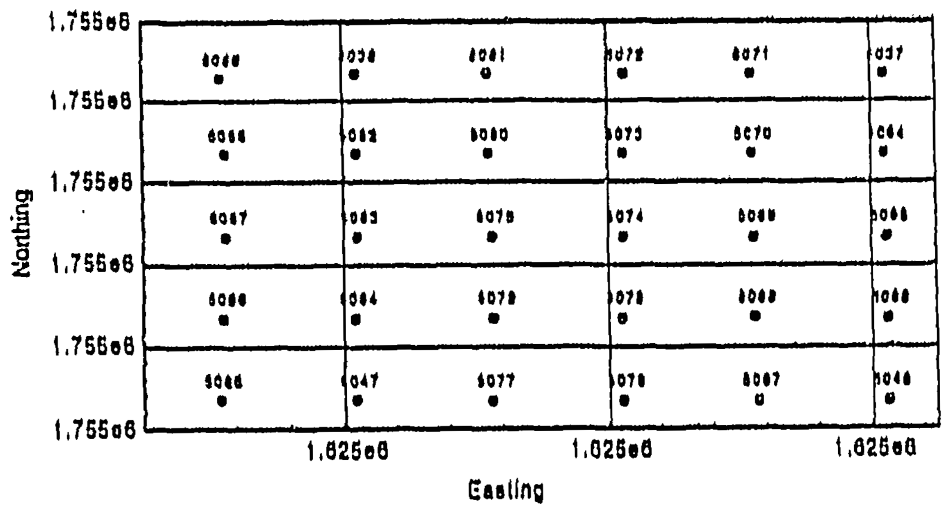


Figure 2

AREA FIVE
Small Landfill Area



2.4 *Landfills, Trenches, and Area 6 Soil Contamination*

- SWMU 49-004 (open burning/landfill area in Area 6)
- SWMU 49-008(b) (potential soil contamination in Area 6)

2.4.1 History

2.4.1.1 Landfills: Open Burning Landfill Area

Extensive site-employee interviews and archival searches indicate that none of the landfills were used for operations other than the burial of uncontaminated debris. Wastes buried in the landfills are reported to have been screened with field instruments to ensure the absence of radionuclides (Purtymun and Stoker

1987, 0204; DOE 1987, 0264; Eller 1992, 03-0035; Purtymun 03-0028). Although checks were made only for radioactive contamination, based on historical information, the disposal of significant amounts of hazardous materials also is unlikely. However, documentation is limited on this point and subsurface sampling at TA-49 landfills and trenches apparently has not been performed.

The landfill in Area 6 (SWMU 49-004) was used from late 1959 to mid-1961 for open pit burning of combustible construction wastes and for burial of uncontaminated residues generated during hydronuclear and related activities in other areas of TA-49 (Purtymun and Stoker 1987, 0204; DOE 1987, 0264). During the 1971 cleanup of TA-49, the Area 6 landfill was reopened for disposal of uncontaminated materials, principally from Area 11.

The Area 6 landfill was reopened during the general TA-49 surface cleanup in 1984. A trench reported to be approximately 30 ft wide by 100 ft long and 15 ft deep was created for burial of uncontaminated debris collected during the cleanup (LANL 1990, 0145).

During the A411 survey of TA-49 in 1987, part of the open burning/landfill area surface was sampled. However, results for this area are not discussed in the A-411 report (Soholt 1990, 0698). In the survey, about 60 soil and 10 vegetation samples were collected on an approximately 25- by 25-ft mesh grid covering an 80- by 275-ft area of the open burning/landfill area.

A few of the A411 samples from the open burning/landfill area were found to be above regional background and indicated highly localized, discontinuous distribution of contaminants. The individual analyte maximum concentrations and total radionuclide concentrations at each sampling point are well below the TRU action levels for unrestricted site use. Radionuclide concentrations in vegetation at the open burning/landfill area also were found to be well below levels of concern.

There is no apparent geographical correlation between elevated soil concentrations of different radionuclides. However, locations of slightly elevated concentrations appear to be concentrated toward the central portion of the sampled area.

In June 1991, a geophysical survey was carried out at the open burning/landfill area to define the limits of the landfill (Geophex 1991, 03-0031). Four metal posts present at the time of the survey (and still in place in May 1992) outline a rectangular area of approximately 35 by 200 ft. These stakes may have defined the landfill area used in the 1984 burial operations. Strong magnetic and electromagnetic anomalies were observed for this area, no doubt as a result of the considerable quantities of cable and other metallic debris known to be buried in the landfill.

The observed geophysical anomalies allow the landfill boundaries to be defined with a high degree of confidence. It is apparent that the trench extends northeast about 130 ft beyond the staked area and nearly to the edge of the Water Canyon, indicating that the total landfill lateral dimensions are approximately 35 by 330 ft. The extension appears to be in line with, and a continuation of, the area defined by the metal stakes. The northernmost detectable geophysical anomaly was about 50 ft from the canyon edge. The geophysical survey, and survey stakes still remaining from the A411 study, also indicate that the A411 sampling stations were not over the main body of the landfill.

Attempts to use ground-penetrating radar to precisely define the depth to the detected metal were unsuccessful, but a minimum of 4 ft of overfill was estimated.

2.4.1.2 Open Trenches

Aerial photographs of TA-49 reveal four previously undocumented open trenches that are located west of the Area 6 open burning/landfill area. Field inspection in 1991 showed that these trenches are about 10 ft wide by 4 to 6 ft deep and 50 to 100 ft long and probably were dug with mechanized equipment. One trench appears to have been backfilled partially and at least one other trench passes directly through a prehistoric ruin. Surface material indicative of burial of artificial debris was not evident at any of the trenches. The amount of excavated soil appears to be commensurate with the open space in the trenches.

The open trenches are especially evident in 1977 photographs, which were taken after the La Mesa fire removed substantial vegetation, but they also are apparent in the 1965 photographs. Because the trenches appear in 1954 aerial photographs, they obviously predate the hydronuclear and related experiments from 1959 to 1961. Because high-altitude photographs from 1935 do not show the trenches, it is evident that the trenches were created between 1935 and 1954. Aerial photographs of TA-49 for the period 1935 to 1954 are not available, and it has not been possible to determine more precisely from other information when the open trenches were created.

Extensive archival searches and interviews with key site employees has revealed no specific knowledge of the open trenches before 1959. Some anecdotal information suggests that the trenches may have been present as early as 1943, and other anecdotal information suggests that the trenches were constructed in the late 1940s. However, this information is not completely consistent with other information discussed in this subsection. It is noteworthy that until 1959, this site was relatively remote from known Laboratory operations and disposal of debris at this site would have involved an unusually high degree of effort.

The ruin intersected by one of the trenches apparently has been described briefly by a Laboratory archeological survey and is designated as archeological Site Number LA 15866 (Steen 1982, 0659). This document states that the ruin was excavated in 1977 and shows a photograph of a trench cut through the ruin.

The 1982 archeological report contains the statement, "When TA-49 was abandoned, it was planned to bury scrap metal and other "garbage" in the three large trenches. Bulldozers bladed out the trenches and one of them was partly filled with trash when it was determined not to bury the scrap." Thus, this report implies that the trenches were created around 1961 when the hydronuclear and related experiments ended. The source of this information cannot be verified, but is questionable because aerial photographs show the trenches existed at least 13 years before 1977. It is likely that the open trenches referred to in this archeological report have been confused with the known open burning/landfill area immediately to the east, which was created just before 1961, as described in the archeological report.

The possibility that the trench was dug by individuals seeking cultural artifacts was considered, but this seems unlikely because other trenches are not associated with obvious cultural resources at TA-49 and the trench depths are unusually deep for such purposes. The trenches conceivably are related to mine-claim speculation activities before the Atomic Energy Commission (AEC) acquired the property in the 1940s. However, investigation of available regional mining records shows no reference to the TA-49 area before acquisition by AEC (Eller 1992, 03-0035).

In summary, the purpose of these open trenches is unknown. However, the possibility that they were created by the Laboratory for waste disposal or other purposes is highly unlikely but cannot be excluded categorically.

2.4.1.3 *Potential Soil Contamination in Area 6: Microwave Test Facility*

A portion of Area 6 just north of the access road to the main experimental area was developed as a general support area very early in the TA-49 hydronuclear program (Eller 1992, 03-0035). Area 6 included storage and office buildings and structures used by carpenters and electricians. All of these structures had been removed by 1977. Anecdotal information suggests a slight possibility that a small lead-casting shop also was operated briefly at Area 6. A "boneyard" approximately 400 ft^2 in area was used to store lumber, fencing, and steel. Cables, pipes, and sand for backfilling shafts also were stored at Area 6.

Area 6 operations would have been greatly complicated by radioactive contamination, and therefore, the presence of radioactive materials was very closely controlled (Eller 1992, 03-0035). For example, after the initial TA-49 experiments, a directive was issued that "salvage material from shot holes will be marked as to the hole from which it came, and will be sorted in a separate area within Area 6 for future use or disposal." It is therefore conceivable that materials with trace contamination were stored in the area temporarily, but effective contamination controls no doubt were in place. It is known that low levels of contamination were tracked into some Area 6 structures during the unintended release of radioactivity in

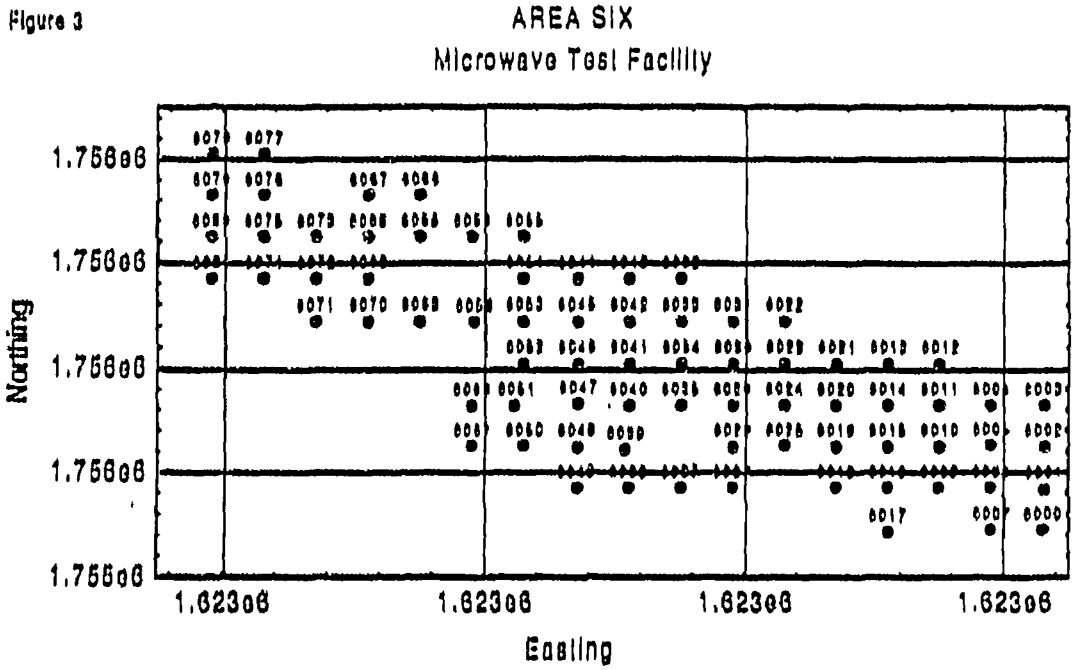
Area 2 in 1960. However, it is highly likely that this contamination was low level, very localized, and quickly cleaned up.

Other than those mentioned above, no other operations involving materials of environmental concern are known or suspected to have been carried out in Area 6.

2.4.2 Radiological Survey

A forty foot grid was surveyed over the Microwave Test Facility in Area 6. Violinist III measurements were taken at each node of the grid as illustrated in Figure 3. No hot spots were identified and none of the locations exceeded three standard deviations of the average background. These results are consistent with the site history and no further radiological survey was required at the Microwave Test Facility in Area 6.

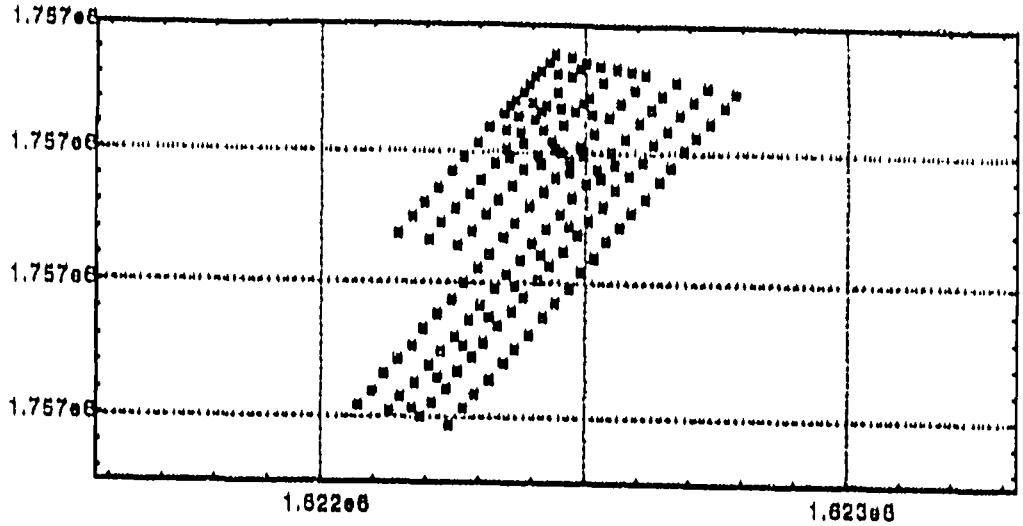
Figure 3



A twenty five foot grid was surveyed over the Open Burning Landfill in Area 6 as illustrated in Figure 4. Violinist III measurements were taken at each node of the grid. No hot spots were identified, however, locations were identified at or above three standard deviations of the average background for americium and cesium. Eighteen additional survey points were added around those locations, a significant number of them were at or above three standard deviations of the average background for americium and cesium. This data suggests possible surface contamination, however, based on the levels seen, it is more likely to be due to natural variation of background. It is interesting to note that the areas exceeding three standard deviations of background for americium and cesium were west of the landfill and heavily vegetated. . The A411 survey also showed the area west of the landfill to be above the regional background at TA-49. These results are consistent with the site history and the results of the A411 survey

Figure 4

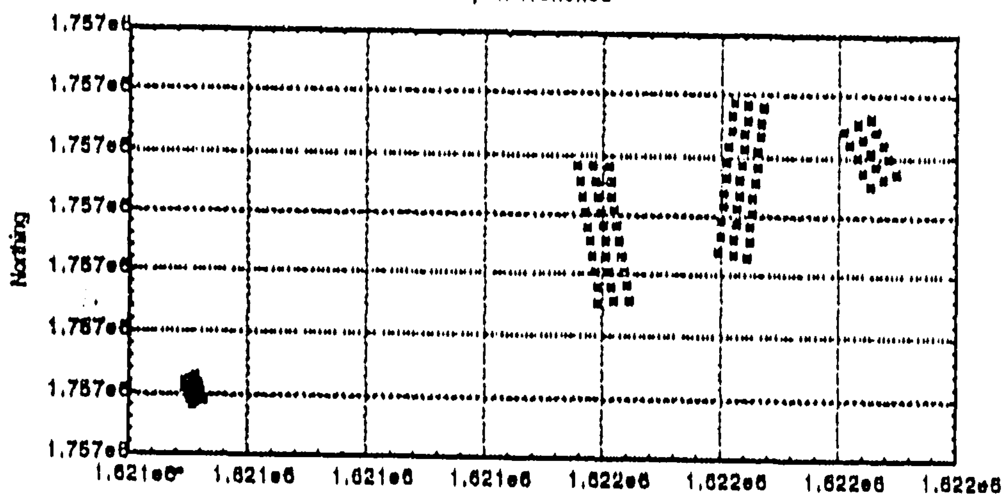
Area Six
Open Burning Landfill Area



A ten foot grid was surveyed over the four trenches to the west of the Open Burning Landfill in Area 6 as seen in Figure 5. Violinist III measurements were taken at each node of the grid. Readings taken at the trenches were consistently above or near three standard deviations of average background. None of the locations exceeded the radioactivity screening level. The variation in the data from the trenches appears to be due to the counting statistics of the instruments. However, the consistent nature of the results could indicate a region of increased background activity possibly due to the excavation of soil. Based on the history of the site and the nature of the results, it was determined that the radiation was not attributable to surface contamination and no further radiological survey was required at the trenches.

Figure 5

Area Six
Open Trenches



2.5 AREA 10 UNDERGROUND EXPERIMENTAL CHAMBER

- SWMU# 49-002 (small landfill)

2.5.1 History

At Area 10, two vertical shafts were drilled, each about 64 ft deep and 7 ft in diameter. These were connected at the bottom by a gallery 4 ft wide, 12 ft long, and 7 ft high. One shaft (the elevator shaft that was used to transport personnel and equipment) presently is covered by a heavy but removable concrete cover and the shaft probably is open at least part way to the bottom. The second shaft (the calibration shaft) was used to position a portable pulse neutron source over calibration samples placed at the bottom of the shaft and probably has been backfilled with local soil and crushed tuff (Eller 1992, 0035). A hydraulic platform was located at the bottom of the calibration chamber and a hydraulic line led to an oil reservoir at the surface. The underground hydraulic system is probably still in place but the surface components have been removed.

A 14-ft-diameter by 10-ft-high calibration room was constructed at the bottom of the calibration shaft. This room was lined with 8 in. of reinforced concrete faced with 1-in. steel plate. No surface structures remain at the calibration chamber area other than several large concrete radiation shields (used during operation of the pulse neutron source) and the concrete and steel pads around the tops of the shafts.

The calibration chamber unit was used primarily during the hydronuclear and related experiments in 1960 and 1961. Subsequent use was minor, was unconnected with the hydronuclear experiments, and apparently did not involve radioactive or hazardous materials, with the possible exception of small radioactive sources for radiochemical counting. These sources are believed to have been removed at the conclusion of the experiments.

During the 1984 cleanup a small pit, now designated as landfill SWMU 49-005(a), was created north of the road that runs eastward from Area 10. Available information, primarily from employee interviews, indicates that this small landfill was used solely to dispose of uncontaminated debris from the 1984 cleanup operations (Purtymun 1991, 03-0028; Weston 1991, 03-0015).

2.5.2 Radiological Survey

Figure 6

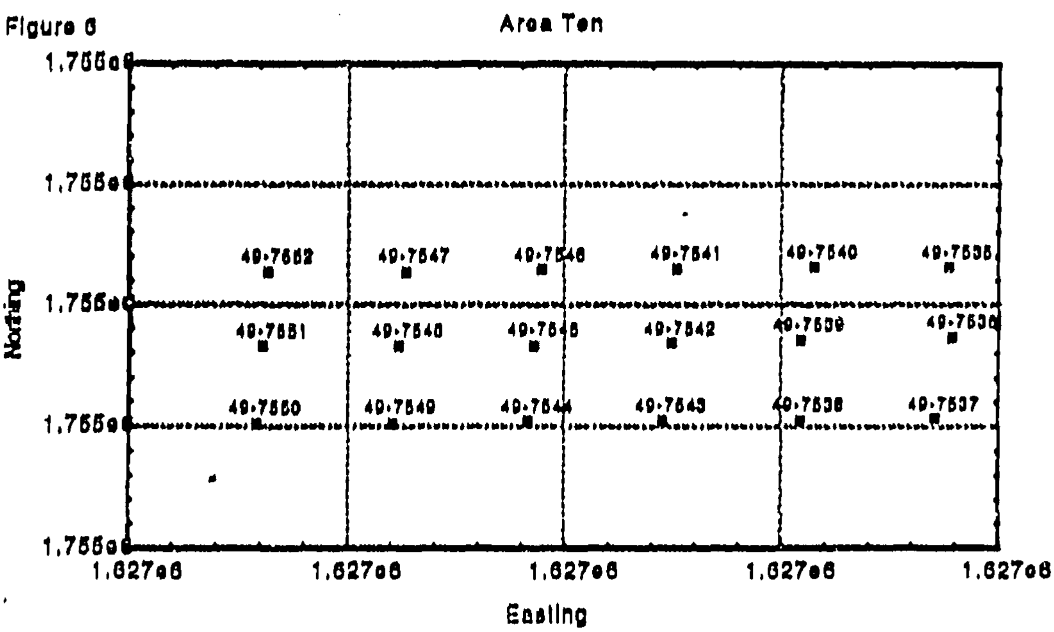
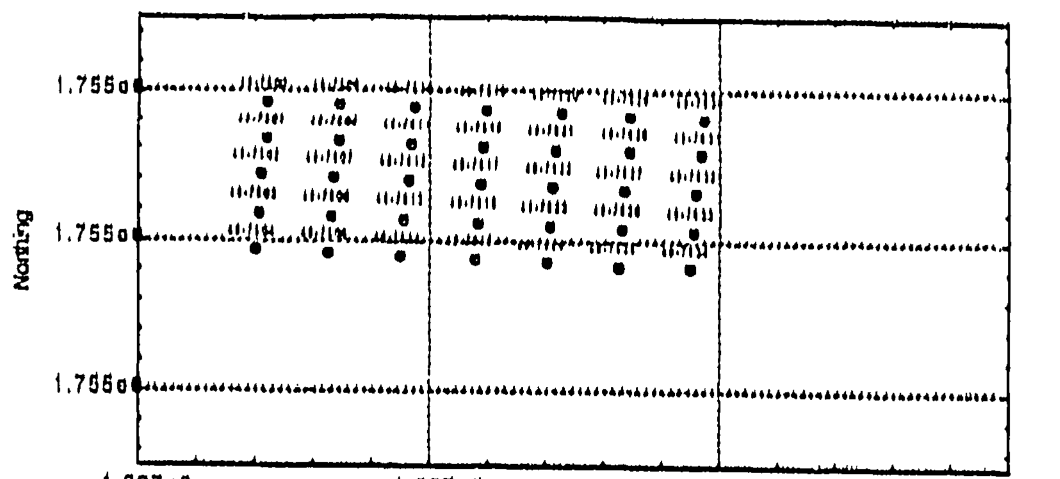


Figure 7



The radiological survey in Area 10 was performed on a twenty five foot grid as illustrated in Figure 6. Two locations were at or above three standard deviation of average the background. Further investigation of Area 10 revealed no history of surface contamination and the deviation from background was consistent with other areas at TA-49. None of the locations exceeded the radioactivity screening level and no further investigation was conducted for this survey. The small landfill area was performed on a ten foot grid as illustrated in Figure 7. The results of this survey did not indicate any surface contamination. None of the survey locations exceeded three standard deviations of the average background or the radioactivity screening level. This is consistent with the historical site information and no further investigation of the small landfill area was conducted for this survey.

2.6 *Area 11 - Radiochemistry and Small-scale Shot Area*

- SWMU# 49-003 (radiochemistry leachfield)
- SWMU# 49-008(c) (soil contamination)

2.6.1 History

Significant Laboratory use of Area 11 was limited to activities related to the hydronuclear program at TA-49 from 1959 to 1961 (Purtyman and Stoker 1987, 0204). Area 11 activities during that period consisted exclusively of limited radiochemistry operations and small-scale containment experiments involving HE detonations in shallow shafts.

Area 11 was used first for small-scale containment experiments involving approximately thirteen 10-in. diameter by 12- ft-deep vertical holes that were cased in steel. Explosive charges were set off at the bottoms of the holes, usually after backfilling the holes with sand to contain the explosive force. In some of the shots, irradiated uranium-238 tracer was used. According to Laboratory records, a maximum of 10.5 g of uranium was used for this purpose and the irradiated samples are estimated to have contained initially only microcurie levels of neptunium-239. Neptunium-239 has a half-life of only 2.3 days and thus has decayed completely to negligible levels of plutonium-239 (Minor 1991, 03-0034). Some of the shot holes also may have contained small quantities of lead. Some holes probably were backfilled partially with concrete at the conclusion of the experiments. Two capped holes with 10-in. casing extending above ground are visible at the present time in this area.

Radiochemistry operations were performed in Area 11 in structure TA-49-15. This building contained hoods and sinks for performing radiochemical operations. Eventually, a drain line was installed to connect the radiochemistry building to a leachfield located a few feet to the east. One site employee recalled that the drainline extended from the southwest portion of the building. Small quantities of liquids may have been discharged to the soil beneath the building before the drainline was connected to the leachfield. The subsurface leachfield and associated pipes remain in place and now constitute SWMU 49-003. The approximate location of the leachfield now is marked by signs labeled "TA-49-15 Drain Field". Other structures in this area were support facilities that did not involve hazardous or radioactive materials.

The structures were located on a level, elevated construction pad created by backfilling the natural area with clean, crushed tuff (Eller 1992, 03-0035). Inspection of laboratory notebooks and interviews of radiochemists and health physicists who worked at Area 11 indicate that radiochemical wastes were limited in quantity and were mostly collected in containers for disposal at a Laboratory waste disposal facility. Total radioactivity involved in Area 11 radiochemistry operations is estimated to have comprised less than 10 mCi of TRU and much lower levels of fission products (Barr 1991, 03-0001).

The radiochemistry operations consisted of initial acid dissolution (by nitric, hydrochloric, hydrofluoric, sulfuric, and perchloric acids) of solid residues recovered from experiments conducted in Areas 2, 2A, 2B, and 4. Quantities of acids were limited to a few tens of liters or less per dissolution. Solvent extraction with only several liters or less of methylisobutyl ketone, ammonium hydroxide, and sodium hydroxide. Small quantities of 8-hydroxyquinoline also were used for chemical separation. Area 11 radiochemical wastes also consisted of low levels of plutonium, americium, uranium, cesium-137, and possibly minor amounts of other alpha, beta, and gamma emitters. Beryllium and lead were present in very limited amounts.

Most Area 11 waste solutions were drained into containers that were taken to a Laboratory waste disposal site. However, it is likely that small quantities of very low level radionuclide solutions were discharged to the soil outside the radiochemistry laboratory. Waste radiochemical solutions sometimes were placed in bottles for interim storage in a steel box. The box was removed from TA-49 during or before cleanup of Area 11 in 1971.

The precise location and details of the underground distribution system of the leachfield are unknown but can be estimated. The estimate is based partially on interviews of the construction engineer who installed the field. The engineer stated that the underground distribution system most likely was constructed of terra cotta pipe laid in a gravel matrix (Eller 1992, 03-0035). Additional information was obtained from Laboratory documents, including a 1971 report which describes the field as a "settling area 20-25 ft east of 49-15" (Eller 1992, 03-0002). Former site radiochemists have estimated that less than 50 gal of organics and less than several hundred gal of water could have been discharged into the leachfield during the entire period of operation (Penneman 1991, 03-0012).

In 1970 and 1971, Area 11 radiochemistry structures were decontaminated, demolished, and removed (Eller 1992, 03-0002). Contaminated equipment, debris, and chemicals were packaged and sent to TA-54 for disposal. All equipment and building debris found to be free of contamination by field instruments used at the time were taken to the open burning/landfill area in Area 6. Approximately 2160 ft^3 of material went to this disposal area, which was then covered with about 3 ft of topsoil.

During removal of the Area 11 radiochemistry building in 1971, typical maximum alpha contamination levels ranged from 10,000 cpm (sinks) to more than 100,000 cpm (hood ducts and blowers), but roofs and other exterior surfaces were found to be essentially free of detectable contamination (Eller 1992, 03-0002).

During the operations from 1959 to 1961, and during the 1971 cleanup, extensive and frequent field monitoring for gross alpha, beta, and gamma radioactivity was conducted. Available information indicates that levels of contamination of concern at that time were not detected except for the Area 11 structures as described above. Additional information on the Area 11 cleanup in 1971, including structure-contamination levels and demolition photographs are available in a detailed report (Eller 1992, 03-0002).

During a reconnaissance investigation in 1987, alpha contamination was detected in pipes leading to the leachfield (DOE 1987, 0264). Soil samples were taken from the leachfield during a DOE environmental survey in 1988, in which the leachfield was identified as a prototypical Laboratory environmental problem (DOE 1989, 0450). The soils were found to contain above background levels of uranium, plutonium, americium, and alpha radioactivity but little detail was is contained in the survey report.

Contamination of Area 11 soils potentially has occurred from airborne transport of low levels of radionuclides from Areas 1 through 4. However, because of the isolated and limited nature of such potential releases, contamination levels at Area 11 resulting from this mechanism are expected to be undetectable.

Currently Area 11 is within the locked exclusion fence that surrounds Areas 1, 2, 2A, 2B, and 4 of MDA AB. Access also is controlled by the locked gate at State Road 4, which limits ingress/egress to and from TA-49.

The extent of surface and subsurface contamination in the radiochemical leachfield has not been determined precisely, but based on the historical information summarized above, contaminant inventories are expected to be localized and limited in quantity. Only limited surface soil sampling has been conducted at Area 11, and no subsurface sampling has been carried out.

The most intensive study of Area 11 contamination was carried out in 1987 as part of the A411 survey. During this survey, soil and vegetation samples were collected in the general area formerly occupied by the radiochemistry building (Soholt 1990, 0698).

Apparently because of errors in the Laboratory's survey database, an adjustment of several hundred feet was necessary to make the plots in the A411 survey agree with field notebooks and A411 survey stakes remaining in Area 11. It appears that the A411 survey sampled only the construction pad and the westernmost edge of the presumed leachfield area. Radionuclide levels were near background for most sampling locations, but activities of total uranium, plutonium-238, plutonium-239/240, and americium-241 were above background for a few samples.

The most elevated radioactivity by far was associated with a sample location near the east edge of the former radiochemistry building, possibly where the sink drain was located. Contamination levels at this sampling point were 121 pCi/g (plutonium-239/240), 22 pCi/g (americium), and 2.4 pCi/g (plutonium-238). The highly discontinuous distribution of radioactive contaminants in Area 11 as has typically been observed at other TA-49 SWMUs. The total radionuclide level averaged over the sampling stations is about 0.6 pCi/g (when the elevated station is excluded), well below the TRU action levels.

During the A411 survey, levels of radionuclides were determined for 20 vegetation samples collected from Area 11 and found to be unexceptional. Statistical comparisons of mean activities in soils and vegetation suggested poor correlation between the two media (Soholt 1990, 0698).

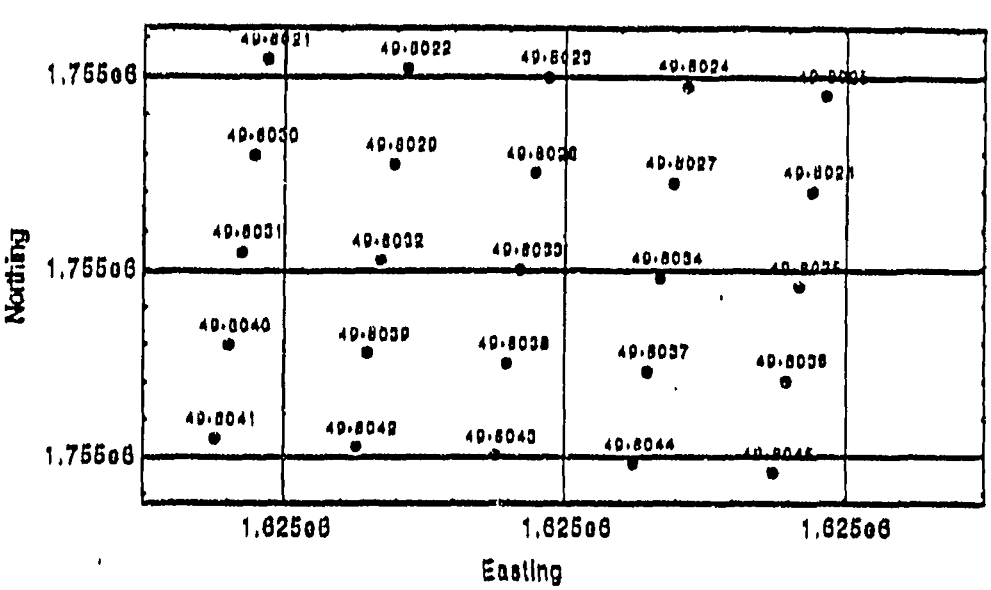
In May 1991, a geophysical survey of Area 11 was performed using magnetometry, electromagnetic, and ground-penetrating radar techniques (Geophex 1991, 03-0031). In the likely location of the leachfield, the survey results suggested near-surface piping and electrically conductive areas possibly related to subsurface chemical contamination or elevated moisture levels. The survey also confirmed the location of some buried metal in the small-scale shot area. Other portions of the area surveyed appeared to be entirely free of artifacts.

In May, 1994, NIS-6 personnel used LRAD technology to characterize the extent of alpha contamination on the soil surface in Area 11. This survey found twice background levels of alpha in the south east corner of Area 11, corresponding to survey location 49-8045. In previous investigations using LRAD at other lab sites, only areas with known surface contamination illustrated such high readings.

2.6.2 Radiological Survey

The radiological survey was performed on a 25 foot grid over the leach field as seen in Figure 8 and at the sample locations at the former storage container location and the small scale shot holes. Violinist III measurements did not indicate any hot spots. Survey location 49-8040 was just above three standard deviations of the average background. This location corresponds geographically to the east edge of the former radiochemistry building, possibly where the sink drain was located. This was the approximate location of most elevated radioactivity found in the A411 survey. Despite the results of the LRAD survey, location 49-8045 was within three standard deviations of the average background. No further investigation of Area 11 was conducted for this survey.

Figure 8



2.7 *Area 12 Bottle House Area*

-SWMU #49-008 (d) (soil contamination and backfilled shaft)

2.7.1 History

The main historic activities in Area 12 were confinement experiments in 1960 and 1961 that were related to the TA-49 hydronuclear program. These experiments consisted of HE detonations in sealed metal "bottles" (up to 5-ft in diameter by 16-ft in length) placed in a 10-ft-diameter by 30-ft-deep shaft. The shaft was surrounded by the Bottle House, which is one of only two surface structures remaining in Area 12. There were small temporary structures to support the confinement experiments in Area 12, in some early aerial and ground-level photographs.

Approximately 26 confinement experiments involving HE detonations were carried out in the Area 12 shaft. Several experiments involved a few kilograms of uranium-238. Six experiments involved a few microcuries of irradiated uranium tracer (typically 3.5 g of uranium-238, and in one case, 10.6 g of uranium-235). Up to 7 tons of road salt were used as an energy absorbent for each of the major experiments. In each experiment, after the HE was detonated, the containment vessel was unsealed and the salt was removed, sometimes with the help of jackhammers. According to several site employees, the salt was disposed of at the TA-54 waste disposal site. Following the final experiment, the containment bottle also was disposed of, probably at TA-54.

During the containment experiments, the area was monitored routinely for the release of radiation. For example, field notes indicate that after several experiments in May 1961, low levels of gross alpha contamination were noted on the interior surfaces of the metal liner and the compressed salt. However, there is no indication from any records or interviews that contamination was released to the site environment from the confinement experiments or from any other Area 12 activities.

After the containment experiments were concluded in 1961, Area 12 structures were used to support operations at the Cable Pull Test Facility, which was constructed in the early 1960s just across the access road from the Bottle House. The Bottle House shaft was backfilled with crushed tuff and a hydraulic system, including a fluid reservoir, compressor, and hydraulic lines, was installed in the building (Eller 1992, 0035). A buried hydraulic line, which probably is still present, connected the Bottle House to the Cable Pull Test Facility. The site construction engineer responsible for Area 12 recalls that no spills of any type occurred and estimated that the total capacity of hydraulic fluid was less than 10 gal (Eller 1992, 0035). Field inspections in 1987 and 1991 noted that oil probably was still present in the Bottle House equipment and some leakage onto the Bottle House floor was noted (Eller 1992, 03-0003; Weston 1989, 03-0015). During these inspections, a sign indicating that the hydraulic equipment is free of PCBs was noted.

Inspection of the Cable Pull Test Facility in September 1991 did not reveal obvious spill areas, but the seriously deteriorating condition of the structure was noted. A 10-ft-diameter depression that contained an unmarked, empty 3-gal drum and a small area of discolored soil also was noticed. Historical information indicates that this area was used only as a staging area for activities in Area 2 and Area 12 (Eller 1992, 03-0035).

In 1987 as part of the A-411 survey of MDA AB, 12 soil samples and 11 vegetation samples were collected around the Bottle House area and analyzed for radionuclides (Soholt 1990, 0698). Area 12 data are not specifically cited in the A411 report but are available for evaluation. Although most samples had analyte levels near background or analytical detection limits, a few samples showed radionuclide levels slightly above background but well within the action levels. The most elevated contaminant level is for plutonium-239/240, for which one sample exhibited 0.69 pCi/g. The data indicate that surface contaminants at Area 12 are low level and highly discontinuous in distribution, which is typical for other SWMU areas at TA-49.

In 1990, soil samples from the roadway between the Bottle House and the Cable Pull Test Facility were surveyed for gross alpha/beta and gamma radioactivity (Romero 1990, 03-0040). Levels of radionuclides were found to be at or below regional background levels or analytical detection limits.

Air-monitoring and dosimetry Station 32, part of the Laboratory's environmental surveillance network, is located about 100 ft northwest of the Bottle House. Air concentrations of tritium, total uranium, plutonium-238, plutonium-239/240, and americium-241, as well as penetrating radiation dose rates (TLD exposure), are measured at this station and compared to results from similar stations at the State Road 4 entrance to TA-49 and at other Laboratory sites. Results are reported in the A-411 report (Soholt 1990, 0698) and in the annual Laboratory Environmental Surveillance reports (for example, ESG 1990, 0497). TLD dose rates at Area 12 have remained within the statistical range of regional background levels since Station 32 was installed in 1987.

A level of plutonium 239/240 slightly above background was recorded at Station 32 during one quarter of 1987 (Purtymun and Stoker 1987, 0204). However, radionuclide concentrations observed in this quarter and in all other periods since the station was installed have been less than 1% of DOE concentration guides for on-site areas (Soholt 1990, 0698; ESG 1990, 0204). The maximum ratio of measured TRU concentration to guideline concentration for any radionuclide was <<0.1% (32×10^{-18} mCi/ml for plutonium 239/240).

Area 12 is located immediately adjacent to Area 2, where surface soil contamination by radionuclides is documented. It is possible that airborne transport of Area 2 soils is the source of the slightly elevated soil and air concentrations of radionuclides that have been observed in Area 12.

Current use of Area 12 is limited to air-monitoring at Station 32 and occasional use of portable microwave experimental equipment in the roadway between Area 10 and 12. Present use does not involve hazardous or radioactive materials, and no change in the use of Area 12 is foreseen for the indefinite future.

2.7.2 Radiological Survey

Radiological survey locations at Area 12 and the Cable Test Facility are illustrated in Figure 9. The radiological survey of the Cable Test Facility did not show any hot spots or areas that exceeded three standard deviations of the average background. A fifteen foot grid was surveyed over the Bottle House area, locations were identified that exceeded three standard deviations of background and additional survey points were added. These additional radiological survey points can be seen in Figure 9. Hot spots were identified for americium at survey locations: 9019, 9036, 9073, 9080, and 9082. The radioactivity screening level was not exceeded for plutonium or cesium at any of the survey locations.

Figure 9

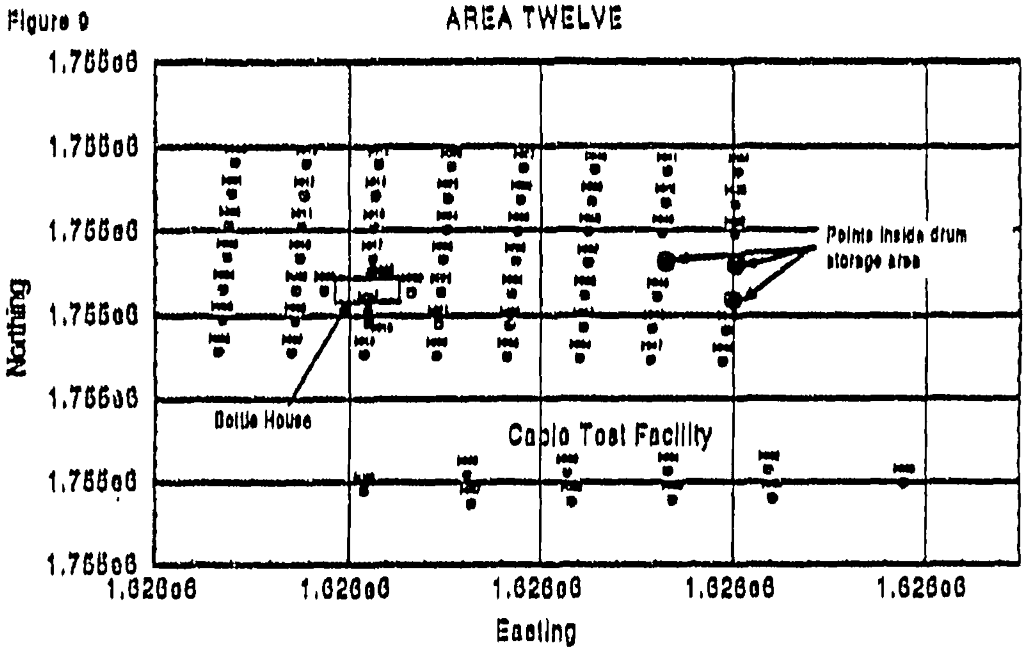


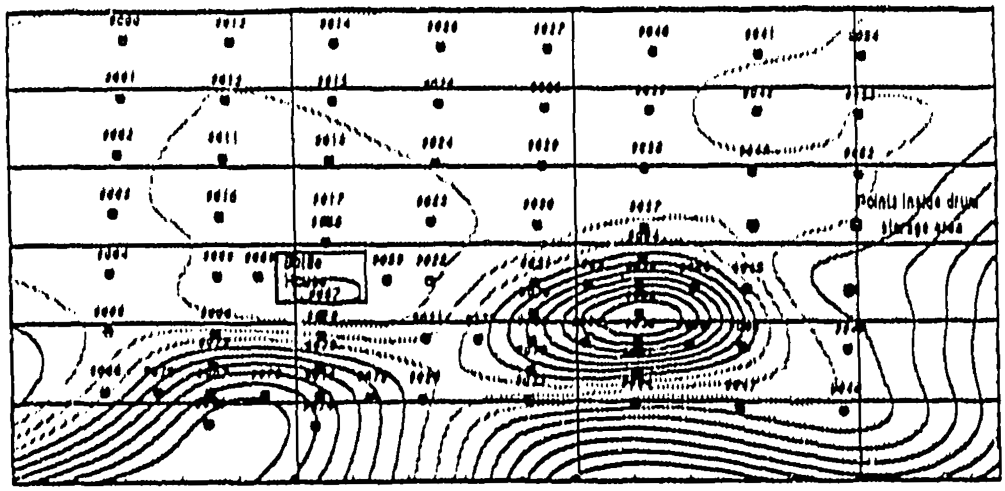
Figure 10 illustrates the areas of surface contamination, this is intended as a visual aid in understanding the estimated location of the surface contamination. The radiological survey points are krieged to extrapolate values for the areas between the actual data points. Radiological survey data is only associated with each radiological survey point.

Figure 10

Area 12

Americium Concentration

uCi/m^2



2.8 *MDA AB-Hydronuclear Shafts and Related Areas*

- SWMU 49-001 (a - g)
- SWMU 49-001 (miscellaneous)

2.8.1 History

MDA AB was the location of the hydronuclear and related experiments performed from late 1959 to mid-1961 that deposited virtually all the contaminants that are expected to exist at TA-49. As is discussed below in greater detail, very little other use has been made of MDA AB. In late summer of 1961, the hydronuclear and related experiments at TA-49 ceased, but for a while TA-49 continued to be employed as a staging and calibration area for equipment used at the Nevada Test Site. The final underground experiments at MDA AB were carried out in Area 4 in August 1961.

Except for Area 3, which is believed to contain little hazardous or radioactive materials, all of MDA AB currently is enclosed by a locked industrial fence, and access is controlled by the Laboratory's Environmental Management Division. The fenced portion of MDA AB also encloses Areas 5 and 11 and the enclosed units are managed together.

MDA AB comprises six separate experimental areas (1, 2, 2A, 2B, 3, and 4). All of these areas (except Area 3) contain significant TRU and heavy metal contamination from about 35 hydronuclear and 12 related calibration and equation of state experiments (Thorne and Westervelt 1987, 03-0014). At least 23 additional underground containment, equipment development, and mockup experiments were carried out, which involved high explosives and, in a few cases, very small amounts of uranium-238 or radioactive tracer but no fissile materials (SNM, or special nuclear materials).

The hydronuclear and related experiments involved high-explosive (HE) dispersal of significant quantities of SNM (uranium-235 and plutonium-239) as well as lead, beryllium, and uranium-238 at the bottom of the shafts. As a result, MDA AB is believed to contain about 40 kg of plutonium, 93 kg of uranium-235, 170 kg of uranium-238, 11 kg of beryllium, and perhaps 90 000 kg or more of lead. Approximately 0.20 kg of americium-241 has grown in from decay of plutonium-241. During the entire series of experiments, the maximum fission energy released from a single experiment was equivalent to four-tenths of a pound of HE, which is an insignificant energy release compared to the energy released by the HE used in the experiments. As discussed below, the maximum radius of underground contaminated zones directly resulting from the detonations is believed to be limited to about 10 to 15 ft, and less in most cases.

2.8.2 Area 1

2.8.2.1 History

Area 1 was developed initially for containment studies and was used later for downhole studies involving uranium-238 and plutonium. These activities deposited significant quantities of uranium-238 and plutonium at the bottoms of several experimental holes in Area 1. Six of these holes were shot with small amounts of plutonium and four were shot with uranium-238 or radioactive tracers as the only radioactive material (The plutonium holes also contain uranium-238). Six holes were used for containment experiments and should be contaminated only by HE residuals and, in a few cases, small quantities of tracer. Of the other Area 1 holes that were drilled, six were backfilled without further use and one was used as a gas expansion hole. Three grid locations were never used.

Other than the initial logging of Area 1 boreholes as they were drilled and checking of Core Hole-1 for water on an approximately annual basis, no subsurface sampling of Area 1 has been carried out.

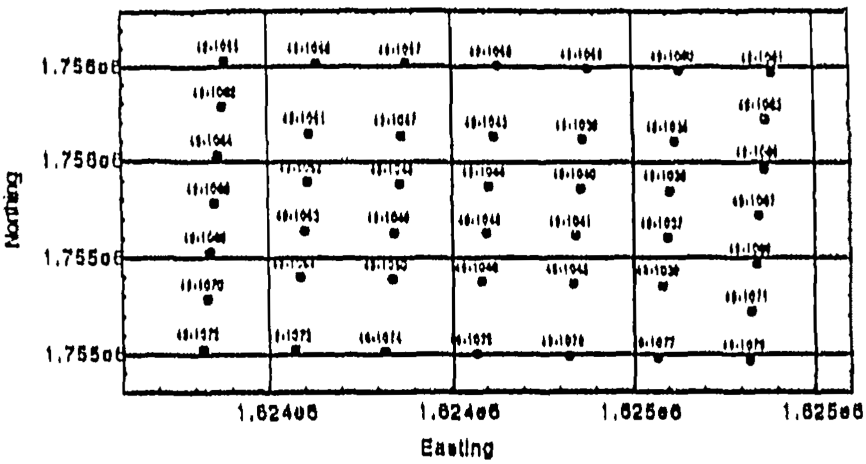
Available information indicates that sample recovery and similar operations, which could have caused significant surface contamination were not conducted in Area 1. Site monitoring during and after the experimental program also suggests strongly that significant levels of surface contamination are unlikely to exist at Area 1. However, firm documentation of this point is essentially limited to the 1987 A411 surface soils survey discussed below. There is some indication that slight contamination of an Area 1 structure was found on at least one occasion.

A detailed soils survey was conducted at MDA AB in 1987 (ESG 1990, 0497). The A411 survey included the collection of 34 surface samples on a grid with 25-ft intervals centered on Area 1. Ten vegetation samples also were collected in and around Area 1. Except those of americium, the mean levels of all soil analytes were near regional background levels. Twenty six of the soil samples showed americium below detection limits, and only one sample indicated a level above 0.7 pCi/g (1.4 pCi/g). The vegetation samples essentially showed background levels except for one anomalous sample that gave 24 pCi/g ash for cesium-137. The A411 results therefore strongly support the historical information, which indicates that surface contamination at Area 1 is negligible.

The May, 1994 LRAD survey at Area 1 was at or below natural background activity levels for mesa tops at LANL. Again, strongly supporting the historical information, which indicates that surface contamination at Area 1 is negligible.

2.8.2.2 Radiological Survey

Figure 11 AREA ONE



The radiological survey was performed on twenty five foot grid as illustrated in Figure 11. Six of the survey locations were at or just above three standard deviations of the average background for americium. One of those locations was at or above three standard deviations of the average background for cesium. Further investigation of Area 1 revealed no history of surface contamination and the deviation from background was consistent with other areas within TA-49. None of the survey locations exceeded the radioactivity screening level and no further investigation of Area 1 was required.

2.8.3 Areas 2, 2A, and 2B

2.8.3.1 History

Areas 2, 2A, and 2B were used for hydronuclear and related experiments. Significant quantities of plutonium, uranium, beryllium, and lead remain at the bottom of the shafts used in these experiments. (Only three shafts in Areas 2, 2A, and 2B are believed to contain beryllium). Twenty shafts were used for plutonium experiments. These shafts also contain uranium-238 and, in some cases, uranium-235. Three shafts were used with uranium-235 and uranium-238, and three shafts contain only uranium-238 (these six shafts contain no plutonium). Four shafts should contain only HE residuals and or tracer as contaminants. Seven experimental shafts were backfilled after drilling and not otherwise used, and seventeen grid locations were never used. Several gas expansion and pipe dump holes are documented in Areas 2, 2A, and 2B and others may be present as well.

Experiments in Areas 2, 2A, 2B, and 4 were distinguished from those in Areas 1 and 3 by the use of a pulse neutron source and radiochemical sample recovery techniques. Some Area 2 experiments also used a downhole neutron sources, that expended a total of a few curies of tritium, now decayed through almost three half-lives.

In Areas 2, 2A, 2B, and 4, short horizontal side-drifts off the bottoms of the main shafts were used to direct explosive gases through piping to sealed steel radiochemical sampling boxes at the surface. In some cases, sampling pipes in Area 2 directly intersected the main shaft. Contaminated residual gases were directed back underground through pipes into a gas expansion hole that served a number of experimental holes. Surface piping to a gas expansion hole is still visible in Area 4. These operations almost certainly have left sampling pipes and boxes with contaminated interiors near the surface of Areas 2, 2A, 2B, and 4.

To collect a sample for subsequent radiochemical analysis, researchers would detach the sampling box cover and remove the collection device. According to site personnel involved in these operations, despite the use of tarpaulins and tents over the sampling box, highly localized surface contamination occasionally resulted when the sampling boxes were opened. When this occurred, the resulting contamination was cleaned to field detection limits or covered with clean soil.

After completion of the experiments, the sampling pipes usually were disconnected from the sampling box and expansion hole and then either reused or buried in waste disposal holes (the aforementioned "pipe dumpholes," 3-ft diameter by 30-ft depth) around the experimental area. The engineering diary covering site operations during this period, as well as other engineering documents, indicate that at least four dump holes were drilled in Area 2B. These holes are presumed to be located as shown in engineering drawings [for example, see ENG-C28506 (1963, 03-0023)]. However, as noted above, other undocumented holes of this type may exist in Areas 2 and 4, and possibly in Area 1.

2.8.3.2 Surface Contamination from Experimental Hole 2-M

The most significant unexpected contamination incident during the entire hydronuclear program at TA-49 occurred during the drilling of Hole 2-M after experiments were conducted with SNM in Hole 2-L in April 1960 (Purtymun and Stoker 1987, 0204). The succeeding experimental hole (2-M) was completed 25 ft to the east of Hole 2-L in October. In November, a drift toward the southwest was constructed in Hole 2-M. This drift was oriented (probably by mistake) toward the southeast-trending drift for Hole 2-L. If drift orientation is accurately indicated in the drift diagram shown in Appendix B, the ends of the drifts for Holes 2-L and 2-M are only about 6 to 7 ft apart. This separation apparently was small enough for the HE detonation to disperse contamination through fractures in the tuff from the Hole 2-L drift to the Hole 2-M drift.

In December 1960, alpha contamination in excess of 100,000 counts/min (cpm) was noted in the as-yet empty shaft 2-M. Monitoring indicated that surface contamination was as high as 800,000 cpm. Lower levels of contamination were found on clothing, tools, and vehicles. Contamination as high as 10,000 cpm and traceable to Area 2 was found in Area 6 and in the main engineering craft shops at TA-3. An investigation of the incident indicated that no personnel were contaminated.

Equipment from this incident that could not be decontaminated, or was of little value, was placed in Hole 2-M with contaminated surface soil (as determined using field survey instruments available at that time). Other contaminated items were sent to low-level radioactive waste disposal areas at other TAs.

Apparently, in this incident the detonation in Hole 2-L drove the contamination through joints or fractures (either naturally occurring or produced by the detonation) into the area subsequently excavated for the Hole 2-M drift. Because downhole cross contamination was never again encountered unintentionally in the TA-49 hydronuclear program (the minimum distance between holes or drifts was about 15 ft in most other cases), the maximum probable downhole radius of contaminated zones resulting from the detonations can be inferred to be less than about 10 to 15 ft. This conclusion is consistent with containment experiments described earlier in this chapter.

In January 1961, the surface of Area 2 was capped with compacted clay and gravel after all the open holes were filled with sand and crushed tuff. Historical estimates of the fill thickness range from 1 to 6 ft, and recent field inspection suggests a maximum fill thickness of about 6 ft. The cap was extended 12.5 ft beyond the outermost shafts and then paved with 4 to 6 in. of asphalt in September 1961 in an effort to retard infiltration of moisture. In April 1961 after snowmelt, a radiological survey was made of the surface from Area 2 to the wall of Water Canyon. In addition, the floor of Water Canyon and the canyon wall were checked for contamination. No detectable alpha activity was found.

The Hole 2-M contamination incident left near-surface radionuclide contamination beneath the Area 2 asphalt pad. It is almost certain that this is the source of most or all of the above-background levels of radionuclides now observed in surface soils around the Area 2 pad and at short distances down the natural drainage toward Water Canyon [SWMU 49-001(g)]. It is estimated that approximately 0.8 acres in this drainage downgradient from the TA-49 exclusionary fence is contaminated with very low levels of plutonium and americium from this source (Purtymun and Stoker 1987, 0204).

After the Area 2 contamination incident, newly drilled holes were carefully monitored as they were created and previously drilled holes were checked. In no other case was contamination found. Area 2 was abandoned in the spring of 1961 and experiments were continued in adjacent experimental Areas 2A and 2B.

The only sampling of the intact fill under the asphalt covering Area 2 was conducted in September 1987 when a power pole was installed 2 ft northeast of Experimental Hole T (Romero 1987, 03-0040). Four samples were collected to a depth of 5 ft and were analyzed for gross alpha and gross beta radioactivity. A uniform distribution of 44 ± 18 pCi/g alpha was found. A second power pole hole 27 ft north of Hole B - 2 in Area 2 B also was sampled. Results from this hole were below detection limits (25 pCi/g) for both alpha and beta constituents.

2.8.3.3 Special Studies of Soil and Vegetation

During a special study in September 1987, about 20 soil samples and 20 vegetation samples were collected around Area 2 (Fresquez 1991, 03-0006). Of the soil samples analyzed, one sample from the northeast corner of Area 2 showed elevated levels of gross alpha activity (80 pCi/g) and a nearby sample showed elevated plutonium-239 activity (1660 pCi/g). Replicate analyses for the first sample gave values of 41 and 1.7 pCi/g of gross alpha activity, indicating a highly discontinuous surface-contaminant distribution. A PHOSWICH survey over the same area showed readings about twice the background level. Positive readings also were measured along the drainage channel leading to the culvert under the road on the north side of Area 2. One sample collected about 50 ft from the site of the most radioactively contaminated sample indicated 44 ppm Be, well above the regional background level of about 1.7 ppm. A vegetation sample from the same location exhibited 24 pCi/g of plutonium-239/240. Elevated levels of other potential contaminants from Area 2 were not detected in the soil and vegetation samples.

During another special study in March 1991, 10 samples of pocket gopher soil diggings along the perimeter of the Area 2 pad were collected and analyzed (Ferenbaugh 1991, 03-0005; Fresquez 1991, 03-0006). Again, there was some indication that the exposed radioactive contamination had washed a short distance along the Area 2 drainage toward Water Canyon. As observed in 1987, elevated radioactivity was detected in a sample from the northeast corner of the asphalt pad: gross alpha (135 pCi/g), americium-241 (38 pCi/g), plutonium-238 (24 pCi/g), and plutonium-239/240 (43 pCi/g). Gopher diggings at the same location were resampled in April 1991. Elevated gross alpha activity (about 1200 pCi/g) was found again, but additional analysis indicated no VOC, SVOC, PCB, or TCLP metal levels above EPA guidelines.

During the A411 survey in 1987, about 40 soil and 45 vegetation samples were collected around Areas 2, 2A, and 2B. The study indicated that levels of contaminants in Area 2B and in the portion of Area 2A away from the asphalt pad were at (or only slightly above) regional background levels. However, at several sampling locations immediately adjacent to the asphalt pad, plutonium and americium levels well above background were observed. As was found in the later Area 2 special studies (described above), this trend was particularly notable at the extreme northeast corner of the pad, where the level of americium-241 in one sample was 53 pCi/g.

To summarize, the most elevated radionuclide levels in surface soils at Areas 2, 2A, and 2B are concentrated in the northeast corner of Area 2 and appear to be associated with the exhumation of contaminated soil from beneath the asphalt pad by gophers.

2.8.3.4 Radiological Survey

Radiological survey locations in Area 2 are illustrated in Figure 12. Area 2, the asphalt pad, the radiological survey was performed on a twenty five foot grid. Areas 2A, 2B, the drainage channel, and the outfall to Water Canyon were also radiologically surveyed. Areas 2, 2A, and 2B did not show any evidence of surface contamination. Only the drainage channel and the outfall to Water Canyon, see Figures 13 and 14, had survey locations that significantly exceeded three standard deviations of the average background. None of these locations exceeded the radioactivity screening level, however, their deviation could not be attributed to variation in background. Based on this survey, it appears that surface contamination does exist in the drainage channel and the outfall to Water Canyon but not at levels that would require further action in this investigation.

Figure 12

AREA TWO

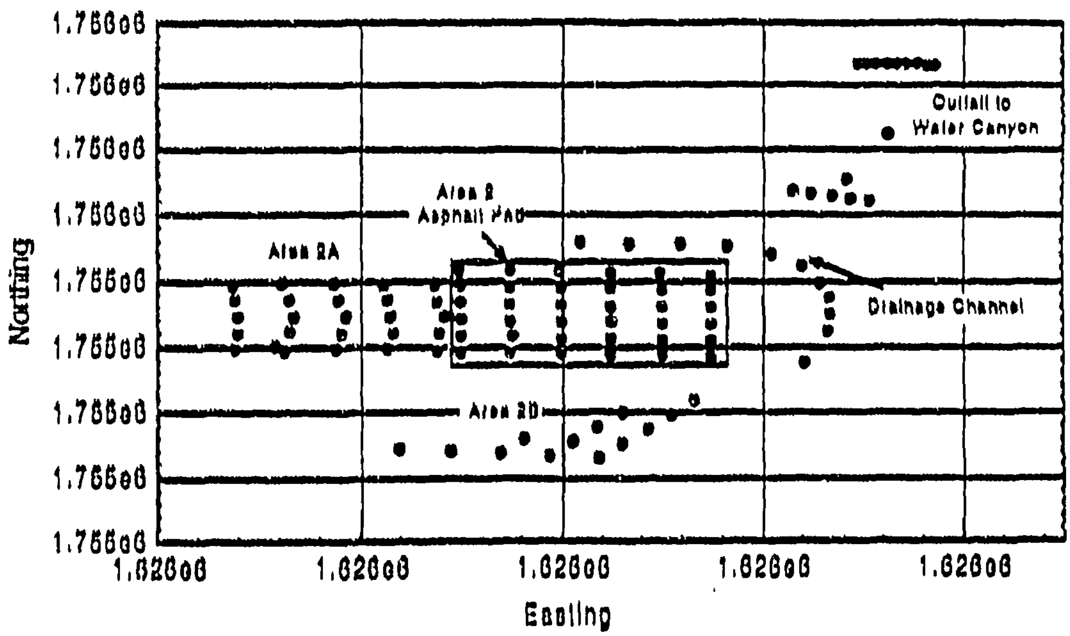


Figure 13

AREA TWO
Outfall to Water Canyon

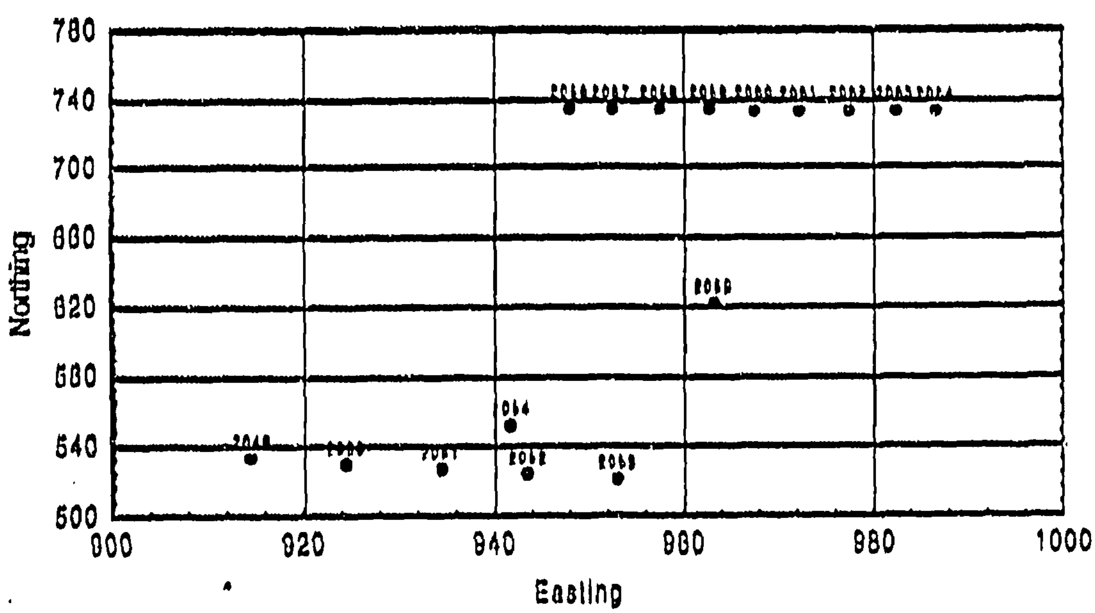
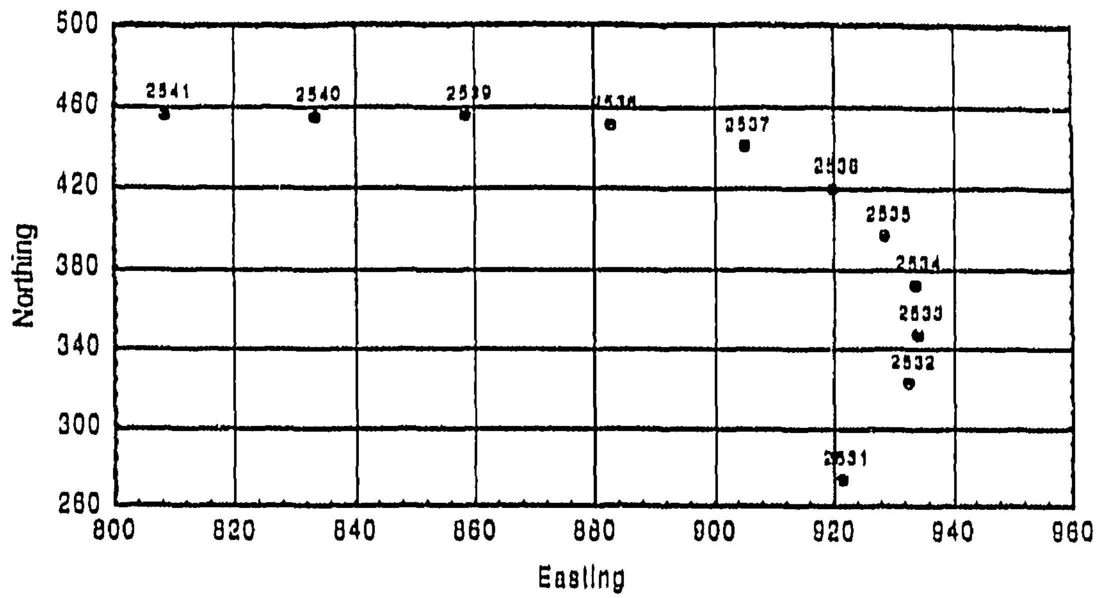


Figure 14 AREA TWO

Drainage Channel



2.8.4 Area 3

2.8.4.1 History

Area 3 was used exclusively for development of confinement and sample recovery techniques that were subsequently used in Areas 1, 2, and 4. Seven shafts were used for experiments with radioactive tracers (usually irradiated uranium). Two other shafts were excavated but backfilled without further use, and twelve grid locations were never used. According to Laboratory records, the activated uranium tracer used in Area 3 shafts contained only about 5 g of uranium-235 and about 30 g of uranium-238. A maximum of several microcuries of neptunium-239 tracer was used in Area 3 shafts and has decayed completely to insignificant levels of plutonium-239 (Minor 1991, 03-0034). No other plutonium is believed to be present in Area 3. As at other experimental areas of MDA AB, downhole materials at Area 3 were left in place at the conclusion of experiments.

Other than the initial logging of Area 3 holes as they were drilled and the checking of Core Hole 3 for water on an approximately annual basis (none was ever detected), subsurface sampling has not been carried out at Area 3. However, the detailed historical information that is available and past surface soil sampling strongly indicate that significant contamination is highly unlikely in the surface or subsurface of Area 3.

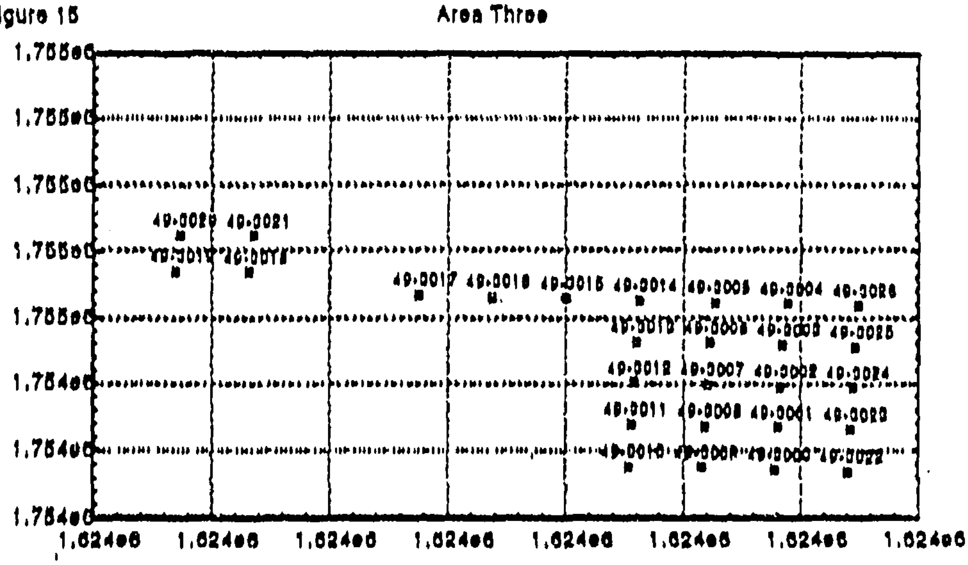
In 1969, low levels of alpha contamination were found in an Area 3 structure that subsequently was burned in place (Eller 1991, 03-0002). The source of this contamination is unknown but probably derived from elsewhere at MDA AB. Area 3 also was used for burning slightly contaminated structures that were removed from other areas of TA-49 (Eller 1991, 03-0002). Slight soil contamination at Area 3 could have occurred from this activity, but the levels are unlikely to be detectable. Anecdotal information suggests the burning area may have been near the curve in the road at the southwest corner of Area 3.

Well-documented surface-soil sampling at Area 3 is essentially restricted to the 1987 A411 survey. In this study, about 40 soil samples were collected on a grid with a 25 ft spacing, approximately centered on the Area 3 shafts. Samples also were collected from the leveled area (possibly used for burning structures) to the west of the Area 3 shafts and in a short extension to the southeast of the shafts. About 45 vegetation samples also were collected for analysis. The analyte levels were found to be essentially at background or analytical detection levels. The A411 results therefore support historical information, which suggests that significant surface contamination does not exist at Area 3.

2.8.4.2 Radiological Survey

Radiological survey locations in Area 3 are illustrated in Figure 15. The radiological survey in Area 3 did not indicate any surface contamination. None of the survey locations exceeded three standard deviations of the average background or the radioactivity screening level. No further investigation of Area 3 was required.

Figure 15



2.8.5 Area 4

2.8.5.1 History

Area 4 was used for containment experiments and hydronuclear experiments involving radiochemical sample recovery, much as described for Area 2. These experiments dispersed significant amounts of uranium, plutonium, beryllium, and lead at the bottoms of the experimental shafts. Eleven shafts contain plutonium, one contains uranium-238 as the only radioactive contaminant, and one contains uranium-235 and uranium-238 as the only radionuclides. The plutonium-containing shafts also contain uranium-235 and -238. One hole was used for a containment experiment and probably contains lead as the only significant contaminant. Three shafts were backfilled without use after being drilled and should contain no contaminants. Eight grid locations were never used. One gas expansion hole is evident in Area 4, and "pipe dump" holes containing contaminated debris (exact locations unknown) almost certainly are present.

Some Area 4 experiments involved the use of a few curies of tritium, which by now have decayed through almost three half-lives.

In July 1969, a skid-mounted structure in Area 4 was found to be slightly alpha contaminated from an unknown source (Eller 1991, 03-0002). The structure was moved to Area 3 and burned.

Other than the initial logging of holes of Area 4 as they were drilled and inspections of Core Hole 4 for water on an approximately annual basis (no water was ever detected), subsurface sampling has not been carried out at Area 4.

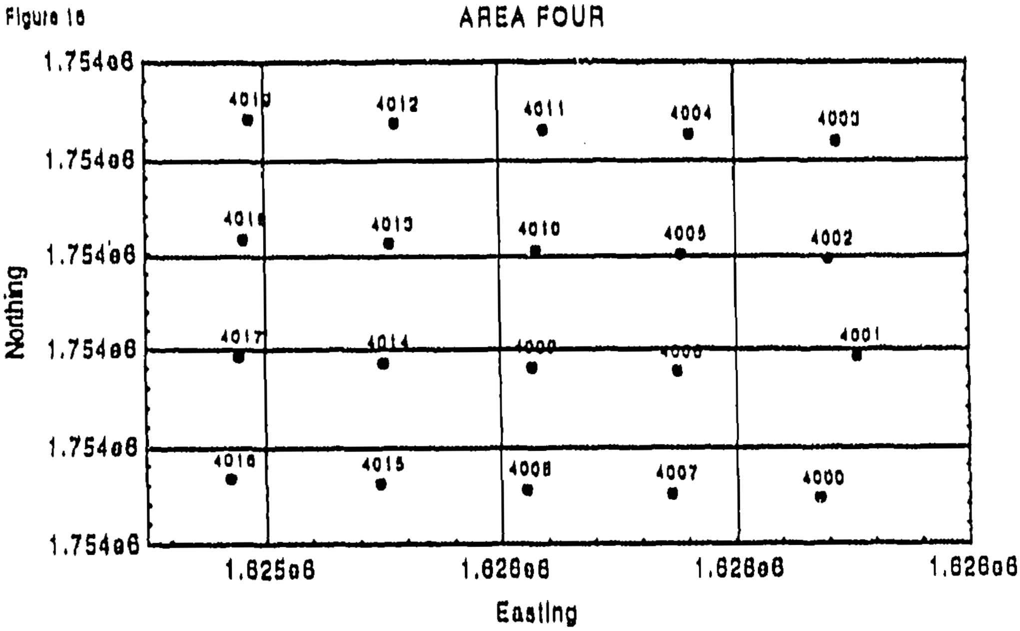
About 36 soil samples were collected in the 1987 A411 survey of Area 4 surface soils and vegetation on a grid pattern with a 25-ft interval, approximately centered on the Area 4 shafts. An additional 25 soil samples were collected from the leveled area immediately southeast of Area 4. About 10 vegetation samples also were collected around the area.

The average soil levels for americium-241 and plutonium-239/240 (and most other analytes) are slightly above regional background but far below TRU action levels. The average values are strongly skewed because only a few points have contaminant levels significantly above background (but below action levels). At most sampling locations, the analyte levels were at or below regional background. The observed distribution indicates a highly discontinuous distribution of soil contaminants, as observed in the other experimental areas at MDA AB.

2.8.5.2 Radiological Survey

Radiological survey locations are illustrated in Figure 16. The radiological survey in Area 4 did not indicate any surface contamination. None of the survey locations exceeded three standard deviations of the average background or the radioactivity screening level. No further investigation of Area 4 was required.

Figure 16



3.0 Conclusion

Of all the areas investigated using the Violinist III, only Area 12, the Bottle House, exhibited areas of surface contamination exceeding the radioactive screening level. Area 6, the open burning landfill area and Area 1, both had data points exceeding three standard deviations of the average background, but they were attributed to natural variation in background. The drainage channel and the outfall to Water Canyon also had survey locations exceeding three standard deviations and the A-411 survey supports surface contamination in these areas, but the concentrations did not exceed the screening action level. The potential for hot spots does exist between the grid points we monitored. However, based on the thorough historical information available and previous investigation results this potential is considered small.

The results of the radiological screening at TA-49 allowed sampling to be biased towards areas of greatest radiological contamination. In Area 12, the sampling could be biased to include the hot spots identified. These changes to the original sampling protocol allow for specific characterization of the radiological surface contamination. Not only identifying surface contamination but also the extent of contamination. This radiological survey allowed for specific sampling to take place, rather than random, and potentially limits the total number of samples taken for analysis thus cutting overall cost of the site characterization.

Appendices

Appendix 1: Violinist III FIDLER Calibration and Performance Records

Appendix 2: Radiological Survey Background Data

Appendix 3: Radiological Survey TA-49 Data

Appendix 1

Violinist III FIDLER Calibration and Performance Records

Appendix 2

Radiological Survey Background Data

LOCATION I.D.	DATE	Pu uCi/m^2	V-130 Am uCi/M^2	Cs ROI(3) Counts/100s	Cs uCi/M^2	DATE	Pu uCi/m^2
9901	OCT 6, 1994	0	0.77	979	1.032785	OCT 6, 1994	0
9901	OCT 7, 1994	0	0.751	931	0.982148	OCT 7, 1994	0
9901	OCT 7, 1994	0	0.77	1010	1.065489	OCT 7, 1994	0
9901	OCT 7, 1994	0	0.77	896	0.945225	OCT 7, 1994	0
9901	OCT 7, 1994	0	0.751	901	0.9505	OCT 7, 1994	0
9901	OCT 7, 1994	0	0.751	967	1.020126	OCT 7, 1994	0
9901	OCT 7, 1994	0	0.751	970	1.023291	OCT 7, 1994	0
9901	OCT 7, 1994	0	0.77	988	1.04228	OCT 7, 1994	0
9901	OCT 7, 1994	0	0.751	958	1.010632	OCT 7, 1994	0
9901	OCT 24,1994	0	0.714	915	0.965269	OCT 24,1994	0
9902	OCT 6, 1994	0	0.77	991	1.045445	OCT 6, 1994	0
9902	OCT 11, 1994	0	0.695	893	0.942061	OCT 11, 1994	0
9902	OCT 11, 1994	0	0.714	959	1.011687	OCT 11, 1994	0
9902	OCT 11, 1994	0	0.695	923	0.973709	OCT 11, 1994	0
9902	OCT 11, 1994	0	0.733	882	0.930456	OCT 11, 1994	0
9902	OCT 11, 1994	0	0.714	883	0.931511	OCT 11, 1994	0
9902	OCT 11, 1994	0	0.714	970	1.023291	OCT 11, 1994	0
9902	OCT 11, 1994	0	0.714	891	0.939951	OCT 11, 1994	0
9902	OCT 11, 1994	0	0.733	888	0.936786	OCT 11, 1994	0
9902	OCT 24,1994	0	0.733	900	0.949445	OCT 24,1994	0
9903	OCT 6, 1994	0	0.77	929	0.980038	OCT 6, 1994	0
9903	OCT 11, 1994	0	0.789	977	1.030676	OCT 12, 1994	0
9903	OCT 11, 1994	0	0.808	961	1.013796	OCT 12, 1994	0
9903	OCT 11, 1994	0	0.789	1000	1.054939	OCT 12, 1994	0
9903	OCT 11, 1994	0	0.789	1040	1.097137	OCT 12, 1994	0
9903	OCT 11, 1994	0	0.827	971	1.024346	OCT 12, 1994	0
9903	OCT 11, 1994	0	0.789	1000	1.054939	OCT 12, 1994	0
9903	OCT 11, 1994	0	0.808	1030	1.086587	OCT 12, 1994	0
9903	OCT 11, 1994	0	0.808	1000	1.054939	OCT 12, 1994	0
9903	OCT 24,1994	0	0.751	858	0.905138	OCT 24,1994	0
9904	OCT 6, 1994	0	0.751	921	0.971599	OCT 6, 1994	0
9904	OCT 11, 1994	0	0.789	994	1.048609	OCT 21, 1994	0
9904	OCT 11, 1994	0	0.789	979	1.032785	OCT 21, 1994	0
9904	OCT 11, 1994	0	0.808	991	1.045445	OCT 21, 1994	0
9904	OCT 11, 1994	0	0.808	1040	1.097137	OCT 21, 1994	0
9904	OCT 11, 1994	0	0.789	1000	1.054939	OCT 21, 1994	0
9904	OCT 11, 1994	0	0.808	1070	1.128785	OCT 21, 1994	0
9904	OCT 11, 1994	0	0.808	961	1.013796	OCT 21, 1994	0
9904	OCT 11, 1994	0	0.808	1000	1.054939	OCT 21, 1994	0
9904	OCT 24,1994	0	0.733	937	0.988478	OCT 24,1994	0
9905	OCT 6, 1994	0	0.77	914	0.964214	OCT 6, 1994	0
9905	OCT 12, 1994	0	0.751	934	0.985313	OCT 12, 1994	0
9905	OCT 12, 1994	0	0.751	920	0.970544	OCT 12, 1994	0
9905	OCT 12, 1994	0	0.751	987	1.041225	OCT 12, 1994	0
9905	OCT 12, 1994	0	0.77	996	1.050719	OCT 12, 1994	0
9905	OCT 12, 1994	0	0.77	956	1.008522	OCT 12, 1994	0
9905	OCT 12, 1994	0	0.77	942	0.993753	OCT 12, 1994	0
9905	OCT 12, 1994	0	0.77	925	0.975819	OCT 12, 1994	0

9905	OCT 12, 1994	0	0,751	1000	1,054939	OCT 12, 1994	0
9905	OCT 24,1994	0	0,751	926	0,976874	OCT 24,1994	0
9911	OCT 6, 1994	0	0,751	939	0,990588	OCT 6, 1994	0
9911	OCT 7, 1994	0	0,753	919	0,969489	OCT 7, 1994	0
9911	OCT 7, 1994	0	0,77	926	0,976874	OCT 7, 1994	0
9911	OCT 7, 1994	0	0,77	898	0,947335	OCT 7, 1994	0
9911	OCT 7, 1994	0	0,751	918	0,968434	OCT 7, 1994	0
9911	OCT 7, 1994	0	0,77	1040	1,097137	OCT 7, 1994	0
9911	OCT 7, 1994	0	0,77	978	1,03173	OCT 7, 1994	0
9911	OCT 7, 1994	0	0,77	976	1,029621	OCT 7, 1994	0
9911	OCT 7, 1994	0	0,77	961	1,013796	OCT 7, 1994	0
9911	OCT 24,1994	0	0,751	962	1,014851	OCT 24,1994	0
9912	OCT 6, 1994	0	0,751	942	0,993753	OCT 6, 1994	0
9912	OCT 11, 1994	0	0,751	879	0,927291	OCT 11, 1994	0
9912	OCT 11, 1994	0	0,751	966	1,019071	OCT 11, 1994	0
9912	OCT 11, 1994	0	0,733	976	1,029621	OCT 11, 1994	0
9912	OCT 11, 1994	0	0,751	928	0,978984	OCT 11, 1994	0
9912	OCT 11, 1994	0	0,751	969	1,022236	OCT 11, 1994	0
9912	OCT 11, 1994	0	0,751	926	0,976874	OCT 11, 1994	0
9912	OCT 11, 1994	0	0,789	917	0,967379	OCT 11, 1994	0
9912	OCT 11, 1994	0	0,789	951	1,003247	OCT 11, 1994	0
9912	OCT 24,1994	0	0,77	1000	1,054939	OCT 24,1994	0
9913	OCT 6, 1994	0	0,77	943	0,994808	OCT 6, 1994	0
9913	OCT 11, 1994	0	0,845	1060	1,118235	OCT 12, 1994	0
9913	OCT 11, 1994	0	0,808	1010	1,065489	OCT 12, 1994	0
9913	OCT 11, 1994	0	0,827	1000	1,054939	OCT 12, 1994	0
9913	OCT 11, 1994	0	0,827	1020	1,076038	OCT 12, 1994	0
9913	OCT 11, 1994	0	0,845	1060	1,118235	OCT 12, 1994	0
9913	OCT 11, 1994	0	0,845	991	1,045445	OCT 12, 1994	0
9913	OCT 11, 1994	0	0,827	990	1,04439	OCT 12, 1994	0
9913	OCT 11, 1994	0	0,845	1060	1,118235	OCT 12, 1994	0
9913	OCT 24,1994	0	0,714	885	0,933621	OCT 24,1994	0
9914	OCT 6, 1994	0	0,751	1010	1,065489	OCT 6, 1994	0
9914	OCT 11, 1994	0	0,845	1010	1,065489	OCT 21, 1994	0
9914	OCT 11, 1994	0	0,827	1100	1,160433	OCT 21, 1994	0
9914	OCT 11, 1994	0	0,845	1060	1,118235	OCT 21, 1994	0
9914	OCT 11, 1994	0	0,845	1030	1,086587	OCT 21, 1994	0
9914	OCT 11, 1994	0	0,845	1000	1,054939	OCT 21, 1994	0
9914	OCT 11, 1994	0	0,845	1020	1,076038	OCT 21, 1994	0
9914	OCT 11, 1994	0	0,827	1010	1,065489	OCT 21, 1994	0
9914	OCT 11, 1994	0	0,827	1100	1,160433	OCT 21, 1994	0
9914	OCT 24,1994	0	0,733	975	1,028566	OCT 24,1994	0
9915	OCT 6, 1994	0	0,751	1010	1,065489	OCT 6, 1994	0
9915	OCT 12, 1994	0	0,789	1030	1,086587	OCT 12, 1994	0
9915	OCT 12, 1994	0	0,808	958	1,010632	OCT 12, 1994	0
9915	OCT 12, 1994	0	0,789	1000	1,054939	OCT 12, 1994	0
9915	OCT 12, 1994	0	0,789	1000	1,054939	OCT 12, 1994	0
9915	OCT 12, 1994	0	0,789	999	1,053884	OCT 12, 1994	0
9915	OCT 12, 1994	0	0,827	1010	1,065489	OCT 12, 1994	0
9915	OCT 12, 1994	0	0,77	1040	1,097137	OCT 12, 1994	0
9915	OCT 12, 1994	0	0,808	949	1,001137	OCT 12, 1994	0

9916	OCT 24,1994	0	0.751	995	1.049684	OCT 24,1994	0
9916	OCT 6, 1994	0	0.789	950	1.002192	OCT 6, 1994	0
9916	OCT 7, 1994	0	0.789	960	1.012742	OCT 7, 1994	0
9916	OCT 7, 1994	0	0.789	972	1.025401	OCT 7, 1994	0
9916	OCT 7, 1994	0	0.808	987	1.041225	OCT 7, 1994	0
9916	OCT 7, 1994	0	0.77	979	1.032785	OCT 7, 1994	0
9916	OCT 7, 1994	0	0.77	947	0.999027	OCT 7, 1994	0
9916	OCT 7, 1994	0	0.77	932	0.983203	OCT 7, 1994	0
9916	OCT 7, 1994	0	0.751	973	1.026456	OCT 7, 1994	0
9916	OCT 7, 1994	0	0.77	957	1.009577	OCT 7, 1994	0
9916	OCT 24,1994	0	0.751	949	1.001137	OCT 24,1994	0
9917	OCT 6, 1994	0	0.789	1030	1.086587	OCT 6, 1994	0
9917	OCT 11, 1994	0	0.789	1040	1.097137	OCT 11, 1994	0
9917	OCT 11, 1994	0	0.789	1030	1.086587	OCT 11, 1994	0
9917	OCT 11, 1994	0	0.808	1040	1.097137	OCT 11, 1994	0
9917	OCT 11, 1994	0	0.808	1050	1.107686	OCT 11, 1994	0
9917	OCT 11, 1994	0	0.808	1080	1.139334	OCT 11, 1994	0
9917	OCT 11, 1994	0	0.808	1020	1.076038	OCT 11, 1994	0
9917	OCT 11, 1994	0	0.789	1040	1.097137	OCT 11, 1994	0
9917	OCT 11, 1994	0	0.789	1090	1.149884	OCT 11, 1994	0
9917	OCT 24,1994	0	0.77	1040	1.097137	OCT 24,1994	0
9918	OCT 6, 1994	0	0.773	924	0.974764	OCT 6, 1994	0
9918	OCT 11, 1994	0	0.77	1000	1.054939	OCT 12, 1994	0
9918	OCT 11, 1994	0	0.77	1000	1.054939	OCT 12, 1994	0
9918	OCT 11, 1994	0	0.789	937	0.988478	OCT 12, 1994	0
9918	OCT 11, 1994	0	0.789	972	1.025401	OCT 12, 1994	0
9918	OCT 11, 1994	0	0.808	1010	1.065489	OCT 12, 1994	0
9918	OCT 11, 1994	0	0.808	967	1.020126	OCT 12, 1994	0
9918	OCT 11, 1994	0	0.789	970	1.023291	OCT 12, 1994	0
9918	OCT 11, 1994	0	0.808	1000	1.054939	OCT 12, 1994	0
9918	OCT 24,1994	0	0.733	970	1.023291	OCT 24,1994	0
9919	OCT 6, 1994	0	0.751	981	1.034895	OCT 6, 1994	0
9919	OCT 12, 1994	0	0.733	911	0.96105	OCT 12, 1994	0
9919	OCT 12, 1994	0	0.733	987	1.041225	OCT 12, 1994	0
9919	OCT 12, 1994	0	0.714	959	1.011687	OCT 12, 1994	0
9919	OCT 12, 1994	0	0.714	958	1.010632	OCT 12, 1994	0
9919	OCT 12, 1994	0	0.733	907	0.95683	OCT 12, 1994	0
9919	OCT 12, 1994	0	0.714	919	0.969489	OCT 12, 1994	0
9919	OCT 12, 1994	0	0.714	953	1.005357	OCT 12, 1994	0
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9920	OCT 6, 1994	0	0.789	1010	1.065489	OCT 6, 1994	0
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9920	OCT 12, 1994	0	0.587	905	0.95472	OCT 12, 1994	0
9920	OCT 12, 1994	0	0.608	889	0.937841	OCT 12, 1994	0
9920	OCT 12, 1994	0	0.629	876	0.924127	OCT 12, 1994	0
9920	OCT 12, 1994	0	0.608	908	0.957885	OCT 12, 1994	0
9920	OCT 12, 1994	0	0.608	930	0.981093	OCT 12, 1994	0
9920	OCT 12, 1994	0	0.629	832	0.877709	OCT 12, 1994	0
9920	OCT 12, 1994	0	0.629	899	0.94839	OCT 12, 1994	0
9920	OCT 24,1994	0	0.714	915	0.965269	OCT 24,1994	0

V-129 Am uCi/M^2	Cs ROI(3) Counts/100s	Cs uCi/M^2	DATE	Pu uCi/m^2	V-133 Am uCi/M^2	Cs ROI(3) ounts/100	Cs uCi/M^2
0.68	875	0.979157	NOV 11, 1994	0	0.628	930	1.070752
0.587	932	1.042942	NOV 11, 1994	0	0.628	945	1.088022
0.608	840	0.939991	NOV 11, 1994	0	0.61	952	1.096082
0.608	870	0.973562	NOV 11, 1994	0	0.628	927	1.067298
0.629	854	0.955657	NOV 11, 1994	0	0.61	933	1.074206
0.608	869	0.972443	NOV 11, 1994	0	0.61	975	1.122563
0.608	921	1.030633	NOV 11, 1994	0	0.628	906	1.04312
0.608	894	1.000419	NOV 11, 1994	0	0.61	975	1.122563
0.608	896	1.002657	NOV 11, 1994	0	0.628	901	1.037363
0.587	827	0.925443	NOV 11, 1994	0	0.628	955	1.099536
0.608	872	0.9758	NOV 21, 1994	0	0.591	899	1.03506
0.671	937	1.048537	NOV 21, 1994	0	0.61	993	1.143287
0.671	864	0.966847	NOV 21, 1994	0	0.628	1000	1.151346
0.65	938	1.049656	NOV 21, 1994	0	0.628	1010	1.16286
0.65	914	1.022799	NOV 21, 1994	0	0.628	984	1.132925
0.65	959	1.073156	NOV 21, 1994	0	0.628	944	1.086871
0.671	923	1.032871	NOV 21, 1994	0	0.628	932	1.073055
0.65	921	1.030633	NOV 21, 1994	0	0.61	1020	1.174373
0.65	937	1.048537	NOV 21, 1994	0	0.61	967	1.113352
0.587	898	1.004895	NOV 21, 1994	0	0.628	922	1.061541
0.608	920	1.029513	NOV 22, 1994	0	0.61	1030	1.185887
0.629	960	1.074275	NOV 22, 1994	0	0.61	1030	1.185887
0.629	936	1.047418	NOV 22, 1994	0	0.628	1060	1.220427
0.65	891	0.997061	NOV 22, 1994	0	0.628	1050	1.208914
0.65	900	1.007133	NOV 22, 1994	0	0.61	1020	1.174373
0.65	974	1.089941	NOV 22, 1994	0	0.591	1040	1.1974
0.65	908	1.016085	NOV 22, 1994	0	0.61	1050	1.208914
0.65	894	1.000419	NOV 22, 1994	0	0.628	1050	1.208914
0.65	905	1.012728	NOV 22, 1994	0	0.628	1040	1.1974
0.587	859	0.961252	NOV 22, 1994	0	0.628	1010	1.16286
0.587	925	1.035109	NOV 22, 1994	0	0.591	959	1.104141
0.608	901	1.008252	NOV 22, 1994	0	0.573	1010	1.16286
0.608	867	0.970205	NOV 22, 1994	0	0.591	1020	1.174373
0.609	900	1.007133	NOV 22, 1994	0	0.591	919	1.058087
0.608	888	0.993704	NOV 22, 1994	0	0.61	968	1.114503
0.608	920	1.029513	NOV 22, 1994	0	0.591	954	1.098385
0.608	892	0.99818	NOV 22, 1994	0	0.591	1010	1.16286
0.587	849	0.950062	NOV 22, 1994	0	0.591	997	1.147892
0.587	889	0.994823	NOV 22, 1994	0	0.591	1020	1.174373
0.566	839	0.938872	NOV 22, 1994	0	0.591	989	1.138682
0.587	898	1.004895	NOV 29, 1994	0	0.591	1060	1.220427
0.65	924	1.03399	NOV 29, 1994	0	0.591	1010	1.16286
0.608	974	1.089941	NOV 29, 1994	0	0.591	968	1.114503
0.587	968	1.083227	NOV 29, 1994	0	0.61	1040	1.1974
0.629	944	1.05637	NOV 29, 1994	0	0.591	967	1.113352
0.629	923	1.032871	NOV 29, 1994	0	0.61	991	1.140984
0.629	868	0.971324	NOV 29, 1994	0	0.591	1010	1.16286
0.629	925	1.035109	NOV 29, 1994	0	0.591	954	1.098385

0,629	864	0,966847	NOV 29, 1994	0	0,61	973	1.12026
0,587	848	0,948943	NOV 29, 1994	0	0.591	981	1.129471
0,608	915	1,023918	NOV 14, 1994	0	0,61	929	1,069601
0,608	905	1,012728	NOV 14, 1994	0	0,591	900	1,036212
0,629	910	1,018323	NOV 14, 1994	0	0,61	939	1,081114
0,629	906	1,013847	NOV 14, 1994	0	0,61	899	1,03506
0,629	886	0,991466	NOV 14, 1994	0	0,61	940	1,082266
0,608	884	0,989228	NOV 14, 1994	0	0,61	963	1,108747
0,608	934	1,04518	NOV 14, 1994	0	0,61	931	1,071904
0,608	904	1,011609	NOV 14, 1994	0	0,628	905	1,041969
0,608	881	0,985871	NOV 14, 1994	0	0,61	929	1,069601
0,566	834	0,933276	NOV 14, 1994	0	0,591	979	1,127168
0,65	905	1,012728	NOV 21, 1994	0	0,628	971	1,117957
0,671	1000	1,119036	NOV 21, 1994	0	0,628	1000	1,151346
0,65	947	1,059727	NOV 21, 1994	0	0,61	970	1,116806
0,65	958	1,072037	NOV 21, 1994	0	0,628	960	1,105293
0,671	964	1,078751	NOV 21, 1994	0	0,628	968	1,114503
0,671	984	1,101132	NOV 21, 1994	0	0,628	896	1,031606
0,65	999	1,117917	NOV 21, 1994	0	0,61	986	1,135228
0,65	946	1,058608	NOV 21, 1994	0	0,628	981	1,129471
0,629	967	1,082108	NOV 21, 1994	0	0,61	952	1,096082
0,587	895	1,001538	NOV 21, 1994	0	0,628	960	1,105293
0,629	851	0,9523	NOV 22, 1994	0	0,61	1030	1,185887
0,65	860	0,962371	NOV 22, 1994	0	0,61	1020	1,174373
0,65	969	1,084346	NOV 22, 1994	0	0,702	961	1,106444
0,65	949	1,061966	NOV 22, 1994	0	0,721	1060	1,220427
0,65	946	1,058608	NOV 22, 1994	0	0,721	1000	1,151346
0,65	973	1,088822	NOV 22, 1994	0	0,721	1030	1,185887
0,65	913	1,02166	NOV 22, 1994	0	0,684	1000	1,151346
0,671	941	1,053013	NOV 22, 1994	0	0,721	1060	1,220427
0,65	932	1,042942	NOV 22, 1994	0	0,721	1040	1.1974
0,566	834	0,933276	NOV 22, 1994	0	0,721	1030	1,185887
0,629	955	1,06668	NOV 23, 1994	0	0,61	1060	1,220427
0,65	914	1,022799	NOV 23, 1994	0	0,628	1030	1,185887
0,65	956	1,069799	NOV 23, 1994	0	0,61	1060	1,220427
0,65	970	1,085466	NOV 23, 1994	0	0,628	986	1,135228
0,65	913	1,02166	NOV 23, 1994	0	0,628	1030	1,185887
0,629	950	1,063085	NOV 23, 1994	0	0,61	1080	1,243454
0,629	881	0,985871	NOV 23, 1994	0	0,628	1050	1,208914
0,629	950	1,063085	NOV 23, 1994	0	0,61	1030	1,185887
0,65	966	1,080989	NOV 23, 1994	0	0,628	1040	1.1974
0,587	884	0,989228	NOV 23, 1994	0	0,628	1000	1,151346
0,608	867	0,970205	NOV 23, 1994	0	0,628	1040	1.1974
0,65	969	1,084346	NOV 23, 1994	0	0,61	1070	1,231941
0,671	1000	1,119036	NOV 23, 1994	0	0,628	1010	1,16286
0,65	1000	1,119036	NOV 23, 1994	0	0,628	967	1,113352
0,65	1020	1,141417	NOV 23, 1994	0	0,628	1010	1,16286
0,65	976	1,09218	NOV 23, 1994	0	0,628	973	1,12026
0,671	989	1,106727	NOV 23, 1994	0	0,629	1030	1,185887
0,65	953	1,066442	NOV 23, 1994	0	0,591	966	1,112201
0,65	987	1,104469	NOV 23, 1994	0	0,61	985	1,134076

0.608	929	1.039585	NOV 23, 1994	0	0.61.	1060	1.220427
0.629	875	0.979157	NOV 14, 1994	0	0.647	999	1.150195
0.587	941	1.053013	NOV 14, 1994	0	0.647	1070	1.231941
0.587	932	1.042942	NOV 14, 1994	0	0.647	1000	1.151346
0.608	891	0.997061	NOV 14, 1994	0	0.647	1030	1.185887
0.608	852	0.953419	NOV 14, 1994	0	0.647	962	1.107595
0.608	919	1.028394	NOV 14, 1994	0	0.628	996	1.146741
0.629	984	1.101132	NOV 14, 1994	0	0.665	976	1.123714
0.692	873	0.976919	NOV 14, 1994	0	0.628	1030	1.185887
0.671	877	0.981395	NOV 14, 1994	0	0.647	964	1.109898
0.587	849	0.950062	NOV 14, 1994	0	0.628	1010	1.16286
0.65	990	1.107846	NOV 22, 1994	0	0.628	996	1.146741
0.671	1005	1.124632	NOV 22, 1994	0	0.665	1040	1.1974
0.692	982	1.098894	NOV 22, 1994	0	0.647	975	1.122563
0.692	1002	1.121274	NOV 22, 1994	0	0.647	962	1.107595
0.692	1008	1.127989	NOV 22, 1994	0	0.647	1010	1.16286
0.692	1000	1.119036	NOV 22, 1994	0	0.628	1000	1.151346
0.692	982	1.098894	NOV 22, 1994	0	0.647	1050	1.208914
0.671	1002	1.121274	NOV 22, 1994	0	0.647	1020	1.174373
0.692	992	1.110084	NOV 22, 1994	0	0.628	1000	1.151346
0.608	903	1.01049	NOV 22, 1994	0	0.665	1060	1.220427
0.629	905	1.012728	NOV 22, 1994	0	0.591	1010	1.16286
0.671	929	1.039585	NOV 22, 1994	0	0.61	1000	1.151346
0.671	918	1.027275	NOV 22, 1994	0	0.61	1000	1.151346
0.65	924	1.03399	NOV 22, 1994	0	0.628	1030	1.185887
0.671	933	1.044061	NOV 22, 1994	0	0.591	928	1.06845
0.629	945	1.057489	NOV 22, 1994	0	0.628	1080	1.243454
0.65	940	1.051894	NOV 22, 1994	0	0.591	1010	1.16286
0.65	931	1.041823	NOV 22, 1994	0	0.591	1050	1.208914
0.65	936	1.047418	NOV 22, 1994	0	0.61	1000	1.151346
0.587	851	0.9523	NOV 22, 1994	0	0.628	1060	1.220427
0.587	927	1.037347	NOV 22, 1994	0	0.591	1030	1.185887
0.608	910	1.018323	NOV 22, 1994	0	0.591	973	1.12026
0.629	921	1.030633	NOV 22, 1994	0	0.591	1020	1.174373
0.608	875	0.979157	NOV 22, 1994	0	0.573	1000	1.151346
0.608	896	1.002657	NOV 22, 1994	0	0.61	1000	1.151346
0.608	959	1.073156	NOV 22, 1994	0	0.591	1030	1.185887
0.608	888	0.993704	NOV 22, 1994	0	0.591	1010	1.16286
0.608	937	1.048537	NOV 22, 1994	0	0.591	1010	1.16286
0.608	893	0.999299	NOV 22, 1994	0	0.591	944	1.086871
0.566	860	0.962371	NOV 22, 1994	0	0.591	1030	1.185887
0.629	925	1.035109	NOV 29, 1994	0	0.573	1010	1.16286
0.751	946	1.058608	NOV 29, 1994	0	0.591	995	1.14559
0.733	898	1.004895	NOV 29, 1994	0	0.591	936	1.07766
0.733	928	1.038466	NOV 29, 1994	0	0.536	1020	1.174373
0.733	957	1.070918	NOV 29, 1994	0	0.61	977	1.124865
0.733	939	1.050775	NOV 29, 1994	0	0.61	1030	1.185887
0.733	946	1.058608	NOV 29, 1994	0	0.591	1030	1.185887
0.751	940	1.051894	NOV 29, 1994	0	0.61	991	1.140984
0.769	961	1.075394	NOV 29, 1994	0	0.61	1020	1.174373
0.566	823	0.920967	NOV 29, 1994	0	0.591	974	1.121411

Appendix 3

Radiological Survey TA-49 Data

	Fimad Number	Pu uCi/m^2	Am uCi/M^2	Cs uCi/M^2	Violinist V.
Area 5	49-5000	0	0.61	1.019563	133
	49-5001	0	0.587	0.917226	129
	49-5002	0	0.647	1.087894	133
	49-5003	0	0.608	0.979868	129
	49-5004	0	0.591	1.059839	133
	49-5005	0	0.629	0.940716	129
	49-5006	0	0.536	0.958573	133
	49-5007	0	0.525	0.86689	129
	49-5010	0	0.587	0.903803	129
	49-5011	0	0.591	1.043728	133
	49-5012	0	0.608	0.944072	129
	49-5013	0	0.591	1.004803	133
	49-5014	0	0.587	0.950783	129
	49-5015	0	0.61	1.01611	133
	49-5016	0	0.608	1.006711	129
	49-5017	0	0.591	1.042578	133
	49-5018	0	0.554	0.988493	133
	49-5019	0	0.608	0.966443	129
	49-5020	0	0.61	1.075949	133
	49-5021	0	0.608	0.927293	129
	49-5022	0	0.591	0.997699	133
	49-5023	0	0.587	0.957494	129
	49-5024	0	0.573	1.01611	133
	49-5025	0	0.587	0.973154	129
	49-5028	0	0.587	0.980984	129
	49-5029	0	0.573	0.919448	133
	49-5030	0	0.587	0.92953	129
	49-5031	0	0.591	1.006904	133
	49-5032	0	0.587	0.975391	129
	49-5033	0	0.628	1.127733	133
	49-5034	0	0.629	0.997763	129
	49-5035	0	0.536	0.964327	133
	49-5036	0	0.61	1.042578	133
	49-5037	0	0.587	0.909396	129
	49-5038	0	0.61	1.081703	133
	49-5039	0	0.587	0.961969	129
	49-5040	0	0.591	1.021864	133
	49-5041	0	0.566	0.948546	129
	49-5044	0	0.566	0.970917	129
	49-5045	0	0.591	1.056387	133
	49-5046	0	0.587	0.947427	129
	49-5047	0	0.61	1.006904	133
	49-5048	0	0.587	0.919463	129
	49-5049	0	0.591	1.040276	133
	49-5050	0	0.591	0.987342	133
	49-5051	0	0.587	0.927293	129
	49-5052	0	0.573	1.105869	133
	49-5053	0	0.587	0.940716	129
	49-5054	0	0.591	0.975834	133

Fimad Number	Pu uCi/m^2	Am uCi/M^2	Cs uCi/M^2	Violinist . V.
49-5059	0	0.587	0.91387	129
49-5060	0	0.545	0.861298	129
49-5061	0	0.564	1.002301	133
49-5062	0	0.566	0.918346	129
49-5063	0	0.573	1.040276	133
49-5064	0	0.628	1.094361	133
49-5065	0	0.629	1.016779	129
49-5066	0	0.61	1.064442	133
49-5067	0	0.629	0.904922	129
49-5068	0	0.628	1.035673	133
49-5069	0	0.608	0.939597	129
49-5070	0	0.628	1.140391	133
49-5071	0	0.629	0.993289	129
49-5072	0	0.608	0.919463	129
49-5073	0	0.628	1.087457	133
49-5074	0	0.587	0.982103	129
49-5075	0	0.61	1.048331	133
49-5076	0	0.608	1.025727	129
49-5077	0	0.647	1.073648	133
49-5078	0	0.629	0.969799	129
49-5079	0	0.628	0.957422	133
49-5080	0	0.587	0.925056	129
49-5081	0	0.61	1.050633	133
49-5082	0	0.608	0.970917	129
49-5083	0	0.628	1.034522	133
49-5084	0	0.629	0.965324	129
49-5085	0	0.591	1.005754	133
49-5086	0	0.608	0.98434	129
49-5087	0	0.628	1.066743	133
49-5088	0	0.629	0.964206	129
49-5089	0	0.628	1.100116	133

	Fimad Number	Pu uCi/m^2	Am uCi/M^2	Cs uCi/M^2	Violinist . V.
Area 6	49-6082	0	0,65	1,09396	129
Open	49-6083	0	0,665	1.1542	133
Burning	49-6084	0	0,629	0,995526	129
Landfill	49-6085	0	0,61	1,058387	133
Area	49-6086	0	0,587	0,959732	129
	49-6087	0	0,62	1,029919	133
	49-6088	0	0,608	0,996644	129
	49-6089	0	0,59	1,027618	133
	49-6090	0	0,629	1,022371	129
	49-6091	0	0,62	1,018412	133
	49-6092	0	0,608	0,96868	129
	49-6093	0	0,55	0,934407	133
	49-6094	0	0,608	0,932886	129
	49-6095	0	0,554	1,079402	133
	49-6096	0	0,608	0,970917	129
	49-6097	0	0,59	0,991845	133
	49-6098	0	0,608	0,914989	129
	49-6099	0	0,61	1,002301	133
	49-6100	0	0,608	0,910515	129
	49-6101	0	0,61	1,078251	133
	49-6102	0	0,608	1,02349	129
	49-6103	0	0,61	0,956272	133
	49-6104	0	0,608	0,905324	129
	49-6105	0	0,587	0,964206	129
	49-6106	0	0,608	0,897092	129
	49-6107	0	0,608	1,005593	129
	49-6108	0	0,608	0,91387	129
	49-6109	0	0,608	0,95302	129
	49-6110	0	0,608	0,947427	129
	49-6111	0	0,629	0,969799	129
	49-6112	0	0,587	0,977829	129
	49-6113	0	0,587	0,96868	129
	49-6114	0	0,587	0,885906	129
	49-6115	0	0,61	1,036824	133
	49-6116	0	0,608	0,939597	129
	49-6117	0	0,628	1,004603	133
	49-6118	0	0,608	0,973154	129
	49-6119	0	0,628	1,089758	133
	49-6120	0	0,629	1,017897	129
	49-6121	0	0,61	1,041427	133
	49-6122	0	0,608	0,986577	129
	49-6123	0	0,591	1,037975	133
	49-6124	0	0,608	0,958613	129
	49-6125	0	0,647	1,084005	133
	49-6126	0	0,65	1,026846	129
	49-6127	0	0,647	1,098964	133
	49-6128	0	0,684	1,242808	133
	49-6129	0	0,692	1,059284	129
	49-6130	0	0,604	1.142893	133

Fimad Number	Pu uCi/m^2	Am uCi/M^2	Cs uCi/M^2	Violinist-V-
49-6131	0	0.692	0.988814	129
49-6132	0	0.647	1.117376	133
49-6133	0	0.629	1.029083	129
49-6134	0	0.665	1.242808	133
49-6135	0	0.65	1.019016	129
49-6136	0	0.61	1.073648	133
49-6137	0	0.608	0.95302	129
49-6138	0	0.61	1.034522	133
49-6139	0	0.587	0.957494	129
49-6140	0	0.591	0.978136	133
49-6141	0	0.608	0.880313	129
49-6142	0	0.61	1.059839	133
49-6143	0	0.566	0.949664	129
49-6144	0	0.61	1.089758	133
49-6145	0	0.608	1.011186	129
49-6146	0	0.628	1.041427	133
49-6147	0	0.608	0.96868	129
49-6148	0	0.591	0.980437	133
49-6149	0	0.587	0.919463	129
49-6150	0	0.591	0.997699	133
49-6151	0	0.629	1.020134	129
49-6152	0	0.628	1.084005	133
49-6153	0	0.629	0.997763	129
49-6154	0	0.626	1.064442	133
49-6155	0	0.608	0.986577	129
49-6156	0	0.665	1.150748	133
49-6157	0	0.629	1.061521	129
49-6158	0	0.628	1.12313	133
49-6159	0	0.65	1.040268	129
49-6160	0	0.628	1.116226	133
49-6161	0	0.671	1.03915	129
49-6162	0	0.647	1.116226	133
49-6163	0	0.587	0.900447	129
49-6164	0	0.628	1.150748	133
49-6165	0	0.65	1.070063	129
49-6166	0	0.665	1.196778	133
49-6167	0	0.692	1.185682	129
49-6168	0	0.665	1.150748	133
49-6169	0	0.671	1.091723	129
49-6170	0	0.721	1.27733	133
49-6171	0	0.671	1.14094	129
49-6172	0	0.702	1.219793	133
49-6173	0	0.692	1.196868	129
49-6174	0	0.684	1.150748	133
49-6175	0	0.692	1.152125	129
49-6176	0	0.721	1.254315	133
49-6177	0	0.734	1.331096	129
49-6178	0	0.702	1.36939	133
49-6179	0	0.692	1.252796	129

Fimad Number	Pu uCi/m^2	Am uCi/M^2	Cs uCi/M^2	Violinist V-
49-6180	0	0.684	1.196778	133
49-6181	0	0.692	1.118568	129
49-6182	0	0.647	1.162255	133
49-6183	0	0.692	1.107383	129
49-6184	0	0.684	1.196778	133
49-6185	0	0.65	1.097315	129
49-6186	0	0.702	1.219793	133
49-6187	0	0.713	1.096197	129
49-6188	0	0.684	1.2313	133
49-6189	0	0.692	1.059284	129
49-6190	0	0.647	1.09206	133
49-6191	0	0.608	1.063758	129
49-6192	0	0.665	1.132336	133
49-6193	0	0.713	1.252796	129
49-6194	0	0.665	1.162255	133
49-6195	0	0.734	1.364653	129
49-6196	0	0.739	1.334868	133
49-6197	0	0.734	1.152125	129
49-6198	0	0.758	1.311653	133
49-6199	0	0.713	1.152125	129
49-6200	0	0.721	1.254315	133
49-6201	0	0.692	1.252796	129
49-6202	0	0.721	1.357883	133
49-6203	0	0.734	1.208054	129
49-6204	0	0.721	1.196778	133
49-6205	0	0.734	1.174497	129
49-6206	0	0.702	1.219793	133
49-6207	0	0.65	1.025727	129
49-6208	0	0.665	1.18527	133
49-6209	0	0.671	1.092841	129
49-6210	0	0.647	1.095512	133
49-6211	0	0.65	1.074944	129
49-6212	0	0.628	1.103567	133
49-6213	0	0.628	0.990794	133
49-6214	0	0.629	0.991051	129
49-6215	0	0.628	1.050633	133
49-6216	0	0.629	0.950783	129
49-6217	0	0.591	1.03107	133
49-6218	0	0.608	0.98868	129
49-6219	0	0.591	1.039125	133
49-6220	0	0.65	1.088367	129
49-6221	0	0.671	1.074944	129
49-6222	0	0.692	1.163311	129
49-6223	0	0.608	0.995528	129
49-6224	0	0.665	1.127733	133
49-6225	0	0.684	1.162255	133
49-6226	0	0.702	1.119678	133
49-6227	0	0.665	1.150748	133
49-6308	0	0.684	1.150748	133

Fimad Number	Pu uCi/m^2	Am uCi/M^2	Cs uCi/M^2	Violinist. V.
49-6309	0	0.739	1.208285	133
49-6310	0	0.671	1.110738	129
49-6311	0	0.713	1.152125	129
49-6312	0	0.776	1.300345	133
49-6313	0	0.776	1.36939	133
49-6314	0	0.755	1.230425	129
49-6315	0	0.758	1.196778	133
49-6316	0	0.758	1.173763	133
49-6317	0	0.739	1.2313	133
49-6318	0	0.713	1.106264	129
49-6319	0	0.692	1.196868	129
49-6320	0	0.713	1.071588	129
49-6321	0	0.734	1.241611	129
49-6322	0	0.739	1.173763	133
49-6323	0	0.692	1.104027	129
49-6324	0	0.713	1.286353	129
49-6325	0	0.739	1.265823	133

	Fimad Number	Pu uCi/m^2	Am uCi/M^2	Cs uCi/M^2	Violinist V.
Area 6	49-6000	0	0.545	0.893736	129
Microwav	49-6001	0	0.591	1.102417	133
Test	49-6002	0	0.587	0.942953	129
Facility	49-6003	0	0.554	0.979287	133
	49-6004	0	0.573	1.048331	133
	49-6005	0	0.587	0.927293	129
	49-6006	0	0.591	0.970985	133
	49-6007	0	0.566	0.922819	129
	49-6009	0	0.591	1.036824	133
	49-6010	0	0.587	0.983221	129
	49-6011	0	0.573	0.956272	133
	49-6012	0	0.587	0.928412	129
	49-6013	0	0.591	0.981588	133
	49-6014	0	0.608	0.889262	129
	49-6015	0	0.591	1.003452	133
	49-6016	0	0.566	0.927293	129
	49-6017	0	0.536	0.928654	133
	49-6018	0	0.566	0.908277	129
	49-6019	0	0.573	1.001151	133
	49-6020	0	0.587	0.91387	129
	49-6021	0	0.573	1.09206	133
	49-6022	0	0.587	0.930649	129
	49-6023	0	0.554	0.988493	133
	49-6024	0	0.608	0.974273	129
	49-6025	0	0.554	0.994246	133
	49-6027	0	0.587	0.885906	129
	49-6028	0	0.536	0.915995	133
	49-6029	0	0.587	0.946309	129
	49-6030	0	0.443	0.789413	133
	49-6031	0	0.545	0.904922	129
	49-6032	0	0.554	1.025316	133
	49-6033	0	0.525	0.805369	129
	49-6034	0	0.554	0.981588	133
	49-6035	0	0.545	0.834452	129
	49-6037	0	0.554	1.008055	133
	49-6038	0	0.566	0.861298	129
	49-6039	0	0.517	0.895282	133
	49-6040	0	0.482	0.769575	129
	49-6041	0	0.406	0.716916	133
	49-6042	0	0.545	0.837808	129
	49-6043	0	0.517	0.884925	133
	49-6044	0	0.443	1.011507	133
	49-6045	0	0.482	0.799776	129
	49-6046	0	0.425	0.795167	133
	49-6047	0	0.503	0.815436	129
	49-6048	0	0.554	0.98389	133
	49-6049	0	0.608	0.986577	129
	49-6050	0	0.608	0.966443	129
	49-6051	0	0.536	0.864212	133

Fimad Number	Pu uCi/m^2	Am uCi/M^2	Cs uCi/M^2	Violinist V.
49-6052	0	0.44	0.668904	129
49-6053	0	0.482	0.814318	129
49-6054	0	0.573	1.002301	133
49-6055	0	0.587	0.932886	129
49-6056	0	0.61	1.056387	133
49-6058	0	0.443	0.688147	133
49-6060	0	0.573	0.964327	133
49-6061	0	0.587	0.910107	129
49-6063	0	0.377	0.616331	129
49-6065	0	0.608	0.961969	129
49-6066	0	0.61	0.994246	133
49-6067	0	0.626	1.037975	133
49-6068	0	0.587	0.850112	129
49-6069	0	0.566	0.949664	129
49-6070				
49-6071	0	0.75	0.970917	129
49-6072	0	0.554	0.979287	133
49-6073	0	0.61	1.071346	133
49-6074				
49-6075	0	0.647	0.979287	133
49-6076	0	0.591	1.054085	133
49-6077	0	0.591	1.124281	133
49-6078	0	0.61	1.041427	133
49-6079	0	0.629	1.03915	129
49-6080	0	0.545	0.85906	129
49-6081	0	0.608	0.853466	129

	Fimad Number	Pu uCi/m^2	Am uCi/M^2	Cs uCi/M^2	Violinist V-
Area 6	49-6230	0	0.832	1.380898	133
Trenches	49-6231	0	0.892	1.300345	133
	49-6232	0	0.813	1.380898	133
	49-6233	0	0.832	1.36939	133
	49-6234	0	0.832	1.449942	133
	49-6235	0	0.734	1.163311	129
	49-6236	0	0.869	1.46145	133
	49-6237	0	0.832	1.357883	133
	49-6238	0	0.671	1.029083	129
	49-6239	0	0.671	1.029083	129
	49-6240	0	0.692	1.074944	129
	49-6241	0	0.832	1.051454	129
	49-6242	0	0.671	1.092841	129
	49-6243	0	0.713	1.087248	129
	49-6244	0	0.713	1.118568	129
	49-6245	0	0.721	1.254315	133
	49-6246	0	0.721	1.196778	133
	49-6247	0	0.739	1.2313	133
	49-6248	0	0.739	1.2313	133
	49-6249	0	0.721	1.300345	133
	49-6250	0	0.758	1.208285	133
	49-6251	0	0.758	1.18527	133
	49-6252	0	0.795	1.300345	133
	49-6253	0	0.795	1.265823	133
	49-6254	0	0.758	1.2313	133
	49-6255	0	0.758	1.254315	133
	49-6256	0	0.755	1.14094	129
	49-6257	0	0.755	1.118331	129
	49-6258	0	0.797	1.152125	129
	49-6259	0	0.776	1.241611	129
	49-6260	0	0.797	1.208054	129
	49-6261	0	0.734	1.163311	129
	49-6262	0	0.671	1.07047	129
	49-6263	0	0.671	1.163311	129
	49-6264	0	0.65	1.065996	129
	49-6265	0	0.692	1.087248	129
	49-6266	0	0.629	0.980984	129
	49-6267	0	0.721	1.18527	133
	49-6268	0	0.692	1.095078	129
	49-6269	0	0.739	1.2313	133
	49-6270	0	0.692	1.08613	129
	49-6271	0	0.702	1.18527	133
	49-6272	0	0.797	1.185682	129
	49-6273	0	0.758	1.311653	133
	49-6274	0	0.776	1.219239	129
	49-6275	0	0.739	1.311653	133
	49-6276	0	0.734	1.219239	129
	49-6277	0	0.776	1.334868	133
	49-6278	0	0.713	1.072707	129

Fimad Number	Pu uCi/m^2	Am uCi/M^2	Cs uCi/M^2	Violinist V-
49-6279	0	0.795	1.32336	133
49-6280	0	0.692	1.033557	129
49-6281	0	0.832	1.32336	133
49-6282	0	0.692	1.095078	129
49-6283	0	0.832	1.208285	133
49-6284	0	0.671	1.051454	129
49-6285	0	0.813	1.32336	133
49-6286	0	0.758	1.300345	133
49-6287	0	0.629	1.043624	129
49-6288	0	0.692	1.089485	129
49-6289	0	0.85	1.380898	133
49-6290	0	0.869	1.380898	133
49-6291	0	0.713	1.129754	129
49-6292	0	0.887	1.357883	133
49-6293	0	0.692	1.090604	129
49-6294	0	0.832	1.36939	133
49-6295	0	0.692	1.096197	129
49-6296	0	0.869	1.403913	133
49-6297	0	0.713	1.10179	129
49-6298	0	0.713	1.10179	129
49-6299	0	0.832	1.380898	133
49-6300	0	0.671	1.077181	129
49-6301	0	0.813	1.346375	133
49-6302	0	0.671	1.05481	129
49-6303	0	0.795	1.357883	133
49-6304	0	0.692	1.129754	129
49-6305	0	0.832	1.36939	133
49-6306	0	0.832	1.357883	133
49-6307	0	0.692	1.163311	129
49-6326	0	0.758	1.208285	133
49-6327	0	0.758	1.32336	133
49-6328	0	0.629	1.006711	129
49-6329	0	0.671	1.059284	129
49-6330	0	0.629	1.068233	129
49-6331	0	0.629	0.997763	129
49-6332	0	0.713	1.174497	129
49-6333	0	0.65	1.040268	129
49-6334	0	0.795	1.405063	133
49-6335	0	0.795	1.357883	133
49-6336	0	0.795	1.426928	133
49-6337	0	0.758	1.32336	133
49-6338	0	0.65	1.0783	129
49-6339	0	0.776	1.196778	133
49-6340	0	0.776	1.380898	133

	Fimad Number	Pu uCi/m^2	Am uCi/M^2	Cs uCi/M^2	Violinist V.
Area 10	49-7500	0	0.629	1	129
	49-7501	0	0.647	1.063291	133
	49-7502	0	0.608	1.03915	129
	49-7503	0	0.647	1.071348	133
	49-7504	0	0.587	0.925056	129
	49-7505	0	0.647	1.087457	133
	49-7506	0	0.629	0.988443	129
	49-7507	0	0.628	1.094361	133
	49-7508	0	0.65	1.032438	129
	49-7509	0	0.665	1.196778	133
	49-7510	0	0.671	1.03915	129
	49-7511	0	0.628	1.041427	133
	49-7512	0	0.608	1.010067	129
	49-7513	0	0.665	1.10817	133
	49-7514	0	0.671	1.010067	129
	49-7515	0	0.647	1.112773	133
	49-7516	0	0.671	1.003356	129
	49-7517	0	0.61	1.089758	133
	49-7518	0	0.608	0.961069	129
	49-7519	0	0.684	1.056387	133
	49-7520	0	0.65	0.995526	129
	49-7521	0	0.628	1.033372	133
	49-7522	0	0.587	0.964208	129
	49-7523	0	0.647	1.088608	133
	49-7524	0	0.65	1.034676	129
	49-7525	0	0.665	1.070196	133
	49-7526	0	0.671	1.097315	129
	49-7527	0	0.628	1.0771	133
	49-7528	0	0.608	0.975391	129
	49-7529	0	0.702	0.128582	133
	49-7530	0	0.671	1.03915	129
	49-7531	0	0.665	1.101266	133
	49-7532	0	0.629	1.022371	129
	49-7533	0	0.647	1.089758	133
	49-7534	0	0.629	1.048098	129
	49-7535	0	0.628	1.063291	133
	49-7536	0	0.525	0.879195	129
	49-7537	0	0.61	1.013809	133
	49-7538	0	0.608	0.964206	129
	49-7539	0	0.517	0.906789	133
	49-7540	0	0.629	0.957494	129
	49-7541	0	0.628	1.079402	133
	49-7542	0	0.608	0.951669	129
	49-7543	0	0.573	1.040276	133
	49-7544	0	0.684	1.148446	133
	49-7545	0	0.734	1.162255	129
	49-7546	0	0.713	1.124281	129
	49-7547	0	0.758	1.27733	133
	49-7548	0	0.702	1.150748	133

Fimad Number	Pu uCi/m^2	Am uCi/M^2	Cs uCi/M^2	Violinist, V.
49-7549	0	0.65	1.042578	129
49-7550	0	0.671	1.101266	129
49-7551	0	0.739	1.254315	133
49-7552	0	0.692	1.162255	129

	Fimad Number	Pu uCi/m^2	Am uCi/M^2	Cs uCi/M^2	Violinist V.
Area 11	49-8021	0	0.608	0.973562	129
	49-8022	0	0.608	0.971324	129
	49-8023	0	0.587	0.997061	129
	49-8024	0	0.587	0.934395	129
	49-8025	0	0.566	0.943348	129
	49-8026	0	0.573	1.173763	133
	49-8027	0	0.591	1.13809	133
	49-8028	0	0.573	1.132338	133
	49-8029	0	0.591	1.146145	133
	49-8030	0	0.591	1.162255	133
	49-8031	0	0.587	0.889634	129
	49-8032	0	0.566	0.9053	129
	49-8033	0	0.587	0.879563	129
	49-8034	0	0.587	0.985871	129
	49-8035	0	0.587	0.944467	129
	49-8036	0	0.573	1.136939	133
	49-8037	0	0.573	1.111623	133
	49-8038	0	0.591	1.103567	133
	49-8039	0	0.591	1.142693	133
	49-8040	0	0.758	1.196778	133
	49-8041	0	0.536	1.090909	133
	49-8042	0	0.65	1.002857	129
	49-8043	0	0.591	1.136939	133
	49-8044	0	0.587	0.900824	129
	49-8045	0	0.573	1.136939	133
	49-8046	0	0.587	0.947824	129
	49-8047	0	0.566	0.897467	129
	49-8048	0	0.573	1.048331	133
	49-8049	0	0.573	1.13809	133
	49-8050	0	0.587	0.897467	129
	49-8051	0	0.573	1.095512	133
	49-8052	0	0.608	0.945586	129
	49-8053	0	0.573	1.162255	133

	Fimad Number	Pu uCi/m^2	Am uCi/M^2	Cs uCi/M^2	Violinist . V.
Area 12	49-9000	0	0,647	1,041427	133
	49-9001	0	0,642	1,013423	129
	49-9002	0	0,647	1,081703	133
	49-9003	0	0,629	0,98434	129
	49-9004	0	0,665	1,047181	133
	49-9005	0	0,65	0,919483	129
	49-9006	0	0,684	1,113924	133
	49-9007	0	1,23	1,756152	129
	49-9008	0	0,647	1,089758	133
	49-9009	0	0,629	0,951902	129
	49-9010	0	0,647	1,113924	133
	49-9011	0	0,587	0,949664	129
	49-9012	0	0,628	1,088608	133
	49-9013	0	0,629	1,025727	129
	49-9014	0	0,665	1,025316	133
	49-9015	0	0,629	0,970917	129
	49-9016	0	0,628	1,041427	133
	49-9017	0	0,629	0,951902	129
	49-9018	0	0,587	0,927293	129
	49-9019	0	1,51	2,002237	129
	49-9020	0	0,65	0,949664	129
	49-9021	0	0,61	1,01611	133
	49-9022	0	0,647	0,98504	133
	49-9023	0	0,608	0,991051	129
	49-9024	0	0,628	1,004603	133
	49-9025	0	0,629	0,978747	129
	49-9026	0	0,647	1,039125	133
	49-9027	0	0,628	1,079402	133
	49-9028	0	0,65	1,001119	129
	49-9029	0	0,702	1,127733	133
	49-9030	0	0,608	0,95302	129
	49-9031	0	0,628	1,136788	133
	49-9032	0	0,965	1,431767	129
	49-9033	0	0,629	0,998881	129
	49-9034	0	0,587	0,969732	129
	49-9035	0	0,776	1,230425	129
	49-9036	0	1,35	2,266974	133
	49-9037	0	0,629	1,017897	129
	49-9038	0	0,629	0,97651	129
	49-9039	0	0,665	1,160746	133
	49-9040	0	0,647	1,136939	133
	49-9041	0	0,628	1,061784	133
	49-9042	0	0,525	0,810962	129
	49-9043	0	0,65	1,06264	129
	49-9045	0	0,608	0,948546	129
	49-9046	0	0,647	1,097814	133
	49-9047	0	0,608	0,969799	129
	49-9048	0	0,647	1,037975	133
	49-9049	0	0,608	0,96085	129

Fimad Number	Pu uCi/m^2	Am uCi/M^2	Cs uCi/M^2	Violinist. V-
49-9052	0	0.629	0.932886	129
49-9053	0	0.647	1.173763	133
49-9054	0	0.61	1.025316	133
49-9055	0	0.591	0.941312	133
49-9056	0	0.517	0.857307	133
49-9057	0	0.462	0.742232	133
49-9058	0	0.587	0.883669	129
49-9059	0	0.545	0.861298	129
49-9060	0	0.525	0.878076	129
49-9061	0	0.525	0.861298	129
49-9062	0	0.525	0.85123	129
49-9063	0	0.608	0.972036	129
49-9064	0	0.482	0.840045	129
49-9065	0	0.482	0.743848	129
49-9066	0	0.671	1.042506	129
49-9067	0	0.545	0.857942	129
49-9068	0	0.545	0.864653	129
49-9069	0	0.721	1.18527	133
49-9070	0	0.861	1.297539	129
49-9071	0	0.986	1.510067	129
49-9072	0	0.671	0.977629	129
49-9073	0	1.93	2.550336	129
49-9074	0	0.86	1.196868	129
49-9075	0	0.797	1.208054	129
49-9076	0	0.713	1.067114	129
49-9077	0	0.713	1.088367	129
49-9078	0	0.65	1.03915	129
49-9079	0	0.671	1.118568	129
49-9080	0	1.82	2.326622	129
49-9081	0	0.692	1.019016	129
49-9082	0	3.04	4.049217	129
49-9083	0	0.713	1.077181	129
49-9084	0	0.671	1.059284	129
49-9085	0	0.692	1.087248	129
49-9086	0	0.671	1.002237	129

	Fimad Number	Pu uCi/m^2	Am uCi/M^2	Cs uCi/M^2	Violinist V-
Area 1	49-1035	0	0.566	0.914253	129
	49-1036	0	0.608	0.943348	129
	49-1037	0	0.608	0.947824	129
	49-1038	0	0.587	0.973562	129
	49-1039	0	0.536	0.965478	133
	49-1040	0	0.503	0.844872	129
	49-1041	0	0.628	1.162255	133
	49-1042	0	0.628	1.196778	133
	49-1043	0	0.61	1.173763	133
	49-1044	0	0.628	1.150748	133
	49-1045	0	0.573	1.135788	133
	49-1046	0	0.61	1.140391	133
	49-1047	0	0.525	0.820254	129
	49-1048	0	0.573	1.150748	133
	49-1049	0	0.61	1.18527	133
	49-1050	0	0.587	0.931038	129
	49-1051	0	0.525	0.907539	129
	49-1052	0	0.482	0.83592	129
	49-1053	0	0.687	1.242808	133
	49-1054	0	0.85	1.075949	133
	49-1055	0	0.739	1.346375	133
	49-1056	0	0.739	1.27733	133
	49-1057	0	0.665	1.288838	133
	49-1058	0	0.482	0.794516	129
	49-1059	0	0.545	0.819135	129
	49-1060	0	0.684	1.219793	133
	49-1061	0	0.545	0.861601	129
	49-1062	0	0.525	0.875086	129
	49-1063	0	0.573	1.139241	133
	49-1064	0	0.869	1.27733	133
	49-1065	0	0.61	1.162255	133
	49-1066	0	0.503	0.873967	129
	49-1067	0	0.61	1.2313	133
	49-1068	0	0.503	0.901943	120
	49-1069	0	0.628	1.2313	133
	49-1070	0	0.525	0.892991	129
	49-1071	0	0.61	1.196778	133
	49-1072	0	0.503	0.810897	129
	49-1073	0	0.869	0.894131	133
	49-1074	0	0.629	0.892991	129
	49-1075	0	0.629	0.981468	129
	49-1076	0	0.629	0.959014	129
	49-1077	0	0.587	1.07987	129
	49-1078	0	0.628	1.147296	133

	Fimad Number	Pu uCi/m^2	Am uCi/M^2	Cs uCi/M^2	Violinist V.
Area 2	49-2049	0	0.702	1.18527	133
	49-2050	0	0.671	1.040268	129
	49-2051	0	0.739	1.208285	133
	49-2052	0	0.758	1.27733	133
	49-2053	0	0.702	1.265823	133
	49-2054	0	0.684	1.18527	133
	49-2055	0	0.647	1.087457	133
	49-2056	0	0.692	1.067114	129
	49-2057	0	0.692	1.057047	129
	49-2058	0	0.665	1.136939	133
	49-2059	0	0.671	1.059284	129
	49-2060	0	0.721	1.196778	133
	49-2061	0	0.692	1.055928	129
	49-2062	0	0.684	1.196778	133
	49-2063	0	0.713	1.14094	129
	49-2064	0	0.721	1.254315	133
	49-2201	0	0.556	0.912752	129
	49-2202	0	0.629	0.970917	129
	49-2203	0	0.591	1.06214	133
	49-2204	0	0.608	1.02349	129
	49-2206	0	0.61	1.063291	133
	49-2207	0	0.629	1.034676	129
	49-2208	0	0.628	1.125432	133
	49-2209	0	0.647	1.135788	133
	49-2210	0	0.608	1.013423	129
	49-2212	0	0.591	1.010357	133
	49-2214	0	0.573	1.034522	133
	49-2215	0	0.554	0.965478	133
	49-2217	0	0.591	1.050633	133
	49-2218	0	0.61	1.065593	133
	49-2219	0	0.629	1.055928	129
	49-2220	0	0.628	1.036824	133
	49-2221	0	0.61	1.002301	133
	49-2222	0	0.608	0.96085	129
	49-2223	0	0.591	1.067894	133
	49-2224	0	0.608	1.006711	129
	49-2225	0	0.628	1.054085	133
	49-2226	0	0.629	0.998881	129
	49-2227	0	0.525	0.787472	129
	49-2228	0	0.608	0.972036	129
	49-2229	0	0.629	1.017897	129
	49-2230	0	0.608	0.949664	129
	49-2301	0	0.61	1.020713	133
	49-2302	0	0.608	0.988577	129
	49-2303	0	0.608	1.02349	129
	49-2304	0	0.587	0.987696	129
	49-2305	0	0.628	1.150748	133
	49-2306	0	0.61	1.173763	133
	49-2307	0	0.61	1.115075	133

Fimad Number	Pu uCi/m^2	Am uCi/M^2	Cs uCi/M^2	Violinist . V.
49-2308	0	0.608	1.003356	129
49-2309	0	0.608	0.987696	129
49-2310	0	0.61	1.074799	133
49-2311	0	0.545	0.812081	129
49-2312	0	0.61	1.110472	133
49-2313	0	0.587	0.956376	129
49-2531	0	0.587	0.966443	129
49-2532	0	0.647	1.065593	133
49-2533	0	0.608	1.029083	129
49-2534	0	0.665	1.162255	133
49-2535	0	0.902	1.263982	129
49-2536	0	0.721	1.139241	133
49-2537	0	0.65	0.988814	129
49-2538	0	0.628	1.085155	133
49-2539	0	0.629	1.129754	129
49-2540	0	0.702	1.16527	133
49-2541	0	0.608	0.932886	129
49-2908	0	0.587	0.850112	129
49-2909	0	0.536	0.990794	133
49-2910	0	0.536	0.945915	133
49-2911	0	0.573	1.03107	133
49-2912	0	0.554	0.905639	133
49-2913	0	0.517	0.949367	133
49-2914	0	0.545	0.901566	129
49-2915	0	0.587	0.946309	129
49-2916	0	0.556	0.900447	129
49-2917	0	0.587	0.920582	129
49-2918.	0	0.566	0.910515	129
49-2919	0	0.554	1.004603	133
49-2920	0	0.566	0.842282	129
49-2921	0	0.517	0.897583	133
49-2922	0	0.545	0.907159	129
49-2923	0	0.545	0.833333	129
49-2924	0	0.566	0.870246	129
49-2925	0	0.536	0.96693	133
49-2926	0	0.545	0.828859	129
49-2927	0	0.573	0.920598	133
49-2928	0	0.554	0.920598	133
49-2929	0	0.554	0.978136	133
49-2930	0	0.56	0.87472	129
49-2931	0	0.554	0.936709	133
49-2932	0	0.545	0.885906	129
49-2933	0	0.55	0.883669	129
49-2934	0	0.556	0.86689	129
49-2935	0	0.587	0.86689	129
49-2936	0	0.545	0.918345	129
49-2937	0	0.566	0.854586	129
49-2938	0	0.573	0.971231	133
49-2939	0	0.573	0.979287	133

Fimad Number	Pu uCi/m^2	Am uCi/M^2	Cs uCi/M^2	Violinist V.
49-2940	0	0.573	1.021864	133
49-2941	0	0.554	0.966628	133
49-2942	0	0.573	0.98389	133
49-2943	0	0.554	0.972382	133

	Fimad Number	Pu uCi/m^2	Am uCi/M^2	Cs uCi/M^2	Violinist V.
Area 3	49-3000	0	0.61	1.055236	133
	49-3001	0	0.608	0.903803	129
	49-3002	0	0.61	1.043728	133
	49-3003	0	0.608	0.958376	129
	49-3004	0	0.591	1.004603	133
	49-3005	0	0.507	0.948546	129
	49-3006	0	0.61	1.005754	133
	49-3007	0	0.629	0.994407	129
	49-3008	0	0.591	1.047181	133
	49-3009	0	0.629	0.910515	129
	49-3010	0	0.545	0.881432	120
	49-3011	0	0.61	1.051784	133
	49-3012	0	0.587	0.967562	129
	49-3013	0	0.61	1.032221	133
	49-3014	0	0.608	0.92963	129
	49-3015	0	0.573	1.011507	133
	49-3016	0	0.566	0.872483	129
	49-3017	0	0.61	1.088608	133
	49-3018	0	0.628	1.026467	133
	49-3019	0	0.629	1.063758	129
	49-3020	0	0.608	0.91387	129
	49-3021	0	0.628	1.111623	133
	49-3022	0	0.629	1.030201	129
	49-3023	0	0.65	1.057047	129
	49-3024	0	0.684	1.162255	133
	49-3025	0	0.65	1.001119	129
	49-3026	0	0.684	1.162255	133

	Fimad Number	Pu uCl/m^2	Am uCl/M^2	Cs uCl/M^2	Violinist . V-
Area 4	49-4000	0	0.61	1.020713	133
	49-4001	0	0.608	1.003356	129
	49-4002	0	0.647	1.12313	133
	49-4003	0	0.608	0.978747	129
	49-4004	0	0.629	0.989933	129
	49-4005	0	0.591	1.067894	133
	49-4006	0	0.65	0.991051	129
	49-4007	0	0.61	1.097814	133
	49-4008	0	0.647	1.144994	133
	49-4009	0	0.587	0.89821	129
	49-4010	0	0.591	0.996548	133
	49-4011	0	0.608	0.969799	129
	49-4012	0	0.608	0.931767	129
	49-4013	0	0.61	1.0771	133
	49-4014	0	0.65	1.004474	129
	49-4015	0	0.573	0.991945	133
	49-4016	0	0.573	1.023015	133
	49-4017	0	0.608	0.987698	129
	49-4018	0	0.608	1.016779	129
	49-4019	0	0.628	1.130035	133