

OFFICE MEMORANDUM

TO : K. J. Schiager, H-8

DATE: April 29, 1974

Via : M. A. Rogers, H-8

MARJ

FROM : D. McCurdy and W. Goode

D. McCurdy
W. Goode

SUBJECT : Plutonium-Americium Surface Contamination and External
Radiation Survey of Area T Waste Disposal Site

SYMBOL : H8-WM-180

Attached is a summary of the survey conducted by W. Goode and D. McCurdy on March 22, 1974 regarding surface contamination and external radiation levels of the fenced portion of the waste burial site designated as Area T. The basic conclusions are:

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TA-21

1. There is no Pu surface contamination (less than approx. $1.2 \mu\text{Ci}/\text{m}^2$) within the boundaries of the fenced site.
2. Americium-241 was detected in Pit #1, but at a level of only $1.1 \mu\text{Ci}/\text{m}^2$ assuming surface contamination.
3. No significant levels of external radiation could be attributed to the radioactivity within the waste pits 1 and 2 of Area T.

DEM/ WEG:jb

cc: K. Pashman, W. Goode, M. Rogers, J. Warren



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Plutonium-Americium Surface Contamination and External Radiation Survey of Area T Waste Disposal Site

On March 22, 1974 investigators W. Goode, D. McCurdy, K. Pashman, and M. Rogers conducted a radiological and mapping survey of the Area T waste disposal area. The specific purpose of the survey was to determine the Pu-Am surface contamination and the external radiation levels which could be attributed to plutonium wastes (and other contaminants) contained within the two waste leaching pits of the site designated as Pits 1 and 3. Wastes from the processing of plutonium at TA-21 were released to these pits as well as Pits 2 and 4 from 1943 to 1952. A total of 10 Ci of ^{239}Pu was discharged to the four absorption pits during the nine years of operation.

The external radiation levels at ten monitoring points within the fenced* portion of Area T were measured by a calibrated Reutor Stokes high-pressure ionization chamber dosimetry system, Model #RSS-111. The sensitivity range of the RSS-111 system is 0-150 $\mu\text{R/hr}$ and is somewhat energy dependent at the lower energy range (0-200 keV). Due to the design of the system its response begins at 50 keV and doesn't reach proper sensitivity until about 70 keV.

The Reutor Stokes system was checked for proper function outside the OHL Building. An environmental background reading of $18 \pm 3 \mu\text{R/hr}$ was measured at the OHL's TLD station, this value agreed with previous external radiation measurements from the TLD records. The instrument was also checked by placing a $10 \mu\text{Ci } ^{137}\text{Cs}$ source one-half meter from the instrument. The corresponding reading agreed with the expected increase over background. All external radiation measurements at the Area T site were taken over flat areas and at a height of one meter above ground level.

The results of the external radiation measurements at the ten monitoring stations (see Fig.1) are given in Table 1. The range of the measured values was between normal background ($18 \mu\text{R/hr}$) and a maximum of $24 \mu\text{R/hr}$. There was a noted increase

*Fenced refers to the security fence surrounding the area.

in the external radiation levels as one approached Building 286, where radioactive materials are being stored. Since the maximum external radiation level corresponds to a level only 30% greater than background, it can be concluded that no external radiation hazard exists for personnel working in the area.

A LAFPHA/FIDLER system was utilized to measure the Pu-Am surface contamination of the area of concern. The system was calibrated by W. Goode one week prior to the Area T survey. Eight of the stations selected for the external radiation monitoring were evaluated by the Pu detection system. Since Station 1 had an obvious visual soil overburden of at least one foot, this station was used as a background reference for the detection unit. Interpretation of the data was somewhat complicated by background interferences caused by the radiation fluxes originating from radioactive materials stored in Building 286. Both the count rates and the spectral shapes measured by the Fidler detector vary with distance from this building. Due to the variation in these parameters, significance parameters were arbitrarily based on a channel 2/ channel 4 or channel 5/ channel 4 + channel 6 ratio of ≥ 2 .

The results of the Pu-Am surface contamination survey appear in Table 2 according to the station numbers on Figure 1. No measurable plutonium surface contamination was detected at the 7 stations surveyed. An estimated $1.1 \mu\text{Ci}/\text{m}^2$ of ^{241}Am was measured at Station 9, which was directly over Pit 1. Since no x rays in the 17 keV region were detected, it was assumed that the contamination was not on the surface but is overburdened by soil. In this case, the 60 keV ^{241}Am result applied to a given soil depth would be biased because of photon absorption in the soil. A semi-quantitative interpretation indicates that there is a considerable amount of Pu activity within the first 10 cm of soil at Station 9.

Table 1. External Radiation Measurements within the Fenced Portion of Waste Burial Site Area T.

<u>Monitoring Station</u>	<u>External Radiation Level ($\mu\text{R/hr}$)</u>
1	19 \pm 3*
2	19 \pm 3
3	21 \pm 3
4	24 \pm 3
5	21 \pm 3
6	21 \pm 3
7	22 \pm 3
8	20 \pm 3
9	19 \pm 3
10	21 \pm 3

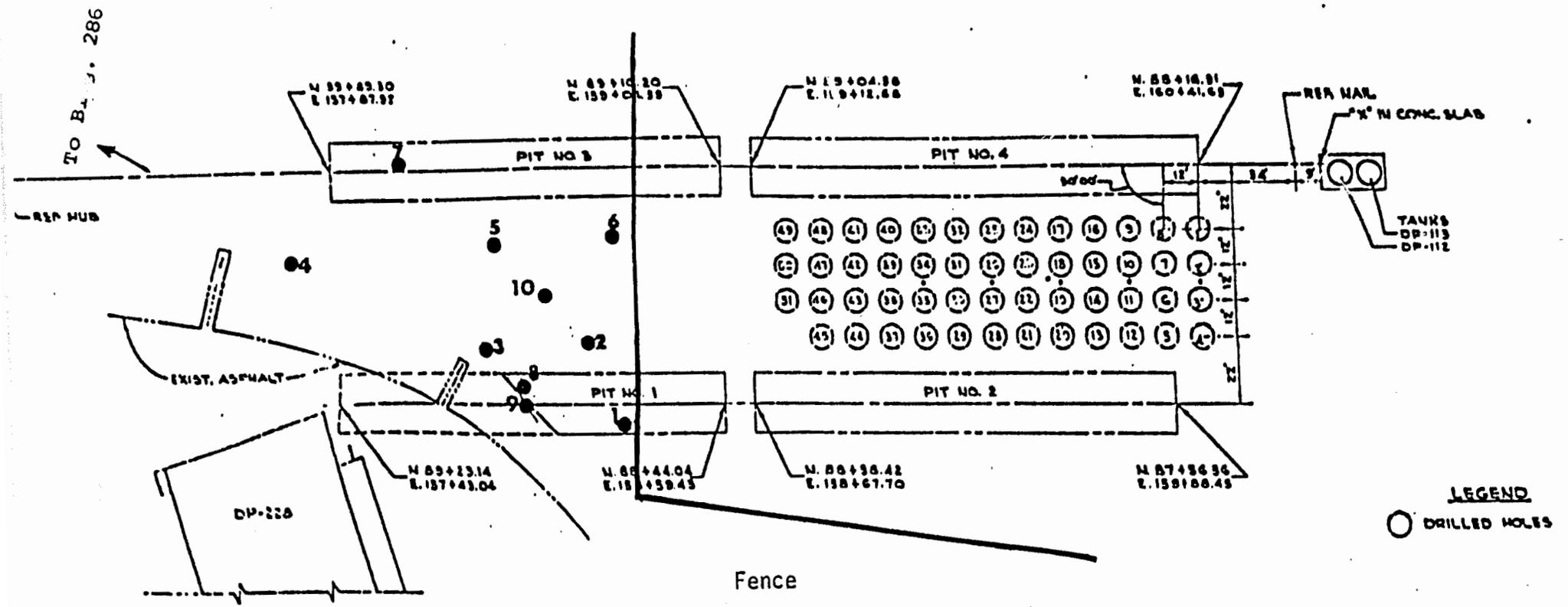
Notes:

- * The standard deviation was estimated by the deviations in the response of the strip chart recorder.
The environmental background reading at the OHL Building averages about 18 $\mu\text{R/hr}$.
All measurements were taken at a height of one meter above ground level.

Table 2. Plutonium-Americium Surface Contamination levels
 Within the Fenced Portion of Waste Burial Site Area T.

<u>Monitoring Station</u>	<u>^{239}Pu, $\mu\text{Ci}/\text{m}^2$</u>	<u>^{241}Am, $\mu\text{Ci}/\text{m}^2$</u>
1	BKG Station	BKG Station
2	<0.7	<0.3
3	<0.9	<0.4
4	<1.2	<0.5
5	<0.9	<0.4
6	<0.7	<0.3
7	<1.2	<0.5
9	<0.8	1.1

Figure 1. Location of Radiological Monitoring Stations, Area T , March 22, 1974.



Scale: 1 inch = 33 feet

LEGEND
 ○ DRILLED HOLES