# Rocky Flats Independent Verification

# Sampling and Survey Report
# Building 729

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# Acronyms and Abbreviations

| | |
|---|---|
| Am-241 | americium-241 |
| ANSI | American National Standards Institute |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR | Code of Federal Regulations |
| CLP | Contract Laboratory Program |
| cm | centimeter(s) |
| cpm | counts per minute |
| CRDL | contract required detection limit |
| $cm^2$ | square centimeter(s) |
| Co-57 | cobalt-57 |
| Co-60 | cobalt-60 |
| Cs-137 | cesium-137 |
| CV | coefficient of variation |
| D&D | decontamination and decomissioning |
| DCGL | derived concentration guideline level |
| $DCGL_{EMC}$ | derived concentration guideline level-elevated measurement comparison |
| $DCGL_W$ | derived concentration guideline level-average concentration |
| DOE | U.S. Department of Energy |
| dpm | disintegration(s) per minute |
| DQA | data quality analysis |
| DQI | data quality indicator |
| DQO | data quality objectives |
| DU | depleted uranium |
| EPA | U.S. Environmental Protection Agency |
| Fe-55 | iron-55 |
| g | gram |
| GM | Geiger-Mueller |
| $ft^2$ | square foot (feet) |
| GJO | Grand Junction Office |
| H-3 | tritium |
| HEUN | highly enriched uranyl nitrate |
| $H_o$ | null hypothesis |
| HVAC | heating, ventilation, and air conditioning |
| Inc. | incorporated |
| IV | independent verification |
| IVC | independent verification contractor |
| IVP | independent verification program |
| keV | kilo electron-volt(s) |
| LCS | laboratory control standard |
| LBGR | lower bound of the gray region |
| LLC | limited liability corporation |
| m | meter(s) |
| MARSSIM | Multi-Agency Radiation Survey and Site Investigation Manual |
| MDA | minimum detectable activity |
| MDC | minimum detectable concentration |
| meV | mega electron-volt(s) |
| mg | milligrams |



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| | |
|---|---|
| mm | millimeter(s) |
| $m^2$ | square meter(s) |
| NIST | National Institute of Standards and Technology |
| OU | operable unit |
| P-10 | instrument counting gas (90 percent argon, 10 percent methane) |
| Pa-234m | Protactinium-234, meta-stable |
| pCi | picoCurie(s) |
| PRP | primary responsible party |
| Pu-238 | plutonium-238 |
| Pu-239 | plutonium-239 |
| Pu-240 | plutonium-240 |
| Pu-241 | plutonium-241 |
| QA | quality assurance |
| QAPP | Quality Assurance Program Plan |
| QAPjP | Quality Assurance Project Plan |
| QC | quality control |
| $r^2$ | coefficient of determination |
| RFETS | Rocky Flats Environmental Technology Site |
| RFFO | Rocky Flats Field Office |
| RMRS | Rocky Mountain Remediation Services |
| SAP | Sampling and Analysis Plan |
| Sr-90 | strontium-90 |
| TBq | teraBecquerel(s) |
| Th-234 | thorium-234 |
| TRU | transuranic |
| µs | microsecond |
| $UCL_{95}$ | 95 percent upper confidence limit |
| VDC | volts direct current |
| vs. | versus |
| WGP | Weapons Grade Plutonium |
| WRS | Wilcoxon Rank Sum |
| WSRIC | Waste Stream and Residue Identification and Characterization |
| °C | degrees Celcius |
| °F | degrees Fahrenheit |

# 1.0 Introduction

## 1.1 Background

This sampling and survey report evaluates the final status survey data collected in Building 729 both by the Rocky Flats Environmental Technology Site's (RFETS) Contractors (Kaiser-Hill, Rocky Mountain Remediation Services, L.L.C., and their subcontractors, hereafter referred to as the Contractor) and by MACTEC–ERS, the independent verification contractor (IVC). Data collected by the IVC is designed to independently assess and verify the RFETS' compliance with the approved Derived Concentration Guideline Levels (DCGLs) established for the buildings in the 779 Cluster. Data collected by the Contractor has been reviewed by the IVC and compared with the independent verification data collected by the IVC.

The sampling and survey data collected has been compared with the approved surface contamination concentration benchmark values known as DCGLs. The RFETS DCGLs for surface contamination concentration are specified in the Contractor's Closeout Radiological Survey Plan for the 779 Cluster (RMRS 1999b) The independent verification DCGLs are specified in the IVC's *Independent Verification Sampling and Analysis Plan for Building 779 Cluster* (IV SAP) (DOE 1999).

Samples collected and surveys performed to obtain independent verification and corroboration of the RFETS sampling and survey results were collected in accordance with the U.S. Environmental Protection Agency (EPA), Colorado Department of Public Health and Environment (CDPHE), and U.S. Department of Energy (DOE) approved *Independent Verification Sampling and Analysis Plan for Building 779 Cluster* (DOE 1999). The data is evaluated herein principally on the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) data quality assessment methods, conventional guidance from EPA, and accepted practice and methods used in radiological site assessment and characterization. Principal guidance documents include:

- *Multi-Agency Radiation Survey and Site Investigation Manual* (EPA 1997)
- *Data Quality Objectives Process for Superfund* (EPA 1993)
- *Guidance for Data Quality Assessment* (EPA 1998)
- *Manual for Conducting Radiological Surveys in Support of License Termination* (NRC 1992)
- *A Nonparametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys* (NRC 1995)

A common theme in these guidance sources is the use of a seven-step data quality objective (DQO) activity as the foundation for the SAP development and subsequent data evaluation.

Following this introductory background is a discussion of the Building 729 history and an overview of the assessment and independent verification process used. Section 2 describes the field methods and procedures used to collect data. Section 3 presents the sampling results and summary statistics for each subset of data. It also describes the data reduction process used and



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statistical comparisons of the data subsets and their significance. Section 4 presents the sampling results in the context of compliance with the benchmark values. Evaluation of the Contractor's Final Status Radiological Survey, computations, and conclusions are presented in Section 6. The IVC collected data are compared to their respective DQOs in what is termed the Data Quality Analysis in Section 7. Section 8 summarizes the data quality analysis, provides objective assessment of the concentrations of residual contamination found in the building, and offers conclusions and recommendations for disposition of the building. Appendices are included to provide additional detail where appropriate.

The risk manager and decision maker for this project is DOE–Rocky Flats Field Office (DOE–RFFO).

## 1.2 Building 729 History

The Building 779 Cluster is located on the DOE's Rocky Flats site near Golden, Colorado. The site is a former nuclear weapons production facility. The various process facilities and laboratories were grouped together with their various support buildings and structures and identified as "clusters," with the building number of the principal building as the cluster name (e.g., the Building 779 Cluster). The 779 Cluster was primarily used for research and development activities and supported a number of various operations as part of the research and development mission including: 1) process chemistry technology, 2) physical metallurgy, 3) machining and gauging, 4) joining technology, and 5) hydriding operations. No processes or operations are now active.

Building 729 is an air filter plenum building built in 1971, which serviced the ventilation requirements of a portion of Building 779. The building is connected to Building 779 via a second story bridge which carried ventilation ducting to support the Annex B addition to Building 779. It contained a filter plenum, associated air handling equipment, and an emergency diesel powered electrical generator. The 2,750 square foot building (excluding the bridge) is constructed of concrete block. The roof is constructed of pre-cast, flanged concrete panels spanning the width of the building. The floor is a poured-in-place concrete slab.

## 1.3 Current Condition of Building 729

Building 729 underwent a decontamination and decommissioning (D&D) process to ready it for final status radiological survey. In the D&D process, the building was stripped of utility services, and equipment and all penetrations were removed or cut flush with the walls. The principal radiological contamination source associated with the building, the air plenum system and filter boxes, have been removed and discarded as radiologically contaminated waste. Paint was not systematically stripped or removed from surfaces in the building. The building was subdivided into three survey units (one exterior and two interior).

## 1.4 Overview of the Assessment and Independent Verification Process

The approach used to independently determine whether Building 729 met the mean, or average, benchmark release criteria (derived concentration guideline level-average concentration [$DCGL_W$]) followed the MARSSIM method. A fraction of the survey units identified in the building were selected for actual measurement by the IVC. In this case, one of the three available

survey units was selected for independent verification, thus meeting the contractual requirement to assess 5 to 10 percent of the Contractor's results. The IVC used oversight of the Contractor's scanning surveys and a critical review of the data collected by the Contractor to independently determine compliance with the maximum concentration benchmark release criteria (derived concentration guideline level-elevated measurement comparison [$DCGL_{EMC}$]).

The first step in the process to independently assess the Contractor's basis for decision on the disposition of Building 729 was to review the Contractor's SAP, (RMRS 1999b) and associated D&D planning documents. All comments and issues raised by the IVC were reported to the DOE–RFFO and were addressed by the RFETS Contractor and implemented in the final status survey plan, as necessary.

The Contractor's SAP establishes the criteria which, when met, represent acceptable levels of risk from exposure to residual contamination which might be present in the building. The DOE–RFFO, EPA, and CDPHE agreed upon surface contamination concentration criteria below which further remedial action would not be warranted. These criteria, or DCGLs, serve as the benchmarks against which the building surfaces were to be measured. The Contractor's DCGLs are:

- The mean removable alpha surface contamination concentration in the selected survey unit(s) is below 20 disintigrations per minute (dpm)/100 square centimeters ($cm^2$).
- The mean total alpha surface contamination concentration attributable to transuranic radioactivity as measured by direct surface emission in the selected survey unit(s) is below 100 dpm/100 $cm^2$ (averaged over 1 square meter [$m^2$]).
- The mean total alpha surface contamination concentration attributable to uranium series radioactivity[1] as measured by direct surface emission in the selected survey unit(s) is below 1,000 dpm/100 $cm^2$ (averaged over 1 $m^2$).
- The maximum total alpha surface contamination concentration attributable to transuranic radioactivity as measured by direct surface emission in the selected survey unit(s) is below 300 dpm/100 $cm^2$.
- The maximum total alpha surface contamination concentration attributable to uranium series radioactivity as measured by direct surface emission in the selected survey unit(s) is below 5,000 dpm/100 $cm^2$.
- The mean total alpha contamination concentration attributable to transuranic radioactivity on and beneath a surface with a surface coating as measured by collection and analysis of a surface media sample in the selected survey unit(s) is below 100 dpm/100 $cm^2$.
- The mean total alpha contamination concentration attributable to uranium series radioactivity on and beneath a surface with a surface coating as measured by collection and analysis of a surface media sample in the selected survey unit(s) is below 1,000 dpm/100 $cm^2$.

[1]In cases where isotopic composition is not determined, the SAP requires the application of the more restrictive limits associated with the transuranic series radionuclides.



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After reviewing the Contractor's SAP, an IV SAP was constructed. The IV SAP was developed in consultation with DOE–RFFO, EPA, and CDPHE. It was designed to detect and measure the concentration of the radioactive contamination remaining in survey units selected for independent verification such that statistically appropriate analyses could be used to determine whether the results obtained by the Contractor in the same survey unit could be verified or corroborated by the IVC. The IV SAP alone does not collect enough data to make the required decision for the entire building but provides sufficient data for critical comparison with the Contractor's conclusion in a single survey unit. In the case of Building 729, the IVC performed surveys and sampled one of the three survey units (729–01) identified by the Contractor.

The next step was to observe and evaluate the Contractor's implementation of the final status survey against the criteria established in the SAP. The IVC spent several days on site observing the Contractor's sampling and survey methods and reviewing analytical processes.

The fourth element of the independent verification process was to provide blind matrix samples to the Contractor for inclusion in their sample batches from Building 729. The blind samples included both blanks and spikes of smear filter paper matrices. Blanks and spikes of surface media matrices were not available for the final status survey of Building 729, but will be incorporated on later survey units when they become available.

Finally, and with the approved IV SAP, the sampling plan was executed. The IVC collected samples and performed measurements in the selected survey unit in order to corroborate the results obtained by the Contractor. The measurements and samples were obtained in accordance with the *Independent Verification Sampling and Analysis Plan for Building 779 Cluster* (DOE 1999).

The field data was reviewed in the field with representatives from DOE and the Contractor. The EPA and CDPHE have been apprized of the results of independent verification field data collected. Field data was recorded both on paper (Appendix D) and electronically (Appendix H). Following data collection, the data was verified and reduced so that the appropriate comparisons and analyses could be conducted. The presentation of the results of the field sampling are detailed in this report along with the IVC's recommendations and verification of the Building 729 final status survey results.



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# 2.0 Field Investigation

## 2.1 Mobilization

Prior to mobilizing the independent verification sampling team at the site, each member of the team was provided with a copy of the IV SAP and was trained on the field sampling equipment and procedures to be used. The Contractor made detailed measurements of the building and supplied simple architectural drawings of each survey unit in Building 729 to be used in laying out the sampling grids and sample locations.

Mobilization to the field began the week of February 22, 1999. Once on site, sampling team personnel completed RFETS required training necessary to support the sampling and survey work. Equipment was staged and final details were arranged.

The radiation survey detectors selected for this application were gas-filled, proportional counters made by Eberline; model HP-100. Gas filled detectors are subject to response and calibration variation with changes in altitude. Consequently, the HP-100 probes were field calibrated on site at the RFETS altitude and using RFETS supplied counting gas. The instrument and probe package was response checked and verified to be in working order and within the parameters established in the SAP. The surface media sampling tool was tested and test measurements were made confirming the suitability of the measurement protocol. A walk-through of the building was made to assess the condition of the building, to identify any intrinsic safety issues, and to compare the building structure and features with the assumptions made and procedures outlined in the SAP. With one notable exception, it was concluded that the assumptions used to develop the SAP and its associated procedures were consistent with the conditions existing in the building and that the procedures developed for characterizing the contaminant concentrations in the building accounted for these conditions. The condition which was not expected was that the Contractor had not completed the removal of the air plenum filter system. This work involved removal of potentially highly contaminated components necessitating the use of personnel protective clothing, containment structures, and auxiliary air handling equipment, and radiological posting. The IVC concluded that it was not prudent to begin a survey to verify that the survey unit was clean when parts of the survey unit were still involved in remedial activity and there was some potential, albeit small, for the spread of radioactive material within the structure. Additionally, the survey unit selected for independent verification was largely obstructed by the ongoing remedial operation. Building 729 was ready for independent verification sampling in the selected survey unit on March 24, 1999.

## 2.2 Field Selection of Survey Units for Independent Verification

The first step in the sample allocation strategy was to select from among the survey units available the survey unit(s) to be sampled and surveyed by the IVC. In the case of Building 729, in which only three survey units were identified, the IVC selected one survey unit (the minimum necessary to satisfy the requirement to verify up to 10 percent of the Contractor's survey) to verify. The random selection process assigned greater weighting or priority to survey units with a classification indicating greater potential to exceed the allowable radiological concentration. Table 2–1 identifies the three survey units identified by the Contractor for Building 729 (RMRS 1999c). A simple, commercially available, spread sheet program with a random number



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generation feature was used to randomly select a survey unit(s) to be independently verified. Appendix A contains a printout of the survey unit selected by the computer generated random number method. Survey unit 729–01, the filter plenum room and duct bridge, was selected.

*Table 2–1. Survey Units Identified for Building 729*

| Survey Unit Description | Survey Unit # | Survey Classification | Weight Factor |
|---|---|---|---|
| Filter Plenum Room (and Duct Bridge) | 729–01 | Class 2 | 2 |
| Generator Control Room (and Auxiliary Spaces) | 729–02 | Class 3 | 1 |
| Exterior | 729–03 | Class 3 | 1 |
| By assigning weighting factors to the survey units based on radiological classification, the independent verification survey will preferably select survey units which have a higher probability of exceeding the applicable DCGLs. Class 1 survey units (the most likely to be contaminated) are three times more likely to be selected than Class 2 units and six times more likely than Class 3 units. | | | |

## 2.3 Field Identification of Sample Locations

Once the survey unit to be verified had been selected, the proposed location of each measurement and sample was laid out using the sample allocation protocol specified in the SAP. A drawing of the survey unit was created with the walls and ceiling "unfolded" and set flat to assist the process of spatial distribution and sample location recording. The survey unit was then divided by a 2-meter sampling grid superimposed over the surface of the survey unit. Figure 2–1 shows the sample grid layout for survey unit 729–01.

The selection and distribution of sampling locations within the survey unit was made using the protocol approved in the SAP including:

- Random selection of the sampling starting point within the selected survey unit(s) (Appendix A),
- Systematic distribution of sample locations within the selected survey unit(s) to ensure representative spatial coverage of the survey unit, and
- Personnel safety during the execution of the sampling plan

Drawings of each surface within the survey unit with the sampling grid and actual sample locations as determined in the field are shown on Figure 2–2. After the sample locations were allocated, an inspection of the survey unit was conducted to ensure that each sample location selected could be accessed and sampled safely. Three sample locations were in fact relocated in accordance with the sample relocation protocol outlined in the SAP due to safety issues. Those samples relocated are annotated on the drawings in Figure 2–2.

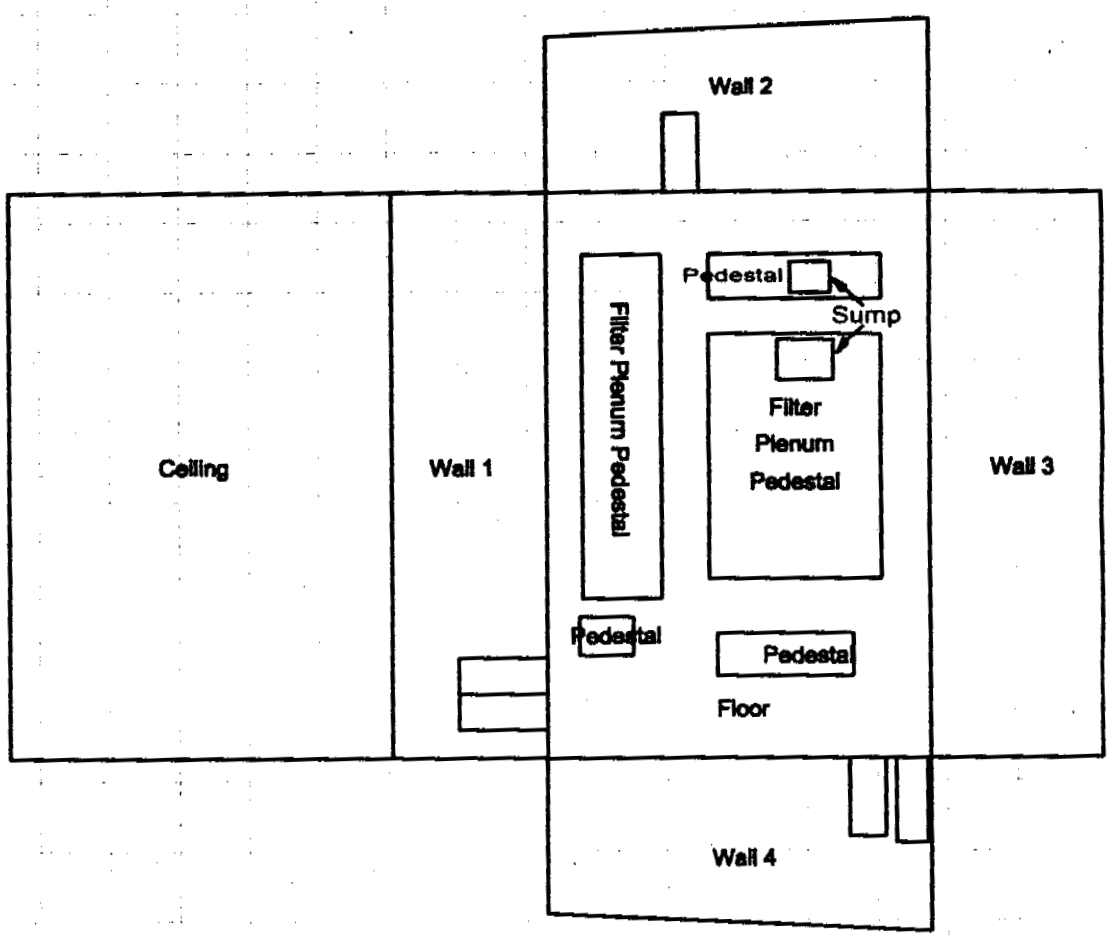
Sample locations were next laid out on the building surfaces within the survey unit. Each sample location was measured out and marked on the surface with a permanent marker. Unique alpha-numeric bar codes (Figure 2–3) were affixed to the surface adjacent to the selected sample location. A duplicate bar code was affixed to the field data sheet and the bar code number was recorded on a copy of the survey unit drawings. It should be noted that all sample locations were

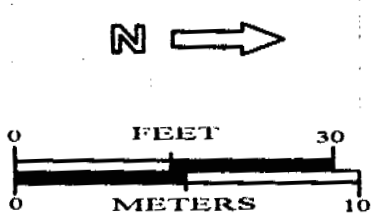
INDEPENDENT VERIFICATION FOR THE BUILDING 779 CLUSTER
SURVEY UNIT SAMPLE PLAN

**Building: 729** **Survey Unit: 729-01** **Number of Sample Locations: 29**

**Classification: 2** **Survey Unit Description: Bldg. 729 Plenum Area** **Grid Size: 2m x 2m**

SURVEY UNIT 729-01 MAP 1 OF 2




Each intersect point of the grid within the frame of the survey unit is a potential sample loaction

*Figure 2–1. Sampling Grid—Survey Unit 729–01*



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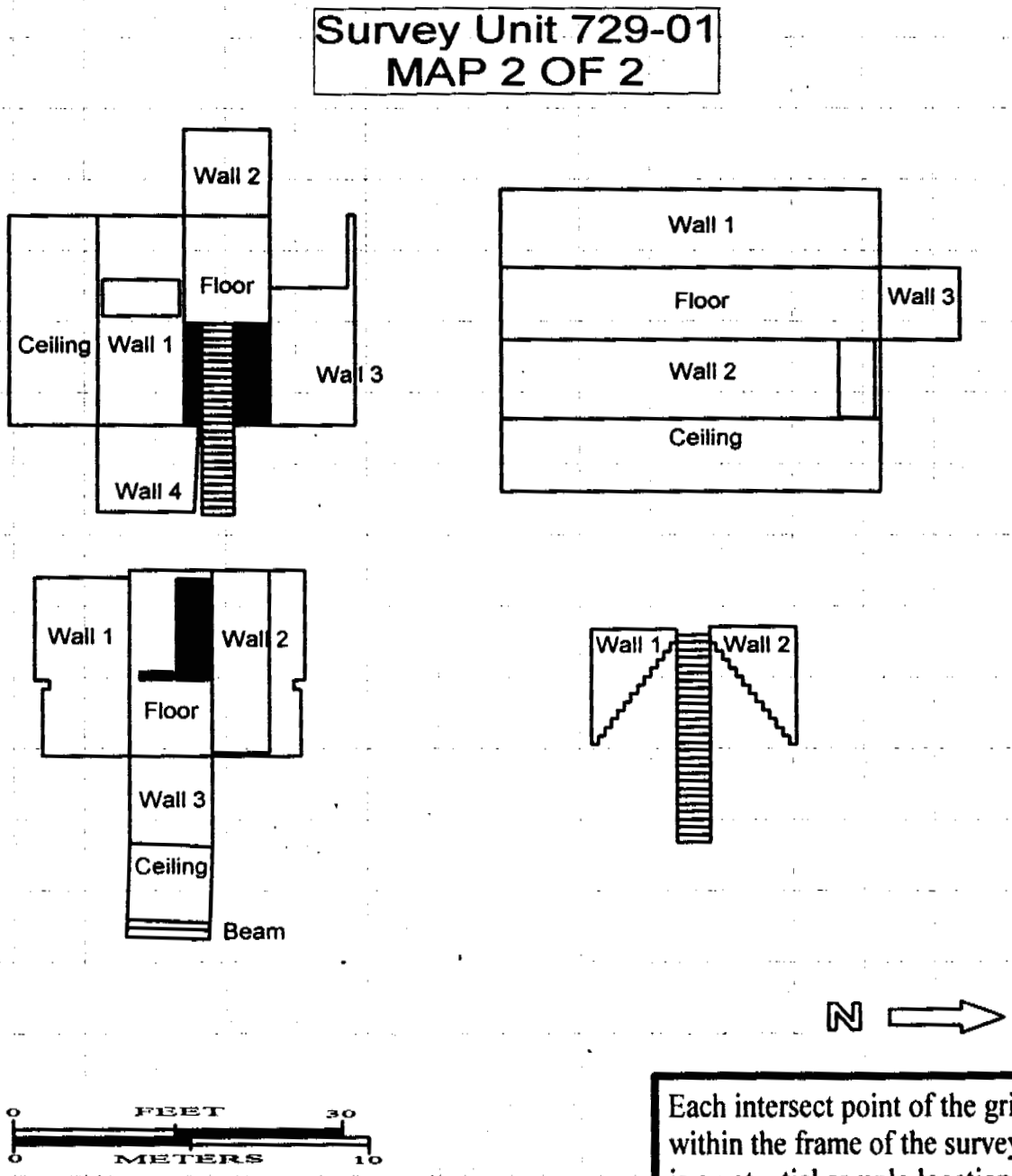
## INDEPENDENT VERIFICATION FOR THE BUILDING 779 CLUSTER SURVEY UNIT SAMPLE PLAN

**Building: 729** **Survey Unit: 729-01** **Survey Unit Description: Bldg. 729 Interior**

**Classification: 2** **Number of Sample Locations: 29** **Grid Size: 2m x 2m**




Each intersect point of the grid within the frame of the survey unit is a potential sample loaction

*Figure 2–1 (continued). Sampling Grid—Survey Unit 729–01*

**INDEPENDENT VERIFICATION FOR THE BUILDING 779 CLUSTER SURVEY UNIT SAMPLE PLAN**

**Building: 729** **Survey Unit: 729-01** **Number of Sample Locations: 29**

**Classification: 2** **Survey Unit Description: Bldg. 729 Plenum Area** **Grid Size: 2m x 2m**

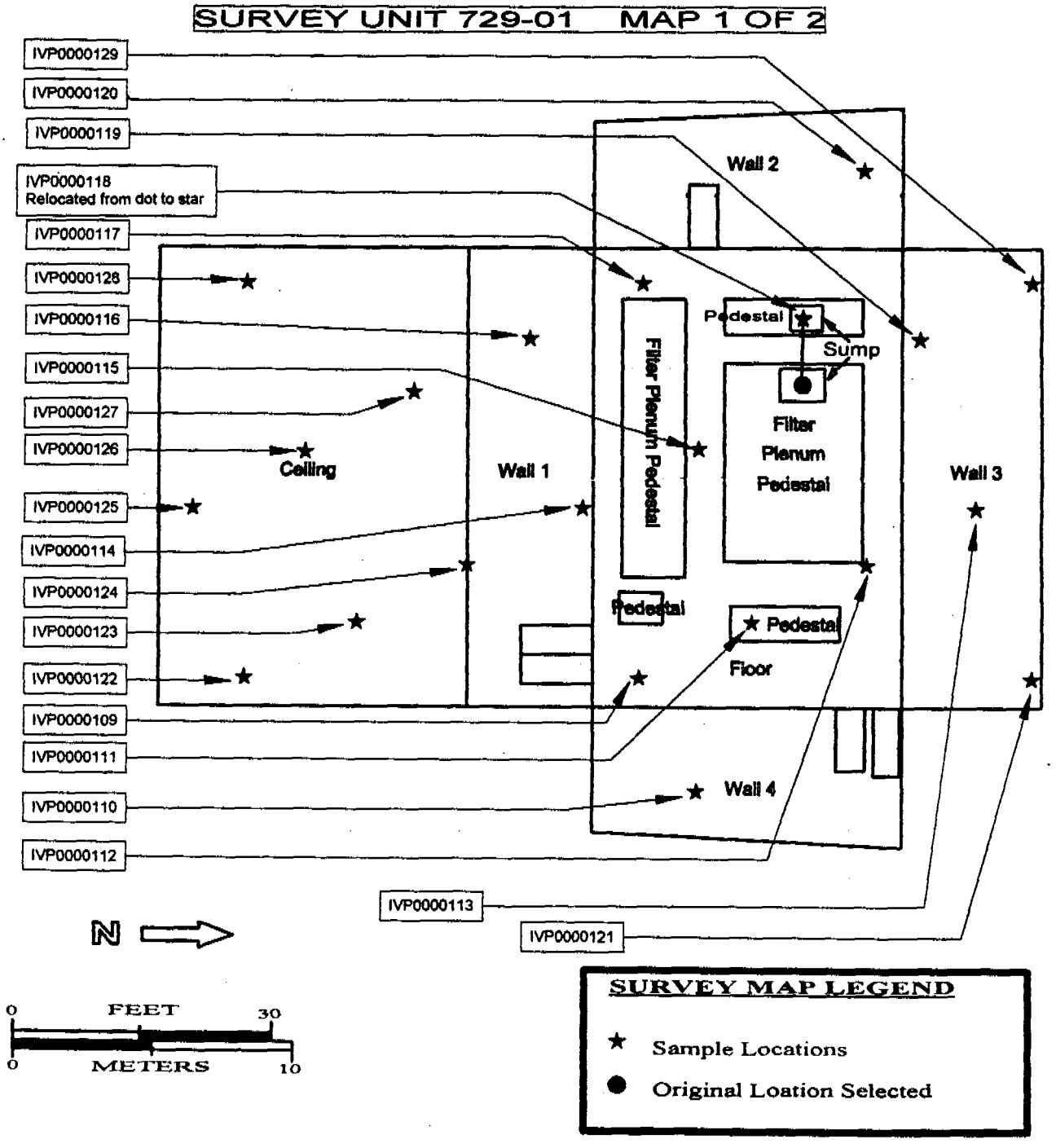



*Figure 2–2. Selected Sample Locations—Survey Unit 729–01*



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**INDEPENDENT VERIFICATION FOR THE BUILDING 779 CLUSTER SURVEY UNIT SAMPLE PLAN**

**Building: 729** **Survey Unit: 729-01** **Survey Unit Description: Bldg. 729 Interior**

**Classification: 2** **Number of Sample Locations: 29** **Grid Size: 2m x 2m**

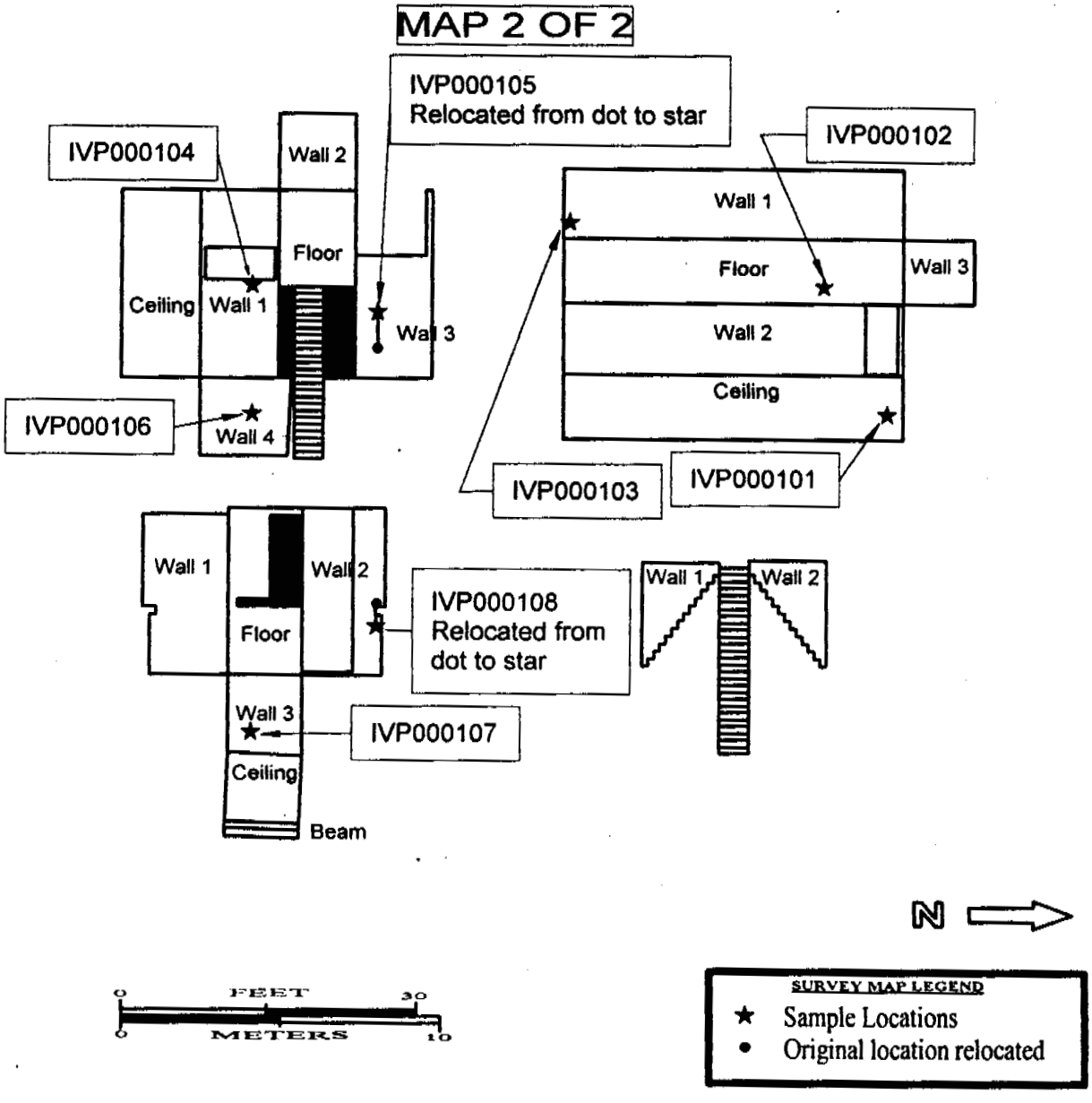


*Figure 2–2 (continued). Selected Sample Locations—Survey Unit 729–01*

IVP0000105

*Figure 2–3. Sample Location Identifier*

selected without prior knowledge of contaminant concentrations in the area and before radiological survey instruments were employed. In this way, sample locations were not biased.

## 2.4 Sampling Equipment and Procedures

### 2.4.1 Radiological Instrumentation

The field measurement instrument used for measuring surface deposited radiological contamination was the Eberline, E-600 Smart Portable Multi-purpose Radiation Survey Instrument with a modified Eberline HP-100 gas proportional detector probe. The detector was fitted with an Eberline "Smart Pack" to convert the conventional detector to be compatible with the microprocessor based E-600 and to electronically store the probe's calibration data. The probe's alpha channel was calibrated to a plutonium-238 (Pu-238) National Institute of Standards and Technology (NIST) traceable calibration source. The calibration certificate for the source is provided in Appendix B and the calibration data sheets for the instruments are provided in Appendix G. Figure 2–4 shows the configuration used to measure the alpha surface emission activity on the surfaces in the survey unit. The direct measurement data was collected in accordance with the procedure outlined in the SAP.

### 2.4.2 Sampling

#### 2.4.2.1 Smear Sampling

Smears were used to wipe the surfaces in order to measure the potential for removable radioactivity on the survey unit surfaces. The IVC chose to use 47 millimeter (mm) disc smears made of a duck cloth material rather than the typical paper or cellulose fiber filters commonly used since many of the surfaces requiring measurement are very rough. The duck cloth smears are very durable and will pick-up loose contaminants from even very rough or abrasive surfaces without disintegrating. The smear samples were collected after the direct static surface measurements were obtained. The technician wiped the surface within the 100 $cm^2$ sample area applying moderate pressure. Each smear was placed individually into a glassine envelope to prevent cross contamination and static charge induced migration of contaminants. Each glassine envelope containing a smear sample was then over-packed in a small sealable plastic bag and then in a manila sample envelope. The envelope was then marked with a bar code label linking it to the sample location from which it was obtained, and entered into a sample custody system to preserve sample integrity for subsequent analysis at the Grand Junction Office (GJO) Analytical



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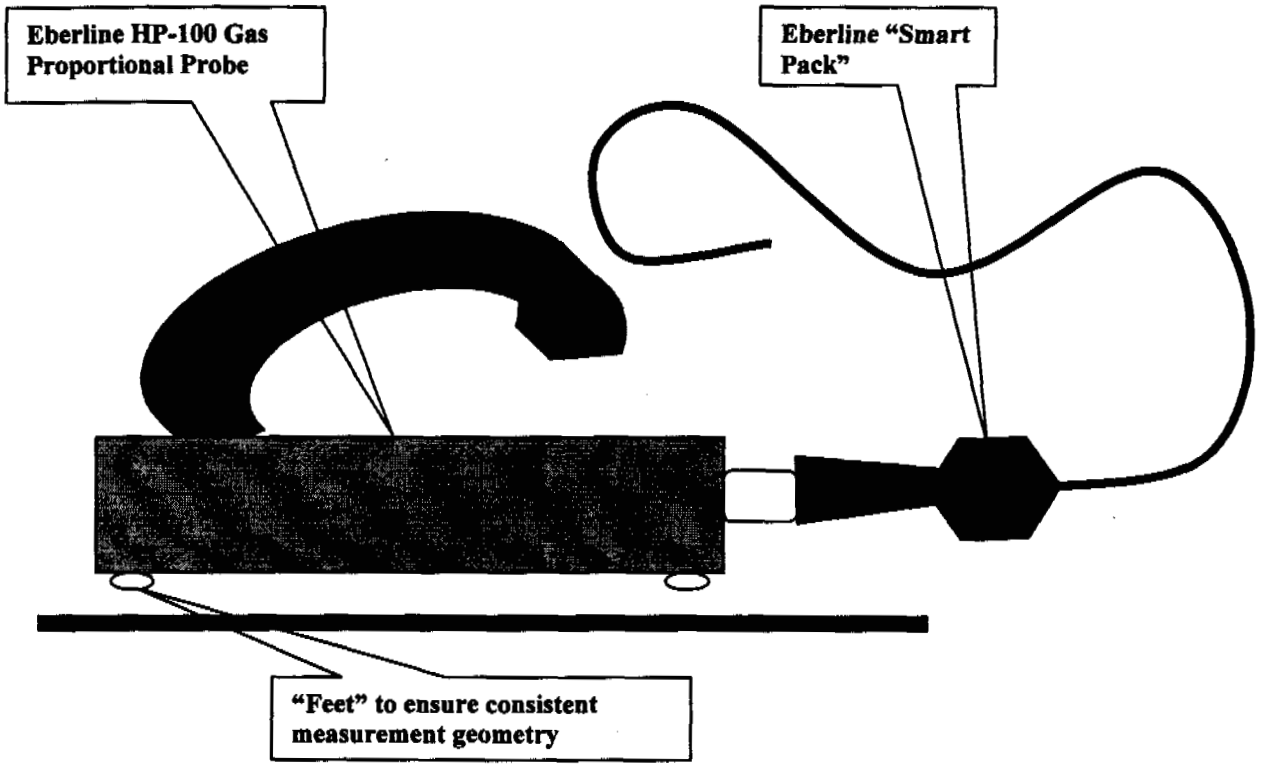


*Figure 2–4. Direct Static Surface Contamination Measurement Configuration*

Laboratory. The smear samples were secured in a sample box sealed with tamper-evident custody seals at the sample site until the field sampling was complete and then transported to the GJO Analytical Laboratory.

In all, 29 smear samples were collected from the survey unit—one at each of the 29 survey locations. These were submitted to the GJO Analytical Laboratory for radiological analysis. The results of these measurements are summarized in Section 3 and the laboratory analytical report is contained in Appendix C.

#### 2.4.2.2 Surface Media Sampling

Paint and other surface coatings or residues present on the surfaces of the building presented an obstruction to detection and measurement of the radioactive surface contamination which might have been present. To assess the potential for, and measure the concentration of, contaminants which might be present in and/or beneath painted or coated surfaces, a "veneer" of the surface (including any surface coating or residue) was removed. When there was no surface coating or residue present, but the radiological measurement of the surface exceeded the *a priori* estimate of the critical detection level of 22 dpm/100 $cm^2$, a veneer of the substrate was collected to assess the potential for a near-surface contamination layer embedded in a porous surface. A disposable plastic containment was erected over the selected sample location. A heavy duty, rotary impact drill (Figure 2–5) was fitted with a special bit designed to pulverize the surface without drilling into it. The bit was inserted through a port in the containment. Only the bit penetrated the containment. The impact tool was moved over the surface removing the thinnest possible layer until all surface coating within the 100 $cm^2$ sample area was removed.

To be inserted later—PHOTO OF THE DRILL AND BIT

*Figure 2–5. Photo of Rotary Impact Drill and Bit*

The surface material removed (the sample) was collected in the bottom of the plastic containment. The technician collected the removed media as a sample. The sample was then transferred to a small sealable plastic bag and then over-packed in a sealed manila sample envelope. The envelope was then marked with a bar code label linking it to the sample location from which it was obtained, and entered into a sample custody system to preserve sample integrity for subsequent analysis at the GJO Analytical Laboratory (see Figure 2–6). These samples were secured in a sample box sealed with tamper-evident custody seals at the sample site until the field sampling was complete and then transported to the analytical lab.

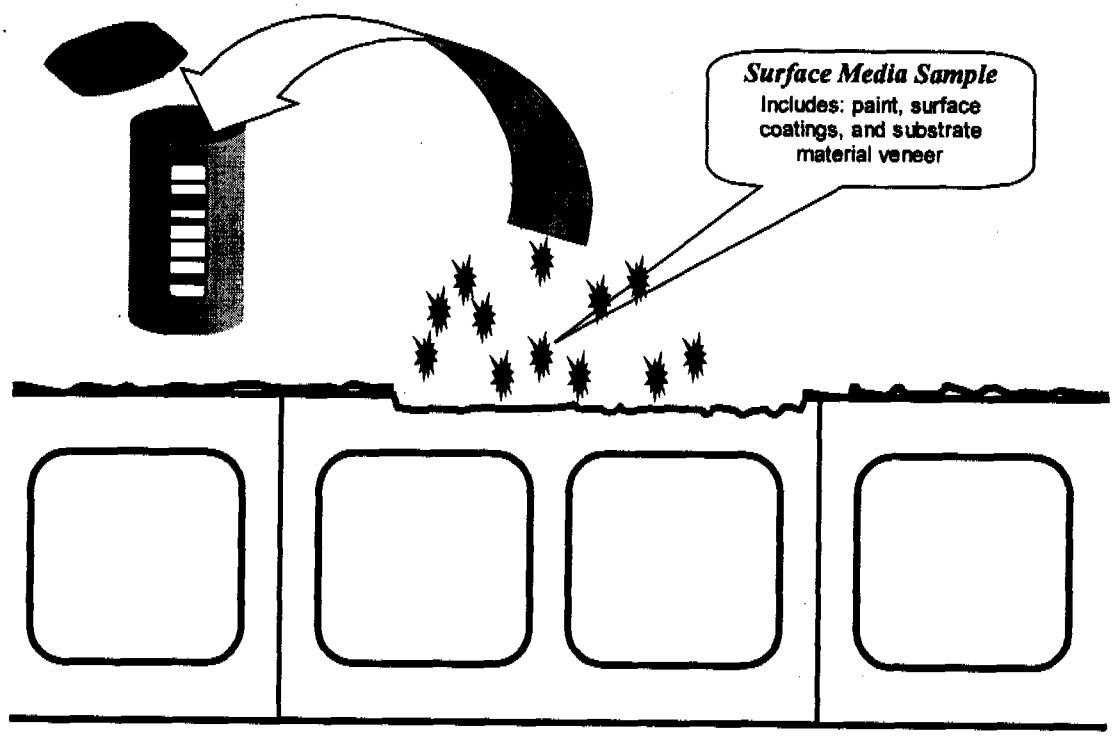


*Figure 2–6. Surface Media Sample Collection*



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### 2.4.3 Laboratory Measurements

Smears and surface media samples were processed and analyzed at the GJO Analytical Laboratory using the methods and procedures identified in Tables 2–2 and 2–3 and prescribed in the IV SAP.

*Table 2–2. Smear Sample Analytical Method*

| Laboratory Method—Gross Alpha Radioactivity | |
|---|---|
| Counting method | Gas Proportional Low-Background Alpha/Beta Counting System |
| Instrumentation | Canberra Model 2404 |
| Procedure(s) | Procedure RC–8, "Gross Alpha/Beta Analysis" (WASTREN–GJ) |
| Laboratory procedures are governed by QA/QC procedures specified in Handbook of Analytical and Sample-Preparation Procedures (WASTREN–GJ). | |

*Table 2–3. Surface Media Sample Analytical Method*

| Laboratory Method—Alpha Radioactivity by Isotope Specific Species | |
|---|---|
| Counting method | Alpha radioactivity by alpha spectroscopy |
| Instrumentation | 1" PIPS with Canberra Alpha Management Software (AMS) Model 48-0721, Ver. 1.0 |
| Procedure(s) | Solids Digestion, Chemical Extraction, Sample Precipitation, and Sample Counting Procedure RC–19, "Alpha Spectrometry" (WASTREN–GJ). |
| Laboratory procedures are governed by QA/QC procedures specified in Handbook of Analytical and Sample-Preparation Procedures (WASTREN–GJ). | |

Based on the EPA's terminology, the methods described in Tables 2–2 and 2–3 are categorized as Analytical Level V because they are non-conventional in the EPA's Contract Laboratory Program (CLP) (EPA 1988). However, comparing the level of quality assurance and quality control (QA/QC) embodied in these procedures, they are comparable to EPA's CLP Analytical Level IV.

### 2.4.4 Field Measurements

#### 2.4.4.1 Background Determination

Background was determined in the survey unit being surveyed before, and at least every 2 hours during, each sampling shift. Additionally, background measurements were collected immediately prior to, and immediately after, changing out a detector probe. In the center of the survey unit, a masonite hardboard surface (the back of a clipboard) that has essentially no inherent alpha radioactivity and which was clearly "unaffected" (i.e., clearly not part of the potentially contaminated buildings within the 779 Cluster) was used for establishing background according to the procedure detailed in the SAP. This method establishes the background associated with the instrument only. Background measurements were recorded both electronically and by hand.

#### 2.4.4.2 Direct Static Surface Radioactivity Measurements

Each of the 29 sample locations identified within the survey unit was directly measured to assess the alpha radioactivity deposited on the surface. Direct static field measurements were made using the approved procedure in the IV SAP. Each measurement was collected for 90 seconds, in the instrument's "SCALER" operating mode, and at a fixed distance of approximately 0.125 inch

(1/8th inch) from the surface. When the acquisition count time was complete, the result was read, manually recorded, and electronically logged into the instrument's memory. Direct measurement results greater than the instrument's *a priori* critical detection level ($L_c$) of 22 dpm/100 $cm^2$ triggered the need to collect a surface media sample even where no surface coating existed. In cases where surface media samples were indicated and collected, a second direct static measurement was made at the same location following removal of the surface veneer. Often, the direct measurement reading obtained subsequent to the veneer removal was unchanged indicating the likelihood that the substrate media (typically concrete) contained an appreciable and measurable alpha background radioactivity[1]. In these circumstances, a field decision was made as to the need for the collection of additional surface media to determine compliance with the DCGLs. Pertinent observations regarding the nature of the surface, substrate material, or instrument response were recorded. No anomalies were noted during the direct static measurement process.

[1]To avoid the need for making reference survey unit measurements to characterize and quantify natural radioactivity, background has been narrowly defined in the Contractor's Closeout Radiological Survey Plan to include only radiation measured by the instrument system operating in "free air". This definition excludes radioactivity which might be present in the building materials but which has not been contributed or added by the DOE. All naturally occurring radioactivity measured during Final Status Survey is to be considered "contributed" or attributable to DOE activities and compared to the applicable DCGLs.

End of current text

# 3.0 Sampling and Survey Results

Sampling and survey results are divided into four basic categories for discussion, analysis, and comparison with the applicable DCGLs. The categories correspond to the three fundamental samples or measurements employed in the independent verification: Smear sampling, Direct Static Measurements, and Surface Media Samples. The fourth category is for quality control data. Quality Control data is presented in Section 6.0 of this report.

## 3.1 Direct Static Field Measurements

Direct measurements of the radioactivity emission from surfaces were made using static, 90-second counting intervals, over which the total counts were integrated. The measurements recorded were gross values normalized to dpm/100 $cm^2$. In the context of this sampling evolution, a "gross measurement" means a measurement made with a radiation detection instrument to which no background correction has been applied. Raw or gross data is important when measurements will be used to make statistical inferences, since not all data will necessarily have the same correction factors applied to properly reduce them to meaningful numbers. Reporting gross or raw data also permits one to analyze the functionality of the instrument with which the measurement was made, and to verify the appropriateness of the data reduction process. The data reduction process for the field measurement data collected in this sampling evolution involves corrections for the efficiency of the radiation detector to the subject radiation and the instrument response to background sources of radiation (excluding surface media contribution to background).

The use of the Eberline E-600 Smart Portable Multi-purpose Radiation Survey Instrument in this application provides a platform for accommodating the probe specific factors including efficiency, high voltage, discrimination thresholds, crossover correction factors and calibration set up parameters within the detector's associated "smart pack" microchip. These correction factors are common to all of the direct field measurements made with the E-600 and HP-100 detector for this SAP. As a result of incorporating these factors, the instrument reads out and electronically logs data points directly in units of dpm/100 $cm^2$. These readings were not, however, field corrected for background radiation.

### 3.1.1 Background Measurements

The assessment of an instrument's response to background radiation is important from two perspectives. First, it permits the assessment of the minimum sensitivity (detection limit) for the instrument and measurement process in the presence of background radiation. The *a posteriori* minimum detectable activity (MDA) is calculated from this actual background data. Second, by assessing the instrument's response to background radiation in terms of the units that field data will be collected, a correction can be applied to the field measurement data to permit determination of radioactivity present in excess of background. Because the naturally occurring concentrations of background radioactivity in building materials used in the construction of the buildings in the 779 Cluster were expected to be below and well within the DCGL benchmarks for radioactive contamination on building surfaces, the Contractor chose to assign all building material background radioactivity as part of the DOE contributed activity for comparison against the DCGL. As a result, no attempt was made to measure the concentrations of naturally occurring radioactivity measurable on surfaces in a "reference survey unit" or unaffected area. Still, there was the need to measure and account for the instrument's response to other sources of



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background radiation (e.g., cosmic radiation) which could otherwise not be distinguished from the contaminant of concern.

To accommodate the need for correcting the instrument data for sensitivity to background radiation, excluding that present in the substrate of the surfaces being measured, instrument background measurements were collected periodically over the sampling period. In all, 31 measurements of the alpha background radiation level were recorded over the 3-day sampling period in accordance with the procedure for determining background (DOE 1999). Each background measurement made during the sampling period is presented in Table 3–1.

*Table 3–1. Direct Static Measurement Background Data, Building 729, Survey Unit 729–01*

| Sample Location | Date | Time | Recorded Value | Units |
|---|---|---|---|---|
| BACKGROUND | 3/26/99 | 13:26:00 | 12.7 | dpm/100cm$^2$ |
| BACKGROUND | 3/26/99 | 13:30:00 | 9.8 | dpm/100cm$^2$ |
| BACKGROUND | 3/26/99 | 13:54:00 | 21.7 | dpm/100cm$^2$ |
| BACKGROUND | 3/26/99 | 14:30:00 | 16.1 | dpm/100cm$^2$ |
| BACKGROUND | 3/26/99 | 14:58:00 | 16.4 | dpm/100cm$^2$ |
| BACKGROUND | 3/27/99 | 10:22:00 | 9.1 | dpm/100cm$^2$ |
| BACKGROUND | 3/27/99 | 10:23:00 | 3.0 | dpm/100cm$^2$ |
| BACKGROUND | 3/27/99 | 11:56:00 | 36.2 | dpm/100cm$^2$ |
| BACKGROUND | 3/27/99 | 11:59:00 | 36.2 | dpm/100cm$^2$ |
| BACKGROUND | 3/27/99 | 12:14:00 | 7.2 | dpm/100cm$^2$ |
| BACKGROUND | 3/27/99 | 12:17:00 | 4.2 | dpm/100cm$^2$ |
| BACKGROUND | 3/27/99 | 15:06:00 | 21.4 | dpm/100cm$^2$ |
| BACKGROUND | 3/27/99 | 15:08:00 | 32.9 | dpm/100cm$^2$ |
| BACKGROUND | 3/27/99 | 15:11:00 | 18.5 | dpm/100cm$^2$ |
| BACKGROUND | 3/27/99 | 16:44:00 | 4.3 | dpm/100cm$^2$ |
| BACKGROUND | 3/27/99 | 16:59:00 | 36.5 | dpm/100cm$^2$ |
| BACKGROUND | 3/27/99 | 17:00:00 | 18.2 | dpm/100cm$^2$ |
| BACKGROUND | 3/27/99 | 18:01:00 | 21.4 | dpm/100cm$^2$ |
| BACKGROUND | 3/27/99 | 18:04:00 | 24.4 | dpm/100cm$^2$ |
| BACKGROUND | 3/29/99 | 10:40:00 | 3.7 | dpm/100cm$^2$ |
| BACKGROUND | 3/29/99 | 10:42:00 | 6.2 | dpm/100cm$^2$ |
| BACKGROUND | 3/29/99 | 11:45:00 | 12.3 | dpm/100cm$^2$ |
| BACKGROUND | 3/29/99 | 11:47:00 | 9.2 | dpm/100cm$^2$ |
| BACKGROUND | 3/29/99 | 12:56:00 | 12.8 | dpm/100cm$^2$ |
| BACKGROUND | 3/29/99 | 12:58:00 | 3.3 | dpm/100cm$^2$ |
| BACKGROUND | 3/29/99 | 14:23:00 | 9.4 | dpm/100cm$^2$ |
| BACKGROUND | 3/29/99 | 14:25:00 | 5.9 | dpm/100cm$^2$ |
| BACKGROUND | 3/29/99 | 15:40:00 | 18.5 | dpm/100cm$^2$ |
| BACKGROUND | 3/29/99 | 15:44:00 | 6.3 | dpm/100cm$^2$ |
| BACKGROUND | 3/29/99 | 16:11:00 | 9.4 | dpm/100cm$^2$ |
| BACKGROUND | 3/29/99 | 16:13:00 | 9.3 | dpm/100cm$^2$ |

From these measurements, it was determined that background did not change appreciably over the duration of the sampling period nor was it significantly different when measured with different detector probes. When the direct static measurement background data is analyzed both graphically and with goodness-of-fit tests (Figure 3–1), it shows that the measurements are better

# DATA EVALUATION STATISTICS

**Data Description**

"Free Air" Instrument Background

Building 779 Cluster Independent Verification Project

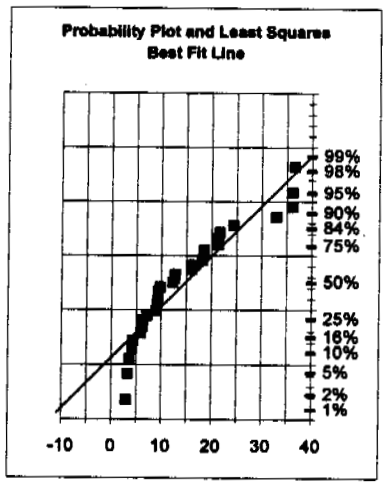
Building 729, Survey Unit 729-01

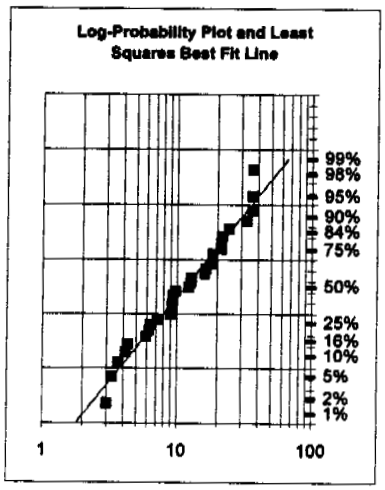
| Critical Level | 22 |
|---|---|
| UNITS - dpm/100 cm² | |
| **Sample Data** | |
| 3.0 | |
| 3.3 | |
| 3.7 | |
| 4.2 | |
| 4.3 | |
| 5.9 | |
| 6.2 | |
| 6.3 | |
| 7.2 | |
| 9.1 | |
| 9.2 | |
| 9.3 | |
| 9.4 | |
| 9.4 | |
| 9.8 | |
| 12.3 | |
| 12.7 | |
| 12.8 | |
| 16.1 | |
| 16.4 | |
| 18.2 | |
| 18.5 | |
| 18.5 | |
| 21.4 | |
| 21.4 | |
| 21.7 | |
| 24.4 | |
| 32.9 | |
| 36.2 | |
| 36.2 | |
| 36.5 | |

| **Descriptive Statistics** | |
|---|---|
| Number of Samples | 31.000 |
| Mean | 14.723 |
| Median | 12.300 |
| Standard Deviation | 10.128 |
| CV | 0.68791 |
| Range | 33.480 |
| Minimum | 3.020 |
| Maximum | 36.500 |
| GM | 11.572 |
| GSD | 2.077 |
| Mean of LN(Data) | 2.449 |
| SD of LN(Data) | 0.731 |
| Percent > Critical Level | 16.129 |

| **Normal Statistics** | |
|---|---|
| Mean | 14.723 |
| UCL(Mean) - Z | 18.289 |
| LCL(Mean) - Z | 11.158 |
| 95%ile - Z | 31.384 |
| Percent > Critical Level | 23.624 |
| W Test (Data) | 0.875962 |
| Normal (a=0.05)? | No |

| **Lognormal Statistics** | |
|---|---|
| GM | 11.572 |
| GSD | 2.077 |
| AM of data | 14.723 |
| AM - MVUE | 14.954 |
| AM - MLE | 15.115 |
| UCL - Norm t stats | 18.438 |
| LCL - Norm t stats | 11.008 |
| UCL LogNorm t | 19.761 |
| LCL LogNorm t | 11.560 |
| UCL - Modified Cox | 20.243 |
| LCL - Modified Cox | 11.047 |
| UCL - "Exact" | |
| LCL - "Exact" | |
| 95%ile | 38.506 |
| UTL 95%, 95% | 58.156 |
| Percent > Critical Level | 18.968 |
| PEP (Upper) | 28.999 |
| PEP (Lower) | 10.13667 |
| W Test (ln Data) | 0.954557 |
| Lognorm (a=0.05)? | Yes |



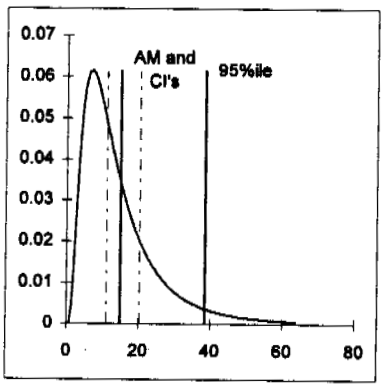




*Figure 3–1. Data Evaluation Statistics—"Free Air" Instrument Background*

represented by, or fit to, a log-normal distribution. This is the expected condition for instrument response to alpha background radiation due to the naturally low alpha background count rate and the Poisson distribution associated with low level radiation counting. The direct static field measurements collected in the survey unit also fit a lognormal distribution (see Section 3.1.2). The variance in the recorded background data was small and within the range expected for a gas proportional counter measuring alpha background radiation (see Appendix E for complete background data set).

Table 3–2 shows the background data summary statistics.

*Table 3–2. Background Data Summary Statistics, Building 729, Survey Unit 729–01*

| Statistic | Total Surface Activity (dpm/100 cm$^2$) |
|---|---|
| Number of Measurements | 31.00 |
| Arithmetic Mean | 14.72 |
| Standard Deviation (sample) | 10.13 |
| Coefficient of Variation | 0.69 |
| Max | 36.50 |
| Median | 12.30 |
| Minimum | 3.02 |
| Range | 33.48 |
| Geometric Mean | 11.57 |
| UCL (lognormal "t", a=0.05) | 19.76 |
| LCL (lognormal "t", b=0.05) | 11.56 |

#### 3.1.1.1 Background Adjustment

Because the background and survey unit sample sets were each lognormally distributed, it was decided that the geometric (or lognormal) mean background value recorded over the 3-day sampling period (11.6 dpm/100 cm$^2$) would be used to correct the gross direct static surface contamination measurements for subsequent comparison to the applicable DCGL. In some situations, a graphical or visual distinction can be made between measurements containing background only and those with added radioactivity. For example, instrument background measurements for beta activity are typically large enough that they tend to be more normally distributed while contributed activity tends to be lognormally distributed. In such a case, a graphical distinction can be clearly seen between the population of measurements containing only background response and those containing elevated or contributed activity. This is not typically the case with alpha radioactivity. No graphic distinction between measurement results attributable to background and those with activity in excess of background is discernable with this data set since both are lognormally distributed and both have comparable mean and median values.

Calculational methods are needed to assess the surface activity above background which could be distinguished with statistical significance from background. As discussed earlier, the geometric mean instrument background measurement over the field sampling period was 11.6 dpm/100 cm$^2$. With the E-600 instruments used, the background radiation influence on the instrument's readings was processed with efficiency corrections and probe size corrections such that background measurements and sample measurements alike read out in units of dpm/100 cm$^2$. In order to calculate the statistically significant surface activity which could be

distinguished from background (*a posteriori* MDA), it was necessary to convert the background measurement units from dpm/100 $cm^2$ to units of counts per minute (cpm). In this case, the more conservative metric, the arithmetic mean, was chosen to calculate the detection sensitivity achieved to account for the skewness of the lognormally distributed data set and to prevent overstating the actual sensitivity achieved. The converted mean background count rate for the sampling period is 3.16 cpm (Table 3–3). Using the actual instrument field measurement parameters, a calculation of the actual field measurement MDA can be determined by solving Equations 3–1, 3–2, and 3–3.

*Table 3–3. Static Surface Contamination Measurement MDA Parameters*

| Parameter | | Value Used | Remarks |
|---|---|---|---|
| $C_b$ | Background Counts | 4.74 | Value used is 14.723 dpm/100 $cm^2$ converted to units of counts (cpm × $T_s$) |
| $T_s$ | Sample count time (in minutes) | 1.5 | Count time programmed into the calibrated instrument specifically for this sampling event |
| $A_P$ | Probe size | 100 | $cm^2$ |
| $\epsilon_T$ | Instrument system efficiency in counts/disintegration | 0.2145 (21.5 percent) | Actual efficiency for each individual probe is programmed into the memory chip of the probes' smart pack and for the three probes used was 21.45%, 22.10%, and 23.10%, respectively. These represent effectively equivalent measures of efficiency and probe performance. |

The following calculations define the *a posteriori* MDA.

$$MDA = \frac{3 + 4.65\sqrt{C_b}}{T_s \times \frac{A_p}{100cm^2} \times \varepsilon_T} \tag{3–1}$$

Where: MDA = the minimum surface activity concentration above background radioactivity (in dpm/100 $cm^2$) that can be detected with 95 percent confidence.
$C_b$ = the total number of background counts over the sample count period ($T_s$).
$T_s$ = sample count time (in minutes).
$A_P$ = probe size (in $cm^2$).
$\epsilon_T$ = counting system efficiency in count/disintegration.

$$\text{MDA} = \frac{3 + 4.65\sqrt{4.74}}{1.5 \times 1 \times 0.2145} \tag{3–2}$$

$$\text{MDA} = \frac{13.12}{0.322} = 41\,dpm/100\,cm^2 \tag{3–3}$$



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Therefore the "gross" field instrument reading, using the procedures identified in the Building 779 Cluster IV SAP, which can be distinguished as different from background—the adjusted gross MDA is defined in equation 3–4:

$$15 + 41 = 56\ dpm/100\ cm^2 \qquad (3\text{–}4)$$

Having identified the *a posteriori* MDA for the field sampling measurements and the adjusted gross MDA, a simple sort of the gross field measurement data points was performed to identify those which were greater than 56 dpm/100 $cm^2$. Those locations with gross surface activity greater than the adjusted gross MDA are credited as positive indicators of added radioactivity, while those less than the adjusted gross MDA are statistically indistinguishable from background values.

Rather than correct each individual measurement for background, the gross measurement data set was statistically analyzed. The data set was treated as lognormally distributed, the best fit for the data set collected. This treatment conforms to standard EPA methodology for data evaluation statistics, and generally yields conservative estimates of the upper confidence intervals and percentiles values. To correct for the instrument's response to background, the geometric mean background, 11.6 dpm/100 $cm^2$, was subtracted from the geometric mean of the total surface activity measured by surface emission data set of interest. When comparisons of other metrics (e.g., the median) are provided for information, the comparable background metric is also used to correct the reading for background radiation influence. For example, when the net (background corrected) ***median*** direct static surface contamination metric is reported, the ***median*** value of the background data set has been subtracted from the ***median*** value of the gross direct static surface contamination measurement data set.

### 3.1.2 Field Measurement Data

Direct static measurements were made at the 29 selected sample locations in survey unit 729–01. Figure 2–2 shows the layout of survey unit 729–01 and the sample locations selected in accordance with the sample allocation protocol identified in the IV SAP (DOE 1999). They were made prior to collection of a smear sample at the location and prior to collecting a surface media sample. In this way, the "total" surface deposited activity emission rate, whether from fixed or removable radioactivity, was accounted for. In all, 33 direct static surface measurements were made prior to collecting surface samples. Four of these were replicate measurements collected as part of the overall QA/QC as described in the SAP. For data reduction purposes, the arithmetic mean of a replicate measurement and the corresponding initial measurement was used as the reported value for a specific sample location at which a replicate measurement was made. Consequently, there are a total of 29 data points (Table 3–4) included in the overall characterization of the building's mean residual surface contamination level as measured by direct surface emission. Further information about the duplicate samples and the assurance of precision and variability are presented in Sections 6.0 and 7.0.

*Table 3–4. Direct Static Surface Contamination Measurements, Building 729, Survey Unit 729–01*

| Sample Location | Instrument Operating Mode | Channel Selected | Background Compensation Mode | Recorded Value | Units |
|---|---|---|---|---|---|
| IVP0000101 | Scaler | Alpha | Gross | 17.7 | dpm/100cm$^2$ |
| IVP0000102 | Scaler | Alpha | Gross | 3.4 | dpm/100cm$^2$ |
| IVP0000103 | Scaler | Alpha | Gross | 18.1 | dpm/100cm$^2$ |
| IVP0000104 | Scaler | Alpha | Gross | 12.4 | dpm/100cm$^2$ |
| IVP0000105 | Scaler | Alpha | Gross | 9.7 | dpm/100cm$^2$ |
| IVP0000106 | Scaler | Alpha | Gross | 24.0 | dpm/100cm$^2$ |
| IVP0000107 | Scaler | Alpha | Gross | 9.3 | dpm/100cm$^2$ |
| IVP0000108 | Scaler | Alpha | Gross | 9.4 | dpm/100cm$^2$ |
| IVP0000109 | Scaler | Alpha | Gross | 9.7 | dpm/100cm$^2$ |
| IVP0000110 | Scaler | Alpha | Gross | 7.0 | dpm/100cm$^2$ |
| IVP0000111 | Scaler | Alpha | Gross | 6.6 | dpm/100cm$^2$ |
| IVP0000112 | Scaler | Alpha | Gross | 1.1 | dpm/100cm$^2$ |
| IVP0000113 | Scaler | Alpha | Gross | 6.9 | dpm/100cm$^2$ |
| IVP0000114 | Scaler | Alpha | Gross | 9.9 | dpm/100cm$^2$ |
| IVP0000115 | Scaler | Alpha | Gross | 9.8 | dpm/100cm$^2$ |
| IVP0000116 | Scaler | Alpha | Gross | 18.7 | dpm/100cm$^2$ |
| IVP0000117 | Scaler | Alpha | Gross | 9.9 | dpm/100cm$^2$ |
| IVP0000118 | Scaler | Alpha | Gross | 32.8 | dpm/100cm$^2$ |
| IVP0000119 | Scaler | Alpha | Gross | 7.3 | dpm/100cm$^2$ |
| IVP0000120 | Scaler | Alpha | Gross | 7.4 | dpm/100cm$^2$ |
| IVP0000121 | Scaler | Alpha | Gross | 23.5 | dpm/100cm$^2$ |
| IVP0000122 | Scaler | Alpha | Gross | 6.2 | dpm/100cm$^2$ |
| IVP0000123 | Scaler | Alpha | Gross | 14.9 | dpm/100cm$^2$ |
| IVP0000124 | Scaler | Alpha | Gross | 20.9 | dpm/100cm$^2$ |
| IVP0000125 | Scaler | Alpha | Gross | 28.2 | dpm/100cm$^2$ |
| IVP0000126 | Scaler | Alpha | Gross | 21.2 | dpm/100cm$^2$ |
| IVP0000127 | Scaler | Alpha | Gross | 40.8 | dpm/100cm$^2$ |
| IVP0000128 | Scaler | Alpha | Gross | 13.5 | dpm/100cm$^2$ |
| IVP0000129 | Scaler | Alpha | Gross | 28.3 | dpm/100cm$^2$ |

A number of statistical tests of the data were performed to assess the data sets. A key test of the data set is for goodness-of-fit. It is important because it identifies the underlying distribution of the data set and permits the analyst as well as the decision makers and risk managers to compare appropriate metrics calculated from the data. The W-test was used to measure the relative goodness of the fit of the observed data distribution to both the normal and lognormal standard distributions. Other distributions were not entertained for this data set since the data were expected to be either normally or lognormally distributed (based on knowledge of radioactivity distribution in the environment and in background) and because the probability plots and histograms generated gave no evidence that other than normal or lognormal distributions might be present. For the direct static measurement data set, the W-test identified the lognormal distribution as the best fit. The data evaluation statistics are provided in Figure 3–2. Table 3–5 summarizes the direct surface measurement data, uncorrected for background, collected in survey unit 729–01.



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# DATA EVALUATION STATISTICS

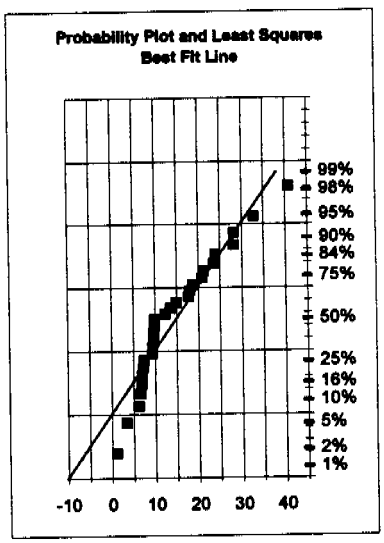
**Data Description**
Direct Static Surface Measurements
Building 779 Cluster Independent Verification Project
Building 729, Survey Unit 729-01

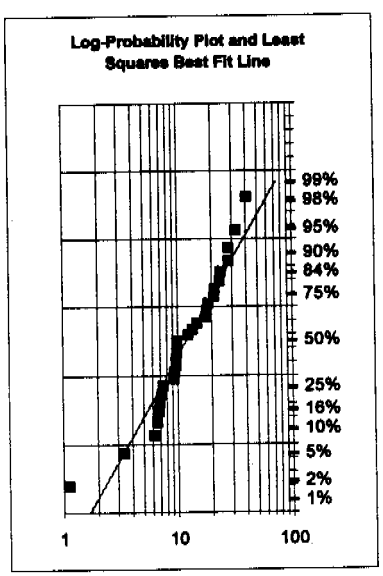
| $DCGL_W$ | 100 |
|---|---|
| UNITS - dpm/100 $cm^2$ | |
| Sample Data | |
| 1.1 | |
| 3.4 | |
| 6.2 | |
| 6.6 | |
| 6.9 | |
| 7.0 | |
| 7.3 | |
| 7.4 | |
| 9.3 | |
| 9.4 | |
| 9.7 | |
| 9.7 | |
| 9.8 | |
| 9.9 | |
| 9.9 | |
| 12.4 | |
| 13.5 | |
| 14.9 | |
| 17.7 | |
| 18.1 | |
| 18.7 | |
| 20.9 | |
| 21.2 | |
| 23.5 | |
| 24.0 | |
| 28.2 | |
| 28.3 | |
| 32.8 | |
| 40.8 | |

| Descriptive Statistics | |
|---|---|
| Number of Samples | 29.000 |
| Mean | 14.775 |
| Median | 9.900 |
| Standard Deviation | 9.491 |
| CV | 0.642359 |
| Range | 39.680 |
| Minimum | 1.120 |
| Maximum | 40.800 |
| GM | 11.812 |
| GSD | 2.107 |
| Mean of LN(Data) | 2.469 |
| SD of LN(Data) | 0.745 |
| Percent > DCGL | 0.000 |

| Normal Statistics | |
|---|---|
| Mean | 14.775 |
| UCL(Mean) - Z | 18.230 |
| LCL(Mean) - Z | 11.321 |
| 95%ile - Z | 30.388 |
| Percent > DCGL | 0.000 |
| W Test (Data) | 0.911078 |
| Normal (a=0.05)? | No |

| Lognormal Statistics | |
|---|---|
| GM | 11.812 |
| GSD | 2.107 |
| AM of data | 14.775 |
| AM - MVUE | 15.410 |
| AM - MLE | 15.595 |
| UCL - Norm t stats | 18.385 |
| LCL - Norm t stats | 11.165 |
| UCL LogNorm t | 20.708 |
| LCL LogNorm t | 11.745 |
| UCL - Modified Cox | 21.260 |
| LCL - Modified Cox | 11.170 |
| UCL - "Exact" | |
| LCL - "Exact" | |
| 95%ile | 40.262 |
| UTL 95%, 95% | 62.476 |
| Percent > DCGL | 0.208 |
| PEP (Upper) | 1.210 |
| PEP (Lower) | 0.009989 |
| W Test (ln Data) | 0.932772 |
| Lognorm (a=0.05)? | Yes |



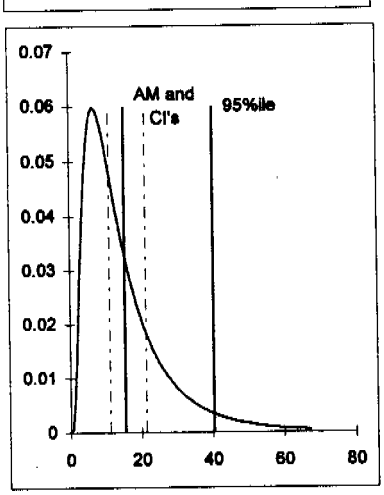




*Figure 3–2. Data Evaluation Statistics—Direct Static Surface Measurements*



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*Table 3–5. Summary Statistics, Direct Static Measurements, Building 729, Survey Unit 729–01*

| Statistic | Value |
|---|---|
| Number of Measurements | 29.00 |
| Arithmetic Mean | 14.75 |
| Standard Deviation (sample) | 9.49 |
| Coefficient of Variation | 0.64 |
| Max | 40.80 |
| Median | 9.90 |
| Minimum | 1.12 |
| Range | 39.68 |
| Geometric Mean | 11.81 |
| UCL (lognormal "t", a=0.05) | 20.71 |
| LCL (lognormal "t", b=0.05) | 11.75 |

From Table 3–5 and the data evaluation and summary statistics, it is evident that approximately 50 percent of all the measurements in this subset are at or below the geometric mean background value of 11.6 dpm/100 $cm^2$. Most are below the critical detection level of 22 dpm/100 $cm^2$. The few that exceed the critical level give some evidence of activity above background but not enough to be quantified with certainty. All of the measurements are below the adjusted gross MDA ($MDA_{Gross}$) of 56 dpm/100 $cm^2$ for the field measurement process. The maximum value of 40.8 dpm/100 $cm^2$ was measured on the bare concrete ceiling of survey unit 729–01 at sample location IVP0000127.

The test of $DCGL_W$ for total surface contamination concentration as measured by direct surface emission is the mean (the geometric mean in this case since the data set is determined to be lognormally distributed) of the data set. Section 4.0 provides detailed analysis of the data set in comparison to the applicable DCGL values.

### 3.1.2.1 Post Surface Media Sampling Measurements

Follow-up direct static measurements were made after each surface media sample was collected in an effort to assure that all of the contaminant which might have been present beneath the immediate surface was removed by the physical sampling process. This measurement was necessary to validate the assumption that any contaminant that may have been deposited beneath a paint layer or embedded in the porous substrate was limited to only shallow deposition and would be collected and measured by the surface media sampling. Evidence of elevated radioactivity by direct measurement after a thin surface veneer had been removed might call into question the validity of that assumption, requiring further investigation. The results, however, are not considered in the data set used to evaluate compliance with the $DCGL_W$ for total surface contamination as measured by direct surface emission. Nonetheless, the post surface media sampling measurements are considered important since they might detect radioactivity that is potentially "hidden" from detection by direct surface emission measurements made before removal of the surface coating or veneer.

A total of 23 surface media samples (Table 3–6) were collected from sample locations which met the stringent surface media sample inclusion criteria (DOE 1999). A total of 27 direct static surface measurements were made at the 23 surface media sample locations subsequent to collecting surface samples. Four of these were replicate measurements collected as part of the



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overall QA/QC as described in the SAP. Where a replicate measurement was made, the arithmetic mean of a replicate measurement and the corresponding initial measurement were used as the reported value for that specific sample location.

*Table 3–6. Post Surface Media Sample Direct Static Surface Measurements*

| Sample Location | Instrument Operating Mode | Channel Selected | Background Compensation Mode | Recorded Value | Units |
|---|---|---|---|---|---|
| IVP0000102 | Scaler | Alpha | Gross | 17.4 | dpm/100cm$^2$ |
| IVP0000103 | Scaler | Alpha | Gross | 8.1 | dpm/100cm$^2$ |
| IVP0000104 | Scaler | Alpha | Gross | 11.2 | dpm/100cm$^2$ |
| IVP0000105 | Scaler | Alpha | Gross | 5.2 | dpm/100cm$^2$ |
| IVP0000106 | Scaler | Alpha | Gross | 14.3 | dpm/100cm$^2$ |
| IVP0000107 | Scaler | Alpha | Gross | 23.0 | dpm/100cm$^2$ |
| IVP0000108 | Scaler | Alpha | Gross | 13.4 | dpm/100cm$^2$ |
| IVP0000109 | Scaler | Alpha | Gross | 11.2 | dpm/100cm$^2$ |
| IVP0000110 | Scaler | Alpha | Gross | 3.7 | dpm/100cm$^2$ |
| IVP0000111 | Scaler | Alpha | Gross | 7.8 | dpm/100cm$^2$ |
| IVP0000112 | Scaler | Alpha | Gross | 7.8 | dpm/100cm$^2$ |
| IVP0000113 | Scaler | Alpha | Gross | 4.7 | dpm/100cm$^2$ |
| IVP0000114 | Scaler | Alpha | Gross | 2.5 | dpm/100cm$^2$ |
| IVP0000115 | Scaler | Alpha | Gross | 14.0 | dpm/100cm$^2$ |
| IVP0000116 | Scaler | Alpha | Gross | 17.2 | dpm/100cm$^2$ |
| IVP0000117 | Scaler | Alpha | Gross | 11.4 | dpm/100cm$^2$ |
| IVP0000118 | Scaler | Alpha | Gross | 22.8 | dpm/100cm$^2$ |
| IVP0000119 | Scaler | Alpha | Gross | 5.0 | dpm/100cm$^2$ |
| IVP0000120 | Scaler | Alpha | Gross | 11.0 | dpm/100cm$^2$ |
| IVP0000121 | Scaler | Alpha | Gross | 18.0 | dpm/100cm$^2$ |
| IVP0000125 | Scaler | Alpha | Gross | 17.7 | dpm/100cm$^2$ |
| IVP0000127 | Scaler | Alpha | Gross | 20.4 | dpm/100cm$^2$ |
| IVP0000129 | Scaler | Alpha | Gross | 26.4 | dpm/100cm$^2$ |

Again, a number of statistical tests of the data were performed to assess the data set. The W-test was used to measure the relative goodness of the fit of the observed data distribution. The W-test and histogram showed the data set to be lognormally distributed. The data evaluation statistics are provided in Figure 3–3. Table 3–7 summarizes the post surface media sampling direct surface measurement data, uncorrected for background, collected in survey unit 729–01.

# DATA EVALUATION STATISTICS

**Data Description**

Direct Static Surface Measurements (Post Surface Media Sampling)
Building 779 Cluster Independent Verification Project
Building 729, Survey Unit 729-01

| Critical Level | 100 |
|---|---|
| UNITS - dpm/100 cm$^2$ | |

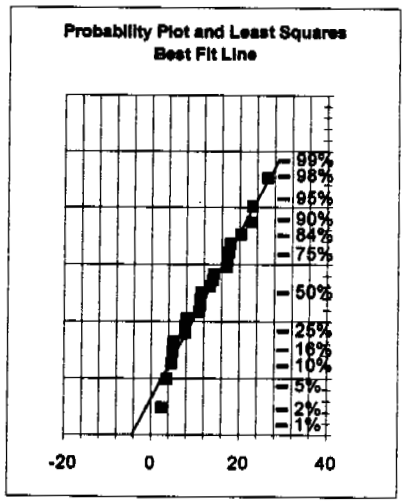
**Sample Data**

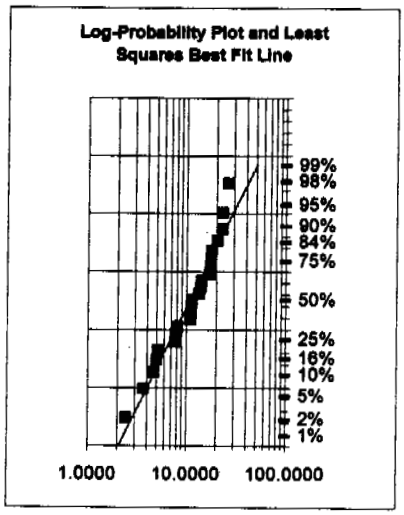
| |
|---|
| 2.5 |
| 3.7 |
| 4.7 |
| 5.0 |
| 5.2 |
| 7.8 |
| 7.8 |
| 8.1 |
| 11.0 |
| 11.2 |
| 11.2 |
| 11.4 |
| 13.4 |
| 14.0 |
| 14.3 |
| 17.2 |
| 17.4 |
| 17.7 |
| 18.0 |
| 20.4 |
| 22.8 |
| 23.0 |
| 26.4 |

| **Descriptive Statistics** | |
|---|---|
| Number of Samples | 23.000 |
| Mean | 12.790 |
| Median | 11.400 |
| Standard Deviation | 6.737 |
| CV | 0.526719 |
| Range | 23.940 |
| Minimum | 2.460 |
| Maximum | 26.400 |
| GM | 10.829 |
| GSD | 1.891 |
| Mean of LN(Data) | 2.382 |
| SD of LN(Data) | 0.637 |
| Percent > Critical Level | 0.000 |

| **Normal Statistics** | |
|---|---|
| Mean | 12.790 |
| UCL(Mean) - Z | 15.543 |
| LCL(Mean) - Z | 10.036 |
| 95%ile - Z | 23.871 |
| Percent > Critical Level | 0.000 |
| W Test (Data) | 0.962896 |
| Normal (a=0.05)? | Yes |

| **Lognormal Statistics** | |
|---|---|
| GM | 10.829 |
| GSD | 1.891 |
| AM of data | 12.790 |
| AM - MVUE | 13.127 |
| AM - MLE | 13.264 |
| UCL - Norm t stats | 15.703 |
| LCL - Norm t stats | 9.876 |
| UCL LogNorm t | 17.469 |
| LCL LogNorm t | 10.071 |
| UCL - Modified Cox | 17.776 |
| LCL - Modified Cox | 9.694 |
| UCL - "Exact" | |
| LCL - "Exact" | |
| 95%ile | 30.872 |
| UTL 95%, 95% | 47.725 |
| Percent > Critical Level | 0.024 |
| PEP (Upper) | 0.354 |
| PEP (Lower) | 0.000149 |
| W Test (ln Data) | 0.940194 |
| Lognorm (a=0.05)? | Yes |



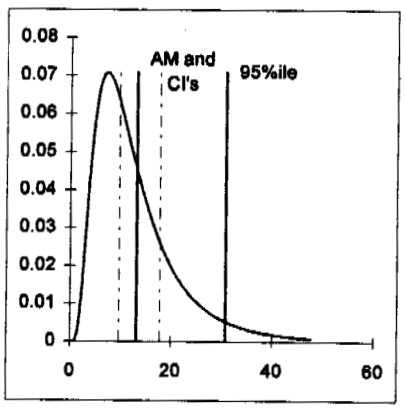




*Figure 3–3. Data Evaluation Statistics—Direct Static Surface Measurements (Post Surface Media Sampling)*



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*Table 3–7. Summary Statistics, Post Media Sampling Direct Static Measurements, Building 729, Survey Unit 729–01*

| Statistic | Value |
|---|---|
| Number of Measurements | 23.00 |
| Arithmetic Mean | 12.79 |
| Standard Deviation (sample) | 6.74 |
| Coefficient of Variation | 0.53 |
| Max | 26.40 |
| Median | 11.40 |
| Minimum | 2.46 |
| Range | 23.94 |
| Geometric Mean | 10.83 |
| UCL (lognormal "t", a=0.05) | 17.47 |
| LCL (lognormal "t", b=0.05) | 10.07 |

The most telling presentation of the post surface media sampling surface measurements is a side by side comparison of the data set summary statistics with the summary statistics from the direct surface measurements made prior to sampling and the instrument background data collected during the sampling process. Table 3–8 compares the summary statistics from each of these three data sets.

*Table 3–8. Comparison of Direct Static Measurement Data Sets Summary Statistics*

| Statistic | Pre-Surface Media Sampling Measurements Value | Post-Surface Media Sampling Measurements Value | Background Measurements Value |
|---|---|---|---|
| Number of Measurements | 29.00 | 23.00 | 31.00 |
| Arithmetic Mean | 14.75 | 12.79 | 14.72 |
| Standard Deviation (sample) | 9.49 | 6.74 | 10.13 |
| Coefficient of Variation | 0.64 | 0.53 | 0.69 |
| Max | 40.80 | 26.40 | 36.50 |
| Median | 9.90 | 11.40 | 12.30 |
| Minimum | 1.12 | 2.46 | 3.02 |
| Range | 39.68 | 23.94 | 33.48 |
| Geometric Mean | 11.81 | 10.83 | 11.57 |
| UCL (lognormal "t", a=0.05) | 20.71 | 17.47 | 19.76 |
| LCL (lognormal "t", b=0.05) | 11.75 | 10.07 | 11.56 |

From the data evaluation and summary statistics, it is evident that the post surface media sampling direct static measurements show slightly lower activity than those collected prior to sampling. More importantly, they are comparable and indistinguishable from the instrument background measurements made over the sampling period indicating that the assumption of radioactivity being deposited only in a very thin veneer is realistic and credible for this survey unit. The maximum value of 26.4 dpm/100 $cm^2$ was measured on a bare concrete beam near the ceiling on the north wall of survey unit 729–01 at sample location IVP0000129.

One interesting, though not conclusive or statistically significant, aspect of the post surface media sampling direct static measurement data set is that the distribution is less skewed than any



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other data set obtained in the survey unit as evidenced by the relationship between the mean, geometric mean and medians and to some degree by the coefficient of variation. In fact some survey results yielded higher direct static measurements of activity once the paint layer had been removed than was obtained before the paint was removed. This coupled with the fact that the corresponding surface media sample yielded no appreciable measure of radioactivity tends to support the possibility that the building materials have a measurable concentration of naturally occurring radionuclides[1]. Both the pre- and post-surface media sampling direct static measurement data set are presented side-by-side in Table 3–9.

*Table 3–9. Direct Static Measurement Data Sets, Pre- and Post Media Sampling*

| Sample Location | Pre Surface Media Sampling Direct Static Surface Measurements dpm/100 cm$^2$ | Post Surface Media Sampling Direct Static Surface Measurements dpm/100 cm$^2$ |
|---|---|---|
| IVP0000101 | 17.7 | NA |
| IVP0000102 | 3.4 | 17.4 |
| IVP0000103 | 18.1 | 8.1 |
| IVP0000104 | 12.4 | 11.2 |
| IVP0000105 | 9.7 | 5.2 |
| IVP0000106 | 24.0 | 14.3 |
| IVP0000107 | 9.3 | 23.0 |
| IVP0000108 | 9.4 | 13.4 |
| IVP0000109 | 9.7 | 11.2 |
| IVP0000110 | 7.0 | 3.7 |
| IVP0000111 | 6.6 | 7.8 |
| IVP0000112 | 1.1 | 7.8 |
| IVP0000113 | 6.9 | 4.7 |
| IVP0000114 | 9.9 | 2.5 |
| IVP0000115 | 9.8 | 14.0 |
| IVP0000116 | 18.7 | 17.2 |
| IVP0000117 | 9.9 | 11.4 |
| IVP0000118 | 32.8 | 22.8 |
| IVP0000119 | 7.3 | 5.0 |
| IVP0000120 | 7.4 | 11.0 |
| IVP0000121 | 23.5 | 18.0 |
| IVP0000122 | 6.2 | NA |
| IVP0000123 | 14.9 | NA |
| IVP0000124 | 20.9 | NA |
| IVP0000125 | 28.2 | 17.7 |
| IVP0000126 | 21.2 | NA |
| IVP0000127 | 40.8 | 20.4 |
| IVP0000128 | 13.5 | NA |
| IVP0000129 | 28.3 | 26.4 |

NA is not applicable. These survey locations were not sampled for surface media activity, thus no post-surface media direct static measurements were made.

[1]Although indications point to the possibility of measurable concentrations of naturally occurring radionuclides, particularly in the concrete materials used in the building construction, no credit is taken by attempting to subtract these from the measured vales in the building. Instead, all radioactivity measured (other than the instrument background) is assumed to be DOE contributed values and is compared against the applicable DCGL to determine compliance with the DQOs.



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## 3.2 Laboratory Measurements

The GJO Analytical Laboratory was used to assay all smear and surface media samples collected for independent verification from survey unit 729–01. The GJO Analytical Laboratory was selected because of its method capabilities, quality program, autonomy, and ability to meet the detection limits specified in the SAP (DOE 1999). In each case, the laboratory met or exceeded the contract required detection limit specified in the SAP. Results of samples analyzed are summarized in the following sections.

### 3.2.1 Smear Samples

Smear samples were collected at each of the 29 designated sample locations. Smear samples were collected following the initial direct static surface measurement by wiping the surface with an absorbent smear filter media using moderate pressure. The smears were packaged and delivered to the GJO Analytical Laboratory for counting. The 29 smear samples were submitted to the GJO Analytical Laboratory along with three blank smears and three "spiked" smears on March 30, 1999, for analysis. Table 3–10 is provided to aid the reader to keep the sample identification numbers straight. Results and conclusions relative to the quality control smear samples are provided in Section 6.0 of this report.

With the exception of the spiked QC samples submitted, the analytical results showed no measurable radioactivity indicating that there is very little likelihood that the $DCGL_W$ for removable surface contamination might be exceeded in the survey unit. Since every sample result was below the detection limit for the analysis (MDA), no statistical inferences can be made for the data set. However, since the method detection limit was significantly below the $DCGL_W$ for removable alpha radioactivity, and each smear sample was shown to have activity less than the detection limit, statistical treatment of the data set is not necessary in order to measure compliance. Table 3–11 summarizes the pertinent information gleaned from the complete analytical report (Requisition #16496). The entire analytical report is provided in Appendix C.

### 3.2.2 Surface Media Samples

Surface media samples were collected at each of the 29 sample locations selected when either of two conditions were satisfied (DOE 1999). First, a sample was collected at each location where a surface coating or residue, such as paint, was present on the selected surface. Second, a sample was collected at each location where the direct static surface measurement exceeded $L_c$, 22 dpm/100 $cm^2$, indicating the possible presence of measurable DOE added radioactivity. In all, 23 surface media samples were collected; 23 of the 29 designated sample locations having met one or both conditions.



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*Table 3–10. Smear Sample Identification Crosswalk*

| Field Sample Location ID# (Location at which the smear was collected) | Unique Sample ID# Assigned to the Smear Sample in the Field | GJO Analytical Laboratory Assigned Sample # |
|---|---|---|
| IVP0000101 | SMR0000101 | 258204 |
| IVP0000102 | SMR0000102 | 258205 |
| IVP0000103 | SMR0000103 | 258206 |
| IVP0000104 | SMR0000104 | 258207 |
| IVP0000105 | SMR0000105 | 258208 |
| IVP0000106 | SMR0000106 | 258209 |
| IVP0000107 | SMR0000107 | 258210 |
| IVP0000108 | SMR0000108 | 258211 |
| IVP0000109 | SMR0000109 | 258212 |
| IVP0000110 | SMR0000110 | 258213 |
| IVP0000111 | SMR0000111 | 258214 |
| IVP0000112 | SMR0000112 | 258215 |
| IVP0000113 | SMR0000113 | 258216 |
| IVP0000114 | SMR0000114 | 258217 |
| IVP0000115 | SMR0000115 | 258218 |
| IVP0000116 | SMR0000116 | 258219 |
| IVP0000117 | SMR0000117 | 258220 |
| IVP0000118 | SMR0000118 | 258221 |
| IVP0000119 | SMR0000119 | 258222 |
| IVP0000120 | SMR0000120 | 258223 |
| IVP0000121 | SMR0000121 | 258224 |
| IVP0000122 | SMR0000122 | 258225 |
| IVP0000123 | SMR0000123 | 258226 |
| IVP0000124 | SMR0000124 | 258227 |
| IVP0000125 | SMR0000125 | 258228 |
| IVP0000126 | SMR0000126 | 258229 |
| IVP0000127 | SMR0000127 | 258230 |
| IVP0000128 | SMR0000128 | 258231 |
| IVP0000129 | SMR0000129 | 258232 |
| SPIKE, NDL299 | SMR0000591 | 258233 |
| SPIKE, NDL297 | SMR0000592 | 258234 |
| SPIKE, NDL295 | SMR0000593 | 258235 |
| BLANK, SMR0000594 | SMR0000594 | 258236 |
| BLANK, SMR0000595 | SMR0000595 | 258237 |
| BLANK, SMR0000596 | SMR0000596 | 258238 |

*Table 3–11. Summary of Analytical Report Data for Smears*

| | |
|---|---|
| Number of Samples | 29 (258204 through 258232) |
| Method Detection Limit ($\alpha$=0.05) | 5.17 dpm/100cm$^2$ |
| Removable Alpha Surface Radioactivity (dpm/100cm$^2$) | All smear samples were less than (<) MDA |
| Sample Count Time | 6 minutes |

In order to achieve the required detection sensitivity and to distinguish between transuranic and uranium series radionuclides, alpha spectroscopy analysis was chosen to assay the surface media



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samples. Distinction between transuranic and uranium series nuclides is important because radionuclide series specific DCGLs were established for the surface media samples. Sample masses ranged from approximately 25 to 50 grams and were collected over a 100 $cm^2$ surface area. The laboratory analyzed each sample for the following radionuclide sets:

- Transuranic Series Isotopes Pu-238, Pu-239/240, and Am-241
- Uranium Series Isotopes U-234, U-235, and U-238

In spectrometric analysis, each isotope has its own counting statistics and detection limit. Many of the sample measurements resulted in one or more of the isotope specific values below the detection limit. When this occurred, a value equal to one half of the sample specific detection limit was used to calculate the total radionuclide series activity. Collated data has been derived from the complete analytical report (Requisition #16495) and presented in Table 3–12. The entire analytical report is provided in Appendix C.

From summary data presented in Table 3–12, several features are apparent:

- Isotopic assay of the contaminants found on and beneath painted and coated surfaces in Building 729 indicate the persistent presence of uranium series radionuclides. Each of the 23 samples collected showed detectable concentrations of the two uranium isotopes found most abundantly in nature, U-234 and U-238. This is indicative of the presence of background contributions of these nuclides and is consistent with the background contributions expected in concrete and cinder block materials (NRC 1997).

- Only one sample, IVP000118, from among the 23 collected showed the clear presence of transuranic radioactivity. This sample was collected from the pit (or sump) in the north west portion of the survey unit. The Contractor had earlier identified radioactive contamination in this sump and performed a decontamination process to remove it to below the applicable DCGL value. Every other sample result had one or more of the transuranic nuclides of interest at concentrations below the detection limit.

- The detection limit for a given isotope varied for each sample. This is due to the variation in the total sample mass collected. The laboratory was limited by the mass of sample that could efficiently be processed to extract the nuclides of interest. As a result, the laboratory fractioned a relatively consistent aliquot of the total mass submitted to actually perform the analysis. The larger the sample collected and submitted, the smaller the fraction represented by the aliquot. Thus, the detection limit increased (got poorer) as the total mass collected increased. In each case, however, actual field sampling procedure collected a sample from a 100 $cm^2$ area until the entire surface had been stripped of the paint layer or surface veneer.

- The one sample which indicated the presence of transuranic activity severely skews the surface media samples for transuranics. This skewness likely results in very conservative estimates of the overall residual transuranic activity in the survey unit.

Surface media sample data evaluation statistics are presented for the uranium series, the transuranic series, and the transuranic series excluding sample #258197 in Figures 3–4, 3–5, and 3–6, respectively. Table 3–13 presents the summary statistics for the surface media sample data

*Table 3–12. Surface Media Sample Data, Building 729, Survey Unit 729–01—Alpha Isotopic Analysis*

| Sample Location | Lab Sample ID# | Sample Weight (grams | Am-241 | | Pu-239/240 | | Pu-238 | | U-238 | U-235 | | U-234 | Total Transuranic Activity | Total Uranium Activity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Reported Value | Reported Value (w/ samples less than MDA @ 0.5 MDA) | Reported Value | Reported Value (w/ samples less than MDA @ 0.5 MDA) | Reported Value | Reported Value (w/ samples less than MDA @ 0.5 MDA) | Reported Value | Reported Value | Reported Value (w/ samples less than MDA @ 0.5 MDA) | Reported Value | dpm/100 cm2 | dpm/100 cm2 |
| IVP0000102 | 258181 | 23.85 | 2.32 | 2.32 | 2.45 | 1.22 | 1.13 | 0.57 | 112.00 | 6.00 | 6.00 | 121.00 | 4.11 | 239.00 |
| IVP0000103 | 258182 | 26.67 | 2.33 | 2.33 | 1.66 | 0.83 | 1.66 | 0.83 | 45.14 | 3.82 | 1.91 | 46.79 | 3.99 | 93.84 |
| IVP0000104 | 258183 | 32.07 | 4.31 | 4.31 | 2.18 | 1.09 | 1.58 | 0.79 | 34.32 | 4.85 | 2.43 | 35.60 | 6.19 | 72.35 |
| IVP0000105 | 258184 | 37.17 | 4.14 | 4.14 | 2.15 | 1.08 | 2.15 | 1.08 | 79.11 | 5.39 | 2.70 | 78.05 | 6.29 | 159.86 |
| IVP0000106 | 258185 | 29.63 | 2.50 | 2.50 | 2.26 | 1.13 | 1.99 | 0.99 | 62.16 | 4.27 | 4.27 | 64.65 | 4.62 | 131.08 |
| IVP0000107 | 258186 | 20.14 | 2.55 | 2.55 | 1.98 | 0.99 | 1.62 | 0.81 | 66.29 | 2.69 | 1.35 | 63.20 | 4.35 | 130.84 |
| IVP0000108 | 258187 | 17.64 | 1.98 | 1.98 | 1.28 | 0.64 | 1.16 | 0.58 | 56.80 | 3.35 | 3.35 | 59.84 | 3.20 | 119.99 |
| IVP0000109 | 258188 | 26.45 | 1.91 | 1.91 | 2.69 | 1.34 | 1.82 | 0.91 | 41.26 | 3.21 | 3.21 | 41.99 | 4.16 | 86.46 |
| IVP0000110 | 258189 | 12.89 | 0.94 | 0.47 | 0.90 | 0.45 | 0.90 | 0.45 | 27.54 | 1.56 | 1.56 | 32.32 | 1.37 | 61.42 |
| IVP0000111 | 258190 | 31.25 | 2.50 | 2.50 | 1.52 | 0.76 | 2.09 | 1.05 | 90.55 | 6.44 | 6.44 | 102.70 | 4.30 | 199.69 |
| IVP0000112 | 258191 | 26.73 | 4.11 | 4.11 | 2.69 | 1.34 | 1.45 | 0.72 | 47.60 | 4.02 | 2.01 | 48.96 | 6.18 | 98.57 |
| IVP0000113 | 258192 | 22.14 | 1.43 | 0.72 | 1.54 | 0.77 | 1.54 | 0.77 | 27.86 | 2.26 | 1.13 | 29.15 | 2.26 | 58.14 |
| IVP0000114 | 258193 | 19.51 | 3.77 | 3.77 | 1.75 | 0.87 | 0.51 | 0.26 | 25.67 | 2.26 | 1.13 | 25.35 | 4.90 | 52.15 |
| IVP0000115 | 258194 | 57.35 | 4.41 | 4.41 | 4.03 | 4.03 | 2.28 | 1.14 | 121.80 | 8.56 | 8.56 | 159.60 | 9.57 | 289.96 |
| IVP0000116 | 258195 | 23.07 | 1.85 | 1.85 | 2.41 | 1.21 | 1.30 | 0.65 | 28.44 | 3.61 | 1.80 | 33.46 | 3.70 | 63.70 |
| IVP0000117 | 258196 | 14.16 | 0.69 | 0.35 | 0.79 | 0.79 | 0.76 | 0.38 | 25.85 | 2.66 | 2.66 | 25.41 | 1.52 | 53.92 |
| IVP0000118 | 258197 | 34.21 | 10.11 | 10.11 | 74.09 | 74.09 | 2.81 | 2.81 | 103.20 | 6.06 | 6.06 | 101.40 | 87.01 | 210.66 |
| IVP0000119 | 258198 | 36.09 | 4.87 | 4.87 | 2.01 | 1.01 | 2.01 | 1.01 | 46.39 | 4.62 | 2.31 | 45.04 | 6.88 | 93.74 |
| IVP0000120 | 258199 | 18.72 | 1.47 | 1.47 | 1.23 | 0.61 | 1.08 | 0.54 | 25.39 | 2.24 | 2.24 | 24.04 | 2.62 | 51.67 |
| IVP0000121 | 258200 | 10.41 | 0.78 | 0.39 | 0.97 | 0.48 | 0.79 | 0.40 | 37.66 | 1.97 | 1.97 | 41.19 | 1.27 | 80.82 |
| IVP0000125 | 258201 | 7.81 | 0.49 | 0.24 | 0.57 | 0.28 | 0.52 | 0.26 | 36.07 | 1.79 | 1.79 | 37.04 | 0.79 | 74.90 |
| IVP0000127 | 258202 | 4.3 | 0.29 | 0.15 | 0.39 | 0.19 | 0.26 | 0.13 | 19.86 | 0.91 | 0.91 | 20.59 | 0.47 | 41.36 |
| IVP0000129 | 258203 | 18.08 | 1.50 | 1.50 | 1.17 | 0.59 | 1.17 | 0.59 | 55.30 | 1.98 | 1.98 | 67.55 | 2.67 | 124.83 |

Shaded cells indicate values below the detection limit. The reported value is the sample-specific MDA.

# DATA EVALUATION STATISTICS

**Data Description**

Uranium Series Activity, Surface Media Samples
Building 779 Cluster, Independent Verification Project
Building 729, Survey Unit 729-01

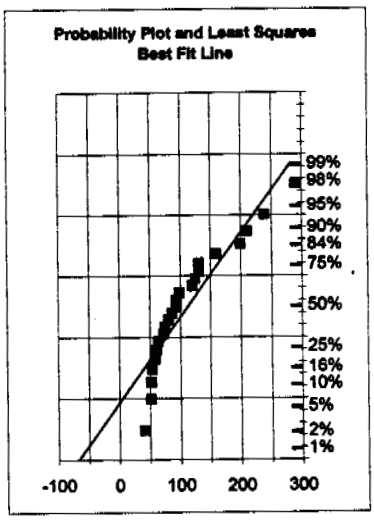
| DCGL Limit | 1000 |
|---|---|
| UNITS - dpm/100 cm$^2$ | |

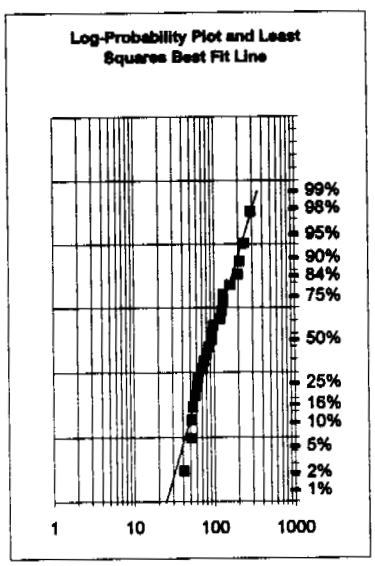
| Sample Data |
|---|
| 41.36 |
| 51.67 |
| 52.15 |
| 53.92 |
| 58.14 |
| 61.42 |
| 63.70 |
| 72.35 |
| 74.90 |
| 80.82 |
| 86.46 |
| 93.74 |
| 93.84 |
| 98.57 |
| 119.99 |
| 124.83 |
| 130.84 |
| 131.08 |
| 159.86 |
| 199.69 |
| 210.66 |
| 239.00 |
| 289.96 |

| Descriptive Statistics | |
|---|---|
| Number of Samples | 23.000 |
| Mean | 112.563 |
| Median | 93.740 |
| Standard Deviation | 66.485 |
| CV | 0.59065 |
| Range | 248.600 |
| Minimum | 41.360 |
| Maximum | 289.960 |
| GM | 97.335 |
| GSD | 1.713 |
| Mean of LN(Data) | 4.578 |
| SD of LN(Data) | 0.538 |
| Percent > DCGL | 0.000 |

| Normal Statistics | |
|---|---|
| Mean | 112.563 |
| UCL(Mean) - Z | 139.735 |
| LCL(Mean) - Z | 85.391 |
| 95%ile - Z | 221.931 |
| Percent > DCGL | 0.000 |
| W Test (Data) | 0.856204 |
| Normal (a=0.05)? | No |

| Lognormal Statistics | |
|---|---|
| GM | 97.335 |
| GSD | 1.713 |
| AM of data | 112.563 |
| AM - MVUE | 111.719 |
| AM - MLE | 112.514 |
| UCL - Norm t stats | 141.313 |
| LCL - Norm t stats | 83.813 |
| UCL LogNorm t | 142.007 |
| LCL LogNorm t | 89.146 |
| UCL - Modified Cox | 143.424 |
| LCL - Modified Cox | 87.023 |
| UCL - "Exact" | |
| LCL - "Exact" | |
| 95%ile | 235.983 |
| UTL 95%, 95% | 341.038 |
| Percent > DCGL | 0.001 |
| PEP (Upper) | 0.039 |
| PEP (Lower) | 4.32E-07 |
| W Test (ln Data) | 0.961215 |
| Lognorm (a=0.05)? | Yes |



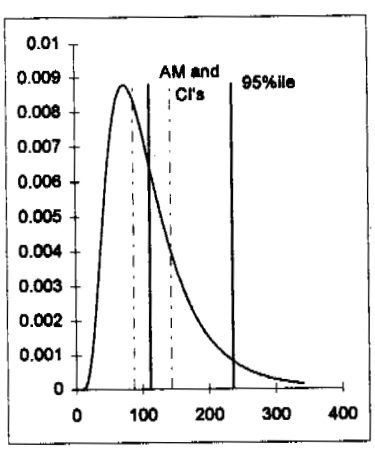




*Figure 3–4. Data Evaluation Statistics—Uranium Series Activity, Surface Media Samples*



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# DATA EVALUATION STATISTICS

## Data Description

Transuranic Activity, Surface Media Samples
Building 779 Cluster, Independent Verification Project
Building 729, Survey Unit 729-01

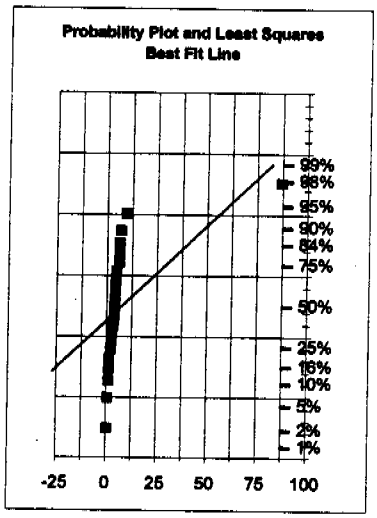
| DCGL Limit | 100 |
|---|---|
| UNITS - dpm/100 cm$^2$ | |

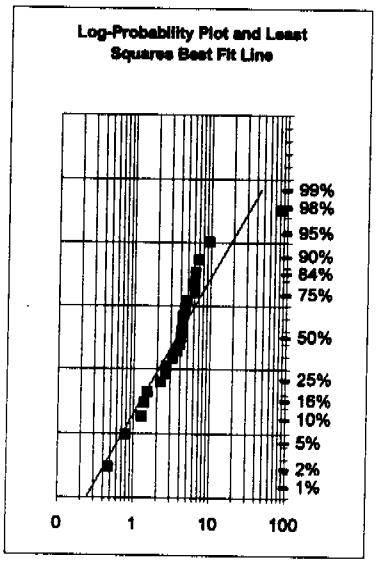
| Sample Data |
|---|
| 0.47 |
| 0.79 |
| 1.27 |
| 1.37 |
| 1.52 |
| 2.26 |
| 2.62 |
| 2.67 |
| 3.20 |
| 3.70 |
| 3.99 |
| 4.11 |
| 4.16 |
| 4.30 |
| 4.35 |
| 4.62 |
| 4.90 |
| 6.18 |
| 6.19 |
| 6.29 |
| 6.88 |
| 9.57 |
| 87.01 |

| Descriptive Statistics | |
|---|---|
| Number of Samples | 23.000 |
| Mean | 7.497 |
| Median | 4.110 |
| Standard Deviation | 17.472 |
| CV | 2.330644 |
| Range | 86.540 |
| Minimum | 0.470 |
| Maximum | 87.010 |
| GM | 3.625 |
| GSD | 2.738 |
| Mean of LN(Data) | 1.288 |
| SD of LN(Data) | 1.007 |
| Percent > DCGL | 0.000 |

| Normal Statistics | |
|---|---|
| Mean | 7.497 |
| UCL(Mean) - Z | 14.637 |
| LCL(Mean) - Z | 0.356 |
| 95%ile - Z | 36.238 |
| Percent > DCGL | 0.000 |
| W Test (Data) | 0.322311 |
| Normal (a=0.05)? | No |

| Lognormal Statistics | |
|---|---|
| GM | 3.625 |
| GSD | 2.738 |
| AM of data | 7.497 |
| AM - MVUE | 5.834 |
| AM - MLE | 6.020 |
| UCL - Norm t stats | 15.052 |
| LCL - Norm t stats | -0.059 |
| UCL LogNorm t | 9.306 |
| LCL LogNorm t | 3.895 |
| UCL - Modified Cox | 10.000 |
| LCL - Modified Cox | 3.404 |
| UCL - "Exact" | |
| LCL - "Exact" | |
| 95%ile | 19.007 |
| UTL 95%, 95% | 37.854 |
| Percent > DCGL | 0.049 |
| PEP (Upper) | 0.565 |
| PEP (Lower) | 0.000505 |
| W Test (ln Data) | 0.893631 |
| Lognorm (a=0.05)? | No |



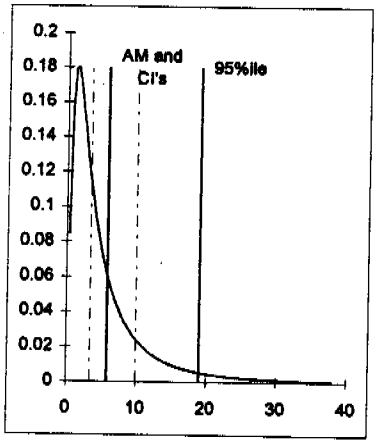




*Figure 3–5. Data Evaluation Statistics—Transuranic Activity, Surface Media Samples*



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# DATA EVALUATION STATISTICS

## Data Description

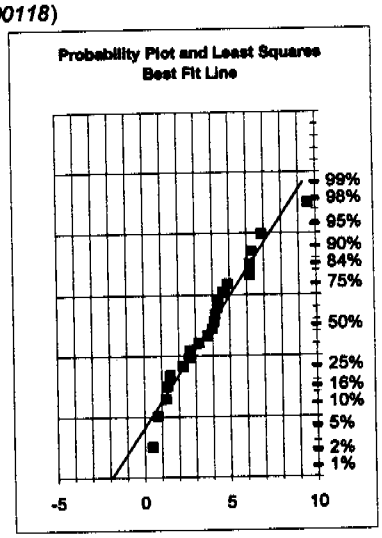
Transuranic Activity, Surface Media Samples (*without sample MED0000118*)
Building 779 Cluster, Independent Verification Project
Building 729, Survey Unit 729-01

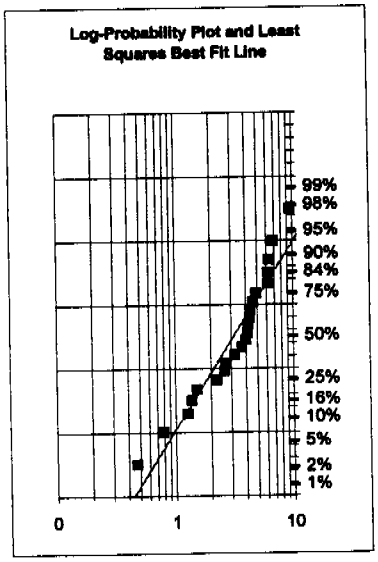
| DCGL Limit | 100 |
|---|---|
| UNITS - dpm/100 cm$^2$ | |
| **Sample Data** | |
| 0.47 | |
| 0.79 | |
| 1.27 | |
| 1.37 | |
| 1.52 | |
| 2.26 | |
| 2.62 | |
| 2.67 | |
| 3.20 | |
| 3.70 | |
| 3.99 | |
| 4.11 | |
| 4.16 | |
| 4.30 | |
| 4.35 | |
| 4.62 | |
| 4.90 | |
| 6.18 | |
| 6.19 | |
| 6.29 | |
| 6.88 | |
| 9.57 | |

| **Descriptive Statistics** | |
|---|---|
| Number of Samples | 22.000 |
| Mean | 3.882 |
| Median | 4.050 |
| Standard Deviation | 2.246 |
| CV | 0.578617 |
| Range | 9.100 |
| Minimum | 0.470 |
| Maximum | 9.570 |
| GM | 3.138 |
| GSD | 2.113 |
| Mean of LN(Data) | 1.143 |
| SD of LN(Data) | 0.748 |
| Percent > DCGL | 0.000 |

| **Normal Statistics** | |
|---|---|
| Mean | 3.882 |
| UCL(Mean) - Z | 4.821 |
| LCL(Mean) - Z | 2.944 |
| 95%ile - Z | 7.578 |
| Percent > DCGL | 0.000 |
| W Test (Data) | 0.959516 |
| Normal (a=0.05)? | Yes |

| **Lognormal Statistics** | |
|---|---|
| GM | 3.138 |
| GSD | 2.113 |
| AM of data | 3.882 |
| AM - MVUE | 4.086 |
| AM - MLE | 4.151 |
| UCL - Norm t stats | 4.878 |
| LCL - Norm t stats | 2.886 |
| UCL LogNorm t | 5.785 |
| LCL LogNorm t | 2.979 |
| UCL - Modified Cox | 5.960 |
| LCL - Modified Cox | 2.802 |
| UCL - "Exact" | |
| LCL - "Exact" | |
| 95%ile | 10.745 |
| UTL 95%, 95% | 18.210 |
| Percent > DCGL | 0.000 |
| PEP (Upper) | 0.017 |
| PEP (Lower) | 2.96E-08 |
| W Test (ln Data) | 0.91997 |
| Lognorm (a=0.05)? | Yes |



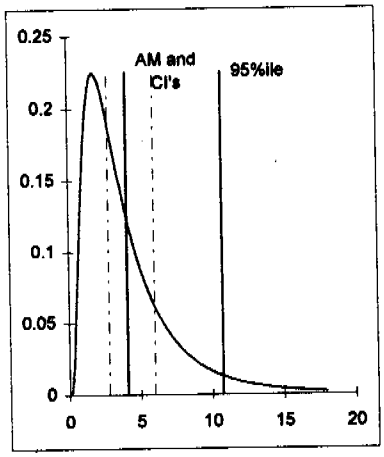




*Figure 3–6. Data Evaluation Statistics—Transuranic Activity, Surface Media Samples (without sample MED0000118)*



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set, with the transuranic and uranium series nuclides presented as independent subsets. For information purposes, the transuranic series data summary statistics have been presented with and without the sample #258197 collected at location IVP0000118.

*Table 3–13. Summary Statistics, Surface Media Samples*

| Statistic | Transuranic Surface Activity Values | | Uranium Series Surface Activity Values |
|---|---|---|---|
| | Sample 258197 included | Sample 258197 excluded | |
| Number of Measurements | 23 | 22 | 23 |
| Arithmetic Mean | 7.50 | 3.88 | 112.56 |
| Standard Deviation | 17.47 | 2.25 | 66.49 |
| Coefficient of Variation | 2.33 | 0.58 | 0.59 |
| Max | 87.01 | 9.57 | 289.96 |
| Median | 4.11 | 4.05 | 93.74 |
| Minimum | 0.47 | 0.47 | 41.36 |
| Range | 86.54 | 9.10 | 248.6 |
| Geometric Mean | 3.63 | 3.14 | 97.34 |
| UCL (lognormal "t", a=0.05) | 9.31 | 5.79 | 142.01 |



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End of current text



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# 4.0 Analysis of Sample Plan Results for Compliance

In accordance with MARSSIM and other EPA guidance (EPA 1997) (EPA 1993), the Building 779 Cluster IV SAP identified the decision rules which provide the basis for independently verifying and assessing the RFETS Contractor's conclusions and recommendations for risk management actions in Building 729 (DOE 1999). To accomplish this objective, the IVC was tasked with performing independent measurements of a representative fraction of the Contractor's survey, such that a statistically valid, yet independent conclusion could be drawn. In order to obtain a data set robust enough to allow statistically valid comparisons with the decision rules, the IVC selected and sampled one of the three designated survey units in Building 729. The first decision rule supports this decision objective. The IVC was also tasked with reviewing and verifying the Contractor's Closeout Radiological Survey Report and its conclusions. Since the Contractor's decision basis is applied independently to each survey unit, a sampling and statistical test with power comparable to that used by the Contractor was needed in order to compare with the conclusions reached by the Contractor. The second decision rule supports this objective. The decision rules which define compliance for the independent verification of the Building 779 Cluster surveys are specified in the IV SAP (DOE 1999) and were reviewed by the EPA and approved by the DOE and CDPHE. The IVC's SAP specifies the following two decision rules:

> *If the independent verification survey concludes that, in the selected survey unit(s), the mean (or median) removable surface contamination concentration is below 20 dpm/100 cm$^2$ gross alpha activity, and the mean (or median) total alpha surface contamination concentration as measured by direct surface emission is below 100 dpm/100 cm$^2$, and the maximum total alpha surface contamination concentration as measured by direct surface emission is below 300 dpm/100 cm$^2$, and the mean (or median) contamination concentration on and beneath a surface with a surface coating as measured by collection and analysis of a surface media sample is below 100 dpm/100 cm$^2$ for all transuranic nuclides combined and below 5,000 dpm/100 cm$^2$ for all uranium series nuclides combined, then conclude that the survey unit meets the release criterion.*
>
> *If the IVC survey conclusion disagrees with the Contractor's final status survey conclusion, then refute the Contractor's conclusion for the survey unit and consult with the DOE–RFFO contact for direction on discrepancy resolution.*

Demonstrating compliance with the decision rules for independent verification provides the DOE with assurance that a substantial and credible case exists for releasing the buildings from further radioactive contamination controls during demolition or disposal.

The first decision rule forms the basis for the five DCGLs, the benchmarks against which measured values are compared to determine compliance. Each component of the decision rule can be reduced to a specific DCGL. The DCGLs for the Building 729 Closeout Radiological Survey are:

- *20 dpm/100 cm$^2$ for removable alpha surface contamination*
- *100 dpm/100 cm$^2$ (mean or median) total alpha surface contamination as measured by direct surface emission*



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- *300 dpm/100 cm$^2$ (maximum) total alpha surface contamination as measured by direct surface emission*
- *100 dpm/100 cm$^2$ (mean or median) total transuranic surface contamination on and beneath a surface with a surface coating as measured by collection and analysis of a surface media sample*
- *5,000 dpm/100 cm$^2$ (mean or median) total uranium series surface contamination on and beneath a surface with a surface coating as measured by collection and analysis of a surface media sample*

## 4.1 Survey and Sampling Results Compared to the DCGLs

The following sections address each component of the sampling performed and compare the results to the applicable DCGLs. While each data set collected by the IVC has been shown to best fit a lognormal distribution, the $DCGL_W$ values, as stated by the RFETS Contractor (RMRS 1999b), do not specify whether the compliance benchmark assumes the arithmetic mean or some other estimate of central tendency appropriate to the distribution. For example, in the case of lognormally distributed data, the lognormal average (i.e., geometric mean) is a more appropriate indicator of the central tendency. When the distribution is not well known or abnormally skewed, the median value generally provides a good estimate of the central tendency for the data set. For comparison purposes in this report, the arithmetic (or normal) mean, the lognormal mean, and the median value are provided for each data set along with the maximum values observed. These provide the risk managers and decision maker with the range of plausible values that might be encountered and considerable evidence, regardless of the underlying distribution, for comparison with the DCGL benchmarks.

### 4.1.1 Direct Static Surface Measurements

Table 4–1 presents the gross direct static surface measurement results obtained in the survey unit selected for independent verification in survey unit 729–01. In this table, no correction for instrument background has been made in order to provide the risk managers and decision makers with the information needed to compare corrected and uncorrected results in the survey unit and correlate the measured residual radioactivity in the survey unit not only with the DCGL but also with the comparable measure of background.

Table 4–2 compares the background adjusted survey unit measurement results to the applicable DCGL. The background adjustment for direct static measurements is made by simply subtracting the central tendency estimate of the background measurements made over the sampling period from the comparable central tendency estimate of the gross, or unadjusted values collected and recorded in the field (see Section 3.2 for detailed discussion of background correction methods employed).

*Table 4–1. Comparison of Direct Static Survey Measurements to Applicable DCGLs*

| Building 729, Survey Unit 729–01 *Unadjusted (Gross) Measurements* *(dpm/100 cm²)* | | | | | | |
|---|---|---|---|---|---|---|
| **DCGL Value (Total Surface Contamination by direct surface emission)** | **Arithmetic Mean** | **Lognormal Geometric Mean** | **Median** | **Arithmetic $UCL_{95}$** | **Lognormal $UCL_{95}$** | **Maximum** |
| ***100 dpm/100 cm²*** | 14.8 | 11.8 | 9.9 | 18.4 | 20.7 | |
| ***300 dpm/100 cm²*** | | | | | | 40.8 |

*Table 4–2. Comparison of Background Adjusted Direct Static Survey Results to Applicable DCGLs*

| Building 729, Survey Unit 729–01 *Background Adjusted (Net) Measurements*[a] *(dpm/100 cm²)* | | | | | | |
|---|---|---|---|---|---|---|
| **DCGL Value** | **Arithmetic Mean** | **Lognormal Geometric Mean** | **Median** | **Arithmetic $UCL_{95}$** | **Lognormal $UCL_{95}$** | **Maximum** |
| ***100 dpm/100 cm²*** Total Surface Contamination by direct surface emission[2] | 0.1[b] | 0.2[b] | -2.4[b] | 0.0[b] | 1.0[b] | |
| ***300 dpm/100 cm²*** Total Surface Contamination by direct surface emission[2] | | | | | | 29.2[b] |

[a]Background corrected values are provided for information. They are not distinguishable with statistical significance from background.
[b]The following background values were used to adjust the direct static measurement values:
Arithmetic Mean = 14.7
Lognormal Geometric Mean = 11.6
Median = 12.3
Arithmetic UCL = 18.4
Lognormal UCL = 19.8
Maximum = 11.6

From the above data, it is evident that the surface contamination as measured by direct surface emission from the building surfaces in survey unit 729–01 is well below the $DCGL_W$. The IVC did not employ a scanning survey method in the independent verification sampling plan. Rather, the IVC has evaluated the scanning data collected by the Contractor to determine if the data supports the conclusions reached by the Contractor with respect to the $DCGL_{EMC}$. However, it is interesting to note the maximum concentration measured using direct static methods as it compares to the $DCGL_{EMC}$. The maximum value measured in survey unit 729–01 is substantially below the $DCGL_{EMC}$ and the background adjusted mean concentration is essentially zero. The independent verification data cannot exclude the possibility that localized concentrations of surface contamination might exist above the $DCGL_{EMC}$ value. But, given the number of measurements made, knowledge about the nature of the distribution of the data, and the large differences between the data metrics and the $DCGL_{EMC}$, it can be inferred that the likelihood of encountering even moderately sized areas with concentrations exceeding the $DCGL_{EMC}$ is small indeed.



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### 4.1.2 Smear Samples for Removable Surface Contamination

Smear samples are not subject to the influence of background radiation at the site, but the radiation counting instruments used to assay these samples are subject to background radiation levels at the counting laboratory and have inherent instrument backgrounds which are corrected by the laboratory processing the samples. Since the background corrections performed are not relevant to the conditions encountered at Building 729, only the background adjusted values are provided here in Table 4–3. The raw counting data can be referenced in the analytical laboratory report for the smear samples contained in Appendix C.

*Table 4–3. Comparison of Smear Sample Results to Applicable $DCGL_W$.*

| Building 729, Survey Unit 729–01 *Smear Sample Results* *(dpm/100 cm²)* | | | | | | |
|---|---|---|---|---|---|---|
| **DCGL Value** | **Arithmetic Mean** | **Lognormal Geometric Mean** | **Median** | **Arithmetic $UCL_{95}$** | **Lognormal $UCL_{95}$** | **Maximum** |
| ***20 dpm/100 cm²*** Removable Surface Contamination | <5.17[a] | <5.17[a] | <5.17[a] | NA | NA | <5.17[a] |

[a]All 29 smear samples yielded total alpha activity below the detection limit for the analysis. The method detection limit is presented for comparative information.

From the above data, it is evident that the removable surface contamination, as measured by smear sampling of the surfaces in survey unit 729–01, is well below the DCGL.

### 4.1.3 Surface Media Samples

As with smear samples, surface media samples are not subject to the influence of background radiation at the site, but have been corrected for the background present at the laboratory by the laboratory processing the samples. Again, since the background corrections performed are not relevant to the conditions encountered at Building 729, only the background adjusted values are provided here in Table 4–4. The raw counting data can be referenced in the analytical laboratory report for the smear samples contained in Appendix C.

*Table 4–4. Comparison of Surface Media Sample Results to Applicable DCGLs*

| Building 729, Survey Unit 729–01 *Surface Media Sample Results* *(dpm/100 cm²)* | | | | | | |
|---|---|---|---|---|---|---|
| **DCGL Value** | **Arithmetic Mean** | **Lognormal Geometric Mean** | **Median** | **Arithmetic $UCL_{95}$** | **Lognormal $UCL_{95}$** | **Maximum** |
| ***100 dpm/100 cm²*** Total Transuranic Activity by surface media sample | 7.5 | 3.6 | 4.1 | 15.1 | 9.3 | 87 |
| ***5,000 dpm/100 cm²*** Total Uranium Series Activity by surface media sample | 112.6 | 97.3 | 93.7 | 141.3 | 142.0 | 290 |

From the above data, it is notable that the maximum total transuranic activity contained on and in a thin veneer beneath the surface sampled is close to the allowable *mean* value. This is notable in that it represents the only data point collected within the entire survey unit that exceeded even

50 percent of an allowable mean value. It shows that the building is not utterly free of added radioactivity. At the same time, however, it shows that even in the extreme case, the residual activity present is well below that permitted and considered safe for unrestricted release.

In fact, most of the samples measured for transuranic activity resulted in measured concentrations below the method detection limit for the analysis. The majority of transuranic activity reported is attributed to americium-241 owing to interference in the energy window for Am-241 rather than americium activity. (See Appendix C for the method blank data indicating the activity showing up as Am-241 even when no americium is present.)

The total uranium series activity was consistently measured at concentrations exceeding the method detection limit even though the concentrations measured were consistently well below the applicable DCGL. The presence of detectable concentrations of uranium series nuclides does not, however, necessarily indicate that the activity is DOE contributed activity. In fact, isotopic ratios present in the samples support the position that the uranium series activity is naturally occurring radioactivity present in the construction materials from which the building was made. Nonetheless, because a decision was made during sampling plan design to avoid the need to make reference survey unit comparisons in order to statistically verify this assumption, all of this activity is herein assumed to be DOE contributed and is compared directly to the applicable DCGL. Even with this conservative assumption, it is clear that the residual uranium series activity on and in a thin veneer beneath the surface sampled is well below the DCGL.

## 4.2 Summary of Field Sampling Data

As evidenced above, each metric—the arithmetic average, logarithmic average, their respective 95 percent upper confidence limit ($UCL_{95}$) estimates and the median value—is well below the applicable $DCGL_W$ concentration value. Moreover, the maximum value for each data set is well below not only the applicable $DCGL_{EMC}$ but also below the $DCGL_W$. Based on the direct static measurements, removable smears sample results, and surface media sample results collected in the survey unit selected for independent verification (729–01) in Building 729, there is no evidence of radiological surface contamination levels exceeding the selected DCGLs.

Thus, the first of the tests of the DQO decision rule—*the residual radioactivity must not exceed the applicable DCGLs*—has been verified.



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End of current text



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# 5.0 Graphic Presentations of the Survey and Sampling Results

Graphics are a powerful and valuable tool used in reviewing the data collected. Graphic presentations—Normal Probability, Log Probability, and Probability Density Function Plots—have already been provided in Section 3.0 in support of the determination of the underlying distribution of each data set. In addition to these graphical treatments of each of the data sets collected, additional pictorial presentations are provided in Section 6.0 to assist the risk manager and decision maker in evaluating the data. Each form of graphic presentation provides a unique perspective or advantage in the data evaluation process.

## 5.1 Posting Plots—Spatial Contamination Distribution Graphics

Posting plots are presented for visualizing the spatial contaminant distribution within the survey unit sampled and surveyed by the IVC. Trends in spatial distribution become evident when data is plotted in this manner. The results of each data set, normalized to units of dpm/100 $cm^2$, are superimposed over the building surfaces. The walls and ceilings in the building are "unfolded" to form a contiguous surface segment, as when a cardboard box is unfolded and laid flat. Three posting plots, each comprised of two sheets, are provided. One plot, (Figure 5–1) displays the 29 direct static surface contamination measurements made in survey unit 729–01. The data used to generate this posting plot are "gross" measurements (not corrected for the mean background of 11.6 dpm/100 $cm^2$) to avoid negative numbers. Figures 5–2 and 5–3 display the 23 surface media sample results for transuranic and uranium series activities, respectively.

With one exception (the surface media sample for transuranic activity from location IVP0000118), the posting plots confirm that no substantial spatial trends in residual activity are present.

## 5.2 Histograms—Concentration Distribution Graphics

One of the oldest methods used for analyzing data set distributions is the histogram (or frequency plot). The data are divided into units, or bins, representing increments of activity. The data set is than sorted into these bins and the number of data points occurring in each bin (the frequency) is counted and then plotted using a bar graph. This presentation is designed to provide for visual means of assessing the symmetry and variability of the data set. When constructed correctly, the histogram will indicate if the data are skewed and will show the direction of skewness (EPA 1998). Figures 5–4, 5–5, 5–6, 5–7, and 5–8 display the histograms (technically frequency plots) for the background, direct static surface measurement, post-surface media sampling direct static surface measurement, surface media samples for transuranics, and surface media samples for uranium data sets, respectively.



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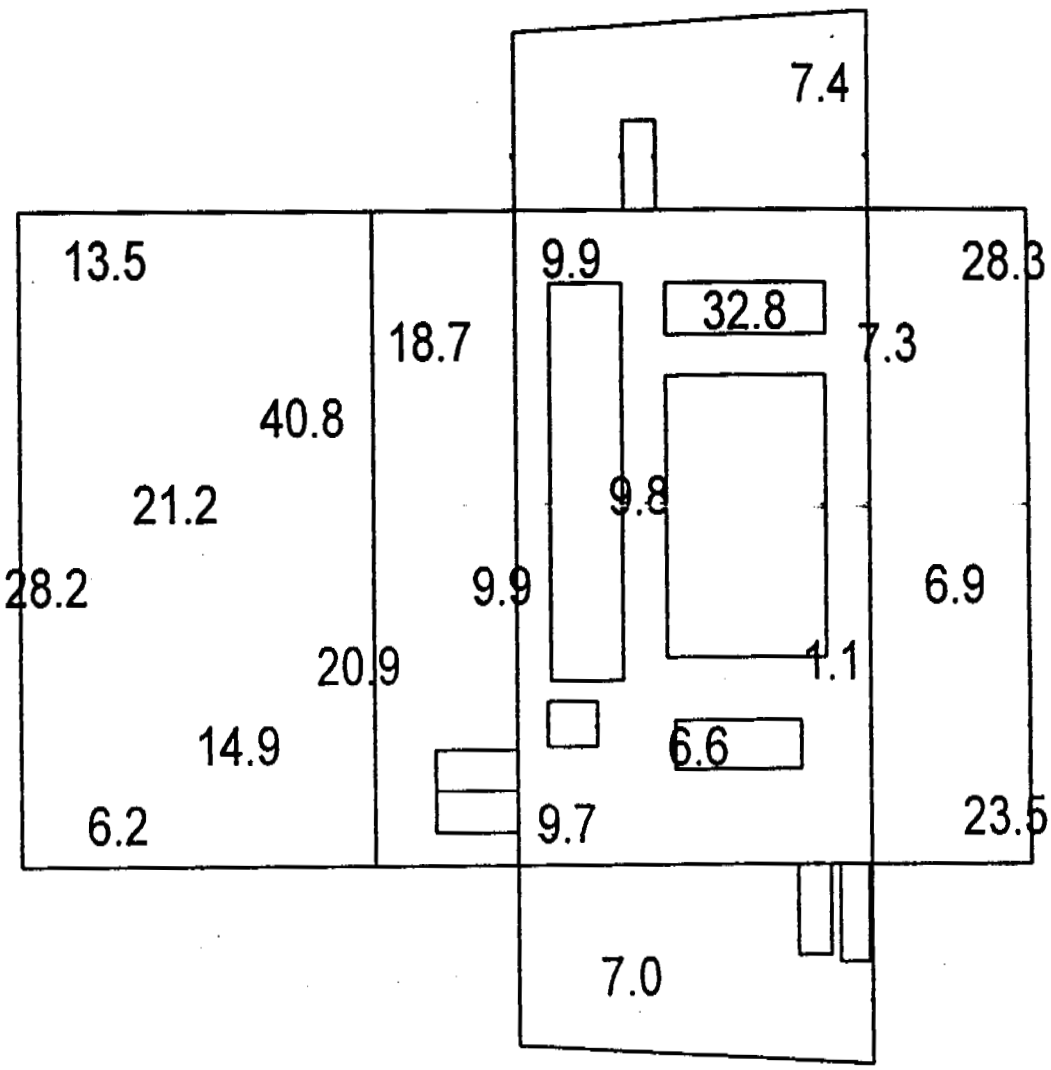
INDEPENDENT VERIFICATION SURVEY
Survey Unit 729-01

## Posting Plot: Direct Static Measurements

MAP 1 OF 2

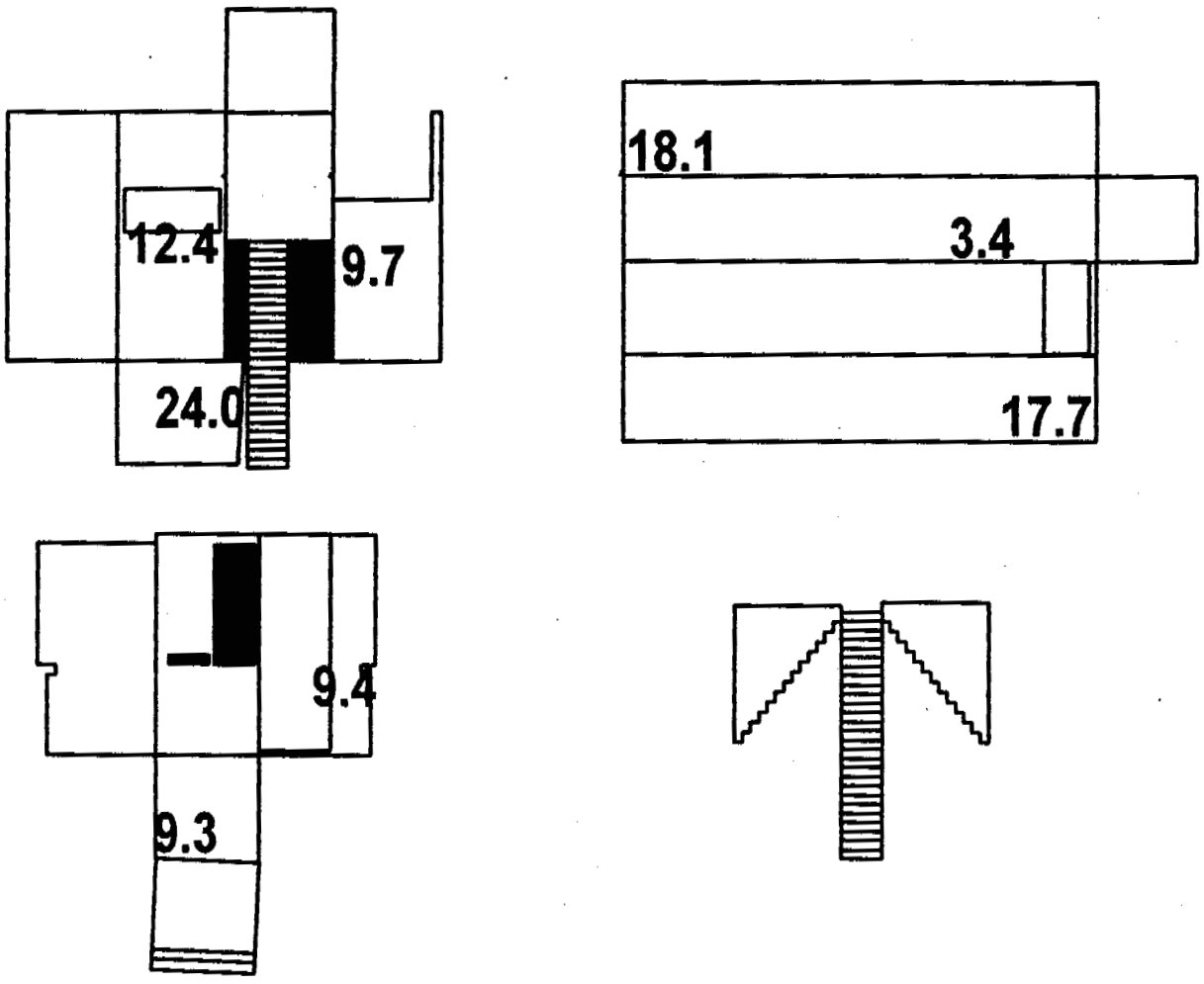



All values "gross" activity in units of dpm/100 cm2

*Figure 5–1. Posting Plot—Direct Static Surface Contamination Measurements*

# INDEPENDENT VERIFICATION SURVEY
## Survey Unit 729-01
## Posting Plot: Direct Static Measurements

MAP 2 OF 2




All values "gross" activity in units of dpm/100 cm2

*Figure 5–1 (continued). Posting Plot—Direct Static Surface Contamination Measurements*



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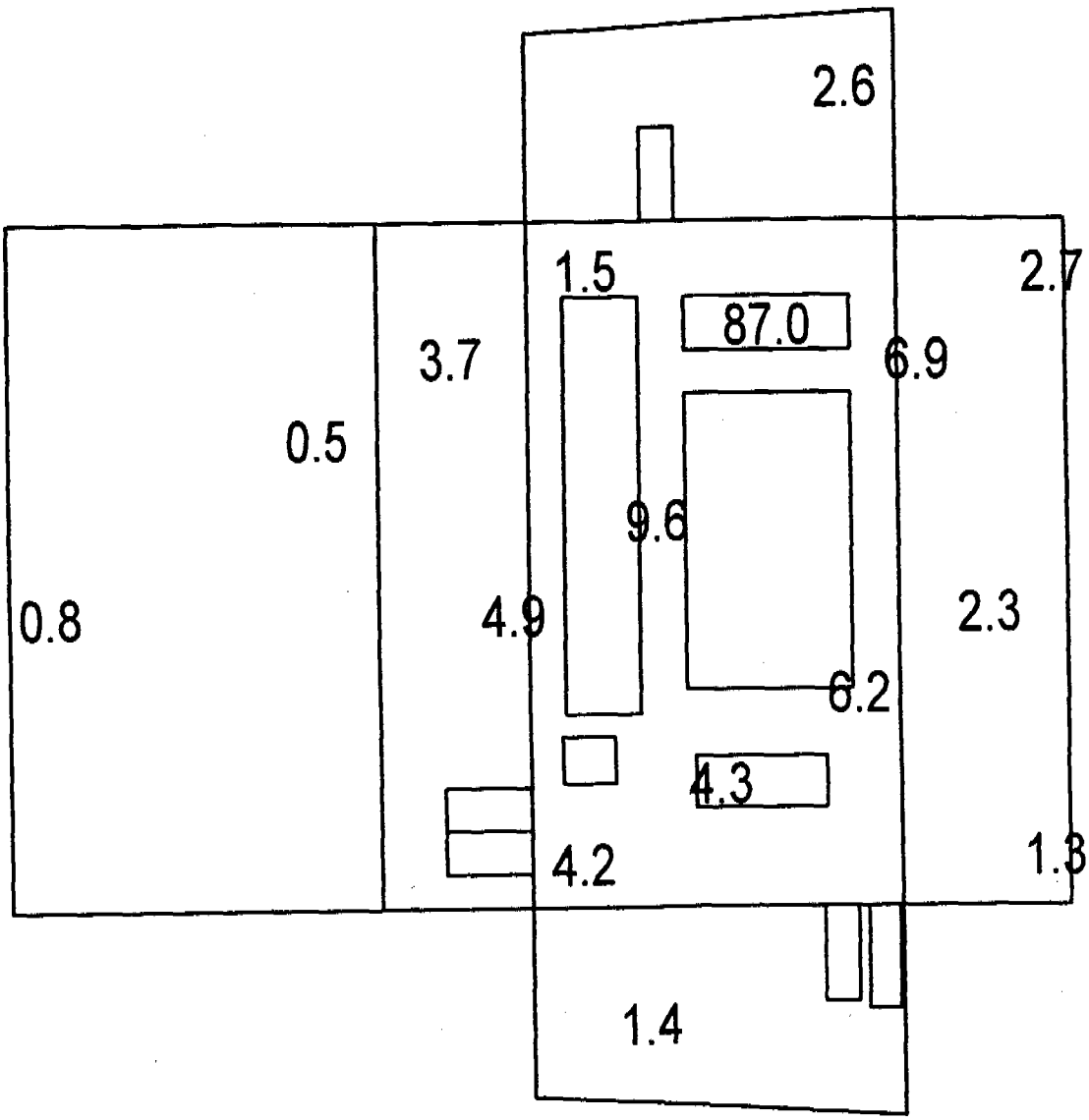
INDEPENDENT VERIFICATION SURVEY
Survey Unit 729-01

**Posting Plot: Surface Media Samples, Transuranic**

MAP 1 OF 2

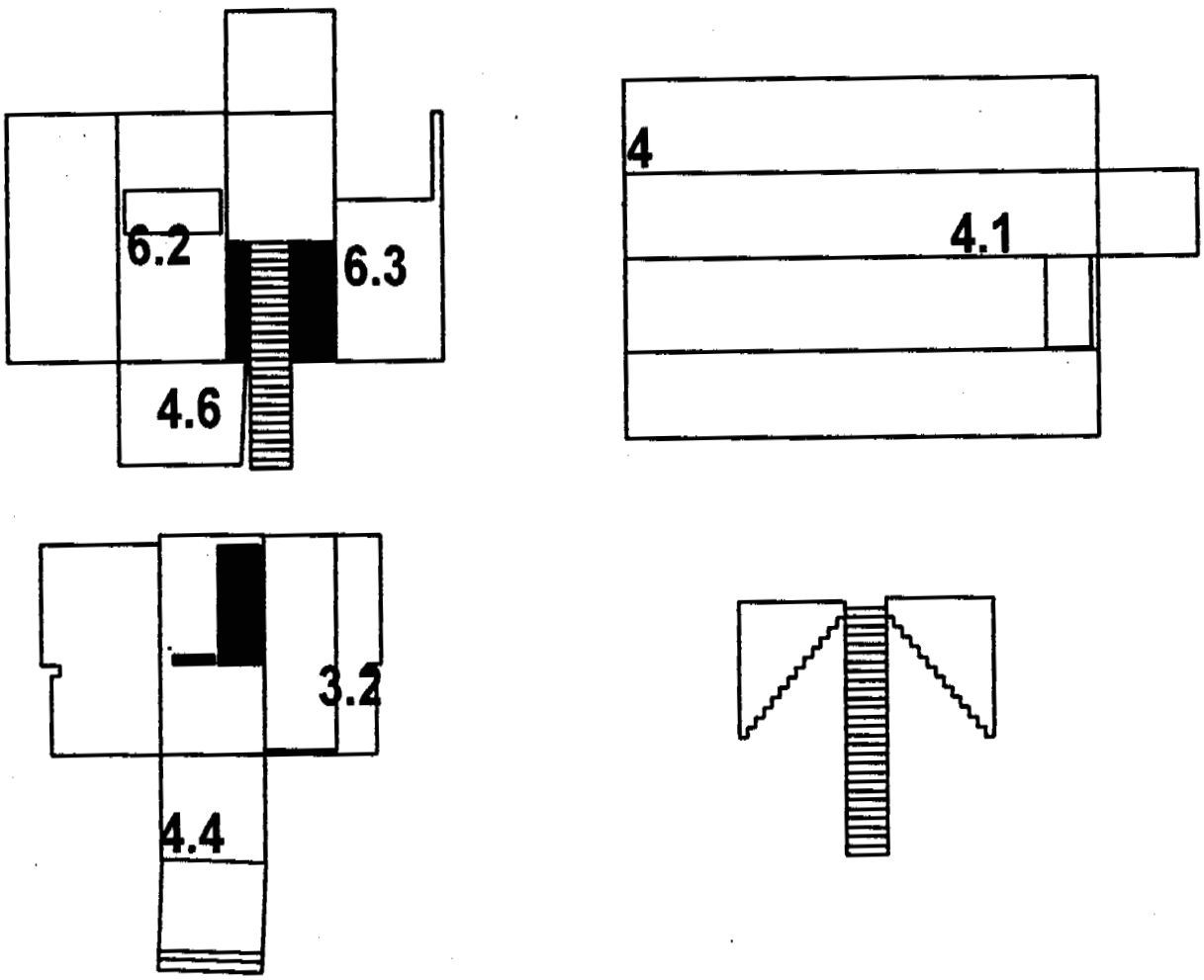



All values "gross" activity in units of dpm/100 cm2

*Figure 5–2. Posting Plot—Surface Media Samples, Transuranic Activity*

# INDEPENDENT VERIFICATION SURVEY
## Survey Unit 729-01
## Posting Plot: Surface Media Samples, Transuranics

MAP 2 OF 2




All values "gross" activity in units of dpm/100 cm2

*Figure 5–2 (continued). Posting Plot—Surface Media Samples, Transuranic Activity*



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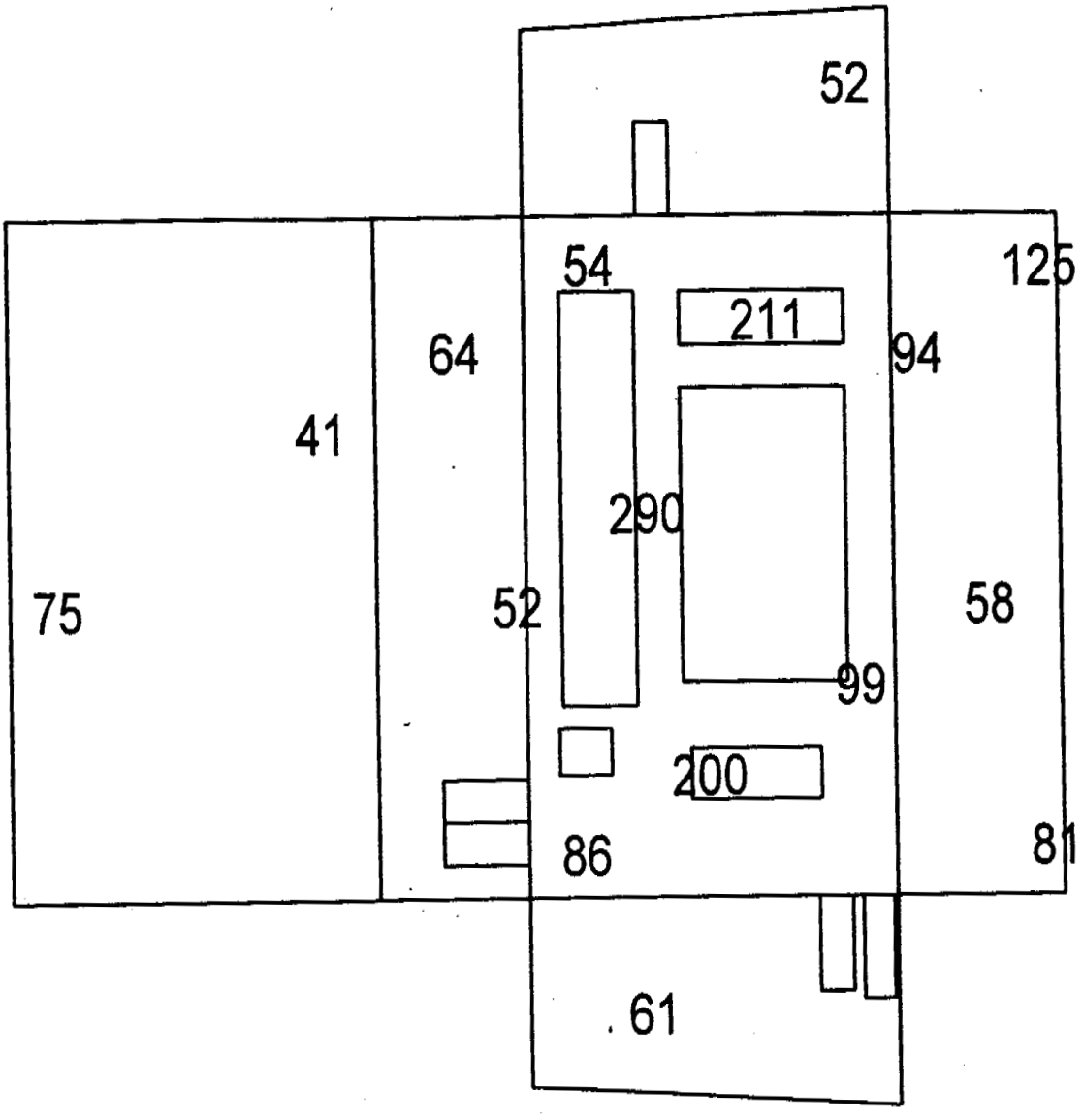
INDEPENDENT VERIFICATION SURVEY
Survey Unit 729-01

**Posting Plot: Surface Media Samples, Uranium Series**

MAP 1 OF 2




All values "gross" activity in units of dpm/100 cm2

*Figure 5–3. Posting Plot—Surface Media Samples, Uranium Series Activity*



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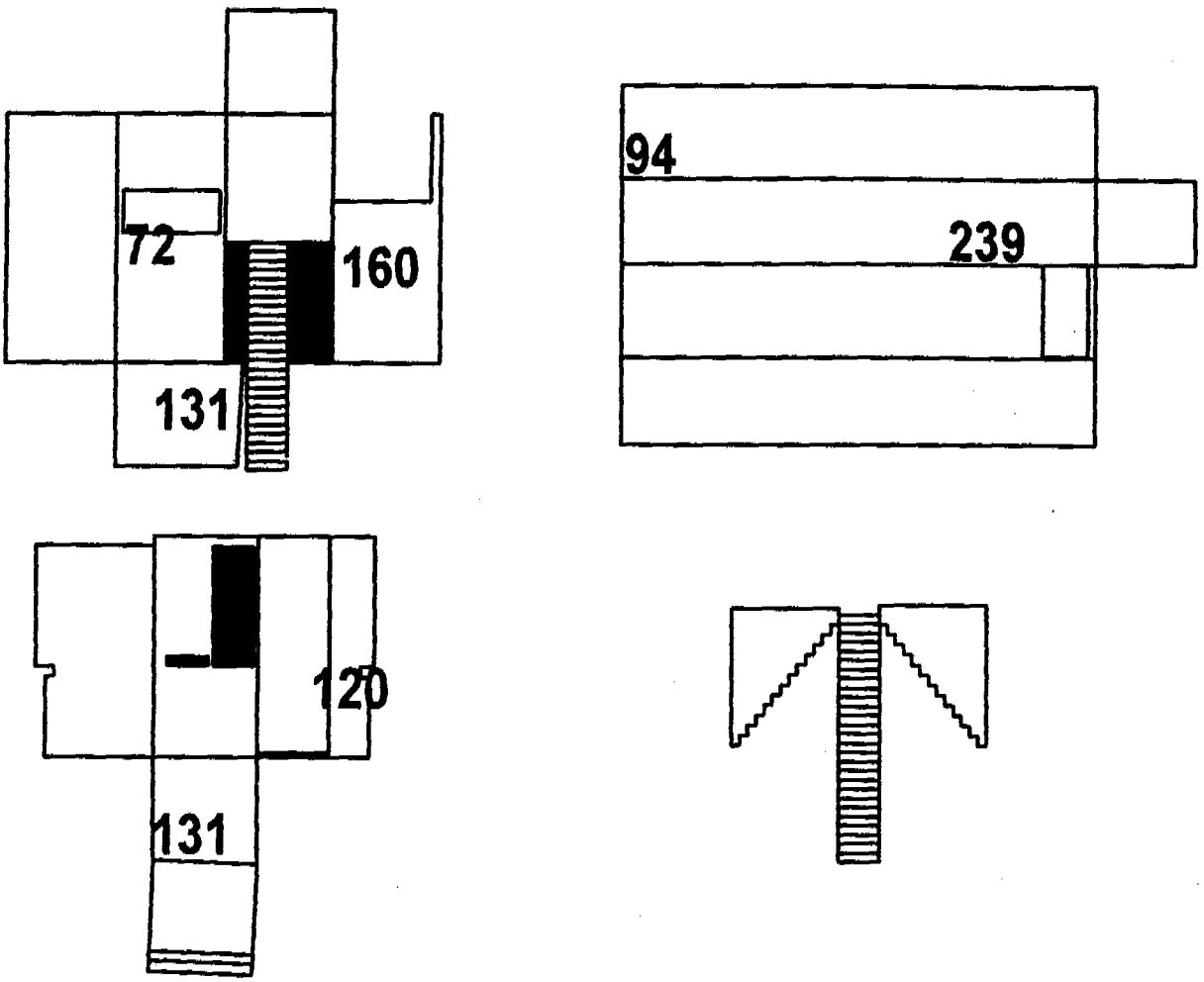
# INDEPENDENT VERIFICATION SURVEY
## Survey Unit 729-01
## Posting Plot: Surface Media Samples, Uranium Series

MAP 2 OF 2




All values "gross" activity in units of dpm/100 cm2

*Figure 5–3 (continued). Posting Plot—Surface Media Samples, Uranium Series Activity*



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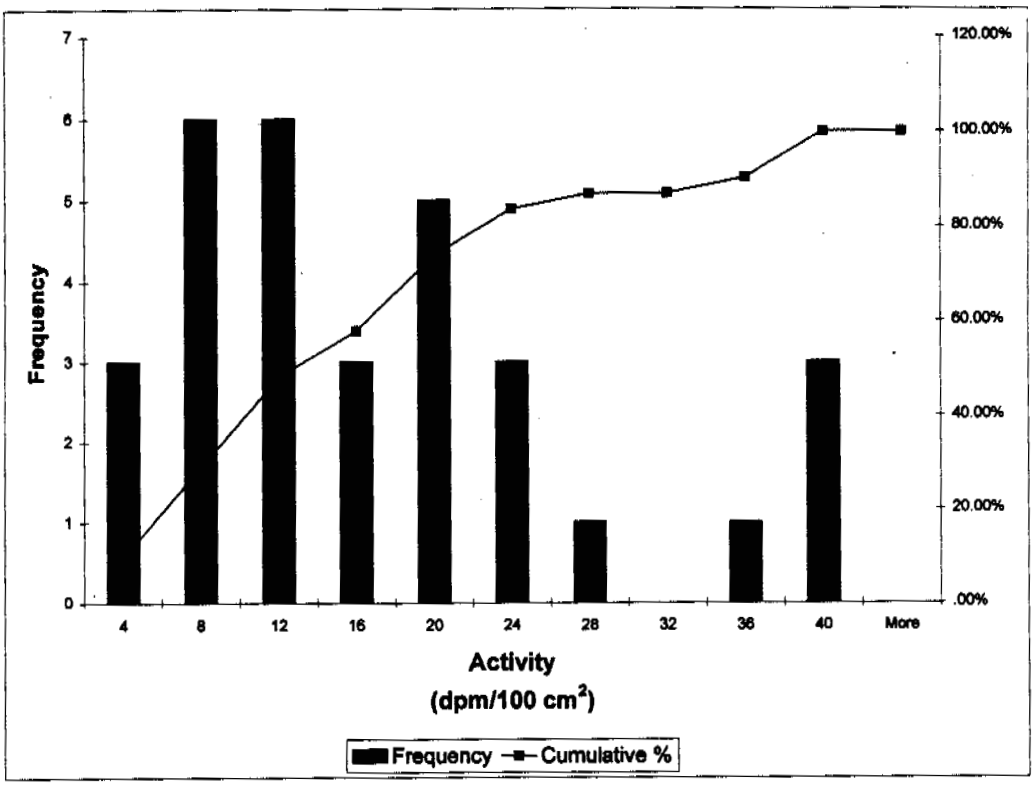


*Figure 5–4. Histogram—Instrument Background Measurements*

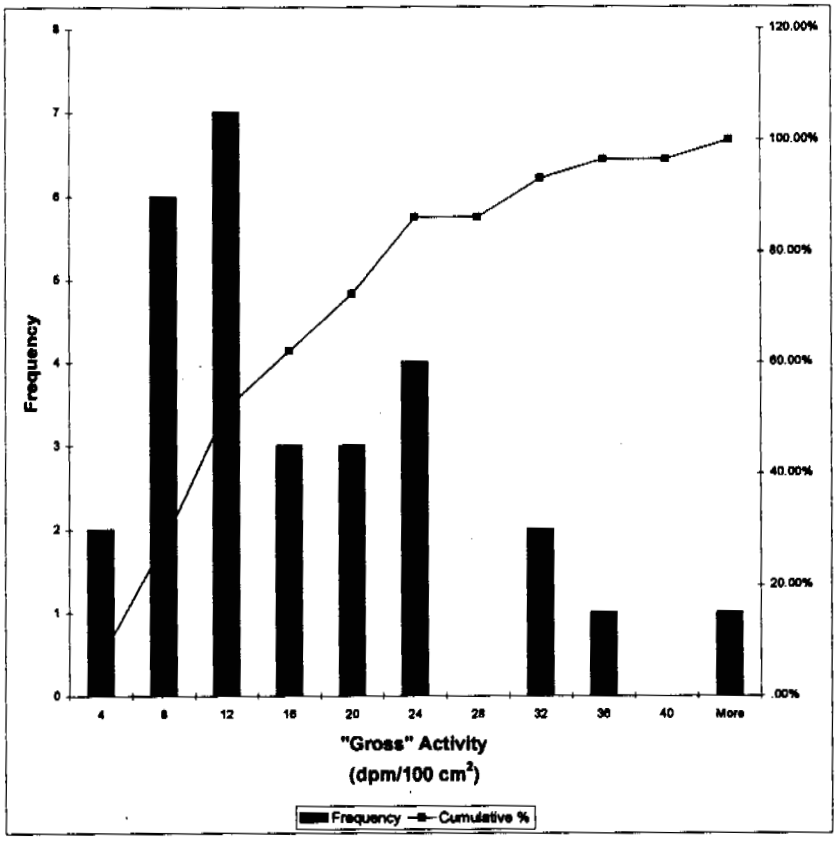


*Figure 5–5. Histogram—Direct Static Surface Contamination Measurements*

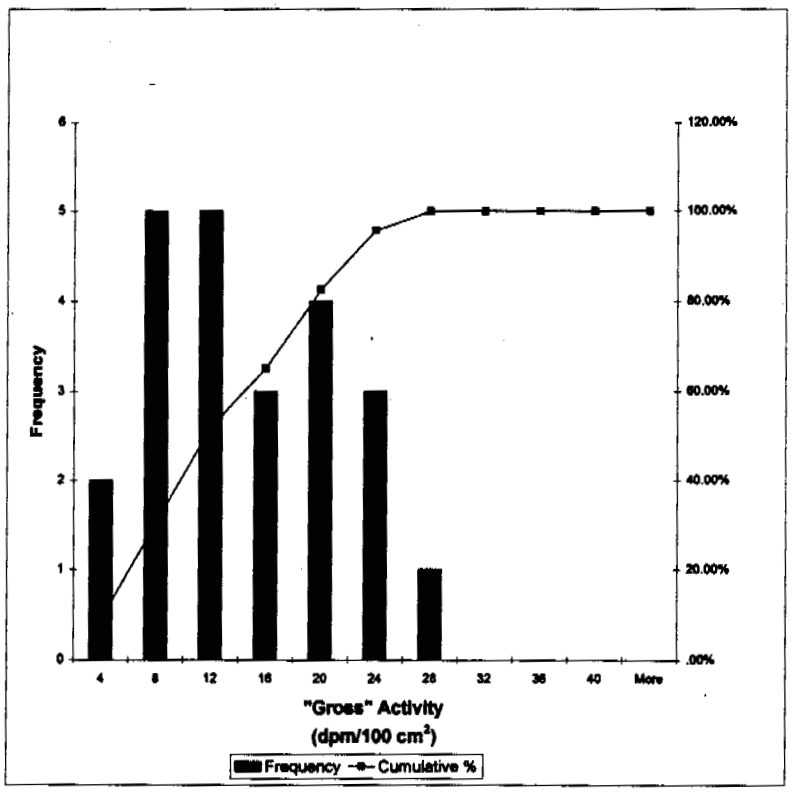


*Figure 5–6. Histogram—Post Surface Media Sampling Direct Static Surface Measurements*

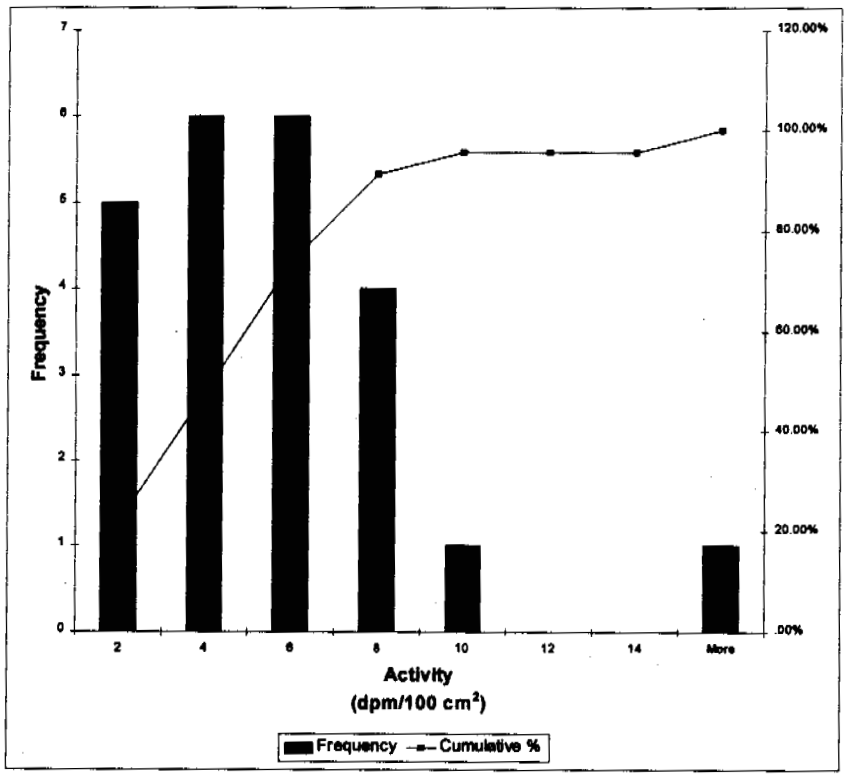


*Figure 5–7. Histogram—Surface Media Samples, Transuranic Activity*



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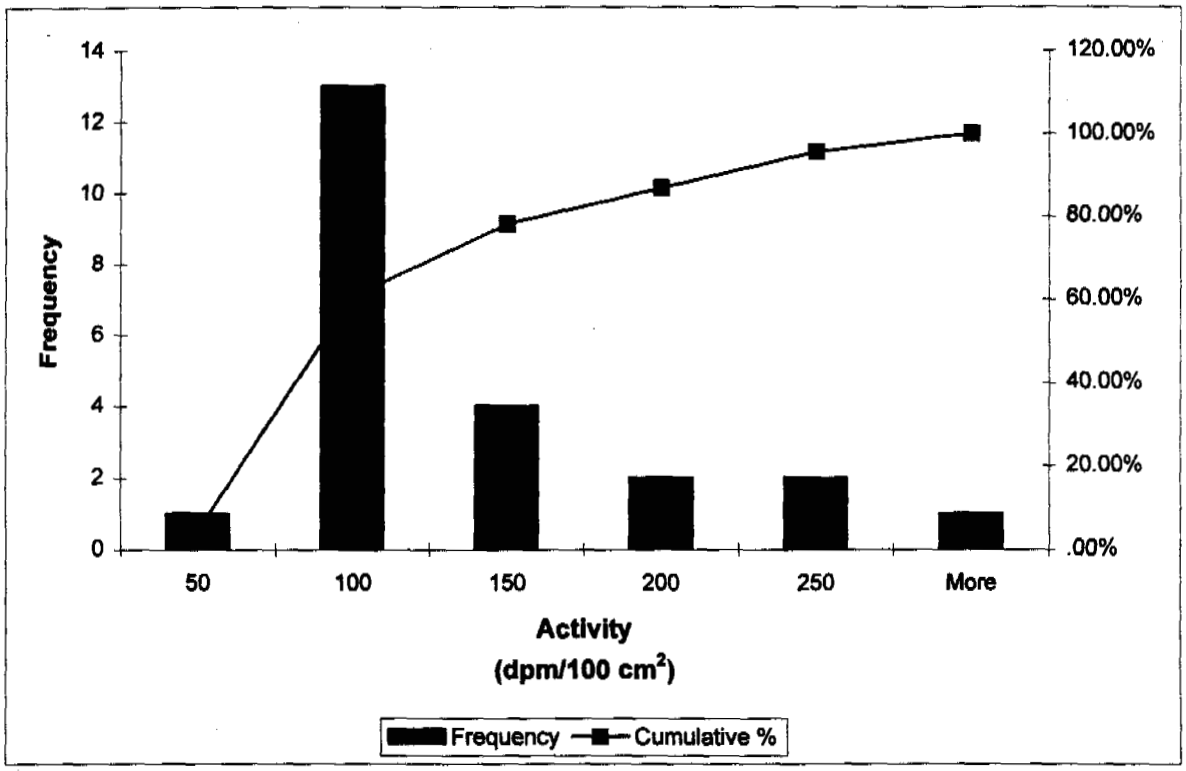


*Figure 5–8. Histogram—Surface Media Samples, Uranium Series Activity*

Each of the histogram plots provides evidence of right shifted skewness in the data set with most data clustered around a non-discrete central concentration which is substantially below the applicable DCGL. This distribution and skewness is typical of environmental radioactivity data and supports the conclusion that the data distributions are best estimated by the lognormal distribution.

## 5.3 High-Low Graphs—Data Variability Graphics

A key element in the evaluation of the sampling and survey data is the variation within the data set. As the data variability increases, the ability of the risk manager to confidently make decisions about true state of radiological contamination in the survey unit or building in relation to the applicable DCGL and null hypothesis decreases. When variability is small (or excessively large) relative to the difference between the mean and the DCGL, the risk manager can be confident in the decisions made using the data set provided. When evaluating data variability, it is important to know, first, that the data set contains a sufficiently large sample population (number of measurements). Retrospective power curves, demonstrating the "power" of the sign test to reject the null hypothesis with the actual sample size collected, are presented in Section 8.0. High-Low graphs are simple presentations showing the range between the upper and lower 95 percent confidence intervals about the geometric mean. Figures 5–9, 5–10, and 5–11 depict the variability observed in each type of data analyzed.

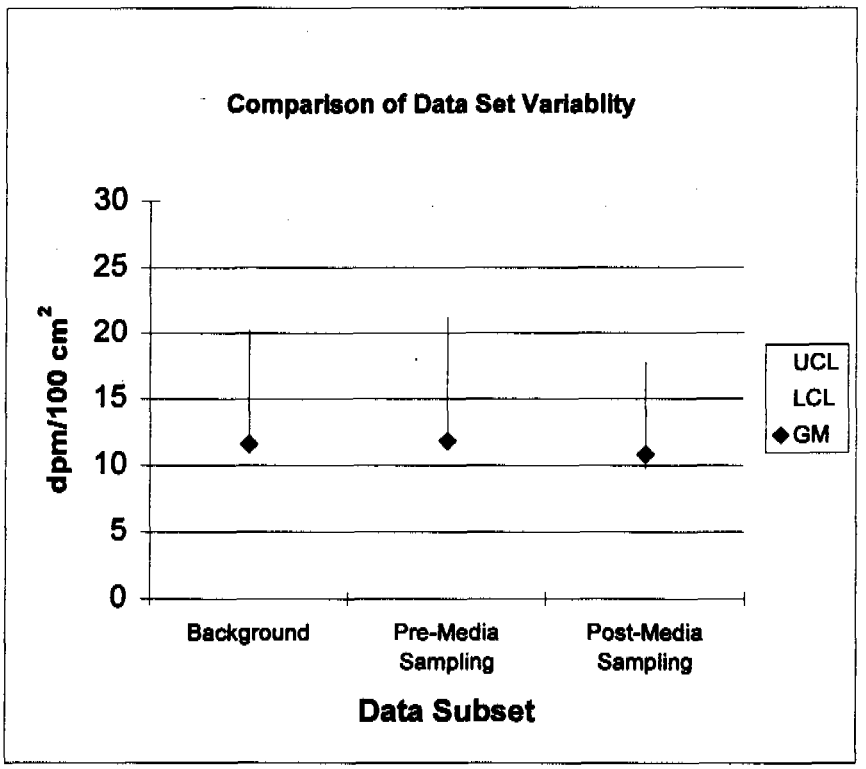


*Figure 5–9. High-Low Graphs—Direct Static Surface Measurements*

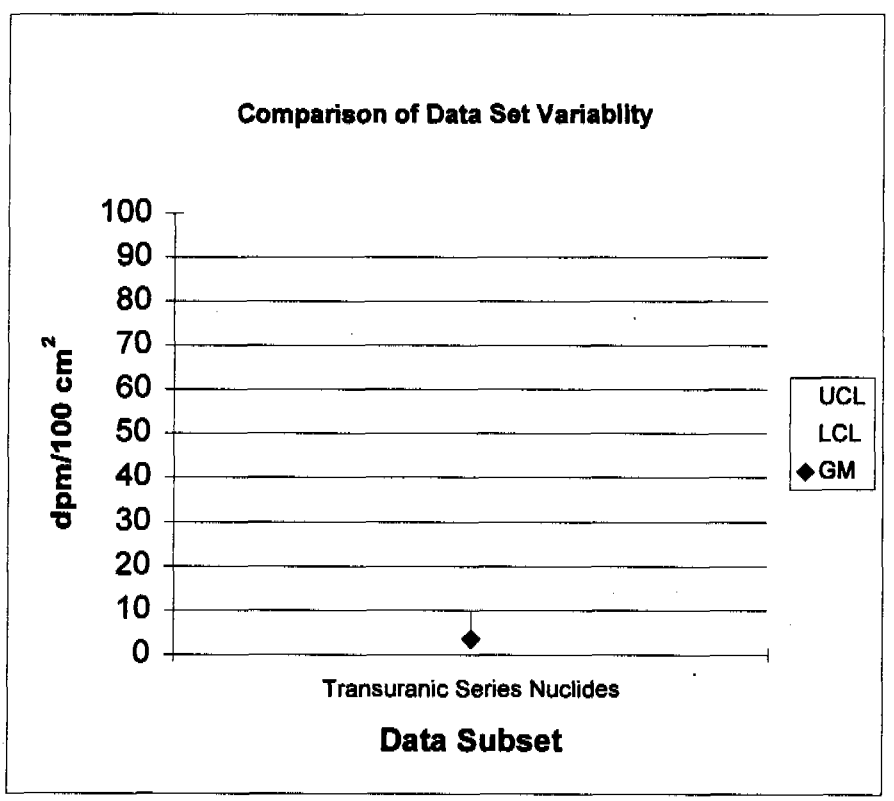


*Figure 5–10. High-Low Graphs—Surface Media Samples, Transuranic Activity*



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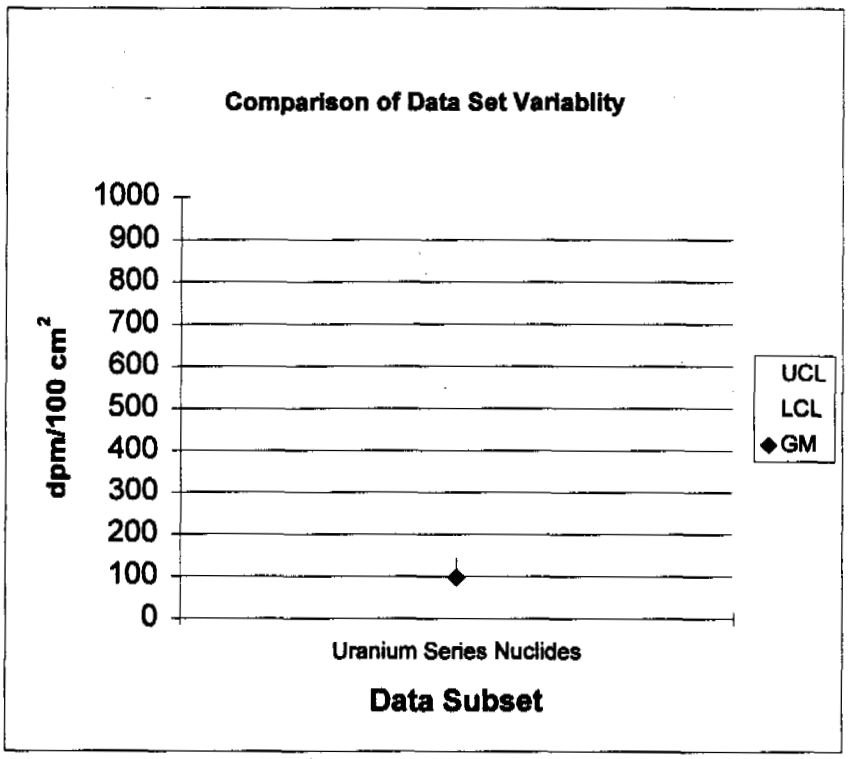


*Figure 5–11. High-Low Graphs—Surface Media Samples, Uranium Series Activity*

The pattern of comparatively low central tendencies, and small measure of data variability in each of the data sets presented provide substantial evidence that the estimates of the true mean residual radioactive concentrations presented are below the DCGLs. No DCGL is included in the 95 percent confidence intervals about the mean. The lack of significant variability in any of the data sets is also indicative of a lack of discretely distributed activity (supporting the conclusions of the posting plots above) and excellent precision in the analytical methods employed in the sampling and measurements processes. By presenting the three data sets made with the same instruments and procedures (background, direct static measurements, and post-surface media sampling direct static measurements), it is also evident that they report essentially equivalent measures of activity. In other words, the best estimates of surface activity as measured by direct surface emission are statistically indistinguishable from background.

Other visual presentations of the data are possible and may have been indicated if the data sets available were less robust than they actually are. However, the graphic treatment of the data presented here and in other sections is sufficient to enable the risk managers and decision maker to make confident determinations respecting the data.

# 6.0 Quality Control Sampling Results and Analysis

An important aspect of any sampling plan is the effort made to assure the quality of data collected. The independent verification process as a whole is a quality assurance method in itself. Thus, it was critical to assure the quality of all of the independent verification data through quality checks and controls, calibrations, training, and qualification of laboratories and services used. The objective of independent verification for the Building 779 Cluster final status radiological surveys, added an element of quality assurance to the design of the sampling evolution. In addition to designing quality checks and controls into the independent verification sampling, the IVC provided for quality control checks to assess the quality of the Contractor's data.

The IV SAP distinguished these two principle quality control objectives in the design of the sampling plan. Stage I quality control sampling was designed to assess the quality of the data collected by the Contractor. Stage II quality control sampling was designed to assess the quality of the data collected by the IVC. In each case where QC samples were used, either for Stage I or Stage II sampling, the samples were maintained under chain-of-custody control from the time they were prepared until they were introduced to either the Contractor's or IVC's sample batch. Tamper seals and locked storage were employed when samples were not in the physical custody of the IVC's Field Team Leader.

The IV SAP specifies quality control sampling to be performed over the duration of the Final Status Survey performance for all survey units in the Building 779 Cluster rather than for each specific building. This report, specific to Building 729, does not contain every element of QC data planned for the cluster of buildings as a whole. The costs associated with implementing separate QC sampling for each building in the 779 Cluster was determined to be prohibitive and unnecessary. Instead, a cumulative assessment and presentation of quality control data will be presented with each successive Independent Verification Report of the Contractor's Final Status Survey.

This section of the report presents the quality control data collected and measures employed to assure that quality objectives in the design of the sampling plan were achieved. Section 7.0 assesses the overall data quality against the published or industry accepted data quality indicators.

## 6.1 Stage I—Independent Quality Control of the Contractor's Sampling

### 6.1.1 Smear Samples

The IVC provided smear samples to the Contractor for measurement and analysis by the Contractor's selected instrumentation and methods. An unopened package of smear sample media was obtained from the Contractor prior to the start of the independent verification of Building 729. The IVC assigned a series of these as "blanks" and spiked a second series of smears with three different concentrations of an alpha emitting transuranic nuclide—one which is part of the nuclide mix identified as a contaminant of concern for the 779 Cluster.

The spikes were not certified as containing traceable concentrations of the nuclide added. Thus, the spikes do not provide a measure of accuracy directly. Accuracy is established for the



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instrument measuring the activity on the smears by the RFETS (or contract laboratory, if used) calibration and analysis procedures. Instead, the spikes serve to provide a comparison between the results achieved by the Contractor and those achieved by the IVC.

The blank smears test the ability of the counting instrument used to distinguish between background and added activity as well as the ability of the counting technician and sample handling process to prevent cross-contamination.

The IVC introduced three blank smears and three spiked smears into the Contractor's smear sampling batch during the final status survey of Building 729[1]. The QC samples were packaged and identified exactly as the Contractor's procedure dictated. Because the Contractor used the same technician to collect and analyze the smear samples they collected, it was not possible to present a double blind set of QC samples; He would know when samples other than those he personally collected were introduced. They were presented as a single blind set of QC samples. The Contractor's counting technician was not aware of the objective of the samples, nor the fact that some were blanks and some were spikes.

The blank smears were prepared by wiping a clean, unaffected, and uncontaminated surface. Each was then packaged individually, assigned a unique QC sample number, and physically controlled to ensure custody and integrity. The spiked smears were prepared by pipetting liquid standard concentrations onto a smear filter disc.

Spiked smears were prepared with three different quantities of radioactivity to provide a range of gross alpha radioactivity concentrations over the range expected to be encountered in the Final Status Survey. This range is necessarily small and near zero for a Final Status Survey.

The QC samples provided to the Contractor were measured and reported to the IVC (Appendix F). Table 6–1 provides a crosswalk between the IVC and Contractor assigned sample numbers and presents a summary of the results obtained by the Contractor.

*Table 6–1. Results of the Contractor's Assay of QC Smear Samples Provided by the IVC*

| IVC Sample ID# | Contractor Assigned Sample ID# | Sample Type | Contractor Reported MDA (dpm) | Contractor Reported Results (dpm) |
|---|---|---|---|---|
| NED428 | 1C | Blank | 4.1 | 0.0 |
| NED429 | 2C | Blank | 4.1 | 4.5 |
| NED430 | 3C | Blank | 4.1 | 0.0 |
| NDL289 | 6C | Spike | 4.1 | 1.5 |
| NDL291 | 8C | Spike | 4.1 | 28.5 |
| NDL293 | 10C | Spike | 4.1 | 57.0 |
| The Contractor counted the smears with an Eberline model SAC-4 alpha smear counter (serial #1407). The measured background was 0.0 cpm. The efficiency was established at 33.3 percent | | | | |

[1]It is important to note that it is not critical to the sampling objective to introduce Stage-I quality control samples to a particular batch of the Contractor's samples or even while they are sampling a particular building or survey unit being considered for independent verification. The measure of comparability between two or more laboratory's measurements of the same sample media is independent of the location from which the sample was collected, or where it was introduced to the batch. More important to the validity of the QC data is that the analysts are not aware that the samples are QC samples causing them to exercise greater care in the sample preparation and measurement process. It is critically important that the analyst does not know that a specific sample provided is a blank or a spike.

From Table 6–1, it is seen that two of the three blank smears provided returned results indicating no detectable radioactivity. One of the three blank samples (RFETS #2C), however, was identified as having 4.5 dpm/100 $cm^2$. While small when compared with the $DCGL_W$ for removable radioactivity, the reported activity is above the stated MDA and is thus considered to be a statistically valid quantity.

While no statement can be made about the accuracy of the results reported by the Contractor, it is clear that one would expect to obtain results less than the MDA in a large percentage of cases when measuring blanks. It is possible that the one blank that was reported as having activity above the MDA was simply a statistically predictable event. If this is the case, an ongoing cumulative assessment of the Contractor's assay of blank QC smears will provide greater statistical power than can be achieved with just three measurements. It is also possible that the sample may have become cross-contaminated during the sample handling and measurement process. If this were the case, and the error was a chronic occurrence in the Contractor's smear measurement process, it would result in a conservative bias toward concluding that the survey unit did not meet the $DCGL_W$ for removable contamination. A third possibility, particularly in light of the result received on spiked sample #6C, is that the counting time (background, sample, or both) is not long enough to adequately distinguish between background and added activity.

Each of the three spiked smear samples yielded measurable radioactivity. The three spiked activities were differentiated from one another in the Contractor's assay. Yet, sample #6C was reported to have activity below the MDA for the method. If, in fact the smear sample counting time employed by the Contractor is too short, it could explain the result. Smear #6C was spiked to the lowest concentration of the three and was expected to return the lowest measurement of activity among the three. Likewise, the highest spiked activity returned the highest measurement of activity among the three. Another possible explanation for the lower than expected result on the smear sample is in the method used to prepare the spiked samples. As mentioned earlier, a liquid standard containing an alpha emitting transuranic nuclide was pipetted onto the smear and then allowed to dry. It is likely that a significant fraction of the total activity deposited migrated to a depth in the smear matrix that the activity was attenuated by the sample media itself. Until a cross-comparison can be made with a second and independent smear counting system analyzing the same QC smears measured by the Contractor, no specific conclusion can be reached.

The IVC intends to have the GJO Analytical Laboratory assay each of the QC samples provided to and measured by the Contractor. A cumulative cross comparison will be established as a measure of the relative accuracy of the instruments and methods employed. The cumulative QC results will be provided as they are available with subsequent reports on buildings in the Building 779 Cluster.

### 6.1.2 Surface Media Samples

The IVC did not have access to surface media sample materials prior to the collection and assay of these samples by the Contractor. As a result, no Stage I QC samples were provided or collected for this building. The IVC now has access to surface media sample material that is representative of that collected in support of the 779 Cluster final status surveys. This material will be prepared and provided to the Contractor in future sampling events to satisfy Stage I quality assurance objectives.



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### 6.1.3 Direct Surface Emission Measurements

The Contractor and the IVC chose to utilize the same response check source to test the response of instruments used to make direct surface emission measurements (Table 6–2). This enabled the comparison of routine instrument response checks using the same isotope, geometry, and activity. Three instrument systems were employed to make direct surface emission measurements during the Final Status Survey of Building 729. The Contractor employed a subcontractor, Millennium Services, who used a proprietary system (SCM/SIMS) developed by Shonka Research Associates to perform the scan surveys. The SCM is fundamentally a gas proportional counter and the SIMS is the survey information management software. The Contractor also used a NE Electra with a DP-6 dual phosphor scintillation probe to make direct static surface measurements for comparison with the $DCGL_W$. The IVC used the Eberline model E-600 multi-purpose survey instrument with a HP-100 gas proportional probe.

The Contractor has not yet provided the results of their response checks to the IVC for cross-comparison.

*Table 6–2. Comparison of Response of Instruments used to Make Direct Surface Measurements*

| Parameter | Millennium SCM/SIMS | | NE Electra w/ DP-6 | EberlineE-600 w/HP-100 |
|---|---|---|---|---|
| | Primary Detector | Recount Detector | | |
| Number of Measurements | | | | 39 |
| Source Activity | | | | 194,400 |
| Mean Activity Observed | | | | 179,182 |
| Standard Deviation | | | | 4,843 |
| Coefficient of Variation | | | | 0.027 |

## 6.2 Stage II—Quality Control of the Independent Verification Sampling

Stage II quality control sampling is associated specifically with the IVC's field sampling and serve to establish confidence in the independent verification sampling results rather than correlate them with the Contractor's results. Again, not every category of QC measure planned for has been completed to this point.

### 6.2.1 Smear Samples

The IVC provided smear samples to the GJO Analytical Laboratory for measurement and analysis. Smear sample media was reserved by the IVC prior to the start of the independent verification of Building 729. A series of these were assigned as "blanks" and a second series of smears was spiked with three different concentrations of an alpha emitting transuranic isotope of the nuclide mix identified as a contaminant of concern for the 779 Cluster.

As with the spikes prepared for the Contractor, the spikes were not certified as containing traceable concentrations of the nuclide added. Thus, the spikes do not provide a direct measure of accuracy. Instead, the spikes serve to provide a measure of confidence in the laboratory's ability to detect radioactivity and to establish a basis for subsequent comparison between the results achieved by the Contractor and those achieved by the IVC.



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The IVC introduced three blank smears and three spiked smears into the smear sampling batch during the independent verification survey of survey unit 729–01 in Building 729. The entire batch of smears was then provided to the GJO Analytical Laboratory. The QC samples were packaged and identified exactly as those samples collected in the survey unit and were not distinguishable to the analyst. Because the IVC used an independent laboratory to assay smears, and because the technician collecting the field smears was not involved with preparing, handling, or counting smears, it was possible to present the QC samples along with the field samples as a double blind set.

The blank smears were prepared by wiping a clean, unaffected, and uncontaminated surface. Each was then packaged individually, assigned a unique QC sample number, and physically controlled to ensure custody and integrity. The spiked smears were prepared by pipetting liquid standard concentrations onto a smear filter disc.

Spiked smears were prepared with three different quantities of radioactivity to provide a range of gross alpha radioactivity concentrations over the range expected to be encountered in the Independent verification of the Final Status Survey. The range was, again, small and near zero.

The QC samples provided to the IVC's laboratory were measured and reported to the IVC (Appendix F). Table 6–3 provides a crosswalk between the IVC and GJO Analytical Laboratory assigned sample numbers and presents a summary of the results obtained by the laboratory.

*Table 6–3. Results of the GJO Analytical Laboratory Assay of QC Smear Samples Provided by the IVC*

| IVC QC Sample ID# | IVC Transfer Sample ID# | Laboratory Assigned Sample ID# | Sample Type | Reported Results(Gross α, dpm[b]) | |
|---|---|---|---|---|---|
| | | | | MDA | Measured Activity |
| SMR000594 | SMR000594 | 258238 | Blank | 5.13 | 0[a] |
| SMR000595 | SMR000595 | 258237 | Blank | 5.17 | 0[a] |
| SMR000596 | SMR000596 | 258236 | Blank | 5.11 | 0[a] |
| NDL295 | SMR000593 | 258235 | Spike | 5.17 | 5.68 |
| NDL297 | SMR000592 | 258234 | Spike | 5.19 | 15.81 |
| NDL299 | SMR000591 | 258233 | Spike | 5.35 | 53.92 |

The GJO Analytical Laboratory counted the smears with a Canberra low background automated scaler, model 2404 smear counter. The measured background was 0.115 cpm over 60 minutes. Sample count time was 6 minutes. The alpha efficiency was established at 21.39 percent.

[a]The laboratory formally reported values as less than the detection limit (<MDA) but provided the raw supporting data in the complete analytical report. Each of the blank QC samples resulted in a negative net count rate.

[b]The analytical report presented results in pCi per sample. The results have been converted to dpm for presentation in this table. Since the smears were collected over a 100 $cm^2$ area, the results in dpm are equivalent to dpm/100 $cm^2$.

From Table 6–3 it is seen that each of the three blank smears returned results indicating no detectable radioactivity in excess of the method detection limit. Each of the three spiked smear samples yielded measurable radioactivity. The three spiked activities were differentiated from one another and the lowest result corresponded to the smear with the lowest spiked concentration while the highest result corresponded to the smear with the highest spiked concentration.

Again, no statement can be made about the accuracy of the results reported by the IVC's laboratory subcontractor but results were in line with those expected. The fact that the GJO Analytical Laboratory apparently used longer counting times than did the Contractor when



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measuring smears adds weight to the possibility that insufficient counting time may be at the root of the disparity in the results on QC smear samples reported by the Contractor.

Unfortunately, the smear samples submitted to the GJO Analytical Laboratory, including the six QC samples interjected to the batch collected in survey unit 729–01, were disposed of by the laboratory before they could be collected and provided to the Contractor to measure. The GJO Analytical Laboratory has been instructed to retain all sample media from the RFETS Building 779 Cluster submitted in the future until disposal is directed by the IVC. The IVC intends to have the Contractor assay each of the QC samples provided to and measured by the GJO Analytical Laboratory in future sampling events for inclusion in the cumulative cross comparison of the relative accuracy of the instruments and methods employed to assay smears.

Aside from the QC measures interjected by the IVC blind to the laboratory, the independent verification sampling benefits from the internal quality control applied to the measurement process within the laboratory. Three measurement quality controls are employed for each batch of smears. The laboratory inserts a preparation blank (PB), a laboratory control sample (LCS) and a continuing calibration verification (CCV) for each batch of twenty-one smears. In this case, because the batch was larger than 21 smears, two sets of laboratory initiated QC measurements were made. Table 6–4 summarizes the internal QC measurements made for the smears from survey unit 729–01.

*Table 6–4. Results of the IV Laboratory Internal QC Measurements for Smear Samples*

| QC Sample Type | Expected Results | MDA | Measured Activity |
|---|---|---|---|
| | (Gross α, dpm) | | |
| Preparation Blank | <MDA | 5.17 | 0.22 |
| Preparation Blank | <MDA | 5.15 | 0.22 |
| Laboratory Control Sample | 475 | 8.97 | 486 |
| Laboratory Control Sample | 95 | 6.04 | 86 |
| Continuing Calibration Verification | 2220 | 21.05 | 2168 |
| Continuing Calibration Verification | 2220 | 21.36 | 2125 |
| The analytical report presented results in pCi per sample. The results have been converted to dpm for presentation in this table. Since the smears were collected over a 100 $cm^2$ area, the results in dpm are equivalent to dpm/100 $cm^2$. | | | |

The internal QC data presented in Table 6–4 shows excellent agreement with the results expected.

### 6.2.2 Surface Media Samples

As was the case with Stage I QC samples for the surface media sample set, the IVC did not have access to homogeneous surface media sample materials prior to the field collection of the first set of samples for the Building 729 independent verification. As a result, no *blind* Stage II QC samples were provided for this building. The IVC's laboratory did perform internal quality control measurements to assess the quality of the data produced. Three measurement quality controls were employed for each of the three element groups (Am, Pu, U) processed. The laboratory inserted two PBs, two LCS, and processed a duplicate (D) of one randomly selected field sample. In all, there were seven PB, seven LCS, and three D measurements made. Table 6–5 summarizes the PB QC measurements made. Table 6–6 summarizes the LCS measurements and Table 6–7 presents the D sample measurements. A regression analysis was

performed to assess the comparability between the first and duplicate measurements and is graphically presented in Figure 6–1.

*Table 6–5. Results of the IV Laboratory Internal Blank QC Measurements for Surface Media Samples*

| Preparation Blank QC Sample (PB) | Expected Results | MDA | Measured Activity |
|---|---|---|---|
| | dpm / sample | | |
| Am-241 | <MDA | 0.0181 | 0.0339[a] |
| Am-241 | <MDA | 0.0273 | 0.0445[a] |
| Pu-238 | <MDA | 0.0200 | 0.0057 |
| Pu-238 | <MDA | 0.0285 | -0.0033 |
| Pu-238 | <MDA | 0.0195 | 0.0159 |
| Pu-239/240 | <MDA | 0.0351 | 0.0021 |
| Pu-239/240 | <MDA | 0.0357 | 0.0058 |
| Pu-239/240 | <MDA | 0.0343 | -0.0014 |
| U-234 | <MDA | 0.0557 | 0.0193 |
| U-234 | <MDA | 0.0533 | 0.0340 |
| U-235 | <MDA | 0.0488 | 0.0301 |
| U-235 | <MDA | 0.0560 | 0.0140 |
| U-238 | <MDA | 0.0307 | 0.0371[1] |
| U-238 | <MDA | 0.0415 | 0.0331 |

[a]The error in the reported result includes the MDA for the measurement.

*Table 6–6. Results of the IV Laboratory Internal LCS QC Measurements for Surface Media Samples*

| Laboratory Control QC Sample (LCS) | Expected Results | MDA | Measured Activity |
|---|---|---|---|
| | pCi / mL | | |
| Am-241 | 4.74 | 0.023 | 4.79 |
| Am-241 | 4.74 | 0.023 | 4.75 |
| Pu-238 | 10.67 | 0.023 | 10.85 |
| Pu-238 | 10.67 | 0.05 | 10.87 |
| Pu-238 | 10.67 | 0.022 | 11.00 |
| Pu-239/240 | 10.5 | 0.049 | 11.38 |
| Pu-239/240 | 10.5 | 0.069 | 10.96 |
| Pu-239/240 | 10.5 | 0.046 | 11.18 |
| U-234 | 16.6 | 0.073 | 16.40 |
| U-234 | 16.6 | 0.079 | 16.27 |
| U-235 | 0.763 | 0.095 | 0.823 |
| U-235 | 0.763 | 0.134 | 0.829 |
| U-238 | 16.6 | 0.093 | 17.18 |
| U-238 | 16.6 | 0.091 | 16.66 |

The units reported for the LCS measurements are different from those used in the rest of the analytical report. The selection of units of pCi/mL was based on convenience since the known value of the standard used is reported in pCi/mL. The function and utility of the LCS sample (comparing a measurement result with a known standard) are not compromised by using units other than those used to report sample results.



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*Table 6–7. Results of the IV Laboratory Internal Duplicate QC Measurements for Surface Media Samples*

| Duplicate QC Samples (D) | Measured Activity (dpm / sample) | | | |
|---|---|---|---|---|
| Lab Sample ID# | 258181 | 258181D | 258191 | 258191D |
| Am-241 | 2.32[a] | 1.42[a] | 4.11 | 2.19[a] |
| Pu-238 | 0.14[a] | 0.04[a] | 0.15[a] | -0.18[a] |
| Pu-239/240 | 0.28[a] | 0.86[a] | 0.82[a] | 0.27[a] |
| U-234 | 121.0 | 115.9 | 48.96 | 52.10 |
| U-235 | 5.996 | 6.553 | 3.04 | 3.84 |
| U-238 | 112.00 | 121.00 | 47.60 | 48.14 |

[a]Either the reported value is less than the MDA for the analysis or the error in the reported result includes the MDA. In this case, reproducibility between duplicate samples is not achievable with high confidence since relative error is high at sample concentrations near the MDA. That the duplicate samples yield results which are consistently at or near the MDA for the analysis provides evidence, in a qualitative sense, that duplicate measurements are comparable.

The Internal QC data presented in Tables 6–5, 6–6, and 6–7 provide substantial indication that the data quality achieved in the surface media sample analysis is excellent.

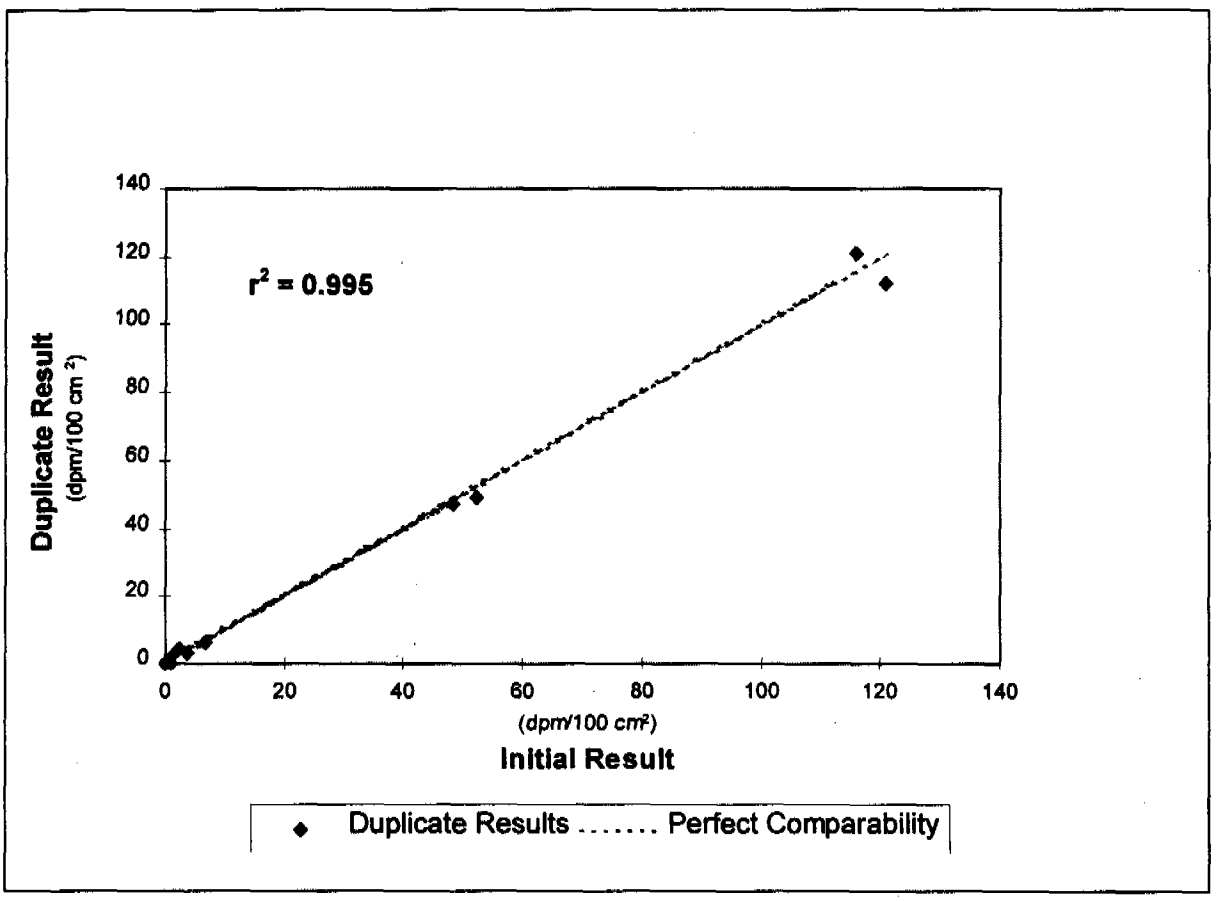


*Figure 6–1. Comparison of Duplicate Alpha Isotopic Sample Analysis Results Linear Regression Fit Plot*



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### 6.2.3 Direct Static Measurements

Two sets of data collected by the IVC are pertinent to the assessment of direct static surface measurement data quality. They are replicate field measurement data and instrument response check data.

#### 6.2.3.1 Replicate Field Measurements

The second of the two data sets contains the replicate measurements periodically made over the duration of the sampling period. A total of eight replicate measurements were made in survey unit 729–01. Table 6–8 summarizes the paired replicate measurement results. A regression analysis was performed to assess the comparability between the initial and replicate measurements and is graphically presented in Figure 6–2.

*Table 6–8. Results of Replicate Direct Static Surface QC Measurements*

| Sample Location | Measured Activity(dpm/100 cm$^2$) | |
|---|---|---|
| | Initial Measurement | Replicate Measurement |
| IVP0000104 | 11.5 | 10.9 |
| IVP0000111 | 7.5 | 8.1 |
| IVP0000118 | 26.0 | 19.6 |
| IVP0000119 | 5.0 | 5.0 |
| IVP0000122 | 6.0 | 6.3 |
| IVP0000125 | 27.2 | 29.2 |
| IVP0000128 | 12.1 | 14.9 |
| IVP0000129 | 30.2 | 26.4 |

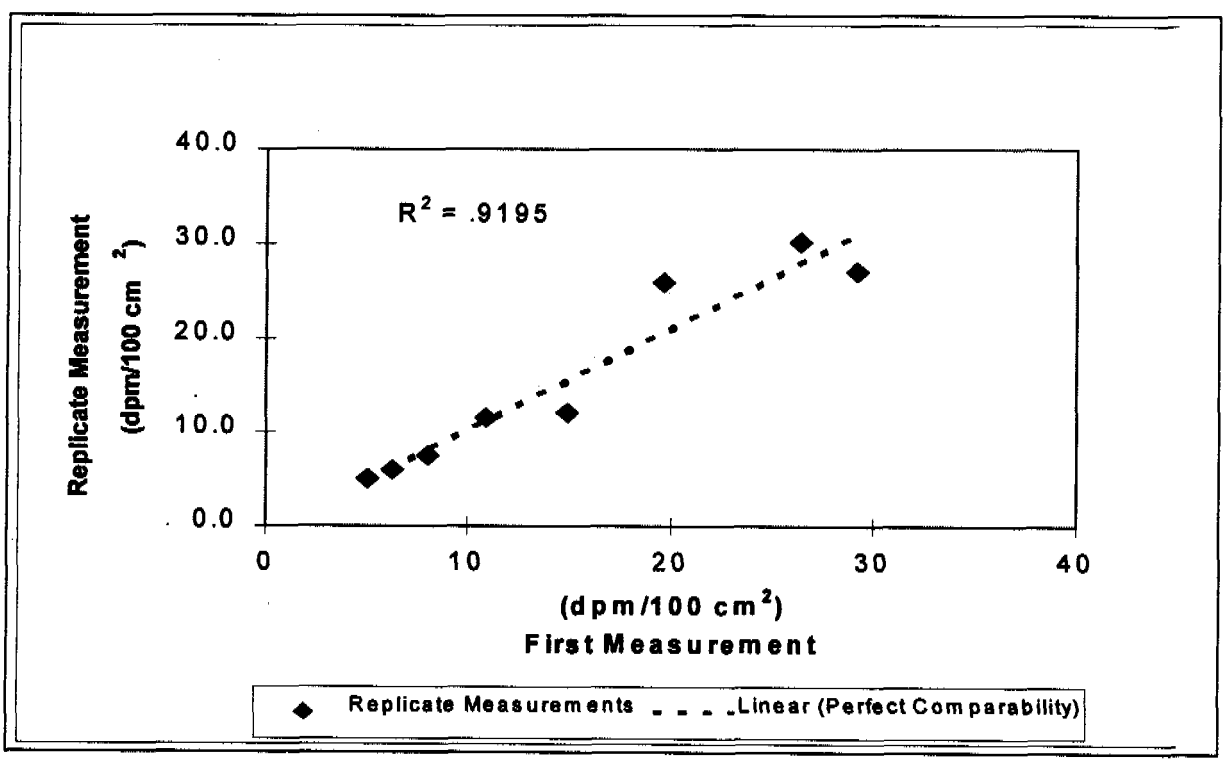


*Figure 6–2. Comparison Between Replicate Direct Static Measurements Linear Regression Fit Plot*



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#### 6.2.3.2 Instrument Response Check Data

The first of the two data sets used to present the quality of direct static surface measurements is the response of the instruments (E600 with a HP-100 probe) to a planar source with a known amount of radioactivity. The source used was the same source used by the Contractor. It is an anodized surface source containing 194,400 dpm of Pu-238 radioactivity. The source was manufactured and certified to be NIST traceable by Amersham, Ltd. and assigned a unique ID# ER-716 (See copy of manufacturer's certification in Appendix B).

Prior to initiating a survey each day, periodically (≈every 2 hours), and at the end of a survey each day, the survey instrument in use was used to make a measurement on the known concentration source. The data sheets are provided for each of the three probes used by the IVC during the independent verification of survey unit 729–01 (Appendix D). A total of 39 response check measurements were made with three different probes during the 3-day survey.

Control charts are provided for each probe (Figures 6–3, 6–4, and 6–5) to graphically portray the steadfastness of the instrument's responses to the source over the sampling period. Notable is the tight band within which the response checks fall and the consistency between probes. No degradation of the instrument response was observed over the period it was used indicating that the 2 hour maximum use constraint on a fresh counting gas charge is adequate and might provide justification for a longer allowable period between purge and charge cycles.



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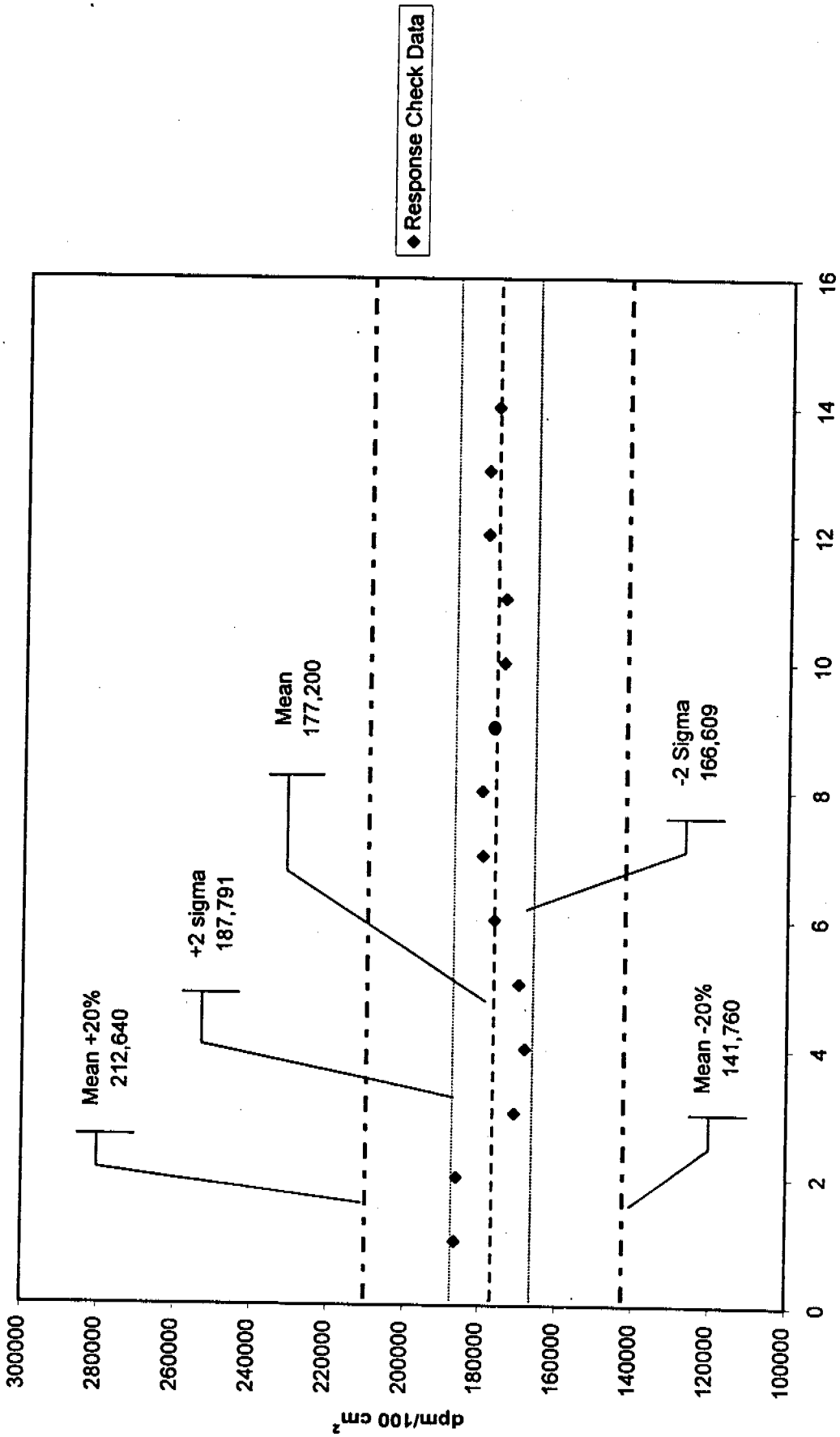


*Figure 6–3. Instrument Response Check Control Chart HP-100 Probe #S16338*

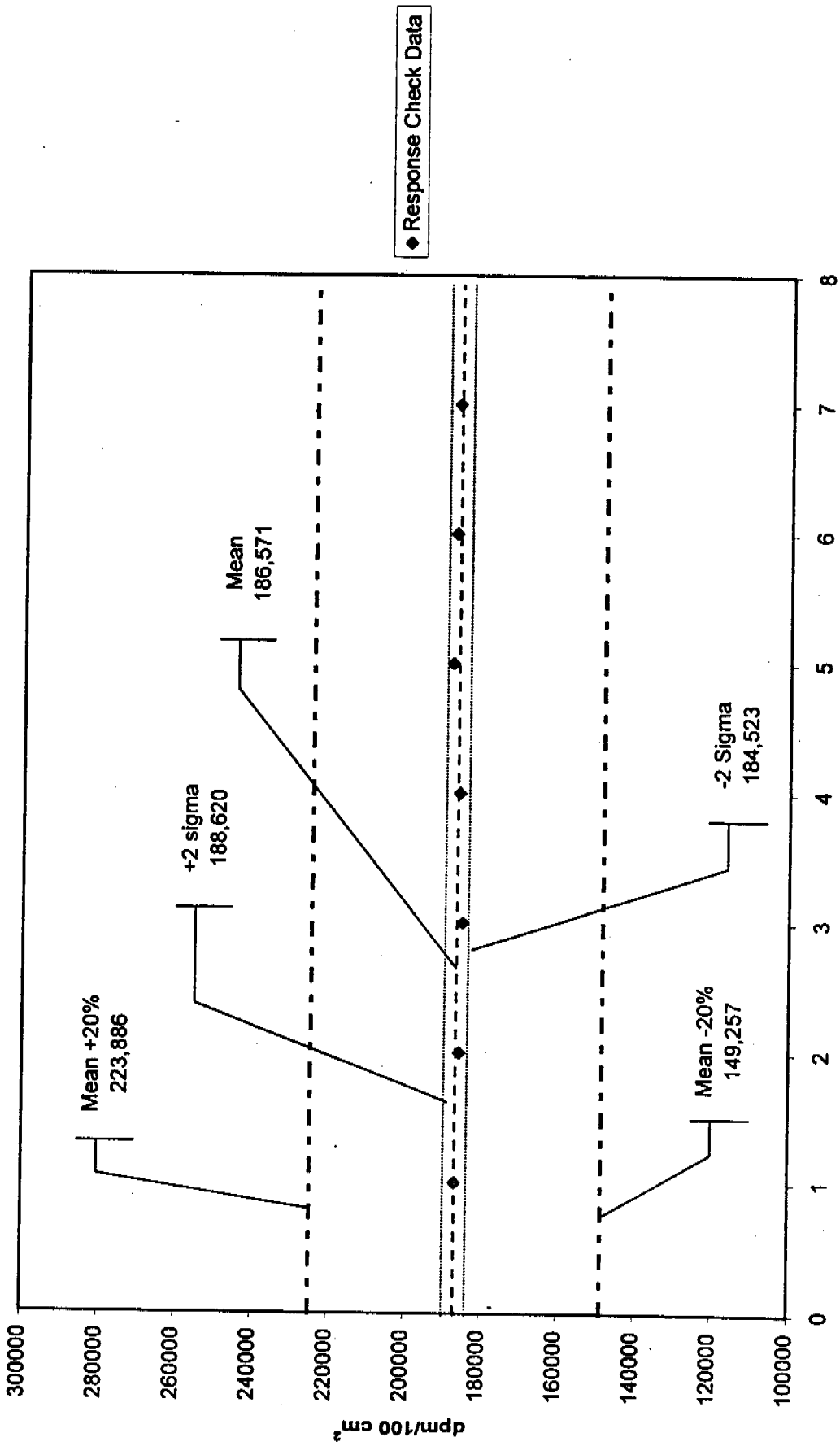


*Figure 6–4. Instrument Response Check Control Chart HP-100 Probe #S16339*



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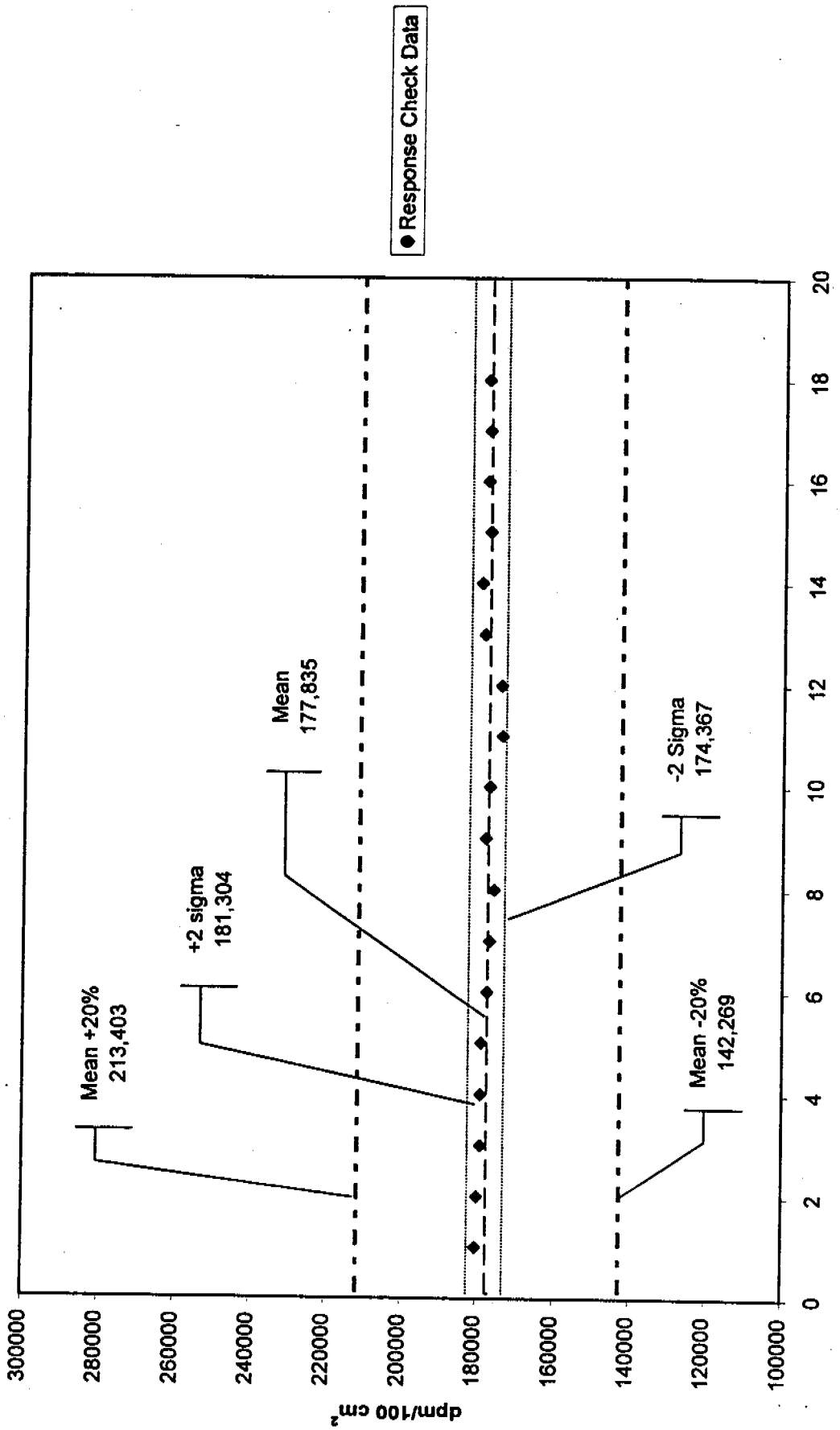


*Figure 6–5. Instrument Response Check Control Chart HP-100 Probe #S15349*



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# 7.0 Data Quality Analysis

The purpose of this data quality analysis (DQA) is to evaluate the data collected from the field in light of its intended use in decision making. Decision makers should obtain an understanding of the verity of the data used in the verification process from reading this section. The DQA uses guidance from *MARSSIM* (EPA 1997), *Guidance for Data Useability in Risk Assessment* (EPA 1992), information from the IV SAP (DOE 1999), and professional judgement.

## 7.1 Detection Limit Adequacy

Each of the three measurement methods used to assess the residual radioactive contamination in Building 729 have measurement sensitivities which limit the ability of the measurement to detect and quantify radioactivity. A key concern and design element of the SAP was to assure that sufficiently low detection sensitivities were achieved. Assumptions had to be made about the environment and response of the instrumentation and preparation methods in order to estimate the detection sensitivity before the fact. Now that the measurements have actually been made, assessment of the actual detection sensitivity achieved is possible. Section 6.0 presented data which demonstrated that the detection sensitivities achieved were adequate to identify and quantify radioactivity at a fraction of the applicable limit or DCGL. The target detection sensitivity planned for in the SAP was ≈50 percent of the applicable DCGL. Method detection limits obtained in both the field measurements and the laboratory measurements used were adequate to compare to the associated DCGL as indicated in Table 7–1, and met or exceeded the data quality target for measurement sensitivity.

*Table 7–1. Adequacy of Independent Verification Measurement Detection Limits*

| Measurement | Analytical Method | DCGL Benchmark (dpm/100 cm$^2$) | Detection Sensitivity Achieved (dpm/100 cm$^2$) |
|---|---|---|---|
| Average removable surface contamination concentration | Smear counting | 20 | ≈5 |
| Average transuranic surface contamination concentration as measured by direct surface emission. | 90 Second Direct Static Surface Emission Count | 100 | 41[a] |
| Maximum transuranic surface contamination concentration as measured by direct surface emission. | | 300 | |
| Average surface transuranic contamination concentration in and beneath surface coatings as measured by surface media sampling. | Alpha Spectroscopy | 100[b] | ≈4 |
| Maximum surface transuranic contamination concentration in and beneath surface coatings as measured by surface media sampling. | | 300[b] | |
| Average surface uranium contamination concentration in and beneath surface coatings as measured by surface media sampling. | Alpha Spectroscopy | 5,000[b] | ≈15 |
| Maximum surface uranium contamination concentration in and beneath surface coatings as measured by surface media sampling. | | 15,000[b] | |

[a]The detection sensitivity reported is net MDA. The adjusted gross MDA is equal to the MDA + background (56 dpm/100 cm$^2$).
[b]Laboratory analytical detection limits were also well below these metrics. See Appendix C for laboratory results.



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If detection limits had exceeded the DCGL metrics, then declarations based on measurements made using that method could not have been substantiated. As evidenced by comparing the decision limits as represented by the DCGLs with the MDA associated with the measurement method employed in assessing the residual contamination in Building 729, each detection limit obtained was more than adequate to detect, observe, and make risk management decisions with confidence.

## 7.2 Sample Size and Statistical Power

According to the SAP, sample sizes were specified to ensure a false positive error rate (alpha error) and a false negative error rate (beta error) of no greater than 5 percent when measurement data sets were compared to the DCGL. For each sample media set—direct surface emission measurements, smears, and surface media samples—a sample size of 29 (allowing for a 20 percent contingency) was specified in the IV SAP (DOE 1999). In the field, 29 direct surface emission measurements, 29 smears, and 23 surface media samples were actually collected from designated locations in Building 729.

Based on the results of each of the data sets, retrospective power curves were developed. Figures 7–1 through 7–4 illustrate the power of the sign test to conclude whether the null hypothesis should be rejected by measuring the probability that a survey unit meets the DCGL. Values of both error types (Type-I and Type-II) can be derived from the power curve at any possible concentration of residual contaminant. Type-I errors (falsely concluding that the DCGL *is not exceeded* when it actually is exceeded) are those that concern the risk manager and decision maker most. The actual and critical sample size (N) are both presented for each of the four data sets evaluated. The retrospective power curve is calculated using the actual sample size obtained. The boundary of the gray region represents the concentrations between which there is insufficient power at the prescribed alpha and beta error rate, given the sample size obtained and the variability observed in the data set.

Inspection of Figure 7–1 illustrates that the Type-I error rate drops below 5 percent (the error rate is 1-Power) when the true mean surface contamination concentration is at the DCGL of 100 dpm/100 $cm^2$, the sample size is 29, and the standard deviation is 9.5 dpm/100 $cm^2$ (the actual standard deviation). Alternately, the power to reject the null hypothesis when the mean surface contamination concentration is as high as 90 dpm/100 $cm^2$ is 95 percent. The critical sample size required to provide the power necessary to meet the sampling objectives outlined in the SAP was determined to be 14. The actual sample size (29) was much higher than that required, thus the actual power was much higher than required by the sample design. Note that the estimate of the central tendency, the geometric mean, is plotted against the power curve. This concentration is significantly less than the concentration at which the power begins to wane (the lower boundary of the gray region). The power to reject the null hypothesis at the observed mean concentration in the survey unit is effectively 100 percent.



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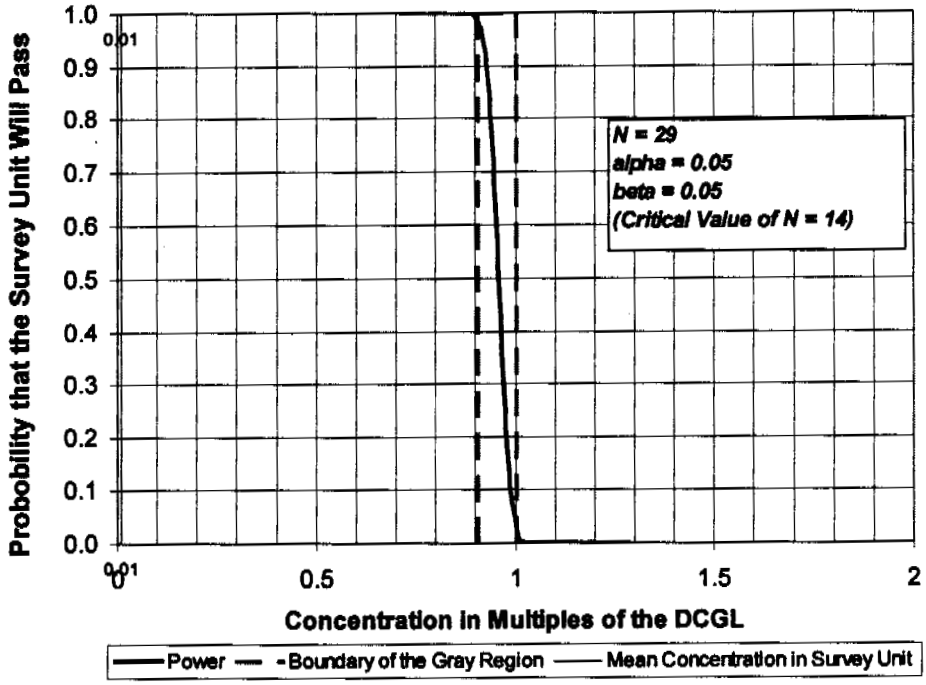


*Figure 7–1. Retrospective Power of the Sign Test*
*Direct Static Surface Measurements*

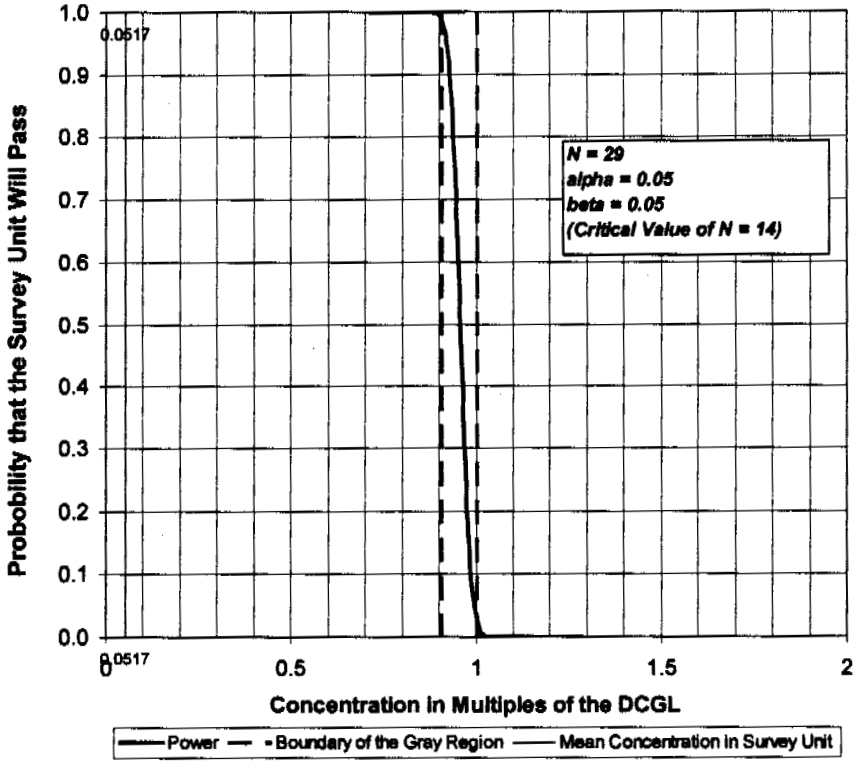


*Figure 7–2. Retrospective Power of the Sign Test*
*Smear Sample Measurements*

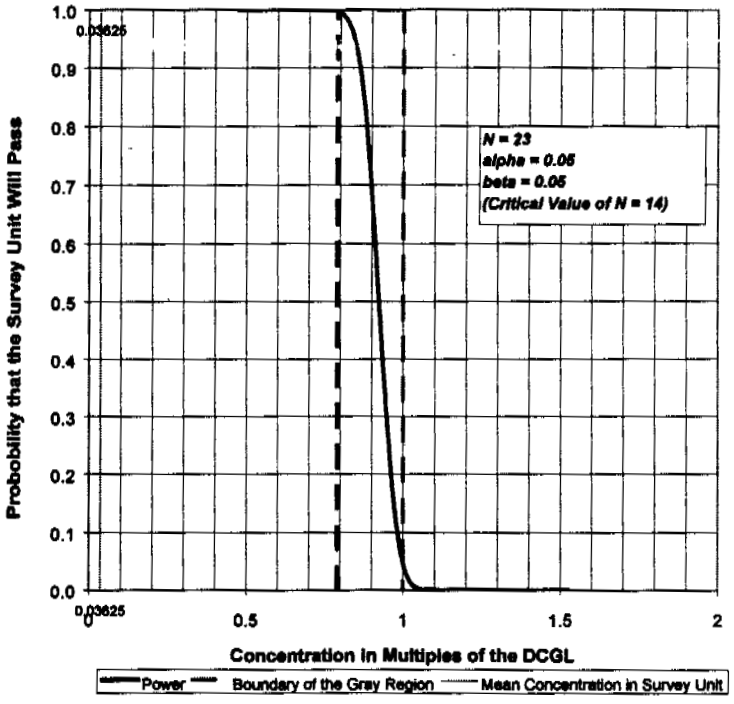


*Figure 7–3. Retrospective Power of the Sign Test Surface Media Samples/Transuranic Activity*

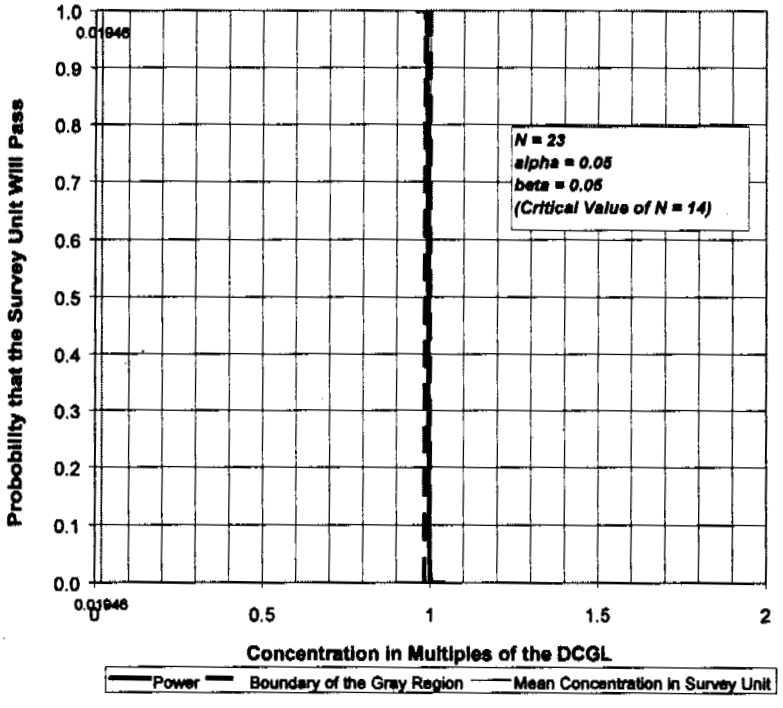


*Figure 7–4. Retrospective Power of the Sign Test Surface Media Samples/Uranium Series Activity*

The same results are observed in Figures 7–2 through 7–4. Rigorous statistical tests of the data sets are not justified since it is known that every data point comprising each of the data sets was less than the applicable DCGL. When this occurs, the sign test will always conclude that the null hypothesis should be rejected, provided that a sufficient number of measurements have been included in the data set (i.e., actual sample size is greater than or equal to the critical sample size). Thus, risk managers can be assured that the data collected is sufficiently robust to decide that the residual surface contamination concentration in the survey unit measured is below the DCGL.

## 7.3 Measurement Uncertainty and Data Quality Indicators

As discussed in the IV SAP (DOE 1999), measurement uncertainty stems from two sources: field sampling variation, and instrument/laboratory measurement variation. Of the two sources, field sampling variation was noted as the greatest contributor to overall uncertainty because of the inherent logistics of sample collection and the one-of-a-kind aspect of sampling the building. The field measurement methods used in the building survey were standard Health Physics instrument techniques and were governed by approved procedures used in the field sampling process. Laboratory procedures were also utilized by the GJO Analytical Laboratory to assess the radioactivity associated with both smear samples and surface media samples. Surface media samples were weighed prior to sample preparation to minimize error due to sample mass loss during sample preparation. An additional control feature utilized to minimize variability and error in the surface media samples was to homogenize the sample by grinding the surface veneer material removed to a fine powder. In this way, any aliquot of the sample selected for analysis could be confidently expected to yield comparable results.

As discussed in the SAP (DOE 1999), an important activity in determining the usability of the data based on sampling is assessing the effectiveness of the sampling program (EPA 1998, EPA 1992). Data Quality Indicators (DQIs) were identified as guidelines for the DQA process to provide quantitative and qualitative measures of overall data quality and usability. For comparative purposes, Table 7–2 repeats the target DQIs from the IV SAP and summarizes the post-sampling data quality assessment.

Inspection of Table 7–2 indicates that the DQIs are achieved and the data is regarded as having sufficient quality to be useable for verification of the DCGL and for assessing the results and conclusions obtained by the Contractor.

## 7.4 Overall Quality Assurance and Quality Control

Based on the forgoing analysis and observed practices in the field, it is apparent that overall project QA/QC goals were obtained. The key technical features of the project included:

The DCGL derivation and SAP development processes were performed in accordance with EPA guidance for DQOs (EPA 1997 and EPA 1993).

Field operations were conducted in accordance with the SAP. Modifications to the sample locations which were either inaccessible or involved appreciable personnel safety hazards were made in accordance with the approved sample relocation procedure outlined in the SAP.

Data analysis was conducted as prescribed by the SAP and in general agreement with EPA guidance (EPA 1997 and EPA 1992).

There were no significant problems or incidents that would compromise the findings. The data collected from the building survey is regarded as useable.



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*Table 7–2. Target Data Quality Indicators and Findings*

| DQI | Quality Objective (DOE 1999) | Significance | Action/Remark | Finding |
|---|---|---|---|---|
| Completeness | 90 percent completeness | Less than complete data set could decrease confidence in supporting information. | Twenty-nine direct surface emission measurements of the 29 scheduled were obtained (100 percent). | DQI accepted. |
| | | | Twenty-nine of the 29 scheduled smear samples were collected (100 percent). | DQI accepted. |
| | | | Twenty-three of the potential 29 surface media samples were collected (79 percent). The sample size required (without the 20% buffer added to account for the possibility that some data may be lost or determined to be unusable) was 24 (DOE 1999), corresponding to a completion ratio of 96%. The reason that fewer than 29 surface media samples were collected is that six of the 29 selected locations did not meet the inclusion criteria for sampling. An assessment of the a posteriori power provided by the surface media sample data set provides evidence that a sample size of 23 is sufficient to be considered complete. | DQI accepted. |
| Comparability | 1) Comparability between instrument efficiencies (~ ±10 percent)<br>2) Common or equivalent sampling procedure used.<br>3) Professional judgement and field observations. | Affects ability to combine data sets produced using different sampling and/or analytical methods. | No measurement data sets were combined for the independent verification of the Final Status Survey of Building 729. Consistent methods, both sampling and analytical, were used throughout the sampling and survey process. | DQI accepted. |
| Representativeness | Sample allocation approach followed to ensure unbiased sample location selection and spatial distribution of the sampling locations. | Non-representativeness increases or decreases Type I error depending on the bias and results in the need to collect additional samples to improve representativeness. | Sample allocation used in the field strictly followed the approach outlined in the SAP. Three of the twenty-nine sample locations selected at random had to be relocated for personnel safety or location accessibility reasons. Each of these three were relocated using the relocation protocol outlined and approved in the SAP and maintained the spatial and unbiased objectives of the sample allocation objective. Each of the 29 sample locations was selected without prior knowledge and is unbiased. The sample locations selected meet the intent of the SAP design and are considered representative of conditions in the building. There are no analytical or measurement effects (e.g., holding times or compositing effects) affecting representativeness. | DQI accepted. |

*Table 7–2 (continued). Target Data Quality Indicators and Findings*

| DQI | Quality Objective (DOE 1999) | Significance | Action/Remark | Finding |
|---|---|---|---|---|
| Precision | Field and laboratory processes will be governed by procedures.<br><br>Replicate and split samples are used to assess variability as an indicator of precision.<br><br>< 10% difference between replicate and split samples.<br><br>Overall $r^2$ of ≈0.75 or better on paired data sets.<br><br>Standard error of the regression estimate (SSE ±10%). | Lack of precision affects the accuracy or confidence in the accuracy of the reported results. | All sampling, field measurement, and laboratory analysis processes were controlled by approved written procedures. Replicate direct static surface measurements made in the field showed remarkable precision even at the low count rates encountered at most sample locations (most were below the detection limit for the method).<br><br>Regression analysis on the paired data yielded a regression coefficient of determination of 0.92 and a standard error estimate of less than 3.2%.<br><br>Field instrument response checks and laboratory control standards and continuing calibration verification measurements demonstrated the precision of the laboratory analytical methods showing less than 10% error when control samples were measured more than once.<br><br>Caution must be exercised when attempting to measure precision on replicate measurements with activity near and below the detection limit. Statistical variability at near zero activity limits the likelihood that measurements results will be precise even when sampling and analytical methods are in fact precise and suitable at concentrations approaching the DCGL.<br><br>Overall sampling variability is another measure of precision. Quantitative metrics describing measurement precision are all acceptable. CV's range from 0.53 to 0.64 and the $CI_{95}$ for each data set was more than 50% below the applicable DCGL. | DQI accepted. |
| Accuracy | Field and laboratory processes will be governed by procedures.<br><br>Response to samples containing known amounts of radioactivity should be within ±10%.<br><br>QC Blank samples should return results below detection limit. QC spike samples should return results indicating the presence of the radioactivity of interest. | Accuracy is affected by bias and precision. A lack of accuracy can affect Type I and Type II errors depending on the bias. | All procedures were implemented. Spikes and Blanks returned expected results. Response to samples (or sources) containing known amounts of radioactivity were consistently within ±10% for every analytical and field measurement method used. As shown above, precision was acceptable. | DQI accepted. |

CV = Coefficient of Variation
CI = Confidence Interval
$r^2$ coefficient of determination





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# 8.0 Summary and Conclusions

## 8.1 Independent Verification Sampling and Survey

On the basis of the analysis presented in Sections 3.0 through 7.0 of this report, the IVC has demonstrated that the survey unit selected for independent verification (729–01) has met each of the compliance benchmarks, or DCGLs. These results show that residual surface radiological contamination are well below the agreed upon benchmarks for the Building 779 Cluster Decontamination and Decommissioning project applicable to Building 729. Table 8–1 provides a summary review of the DCGLs compared to the appropriate compliance parameter. The independent verification sampling and survey results are highly reliable and consistent with the field sampling and survey design. No unexpected results or trends are evident in the data. The sampling and survey results determined that residual radiological contamination in Building 729 is very minimal and, for the most part, barely above background levels. Thus, the IVC concludes that the null hypothesis for survey unit 729–01 (that residual radiological surface contamination exists in concentrations above the DCGLs) should be rejected.

*Table 8–1. Comparison of Building 729 DCGLs to Observed Compliance Parameters*

| Metric | Surface Radioactivity (dpm/100 cm$^2$) | | | Pass/Fail |
|---|---|---|---|---|
| | DCGL | Actual | | |
| | | ($UCL_{95}$) | Maximum | |
| Mean surface contamination as measured by direct surface emission | 100 | 20.7 | | Pass |
| Maximum surface contamination as measured by direct surface emission | 300 | | 40.8 | Pass |
| Mean removable surface contamination | 20 | <5.17 | | Pass |
| Mean total transuranic surface contamination on and beneath a surface with a surface coating as measured by surface media sample | 100 | 9.3 | | Pass |
| Maximum total transuranic surface contamination on and beneath a surface with a surface coating as measured by surface media sample | 300 | | 87.0 | Pass |
| Mean total uranium series surface contamination on and beneath a surface with a surface coating as measured by surface media sample | 5000 | 142.0 | | Pass |
| Maximum total uranium series surface contamination on and beneath a surface with a surface coating as measured by surface media sample | 15,000 | | 290 | Pass |

## 8.2 Independent Review of the Contractor's Final Status Survey Report and Conclusions

The IVC has completed a comprehensive review of the Contractor's Closeout Radiological Survey Report for Building 729 (RMRS 1999a). At this time, the Contractor is addressing the IVC's comments. While the IVC had comments that were considered "critical", it was determined that none of the issues identified by the IVC would impact the overall conclusion reached by the Contractor—that each survey unit in Building 729 met the applicable DCGLs and that the building should be released from further radiological controls. The IVC will include a



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statement of concurrence with the Contractor's conclusions in this report after all comments and issues are addressed.

# 9.0 References

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# Appendix A

# Random Selection Data

# Random Selection Program to Select Survey Units for IV

CTRL - ALT - F9 to recalculate

**Random Number Selected = 2**

**Building 729**

| Survey Unit ID# | Class (1, 2, 3) | Weighting |
|---|---|---|
| 729-01 | 2 | 3 |
| 729-02 | 3 | 1 |
| 729-03 | 3 | 1 |

| | |
|---|---|
| 1 | 729-01 |
| 2 | 729-01 |
| 3 | 729-01 |
| 4 | 729-02 |
| 5 | 729-03 |

5

Jeffrey W Livey
JEFFREY LIVEY ~~3/R~~ R
2/25/99



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# Random Selection Program to Select Survey Start Point

CTRL - ALT - F9 to recalculate

**Random Start Number Selected = 167**

| | |
|---|---|
| **Building #** | **729** |
| **Survey Unit ID#** | **729-01** |
| **Class (1, 2, 3)** | **2** |
| **# of Potential Sample Locations** | **206** |
| **Total Number of Samples Required** | **29** |
| **Sample Frequency** | **7.1** |



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# Appendix B

# Manufacturer's Certification

16 August 1995 Men/wo
Page 1 of 2 pages, issue 07/95

Amersham Buchler
GmbH & Co KG
Gieselweg 1
D-38110 Braunschweig
Postfach 11 49
D-38001 Braunschweig
Tel. (05307) 930-0
Fax (05307) 930-293
Fax-Zentrale 930-237

Amersham
The Health Science Group

# CERTIFICATE

## No. 109597-2

for a Sealed Radioactive Source

### Source Type: Alpha Wide Area Reference Source

| | |
|---|---|
| Product Code | PPRX1754 |
| Drawing | VZ-1246 |
| Dimensions of Active Surface | 71 mm x 71 mm |
| Overall Dimensions | 87 mm x 87 mm x 7 mm |
| Source No. | ER 716 |
| Nuclide | Plutonium-238 |

### Measurement Data

| | |
|---|---|
| Activity | 3.24 kBq |
| Overall Uncertainty* | ± 10 % |
| Alpha Surface Emission Rate | 1.54E03 $s^{-1}$ ± 5 % in 2π steradian |
| Reference Date | 1 August 1995 |
| Traceability* | Defined on page 2 |

### Leakage and Contamination Test(s)

| | |
|---|---|
| Test Method(s)* | I |
| Test(s) passed on | 15 August 1995 |

### Additional Information

| | |
|---|---|
| ISO Classification* | C.11111 |
| Recommended Working Life* | 10 years |
| Remark | — |

* see page 2 for explanation

Amersham Buchler

i. A. [signature]

(Production Manager)

Amersham Buchler GmbH & Co KG Ein Braunschweig, Registergericht
Persönlich haftende Gesellschafterin: Amersham Buchler GmbH, Ein Braunschweig, Registergericht
Geschäftsführer: Dr. Anthony J. D'Eustachio
Deutsche Bank AG Braunschweig BLZ 270 700 30, Konto 0165815

04/08 '99 12:39 NO.055 02/03

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# Explanations for Certificates (Page 2 of Certificates)

## Overall uncertainty

The reported uncertainty is based on standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 %. (ISO Guide, 1995)

## Traceability

This certificate documents the traceability of measurement results to national standards, standard measuring equipment and methods for the realisation of physical units of measurement according to the International System of Units (SI).
Traceability is defined as 'the property of a result of a measurement whereby it can be related to appropriate standards, generally international or national standards, through an unbroken chain of comparisons'.

AEA Technology QSA GmbH has been accredited as DKD (Deutscher Kalibrierdienst) calibration laboratory by the Physikalisch-Technische Bundesanstalt (PTB) and is authorized to issue reference sources which are traceable to national standards held at the PTB in Germany.
Because of the European Cooperation for Accreditation of Laboratories (EAL) mutual recognition agreement the certificates are also accepted by all EAL-members (e. g. NAMAS, UK).

This product complies with the requirements for traceability to NIST specified in the American National Standard "Traceability of Radioactive Sources to the NIST and Associated Instrument Quality Control (ANSI N42.22-1995)".
As a requirement for the ANSI N42.22-1995 AEA Technology QSA participates in the NEI/NIST Measurements Assurance Program of the Nuclear Power Industry.

## Leakage and contamination tests

Stringent tests for leakage are an essential feature of radioactive sources production. They are based on ISO 9978. Some standard methods used for testing radiation sources are listed below.

### Wipe test I

The source is wiped with a swab or tissue, moistened with ethanol or water, the activity removed is measured.
Limit: 185 Bq

### Immersion test II

The source is immersed in a suitable liquid at 50 °C for at least 4 hours and the activity removed is measured.
Limit: 185 Bq

### Bubble test III

The source is immersed in water or a suitable liquid and the pressure in the vessel reduced to 13 kPa (100 mm Hg). No bubbles must be observed.
(This test conforms to ISO 9978 except that for some sources, the 100 mm³ free volume requirement is not met.)

### Emanation test IV

The source is placed in a gas tight enclosure with activated carbon as absorber and is left there for at least 3 h. The source is considered leak tight when not more than 185 Bq Radon related to a collection time of 12 h can be measured afterwards.

## ISO classification

The International Organization for Standardization (ISO) has proposed a system of classification of sealed radioactive sources based on safety requirements for typical uses (see ISO 2919). This system provides a manufacturer of sealed radioactive sources with a set of tests to evaluate the safety of his products. It also assists a user of such sealed sources to select types which suit the application he has in mind. The tests to which specimen sources are subjected are listed in the following table.

### Classification of sealed source performance standard according to ISO 2919

| | Class 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Temperature | No test | - 40 °C (20 min) + 80 °C (1 h) | - 40 °C (20 min) + 180 °C (1 h) | - 40 °C (20 min) + 400 °C (1 h) and thermal shock 400 °C to 20 °C | - 40 °C (20 min) + 600 °C (1 h) and thermal shock 600 °C to 20 °C | - 40 °C (20 min) + 800 °C (1 h) and thermal shock 800 °C to 20 °C |
| External Pressure | No test | 25 kPa absolute | 25 kPa absolute to 2 MPa absolute | 25 kPa absolute to 7 MPa absolute | 25 kPa absolute to 70 MPa absolute | 25 kPa absolute to 170 MPa absolute |
| Impact | No test | 50 g from 1 m | 200 g from 1 m | 2 kg from 1 m | 5 kg from 1 m | 20 kg from 1 m |
| Vibration | No test | 3 x 10 min 25 - 500 Hz at 5 g peak amplitude | 3 x 10 min 25 - 50 Hz at 5 g peak amplitude and 50 - 90 Hz at 0.635 mm amplitude peak to peak and 90 - 500 Hz at 10 g peak amplitude | 3 x 30 min 25 - 80 Hz at 1.5 mm amplitude peak to peak and 80 - 2000 Hz at 20 g peak amplitude | | |
| Puncture | No test | 1 g from 1 m | 10 g from 1 m | 50 g from 1 m | 300 g from 1 m | 1 kg from 1 m |

## Special applications

No test programme can cover all possible combinations of environments to which a source may be exposed.
Users should therefore consult our experts before using sources in potentially adverse environments.

## IAEA Special Form

'Special Form' is a test specification for sealed sources given in the IAEA transport regulations (IAEA Safety Series No. 6, 1985, revised edition).
It is used in determining the maximum acceptable activities for various types of transport containers.

AEA TECHNOLOGY





Ale

# Appendix C

## Analytical Laboratory Reports
## Requisition Number 16495
## Requisition Number 16496

# ANALYTICAL REPORT

TO: JEFF LIVELY

PROJECT: 332302001

DATE: Wednesday, April 7, 1999

REQUISITION(S): 16495

PREPARED BY:

GRAND JUNCTION OFFICE ANALYTICAL LABORATORY
2597 B 3/4 ROAD
GRAND JUNCTION, COLORADO 81503
(970-248-6165)

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# ANALYTICAL SUMMARY

This report contains the results for twenty-three samples of miscellaneous solids received on March 30, 1999, under Project Number 332302001 and Requisition Number 16495. The samples were submitted for the determination of americium-241, plutonium isotopes, and uranium isotopes.

The results are reported as disintegrations per minute per sample (dpm/sa) as requested.

Sample weights are recorded on page 183 of Section II. The samples were milled prior to analysis. Americium-241, plutonium isotopes, and uranium isotopes were analyzed by alpha spectrometry according to SOP RC-19.

On pages 60 of Section II, the analyst has noted the chemical recovery for the plutonium duplicate of sample 258191 was greater than 105 percent. Both 258191 and 258191D (its duplicate) were reanalyzed.

Except as noted, all laboratory quality control parameters were met during the course of these analyses.

RELEASE OF THE DATA CONTAINED IN THIS REPORT HAS BEEN AUTHORIZED BY THE LABORATORY MANAGER OR THE MANAGER'S DESIGNEE

R B Chesman 7/7/99
LABORATORY MANAGER DATE

Susan E. Ball 7 April 1999
PREPARED BY DATE

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# ANALYTICAL REPORT INDEX

This report is the final data package for Requisition 16495 generated by the Analytical Laboratory for the RFETS-IV project. It is the official record, and requestors are responsible for proper record-keeping in compliance with project requirements.

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, project, or process disclosed in this report, or represents that its use would not infringe privately owned rights. Reference therein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

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Sample Cross Reference

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**Section II**
Radiochemical Supporting Documentation

**Section III**
Receiving Documentation

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SAMPLE CROSS REFERENCE V2.05

GRAND JUNCTION OFFICE ANALYTICAL LABORATORY

REQUISITION(S): 16495

| CUSTOMER ID | TICKET | LAB ID |
|---|---|---|
| IVP0000102 | MED0000102 | 258181 |
| IVP0000103 | MED0000103 | 258182 |
| IVP0000104 | MED0000104 | 258183 |
| IVP0000105 | MED0000105 | 258184 |
| IVP0000106 | MED0000106 | 258185 |
| IVP0000107 | MED0000107 | 258186 |
| IVP0000108 | MED0000108 | 258187 |
| IVP0000109 | MED0000109 | 258188 |
| IVP0000110 | MED0000110 | 258189 |
| IVP0000111 | MED0000111 | 258190 |
| IVP0000112 | MED0000112 | 258191 |
| IVP0000113 | MED0000113 | 258192 |
| IVP0000114 | MED0000114 | 258193 |
| IVP0000115 | MED0000115 | 258194 |
| IVP0000116 | MED0000116 | 258195 |
| IVP0000117 | MED0000117 | 258196 |
| IVP0000118 | MED0000118 | 258197 |
| IVP0000119 | MED0000119 | 258198 |
| IVP0000120 | MED0000120 | 258199 |
| IVP0000121 | MED0000121 | 258200 |
| IVP0000125 | MED0000125 | 258201 |
| IVP0000127 | MED0000127 | 258202 |
| IVP0000129 | MED0000129 | 258203 |

(SECTION I)

# ANALYTICAL DATA SUMMARY

This section contains 29 pages, not including this page.

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Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS **(SECTION I)**

Customer ID: IVP0000102
Ticket ID: MED0000102

Date: April 7, 1999
Lab ID: 258181

Requestor: JEFF LIVELY
Sample Matrix: MISCELLANEOUS
Project Number: 332302001

Case: 16495
Date Received: Mar 30, 1999
Date Collected: Mar 29, 1999

| ANALYSIS REQUESTED | RESULTS | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|
| Americium-241 | 2.3210 | 1.4680 | dpm/sa | 04/03/99 | RC-19 R05 |
| Pu-239+240 | <2.4480 | NA | dpm/sa | 04/01/99 | RC-19 R05 |
| Plutonium-238 | <1.3190 | NA | dpm/sa | 04/01/99 | RC-19 R05 |
| Uranium-238 | 112.0000 | 10.3700 | dpm/sa | 04/03/99 | RC-19 R05 |
| Uranium-235 | 5.9960 | 2.6060 | dpm/sa | 04/03/99 | RC-19 R05 |
| Uranium-234 | 121.0000 | 10.9100 | dpm/sa | 04/03/99 | RC-19 R05 |

Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000103
Ticket ID: MED0000103

Date: April 7, 1999
Lab ID: 258182

Requestor: JEFF LIVELY
Sample Matrix: MISCELLANEOUS
Project Number: 332302001

Case: 16495
Date Received: Mar 30, 1999
Date Collected: Mar 29, 1999

| ANALYSIS REQUESTED | RESULTS | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|
| Americium-241 | 2.3280 | 1.4720 | dpm/sa | 04/03/99 | RC-19 R05 |
| Pu-239+240 | <1.6570 | NA | dpm/sa | 04/01/99 | RC-19 R05 |
| Plutonium-238 | <1.6570 | NA | dpm/sa | 04/01/99 | RC-19 R05 |
| Uranium-238 | 45.1400 | 6.5540 | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-235 | <3.8150 | NA | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-234 | 46.7900 | 6.6800 | dpm/sa | 04/02/99 | RC-19 R05 |

Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000104
Ticket ID: MED0000104

Date: April 7, 1999
Lab ID: 258183

Requestor: JEFF LIVELY
Sample Matrix: MISCELLANEOUS
Project Number: 332302001

Case: 16495
Date Received: Mar 30, 1999
Date Collected: Mar 29, 1999

| ANALYSIS REQUESTED | RESULTS | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|
| Americium-241 | 4.3140 | 2.3990 | dpm/sa | 04/03/99 | RC-19 R05 |
| Pu-239+240 | <2.1800 | NA | dpm/sa | 04/01/99 | RC-19 R05 |
| Plutonium-238 | <1.5790 | NA | dpm/sa | 04/01/99 | RC-19 R05 |
| Uranium-238 | 34.3200 | 6.1210 | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-235 | <4.8520 | NA | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-234 | 35.6000 | 6.2060 | dpm/sa | 04/02/99 | RC-19 R05 |

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ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000105
Ticket ID: MED0000105

Date: April 7, 1999
Lab ID: 258184

Requestor: JEFF LIVELY
Sample Matrix: MISCELLANEOUS
Project Number: 332302001

Case: 16495
Date Received: Mar 30, 1999
Date Collected: Mar 29, 1999

| ANALYSIS REQUESTED | RESULTS | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|
| Americium-241 | 4.1440 | 2.5020 | dpm/sa | 04/03/99 | RC-19 R05 |
| Pu-239+240 | <2.1500 | NA | dpm/sa | 04/01/99 | RC-19 R05 |
| Plutonium-238 | <2.1500 | NA | dpm/sa | 04/01/99 | RC-19 R05 |
| Uranium-238 | 79.1100 | 10.1000 | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-235 | <5.3900 | NA | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-234 | 78.0500 | 10.1700 | dpm/sa | 04/02/99 | RC-19 R05 |

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Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000106
Ticket ID: MED0000106

Date: April 7, 1999
Lab ID: 258185

Requestor: JEFF LIVELY
Sample Matrix: MISCELLANEOUS
Project Number: 332302001

Case: 16495
Date Received: Mar 30, 1999
Date Collected: Mar 29, 1999

| ANALYSIS REQUESTED | RESULTS | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|
| Americium-241 | 2.4970 | 1.7490 | dpm/sa | 04/03/99 | RC-19 R05 |
| Pu-239+240 | <2.2590 | NA | dpm/sa | 04/01/99 | RC-19 R05 |
| Plutonium-238 | <1.9880 | NA | dpm/sa | 04/01/99 | RC-19 R05 |
| Uranium-238 | 62.1600 | 7.9290 | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-235 | 4.2720 | 2.3920 | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-234 | 64.6500 | 8.1520 | dpm/sa | 04/02/99 | RC-19 R05 |

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Grand Junction Office Analytical Laboratory

V1.05

ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000107
Ticket ID: MED0000107

Date: April 7, 1999
Lab ID: 258186

Requestor: JEFF LIVELY
Sample Matrix: MISCELLANEOUS
Project Number: 332302001

Case: 16495
Date Received: Mar 30, 1999
Date Collected: Mar 29, 1999

| ANALYSIS REQUESTED | RESULTS | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|
| Americium-241 | 2.5470 | 1.5640 | dpm/sa | 04/03/99 | RC-19 R05 |
| Pu-239+240 | <1.9830 | NA | dpm/sa | 04/01/99 | RC-19 R05 |
| Plutonium-238 | <1.6240 | NA | dpm/sa | 04/01/99 | RC-19 R05 |
| Uranium-238 | 66.2900 | 7.0320 | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-235 | <2.6910 | NA | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-234 | 63.2000 | 6.8820 | dpm/sa | 04/02/99 | RC-19 R05 |

Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000108
Ticket ID: MED0000108

Date: April 7, 1999
Lab ID: 258187

Requestor: JEFF LIVELY
Sample Matrix: MISCELLANEOUS
Project Number: 332302001

Case: 16495
Date Received: Mar 30, 1999
Date Collected: Mar 29, 1999

| ANALYSIS REQUESTED | RESULTS | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|
| Americium-241 | 1.9810 | 1.2370 | dpm/sa | 04/03/99 | RC-19 R05 |
| Pu-239+240 | <1.2760 | NA | dpm/sa | 04/01/99 | RC-19 R05 |
| Plutonium-238 | <1.1590 | NA | dpm/sa | 04/01/99 | RC-19 R05 |
| Uranium-238 | 56.8000 | 6.0180 | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-235 | 3.3460 | 1.6610 | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-234 | 59.8400 | 6.2300 | dpm/sa | 04/02/99 | RC-19 R05 |

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Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000109
Ticket ID: MED0000109

Date: April 7, 1999
Lab ID: 258188

Requestor: JEFF LIVELY
Sample Matrix: MISCELLANEOUS
Project Number: 332302001

Case: 16495
Date Received: Mar 30, 1999
Date Collected: Mar 29, 1999

| ANALYSIS REQUESTED | RESULTS | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|
| Americium-241 | 1.9050 | 1.4050 | dpm/sa | 04/03/99 | RC-19 R05 |
| Pu-239+240 | <2.6870 | NA | dpm/sa | 04/01/99 | RC-19 R05 |
| Plutonium-238 | <1.8180 | NA | dpm/sa | 04/01/99 | RC-19 R05 |
| Uranium-238 | 41.2600 | 5.9870 | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-235 | 3.2070 | 2.0150 | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-234 | 41.9900 | 6.0410 | dpm/sa | 04/02/99 | RC-19 R05 |

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ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000110
Ticket ID: MED0000110

Date: April 7, 1999
Lab ID: 258189

Requestor: JEFF LIVELY
Sample Matrix: MISCELLANEOUS
Project Number: 332302001

Case: 16495
Date Received: Mar 30, 1999
Date Collected: Mar 27, 1999

| ANALYSIS REQUESTED | RESULTS | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|
| Americium-241 | <0.9398 | NA | dpm/sa | 04/03/99 | RC-19 R05 |
| Pu-239+240 | <0.8995 | NA | dpm/sa | 04/01/99 | RC-19 R05 |
| Plutonium-238 | <0.8995 | NA | dpm/sa | 04/01/99 | RC-19 R05 |
| Uranium-238 | 27.5400 | 3.4700 | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-235 | 1.5610 | 0.9807 | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-234 | 32.3200 | 3.8040 | dpm/sa | 04/02/99 | RC-19 R05 |

Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000111
Ticket ID: MED0000111

Date: April 7, 1999
Lab ID: 258190

Requestor: JEFF LIVELY
Sample Matrix: MISCELLANEOUS
Project Number: 332302001

Case: 16495
Date Received: Mar 30, 1999
Date Collected: Mar 29, 1999

| ANALYSIS REQUESTED | RESULTS | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|
| Americium-241 | 2.4980 | 1.7320 | dpm/sa | 04/03/99 | RC-19 R05 |
| Pu-239+240 | <1.5170 | NA | dpm/sa | 04/01/99 | RC-19 R05 |
| Plutonium-238 | <2.0940 | NA | dpm/sa | 04/01/99 | RC-19 R05 |
| Uranium-238 | 90.5500 | 10.0800 | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-235 | 6.4390 | 2.8150 | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-234 | 102.7000 | 10.8400 | dpm/sa | 04/02/99 | RC-19 R05 |

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Grand Junction Office Analytical Laboratory

V1.05

ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000112
Ticket ID: MED0000112

Date: April 7, 1999
Lab ID: 258191

Requestor: JEFF LIVELY
Sample Matrix: MISCELLANEOUS
Project Number: 332302001

Case: 16495
Date Received: Mar 30, 1999
Date Collected: Mar 29, 1999

| ANALYSIS REQUESTED | RESULTS | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|
| Americium-241 | 4.1120 | 2.1980 | dpm/sa | 04/03/99 | RC-19 R05 |
| Pu-239+240 | <2.6890 | NA | dpm/sa | 04/06/99 | RC-19 R05 |
| Plutonium-238 | <1.4480 | NA | dpm/sa | 04/06/99 | RC-19 R05 |
| Uranium-238 | 47.6000 | 6.6590 | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-235 | <4.0190 | NA | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-234 | 48.9600 | 6.7450 | dpm/sa | 04/02/99 | RC-19 R05 |

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Grand Junction Office Analytical Laboratory

71.05

ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000113
Ticket ID: MED0000113

Date: April 7, 1999
Lab ID: 258192

Requestor: JEFF LIVELY
Sample Matrix: MISCELLANEOUS
Project Number: 332302001

Case: 16495
Date Received: Mar 30, 1999
Date Collected: Mar 27, 1999

| ANALYSIS REQUESTED | RESULTS | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|
| Americium-241 | <1.4300 | NA | dpm/sa | 04/03/99 | RC-19 R05 |
| Pu-239+240 | <1.5430 | NA | dpm/sa | 04/01/99 | RC-19 R05 |
| Plutonium-238 | <1.5430 | NA | dpm/sa | 04/01/99 | RC-19 R05 |
| Uranium-238 | 27.8600 | 4.4840 | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-235 | <2.2610 | NA | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-234 | 29.1500 | 4.7020 | dpm/sa | 04/02/99 | RC-19 R05 |

Grand Junction Office Analytical Laboratory

V1.05

ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000114
Ticket ID: MED0000114

Date: April 7, 1999
Lab ID: 258193

Requestor: JEFF LIVELY
Sample Matrix: MISCELLANEOUS
Project Number: 332302001

Case: 16495
Date Received: Mar 30, 1999
Date Collected: Mar 29, 1999

| ANALYSIS REQUESTED | RESULTS | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|
| Americium-241 | 3.7710 | 1.8420 | dpm/sa | 04/03/99 | RC-19 R05 |
| Pu-239+240 | <1.7490 | NA | dpm/sa | 04/01/99 | RC-19 R05 |
| Plutonium-238 | <0.5103 | NA | dpm/sa | 04/01/99 | RC-19 R05 |
| Uranium-238 | 25.6700 | 4.1550 | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-235 | <2.2630 | NA | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-234 | 25.3500 | 4.1810 | dpm/sa | 04/02/99 | RC-19 R05 |

Grand Junction Office Analytical Laboratory

'1.05

ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000115
Ticket ID: MED0000115

Date: April 7, 1999
Lab ID: 258194

Requestor: JEFF LIVELY
Sample Matrix: MISCELLANEOUS
Project Number: 332302001

Case: 16495
Date Received: Mar 30, 1999
Date Collected: Mar 29, 1999

| ANALYSIS REQUESTED | RESULTS | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|
| Americium-241 | 4.4100 | 2.6600 | dpm/sa | 04/05/99 | RC-19 R05 |
| Pu-239+240 | 4.0260 | 2.8890 | dpm/sa | 04/02/99 | RC-19 R05 |
| Plutonium-238 | <2.2750 | NA | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-238 | 121.8000 | 15.9100 | dpm/sa | 04/03/99 | RC-19 R05 |
| Uranium-235 | 8.5630 | 5.6150 | dpm/sa | 04/03/99 | RC-19 R05 |
| Uranium-234 | 159.6000 | 18.4700 | dpm/sa | 04/03/99 | RC-19 R05 |

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Grand Junction Office Analytical Laboratory

1.05

ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000116
Ticket ID: MED0000116

Date: April 7, 1999
Lab ID: 258195

Requestor: JEFF LIVELY
Sample Matrix: MISCELLANEOUS
Project Number: 332302001

Case: 16495
Date Received: Mar 30, 1999
Date Collected: Mar 27, 1999

| ANALYSIS REQUESTED | RESULTS | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|
| Americium-241 | 1.8470 | 1.3920 | dpm/sa | 04/05/99 | RC-19 R05 |
| Pu-239+240 | <2.4140 | NA | dpm/sa | 04/02/99 | RC-19 R05 |
| Plutonium-238 | <1.3000 | NA | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-238 | 28.4400 | 4.8120 | dpm/sa | 04/03/99 | RC-19 R05 |
| Uranium-235 | <3.6050 | NA | dpm/sa | 04/03/99 | RC-19 R05 |
| Uranium-234 | 33.4600 | 5.2190 | dpm/sa | 04/03/99 | RC-19 R05 |

Grand Junction Office Analytical Laboratory

71.05

ANALYTICAL RESULTS (SECTION I)

Customer ID: IVP0000117
Ticket ID: MED0000117

Date: April 7, 1999
Lab ID: 258196

Requestor: JEFF LIVELY
Sample Matrix: MISCELLANEOUS
Project Number: 332302001

Case: 16495
Date Received: Mar 30, 1999
Date Collected: Mar 29, 1999

| ANALYSIS REQUESTED | RESULTS | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|
| Americium-241 | <0.6939 | NA | dpm/sa | 04/05/99 | RC-19 R05 |
| Pu-239+240 | 0.7944 | 0.6380 | dpm/sa | 04/02/99 | RC-19 R05 |
| Plutonium-238 | <0.7579 | NA | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-238 | 25.8500 | 3.6000 | dpm/sa | 04/03/99 | RC-19 R05 |
| Uranium-235 | 2.6620 | 1.5090 | dpm/sa | 04/03/99 | RC-19 R05 |
| Uranium-234 | 25.4100 | 3.6310 | dpm/sa | 04/03/99 | RC-19 R05 |

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Grand Junction Office Analytical Laboratory

.05

ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000118
Ticket ID: MED0000118

Date: April 7, 1999
Lab ID: 258197

Requestor: JEFF LIVELY
Sample Matrix: MISCELLANEOUS
Project Number: 332302001

Case: 16495
Date Received: Mar 30, 1999
Date Collected: Mar 29, 1999

| ANALYSIS REQUESTED | RESULTS | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|
| Americium-241 | 10.1100 | 3.8580 | dpm/sa | 04/05/99 | RC-19 R05 |
| Pu-239+240 | 74.0900 | 10.7700 | dpm/sa | 04/02/99 | RC-19 R05 |
| Plutonium-238 | 2.8100 | 1.9840 | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-238 | 103.2000 | 11.1200 | dpm/sa | 04/03/99 | RC-19 R05 |
| Uranium-235 | 6.0640 | 2.9770 | dpm/sa | 04/03/99 | RC-19 R05 |
| Uranium-234 | 101.4000 | 11.0600 | dpm/sa | 04/03/99 | RC-19 R05 |

Grand Junction Office Analytical Laboratory

71.05

ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000119
Ticket ID: MED0000119

Date: April 7, 1999
Lab ID: 258198

Requestor: JEFF LIVELY
Sample Matrix: MISCELLANEOUS
Project Number: 332302001

Case: 16495
Date Received: Mar 30, 1999
Date Collected: Mar 29, 1999

| ANALYSIS REQUESTED | RESULTS | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|
| Americium-241 | 4.8710 | 2.5240 | dpm/sa | 04/05/99 | RC-19 R05 |
| Pu-239+240 | <2.0130 | NA | dpm/sa | 04/02/99 | RC-19 R05 |
| Plutonium-238 | <2.0130 | NA | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-238 | 46.3900 | 7.3760 | dpm/sa | 04/03/99 | RC-19 R05 |
| Uranium-235 | <4.6200 | NA | dpm/sa | 04/03/99 | RC-19 R05 |
| Uranium-234 | 45.0400 | 7.3550 | dpm/sa | 04/03/99 | RC-19 R05 |

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Grand Junction Office Analytical Laboratory

V1.05

ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000120
Ticket ID: MED0000120

Date: April 7, 1999
Lab ID: 258199

Requestor: JEFF LIVELY
Sample Matrix: MISCELLANEOUS
Project Number: 332302001

Case: 16495
Date Received: Mar 30, 1999
Date Collected: Mar 27, 1999

| ANALYSIS REQUESTED | RESULTS | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|
| Americium-241 | 1.4690 | 1.0290 | dpm/sa | 04/05/99 | RC-19 R05 |
| Pu-239+240 | <1.2290 | NA | dpm/sa | 04/02/99 | RC-19 R05 |
| Plutonium-238 | <1.0820 | NA | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-238 | 25.3900 | 4.0330 | dpm/sa | 04/03/99 | RC-19 R05 |
| Uranium-235 | 2.2420 | 1.5130 | dpm/sa | 04/03/99 | RC-19 R05 |
| Uranium-234 | 24.0400 | 3.9560 | dpm/sa | 04/03/99 | RC-19 R05 |

Grand Junction Office Analytical Laboratory

1.05

ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000121
Ticket ID: MED0000121

Date: April 7, 1999
Lab ID: 258200

Requestor: JEFF LIVELY
Sample Matrix: MISCELLANEOUS
Project Number: 332302001

Case: 16495
Date Received: Mar 30, 1999
Date Collected: Mar 27, 1999

| ANALYSIS REQUESTED | RESULTS | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|
| Americium-241 | <0.7841 | NA | dpm/sa | 04/05/99 | RC-19 R05 |
| Pu-239+240 | <0.9664 | NA | dpm/sa | 04/02/99 | RC-19 R05 |
| Plutonium-238 | <0.7914 | NA | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-238 | 37.6600 | 3.7320 | dpm/sa | 04/03/99 | RC-19 R05 |
| Uranium-235 | 1.9690 | 0.9347 | dpm/sa | 04/03/99 | RC-19 R05 |
| Uranium-234 | 41.1900 | 3.9400 | dpm/sa | 04/03/99 | RC-19 R05 |

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Grand Junction Office Analytical Laboratory

V1.05

ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000125
Ticket ID: MED0000125

Date: April 7, 1999
Lab ID: 258201

Requestor: JEFF LIVELY
Sample Matrix: MISCELLANEOUS
Project Number: 332302001

Case: 16495
Date Received: Mar 30, 1999
Date Collected: Mar 27, 1999

| ANALYSIS REQUESTED | RESULTS | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|
| Americium-241 | <0.4873 | NA | dpm/sa | 04/05/99 | RC-19 R05 |
| Pu-239+240 | <0.5695 | NA | dpm/sa | 04/02/99 | RC-19 R05 |
| Plutonium-238 | <0.5172 | NA | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-238 | 36.0700 | 3.3330 | dpm/sa | 04/03/99 | RC-19 R05 |
| Uranium-235 | 1.7920 | 0.7890 | dpm/sa | 04/03/99 | RC-19 R05 |
| Uranium-234 | 37.0400 | 3.3940 | dpm/sa | 04/03/99 | RC-19 R05 |

Grand Junction Office Analytical Laboratory

1.05

ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000127
Ticket ID: MED0000127

Date: April 7, 1999
Lab ID: 258202

Requestor: JEFF LIVELY
Sample Matrix: MISCELLANEOUS
Project Number: 332302001

Case: 16495
Date Received: Mar 30, 1999
Date Collected: Mar 27, 1999

| ANALYSIS REQUESTED | RESULTS | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|
| Americium-241 | <0.2916 | NA | dpm/sa | 04/05/99 | RC-19 R05 |
| Pu-239+240 | <0.3893 | NA | dpm/sa | 04/02/99 | RC-19 R05 |
| Plutonium-238 | <0.2634 | NA | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-238 | 19.8600 | 1.8080 | dpm/sa | 04/03/99 | RC-19 R05 |
| Uranium-235 | 0.9092 | 0.3885 | dpm/sa | 04/03/99 | RC-19 R05 |
| Uranium-234 | 20.5900 | 1.8490 | dpm/sa | 04/03/99 | RC-19 R05 |

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Grand Junction Office Analytical Laboratory

1.05

ANALYTICAL RESULTS (SECTION I)

Customer ID: IVP0000129
Ticket ID: MED0000129

Date: April 7, 1999
Lab ID: 258203

Requestor: JEFF LIVELY
Sample Matrix: MISCELLANEOUS
Project Number: 332302001

Case: 16495
Date Received: Mar 30, 1999
Date Collected: Mar 27, 1999

| ANALYSIS REQUESTED | RESULTS | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|
| Americium-241 | 1.5030 | 0.9860 | dpm/sa | 04/05/99 | RC-19 R05 |
| Pu-239+240 | <1.1710 | NA | dpm/sa | 04/02/99 | RC-19 R05 |
| Plutonium-238 | <1.1710 | NA | dpm/sa | 04/02/99 | RC-19 R05 |
| Uranium-238 | 55.3000 | 5.8850 | dpm/sa | 04/03/99 | RC-19 R05 |
| Uranium-235 | 1.9800 | 1.3360 | dpm/sa | 04/03/99 | RC-19 R05 |
| Uranium-234 | 67.5500 | 6.6020 | dpm/sa | 04/03/99 | RC-19 R05 |

(SECTION I)

LCSWR1 QC REPORT

V1.02

Lab Name: GJO Analytical Laboratory

CASE: 16495

| Analyte | Date | Result | Known Value | Units | Acceptance Low | Acceptance High |
|---|---|---|---|---|---|---|
| Uranium-234 | 04/02/99 | 16.4000 | 16.6 | pCi/L | 13.3 | 21.1 |
| Uranium-234 | 04/03/99 | 16.2700 | 16.6 | pCi/L | 13.3 | 21.1 |
| Uranium-235 | 04/02/99 | 0.8230 | 0.763 | pCi/L | 0.10 | 1.57 |
| Uranium-235 | 04/03/99 | 0.8290 | 0.763 | pCi/L | 0.10 | 1.57 |
| Uranium-238 | 04/02/99 | 17.1800 | 16.6 | pCi/L | 13.2 | 21.1 |
| Uranium-238 | 04/03/99 | 16.6600 | 16.6 | pCi/L | 13.2 | 21.1 |

COMMENTS:

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(SECTION I)

LCSWR33 QC REPORT V1.02

Lab Name: GJO Analytical Laboratory CASE: 16495

| Analyte | Date | Result | Known Value | Units | Acceptance Low | Acceptance High |
|---|---|---|---|---|---|---|
| Americium-241 | 04/03/99 | 4.7920 | 4.74 | pCi/mL | 4.04 | 5.23 |
| Americium-241 | 04/05/99 | 4.7480 | 4.74 | pCi/mL | 4.04 | 5.23 |
| Plutonium-238 | 04/01/99 | 10.8500 | 10.67 | pCi/mL | 9.35 | 11.6 |
| Plutonium-238 | 04/06/99 | 10.8700 | 10.67 | pCi/mL | 9.35 | 11.6 |
| Plutonium-238 | 04/02/99 | 11.0000 | 10.67 | pCi/mL | 9.35 | 11.6 |
| Pu-239+240 | 04/01/99 | 11.3800 | 10.5 | pCi/mL | 9.56 | 11.87 |
| Pu-239+240 | 04/06/99 | 10.9600 | 10.5 | pCi/mL | 9.56 | 11.87 |
| Pu-239+240 | 04/02/99 | 11.1800 | 10.5 | pCi/mL | 9.56 | 11.87 |

COMMENTS:

127

(SECTION I)

REPLICATE SAMPLE QC REPORT V1.02

Lab Name: GJO Analytical Laboratory CASE: 16495

SAMPLE: 258181

| Analyte | Date | Acceptance Low | Acceptance High | Sample Result | Replicat Result | Units | %RPD |
|---|---|---|---|---|---|---|---|
| Americium-241 | 04/03/99 | | | 2.3210 | 1.4170 | dpm/sa | -48.37 |
| Plutonium-238 | 04/01/99 | | | 0.1400 | 0.0392 | dpm/sa | -112.50 |
| Pu-239+240 | 04/01/99 | | | 0.2800 | 0.8631 | dpm/sa | 102.02 |
| Uranium-234 | 04/02/99 | | | 121.0000 | 115.9000 | dpm/sa | -4.31 |
| Uranium-235 | 04/02/99 | | | 5.9960 | 6.5530 | dpm/sa | 8.88 |
| Uranium-238 | 04/02/99 | | | 112.0000 | 121.0000 | dpm/sa | 7.73 |

COMMENTS:

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(SECTION I)

REPLICATE SAMPLE QC REPORT V1.02

Lab Name: GJO Analytical Laboratory CASE: 16495

SAMPLE: 258191

| Analyte | Date | Acceptance Low | Acceptance High | Sample Result | Replicat Result | Units | %RPD |
|---|---|---|---|---|---|---|---|
| Americium-241 | 04/05/99 | | | 4.1120 | 2.1920 | dpm/sa | -60.91 |
| Plutonium-238 | 04/06/99 | | | 0.1538 | -0.1810 | dpm/sa | 2461.76 |
| Pu-239+240 | 04/06/99 | | | 0.8202 | 0.2714 | dpm/sa | -100.55 |
| Uranium-234 | 04/03/99 | | | 48.9600 | 52.1000 | dpm/sa | 6.21 |
| Uranium-235 | 04/03/99 | | | 3.0400 | 3.8380 | dpm/sa | 23.20 |
| Uranium-238 | 04/03/99 | | | 47.6000 | 48.1400 | dpm/sa | 1.13 |

COMMENTS:

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(SECTION I)

BLANKS QC REPORT

V1.02

Lab Name: GJO Analytical Laboratory

CASE: 16495

| Analyte | Date | Calibration Blanks Result | Units | Result | Units | Prep Blank Result | Units |
|---|---|---|---|---|---|---|---|
| Americium-241 | 04/03/99 | | | | | 0.0339 | dpm/sa |
| Americium-241 | 04/05/99 | | | | | 0.0445 | dpm/sa |
| Plutonium-238 | 04/01/99 | | | | | 0.0057 | dpm/sa |
| Plutonium-238 | 04/02/99 | | | | | -0.0033 | dpm/sa |
| Plutonium-238 | 04/06/99 | | | | | 0.0159 | dpm/sa |
| Pu-239+240 | 04/01/99 | | | | | 0.0021 | dpm/sa |
| Pu-239+240 | 04/02/99 | | | | | 0.0058 | dpm/sa |
| Pu-239+240 | 04/06/99 | | | | | -0.0014 | dpm/sa |
| Uranium-234 | 04/03/99 | | | | | 0.0193 | dpm/sa |
| Uranium-234 | 04/05/99 | | | | | 0.0340 | dpm/sa |
| Uranium-235 | 04/03/99 | | | | | 0.0301 | dpm/sa |
| Uranium-235 | 04/05/99 | | | | | 0.0140 | dpm/sa |
| Uranium-238 | 04/03/99 | | | | | 0.0371 | dpm/sa |
| Uranium-238 | 04/05/99 | | | | | 0.0331 | dpm/sa |

COMMENTS:

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(SECTION I)

# QUALITY CONTROL SUMMARY

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(SECTION II)

# RADIOCHEMICAL

# SUPPORTING DOCUMENTATION

Requisition Number 16495

The following section contains the analytical supporting documentation for the determination of americium-241, plutonium isotopes, and uranium isotopes. Commonly used laboratory codes in this section include:

## PROCEDURES:

RC-19: Alpha Spectrometry

## QUALITY CONTROL ABBREVIATIONS:

PB: Preparation Blank
LCS: Laboratory Control Sample

This section contains 183 pages numbered 1 through 183.

## Sample Preparation and Analysis Log

**(SECTION II)**

1

ample Type: Various Solids (chipped paint, concrete, and cinder block)

| | Method | Isotopes | Worklist Names | Chemist | Date |
|---|---|---|---|---|---|
| Digestion & Purification | RC-19 R05 | Am-241 | 99032743 | [signature] | 4/1/99 |
| | | Pu-239/240,Pu-238 | 99032744 | | |
| | | U-238, U235, U234 | 99032745 | | |
| Counting | RC-19 R05 | Am241 | 99032743 | [signature] | 4/6/99 |

Tracers (Internal Standards)

| Isotope | ID | Conc(pCi/mL) | @ RD | Aliquot(mL) | HL (years) | Activity(dpm) | Activity(pCi) |
|---|---|---|---|---|---|---|---|
| U-232 | 82-76-3 | 50.91 | 12/15/92 | 0.250 | 72 | 26.59 | 11.98 |
| Am-243 | 82-76-2 | 50.80 | 12/15/92 | 0.100 | 7380 | 11.27 | 5.08 |
| Pu-242 | 82-75-5 | 41.22 | 12/18/89 | 0.100 | 3.758E+05 | 9.15 | 4.12 |

| Req | Sample ID | # | Aliquot Size | Comments | *Sample Aliquot | Total Sample Size | Detector Number | |
|---|---|---|---|---|---|---|---|---|
| | PB | 1 | 1 SA | | 1.0000 | 1 SA | 33 | |
| 16495 | 258181 | 2 | 0.500 G | | 0.0210 | 23.85 G | 34 | |
| 16495 | 258182 | 3 | 0.500 G | | 0.0187 | 26.67 G | 35 | |
| 16495 | 258183 | 4 | 0.500 G | | 0.0156 | 32.07 G | 36 | |
| 16495 | 258184 | 5 | 0.500 G | | 0.0135 | 37.17 G | 37 | |
| 16495 | 258185 | 6 | 0.500 G | | 0.0169 | 29.63 G | 38 | |
| 16495 | 258186 | 7 | 0.500 G | | 0.0248 | 20.14 G | 39 | |
| 16495 | 258187 | 8 | 0.500 G | | 0.0283 | 17.64 G | 40 | |
| 16495 | 258188 | 9 | 0.500 G | | 0.0189 | 26.45 G | 41 | |
| 16495 | 258189 | 10 | 0.500 G | | 0.0388 | 12.89 G | 42 | |
| 16495 | 258190 | 11 | 0.500 G | | 0.0160 | 31.25 G | 43 | |
| LCSWR1, LCSWR33 | | 12 | 0.250 mL | | 0.2500 | 1.00 mL | 44 | |
| 16495 | 258181D | 13 | 0.500 G | | 0.0210 | 23.85 G | 45 | |
| 16495 | 258191 | 14 | 0.500 G | | 0.0187 | 26.73 G | 46 | |
| 16495 | 258192 | 15 | 0.500 G | | 0.0226 | 22.14 G | 47 | |
| 16495 | 258193 | 16 | 0.500 G | | 0.0256 | 19.51 G | 48 | |
| 16495 | 258194 | 17 | 0.500 G | | 0.0087 | 57.35 G | 33 | |
| 16495 | 258195 | 18 | 0.500 G | | 0.0217 | 23.07 G | 34 | |
| 16495 | 258196 | 19 | 0.500 G | | 0.0353 | 14.16 G | 35 | |
| 16495 | 258197 | 20 | 0.500 G | | 0.0146 | 34.21 G | 36 | |
| 16495 | 258198 | 21 | 0.500 G | | 0.0139 | 36.09 G | 37 | |
| 16495 | 258199 | 22 | 0.500 G | | 0.0267 | 18.72 G | 38 | |
| 16495 | 258200 | 23 | 0.500 G | | 0.0480 | 10.41 G | 39 | |
| 16495 | 258201 | 24 | 0.500 G | | 0.0640 | 7.81 G | 40 | |
| 16495 | 258202 | 25 | 0.500 G | | 0.1163 | 4.30 G | 41 | |
| 16495 | 258203 | 26 | 0.500 G | | 0.0277 | 18.08 G | 42 | |
| 16495 | 258191D | 27 | 0.500 G | | 0.0187 | 26.73 G | 43 | |
| LCSWR1, LCSWR33 | | 28 | 0.250 mL | | 0.2500 | 1.00 mL | 44 | |
| | PB | 29 | 1 SA | | 1.0000 | 1 SA | 45 | |
| | | 30 | | | | | | |

**Comments and Actual conditions:**

tart of digestion: 3/31/99

utomatic pipets calibrated in accord with QC-6 on balance # 9

* SAMPLE ALIQUOT = FRACTION OF TOTAL SAMPLE USED FOR ANALYSIS

OK
4655
Qidby
S. [signature]
4/6/99

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WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:17:25

(SECTION II)

2

**********
Spectral File: ND_AMS_ARCHIVE_R:R_99032743$PBA_AM.CNF
**********

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | PBA |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: 1.000E+00 | sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 033 |
| ACQ DATE: | 3-APR-1999 13:53 | AVERAGE EFFICIENCY: | 27.4% |
| ELAPSED LIVE TIME: | 80002. | RECOVERY: | 85.59% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 38.52 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.271 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:08 | EFF CAL DATE: | 30-MAR-1999 07:08 |
| BKG FILENAME: | B_033_30MAR99 | | |

**********

NUCLIDE ACTIVITY SUMMARY

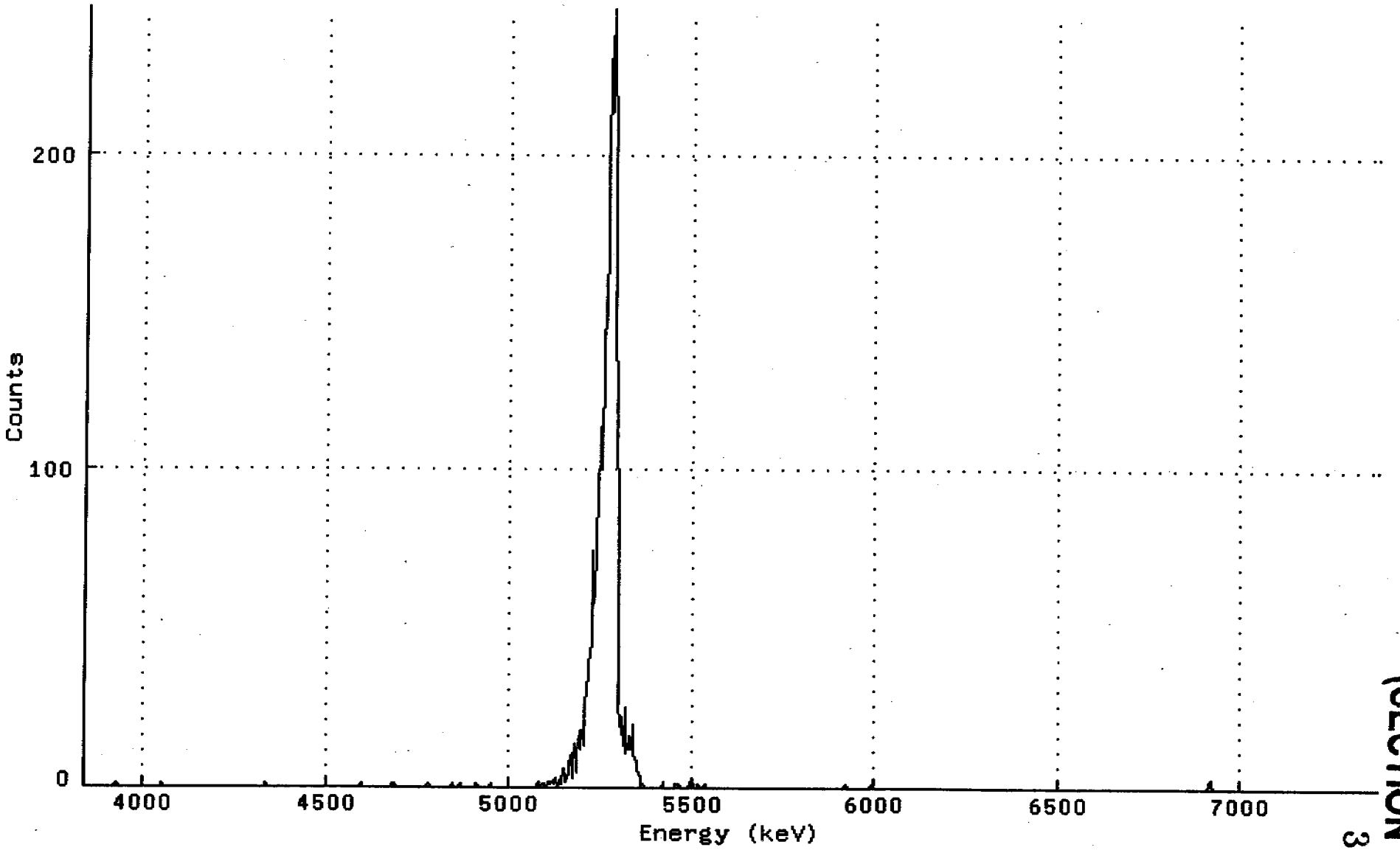
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 10.60 | 0.40 | 99.9 | 3.387E-02 | 2.141E-02 | 1.806E-02 | 1.336E-02 |
| AM243 | 5270.0 | 3516.00 | 2.00 | 99.6 | 1.127E+01 | 4.755E-01 | 2.977E-02 | 1.923E-02 |

**********

*** POSITIVE ***

134

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.R]R_99032743$PBA_AM.CNF;1
Title : 033
Sample Title:
Start Time: 3-APR-1999 13:53: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.82849E+03
Real Time : 0 22:13:22.00 Sample ID : PBA Energy Slope : 3.46124E+00
Live Time : 0 22:13:22.00 Sample Type: AM Energy Quad : 0.00000E+00




(SECTION II)
3

135

WASTREN '-- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:18:48

(SECTION II)

4

**********
Spectral File: ND_AMS_ARCHIVE_S:S_99032743$258181_AM.CNF
**********

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | 258181 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.100E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 034 |
| ACQ DATE: | 3-APR-1999 13:53 | AVERAGE EFFICIENCY: | 22.4% |
| ELAPSED LIVE TIME: | 80003. | RECOVERY: | 72.97% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 39.65 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.271 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:10 | EFF CAL DATE: | 30-MAR-1999 07:10 |
| BKG FILENAME: | B_034_30MAR99 | | |

**********

NUCLIDE ACTIVITY SUMMARY

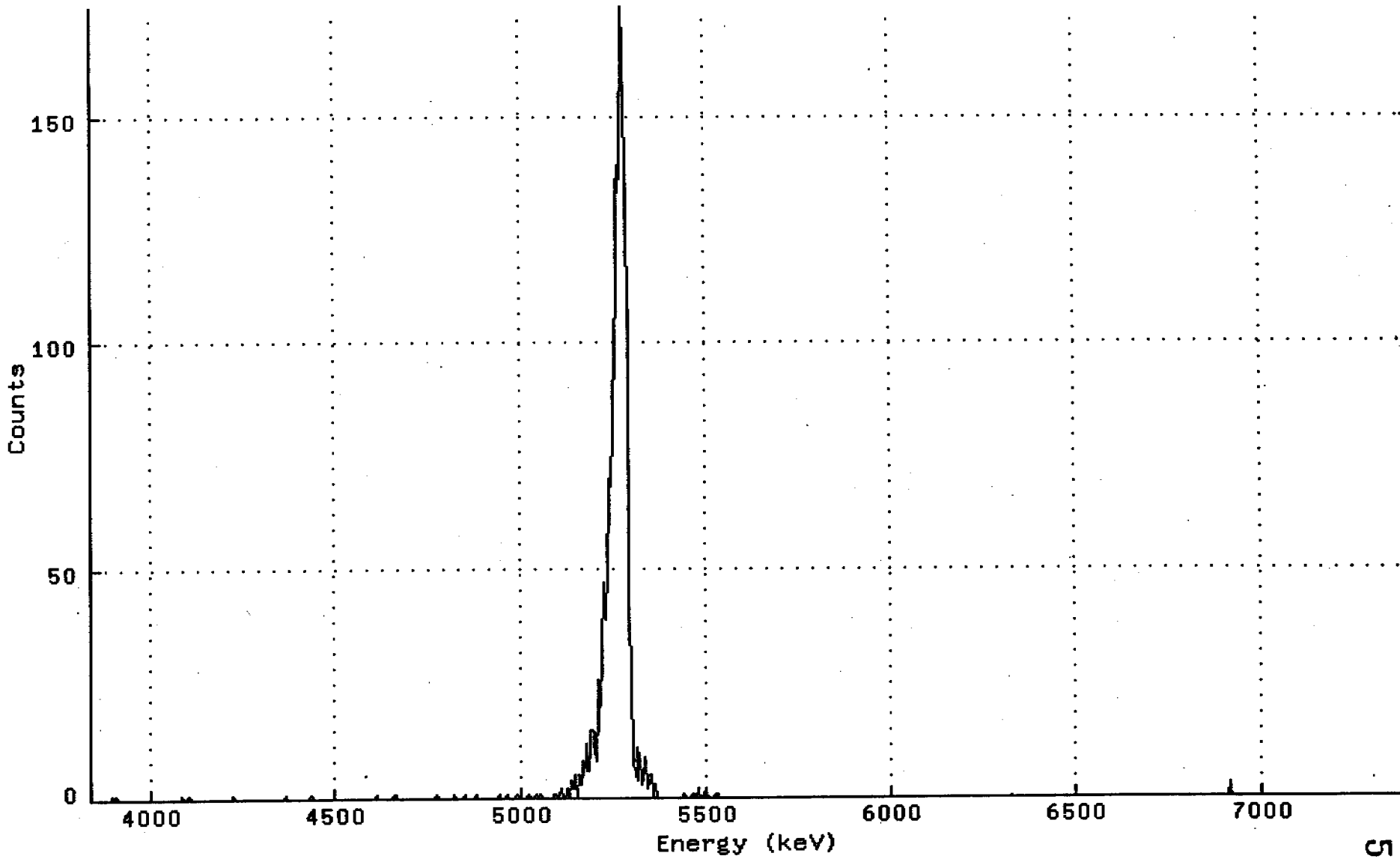
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 10.60 | 0.40 | 99.9 | 2.321E+00 | 1.468E+00 | 1.237E+00 | 9.153E-01 |
| AM243 | 5270.0 | 2443.40 | 1.60 | 99.6 | 5.367E+02 | 2.569E+01 | 1.887E+00 | 1.241E+00 |

**********

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

136

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032743$258181_AM.CNF;1
Title : 034
Sample Title:
Start Time: 3-APR-1999 13:53: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.82789E+03
Real Time : 0 22:13:23.00 Sample ID : 258181 Energy Slope : 3.46972E+00
Live Time : 0 22:13:23.00 Sample Type: AM Energy Quad : 0.00000E+00




(SECTION II)

5

137

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:19:16

(SECTION II) 6

**********
Spectral File: ND_AMS_ARCHIVE_S:S_99032743$258182_AM.CNF
**********

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | 258182 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.870E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 035 |
| ACQ DATE: | 3-APR-1999 13:53 | AVERAGE EFFICIENCY: | 25.9% |
| ELAPSED LIVE TIME: | 80002. | RECOVERY: | 70.59% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 34.40 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.271 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:11 | EFF CAL DATE: | 30-MAR-1999 07:11 |
| BKG FILENAME: | B_035_30MAR99 | | |

**********

NUCLIDE ACTIVITY SUMMARY

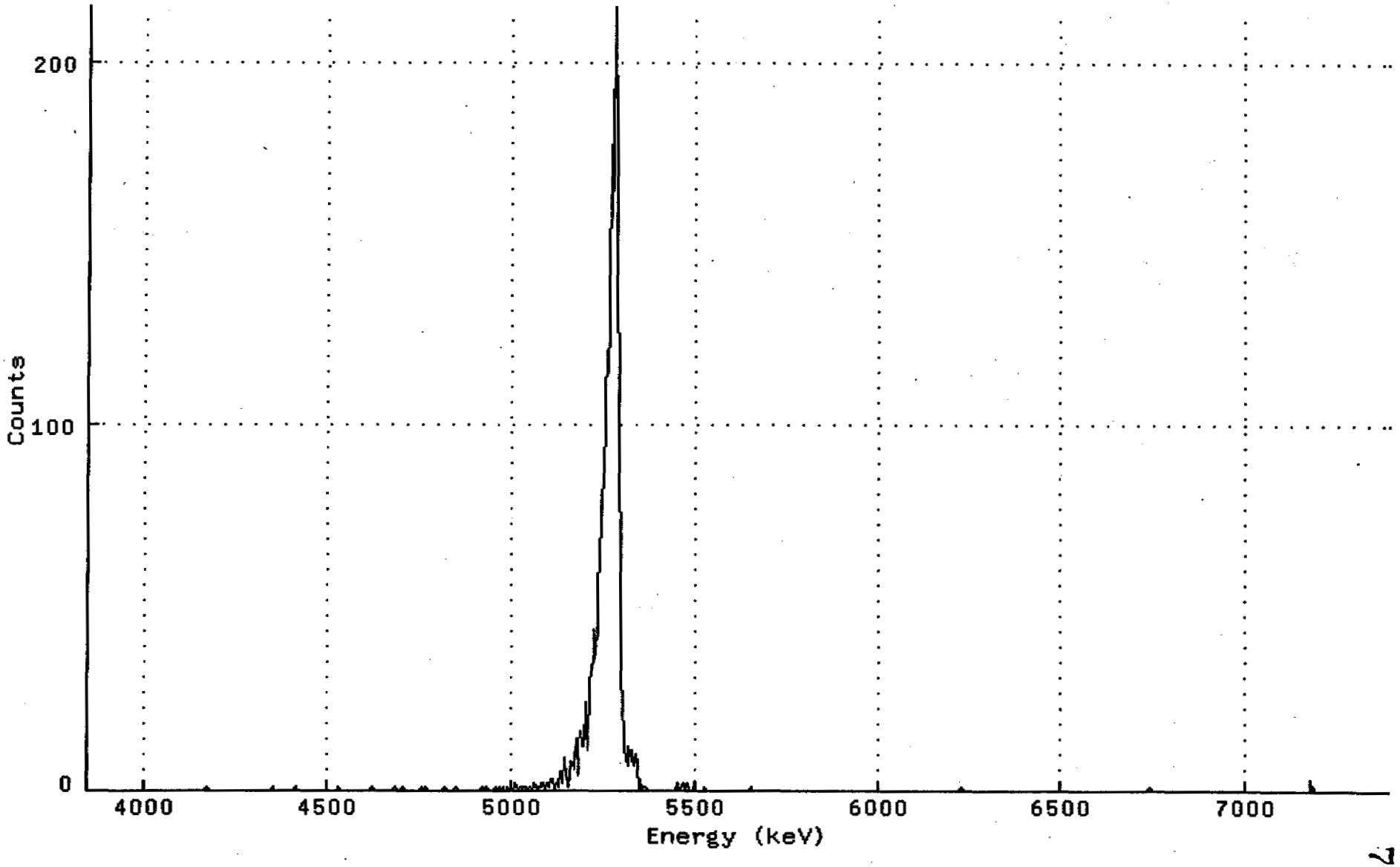
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 10.60 | 0.40 | 99.9 | 2.328E+00 | 1.472E+00 | 1.241E+00 | 9.180E-01 |
| AM243 | 5270.0 | 2736.00 | 2.00 | 99.6 | 6.027E+02 | 2.764E+01 | 2.046E+00 | 1.321E+00 |

**********

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

138

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032743$258182_AM.CNF;1
Title : 035
Sample Title:
Start Time: 3-APR-1999 13:53: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.83352E+03
Real Time : 0 22:13:23.00 Sample ID : 258182 Energy Slope : 3.46965E+00
Live Time : 0 22:13:22.00 Sample Type: AM Energy Quad : 0.00000E+00




(SECTION II)

7

39

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:19:37

(SECTION II)

8

Spectral File: ND_AMS_ARCHIVE_S:S_99032743$258183_AM.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | 258183 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.560E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 036 |
| ACQ DATE: | 3-APR-1999 13:54 | AVERAGE EFFICIENCY: | 23.5% |
| ELAPSED LIVE TIME: | 80001. | RECOVERY: | 64.43% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 27.94 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.271 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:13 | EFF CAL DATE: | 30-MAR-1999 07:13 |
| BKG FILENAME: | B_036_30MAR99 | | |

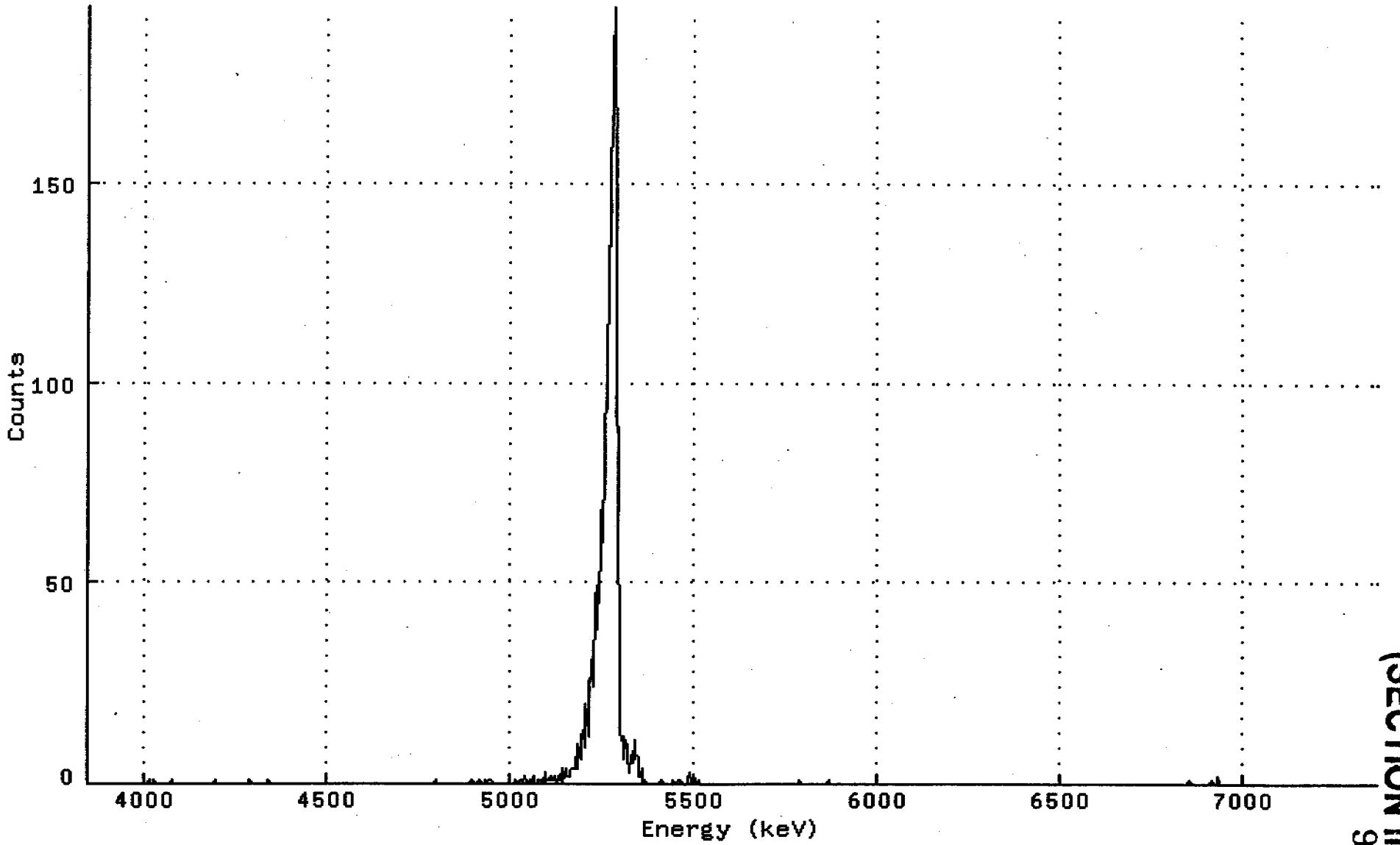
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 13.60 | 0.40 | 99.9 | 4.314E+00 | 2.399E+00 | 1.792E+00 | 1.326E+00 |
| AM243 | 5270.0 | 2270.60 | 2.40 | 99.6 | 7.225E+02 | 3.545E+01 | 3.154E+00 | 2.008E+00 |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

140

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032743$258183_AM.CNF;1
Title : 036
Sample Title:
Start Time: 3-APR-1999 13:54: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.83490E+03
Real Time : 0 22:13:21.00 Sample ID : 258183 Energy Slope : 3.44567E+00
Live Time : 0 22:13:21.00 Sample Type: AM Energy Quad : 0.00000E+00




(SECTION II) 9

141

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:19:57

(SECTION II)

10

Spectral File: ND_AMS_ARCHIVE_S:S_99032743$258184_AM.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | 258184 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.350E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 037 |
| ACQ DATE: | 3-APR-1999 13:54 | AVERAGE EFFICIENCY: | 22.9% |
| ELAPSED LIVE TIME: | 80005. | RECOVERY: | 68.08% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 32.57 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.271 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:14 | EFF CAL DATE: | 30-MAR-1999 07:14 |
| BKG FILENAME: | B_037_30MAR99 | | |

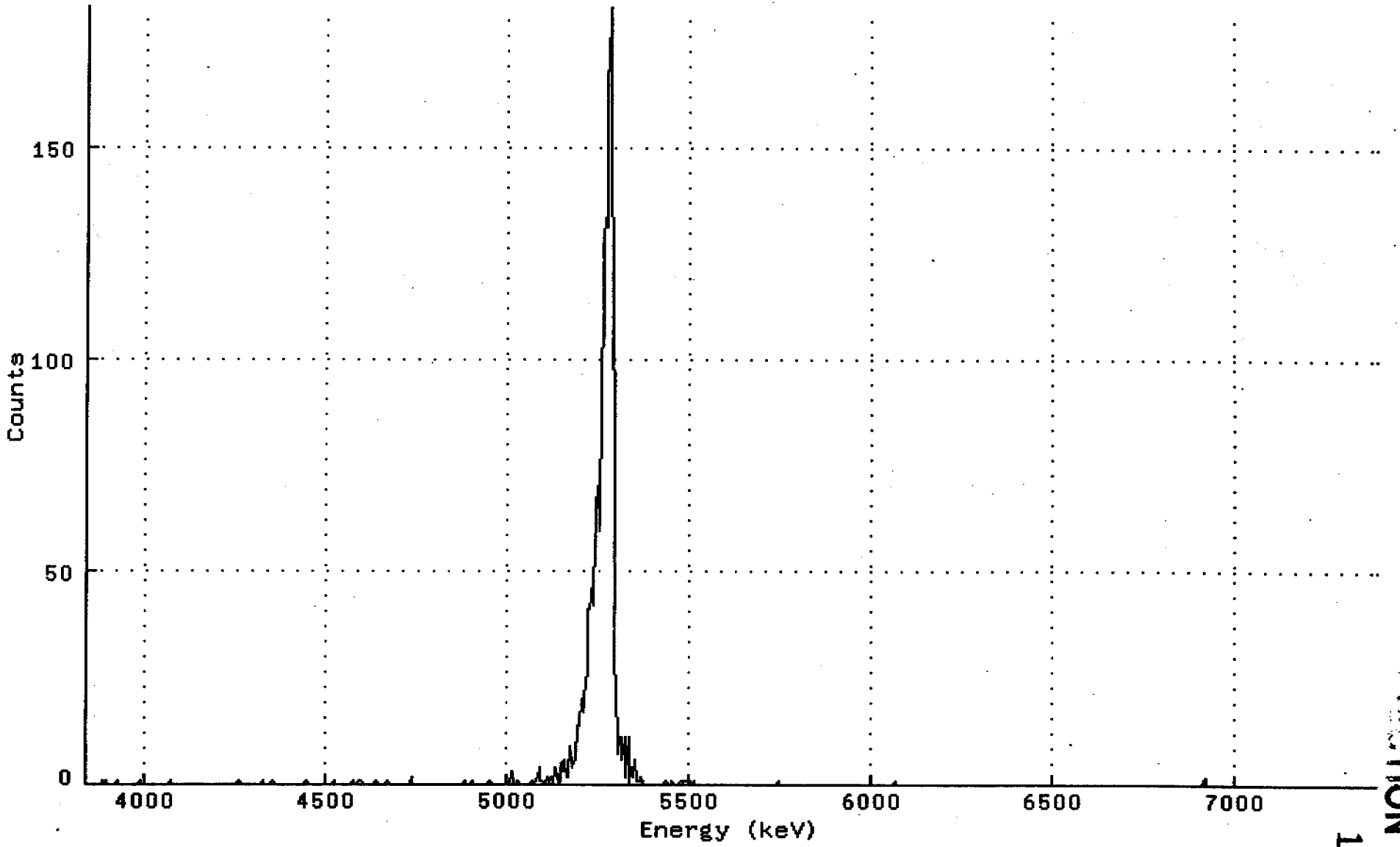
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 11.60 | 0.40 | 99.9 | 4.144E+00 | 2.502E+00 | 2.019E+00 | 1.493E+00 |
| AM243 | 5270.0 | 2329.60 | 0.40 | 99.6 | 8.349E+02 | 4.066E+01 | 2.025E+00 | 1.498E+00 |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

142

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032743$258184_AM.CNF;1
Title : 037
Sample Title:
Start Time: 3-APR-1999 13:54: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.83056E+03
Real Time : 0 22:13:25.00 Sample ID : 258184 Energy Slope : 3.46883E+00
Live Time : 0 22:13:25.00 Sample Type: AM Energy Quad : 0.00000E+00




(SECTION II)
11

143

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:20:18

(SECTION II)
12

Spectral File: ND_AMS_ARCHIVE_S:S_99032743$258185_AM.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | 258185 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.690E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 038 |
| ACQ DATE: | 3-APR-1999 13:54 | AVERAGE EFFICIENCY: | 22.2% |
| ELAPSED LIVE TIME: | 80003. | RECOVERY: | 73.56% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 27.14 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.271 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:15 | EFF CAL DATE: | 30-MAR-1999 07:15 |
| BKG FILENAME: | B_038_30MAR99 | | |

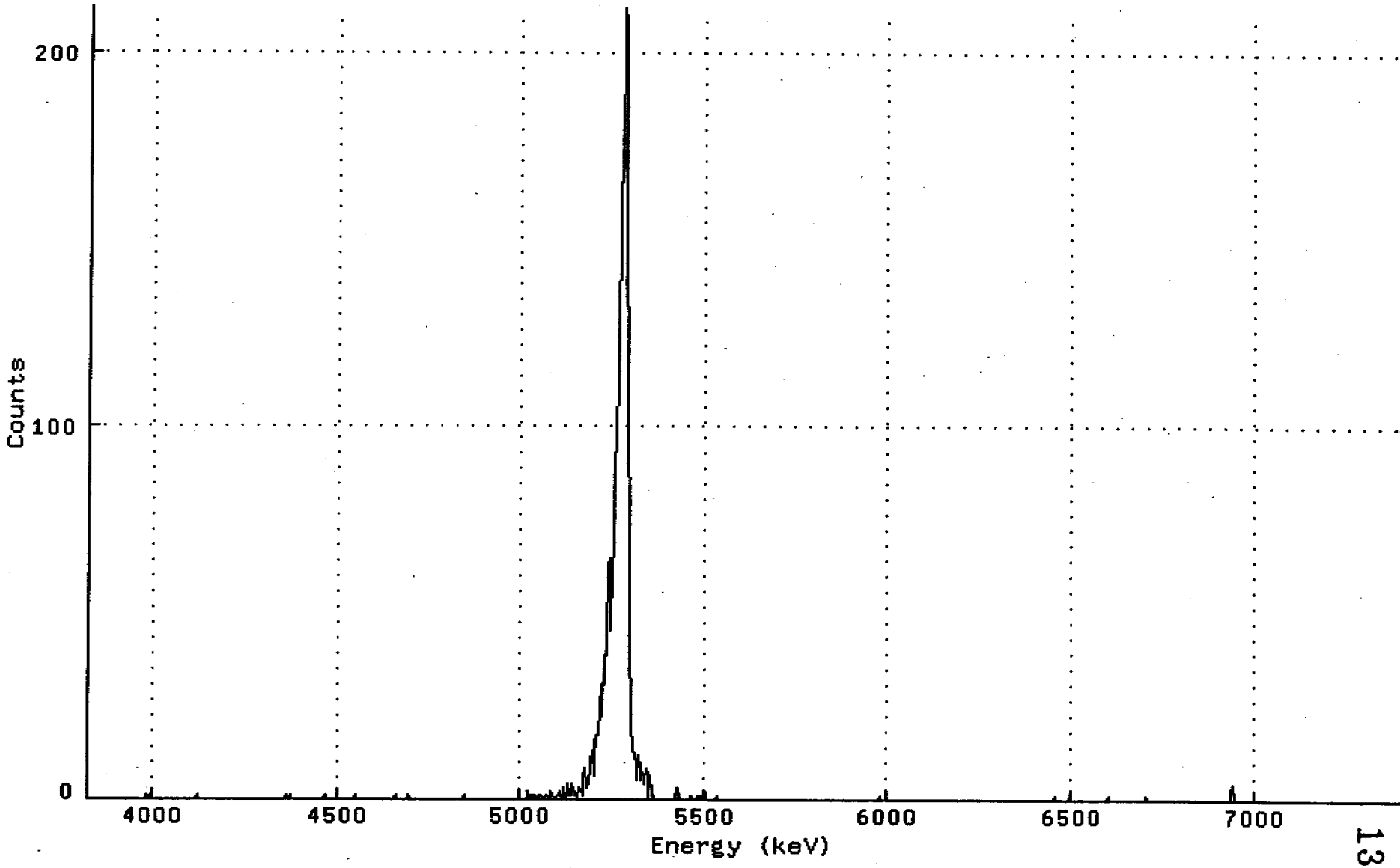
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 9.20 | 0.80 | 99.9 | 2.497E+00 | 1.749E+00 | 1.864E+00 | 1.300E+00 |
| AM243 | 5270.0 | 2449.60 | 2.40 | 99.6 | 6.669E+02 | 3.196E+01 | 2.699E+00 | 1.718E+00 |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

144

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032743$258185_AM.CNF;1
Title : 038
Sample Title:
Start Time: 3-APR-1999 13:54: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.80963E+03
Real Time : 0 22:13:23.00 Sample ID : 258185 Energy Slope : 3.49740E+00
Live Time : 0 22:13:23.00 Sample Type: AM Energy Quad : 0.00000E+00




(SECTION II)



145

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:21:05

(SECTION II)
14

**********
Spectral File: ND_AMS_ARCHIVE_S:S_99032743$258186_AM.CNF
**********

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | 258186 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.480E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 039 |
| ACQ DATE: | 3-APR-1999 13:54 | AVERAGE EFFICIENCY: | 23.2% |
| ELAPSED LIVE TIME: | 80001. | RECOVERY: | 66.54% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 47.46 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.271 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:17 | EFF CAL DATE: | 30-MAR-1999 07:17 |
| BKG FILENAME: | B_039_30MAR99 | | |

**********

NUCLIDE ACTIVITY SUMMARY

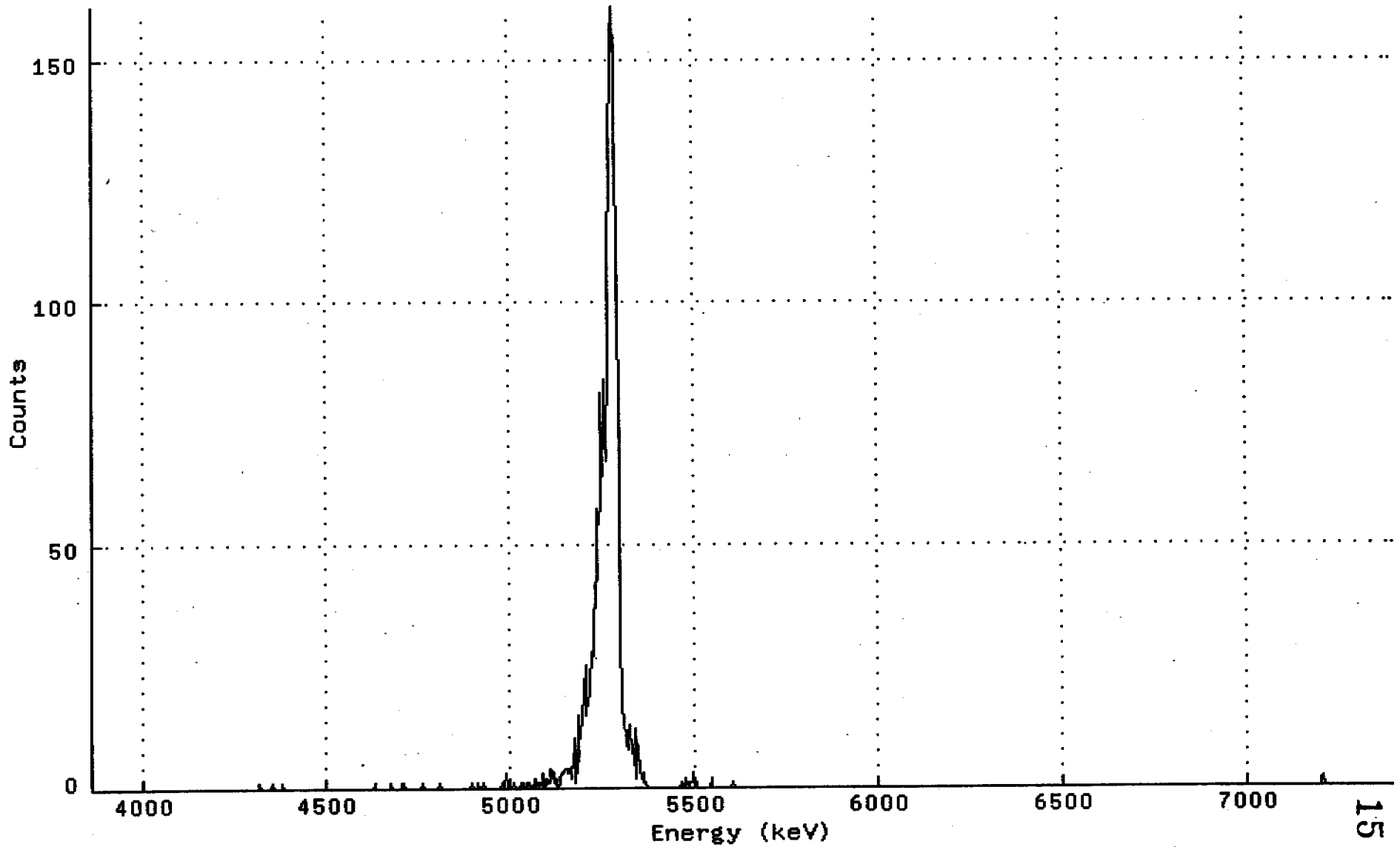
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 13.00 | 2.00 | 99.9 | 2.547E+00 | 1.564E+00 | 1.820E+00 | 1.175E+00 |
| AM243 | 5270.0 | 2312.00 | 2.00 | 99.6 | 4.545E+02 | 2.219E+01 | 1.825E+00 | 1.179E+00 |

**********

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

146

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032743$258186_AM.CNF;1
Title : 039
Sample Title:
Start Time: 3-APR-1999 13:54: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.85181E+03
Real Time : 0 22:13:22.00 Sample ID : 258186 Energy Slope : 3.45506E+00
Live Time : 0 22:13:21.00 Sample Type: AM Energy Quad : 0.00000E+00




(SECTION II)



147

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:21:38

(SECTION II)



Spectral File: ND_AMS_ARCHIVE_S:S_99032743$258187_AM.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | 258187 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.830E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 040 |
| ACQ DATE: | 3-APR-1999 13:54 | AVERAGE EFFICIENCY: | 23.2% |
| ELAPSED LIVE TIME: | 80004. | RECOVERY: | 68.18% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 31.49 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.271 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:18 | EFF CAL DATE: | 30-MAR-1999 07:18 |
| BKG FILENAME: | B_040_30MAR99 | | |

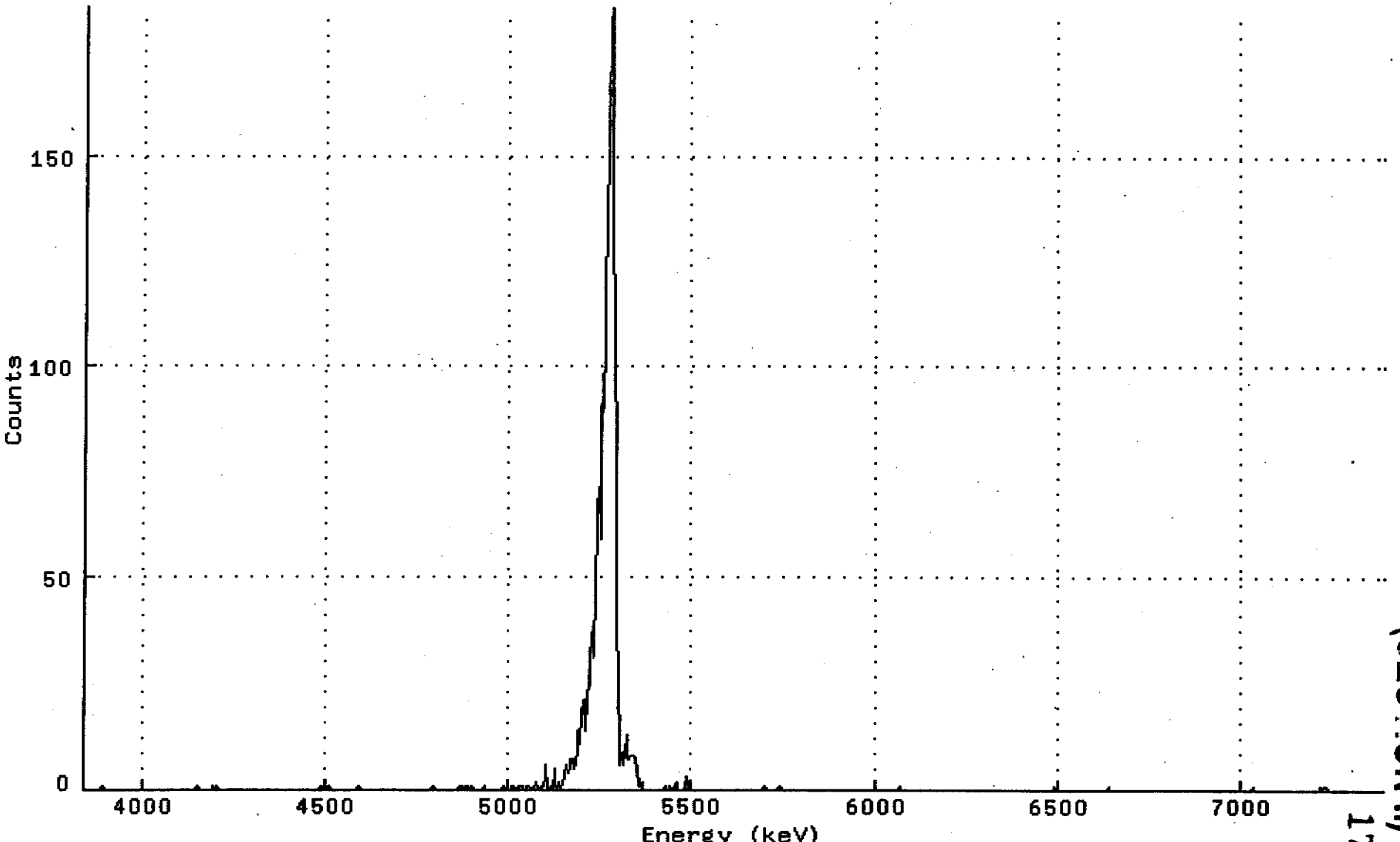
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ | sa | TPU/ERROR 2-SIGMA | MDC dpm/ | sa | CRIT LEVEL dpm/ | sa |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 11.80 | 1.20 | 99.9 | 1.981E+00 | | 1.237E+00 | 1.310E+00 | | 8.824E-01 | |
| AM243 | 5270.0 | 2365.20 | 0.80 | 99.6 | 3.983E+02 | | 1.928E+01 | 1.157E+00 | | 8.065E-01 | |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

148

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032743$258187_AM.CNF;1
Title : 040
Sample Title:
Start Time: 3-APR-1999 13:54: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.83002E+03
Real Time : 0 22:13:24.00 Sample ID : 258187 Energy Slope : 3.47052E+00
Live Time : 0 22:13:24.00 Sample Type: AM Energy Quad : 0.00000E+00




(SECTION II)

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149

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:22:12

(SECTION II)

18

**********
Spectral File: ND_AMS_ARCHIVE_S:S_99032743$258188_AM.CNF
**********

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | 258188 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.890E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 041 |
| ACQ DATE: | 3-APR-1999 13:55 | AVERAGE EFFICIENCY: | 23.2% |
| ELAPSED LIVE TIME: | 80001. | RECOVERY: | 79.11% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 47.84 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.271 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:20 | EFF CAL DATE: | 30-MAR-1999 07:20 |
| BKG FILENAME: | B_041_30MAR99 | | |

**********

NUCLIDE ACTIVITY SUMMARY

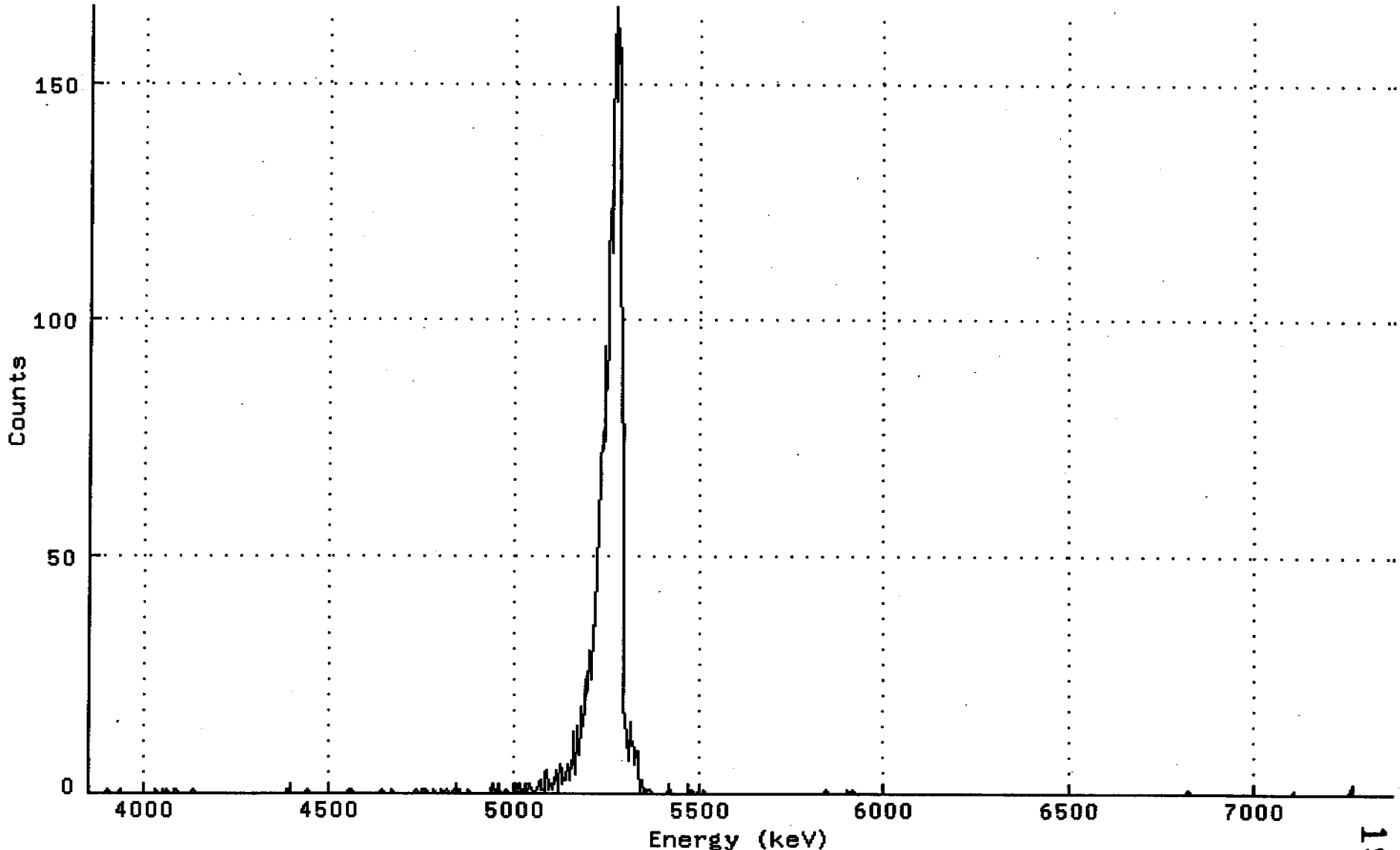
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 8.80 | 1.20 | 99.9 | 1.905E+00 | 1.405E+00 | 1.689E+00 | 1.138E+00 |
| AM243 | 5270.0 | 2746.40 | 1.60 | 99.6 | 5.963E+02 | 2.742E+01 | 1.866E+00 | 1.227E+00 |

**********

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

150

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032743$258188_AM.CNF;1
Title : 041
Sample Title:
Start Time: 3-APR-1999 13:55: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.83895E+03
Real Time : 0 22:13:22.00 Sample ID : 258188 Energy Slope : 3.45079E+00
Live Time : 0 22:13:21.00 Sample Type: AM Energy Quad : 0.00000E+00




(SECTION II)

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151

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:22:46

(SECTION II)
20

**********
Spectral File: ND_AMS_ARCHIVE_S:S_99032743$258189_AM.CNF
**********

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | 258189 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 3.880E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 042 |
| ACQ DATE: | 3-APR-1999 13:55 | AVERAGE EFFICIENCY: | 23.9% |
| ELAPSED LIVE TIME: | 80002. | RECOVERY: | 67.08% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 30.66 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.271 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:21 | EFF CAL DATE: | 30-MAR-1999 07:21 |
| BKG FILENAME: | B_042_30MAR99 | | |

**********

NUCLIDE ACTIVITY SUMMARY

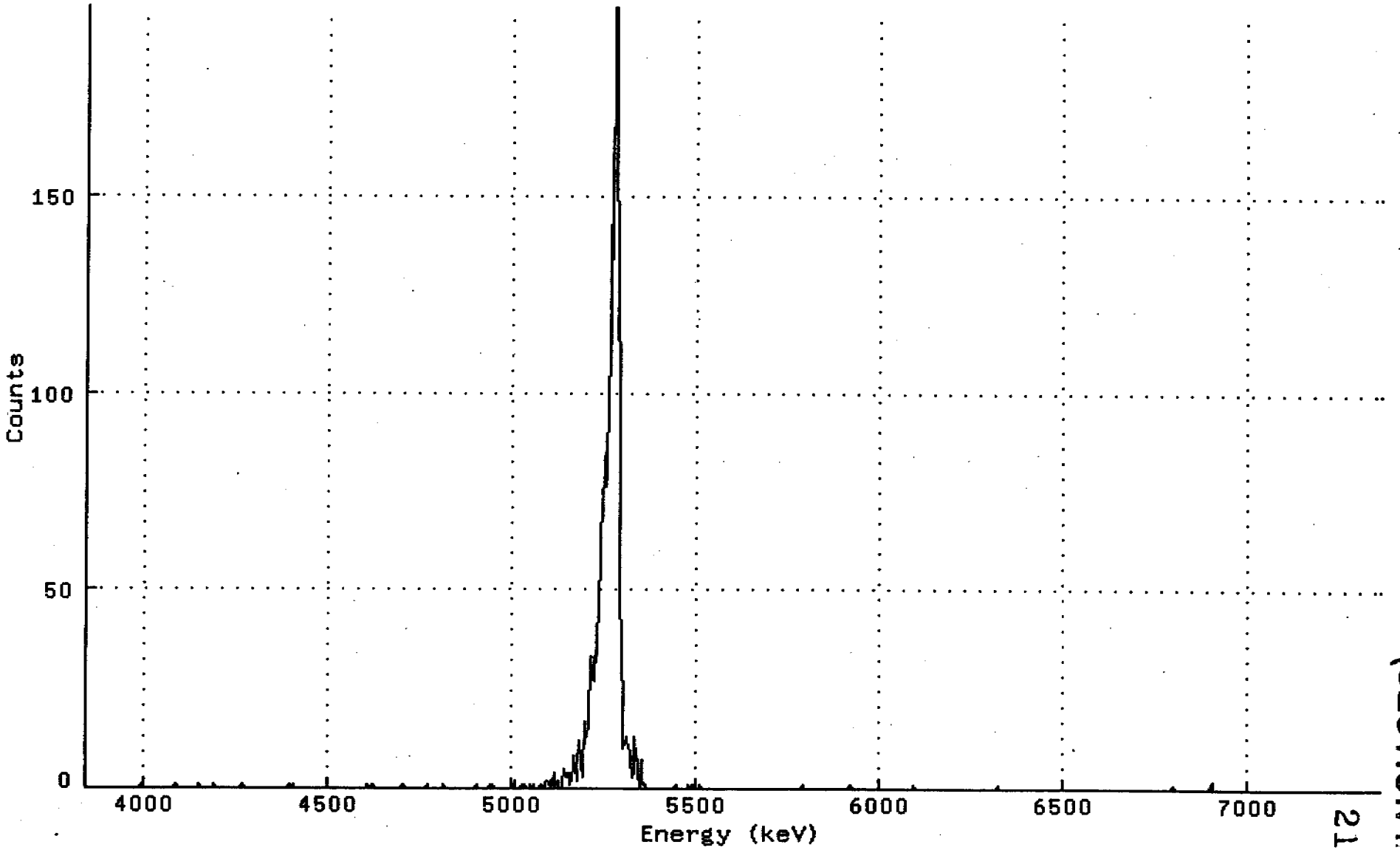
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 4.80 | 1.20 | 99.9 | 5.781E-01 | 6.139E-01 | 9.398E-01 | 6.331E-01 |
| AM243 | 5270.0 | 2404.40 | 1.60 | 99.6 | 2.905E+02 | 1.396E+01 | 1.038E+00 | 6.827E-01 |

**********

*** RECOUNT SAMPLE CL > 0.067 ***

152

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032743$258189_AM.CNF;1
Title : 042
Sample Title:
Start Time: 3-APR-1999 13:55: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.83219E+03
Real Time : 0 22:13:22.00 Sample ID : 258189 Energy Slope : 3.43814E+00
Live Time : 0 22:13:22.00 Sample Type: AM Energy Quad : 0.00000E+00




(SECTION II)

21

153

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:23:19

(SECTION III)

22

**********
Spectral File: ND_AMS_ARCHIVE_S:S_99032743$258190_AM.CNF
**********

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | 258190 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.600E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 043 |
| ACQ DATE: | 3-APR-1999 13:55 | AVERAGE EFFICIENCY: | 23.0% |
| ELAPSED LIVE TIME: | 80003. | RECOVERY: | 79.94% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 41.49 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.271 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:22 | EFF CAL DATE: | 30-MAR-1999 07:22 |
| BKG FILENAME: | B_043_30MAR99 | | |

**********

NUCLIDE ACTIVITY SUMMARY

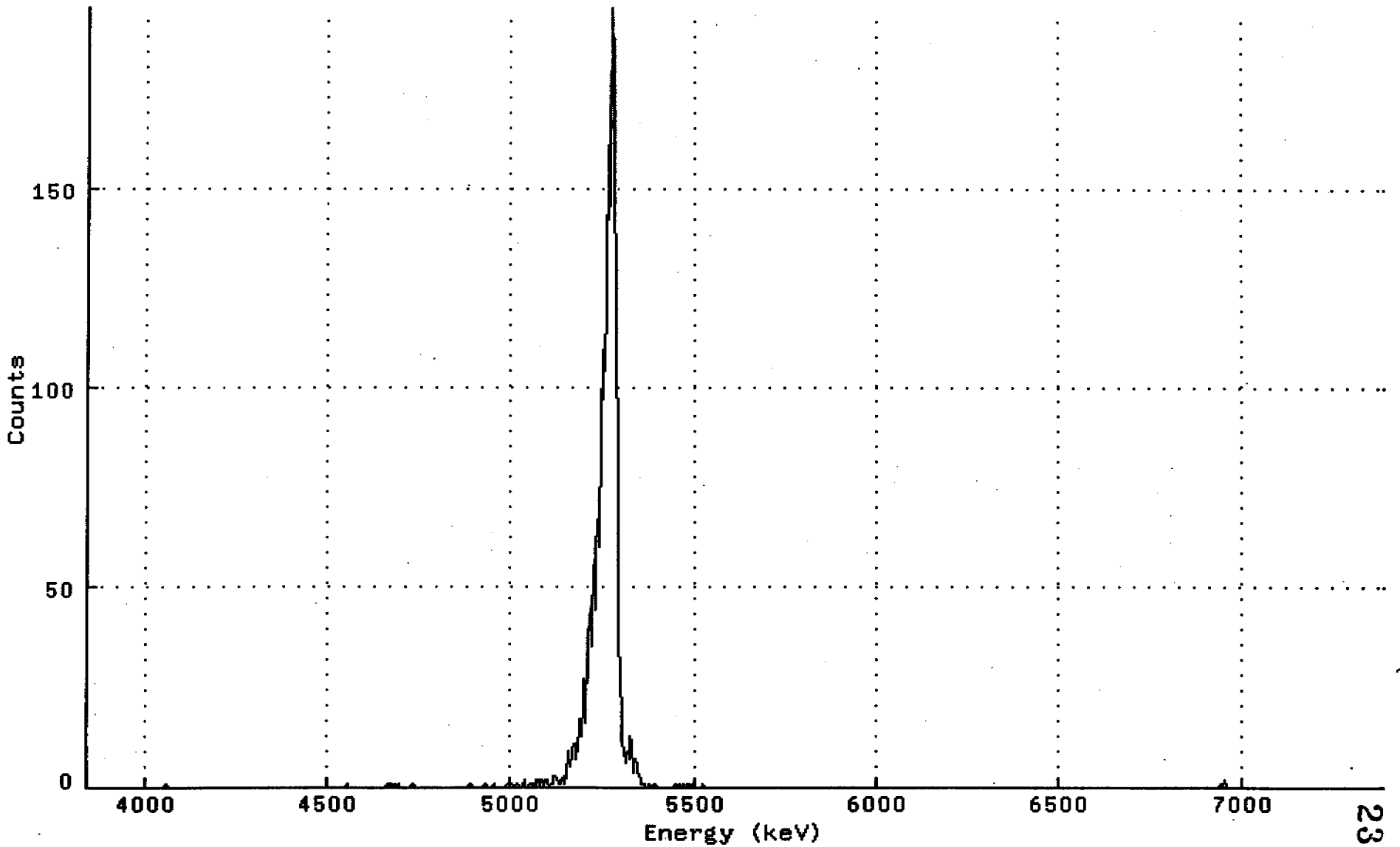
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 9.80 | 1.20 | 99.9 | 2.498E+00 | 1.732E+00 | 1.989E+00 | 1.340E+00 |
| AM243 | 5270.0 | 2755.20 | 0.80 | 99.6 | 7.044E+02 | 3.230E+01 | 1.756E+00 | 1.225E+00 |

**********

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

154

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032743$258190_AM.CNF;1
Title : 043
Sample Title:
Start Time: 3-APR-1999 13:55: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.83111E+03
Real Time : 0 22:13:23.00 Sample ID : 258190 Energy Slope : 3.46623E+00
Live Time : 0 22:13:23.00 Sample Type: AM Energy Quad : 0.00000E+00




(SECTION II)
23

155

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:16:26

(SECTION II)



Spectral File: ND_AMS_ARCHIVE_C:C_99032743$LCSWR33A_AM.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | LCSWR33A |
| SAMPLE DATE: | 1-APR-1985 00:00 | ALIQUOT: | 2.500E-01 mL |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 044 |
| ACQ DATE: | 3-APR-1999 13:56 | AVERAGE EFFICIENCY: | 21.8% |
| ELAPSED LIVE TIME: | 80003. | RECOVERY: | 73.01% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 39.91 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.269 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:24 | EFF CAL DATE: | 30-MAR-1999 07:24 |
| BKG FILENAME: | B_044_30MAR99 | | |

NUCLIDE ACTIVITY SUMMARY

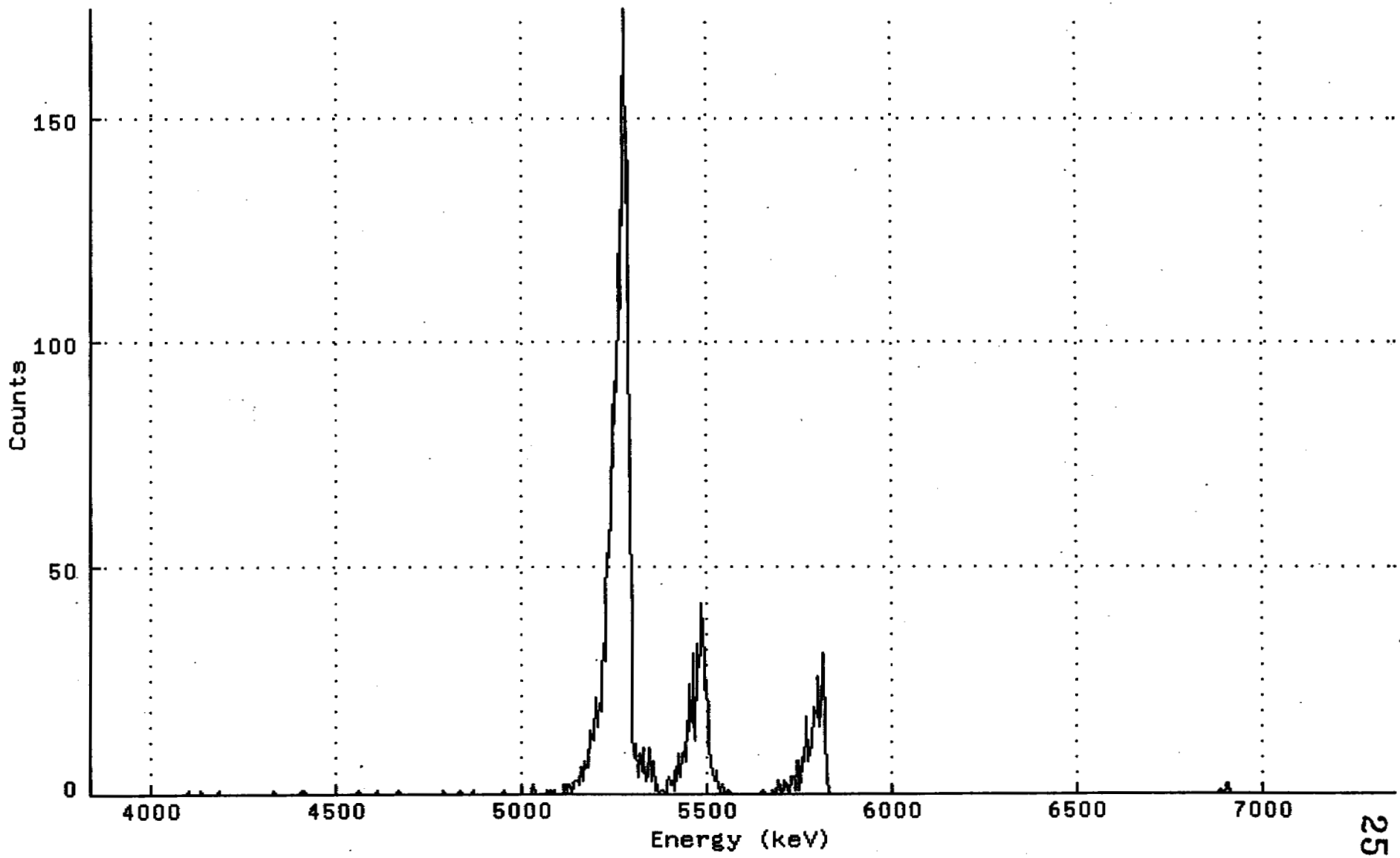
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY pCi/ mL | TPU/ERROR 2-SIGMA | MDC pCi/ mL | CRIT LEVEL pCi/ mL |
|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 552.00 | 0.00 | 99.9 | 4.792E+00 | 4.851E-01 | 2.300E-02 | 2.300E-02 |
| AM243 | 5270.0 | 2381.20 | 0.80 | 99.6 | 2.031E+01 | 9.824E-01 | 5.850E-02 | 4.079E-02 |

*** POSITIVE ***

156

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.C]C_99032743$LCSWR33A_AM.CNF;2
Title : 044
Sample Title:

| | | |
|---|---|---|
| Start Time: 3-APR-1999 13:56: | Sample Time: 1-APR-1985 00:00: | Energy Offset: 3.82541E+03 |
| Real Time : 0 22:13:23.00 | Sample ID : LCSWR33A | Energy Slope : 3.44193E+00 |
| Live Time : 0 22:13:23.00 | Sample Type: AM | Energy Quad : 0.00000E+00 |




(SECTION II)

25

157

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:18:26

(SECTION II)



Spectral File: ND_AMS_ARCHIVE_S:S_99032743$258181D_AM.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | 258181D |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.100E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 045 |
| ACQ DATE: | 3-APR-1999 13:56 | AVERAGE EFFICIENCY: | 24.0% |
| ELAPSED LIVE TIME: | 80001. | RECOVERY: | 75.70% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 42.68 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.271 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:26 | EFF CAL DATE: | 30-MAR-1999 07:26 |
| BKG FILENAME: | B_045_30MAR99 | | |

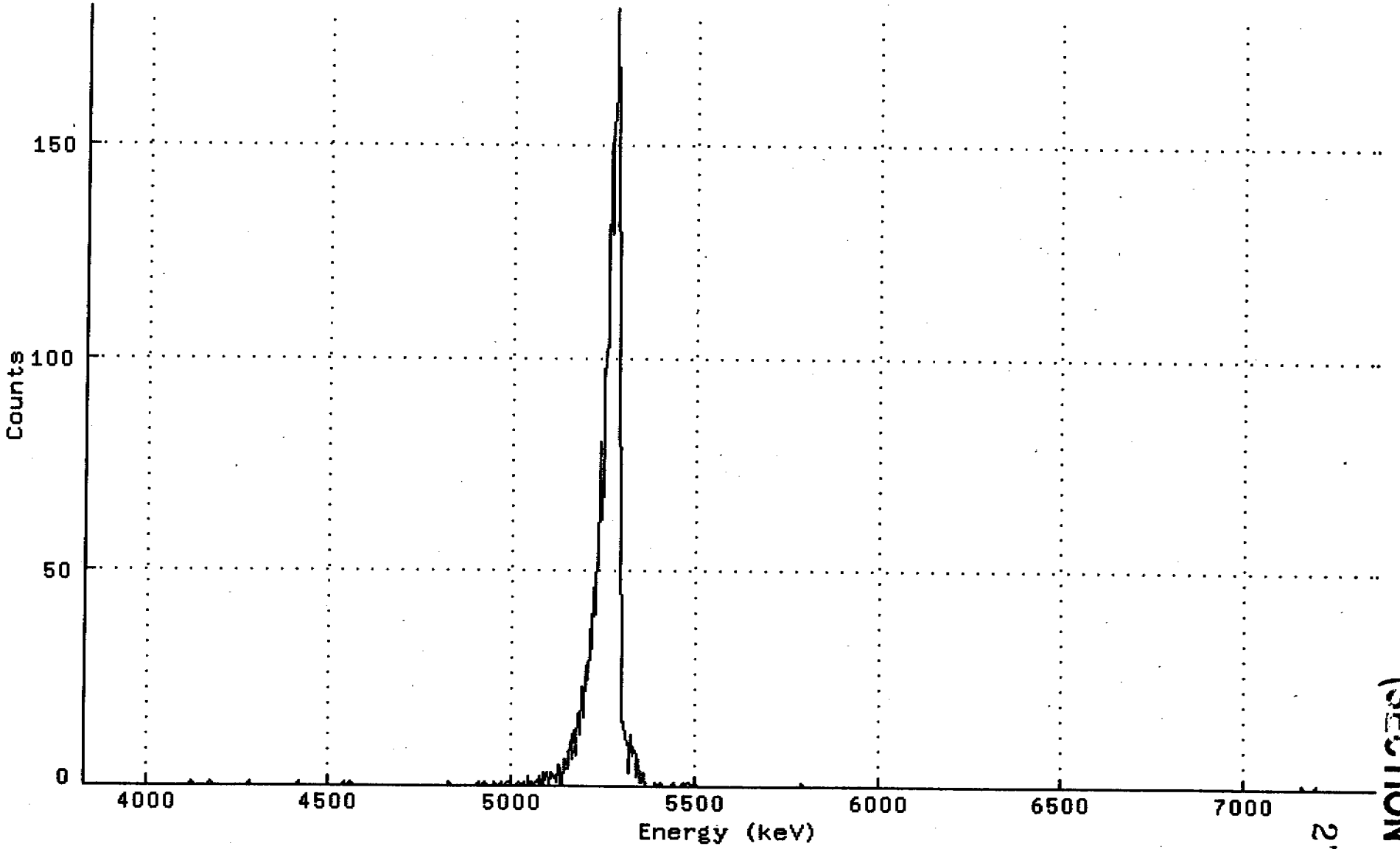
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ | sa | TPU/ERROR 2-SIGMA | MDC dpm/ | sa | CRIT LEVEL dpm/ | sa |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 7.20 | 0.80 | 99.9 | 1.417E+00 | | 1.138E+00 | 1.352E+00 | | 9.426E-01 | |
| AM243 | 5270.0 | 2718.40 | 1.60 | 99.6 | 5.367E+02 | | 2.474E+01 | 1.696E+00 | | 1.116E+00 | |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

158

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032743$258181D_AM.CNF;1
Title : 045
Sample Title:
Start Time: 3-APR-1999 13:56: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.82067E+03
Real Time : 0 22:13:21.00 Sample ID : 258181D Energy Slope : 3.45334E+00
Live Time : 0 22:13:21.00 Sample Type: AM Energy Quad : 0.00000E+00




(SECTION III)

27

159

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:24:28

(SECTION II)



Spectral File: ND_AMS_ARCHIVE_S:S_99032743$258191_AM.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | 258191 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.870E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 046 |
| ACQ DATE: | 3-APR-1999 13:56 | AVERAGE EFFICIENCY: | 23.8% |
| ELAPSED LIVE TIME: | 80001. | RECOVERY: | 62.28% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 37.51 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.271 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:27 | EFF CAL DATE: | 30-MAR-1999 07:27 |
| BKG FILENAME: | B_046_30MAR99 | | |

NUCLIDE ACTIVITY SUMMARY

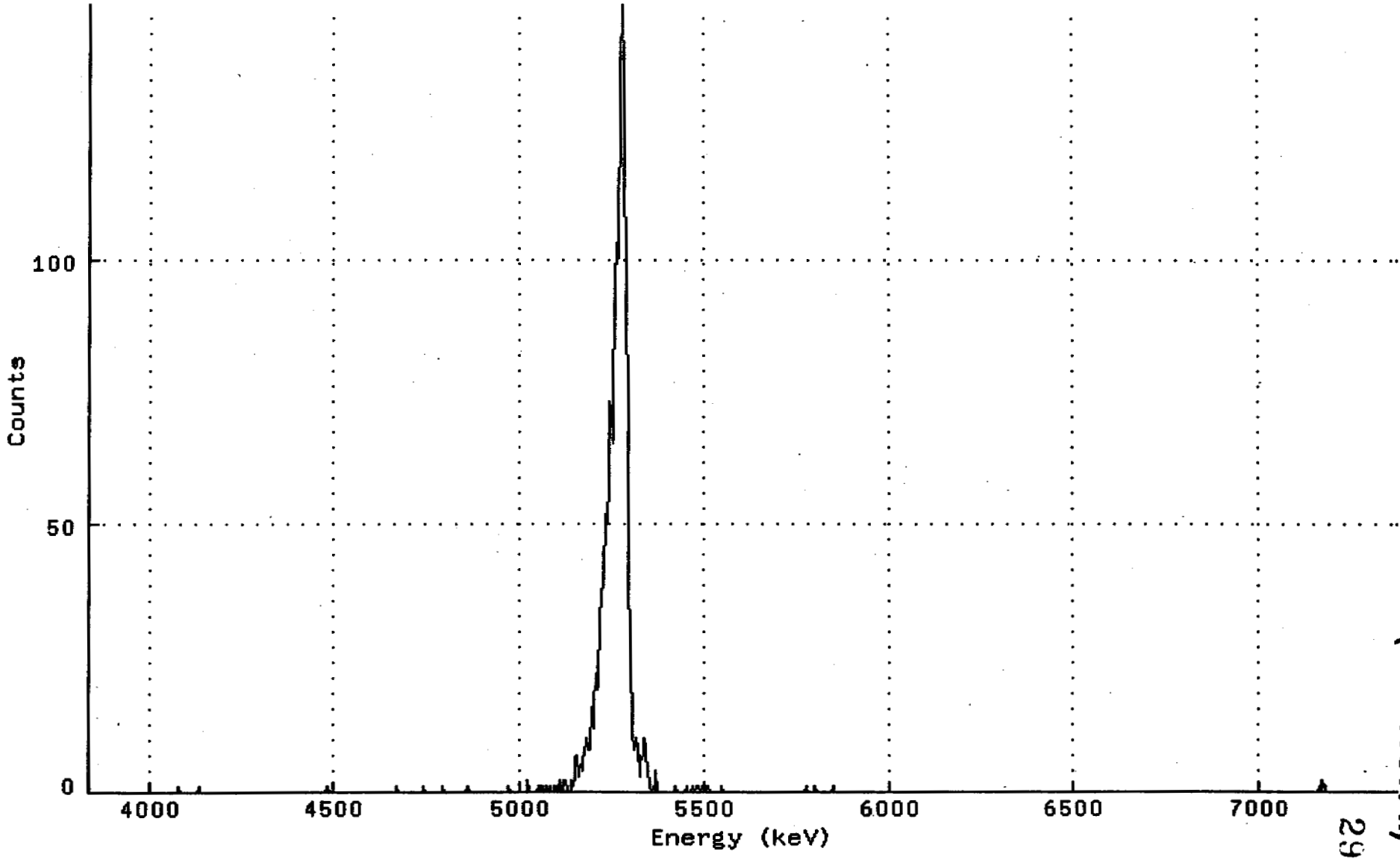
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 15.20 | 0.80 | 99.9 | 4.112E+00 | 2.198E+00 | 1.858E+00 | 1.296E+00 |
| AM243 | 5270.0 | 2221.00 | 2.00 | 99.6 | 6.027E+02 | 2.985E+01 | 2.520E+00 | 1.628E+00 |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

160

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032743$258191_AM.CNF;1
Title : 046
Sample Title:

| | | |
|---|---|---|
| Start Time: 3-APR-1999 13:56: | Sample Time: 31-MAR-1999 00:00 | Energy Offset: 3.82468E+03 |
| Real Time : 0 22:13:21.00 | Sample ID : 258191 | Energy Slope : 3.46057E+00 |
| Live Time : 0 22:13:21.00 | Sample Type: AM | Energy Quad : 0.00000E+00 |




(SECTION II)

29

161

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:24:52

(SECTION II)

30

Spectral File: ND_AMS_ARCHIVE_S:S_99032743$258192_AM.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | 258192 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.260E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 047 |
| ACQ DATE: | 3-APR-1999 13:56 | AVERAGE EFFICIENCY: | 23.6% |
| ELAPSED LIVE TIME: | 80002. | RECOVERY: | 76.84% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 38.96 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.271 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:28 | EFF CAL DATE: | 30-MAR-1999 07:28 |
| BKG FILENAME: | B_047_30MAR99 | | |

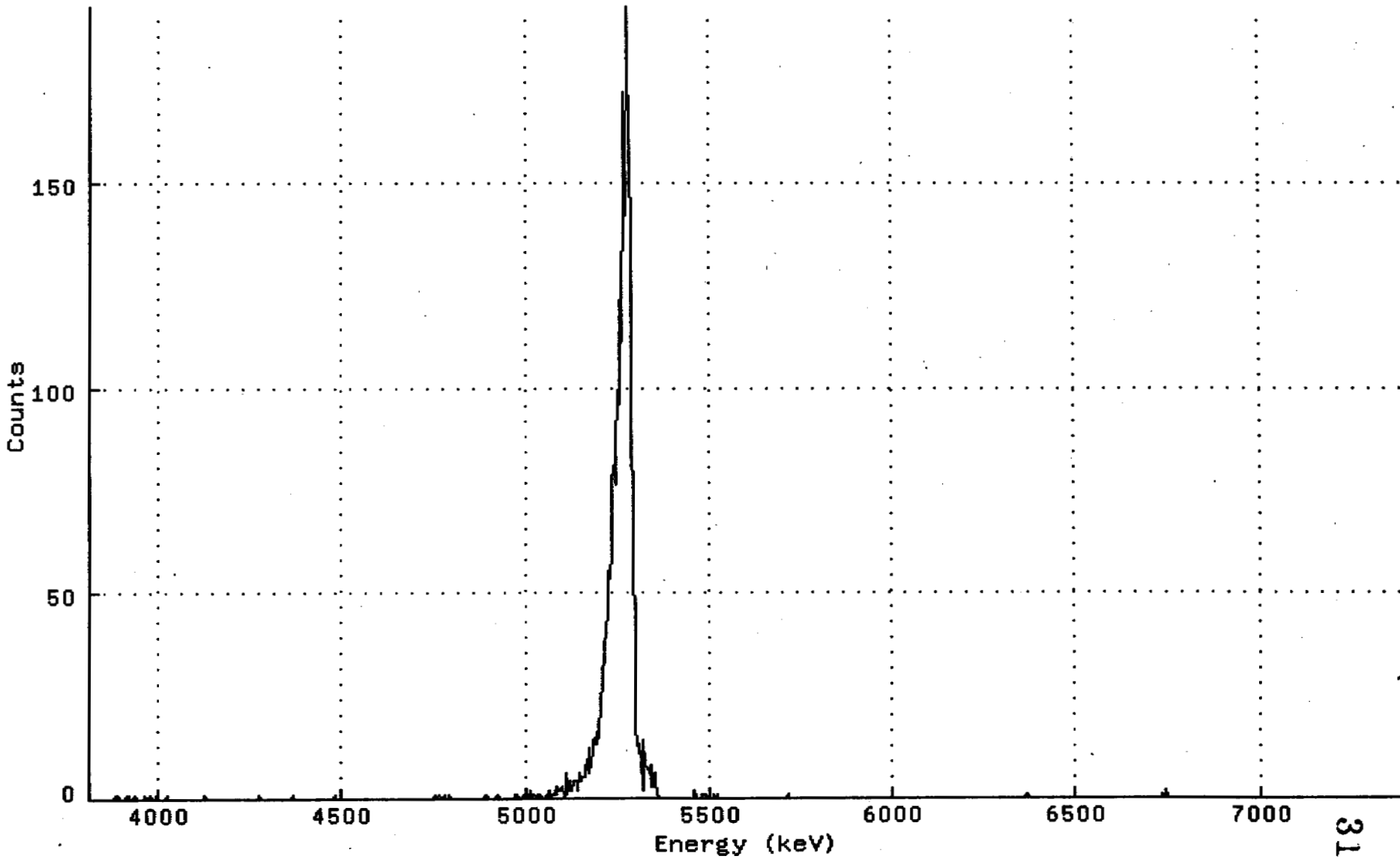
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ | sa | TPU/ERROR 2-SIGMA | MDC dpm/ | sa | CRIT LEVEL dpm/ | sa |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 6.80 | 1.20 | 99.9 | 1.246E+00 | | 1.070E+00 | 1.430E+00 | | 9.635E-01 | |
| AM243 | 5270.0 | 2712.20 | 2.80 | 99.6 | 4.987E+02 | | 2.301E+01 | 1.929E+00 | | 1.214E+00 | |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

162

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032743$258192_AM.CNF;1
Title : 047
Sample Title:
Start Time: 3-APR-1999 13:56: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.80045E+03
Real Time : 0 22:13:22.00 Sample ID : 258192 Energy Slope : 3.50546E+00
Live Time : 0 22:13:22.00 Sample Type: AM Energy Quad : 0.00000E+00




(SECTION II)

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:26:11

(SECTION II)



Spectral File: ND_AMS_ARCHIVE_S:S_99032743$258193_AM.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | 258193 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.560E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 048 |
| ACQ DATE: | 3-APR-1999 13:57 | AVERAGE EFFICIENCY: | 23.8% |
| ELAPSED LIVE TIME: | 80004. | RECOVERY: | 55.56% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 32.71 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.271 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:30 | EFF CAL DATE: | 30-MAR-1999 07:30 |
| BKG FILENAME: | B_048_30MAR99 | | |

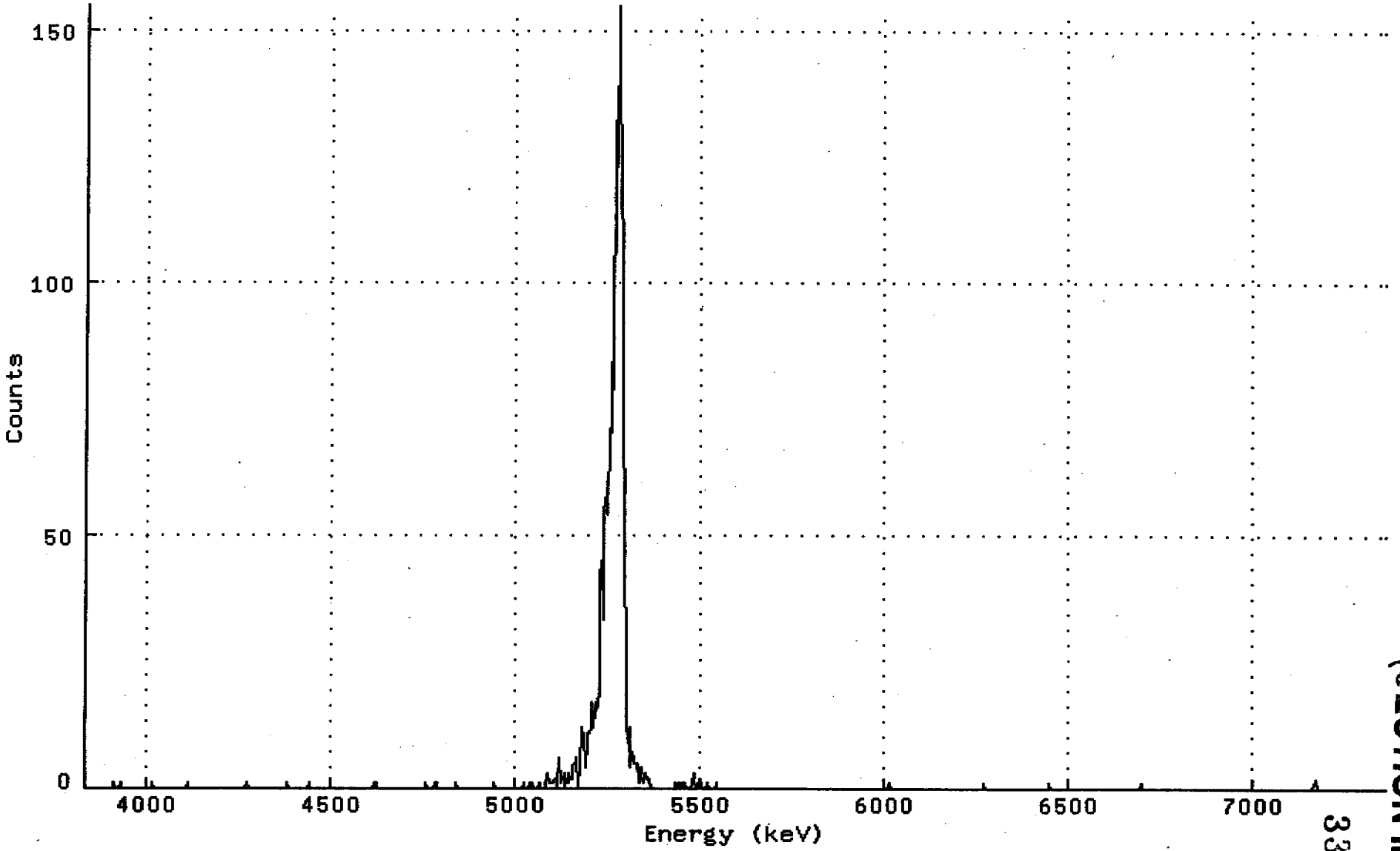
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 17.00 | 0.00 | 99.9 | 3.771E+00 | 1.842E+00 | 6.011E-01 | 6.011E-01 |
| AM243 | 5270.0 | 1978.60 | 2.40 | 99.6 | 4.403E+02 | 2.275E+01 | 2.206E+00 | 1.405E+00 |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

164

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032743$258193_AM.CNF;1
Title : 048
Sample Title:
Start Time: 3-APR-1999 13:57: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.82364E+03
Real Time : 0 22:13:24.00 Sample ID : 258193 Energy Slope : 3.44986E+00
Live Time : 0 22:13:24.00 Sample Type: AM Energy Quad : 0.00000E+00




(SECTION II)



165

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:27:04

(SECTION II)
34

**********
Spectral File: ND_AMS_ARCHIVE_S:S_99032743$258194_AM.CNF
**********

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | 258194 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 8.700E-03 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 033 |
| ACQ DATE: | 5-APR-1999 07:24 | AVERAGE EFFICIENCY: | 27.4% |
| ELAPSED LIVE TIME: | 80002. | RECOVERY: | 82.70% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 39.28 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.271 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:08 | EFF CAL DATE: | 30-MAR-1999 07:08 |
| BKG FILENAME: | B_033_30MAR99 | | |

**********

NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 11.60 | 0.40 | 99.9 | 4.410E+00 | 2.660E+00 | 2.148E+00 | 1.589E+00 |
| AM243 | 5270.0 | 3397.00 | 2.00 | 99.6 | 1.296E+03 | 5.526E+01 | 3.541E+00 | 2.287E+00 |

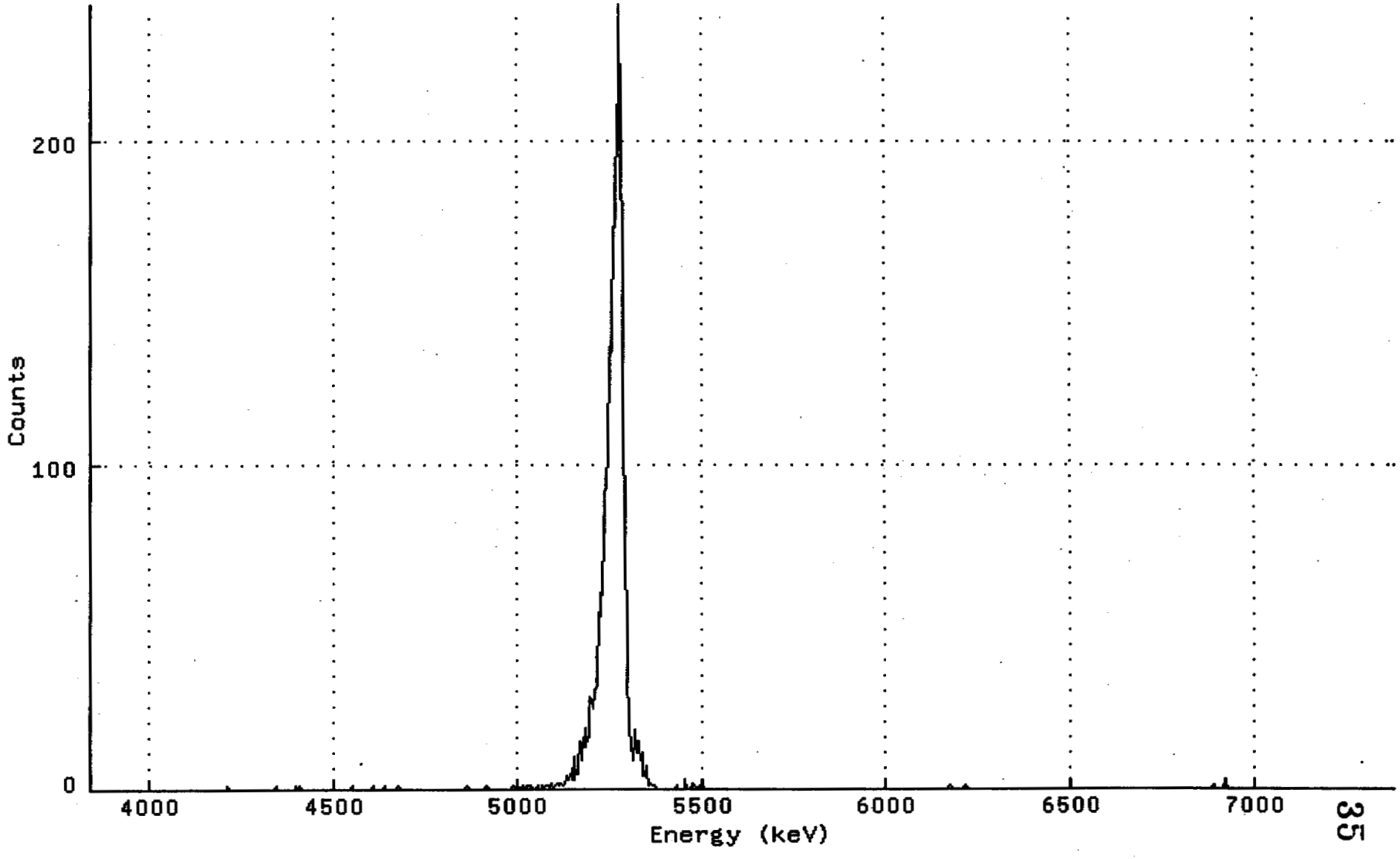
**********

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

Nde

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032743$258194_AM.CNF;1
Title : 033
Sample Title:

| | | |
|---|---|---|
| Start Time: 5-APR-1999 07:24: | Sample Time: 31-MAR-1999 00:00 | Energy Offset: 3.82849E+03 |
| Real Time : 0 22:13:22.00 | Sample ID : 258194 | Energy Slope : 3.46124E+00 |
| Live Time : 0 22:13:22.00 | Sample Type: AM | Energy Quad : 0.00000E+00 |




(SECTION II)

35

167

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:27:43

(SECTION II)

36

Spectral File: ND_AMS_ARCHIVE_S:S_99032743$258195_AM.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | 258195 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.170E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 034 |
| ACQ DATE: | 5-APR-1999 07:24 | AVERAGE EFFICIENCY: | 22.4% |
| ELAPSED LIVE TIME: | 80006. | RECOVERY: | 63.62% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 31.80 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.271 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:10 | EFF CAL DATE: | 30-MAR-1999 07:10 |
| BKG FILENAME: | B_034_30MAR99 | | |

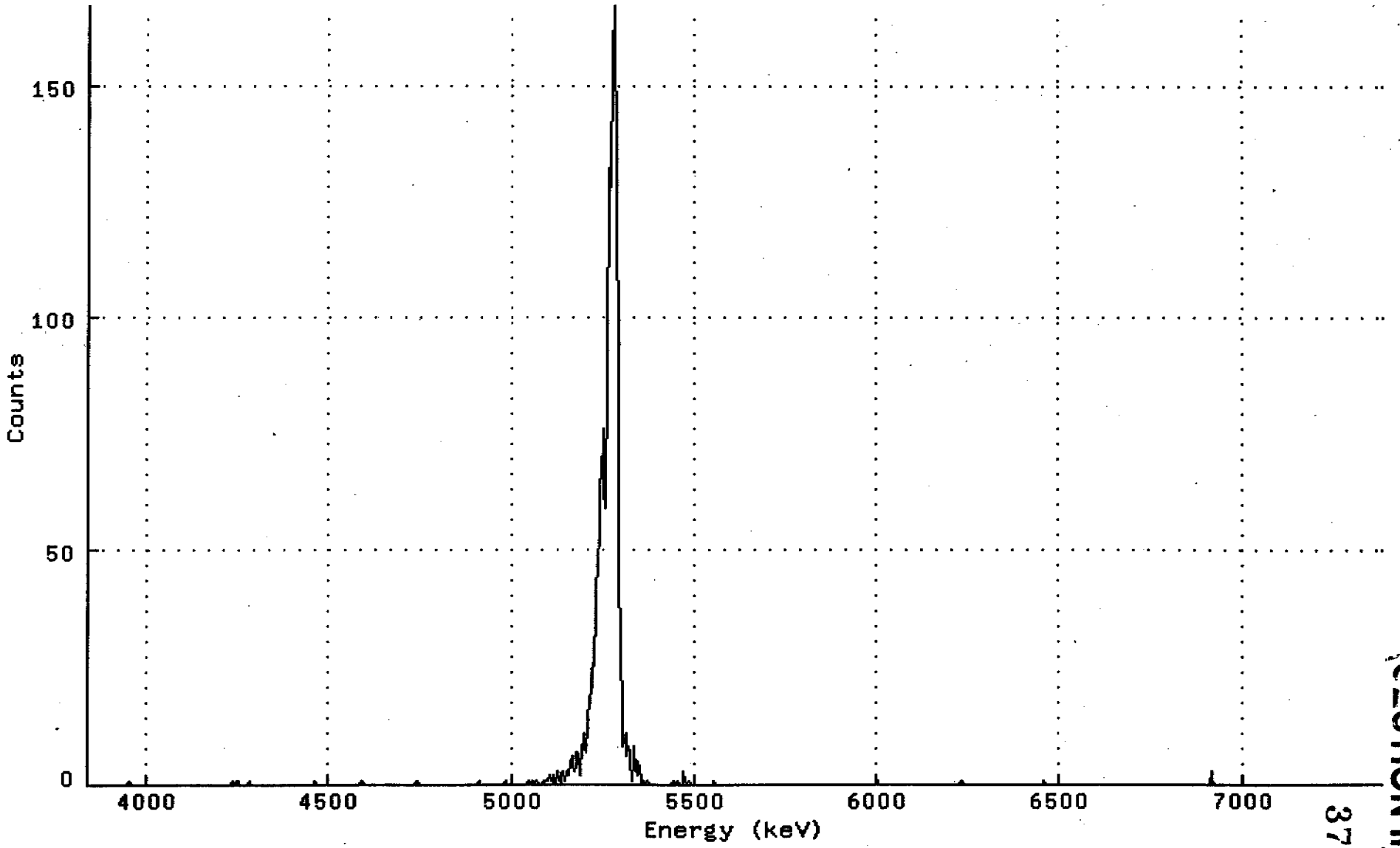
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ | sa | TPU/ERROR 2-SIGMA | MDC dpm/ | sa | CRIT LEVEL dpm/ | sa |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 7.60 | 0.40 | 99.9 | 1.847E+00 | | 1.392E+00 | 1.373E+00 | | 1.016E+00 | |
| AM243 | 5270.0 | 2130.40 | 1.60 | 99.6 | 5.194E+02 | | 2.614E+01 | 2.095E+00 | | 1.378E+00 | |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

168

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032743$258195_AM.CNF;1
Title : 034
Sample Title:
Start Time: 5-APR-1999 07:24: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.82789E+03
Real Time : 0 22:13:26.00 Sample ID : 258195 Energy Slope : 3.46972E+00
Live Time : 0 22:13:26.00 Sample Type: AM Energy Quad : 0.00000E+00




(SECTION II)

37

169

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:28:08

(SECTION II)

38

Spectral File: ND_AMS_ARCHIVE_S:S_99032743$258196_AM.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | 258196 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 3.530E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 035 |
| ACQ DATE: | 5-APR-1999 07:25 | AVERAGE EFFICIENCY: | 25.9% |
| ELAPSED LIVE TIME: | 80005. | RECOVERY: | 66.87% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 52.81 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.271 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:11 | EFF CAL DATE: | 30-MAR-1999 07:11 |
| BKG FILENAME: | B_035_30MAR99 | | |

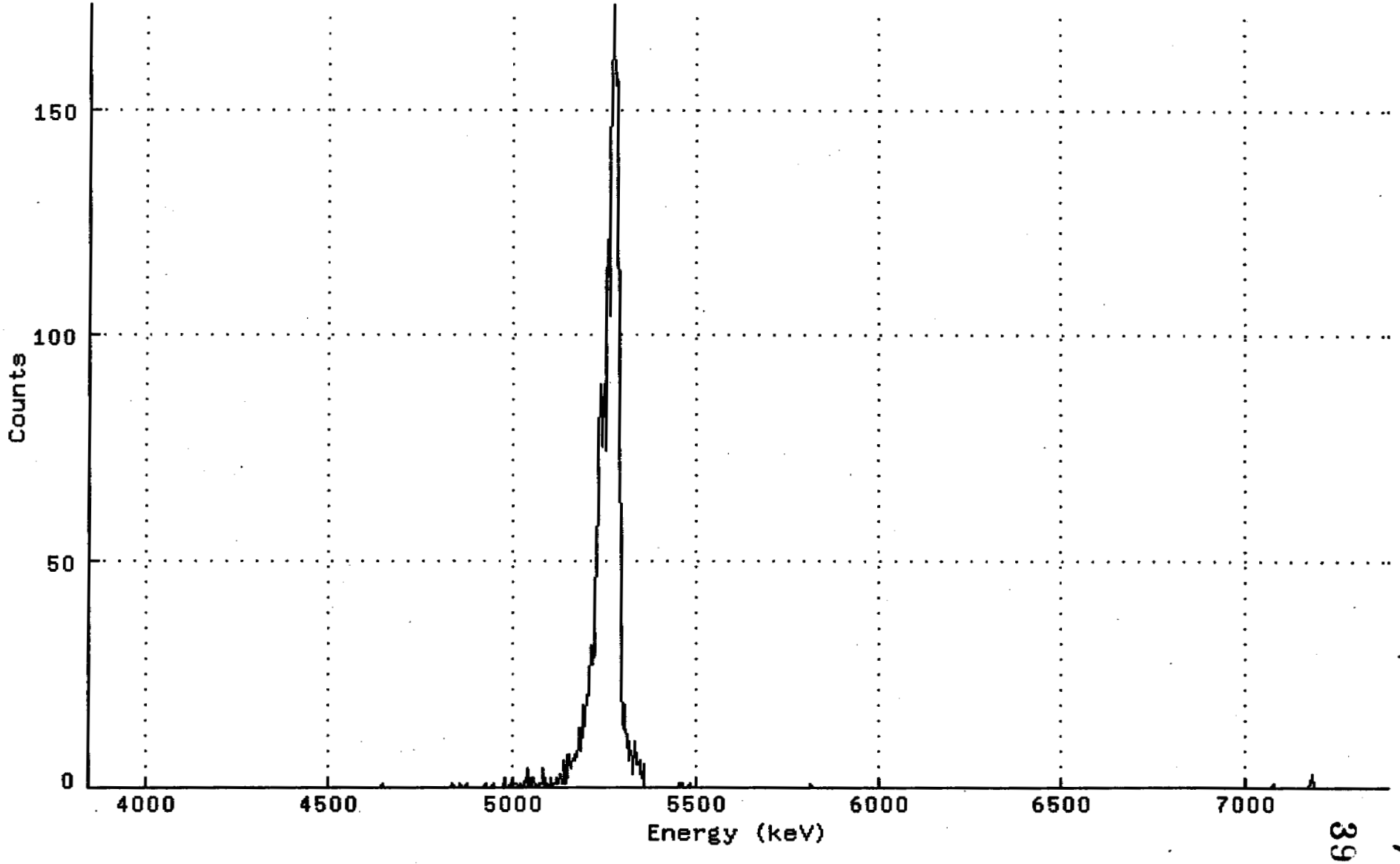
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 3.60 | 0.40 | 99.9 | 4.420E-01 | 5.014E-01 | 6.939E-01 | 5.133E-01 |
| AM243 | 5270.0 | 2592.00 | 2.00 | 99.6 | 3.193E+02 | 1.492E+01 | 1.144E+00 | 7.389E-01 |

*** RECOUNT SAMPLE CL > 0.067 ***

170

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032743$258196_AM.CNF;1
Title : 035
Sample Title:
Start Time: 5-APR-1999 07:25: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.83352E+03
Real Time : 0 22:13:25.00 Sample ID : 258196 Energy Slope : 3.46965E+00
Live Time : 0 22:13:25.00 Sample Type: AM Energy Quad : 0.00000E+00




(SECTION II)



171

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:28:48

(SECTION II)
40

Spectral File: ND_AMS_ARCHIVE_S:S_99032743$258197_AM.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | 258197 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.460E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 036 |
| ACQ DATE: | 5-APR-1999 07:25 | AVERAGE EFFICIENCY: | 23.5% |
| ELAPSED LIVE TIME: | 80005. | RECOVERY: | 61.78% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 32.81 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.271 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:13 | EFF CAL DATE: | 30-MAR-1999 07:13 |
| BKG FILENAME: | B_036_30MAR99 | | |

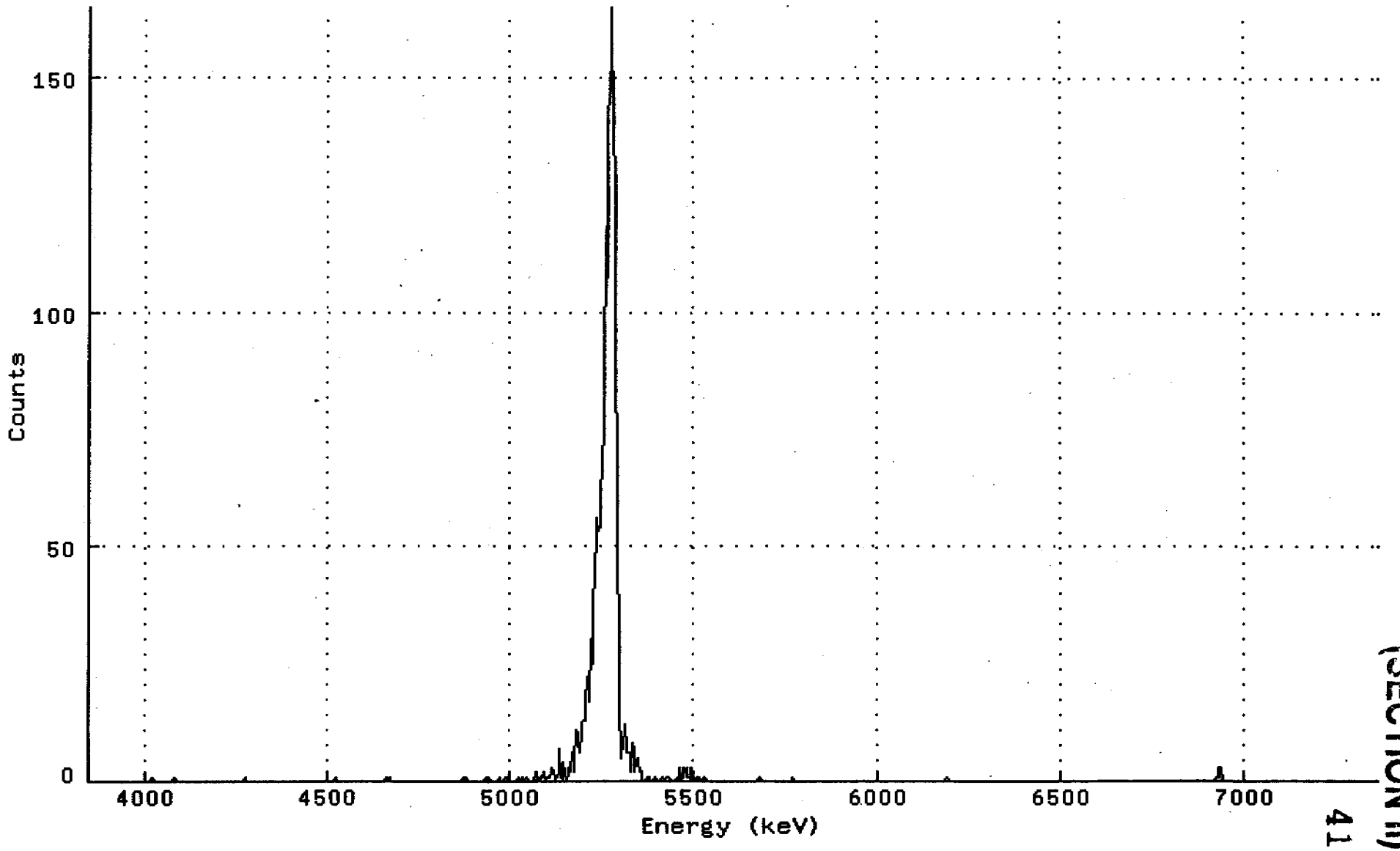
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 28.60 | 0.40 | 99.9 | 1.011E+01 | 3.858E+00 | 1.997E+00 | 1.477E+00 |
| AM243 | 5270.0 | 2177.60 | 2.40 | 99.6 | 7.720E+02 | 3.847E+01 | 3.515E+00 | 2.238E+00 |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

172

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032743$258197_AM.CNF;1
Title : 036
Sample Title:
Start Time: 5-APR-1999 07:25: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.83490E+03
Real Time : 0 22:13:25.00 Sample ID : 258197 Energy Slope : 3.44567E+00
Live Time : 0 22:13:25.00 Sample Type: AM Energy Quad : 0.00000E+00




(SECTION II)



173

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:30:06

(SECTION II)

42

**********
Spectral File: ND_AMS_ARCHIVE_S:S_99032743$258198_AM.CNF
**********

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | 258198 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.390E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 037 |
| ACQ DATE: | 5-APR-1999 07:25 | AVERAGE EFFICIENCY: | 22.9% |
| ELAPSED LIVE TIME: | 80005. | RECOVERY: | 75.65% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 40.30 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.271 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:14 | EFF CAL DATE: | 30-MAR-1999 07:14 |
| BKG FILENAME: | B_037_30MAR99 | | |

**********

NUCLIDE ACTIVITY SUMMARY

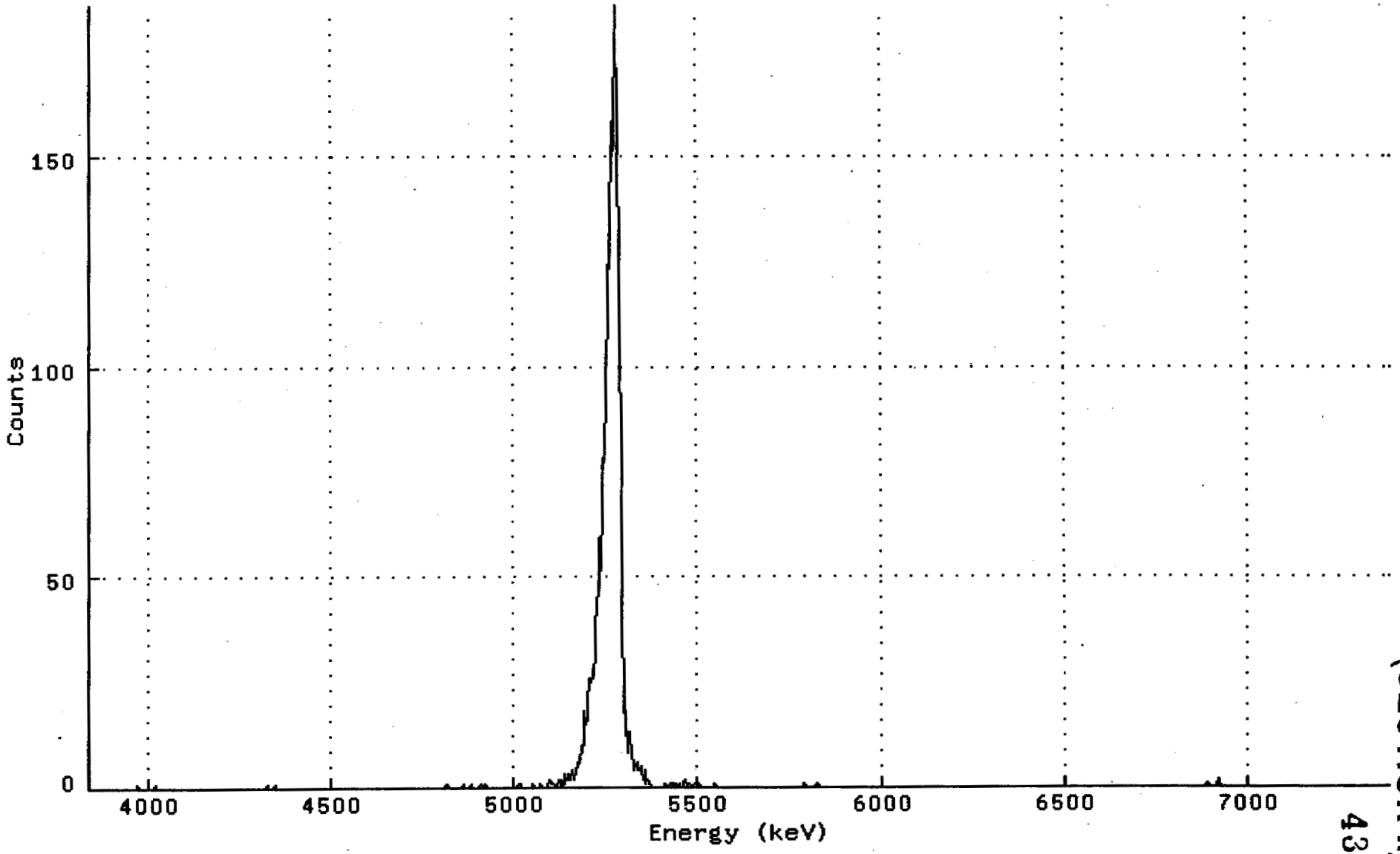
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 15.60 | 0.40 | 99.9 | 4.871E+00 | 2.524E+00 | 1.764E+00 | 1.305E+00 |
| AM243 | 5270.0 | 2588.60 | 0.40 | 99.6 | 8.109E+02 | 3.803E+01 | 1.770E+00 | 1.310E+00 |

**********

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

74.

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032743$258198_AM.CNF;1
Title : 037
Sample Title:
Start Time: 5-APR-1999 07:25: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.83056E+03
Real Time : 0 22:13:25.00 Sample ID : 258198 Energy Slope : 3.46883E+00
Live Time : 0 22:13:25.00 Sample Type: AM Energy Quad : 0.00000E+00




(SECTION II)

43

175

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:30:37

(SECTION II)



Spectral File: ND_AMS_ARCHIVE_S:S_99032743$258199_AM.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | 258199 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.670E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 038 |
| ACQ DATE: | 5-APR-1999 07:25 | AVERAGE EFFICIENCY: | 22.2% |
| ELAPSED LIVE TIME: | 80004. | RECOVERY: | 79.11% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 49.22 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.271 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:15 | EFF CAL DATE: | 30-MAR-1999 07:15 |
| BKG FILENAME: | B_038_30MAR99 | | |

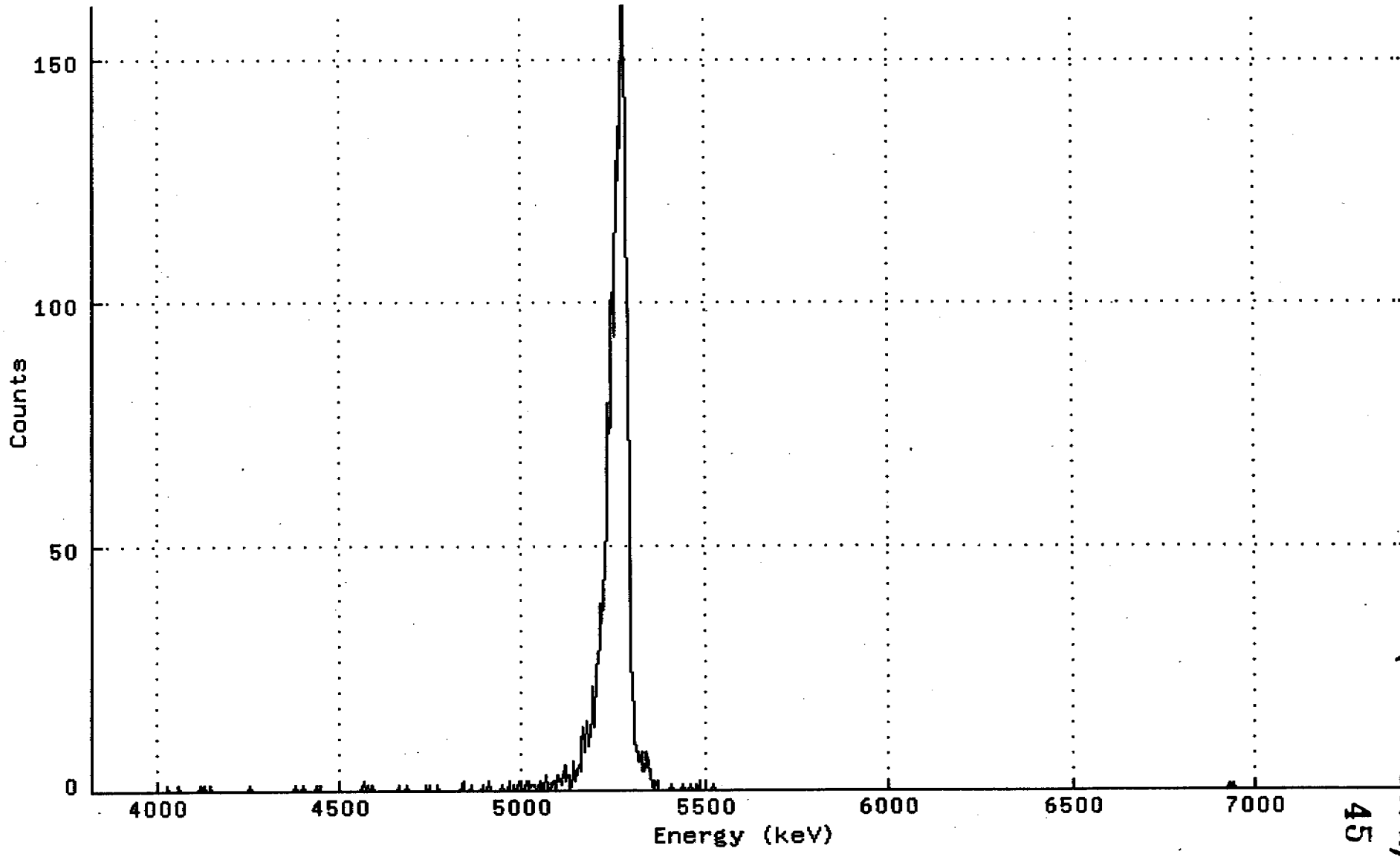
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 9.20 | 0.80 | 99.9 | 1.469E+00 | 1.029E+00 | 1.097E+00 | 7.650E-01 |
| AM243 | 5270.0 | 2634.60 | 2.40 | 99.6 | 4.221E+02 | 1.972E+01 | 1.588E+00 | 1.011E+00 |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

176

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032743$258199_AM.CNF;1
Title : 038
Sample Title:
Start Time: 5-APR-1999 07:25: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.80963E+03
Real Time : 0 22:13:25.00 Sample ID : 258199 Energy Slope : 3.49740E+00
Live Time : 0 22:13:24.00 Sample Type: AM Energy Quad : 0.00000E+00




(SECTION II)

45

177

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:31:07

(SECTION II)

46

**********
Spectral File: ND_AMS_ARCHIVE_S:S_99032743$258200_AM.CNF
**********

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | 258200 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 4.800E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 039 |
| ACQ DATE: | 5-APR-1999 07:25 | AVERAGE EFFICIENCY: | 23.2% |
| ELAPSED LIVE TIME: | 80003. | RECOVERY: | 79.77% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 41.92 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.271 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:17 | EFF CAL DATE: | 30-MAR-1999 07:17 |
| BKG FILENAME: | B_039_30MAR99 | | |

**********

NUCLIDE ACTIVITY SUMMARY

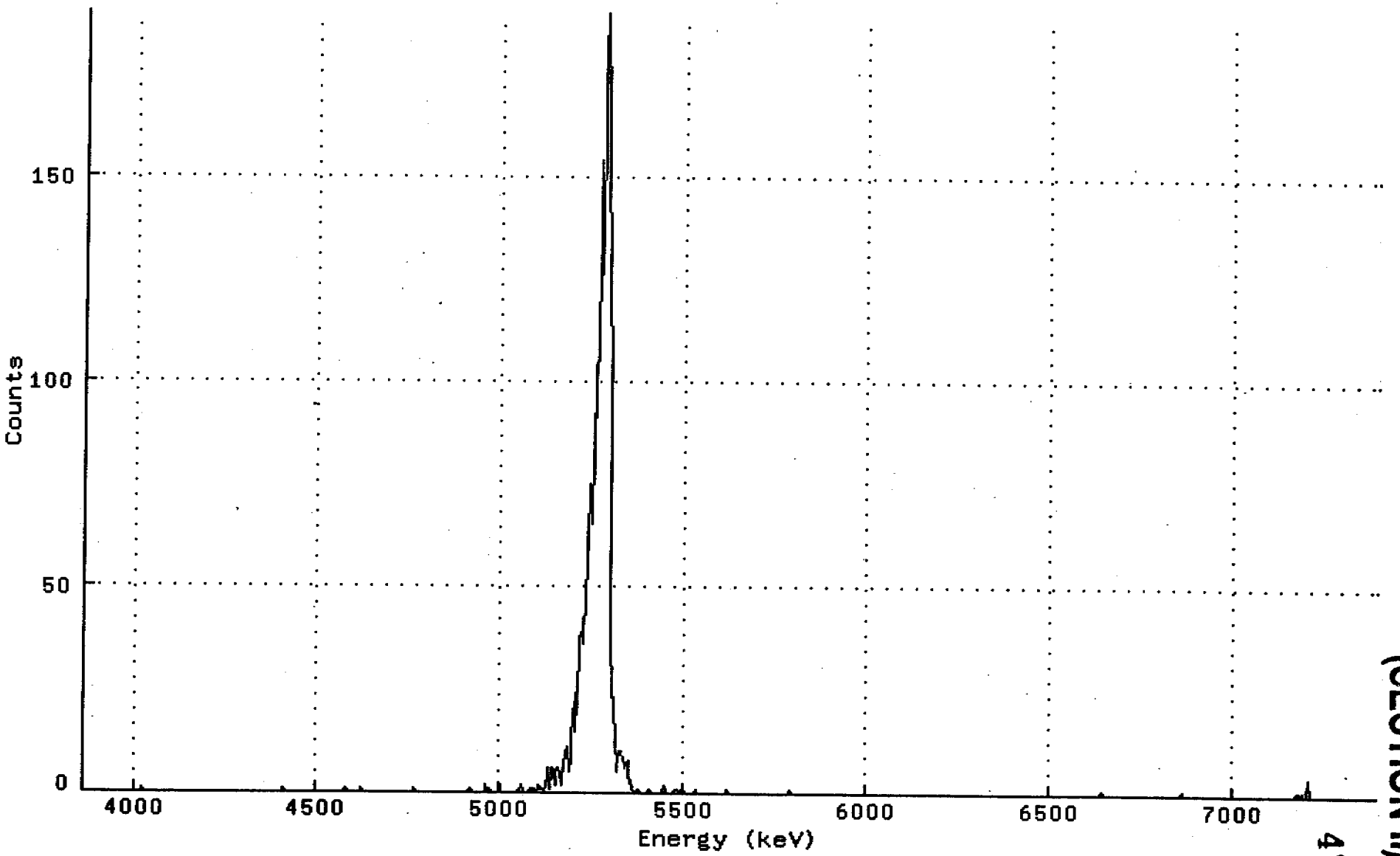
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 8.00 | 2.00 | 99.9 | 6.755E-01 | 5.561E-01 | 7.841E-01 | 5.065E-01 |
| AM243 | 5270.0 | 2772.00 | 2.00 | 99.6 | 2.348E+02 | 1.075E+01 | 7.866E-01 | 5.081E-01 |

**********

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

178

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032743$258200_AM.CNF;1
Title : 039
Sample Title:
Start Time: 5-APR-1999 07:25: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.85181E+03
Real Time : 0 22:13:23.00 Sample ID : 258200 Energy Slope : 3.45506E+00
Live Time : 0 22:13:23.00 Sample Type: AM Energy Quad : 0.00000E+00




(SECTION II)

47

179

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:31:44

(SECTION II)

48

Spectral File: ND_AMS_ARCHIVE_S:S_99032743$258201_AM.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | 258201 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 6.400E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 040 |
| ACQ DATE: | 5-APR-1999 07:26 | AVERAGE EFFICIENCY: | 23.2% |
| ELAPSED LIVE TIME: | 80004. | RECOVERY: | 81.04% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 38.53 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.271 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:18 | EFF CAL DATE: | 30-MAR-1999 07:18 |
| BKG FILENAME: | B_040_30MAR99 | | |

NUCLIDE ACTIVITY SUMMARY

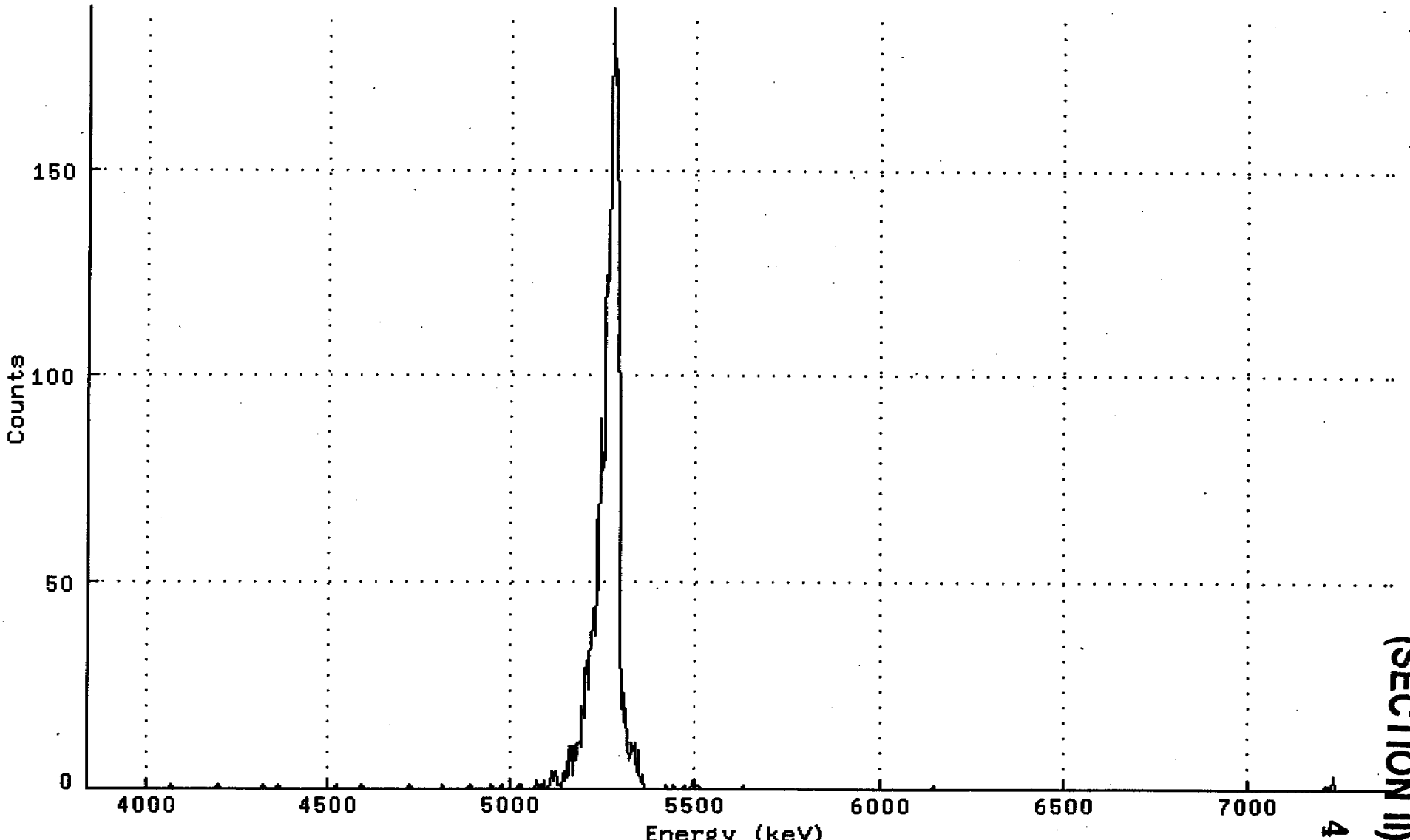
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 7.80 | 1.20 | 99.9 | 4.871E-01 | 3.854E-01 | 4.873E-01 | 3.283E-01 |
| AM243 | 5270.0 | 2811.20 | 0.80 | 99.6 | 1.761E+02 | 8.024E+00 | 4.303E-01 | 3.000E-01 |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

180

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032743$258201_AM.CNF;1
Title : 040
Sample Title:

| | | |
|---|---|---|
| Start Time: 5-APR-1999 07:26: | Sample Time: 31-MAR-1999 00:00 | Energy Offset: 3.83002E+03 |
| Real Time : 0 22:13:24.00 | Sample ID : 258201 | Energy Slope : 3.47052E+00 |
| Live Time : 0 22:13:24.00 | Sample Type: AM | Energy Quad : 0.00000E+00 |




(SECTION II)



181

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:32:26

(SECTION II)

50

Spectral File: ND_AMS_ARCHIVE_S:S_99032743$258202_AM.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | 258202 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.163E-01 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 041 |
| ACQ DATE: | 5-APR-1999 07:26 | AVERAGE EFFICIENCY: | 23.2% |
| ELAPSED LIVE TIME: | 80002. | RECOVERY: | 74.47% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 51.26 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.271 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:20 | EFF CAL DATE: | 30-MAR-1999 07:20 |
| BKG FILENAME: | B_041_30MAR99 | | |

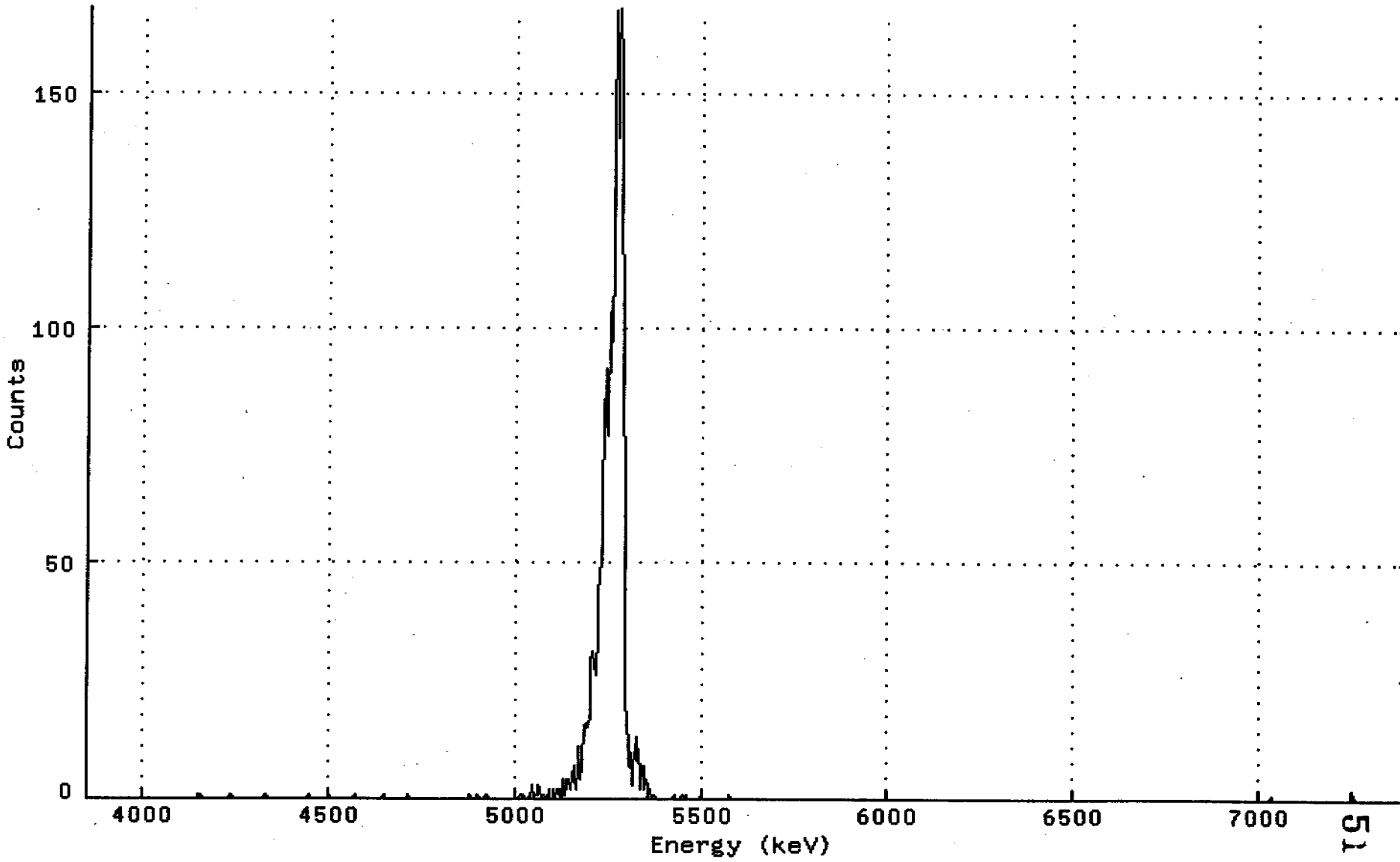
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 4.80 | 1.20 | 99.9 | 1.794E-01 | 1.905E-01 | 2.916E-01 | 1.964E-01 |
| AM243 | 5270.0 | 2585.40 | 1.60 | 99.6 | 9.691E+01 | 4.551E+00 | 3.221E-01 | 2.118E-01 |

*** RECOUNT SAMPLE CL > 0.067 ***

182

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032743$258202_AM.CNF;1
Title : 041
Sample Title:
Start Time: 5-APR-1999 07:26: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.83895E+03
Real Time : 0 22:13:22.00 Sample ID : 258202 Energy Slope : 3.45079E+00
Live Time : 0 22:13:22.00 Sample Type: AM Energy Quad : 0.00000E+00




(SECTION II)



183

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:33:05

(SECTION II)

52

Spectral File: ND_AMS_ARCHIVE_S:S_99032743$258203_AM.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | 258203 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.770E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 042 |
| ACQ DATE: | 5-APR-1999 07:26 | AVERAGE EFFICIENCY: | 23.9% |
| ELAPSED LIVE TIME: | 80002. | RECOVERY: | 81.34% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 46.43 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.271 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:21 | EFF CAL DATE: | 30-MAR-1999 07:21 |
| BKG FILENAME: | B_042_30MAR99 | | |

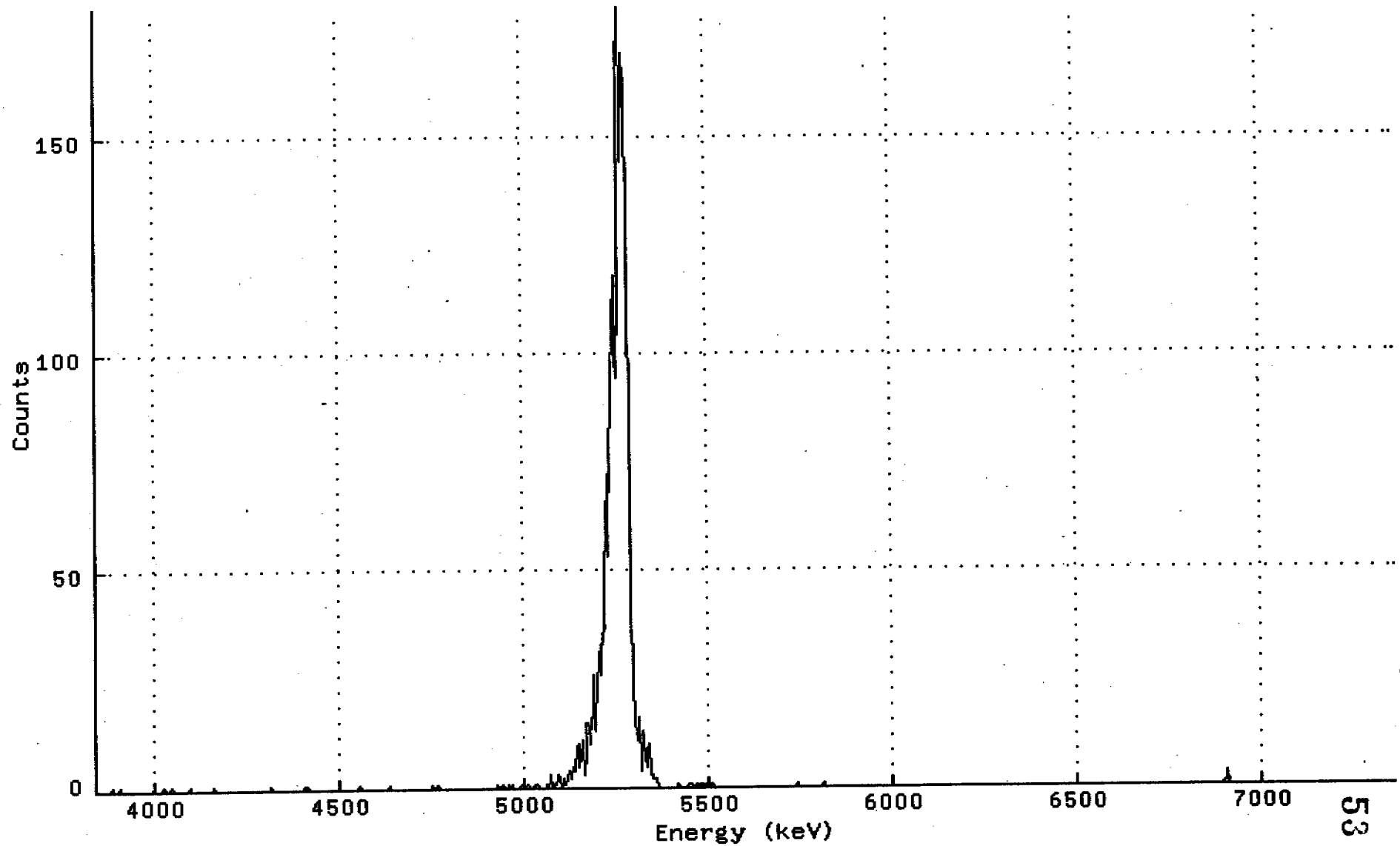
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 10.80 | 1.20 | 99.9 | 1.503E+00 | 9.860E-01 | 1.086E+00 | 7.313E-01 |
| AM243 | 5270.0 | 2915.40 | 1.60 | 99.6 | 4.069E+02 | 1.828E+01 | 1.199E+00 | 7.887E-01 |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

184

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032743$258203_AM.CNF;1
Title : 042
Sample Title:
Start Time: 5-APR-1999 07:26: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.83219E+03
Real Time : 0 22:13:23.00 Sample ID : 258203 Energy Slope : 3.43814E+00
Live Time : 0 22:13:22.00 Sample Type: AM Energy Quad : 0.00000E+00




(SECTION III)



185

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:23:44



Spectral File: ND_AMS_ARCHIVE_S:S_99032743$258191D_AM.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | 258191D |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.870E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 043 |
| ACQ DATE: | 5-APR-1999 07:27 | AVERAGE EFFICIENCY: | 23.0% |
| ELAPSED LIVE TIME: | 80000. | RECOVERY: | 69.99% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 35.52 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.271 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:22 | EFF CAL DATE: | 30-MAR-1999 07:22 |
| BKG FILENAME: | B_043_30MAR99 | | |

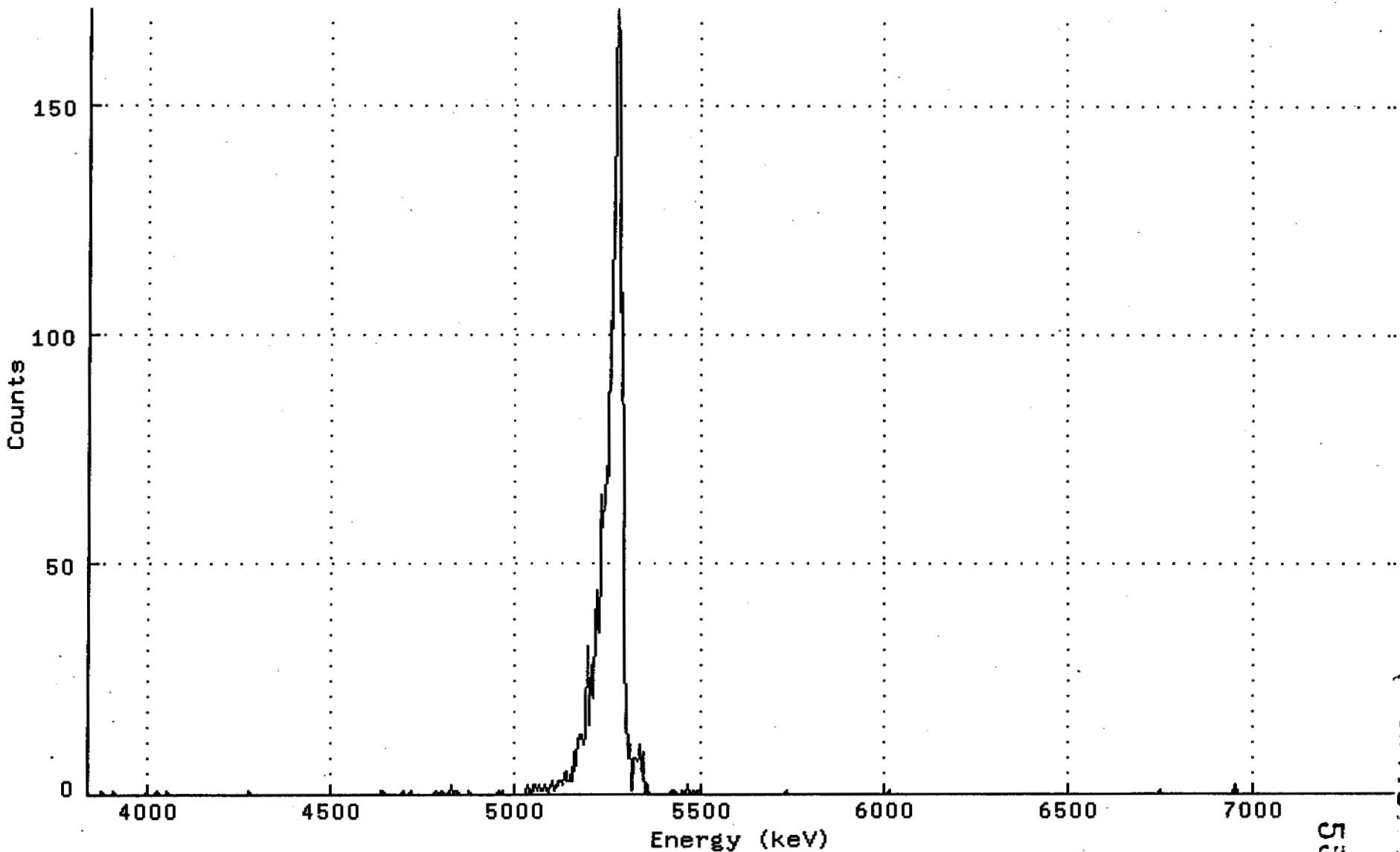
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 8.80 | 1.20 | 99.9 | 2.192E+00 | 1.617E+00 | 1.944E+00 | 1.309E+00 |
| AM243 | 5270.0 | 2412.20 | 0.80 | 99.6 | 6.027E+02 | 2.896E+01 | 1.716E+00 | 1.197E+00 |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

186

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032743$258191D_AM.CNF;1
Title : 043
Sample Title:
Start Time: 5-APR-1999 07:27: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.83111E+03
Real Time : 0 22:13:20.00 Sample ID : 258191D Energy Slope : 3.46623E+00
Live Time : 0 22:13:20.00 Sample Type: AM Energy Quad : 0.00000E+00




(SECTION II)

55

187

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:16:53

56

Spectral File: ND_AMS_ARCHIVE_C:C_99032743$LCSWR33B_AM.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | LCSWR33B |
| SAMPLE DATE: | 1-APR-1985 00:00 | ALIQUOT: | 2.500E-01 mL |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 044 |
| ACQ DATE: | 5-APR-1999 07:27 | AVERAGE EFFICIENCY: | 21.8% |
| ELAPSED LIVE TIME: | 80000. | RECOVERY: | 72.09% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 38.35 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.269 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:24 | EFF CAL DATE: | 30-MAR-1999 07:24 |
| BKG FILENAME: | B_044_30MAR99 | | |

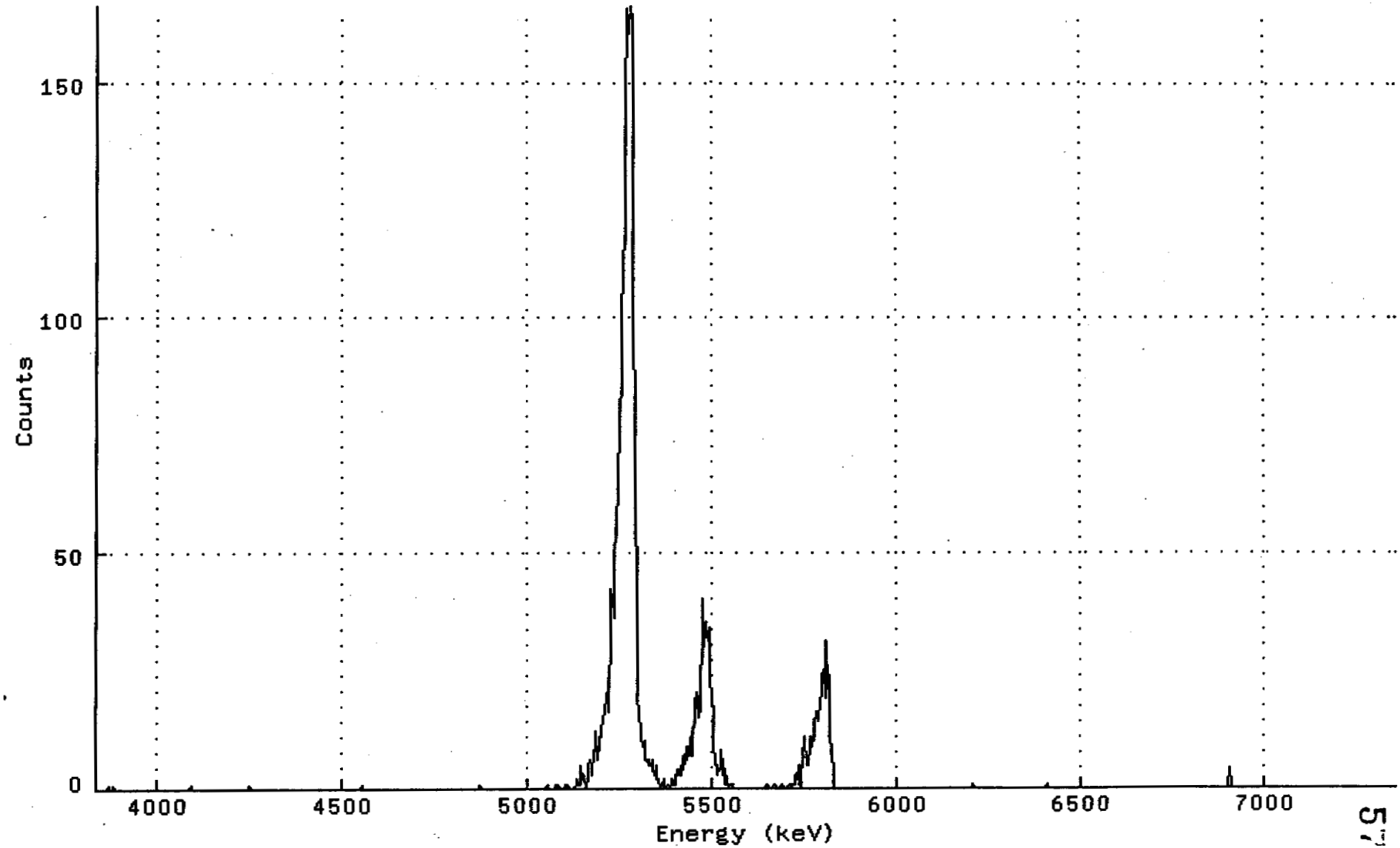
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY pCi/ mL | TPU/ERROR 2-SIGMA | MDC pCi/ mL | CRIT LEVEL pCi/ mL |
|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 540.00 | 0.00 | 99.9 | 4.748E+00 | 4.849E-01 | 2.330E-02 | 2.330E-02 |
| AM243 | 5270.0 | 2351.20 | 0.80 | 99.6 | 2.031E+01 | 9.869E-01 | 5.924E-02 | 4.131E-02 |

*** POSITIVE ***

186

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.C]C_99032743$LCSWR33B_AM.CNF;1
Title : 044
Sample Title:
Start Time: 5-APR-1999 07:27: Sample Time: 1-APR-1985 00:00: Energy Offset: 3.82541E+03
Real Time : 0 22:13:20.00 Sample ID : LCSWR33B Energy Slope : 3.44193E+00
Live Time : 0 22:13:20.00 Sample Type: AM Energy Quad : 0.00000E+00

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189

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 06:17:59

SECTION D

5a

Spectral File: ND_AMS_ARCHIVE_R:R_99032743$PBB_AM.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032743 | SAMPLE ID: | PBB |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: 1.000E+00 | sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 045 |
| ACQ DATE: | 5-APR-1999 07:28 | AVERAGE EFFICIENCY: | 24.0% |
| ELAPSED LIVE TIME: | 80000. | RECOVERY: | 78.73% |
| TRACER ID: | AM243_82-76-2 | TRACER FWHM (kev): | 47.17 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 11.271 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:26 | EFF CAL DATE: | 30-MAR-1999 07:26 |
| BKG FILENAME: | B_045_30MAR99 | | |

NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| AM-241 | 5479.1 | 11.20 | 0.80 | 99.9 | 4.451E-02 | 2.799E-02 | 2.729E-02 | 1.903E-02 |
| AM243 | 5270.0 | 2827.40 | 1.60 | 99.6 | 1.127E+01 | 5.126E-01 | 3.425E-02 | 2.253E-02 |

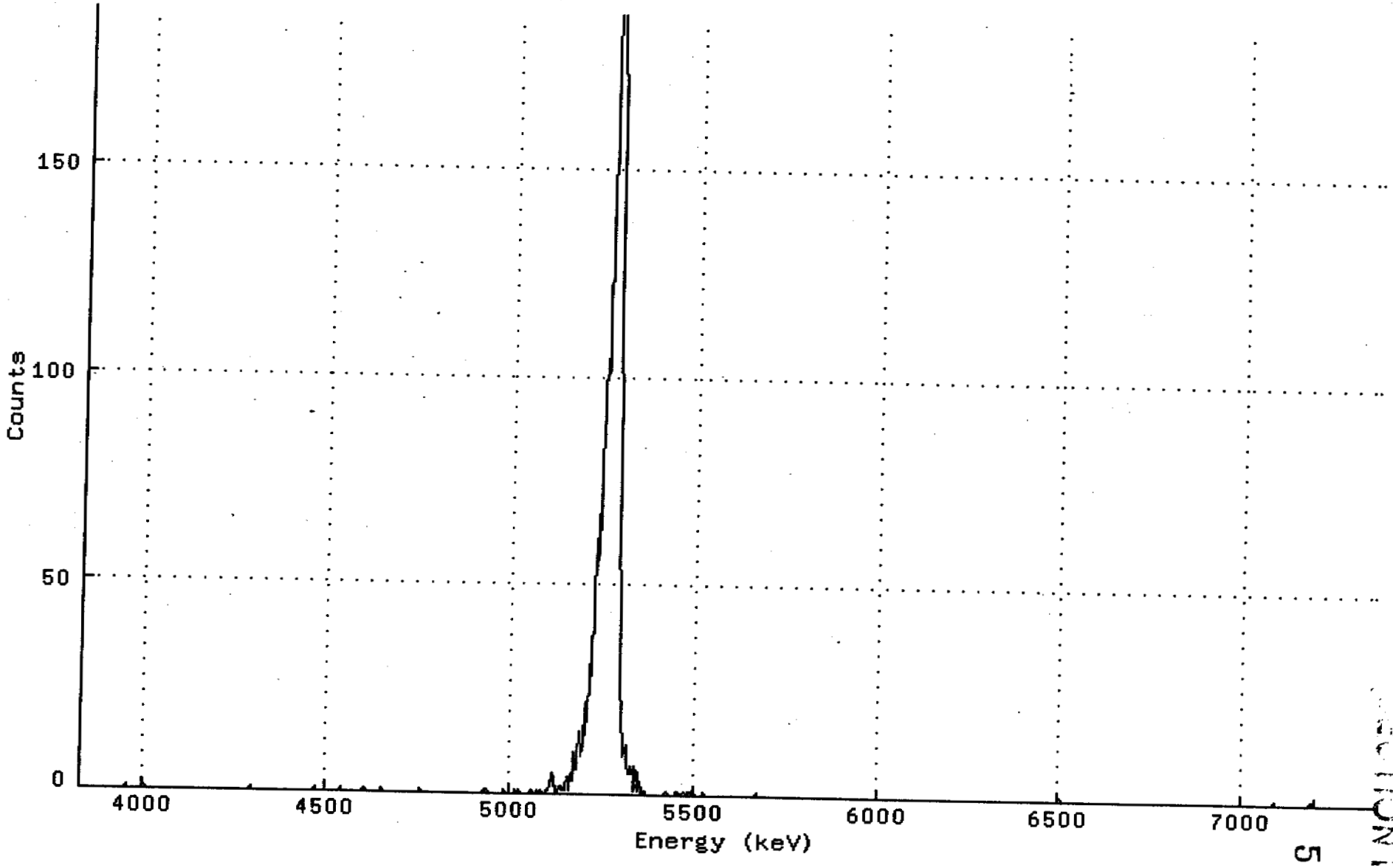
*** POSITIVE ***

190

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.R]R_99032743$PBB_AM.CNF;1
Title : 045
Sample Title:
Start Time: 5-APR-1999 07:28:
Real Time : 0 22:13:20.00
Live Time : 0 22:13:20.00

Sample Time: 31-MAR-1999 00:00
Sample ID : PBB
Sample Type: AM

Energy Offset: 3.82067E+03
Energy Slope : 3.45334E+00
Energy Quad : 0.00000E+00




59

191

(SECTION II)

## Sample Preparation and Analysis Log

Sample Type: Various Solids (chipped paint, concrete, and cinder block)

60

| | Method | Isotopes | Worklist Names | Chemist | Date |
|---|---|---|---|---|---|
| Digestion & Purification | RC-19 R05 | Am-241 | 99032743 | | 4/1/99 |
| | | Pu-239/240,Pu-238 | 99032744 | | |
| | | U-238, U235, U234 | 99032745 | | |
| Counting | RC-19 R05 | Pu150 | 99032744 | | 4/6/99 |

Tracers (Internal Standards)

| Isotope | ID | Conc(pCi/mL) @ RD | | Aliquot(mL) | HL (years) | Activity(dpm) | Activity(pCi) |
|---|---|---|---|---|---|---|---|
| U-232 | 82-76-3 | 50.91 | 12/15/92 | 0.250 | 72 | 26.59 | 11.98 |
| Am-243 | 82-76-2 | 50.80 | 12/15/92 | 0.100 | 7380 | 11.27 | 5.08 |
| Pu-242 | 82-75-5 | 41.22 | 12/18/89 | 0.100 | 3.758E+05 | 9.15 | 4.12 |

| Req | Sample ID | # | Aliquot Size | Comments | *Sample Aliquot | Total Sample Size | Detector Number | |
|---|---|---|---|---|---|---|---|---|
| | PB | 1 | 1 SA | | 1.0000 | 1 SA | 33 | |
| 16495 | 258181 | 2 | 0.500 G | | 0.0210 | 23.85 G | 34 | |
| 16495 | 258182 | 3 | 0.500 G | | 0.0187 | 26.67 G | 35 | |
| 16495 | 258183 | 4 | 0.500 G | | 0.0156 | 32.07 G | 36 | |
| 16495 | 258184 | 5 | 0.500 G | | 0.0135 | 37.17 G | 37 | |
| 16495 | 258185 | 6 | 0.500 G | | 0.0169 | 29.63 G | 38 | |
| 16495 | 258186 | 7 | 0.500 G | | 0.0248 | 20.14 G | 39 | |
| 16495 | 258187 | 8 | 0.500 G | | 0.0283 | 17.64 G | 40 | |
| 16495 | 258188 | 9 | 0.500 G | | 0.0189 | 26.45 G | 41 | |
| 16495 | 258189 | 10 | 0.500 G | | 0.0388 | 12.89 G | 42 | |
| 16495 | 258190 | 11 | 0.500 G | | 0.0160 | 31.25 G | 43 | |
| LCSWR1, | LCSWR33 | 12 | 0.250 mL | | 0.2500 | 1.00 mL | 44 | |
| 16495 | 258181D | 13 | 0.500 G | | 0.0210 | 23.85 G | 45 | |
| 16495 | 258191 | 14 | 0.500 G | ** | 0.0187 | 26.73 G | 46 | |
| 16495 | 258192 | 15 | 0.500 G | | 0.0226 | 22.14 G | 47 | |
| 16495 | 258193 | 16 | 0.500 G | | 0.0256 | 19.51 G | 48 | |
| 16495 | 258194 | 17 | 0.500 G | | 0.0087 | 57.35 G | 33 | |
| 16495 | 258195 | 18 | 0.500 G | | 0.0217 | 23.07 G | 34 | |
| 16495 | 258196 | 19 | 0.500 G | | 0.0353 | 14.16 G | 35 | |
| 16495 | 258197 | 20 | 0.500 G | | 0.0146 | 34.21 G | 36 | |
| 16495 | 258198 | 21 | 0.500 G | | 0.0139 | 36.09 G | 37 | |
| 16495 | 258199 | 22 | 0.500 G | | 0.0267 | 18.72 G | 38 | |
| 16495 | 258200 | 23 | 0.500 G | | 0.0480 | 10.41 G | 39 | |
| 16495 | 258201 | 24 | 0.500 G | | 0.0640 | 7.81 G | 40 | |
| 16495 | 258202 | 25 | 0.500 G | | 0.1163 | 4.30 G | 41 | |
| 16495 | 258203 | 26 | 0.500 G | | 0.0277 | 18.08 G | 42 | |
| 16495 | 258191D | 27 | 0.500 G | ** | 0.0187 | 26.73 G | 43 | |
| LCSWR1, | LCSWR33 | 28 | 0.250 mL | | 0.2500 | 1.00 mL | 44 | |
| | PB | 29 | 1 SA | | 1.0000 | 1 SA | 45 | |
| | | 30 | | | | | | |

**Comments and Actual conditions:**

Start of digestion: 3/31/99

Automatic pipets calibrated in accord with QC-6 on balance # 9

OLAB 4-6-99

* SAMPLE ALIQUOT - FRACTION OF TOTAL SAMPLE USED FOR ANALYSIS

** - Sample 258191D had a chemical recovery > 105%; this sample was a duplicate of 258191 therefore both will be reanalyzed. 4/5/99

Rcvd 4/7/99 SEB

192

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 13:14:47

SECTION III)

61

Spectral File: ND_AMS_ARCHIVE_R:R_99032744$PBA_PU.CNF

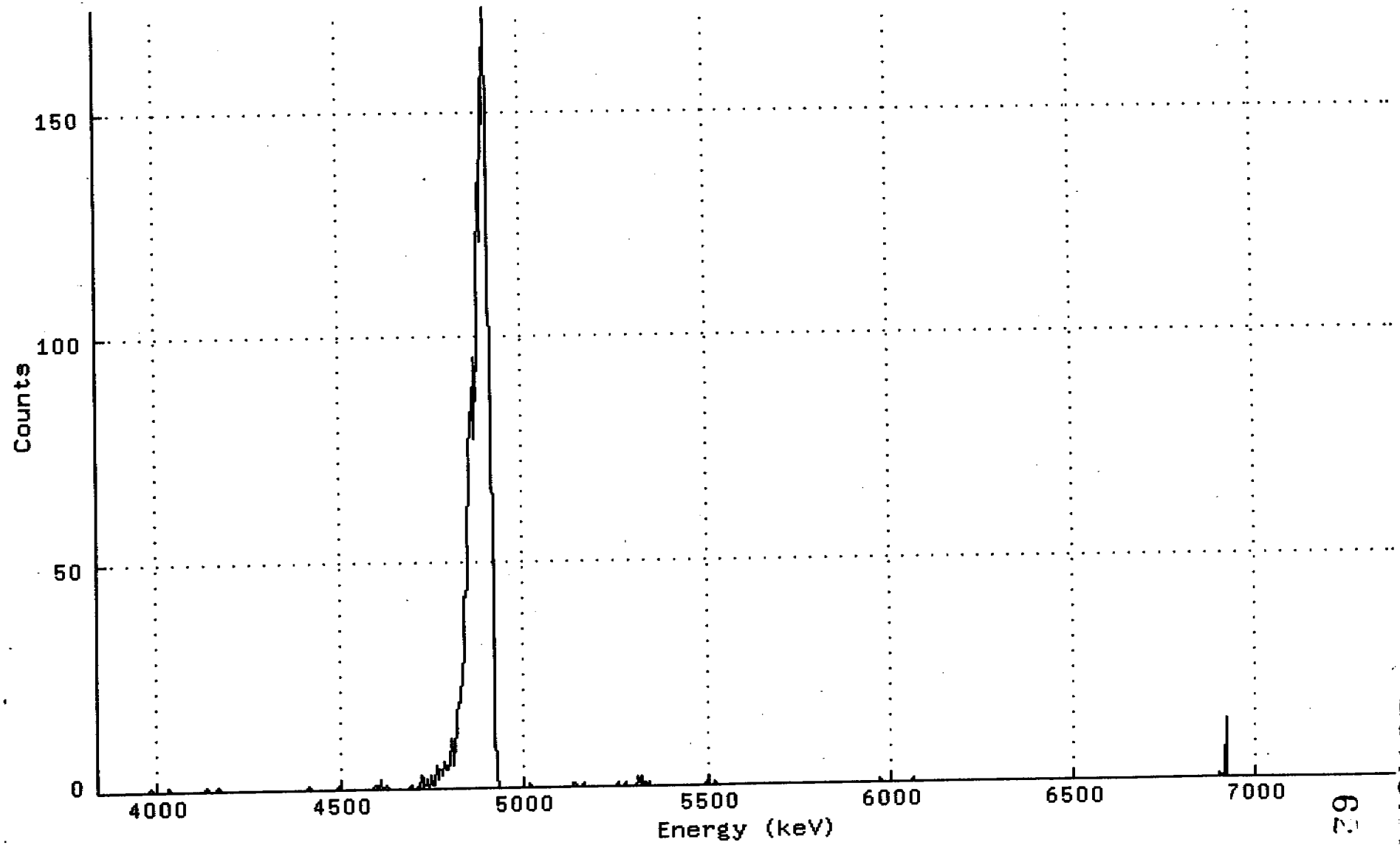
| | | | |
|---|---|---|---|
| BATCH ID: | 99032744 | SAMPLE ID: | PBA |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: 1.000E+00 | sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 033 |
| ACQ DATE: | 1-APR-1999 15:33 | AVERAGE EFFICIENCY: | 27.4% |
| ELAPSED LIVE TIME: | 80003. | RECOVERY: | 77.28% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 50.26 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:08 | EFF CAL DATE: | 30-MAR-1999 07:08 |
| BKG FILENAME: | B_033_30MAR99 | | |

NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ | sa | TPU/ERROR 2-SIGMA | MDC dpm/ | sa | CRIT LEVEL dpm/ | sa |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | 1.60 | 0.40 | 99.9 | 5.665E-03 | | 1.041E-02 | 2.001E-02 | | 1.480E-02 | |
| PU-239 | 5147.7 | 0.60 | 2.40 | 99.9 | 2.124E-03 | | 1.409E-02 | 3.510E-02 | | 2.235E-02 | |
| PU242 | 4890.7 | 2597.60 | 2.40 | 100.4 | 9.151E+00 | | 4.276E-01 | 3.492E-02 | | 2.224E-02 | |

193

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.R]R_99032744$PBA_PU.CNF;3
Title : 033
Sample Title:
Start Time: 1-APR-1999 15:33: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.82849E+03
Real Time : 0 22:13:23.00 Sample ID : PBA Energy Slope : 3.46124E+00
Live Time : 0 22:13:23.00 Sample Type: PU Energy Quad : 0.00000E+00




(SECTION II)

62

194

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 13:15:44

63

Spectral File: ND_AMS_ARCHIVE_S:S_99032744$258181_PU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032744 | SAMPLE ID: | 258181 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.100E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 034 |
| ACQ DATE: | 1-APR-1999 15:41 | AVERAGE EFFICIENCY: | 22.4% |
| ELAPSED LIVE TIME: | 80000. | RECOVERY: | 68.50% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 23.93 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:10 | EFF CAL DATE: | 30-MAR-1999 07:10 |
| BKG FILENAME: | B_034_30MAR99 | | |

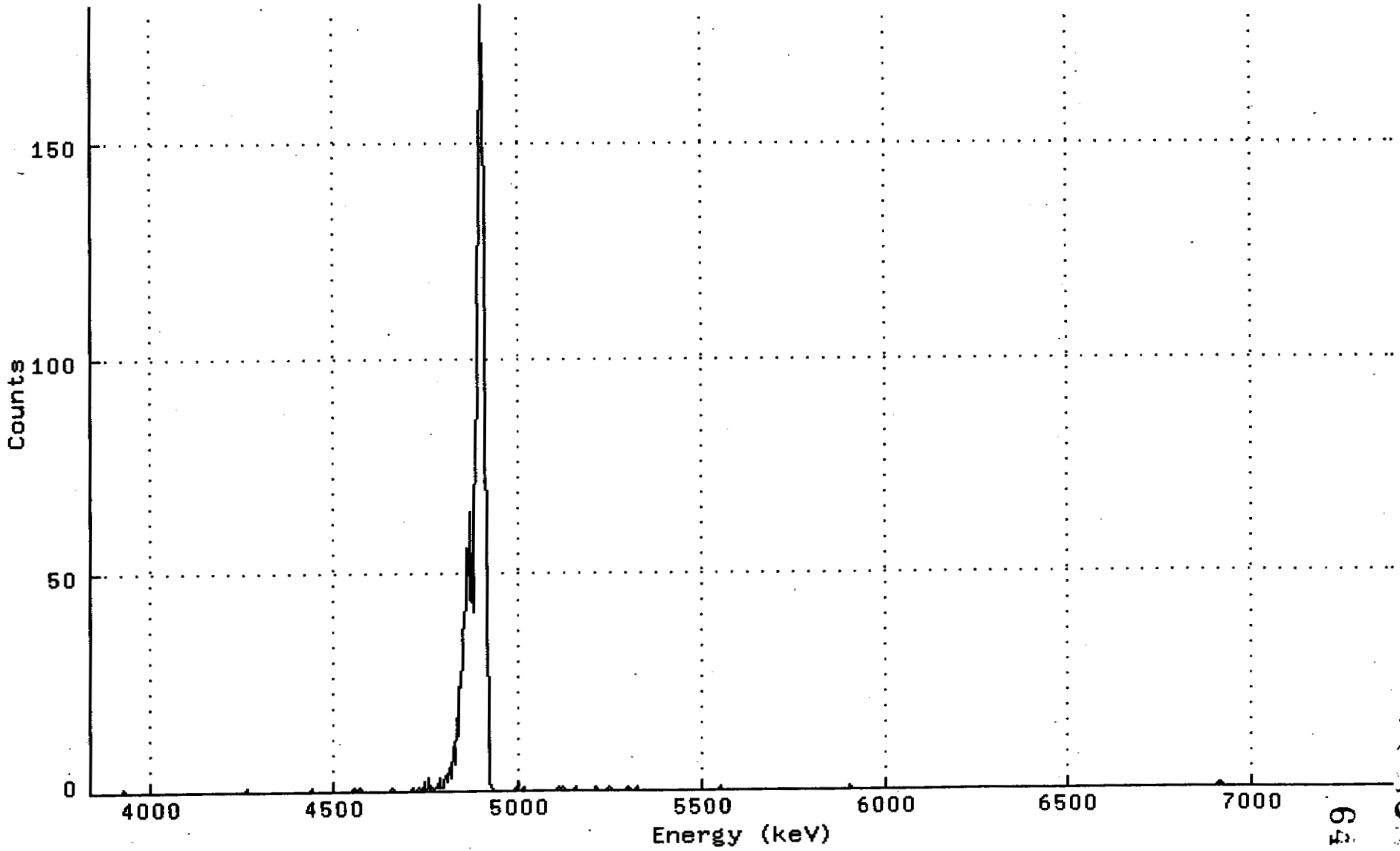
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ | sa | TPU/ERROR 2-SIGMA | MDC dpm/ | sa | CRIT LEVEL dpm/ | sa |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | 0.60 | 0.40 | 99.9 | 1.400E-01 | | 5.027E-01 | 1.319E+00 | | 9.755E-01 | |
| PU-239 | 5147.7 | 1.20 | 2.80 | 99.9 | 2.800E-01 | | 1.056E+00 | 2.448E+00 | | 1.540E+00 | |
| PU242 | 4890.7 | 1876.80 | 1.20 | 100.4 | 4.357E+02 | | 2.300E+01 | 1.812E+00 | | 1.221E+00 | |

*** RECOUNT SAMPLE CL > 0.067 ***

195

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032744$258181_PU.CNF;3
Title : 034
Sample Title:
Start Time: 1-APR-1999 15:41: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.82789E+03
Real Time : 0 22:13:21.00 Sample ID : 258181 Energy Slope : 3.46972E+00
Live Time : 0 22:13:20.00 Sample Type: PU Energy Quad : 0.00000E+00




196

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 13:15:57



Spectral File: ND_AMS_ARCHIVE_S:S_99032744$258182_PU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032744 | SAMPLE ID: | 258182 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.870E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 035 |
| ACQ DATE: | 1-APR-1999 15:42 | AVERAGE EFFICIENCY: | 25.9% |
| ELAPSED LIVE TIME: | 80004. | RECOVERY: | 64.29% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 23.80 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:11 | EFF CAL DATE: | 30-MAR-1999 07:11 |
| BKG FILENAME: | B_035_30MAR99 | | |

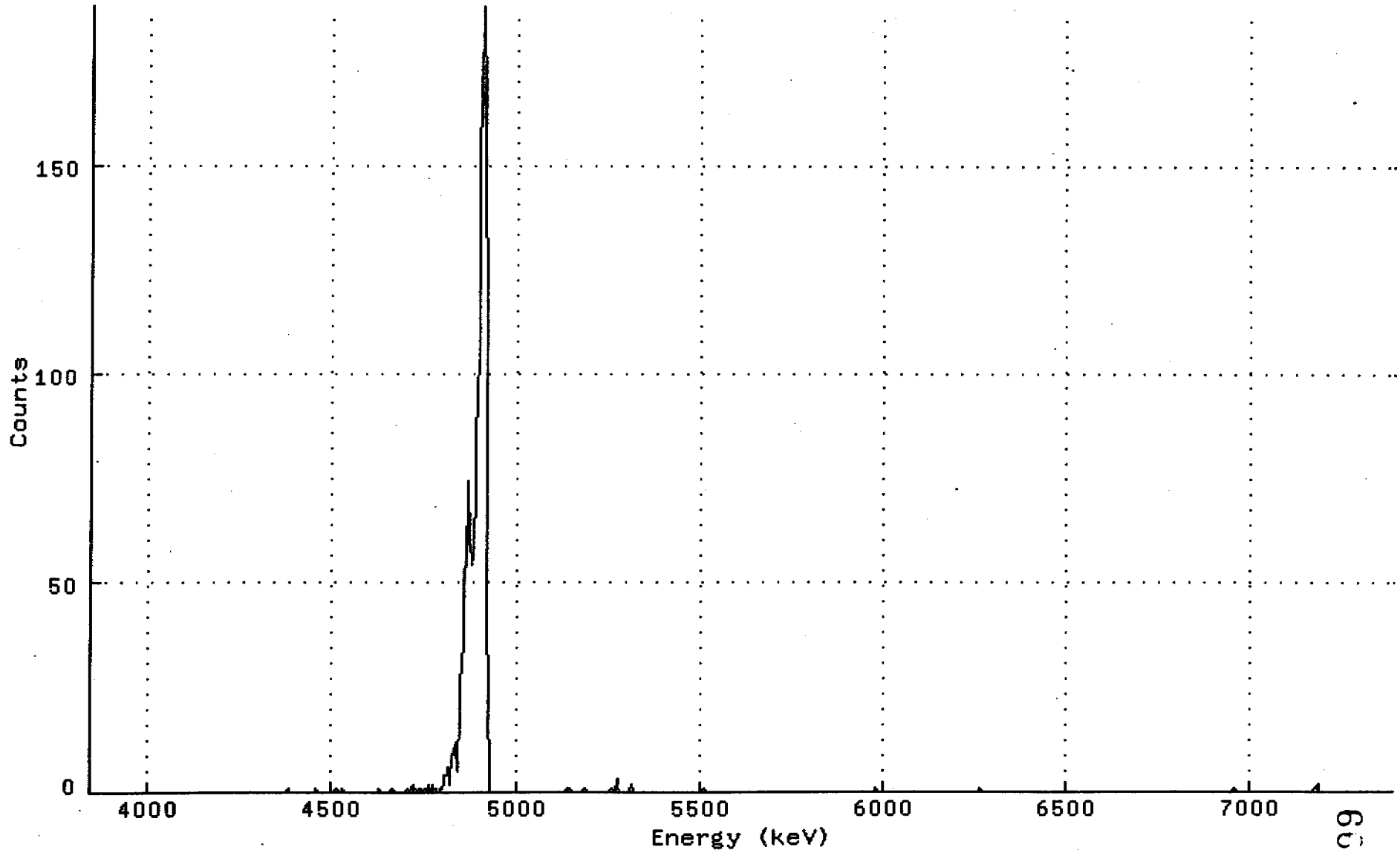
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | 0.20 | 0.80 | 99.9 | 4.823E-02 | 5.542E-01 | 1.657E+00 | 1.155E+00 |
| PU-239 | 5147.7 | 2.20 | 0.80 | 99.9 | 5.306E-01 | 8.794E-01 | 1.657E+00 | 1.155E+00 |
| PU242 | 4890.7 | 2039.20 | 0.80 | 100.4 | 4.893E+02 | 2.496E+01 | 1.648E+00 | 1.149E+00 |

*** RECOUNT SAMPLE CL > 0.067 ***

197

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032744$258182_PU.CNF;3
Title : 035
Sample Title:
Start Time: 1-APR-1999 15:42: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.83352E+03
Real Time : 0 22:13:24.00 Sample ID : 258182 Energy Slope : 3.46965E+00
Live Time : 0 22:13:24.00 Sample Type: PU Energy Quad : 0.00000E+00



WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 13:16:11

67

**********
Spectral File: ND_AMS_ARCHIVE_S:S_99032744$258183_PU.CNF
**********

| | | | |
|---|---|---|---|
| BATCH ID: | 99032744 | SAMPLE ID: | 258183 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.560E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 036 |
| ACQ DATE: | 1-APR-1999 15:42 | AVERAGE EFFICIENCY: | 23.5% |
| ELAPSED LIVE TIME: | 80000. | RECOVERY: | 73.18% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 27.92 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:13 | EFF CAL DATE: | 30-MAR-1999 07:13 |
| BKG FILENAME: | B_036_30MAR99 | | |

**********

NUCLIDE ACTIVITY SUMMARY

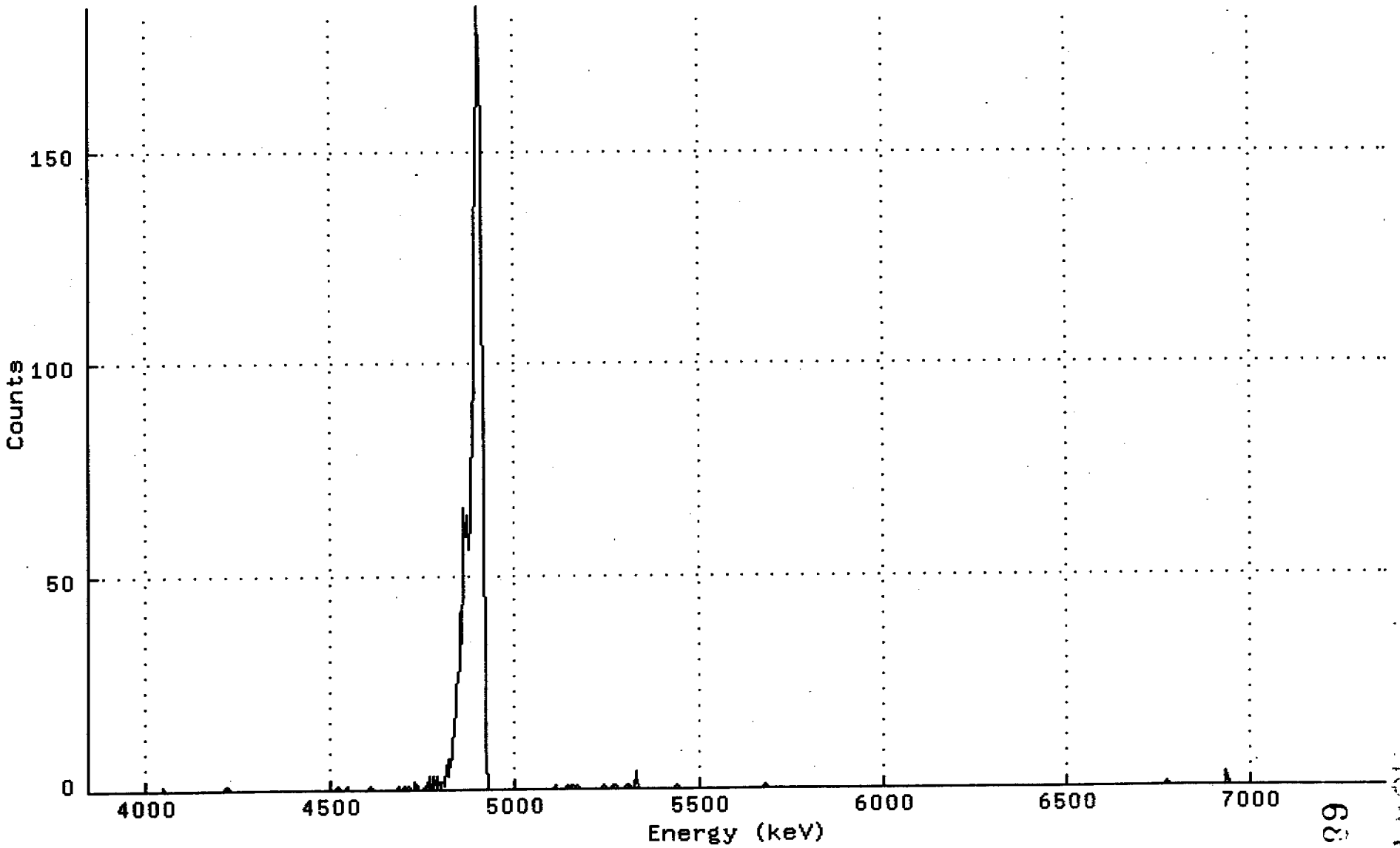
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | 0.60 | 0.40 | 99.9 | 1.676E-01 | 6.019E-01 | 1.579E+00 | 1.168E+00 |
| PU-239 | 5147.7 | 3.80 | 1.20 | 99.9 | 1.062E+00 | 1.309E+00 | 2.180E+00 | 1.469E+00 |
| PU242 | 4890.7 | 2110.20 | 0.80 | 100.4 | 5.866E+02 | 2.956E+01 | 1.909E+00 | 1.331E+00 |

**********

*** RECOUNT SAMPLE CL > 0.067 ***

199

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032744$258183_PU.CNF;3
Title : 036
Sample Title:
Start Time: 1-APR-1999 15:42: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.83490E+03
Real Time : 0 22:13:20.00 Sample ID : 258183 Energy Slope : 3.44567E+00
Live Time : 0 22:13:20.00 Sample Type: PU Energy Quad : 0.00000E+00




200

63

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 13:16:26

69

Spectral File: ND_AMS_ARCHIVE_S:S_99032744$258184_PU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032744 | SAMPLE ID: | 258184 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.350E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 037 |
| ACQ DATE: | 1-APR-1999 15:42 | AVERAGE EFFICIENCY: | 22.9% |
| ELAPSED LIVE TIME: | 80003. | RECOVERY: | 77.74% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 29.57 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:14 | EFF CAL DATE: | 30-MAR-1999 07:14 |
| BKG FILENAME: | B_037_30MAR99 | | |

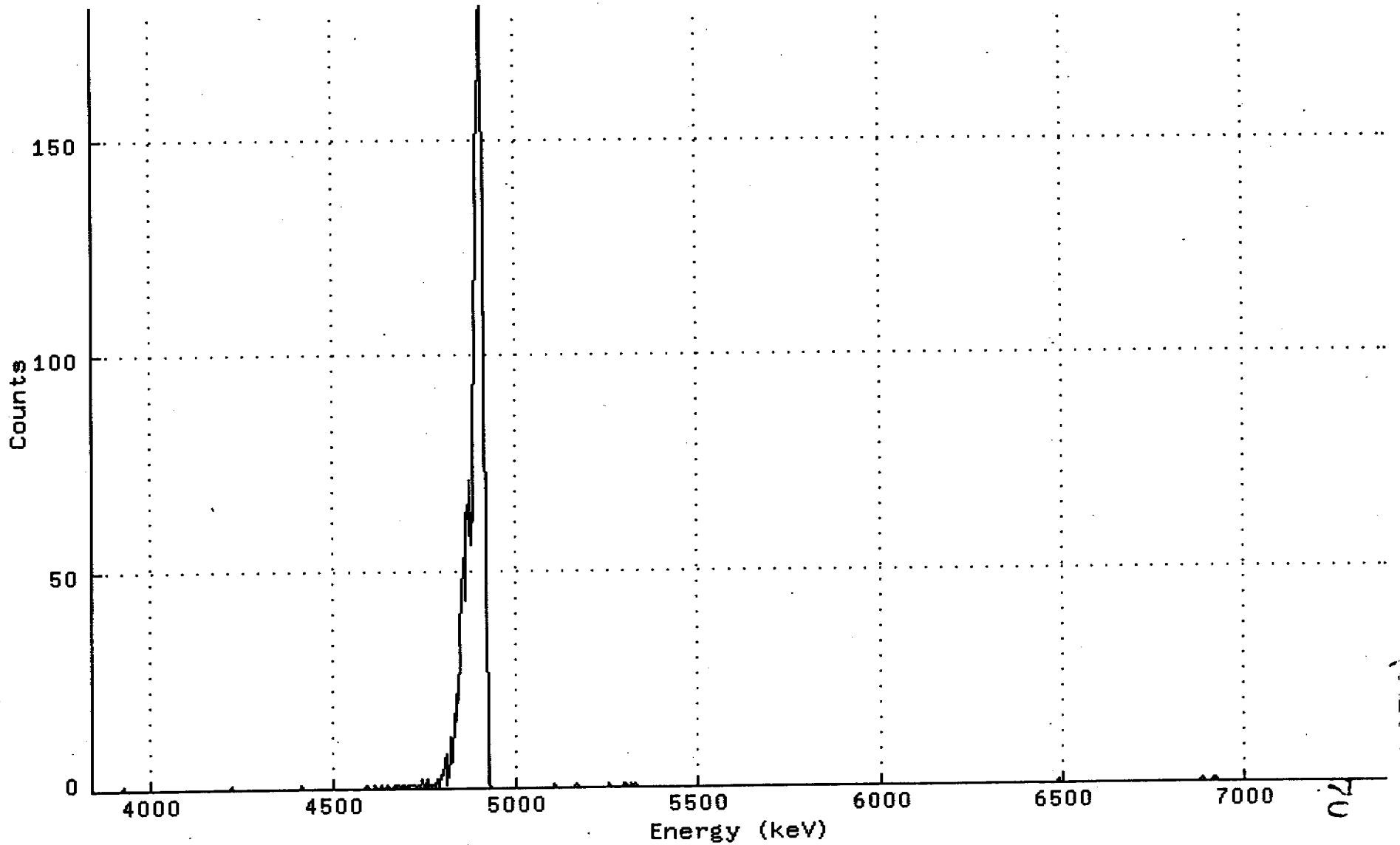
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | -0.80 | 0.80 | 99.9 | -2.504E-01 | 3.544E-01 | 2.150E+00 | 1.499E+00 |
| PU-239 | 5147.7 | 1.20 | 0.80 | 99.9 | 3.756E-01 | 9.537E-01 | 2.150E+00 | 1.499E+00 |
| PU242 | 4890.7 | 2176.60 | 0.40 | 100.4 | 6.778E+02 | 3.384E+01 | 1.760E+00 | 1.302E+00 |

*** RECOUNT SAMPLE CL > 0.067 ***

201

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032744$258184_PU.CNF;3
Title : 037
Sample Title:
Start Time: 1-APR-1999 15:42: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.83056E+03
Real Time : 0 22:13:23.00 Sample ID : 258184 Energy Slope : 3.46883E+00
Live Time : 0 22:13:23.00 Sample Type: PU Energy Quad : 0.00000E+00




202

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 13:16:42

SECTION III
71

Spectral File: ND_AMS_ARCHIVE_S:S_99032744$258185_PU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032744 | SAMPLE ID: | 258185 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.690E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 038 |
| ACQ DATE: | 1-APR-1999 15:43 | AVERAGE EFFICIENCY: | 22.2% |
| ELAPSED LIVE TIME: | 80000. | RECOVERY: | 69.00% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 28.79 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:15 | EFF CAL DATE: | 30-MAR-1999 07:15 |
| BKG FILENAME: | B_038_30MAR99 | | |

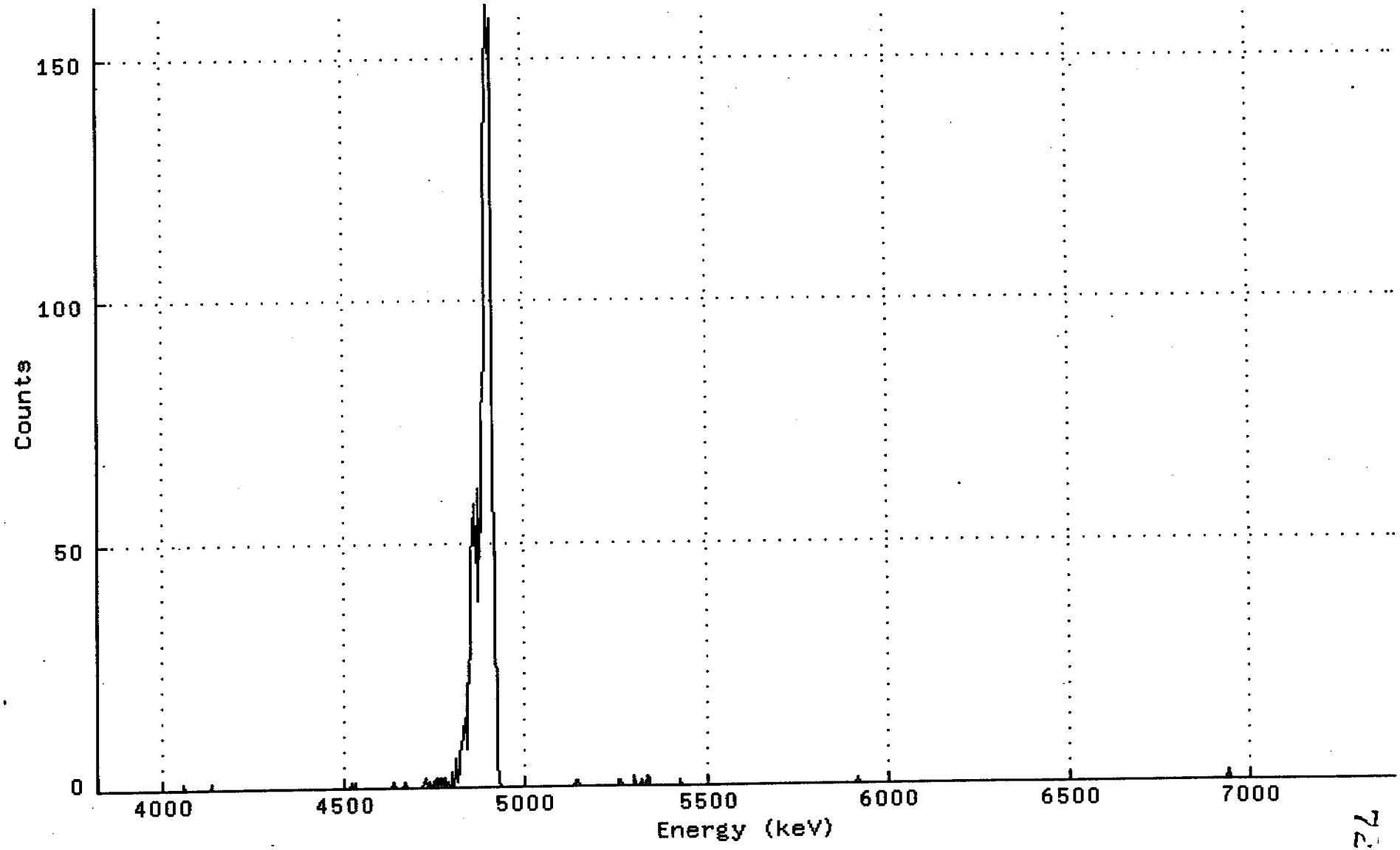
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | 0.20 | 0.80 | 99.9 | 5.789E-02 | 6.651E-01 | 1.988E+00 | 1.386E+00 |
| PU-239 | 5147.7 | 0.80 | 1.20 | 99.9 | 2.315E-01 | 9.117E-01 | 2.259E+00 | 1.521E+00 |
| PU242 | 4890.7 | 1880.20 | 0.80 | 100.4 | 5.415E+02 | 2.860E+01 | 1.978E+00 | 1.379E+00 |

*** RECOUNT SAMPLE CL > 0.067 ***

203

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032744$258185_PU.CNF;3
Title : 038
Sample Title:
Start Time: 1-APR-1999 15:43: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.80963E+03
Real Time : 0 22:13:20.00 Sample ID : 258185 Energy Slope : 3.49740E+00
Live Time : 0 22:13:20.00 Sample Type: PU Energy Quad : 0.00000E+00

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204

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 13:16:56

73

**********
pectral File: ND_AMS_ARCHIVE_S:S_99032744$258186_PU.CNF
**********

| | | | |
|---|---|---|---|
| ATCH ID: | 99032744 | SAMPLE ID: | 258186 |
| AMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.480E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 039 |
| ACQ DATE: | 1-APR-1999 15:43 | AVERAGE EFFICIENCY: | 23.2% |
| LAPSED LIVE TIME: | 80002. | RECOVERY: | 69.01% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 32.37 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| ORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL:. | 4.65 |
| AMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:17 | EFF CAL DATE: | 30-MAR-1999 07:17 |
| KG FILENAME: | B_039_30MAR99 | | |

**********

NUCLIDE ACTIVITY SUMMARY

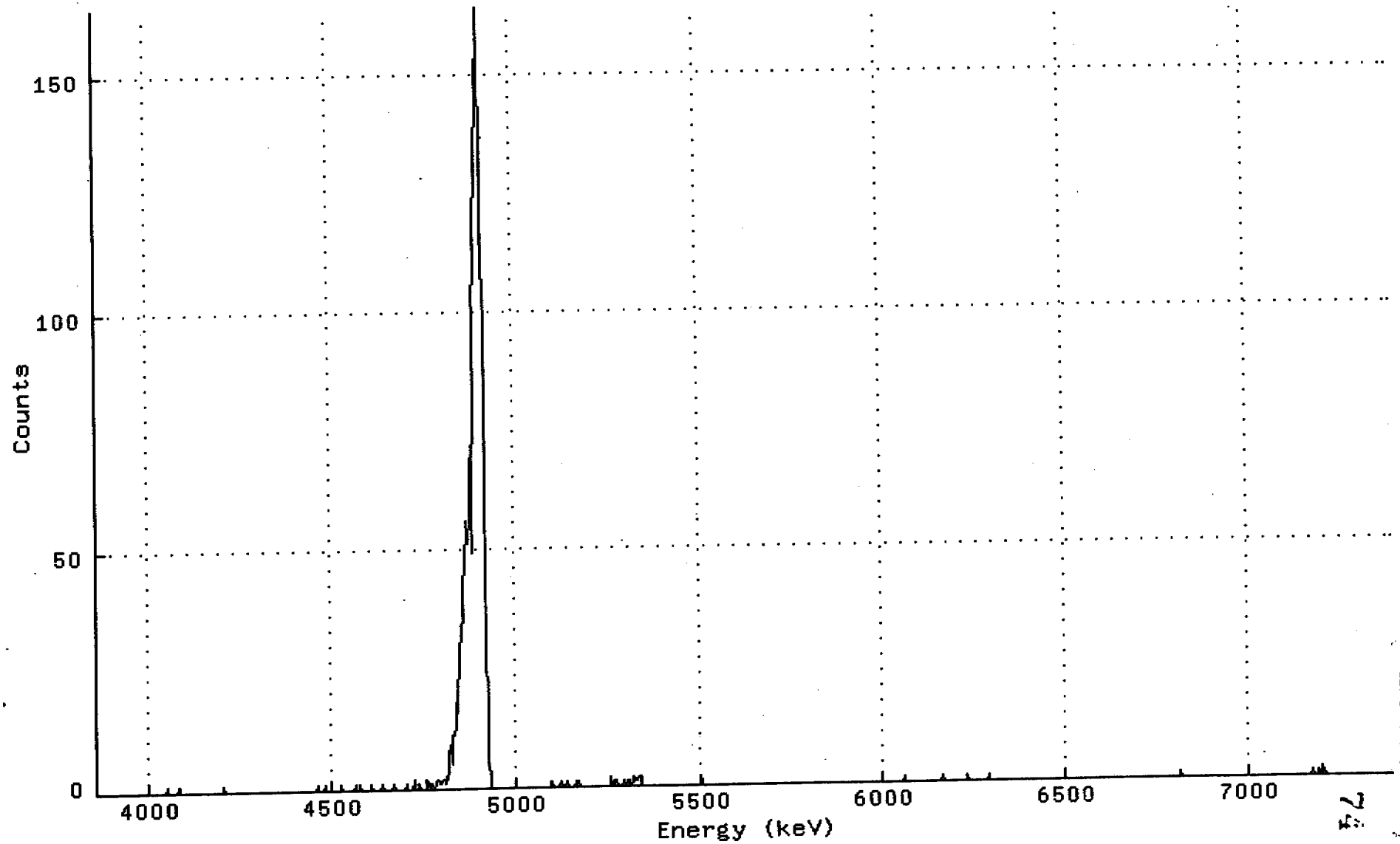
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| U-238 | 5487.1 | -0.60 | 1.60 | 99.9 | -1.134E-01 | 4.841E-01 | 1.624E+00 | 1.068E+00 |
| U-239 | 5147.7 | 2.20 | 2.80 | 99.9 | 4.158E-01 | 9.354E-01 | 1.983E+00 | 1.248E+00 |
| PU242 | 4890.7 | 1962.00 | 0.00 | 100.4 | 3.690E+02 | 1.914E+01 | 5.097E-01 | 5.097E-01 |

**********

*** RECOUNT SAMPLE CL > 0.067 ***

205

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032744$258186_PU.CNF;3
Title : 039
Sample Title:
Start Time: 1-APR-1999 15:43: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.85181E+03
Real Time : 0 22:13:22.00 Sample ID : 258186 Energy Slope : 3.45506E+00
Live Time : 0 22:13:22.00 Sample Type: PU Energy Quad : 0.00000E+00




206

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 13:17:10

(SECTION H)

75

**********
Spectral File: ND_AMS_ARCHIVE_S:S_99032744$258187_PU.CNF
**********

| | | | |
|---|---|---|---|
| BATCH ID: | 99032744 | SAMPLE ID: | 258187 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.830E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 040 |
| ACQ DATE: | 1-APR-1999 15:43 | AVERAGE EFFICIENCY: | 23.2% |
| ELAPSED LIVE TIME: | 80002. | RECOVERY: | 77.09% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 26.34 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:18 | EFF CAL DATE: | 30-MAR-1999 07:18 |
| BKG FILENAME: | B_040_30MAR99 | | |

**********

NUCLIDE ACTIVITY SUMMARY

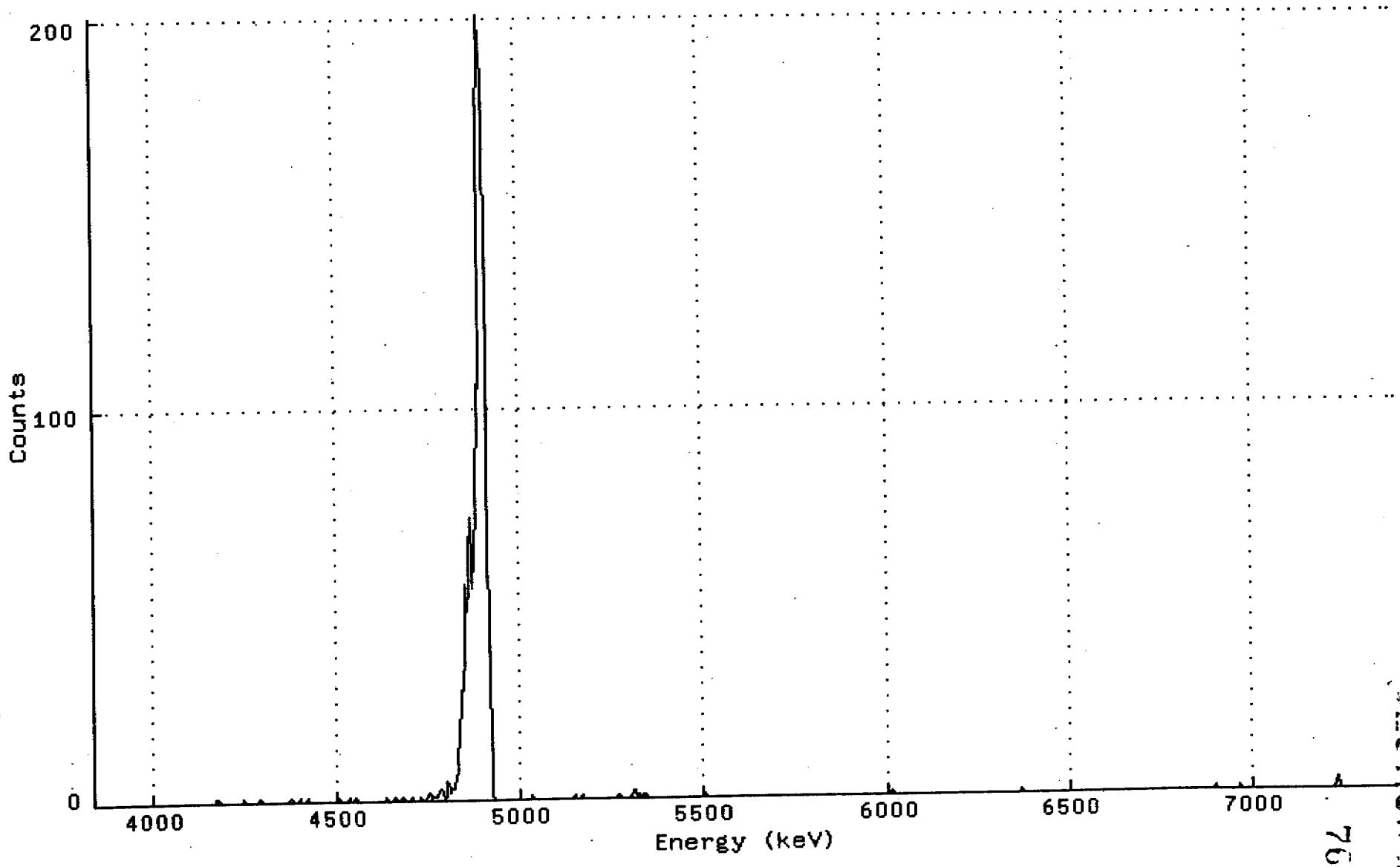
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | -0.20 | 1.20 | 99.9 | -2.970E-02 | 3.614E-01 | 1.159E+00 | 7.808E-01 |
| PU-239 | 5147.7 | 1.40 | 1.60 | 99.9 | 2.079E-01 | 5.668E-01 | 1.276E+00 | 8.393E-01 |
| PU242 | 4890.7 | 2188.00 | 2.00 | 100.4 | 3.233E+02 | 1.611E+01 | 1.372E+00 | 8.864E-01 |

**********

*** RECOUNT SAMPLE CL > 0.067 ***

207

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032744$258187_PU.CNF;3
Title : 040
Sample Title:
Start Time: 1-APR-1999 15:43: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.83002E+03
Real Time : 0 22:13:22.00 Sample ID : 258187 Energy Slope : 3.47052E+00
Live Time : 0 22:13:22.00 Sample Type: PU Energy Quad : 0.00000E+00




76

208

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 13:17:24



Spectral File: ND_AMS_ARCHIVE_S:S_99032744$258188_PU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032744 | SAMPLE ID: | 258188 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.890E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 041 |
| ACQ DATE: | 1-APR-1999 15:43 | AVERAGE EFFICIENCY: | 23.2% |
| ELAPSED LIVE TIME: | 80002. | RECOVERY: | 73.53% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 30.94 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:20 | EFF CAL DATE: | 30-MAR-1999 07:20 |
| BKG FILENAME: | B_041_30MAR99 | | |

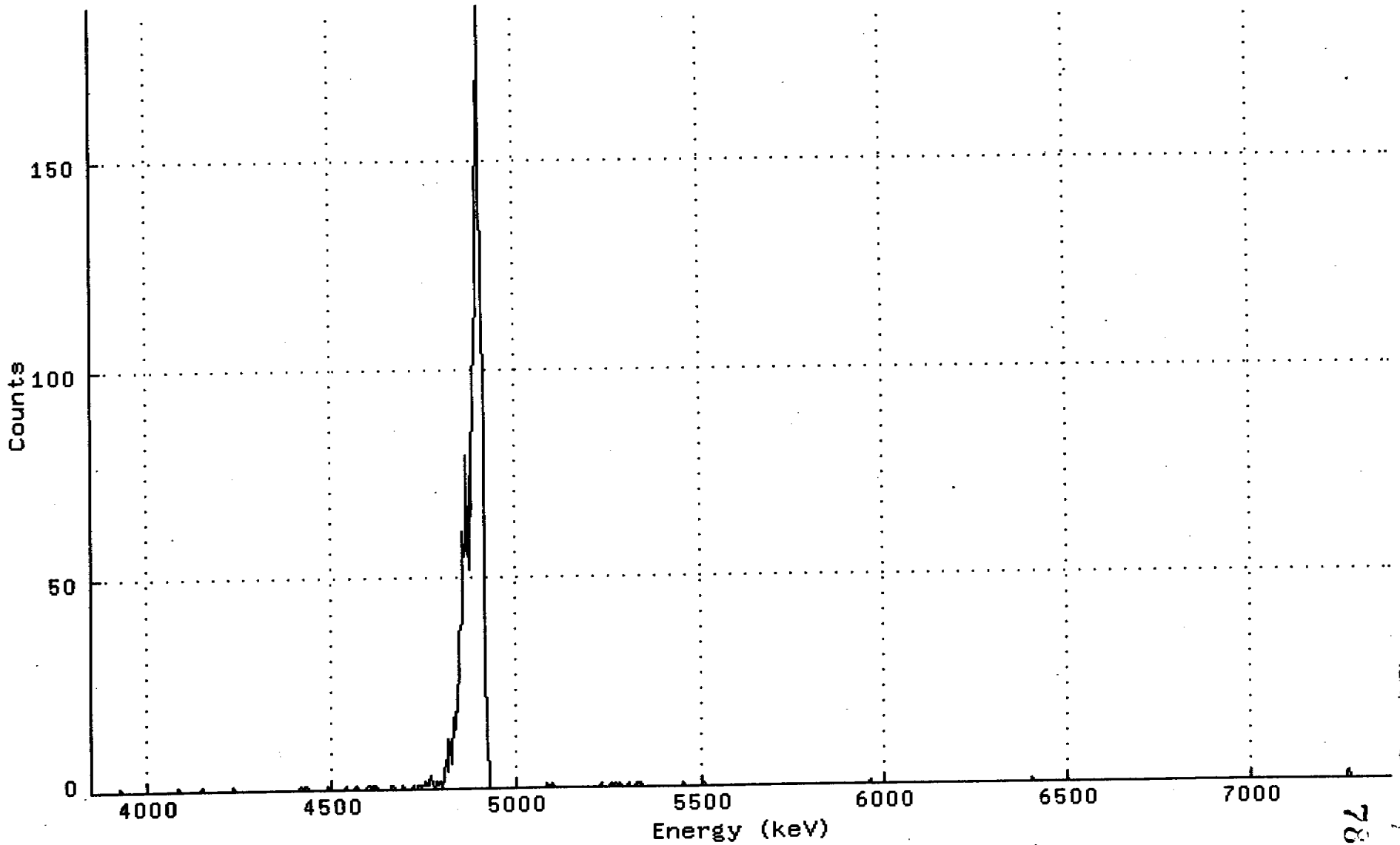
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | 0.80 | 1.20 | 99.9 | 1.864E-01 | 7.338E-01 | 1.818E+00 | 1.225E+00 |
| PU-239 | 5147.7 | -1.60 | 3.60 | 99.9 | -3.727E-01 | 8.644E-01 | 2.687E+00 | 1.659E+00 |
| PU242 | 4890.7 | 2088.80 | 1.20 | 100.4 | 4.842E+02 | 2.456E+01 | 1.809E+00 | 1.219E+00 |

*** RECOUNT SAMPLE CL > 0.067 ***

209

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032744$258188_PU.CNF;3
Title : 041
Sample Title:
Start Time: 1-APR-1999 15:43: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.83895E+03
Real Time : 0 22:13:22.00 Sample ID : 258188 Energy Slope : 3.45079E+00
Live Time : 0 22:13:22.00 Sample Type: PU Energy Quad : 0.00000E+00






210

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 13:17:42

79

Spectral File: ND_AMS_ARCHIVE_S:S_99032744$258189_PU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032744 | SAMPLE ID: | 258189 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 3.880E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 042 |
| ACQ DATE: | 1-APR-1999 15:44 | AVERAGE EFFICIENCY: | 23.9% |
| ELAPSED LIVE TIME: | 80001. | RECOVERY: | 70.12% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 26.49 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:21 | EFF CAL DATE: | 30-MAR-1999 07:21 |
| BKG FILENAME: | B_042_30MAR99 | | |

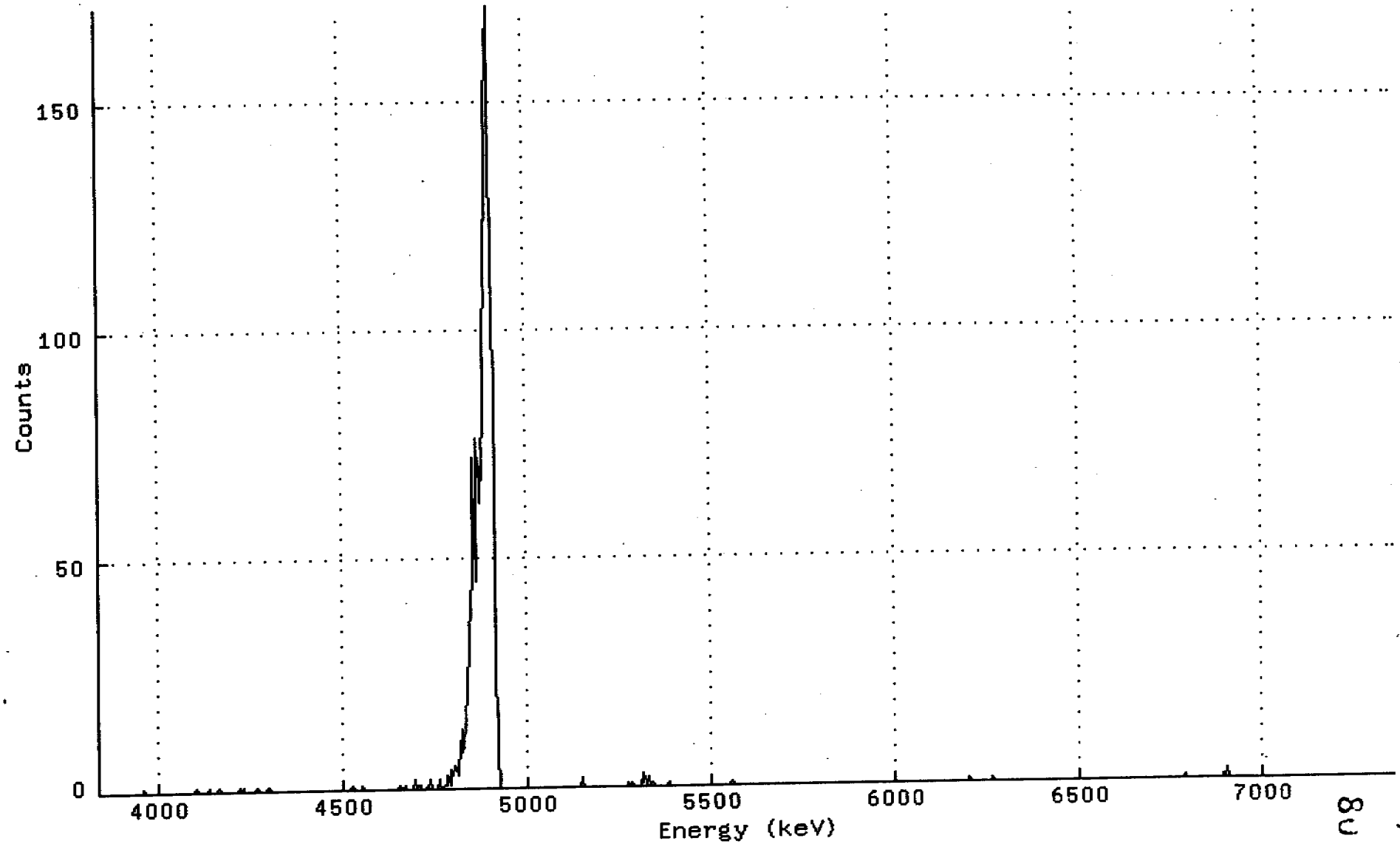
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | -0.20 | 1.20 | 99.9 | -2.305E-02 | 2.805E-01 | 8.995E-01 | 6.059E-01 |
| PU-239 | 5147.7 | 1.80 | 1.20 | 99.9 | 2.075E-01 | 4.302E-01 | 8.995E-01 | 6.059E-01 |
| PU242 | 4890.7 | 2056.40 | 1.60 | 100.4 | 2.358E+02 | 1.201E+01 | 9.854E-01 | 6.481E-01 |

*** RECOUNT SAMPLE CL > 0.067 ***

211

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032744$258189_PU.CNF;3
Title : 042
Sample Title:
Start Time: 1-APR-1999 15:44: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.83219E+03
Real Time : 0 22:13:21.00 Sample ID : 258189 Energy Slope : 3.43814E+00
Live Time : 0 22:13:21.00 Sample Type: PU Energy Quad : 0.00000E+00




2/2

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 13:18:49

81

Spectral File: ND_AMS_ARCHIVE_S:S_99032744$258190_PU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032744 | SAMPLE ID: | 258190 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.600E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 043 |
| ACQ DATE: | 1-APR-1999 15:44 | AVERAGE EFFICIENCY: | 23.0% |
| ELAPSED LIVE TIME: | 80003. | RECOVERY: | 75.95% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 32.18 |
| LAMBDA VALUE: | 100. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:22 | EFF CAL DATE: | 30-MAR-1999 07:22 |
| BKG FILENAME: | B_043_30MAR99 | | |

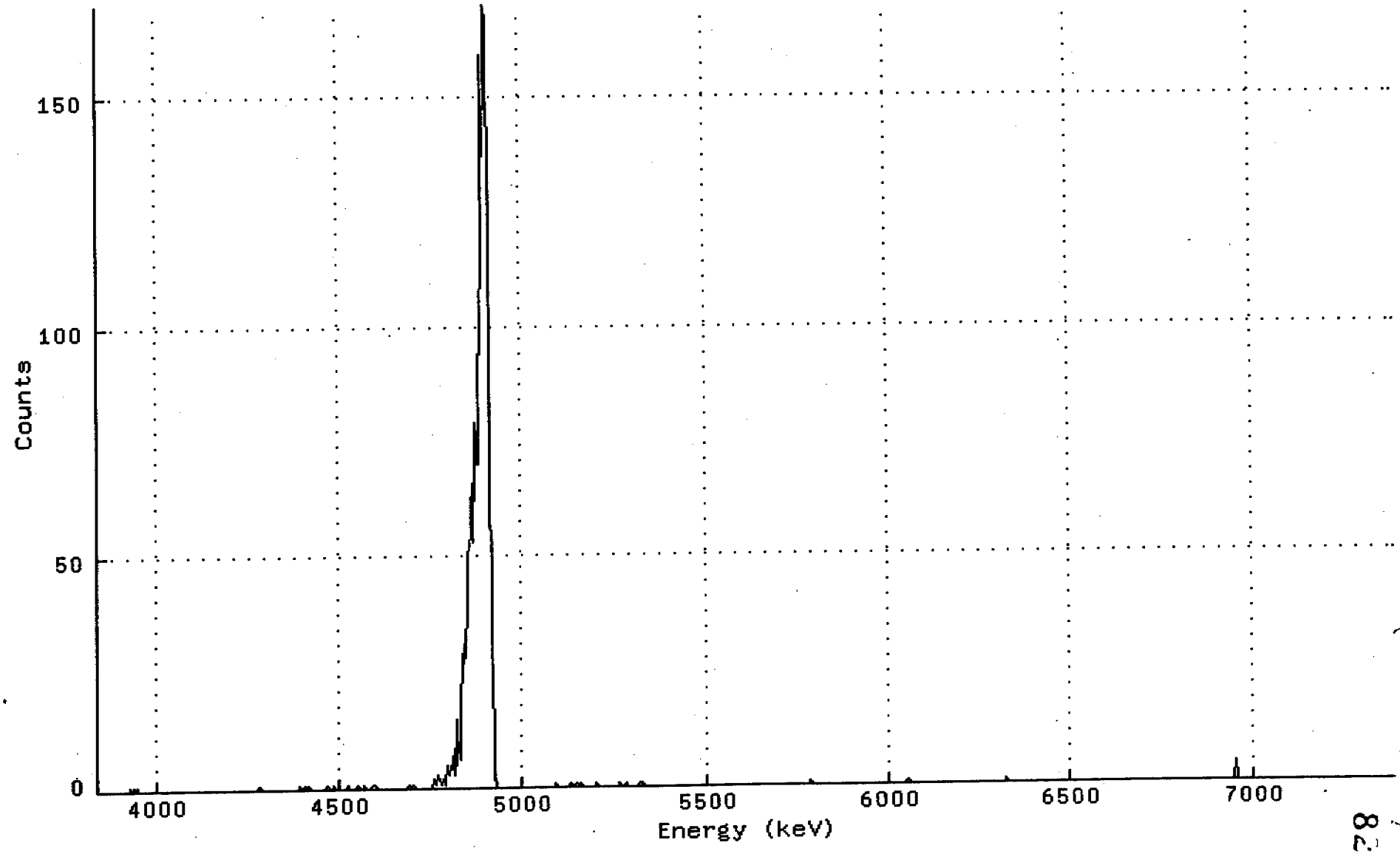
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | -1.20 | 1.20 | 99.9 | -3.221E-01 | 3.723E-01 | 2.094E+00 | 1.411E+00 |
| PU-239 | 5147.7 | 4.60 | 0.40 | 99.9 | 1.234E+00 | 1.221E+00 | 1.517E+00 | 1.122E+00 |
| PU242 | 4890.7 | 2141.80 | 1.20 | 100.4 | 5.719E+02 | 2.870E+01 | 2.084E+00 | 1.404E+00 |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

213

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032744$258190_PU.CNF;3
Title : 043
Sample Title:
Start Time: 1-APR-1999 15:44: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.83111E+03
Real Time : 0 22:13:23.00 Sample ID : 258190 Energy Slope : 3.46623E+00
Live Time : 0 22:13:23.00 Sample Type: PU Energy Quad : 0.00000E+00






214

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 13:14:11

85

Spectral File: ND_AMS_ARCHIVE_C:C_99032744$LCSWR33A_PU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032744 | SAMPLE ID: | LCSWR33A |
| SAMPLE DATE: | 1-JAN-1987 00:00 | ALIQUOT: | 2.500E-01 mL |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 044 |
| ACQ DATE: | 1-APR-1999 15:44 | AVERAGE EFFICIENCY: | 21.8% |
| ELAPSED LIVE TIME: | 80002. | RECOVERY: | 71.64% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 29.23 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:24 | EFF CAL DATE: | 30-MAR-1999 07:24 |
| BKG FILENAME: | B_044_30MAR99 | | |

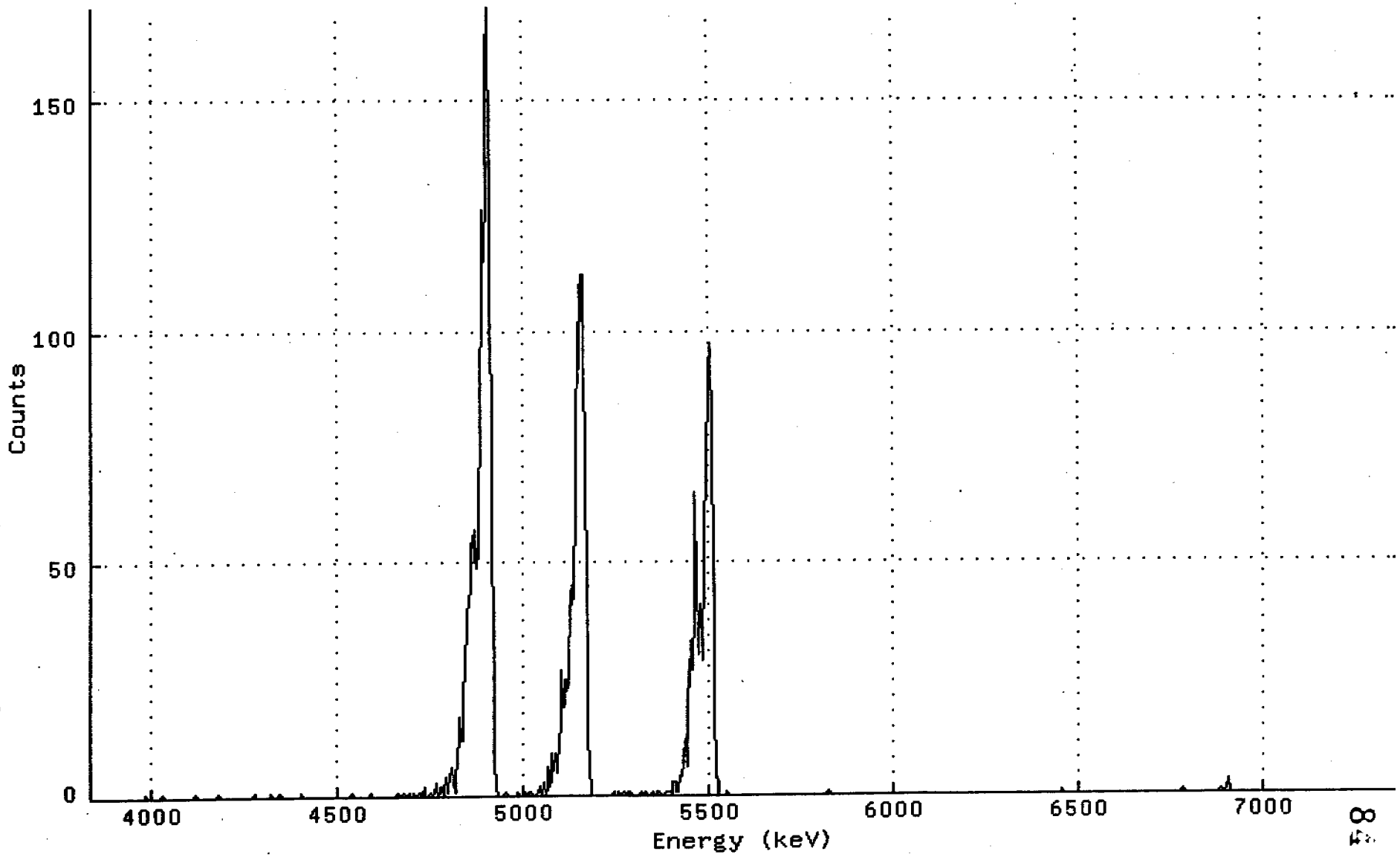
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY pCi/ mL | TPU/ERROR 2-SIGMA | MDC pCi/ mL | CRIT LEVEL pCi/ mL |
|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | 1138.00 | 0.00 | 99.9 | 1.085E+01 | 9.029E-01 | 2.345E-02 | 2.345E-02 |
| PU-239 | 5147.7 | 1314.60 | 0.40 | 99.9 | 1.138E+01 | 9.143E-01 | 4.891E-02 | 3.618E-02 |
| PU242 | 4890.7 | 1914.60 | 0.40 | 100.4 | 1.649E+01 | 8.646E-01 | 4.866E-02 | 3.600E-02 |

*** POSITIVE ***

215

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.C]C_99032744$LCSWR33A_PU.CNF;5
Title : 044
Sample Title:
Start Time: 1-APR-1999 15:44: Sample Time: 1-JAN-1987 00:00: Energy Offset: 3.82541E+03
Real Time : 0 22:13:22.00 Sample ID : LCSWR33A Energy Slope : 3.44193E+00
Live Time : 0 22:13:22.00 Sample Type: PU Energy Quad : 0.00000E+00

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WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 13:15:27

85

Spectral File: ND_AMS_ARCHIVE_S:S_99032744$258181D_PU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032744 | SAMPLE ID: | 258181D |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.100E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 045 |
| ACQ DATE: | 1-APR-1999 15:45 | AVERAGE EFFICIENCY: | 24.0% |
| ELAPSED LIVE TIME: | 80002. | RECOVERY: | 75.97% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 27.67 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:26 | EFF CAL DATE: | 30-MAR-1999 07:26 |
| BKG FILENAME: | B_045_30MAR99 | | |

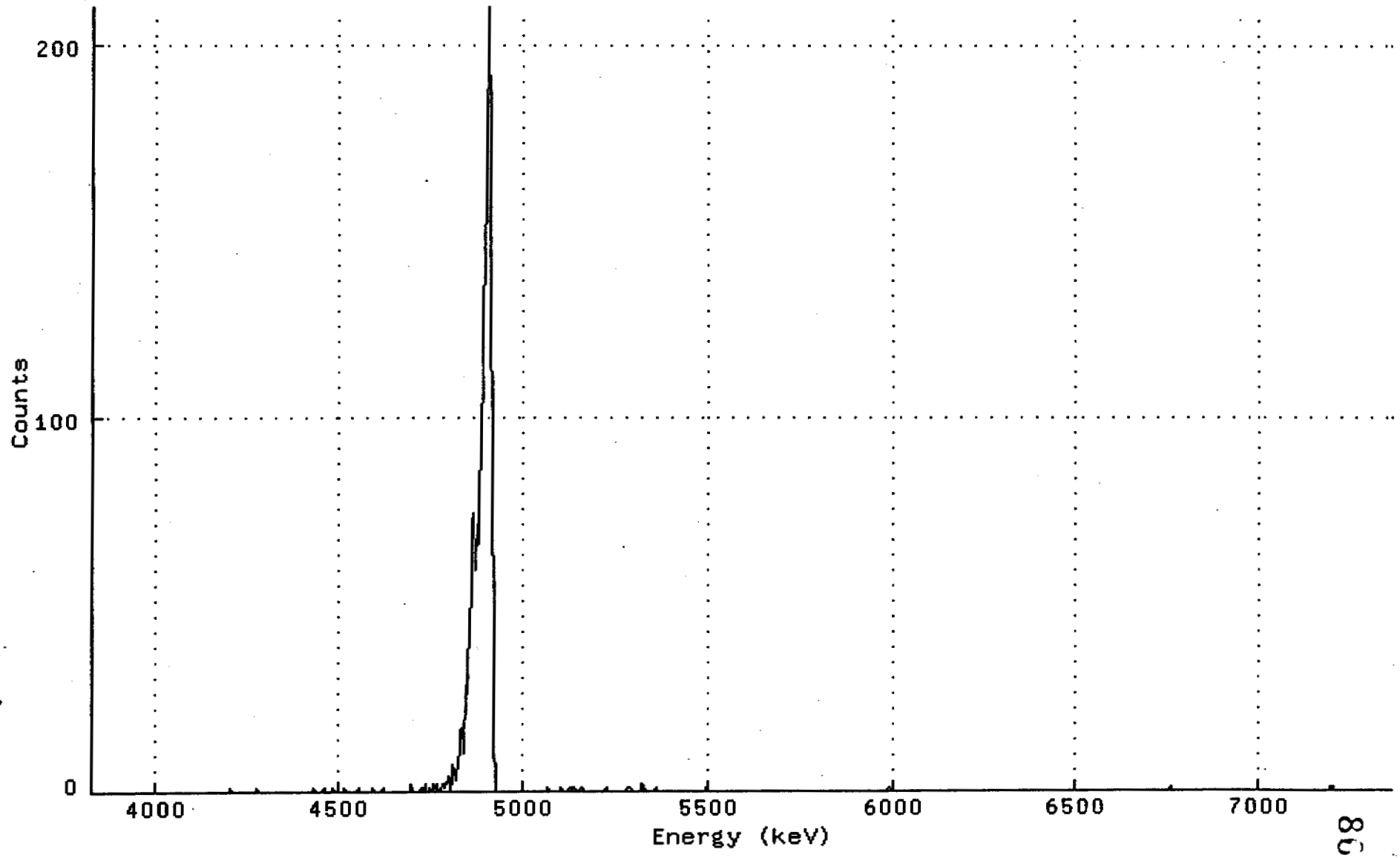
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | 0.20 | 0.80 | 99.9 | 3.923E-02 | 4.508E-01 | 1.348E+00 | 9.396E-01 |
| PU-239 | 5147.7 | 4.40 | 1.60 | 99.9 | 8.631E-01 | 1.012E+00 | 1.685E+00 | 1.109E+00 |
| PU242 | 4890.7 | 2232.40 | 1.60 | 100.4 | 4.357E+02 | 2.155E+01 | 1.677E+00 | 1.103E+00 |

*** RECOUNT SAMPLE CL > 0.067 ***

217

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032744$258181D_PU.CNF;7
Title : 045
Sample Title:
Start Time: 1-APR-1999 15:45: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.82067E+03
Real Time : 0 22:13:22.00 Sample ID : 258181D Energy Slope : 3.45334E+00
Live Time : 0 22:13:22.00 Sample Type: PU Energy Quad : 0.00000E+00






2/8

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 13:19:54

87

**********
Spectral File: ND_AMS_ARCHIVE_S:S_99032744$258192_PU.CNF
**********

| | | | |
|---|---|---|---|
| BATCH ID: | 99032744 | SAMPLE ID: | 258192 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.260E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 047 |
| ACQ DATE: | 1-APR-1999 15:46 | AVERAGE EFFICIENCY: | 23.6% |
| ELAPSED LIVE TIME: | 80000. | RECOVERY: | 71.25% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 30.64 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:28 | EFF CAL DATE: | 30-MAR-1999 07:28 |
| BKG FILENAME: | B_047_30MAR99 | | |

**********

NUCLIDE ACTIVITY SUMMARY

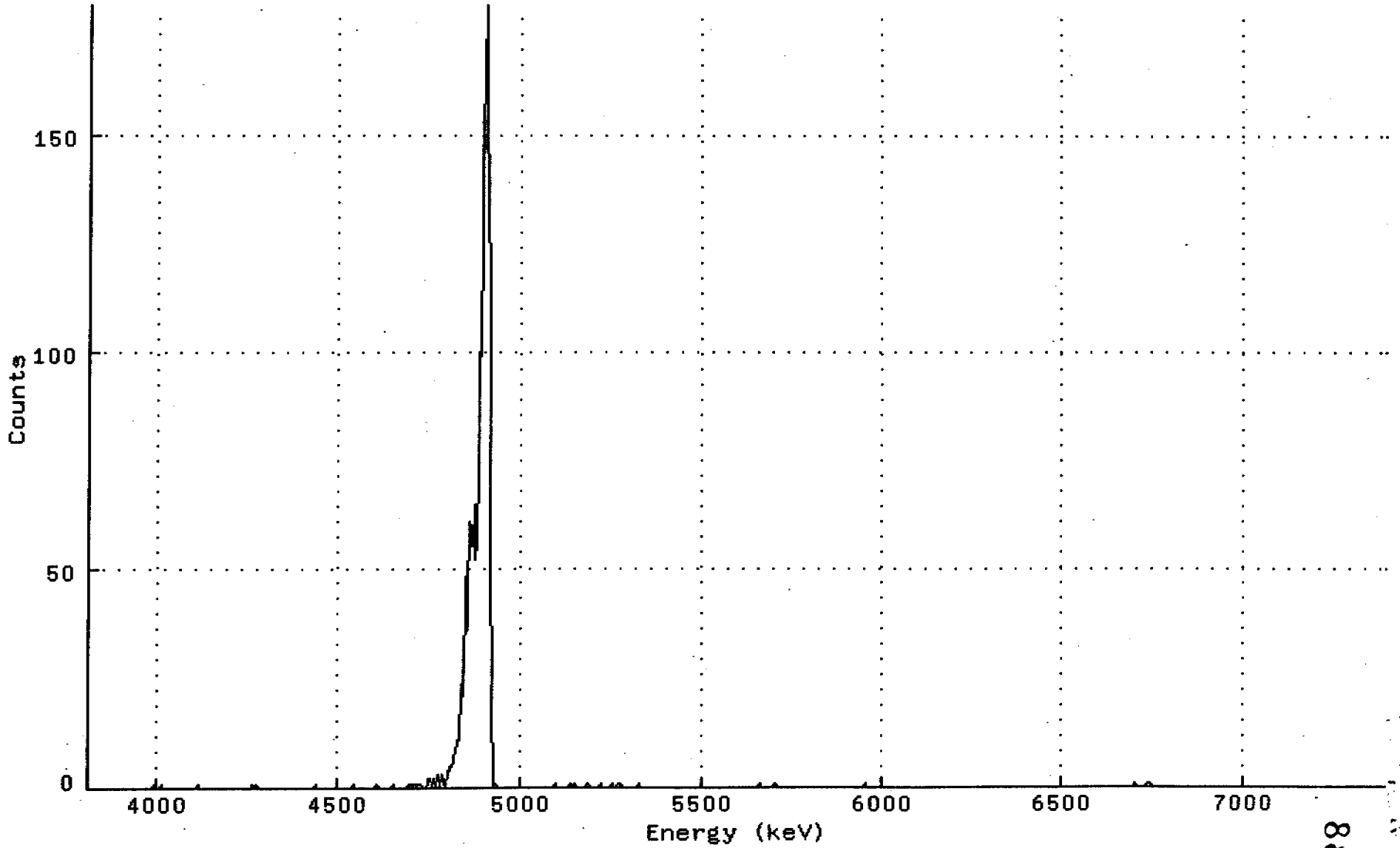
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | -1.20 | 1.20 | 99.9 | -2.373E-01 | 2.743E-01 | 1.543E+00 | 1.040E+00 |
| PU-239 | 5147.7 | 2.80 | 1.20 | 99.9 | 5.537E-01 | 8.377E-01 | 1.543E+00 | 1.040E+00 |
| PU242 | 4890.7 | 2057.80 | 1.20 | 100.4 | 4.049E+02 | 2.063E+01 | 1.535E+00 | 1.034E+00 |

**********

*** RECOUNT SAMPLE CL > 0.067 ***

219

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032744$258192_PU.CNF;2
Title : 047
Sample Title:
Start Time: 1-APR-1999 15:46: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.80045E+03
Real Time : 0 22:13:20.00 Sample ID : 258192 Energy Slope : 3.50546E+00
Live Time : 0 22:13:20.00 Sample Type: PU Energy Quad : 0.00000E+00




88

220

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 13:20:14



Spectral File: ND_AMS_ARCHIVE_S:S_99032744$258193_PU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032744 | SAMPLE ID: | 258193 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.560E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 048 |
| ACQ DATE: | 1-APR-1999 15:46 | AVERAGE EFFICIENCY: | 23.8% |
| ELAPSED LIVE TIME: | 80002. | RECOVERY: | 65.47% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 22.33 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:30 | EFF CAL DATE: | 30-MAR-1999 07:30 |
| BKG FILENAME: | B_048_30MAR99 | | |

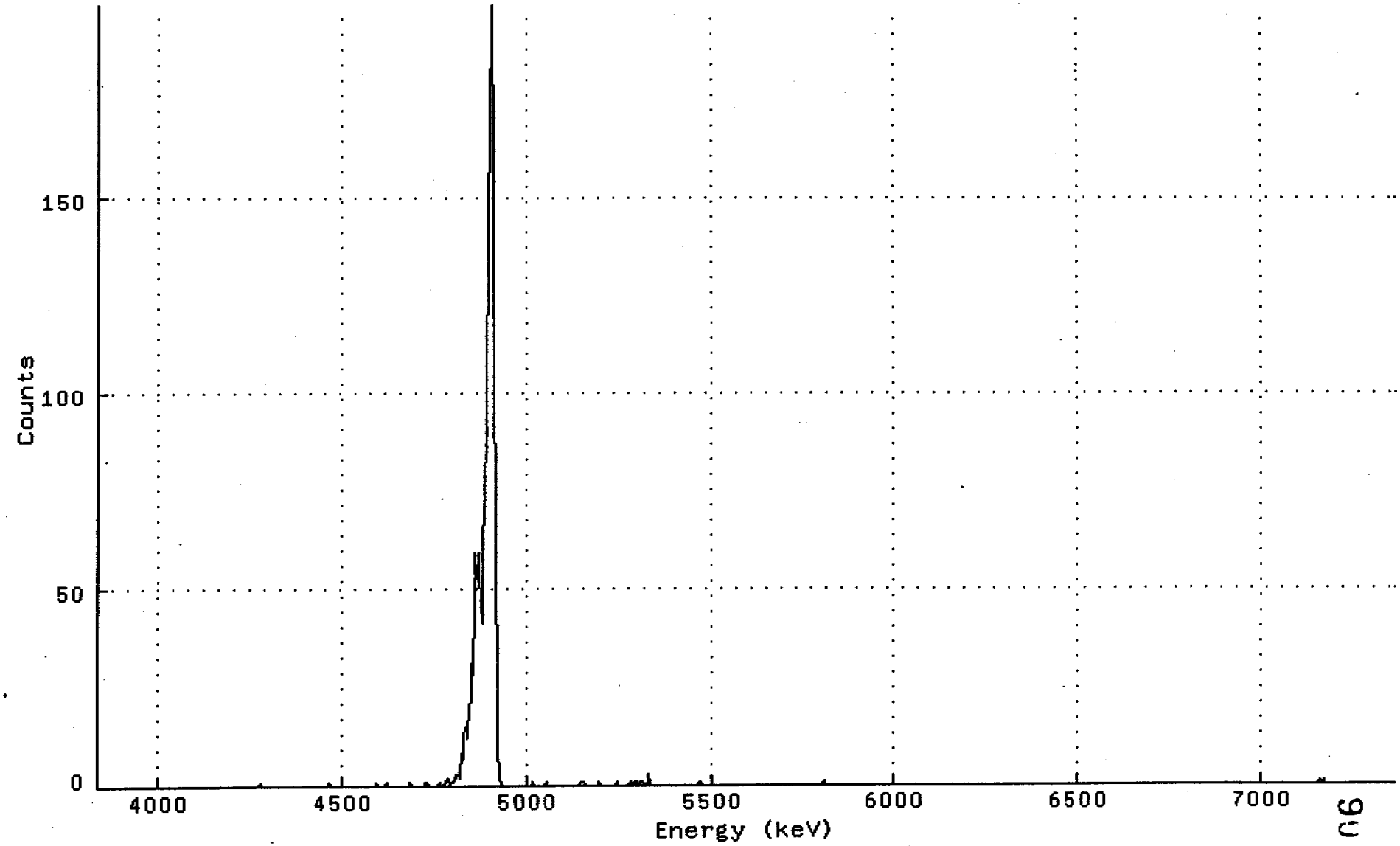
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | 1.00 | 0.00 | 99.9 | 1.883E-01 | 3.768E-01 | 5.103E-01 | 5.103E-01 |
| PU-239 | 5147.7 | 3.00 | 2.00 | 99.9 | 5.649E-01 | 9.076E-01 | 1.749E+00 | 1.129E+00 |
| PU242 | 4890.7 | 1907.80 | 1.20 | 100.4 | 3.574E+02 | 1.873E+01 | 1.462E+00 | 9.849E-01 |

*** RECOUNT SAMPLE CL > 0.067 ***

221

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032744$258193_PU.CNF;2
Title : 048
Sample Title:
Start Time: 1-APR-1999 15:46: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.82364E+03
Real Time : 0 22:13:22.00 Sample ID : 258193 Energy Slope : 3.44986E+00
Live Time : 0 22:13:22.00 Sample Type: PU Energy Quad : 0.00000E+00




90

222

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 13:23:29

91

Spectral File: ND_AMS_ARCHIVE_S:S_99032744$258194_PU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032744 | SAMPLE ID: | 258194 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 8.700E-03 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 033 |
| ACQ DATE: | 2-APR-1999 14:08 | AVERAGE EFFICIENCY: | 27.4% |
| ELAPSED LIVE TIME: | 80008. | RECOVERY: | 78.11% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 26.15 |
| LAMBDA VALUE: | 100. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL:. | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:08 | EFF CAL DATE: | 30-MAR-1999 07:08 |
| BKG FILENAME: | B_033_30MAR99 | | |

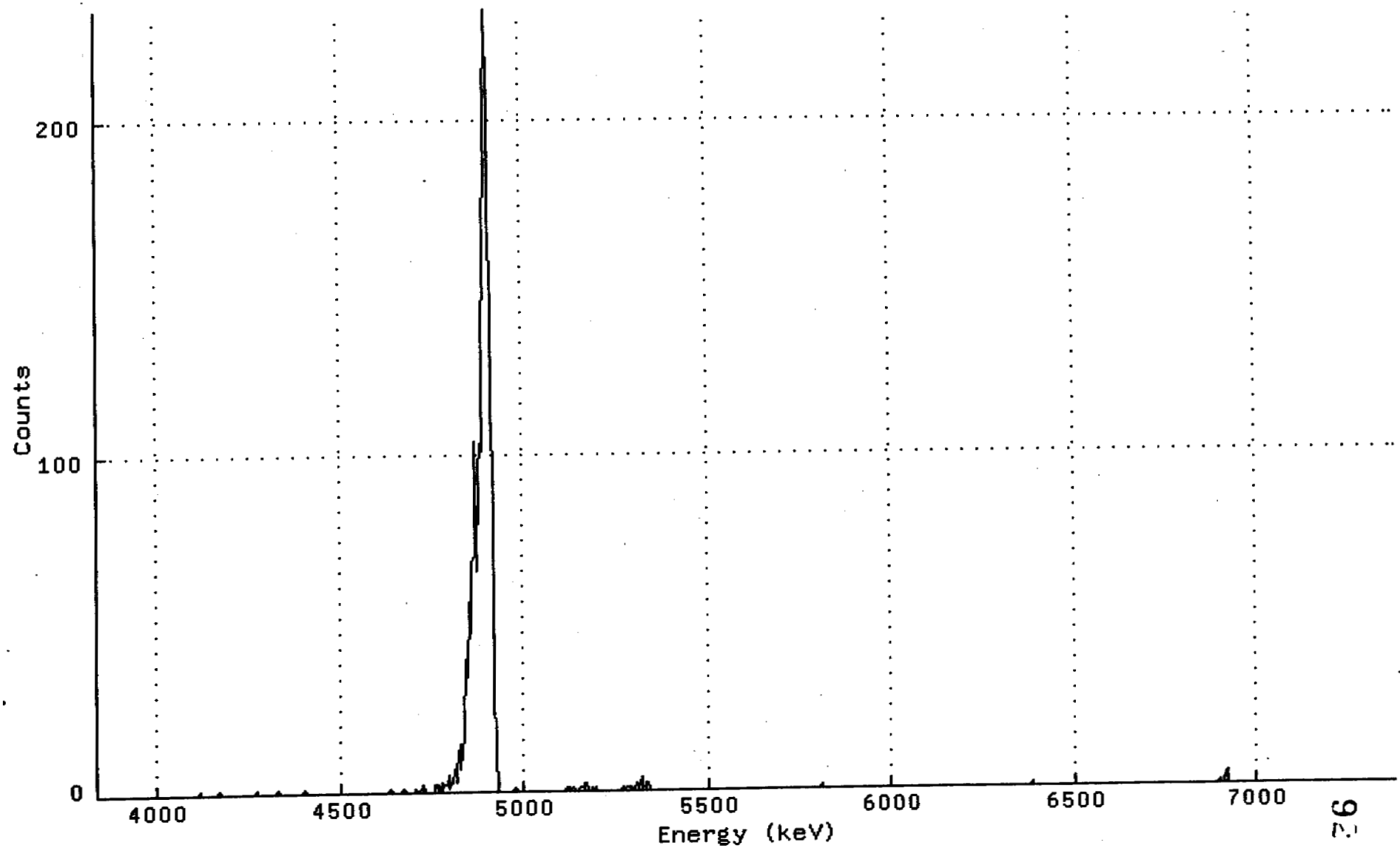
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | -0.40 | 0.40 | 99.9 | -1.611E-01 | 3.222E-01 | 2.275E+00 | 1.683E+00 |
| PU-239 | 5147.7 | 10.00 | 2.00 | 99.9 | 4.026E+00 | 2.889E+00 | 3.739E+00 | 2.415E+00 |
| PU242 | 4890.7 | 2625.60 | 2.40 | 100.4 | 1.052E+03 | 4.896E+01 | 3.972E+00 | 2.529E+00 |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

223

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032744$258194_PU.CNF;2
Title : 033
Sample Title:
Start Time: 2-APR-1999 14:08: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.82849E+03
Real Time : 0 22:13:28.00 Sample ID : 258194 Energy Slope : 3.46124E+00
Live Time : 0 22:13:28.00 Sample Type: PU Energy Quad : 0.00000E+00




(SECTION II)

92

224

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 13:24:08



Spectral File: ND_AMS_ARCHIVE_S:S_99032744$258195_PU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032744 | SAMPLE ID: | 258195 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.170E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 034 |
| ACQ DATE: | 2-APR-1999 14:09 | AVERAGE EFFICIENCY: | 22.4% |
| ELAPSED LIVE TIME: | 80004. | RECOVERY: | 67.22% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 27.07 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:10 | EFF CAL DATE: | 30-MAR-1999 07:10 |
| BKG FILENAME: | B_034_30MAR99 | | |

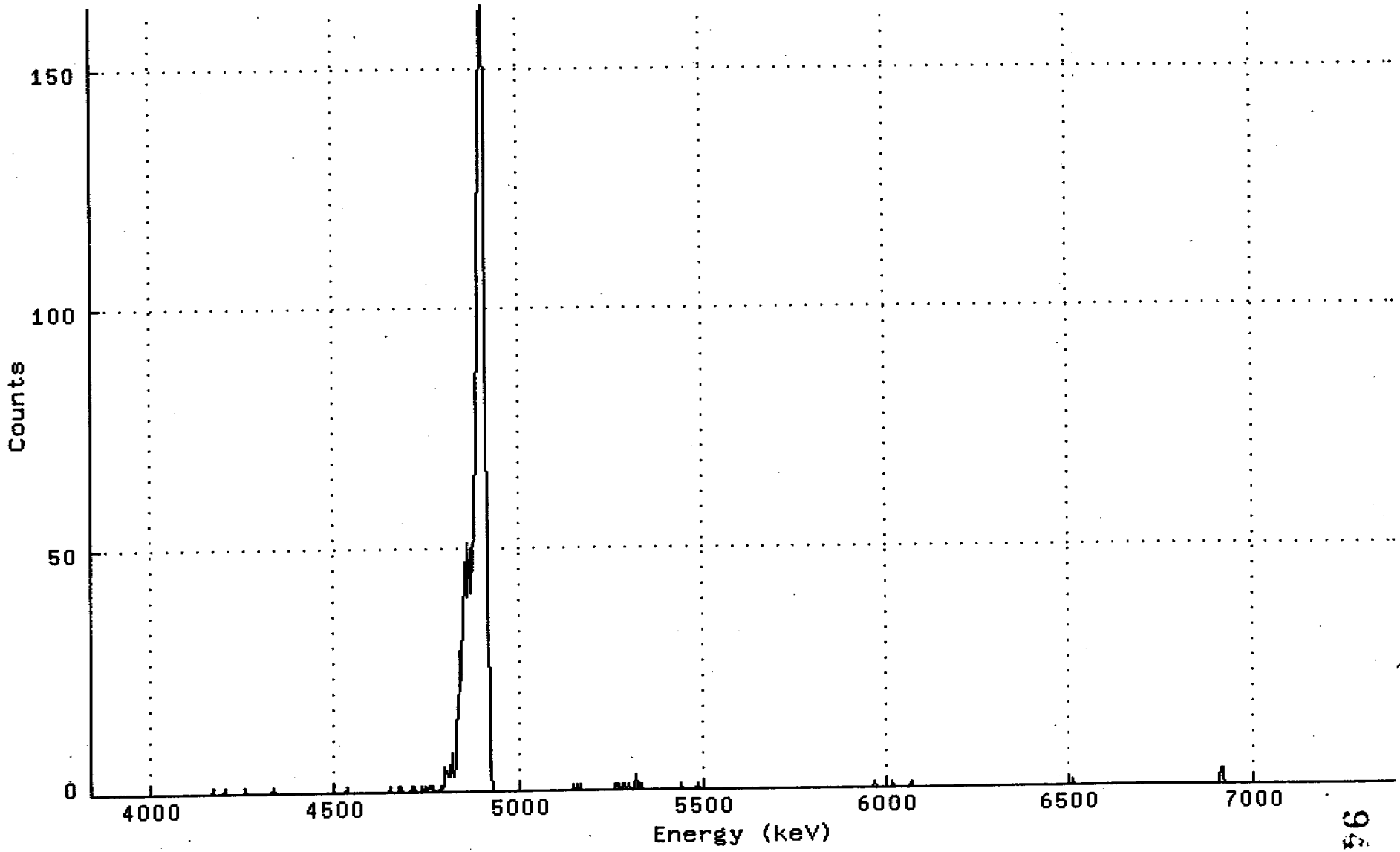
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | 1.60 | 0.40 | 99.9 | 3.682E-01 | 6.768E-01 | 1.300E+00 | 9.619E-01 |
| PU-239 | 5147.7 | 0.20 | 2.80 | 99.9 | 4.601E-02 | 9.341E-01 | 2.414E+00 | 1.519E+00 |
| PU242 | 4890.7 | 1841.80 | 1.20 | 100.4 | 4.217E+02 | 2.242E+01 | 1.787E+00 | 1.204E+00 |

*** RECOUNT SAMPLE CL > 0.067 ***

225

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032744$258195_PU.CNF;2
Title : 034
Sample Title:
Start Time: 2-APR-1999 14:09: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.82789E+03
Real Time : 0 22:13:24.00 Sample ID : 258195 Energy Slope : 3.46972E+00
Live Time : 0 22:13:24.00 Sample Type: PU Energy Quad : 0.00000E+00




94

226

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 13:25:15

(SECTION I)

95

**********
Spectral File: ND_AMS_ARCHIVE_S:S_99032744$258196_PU.CNF
**********

| | | | |
|---|---|---|---|
| BATCH ID: | 99032744 | SAMPLE ID: | 258196 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 3.530E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 035 |
| ACQ DATE: | 2-APR-1999 14:09 | AVERAGE EFFICIENCY: | 25.9% |
| ELAPSED LIVE TIME: | 80006. | RECOVERY: | 74.44% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 29.90 |
| LAMBDA VALUE: | 100. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:11 | EFF CAL DATE: | 30-MAR-1999 07:11 |
| BKG FILENAME: | B_035_30MAR99 | | |

**********

NUCLIDE ACTIVITY SUMMARY

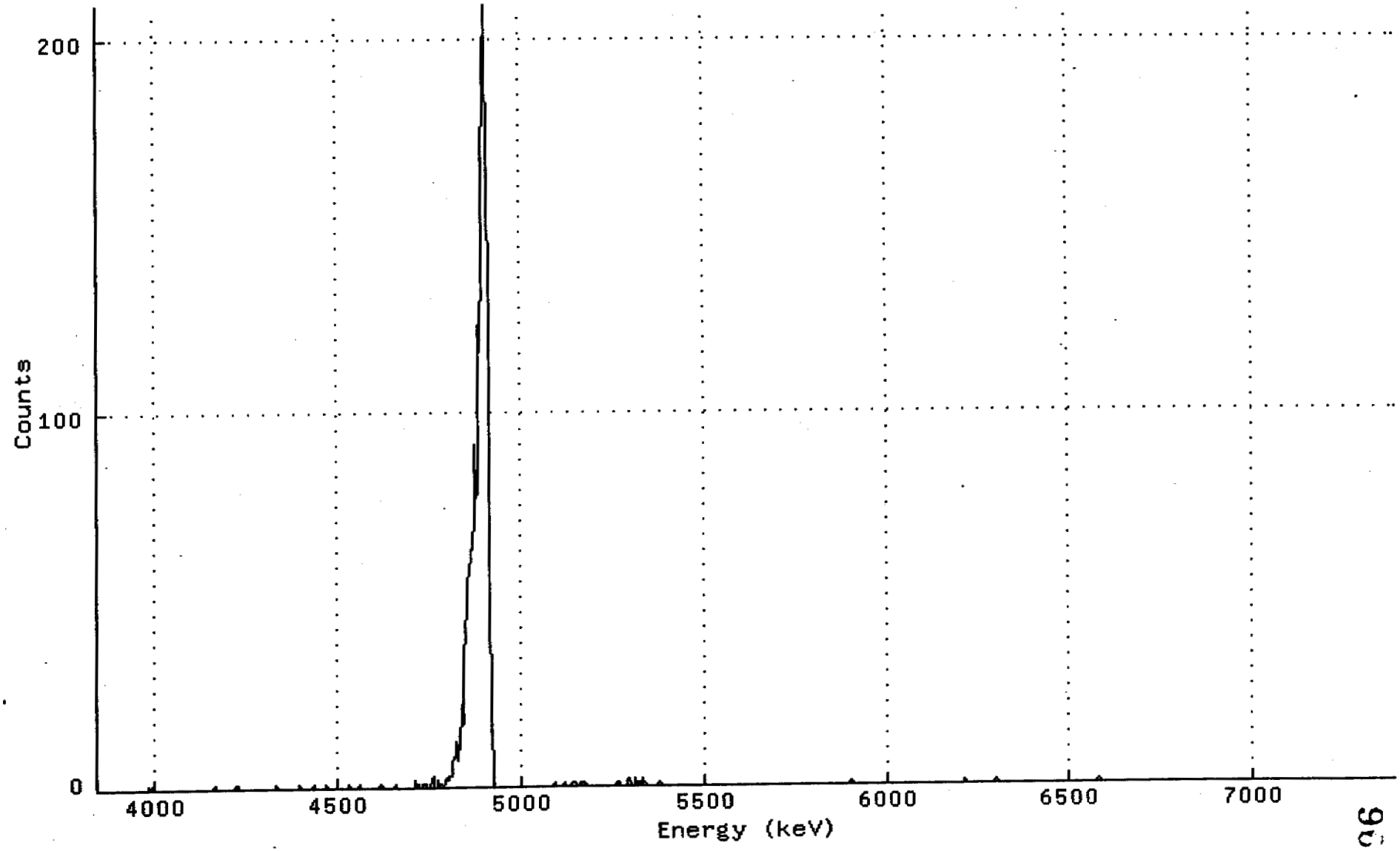
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | -0.80 | 0.80 | 99.9 | -8.828E-02 | 1.249E-01 | 7.579E-01 | 5.285E-01 |
| PU-239 | 5147.7 | 7.20 | 0.80 | 99.9 | 7.944E-01 | 6.380E-01 | 7.579E-01 | 5.285E-01 |
| PU242 | 4890.7 | 2361.20 | 0.80 | 100.4 | 2.592E+02 | 1.253E+01 | 7.541E-01 | 5.258E-01 |

**********

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

227

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032744$258196_PU.CNF;2
Title : 035
Sample Title:
Start Time: 2-APR-1999 14:09: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.83352E+03
Real Time : 0 22:13:26.00 Sample ID : 258196 Energy Slope : 3.46965E+00
Live Time : 0 22:13:26.00 Sample Type: PU Energy Quad : 0.00000E+00




96

228

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 13:25:54

97

Spectral File: ND_AMS_ARCHIVE_S:S_99032744$258197_PU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032744 | SAMPLE ID: | 258197 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.460E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 036 |
| ACQ DATE: | 2-APR-1999 14:09 | AVERAGE EFFICIENCY: | 23.5% |
| ELAPSED LIVE TIME: | 80003. | RECOVERY: | 66.86% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 27.98 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:13 | EFF CAL DATE: | 30-MAR-1999 07:13 |
| BKG FILENAME: | B_036_30MAR99 | | |

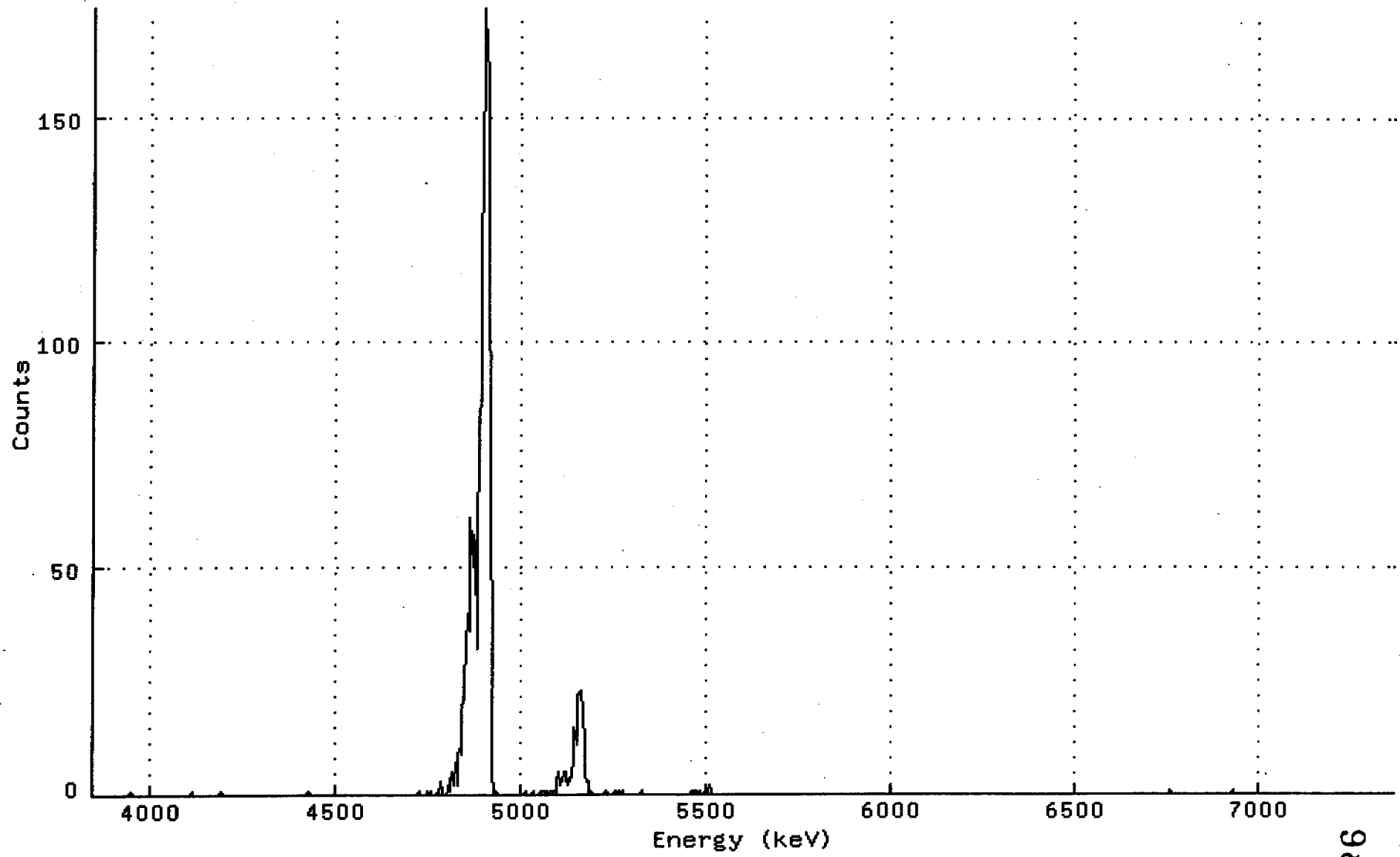
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ | sa | TPU/ERROR 2-SIGMA | MDC dpm/ | sa | CRIT LEVEL dpm/ | sa |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | 8.60 | 0.40 | 99.9 | 2.810E+00 | | 1.984E+00 | 1.846E+00 | | 1.366E+00 | |
| PU-239 | 5147.7 | 226.80 | 1.20 | 99.9 | 7.409E+01 | | 1.077E+01 | 2.549E+00 | | 1.717E+00 | |
| PU242 | 4890.7 | 1928.20 | 0.80 | 100.4 | 6.268E+02 | | 3.268E+01 | 2.233E+00 | | 1.557E+00 | |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.067 ***

229

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032744$258197_PU.CNF;2
Title : 036
Sample Title:
Start Time: 2-APR-1999 14:09: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.83490E+03
Real Time : 0 22:13:23.00 Sample ID : 258197 Energy Slope : 3.44567E+00
Live Time : 0 22:13:23.00 Sample Type: PU Energy Quad : 0.00000E+00




(SECTION 4)



230

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 13:26:08

(SECTION II)

99

Spectral File: ND_AMS_ARCHIVE_S:S_99032744$258198_PU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032744 | SAMPLE ID: | 258198 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.390E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 037 |
| ACQ DATE: | 2-APR-1999 14:14 | AVERAGE EFFICIENCY: | 22.9% |
| ELAPSED LIVE TIME: | 80005. | RECOVERY: | 80.63% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 27.48 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:14 | EFF CAL DATE: | 30-MAR-1999 07:14 |
| BKG FILENAME: | B_037_30MAR99 | | |

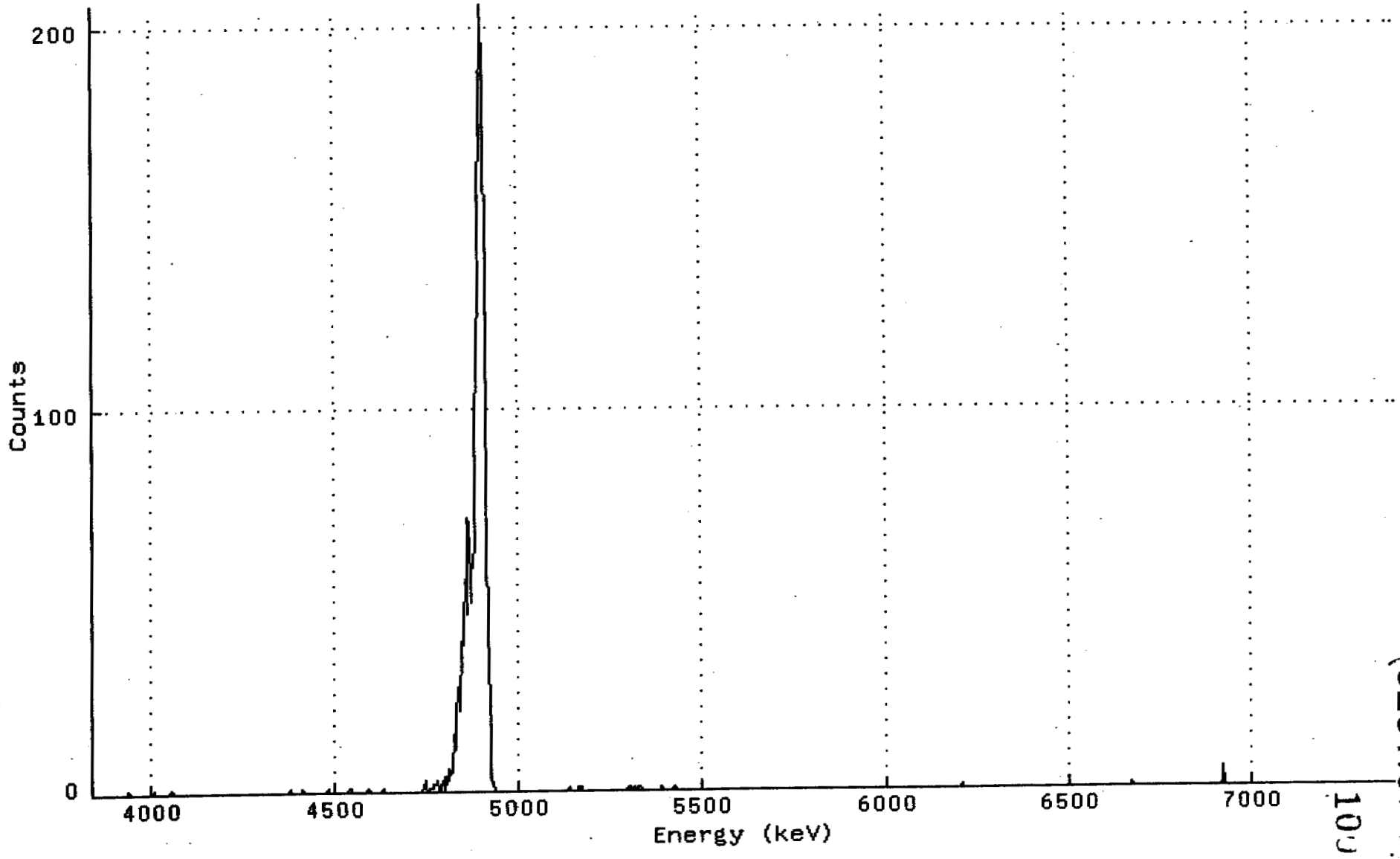
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | 1.20 | 0.80 | 99.9 | 3.517E-01 | 8.930E-01 | 2.013E+00 | 1.404E+00 |
| PU-239 | 5147.7 | 3.20 | 0.80 | 99.9 | 9.378E-01 | 1.219E+00 | 2.013E+00 | 1.404E+00 |
| PU242 | 4890.7 | 2257.60 | 0.40 | 100.4 | 6.583E+02 | 3.243E+01 | 1.648E+00 | 1.219E+00 |

*** RECOUNT SAMPLE CL > 0.067 ***

231

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032744$258198_PU.CNF;2
Title : 037
Sample Title:
Start Time: 2-APR-1999 14:14: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.83056E+03
Real Time : 0 22:13:26.00 Sample ID : 258198 Energy Slope : 3.46883E+00
Live Time : 0 22:13:25.00 Sample Type: PU Energy Quad : 0.00000E+00




232

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 13:26:50

SECTION D

101

**********
Spectral File: ND_AMS_ARCHIVE_S:S_99032744$258199_PU.CNF
**********

| | | | |
|---|---|---|---|
| BATCH ID: | 99032744 | SAMPLE ID: | 258199 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.670E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 038 |
| ACQ DATE: | 2-APR-1999 14:10 | AVERAGE EFFICIENCY: | 22.2% |
| ELAPSED LIVE TIME: | 80003. | RECOVERY: | 80.27% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 25.09 |
| LAMBDA VALUE: | 100. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:15 | EFF CAL DATE: | 30-MAR-1999 07:15 |
| BKG FILENAME: | B_038_30MAR99 | | |

**********

NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | 0.20 | 0.80 | 99.9 | 3.149E-02 | 3.619E-01 | 1.082E+00 | 7.543E-01 |
| PU-239 | 5147.7 | 5.80 | 1.20 | 99.9 | 9.134E-01 | 8.629E-01 | 1.229E+00 | 8.279E-01 |
| PU242 | 4890.7 | 2187.20 | 0.80 | 100.4 | 3.427E+02 | 1.711E+01 | 1.076E+00 | 7.505E-01 |

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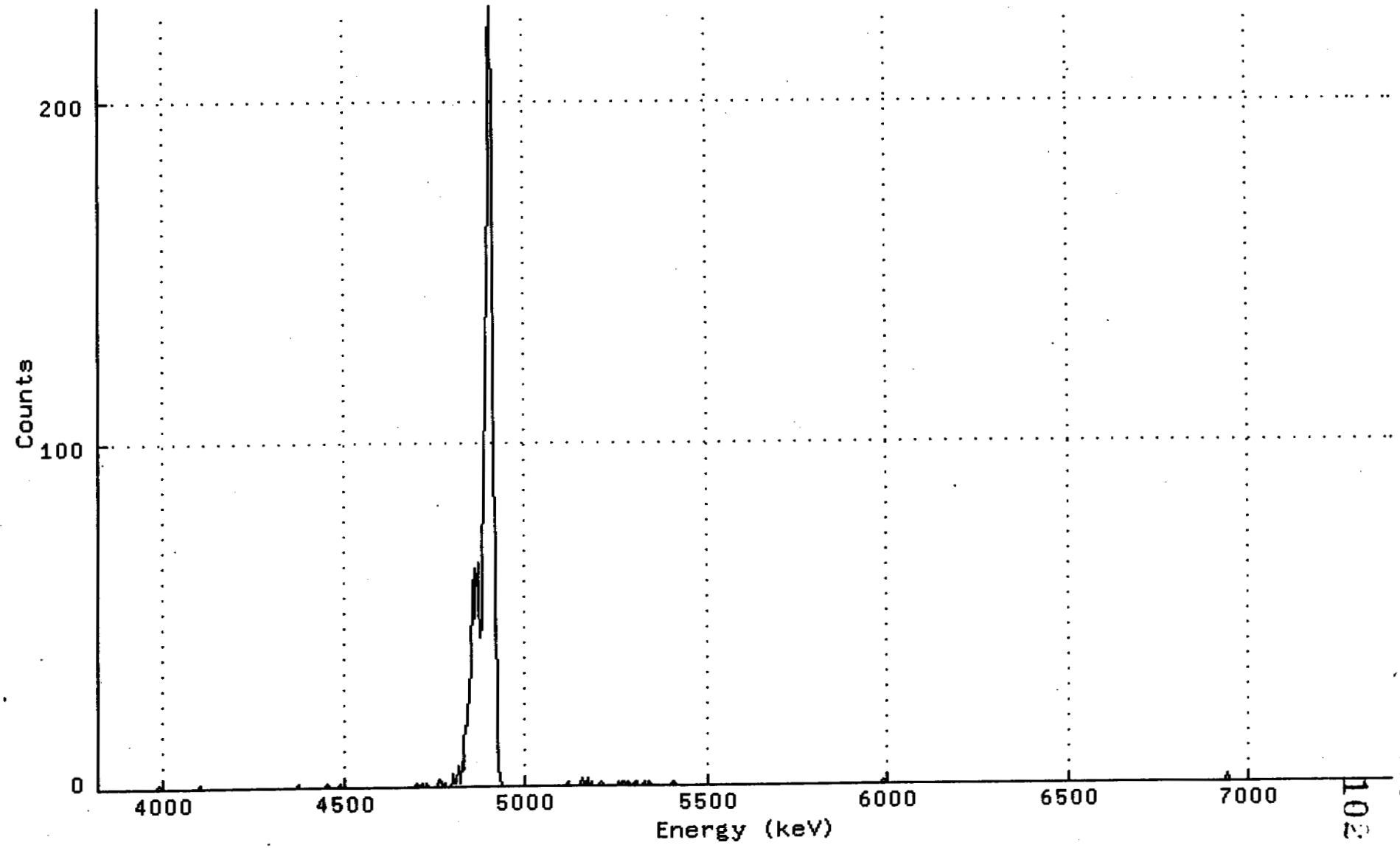
*** POSITIVE ***
** RECOUNT SAMPLE CL > 0.067 ***

233

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032744$258199_PU.CNF;2
Title : 038
Sample Title:
Start Time: 2-APR-1999 14:10: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.80963E+03
Real Time : 0 22:13:23.00 Sample ID : 258199 Energy Slope : 3.49740E+00
Live Time : 0 22:13:23.00 Sample Type: PU Energy Quad : 0.00000E+00




234

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 13:27:30



Spectral File: ND_AMS_ARCHIVE_S:S_99032744$258200_PU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032744 | SAMPLE ID: | 258200 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 4.800E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 039 |
| ACQ DATE: | 2-APR-1999 14:10 | AVERAGE EFFICIENCY: | 23.2% |
| ELAPSED LIVE TIME: | 80006. | RECOVERY: | 73.15% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 25.91 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:17 | EFF CAL DATE: | 30-MAR-1999 07:17 |
| BKG FILENAME: | B_039_30MAR99 | | |

NUCLIDE ACTIVITY SUMMARY

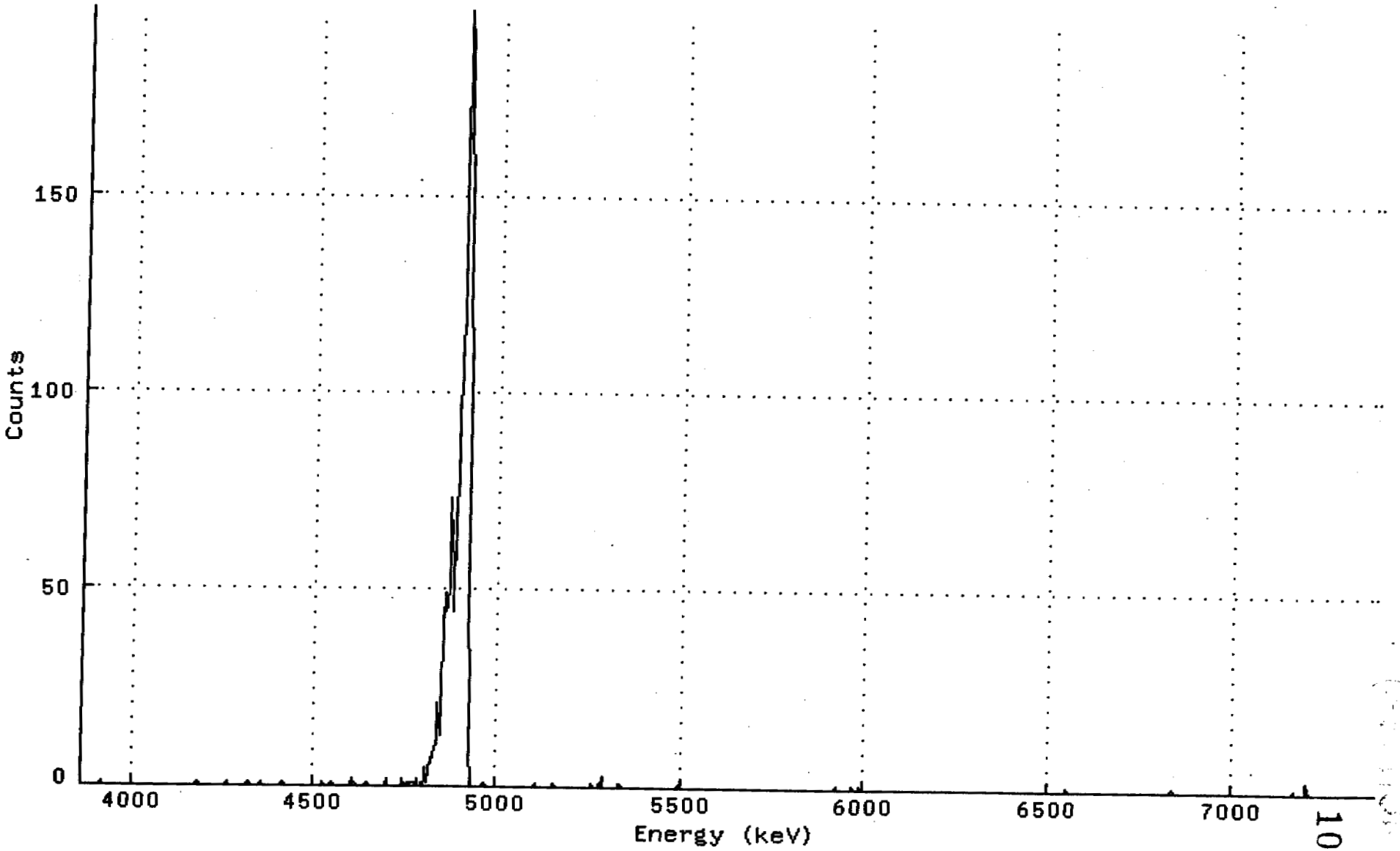
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | -0.60 | 1.60 | 99.9 | -5.528E-02 | 2.360E-01 | 7.914E-01 | 5.205E-01 |
| PU-239 | 5147.7 | -0.80 | 2.80 | 99.9 | -7.370E-02 | 3.254E-01 | 9.664E-01 | 6.080E-01 |
| PU242 | 4890.7 | 2080.00 | 0.00 | 100.4 | 1.906E+02 | 9.675E+00 | 2.484E-01 | 2.484E-01 |

*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032744$258200_PU.CNF;2
Title : 039
Sample Title:
Start Time: 2-APR-1999 14:10:
Real Time : 0 22:13:27.00
Live Time : 0 22:13:26.00

Sample Time: 31-MAR-1999 00:00
Sample ID : 258200
Sample Type: PU

Energy Offset: 3.85181E+03
Energy Slope : 3.45506E+00
Energy Quad : 0.00000E+00






36

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 13:27:46



Spectral File: ND_AMS_ARCHIVE_S:S_99032744$258201_PU.CNF

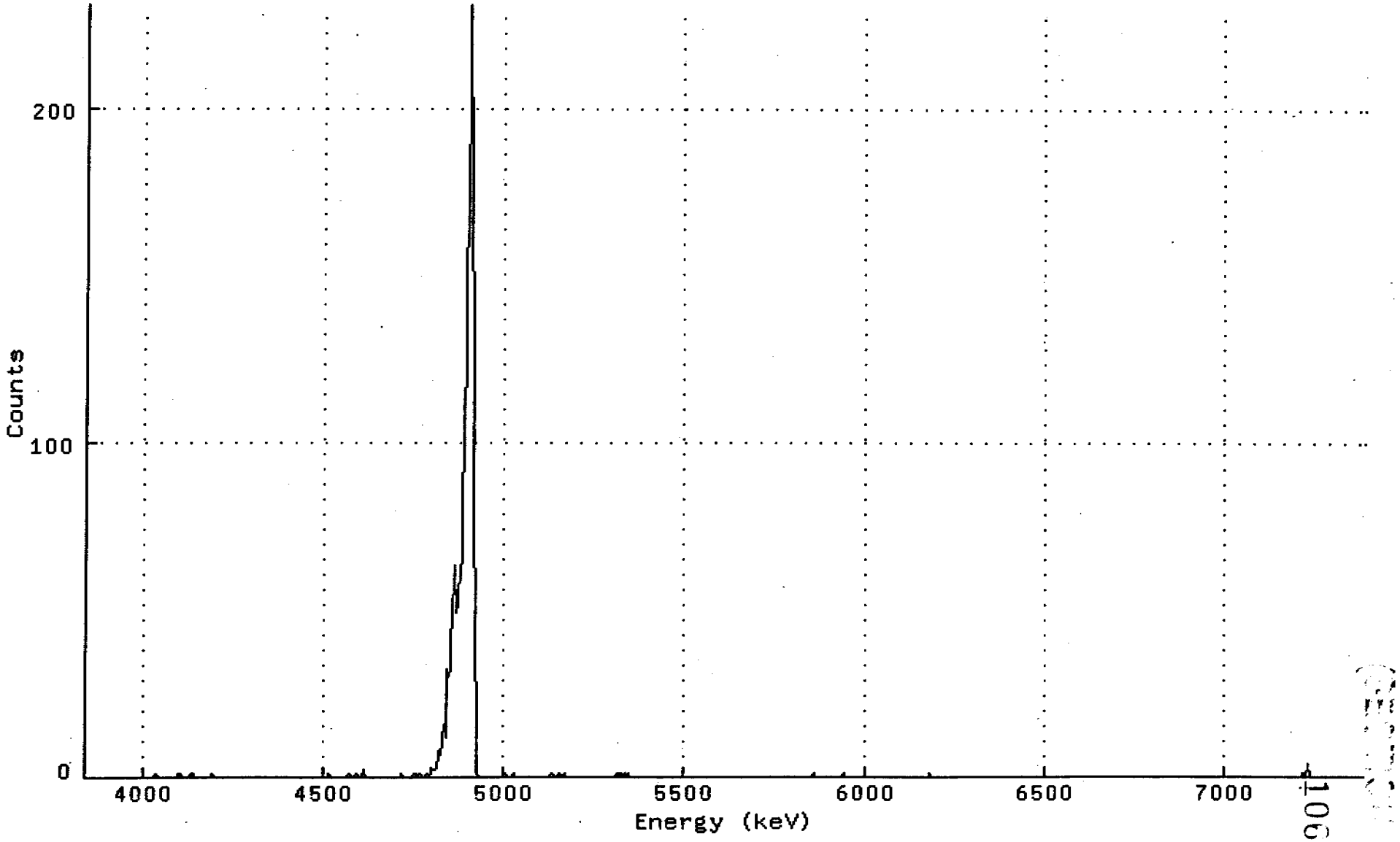
| | | | |
|---|---|---|---|
| BATCH ID: | 99032744 | SAMPLE ID: | 258201 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 6.400E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 040 |
| ACQ DATE: | 2-APR-1999 14:10 | AVERAGE EFFICIENCY: | 23.2% |
| ELAPSED LIVE TIME: | 80003. | RECOVERY: | 76.38% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 23.45 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:18 | EFF CAL DATE: | 30-MAR-1999 07:18 |
| BKG FILENAME: | B_040_30MAR99 | | |

NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | -1.20 | 1.20 | 99.9 | -7.954E-02 | 9.196E-02 | 5.172E-01 | 3.484E-01 |
| PU-239 | 5147.7 | 2.40 | 1.60 | 99.9 | 1.591E-01 | 2.857E-01 | 5.695E-01 | 3.745E-01 |
| PU242 | 4890.7 | 2168.00 | 2.00 | 100.4 | 1.430E+02 | 7.149E+00 | 6.124E-01 | 3.956E-01 |

*** RECOUNT SAMPLE CL > 0.067 ***

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032744$258201_PU.CNF;2
Title : 040
Sample Title:
Start Time: 2-APR-1999 14:10: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.83002E+03
Real Time : 0 22:13:23.00 Sample ID : 258201 Energy Slope : 3.47052E+00
Live Time : 0 22:13:23.00 Sample Type: PU Energy Quad : 0.00000E+00




238

106

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 13:28:00

107

**********
Spectral File: ND_AMS_ARCHIVE_S:S_99032744$258202_PU.CNF
**********

| | | | |
|---|---|---|---|
| BATCH ID: | 99032744 | SAMPLE ID: | 258202 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: 1.163E-01 | sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 041 |
| ACQ DATE: | 2-APR-1999 14:11 | AVERAGE EFFICIENCY: | 23.2% |
| ELAPSED LIVE TIME: | 80004. | RECOVERY: | 82.47% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 27.55 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:20 | EFF CAL DATE: | 30-MAR-1999 07:20 |
| BKG FILENAME: | B_041_30MAR99 | | |

**********

NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | -0.20 | 1.20 | 99.9 | -6.752E-03 | 8.213E-02 | 2.634E-01 | 1.774E-01 |
| PU-239 | 5147.7 | 0.40 | 3.60 | 99.9 | 1.350E-02 | 1.575E-01 | 3.893E-01 | 2.404E-01 |
| PU242 | 4890.7 | 2342.80 | 1.20 | 100.4 | 7.868E+01 | 3.827E+00 | 2.621E-01 | 1.766E-01 |

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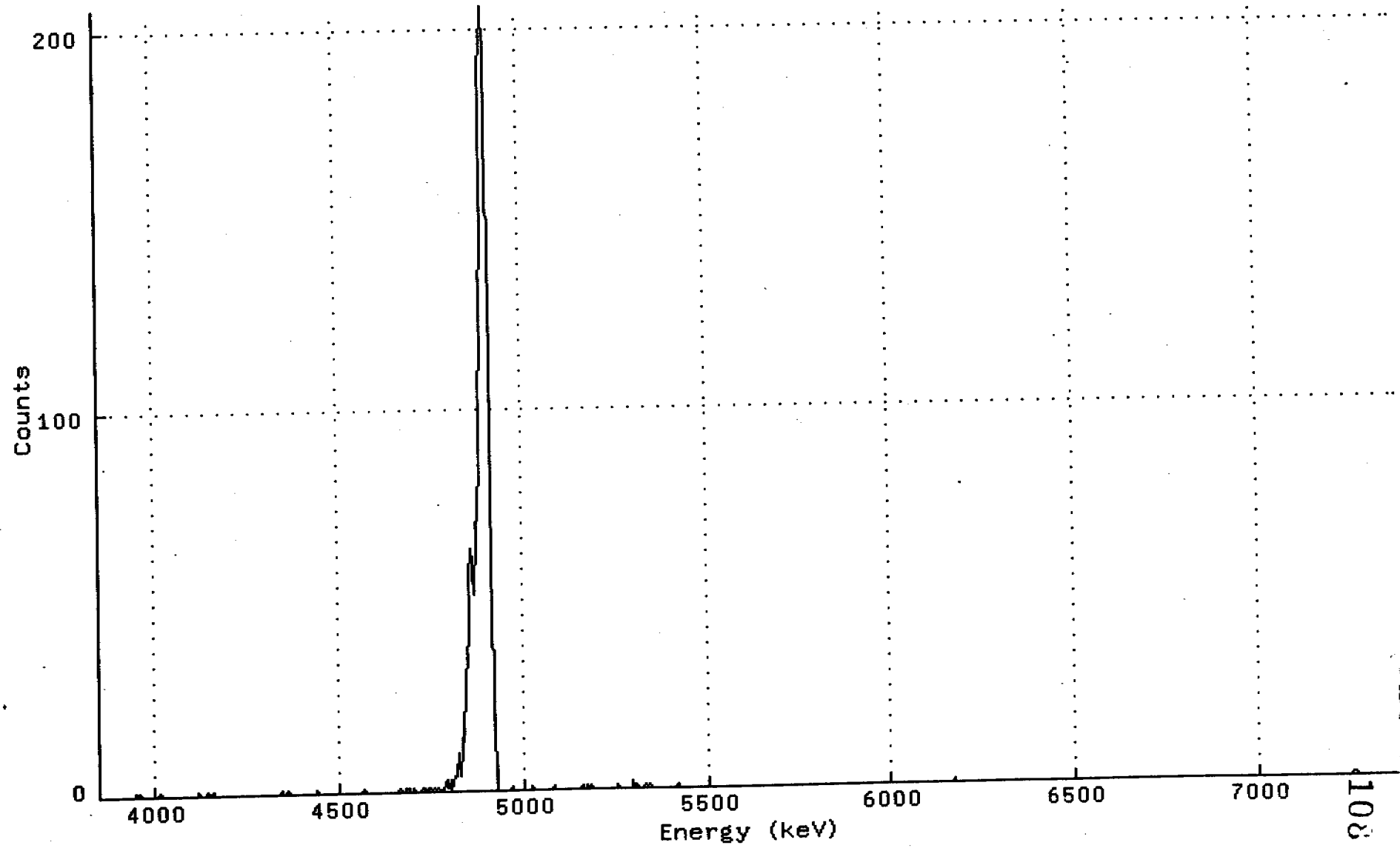
*** RECOUNT SAMPLE CL > 0.067 ***

-239

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032744$258202_PU.CNF;2
Title : 041
Sample Title:
Start Time: 2-APR-1999 14:11:
Real Time : 0 22:13:24.00
Live Time : 0 22:13:24.00

Sample Time: 31-MAR-1999 00:00
Sample ID : 258202
Sample Type: PU

Energy Offset: 3.83895E+03
Energy Slope : 3.45079E+00
Energy Quad : 0.00000E+00




240

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 13:28:13



Spectral File: ND_AMS_ARCHIVE_S:S_99032744$258203_PU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032744 | SAMPLE ID: | 258203 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.770E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 042 |
| ACQ DATE: | 2-APR-1999 14:11 | AVERAGE EFFICIENCY: | 23.9% |
| ELAPSED LIVE TIME: | 80005. | RECOVERY: | 75.47% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 28.18 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:21 | EFF CAL DATE: | 30-MAR-1999 07:21 |
| BKG FILENAME: | B_042_30MAR99 | | |

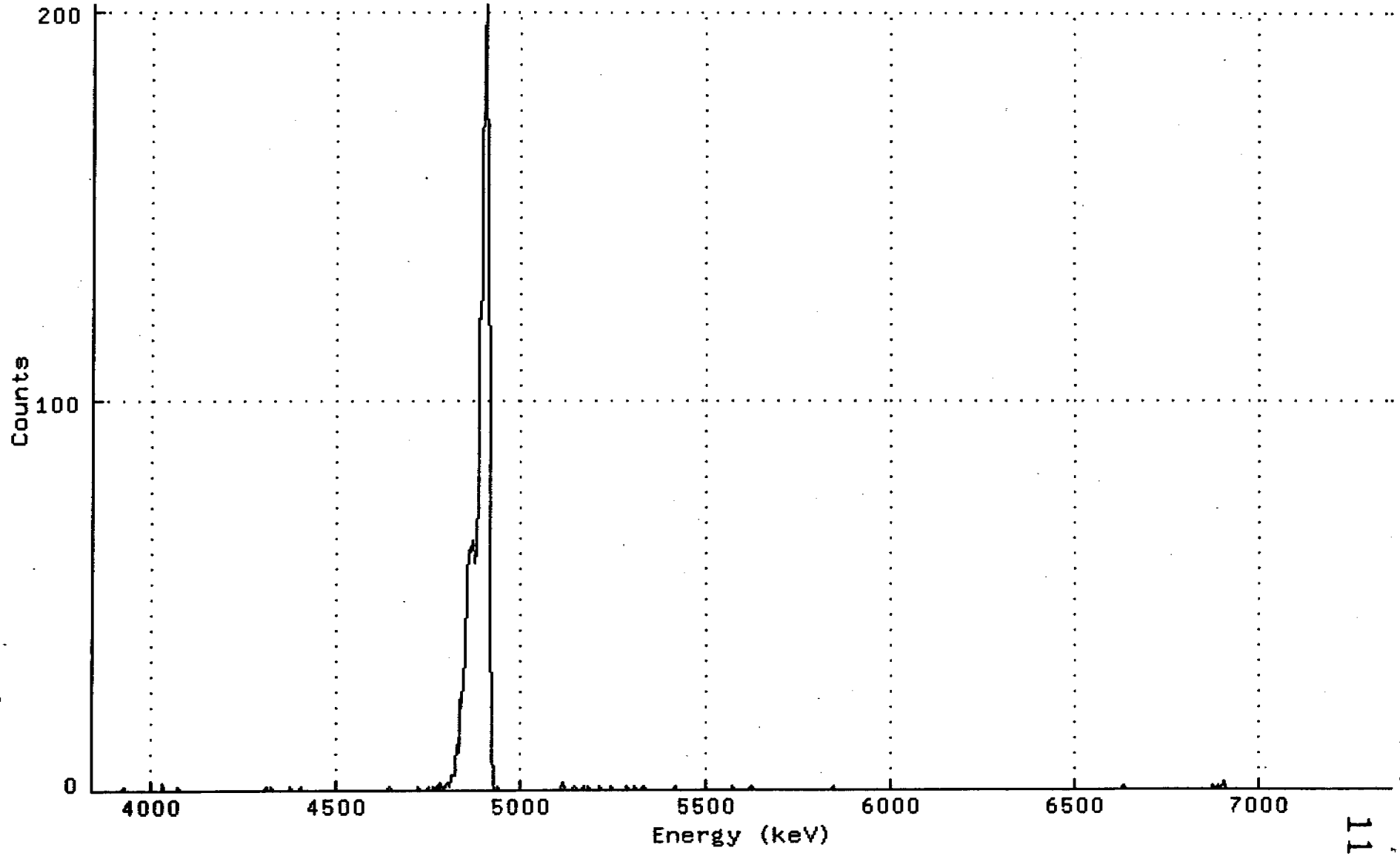
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | -0.20 | 1.20 | 99.9 | -3.001E-02 | 3.650E-01 | 1.171E+00 | 7.885E-01 |
| PU-239 | 5147.7 | 4.80 | 1.20 | 99.9 | 7.200E-01 | 7.647E-01 | 1.171E+00 | 7.885E-01 |
| PU242 | 4890.7 | 2213.40 | 1.60 | 100.4 | 3.303E+02 | 1.637E+01 | 1.282E+00 | 8.434E-01 |

*** RECOUNT SAMPLE CL > 0.067 ***

241

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99032744$258203_PU.CNF;2
Title : 042
Sample Title:
Start Time: 2-APR-1999 14:11: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.83219E+03
Real Time : 0 22:13:25.00 Sample ID : 258203 Energy Slope : 3.43814E+00
Live Time : 0 22:13:25.00 Sample Type: PU Energy Quad : 0.00000E+00




110

242

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 13:14:31

111

**********
Spectral File: ND_AMS_ARCHIVE_C:C_99032744$LCSWR33B_PU.CNF
**********

| | | | |
|---|---|---|---|
| BATCH ID: | 99032744 | SAMPLE ID: | LCSWR33B |
| SAMPLE DATE: | 1-JAN-1987 00:00 | ALIQUOT: | 2.500E-01 mL |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 044 |
| ACQ DATE: | 2-APR-1999 14:13 | AVERAGE EFFICIENCY: | 21.8% |
| ELAPSED LIVE TIME: | 80004. | RECOVERY: | 75.79% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 23.98 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:24 | EFF CAL DATE: | 30-MAR-1999 07:24 |
| BKG FILENAME: | B_044_30MAR99 | | |

**********

NUCLIDE ACTIVITY SUMMARY

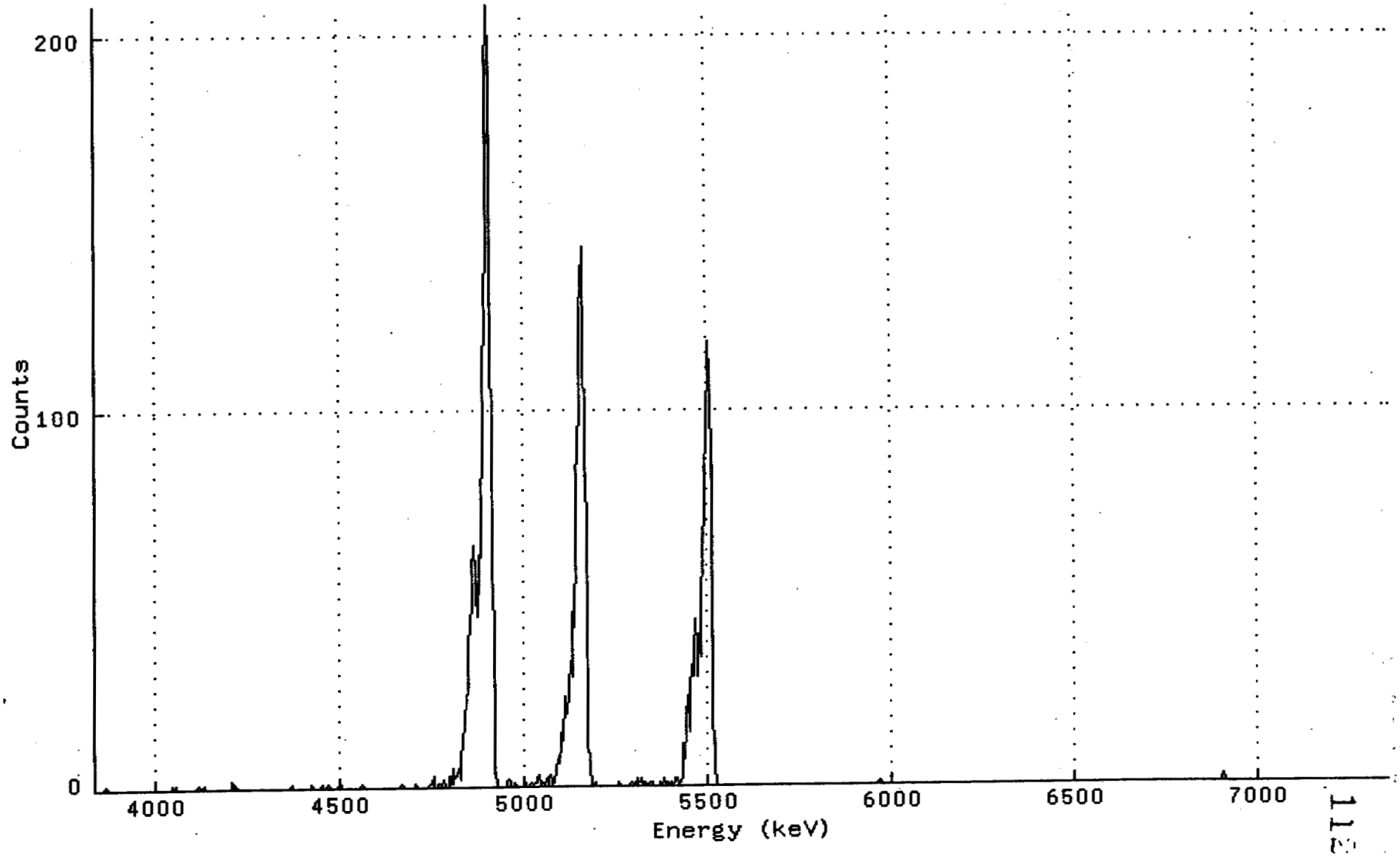
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY pCi/ mL | TPU/ERROR 2-SIGMA | MDC pCi/ mL | CRIT LEVEL pCi/ mL |
|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | 1221.00 | 0.00 | 99.9 | 1.100E+01 | 8.920E-01 | 2.217E-02 | 2.217E-02 |
| PU-239 | 5147.7 | 1366.60 | 0.40 | 99.9 | 1.118E+01 | 8.822E-01 | 4.623E-02 | 3.420E-02 |
| PU242 | 4890.7 | 2025.60 | 0.40 | 100.4 | 1.649E+01 | 8.464E-01 | 4.600E-02 | 3.403E-02 |

**********

*** POSITIVE ***

243

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.C]C_99032744$LCSWR33B_PU.CNF;4
Title : 044
Sample Title:
Start Time: 2-APR-1999 14:13: Sample Time: 1-JAN-1987 00:00: Energy Offset: 3.82541E+03
Real Time : 0 22:13:24.00 Sample ID : LCSWR33B Energy Slope : 3.44193E+00
Live Time : 0 22:13:24.00 Sample Type: PU Energy Quad : 0.00000E+00




244

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 13:15:06

113

Spectral File: ND_AMS_ARCHIVE_R:R_99032744$PBB_PU.CNF

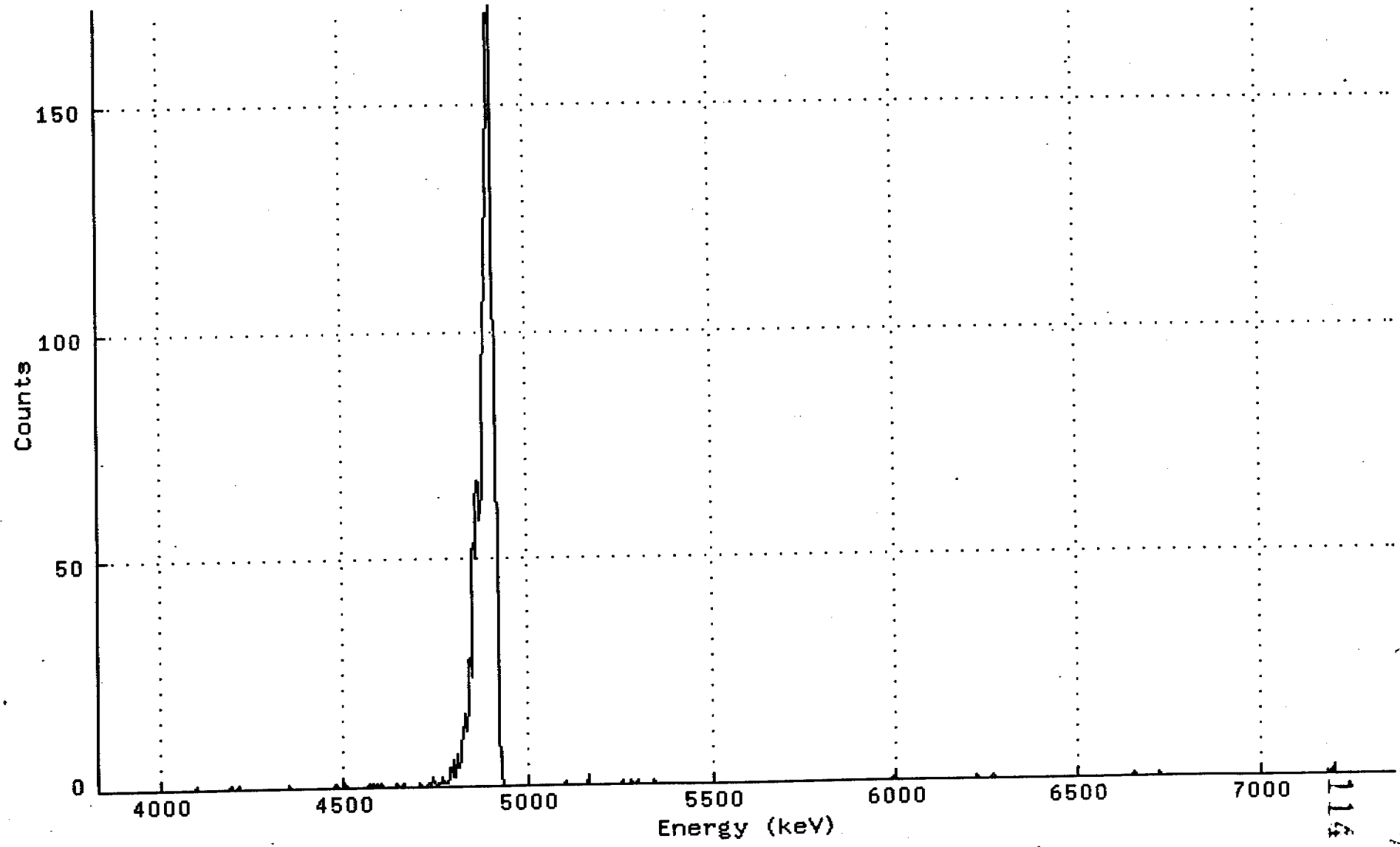
| | | | |
|---|---|---|---|
| BATCH ID: | 99032744 | SAMPLE ID: | PBB |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: 1.000E+00 | sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 045 |
| ACQ DATE: | 2-APR-1999 14:13 | AVERAGE EFFICIENCY: | 24.0% |
| ELAPSED LIVE TIME: | 80005. | RECOVERY: | 75.36% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 34.65 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:26 | EFF CAL DATE: | 30-MAR-1999 07:26 |
| BKG FILENAME: | B_045_30MAR99 | | |

NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | -0.80 | 0.80 | 99.9 | -3.323E-03 | 4.703E-03 | 2.853E-02 | 1.989E-02 |
| PU-239 | 5147.7 | 1.40 | 1.60 | 99.9 | 5.814E-03 | 1.585E-02 | 3.568E-02 | 2.347E-02 |
| PU242 | 4890.7 | 2214.40 | 1.60 | 100.4 | 9.151E+00 | 4.539E-01 | 3.551E-02 | 2.335E-02 |

245

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.R]R_99032744$PBB_PU.CNF;3
Title : 045
Sample Title:
Start Time: 2-APR-1999 14:13: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.82067E+03
Real Time : 0 22:13:25.00 Sample ID : PBB Energy Slope : 3.45334E+00
Live Time : 0 22:13:25.00 Sample Type: PU Energy Quad : 0.00000E+00




246

## Sample Preparation and Analysis Log

115

Sample Type: Various Solids (chipped paint, concrete, and cinder block)

| | Method | Isotopes | Worklist Names | Chemist | Date |
|---|---|---|---|---|---|
| Digestion & Purification | RC-19 R05 | Pu-239/240,Pu-238 | 99042844 | [signature] | 4/7/99 |
| Counting | RC-19 R05 | Pu iso | 99042844 | [signature] | 4/7/99 |

Tracers (Internal Standards)

| Isotope | ID | Conc(pCi/mL) | @ RD | Aliquot(mL) | HL (years) | Activity(dpm) | Activity(pCi) |
|---|---|---|---|---|---|---|---|
| u-242 | 82-75-5 | 41.22 | 12/18/89 | 0.100 | 3.758E+05 | 9.15 | 4.12 |
| | | | | | | | |
| | | | | | | | |

| Req | Sample ID | # | Aliquot Size | Comments | Sample Aliquot | Total Sample Size | Detector Number | |
|---|---|---|---|---|---|---|---|---|
| | PB | 1 | 1 SA | | 1.0000 | 1 SA | 33 | |
| 16495 | 258191 | 2 | 0.500 G | | 0.0187 | 26.73 G | 34 | |
| 16495 | 258191D | 3 | 0.500 G | | 0.0187 | 26.73 G | 35 | |
| | LCSWR33 | 4 | 0.250 mL | | 0.2500 | 1.00 mL | 36 | |
| | | 5 | | | | | | |
| | | 6 | | | | | | |
| | | 7 | | | | | | |
| | | 8 | | | | | | |
| | | 9 | | | | | | |
| | | 10 | | | | | | |
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| | | 19 | | | | | | |
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| | | 24 | | | | | | |
| | | 25 | | | | | | |
| | | 26 | | | | | | |
| | | 27 | | | | | | |
| | | 28 | | | | | | |
| | | 29 | | | | | | |
| | | 30 | | | | | | |

**Comments and Actual conditions:**

Start of digestion: 4/5/99

Automatic pipets calibrated in accord with QC-6 on balance # 9

The sample aliquot is equal to the fraction of the total sample used for analysis.

[signature] 4-7-99

[signature] 4/7/99 SEK

247

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
7-APR-1999 10:05:46

116

**********
Spectral File: ND_AMS_ARCHIVE_R:R_99042844$PB_PU.CNF
**********

| | | | |
|---|---|---|---|
| BATCH ID: | 99042844 | SAMPLE ID: | PB |
| SAMPLE DATE: | 5-APR-1999 00:00 | ALIQUOT: 1.000E+00 | sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 033 |
| ACQ DATE: | 6-APR-1999 11:31 | AVERAGE EFFICIENCY: | 27.4% |
| ELAPSED LIVE TIME: | 80001. | RECOVERY: | 79.16% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 29.58 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:08 | EFF CAL DATE: | 30-MAR-1999 07:08 |
| BKG FILENAME: | B_033_30MAR99 | | |

**********

NUCLIDE ACTIVITY SUMMARY

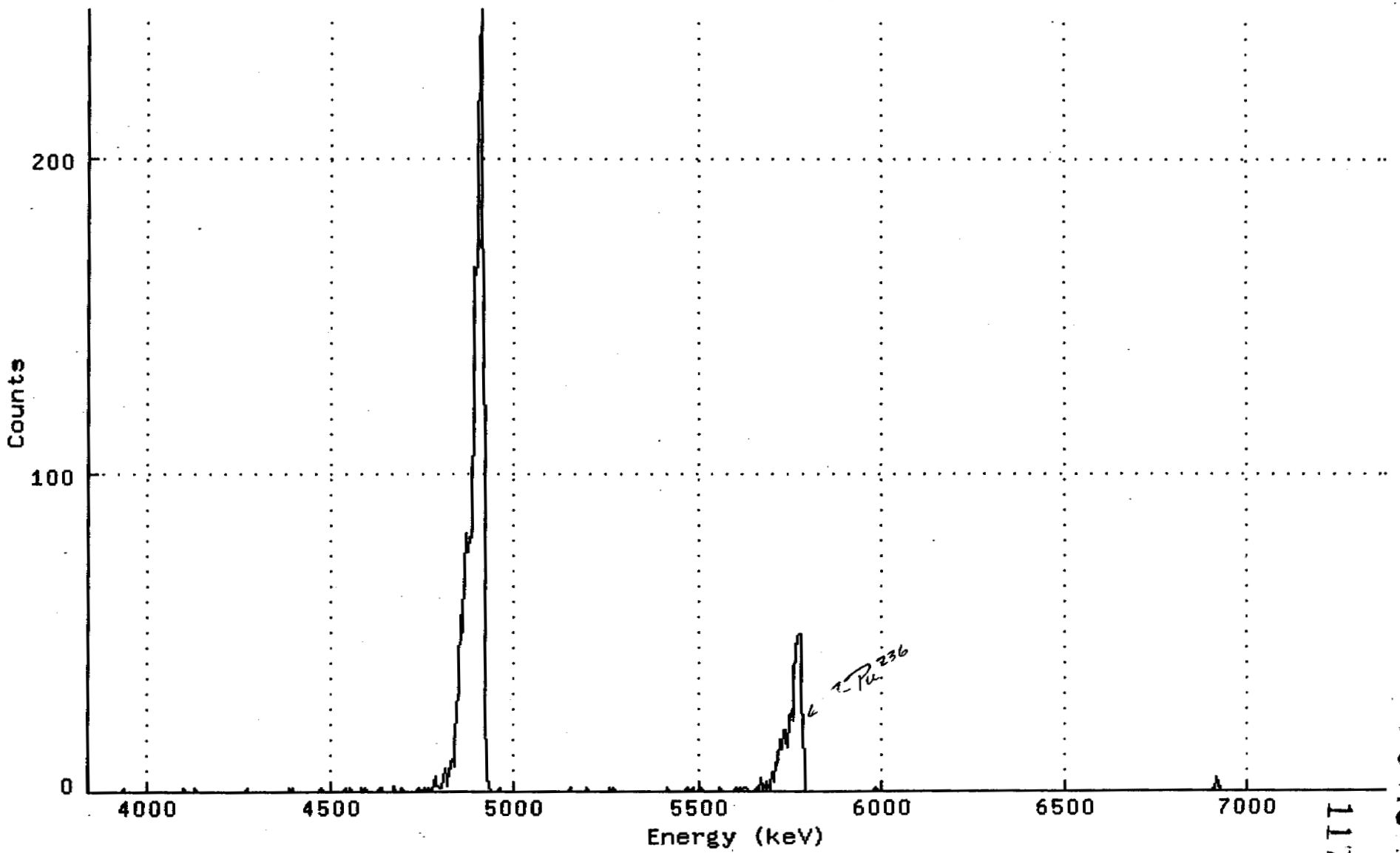
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | 4.60 | 0.40 | 99.9 | 1.590E-02 | 1.573E-02 | 1.953E-02 | 1.445E-02 |
| PU-239 | 5147.7 | -0.40 | 2.40 | 99.9 | -1.383E-03 | 1.189E-02 | 3.427E-02 | 2.182E-02 |
| PU242 | 4890.7 | 2660.60 | 2.40 | 100.4 | 9.151E+00 | 4.240E-01 | 3.410E-02 | 2.171E-02 |

**********

*** POSITIVE ***

248

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.R]R_99042844$PB_PU.CNF;1
Title : 033
Sample Title:
Start Time: 6-APR-1999 11:31: Sample Time: 5-APR-1999 00:00: Energy Offset: 3.82849E+03
Real Time : 0 22:13:21.00 Sample ID : PB Energy Slope : 3.46124E+00
Live Time : 0 22:13:21.00 Sample Type: PU Energy Quad : 0.00000E+00




117

249

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
7-APR-1999 10:06:32

118

Spectral File: ND_AMS_ARCHIVE_S:S_99042844$258191_PU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99042844 | SAMPLE ID: | 258191 |
| SAMPLE DATE: | 5-APR-1999 00:00 | ALIQUOT: | 1.870E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 034 |
| ACQ DATE: | 6-APR-1999 11:31 | AVERAGE EFFICIENCY: | 22.4% |
| ELAPSED LIVE TIME: | 80002. | RECOVERY: | 70.03% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 24.70 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:10 | EFF CAL DATE: | 30-MAR-1999 07:10 |
| BKG FILENAME: | B_034_30MAR99 | | |

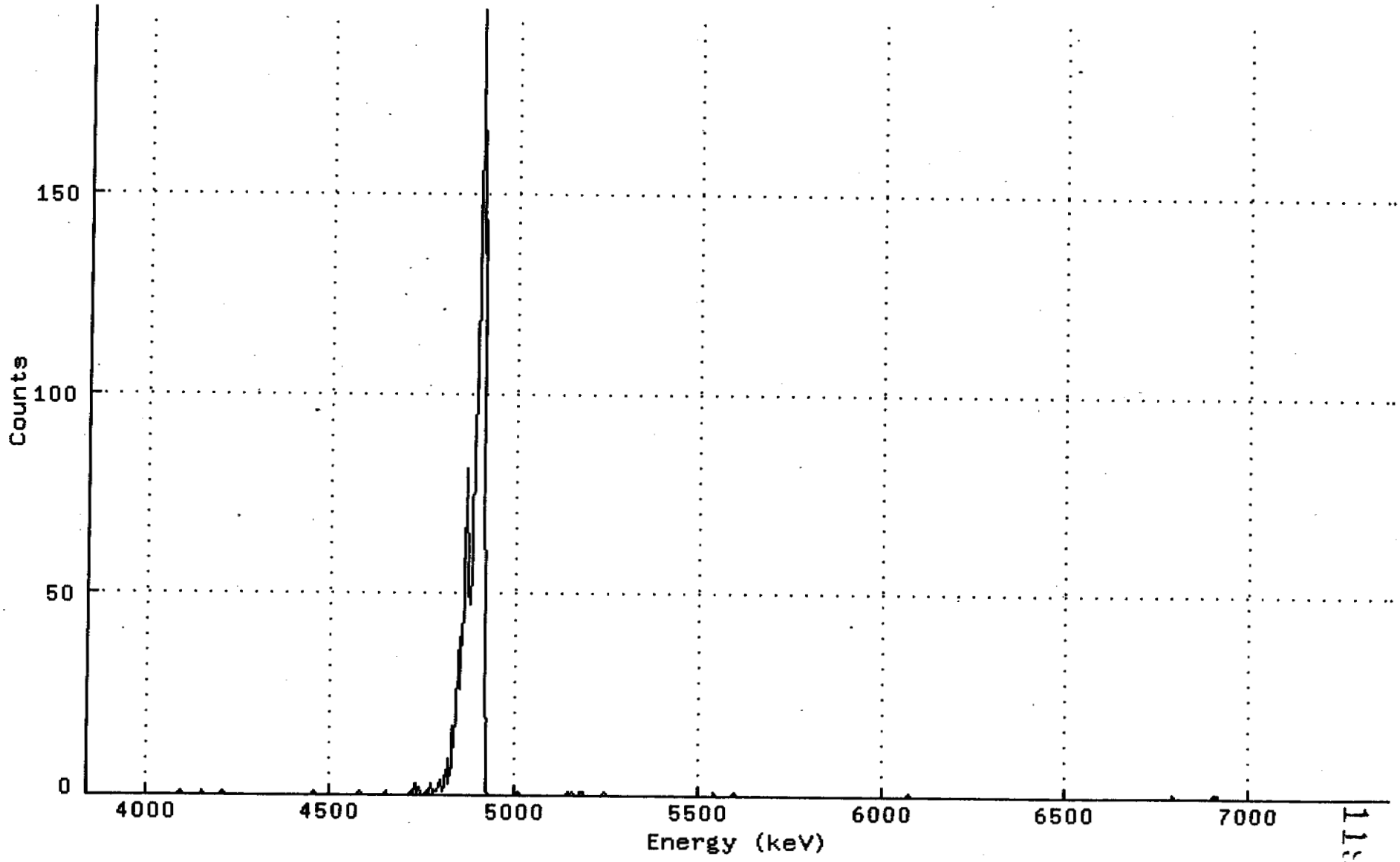
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ | ACTIVITY sa | TPU/ERROR 2-SIGMA | MDC dpm/ | MDC sa | CRIT LEVEL dpm/ | CRIT LEVEL sa |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | 0.60 | 0.40 | 99.9 | 1.538E-01 | | 5.522E-01 | 1.448E+00 | | 1.071E+00 | |
| PU-239 | 5147.7 | 3.20 | 2.80 | 99.9 | 8.202E-01 | | 1.369E+00 | 2.689E+00 | | 1.692E+00 | |
| PU242 | 4890.7 | 1918.80 | 1.20 | 100.4 | 4.893E+02 | | 2.561E+01 | 1.990E+00 | | 1.341E+00 | |

*** RECOUNT SAMPLE CL > 0.067 ***

250

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99042844$258191_PU.CNF;1
Title : 034
Sample Title:
Start Time: 6-APR-1999 11:31: Sample Time: 5-APR-1999 00:00: Energy Offset: 3.82789E+03
Real Time : 0 22:13:22.00 Sample ID : 258191 Energy Slope : 3.46972E+00
Live Time : 0 22:13:22.00 Sample Type: PU Energy Quad : 0.00000E+00




119

251

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
7-APR-1999 10:06:10

129

Spectral File: ND_AMS_ARCHIVE_S:S_99042844$258191D_PU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99042844 | SAMPLE ID: | 258191D |
| SAMPLE DATE: | 5-APR-1999 00:00 | ALIQUOT: | 1.870E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 035 |
| ACQ DATE: | 6-APR-1999 11:31 | AVERAGE EFFICIENCY: | 25.9% |
| ELAPSED LIVE TIME: | 80003. | RECOVERY: | 68.55% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 29.83 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:11 | EFF CAL DATE: | 30-MAR-1999 07:11 |
| BKG FILENAME: | B_035_30MAR99 | | |

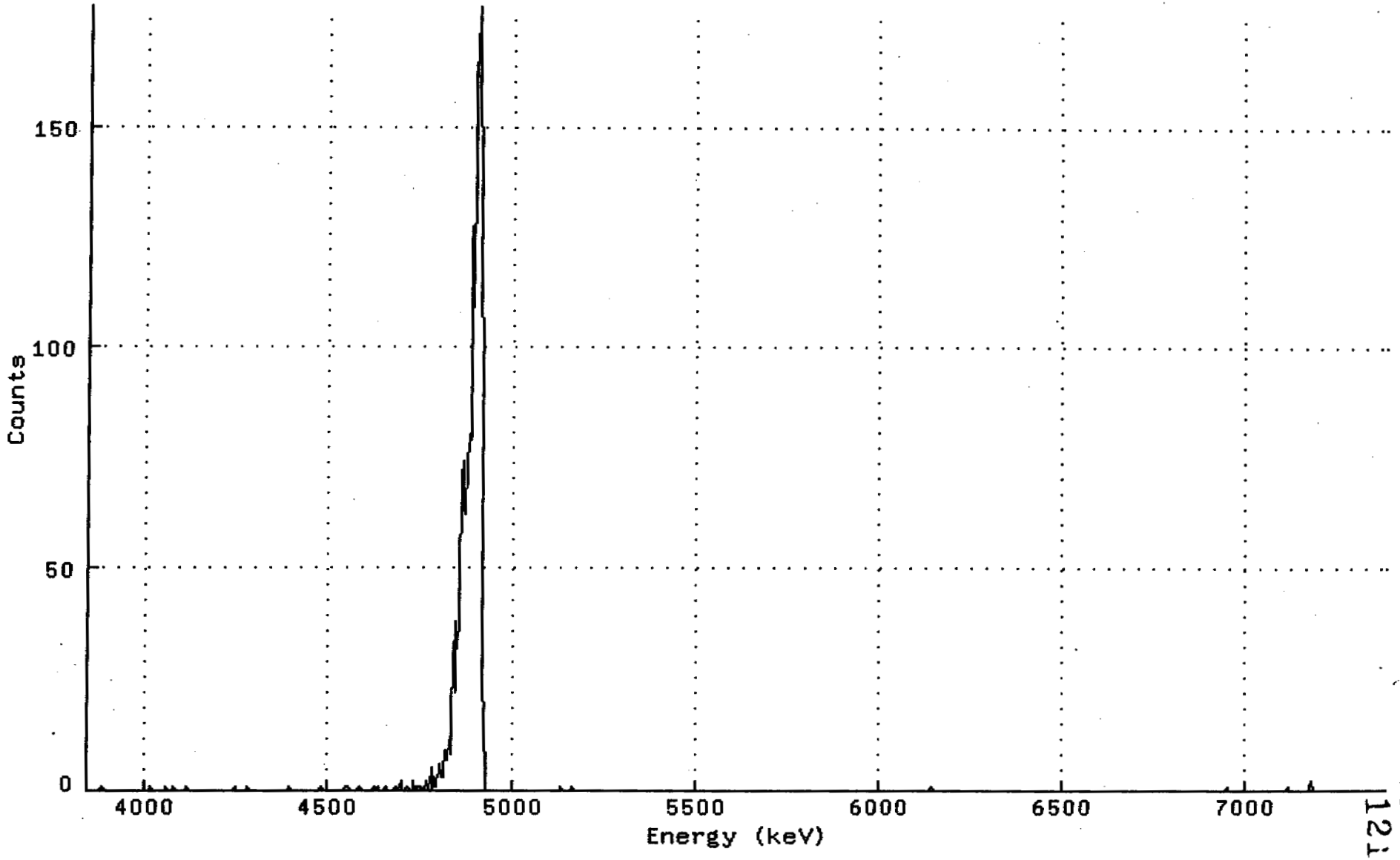
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | -0.80 | 0.80 | 99.9 | -1.810E-01 | 2.561E-01 | 1.554E+00 | 1.083E+00 |
| PU-239 | 5147.7 | 1.20 | 0.80 | 99.9 | 2.714E-01 | 6.892E-01 | 1.554E+00 | 1.083E+00 |
| PU242 | 4890.7 | 2174.20 | 0.80 | 100.4 | 4.893E+02 | 2.437E+01 | 1.546E+00 | 1.078E+00 |

*** RECOUNT SAMPLE CL > 0.067 ***

252

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.S]S_99042844$258191D_PU.CNF;1
Title : 035
Sample Title:
Start Time: 6-APR-1999 11:31: Sample Time: 5-APR-1999 00:00: Energy Offset: 3.83352E+03
Real Time : 0 22:13:23.00 Sample ID : 258191D Energy Slope : 3.46965E+00
Live Time : 0 22:13:23.00 Sample Type: PU Energy Quad : 0.00000E+00




121

253

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
7-APR-1999 10:05:24



**********
Spectral File: ND_AMS_ARCHIVE_C:C_99042844$LCSWR33_PU.CNF
**********

| | | | |
|---|---|---|---|
| BATCH ID: | 99042844 | SAMPLE ID: | LCSWR33 |
| SAMPLE DATE: | 1-JAN-1987 00:00 | ALIQUOT: | 2.500E-01 mL |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 036 |
| ACQ DATE: | 6-APR-1999 11:31 | AVERAGE EFFICIENCY: | 23.5% |
| ELAPSED LIVE TIME: | 80001. | RECOVERY: | 65.27% |
| TRACER ID: | PU242_82-75-5 | TRACER FWHM (kev): | 26.48 |
| LAMBDA VALUE: | 100. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 9.151 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:13 | EFF CAL DATE: | 30-MAR-1999 07:13 |
| BKG FILENAME: | B_036_30MAR99 | | |

**********

NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY pCi/ mL | TPU/ERROR 2-SIGMA | MDC pCi/ mL | CRIT LEVEL pCi/ mL |
|---|---|---|---|---|---|---|---|---|
| PU-238 | 5487.1 | 1120.60 | 0.40 | 99.9 | 1.087E+01 | 9.084E-01 | 4.975E-02 | 3.680E-02 |
| PU-239 | 5147.7 | 1244.80 | 1.20 | 99.9 | 1.096E+01 | 8.927E-01 | 6.870E-02 | 4.628E-02 |
| PU242 | 4890.7 | 1882.20 | 0.80 | 100.4 | 1.649E+01 | 8.678E-01 | 6.017E-02 | 4.195E-02 |

**********

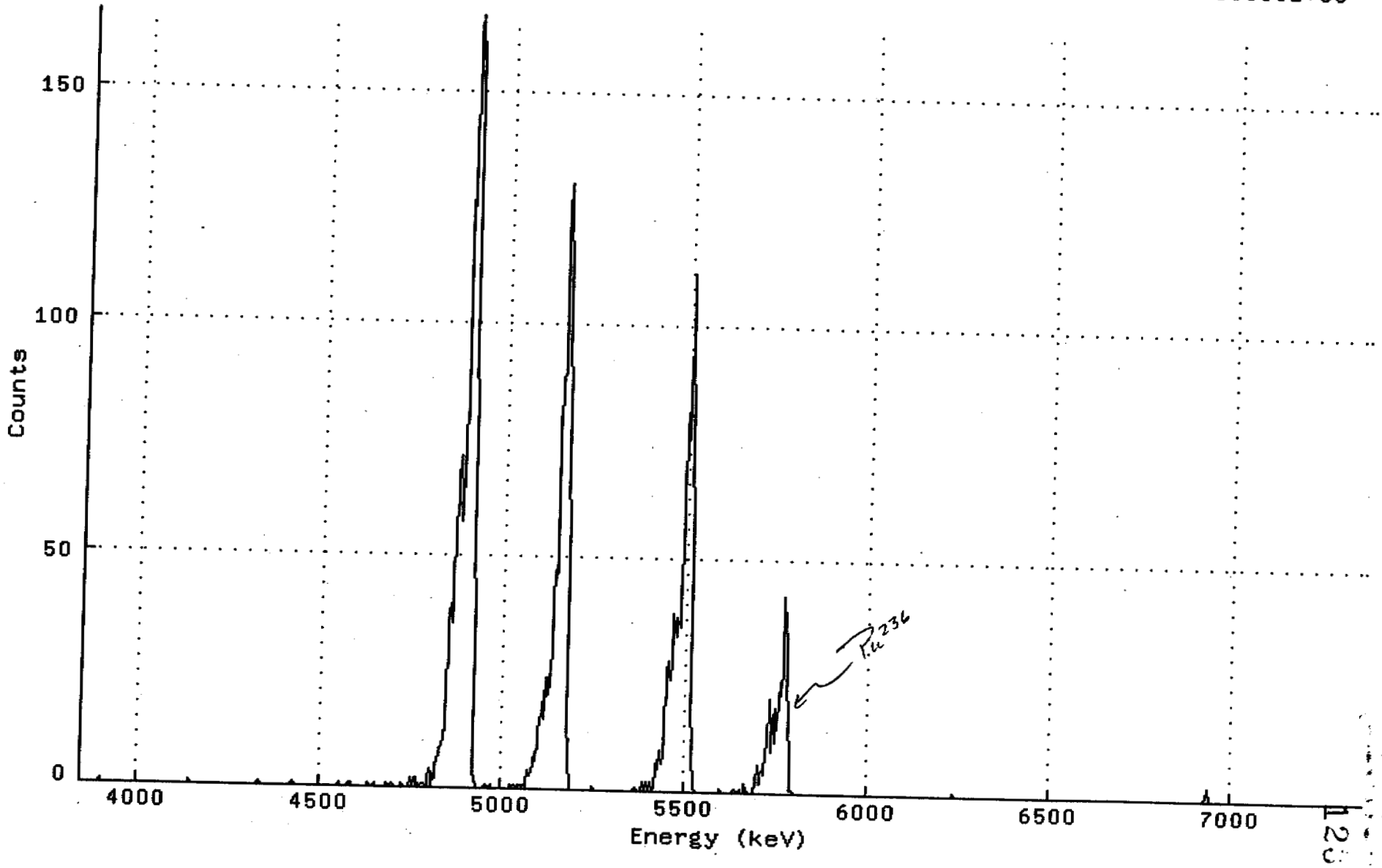
*** POSITIVE ***

254

Spectrum : WIZARD$DKC200:[AHIGH.ALUSR.ARCHIVE.C]C_99042844$LCSWR33_PU.CNF;2
Title : 036
Sample Title:
Start Time: 6-APR-1999 11:31:
Real Time : 0 22:13:21.00
Live Time : 0 22:13:21.00

Sample Time: 1-JAN-1987 00:00:
Sample ID : LCSWR33
Sample Type: PU

Energy Offset: 3.83490E+03
Energy Slope : 3.44567E+00
Energy Quad : 0.00000E+00




255

## Sample Preparation and Analysis Log

ample Type: Various Solids (chipped paint, concrete, and cinder block)

124

| | Method | Isotopes | Worklist Names | Chemist | Date |
|---|---|---|---|---|---|
| Digestion & Purification | RC-19 R05 | Am-241 | 99032743 | | 4/1/99 |
| | | Pu-239/240,Pu-238 | 99032744 | | |
| | | U-238, U235, U234 | 99032745 | | |
| | | | | | |
| Counting | RC-19 R05 | $U^{150}$ | 99032745 | | 4/6/99 |

Tracers (Internal Standards)

| Isotope | ID | Conc(pCi/mL) | @ RD | Aliquot(mL) | HL (years) | Activity(dpm) | Activity(pCi) |
|---|---|---|---|---|---|---|---|
| U-232 | 82-76-3 | 50.91 | 12/15/92 | 0.250 | 72 | 26.59 | 11.98 |
| Am-243 | 82-76-2 | 50.80 | 12/15/92 | 0.100 | 7380 | 11.27 | 5.08 |
| Pu-242 | 82-75-5 | 41.22 | 12/18/89 | 0.100 | 3.758E+05 | 9.15 | 4.12 |

| Req | Sample ID | # | Aliquot Size | Comments | *Sample Aliquot | Total Sample Size | Detector Number | |
|---|---|---|---|---|---|---|---|---|
| | PB | 1 | 1 SA | | 1.0000 | 1 SA | ~~3~~ 32 BT 4/5/99 | |
| 16495 | 258181 | 2 | 0.500 G | | 0.0210 | 23.85 G | ~~3~~ 32 BT 4/3/99 | |
| 16495 | 258182 | 3 | 0.500 G | | 0.0187 | 26.67 G | 4 | |
| 16495 | 258183 | 4 | 0.500 G | | 0.0156 | 32.07 G | 5 | |
| 16495 | 258184 | 5 | 0.500 G | | 0.0135 | 37.17 G | 14 | |
| 16495 | 258185 | 6 | 0.500 G | | 0.0169 | 29.63 G | 15 | |
| 16495 | 258186 | 7 | 0.500 G | | 0.0248 | 20.14 G | 17 | |
| 16495 | 258187 | 8 | 0.500 G | | 0.0283 | 17.64 G | 18 | |
| 16495 | 258188 | 9 | 0.500 G | | 0.0189 | 26.45 G | 21 | |
| 16495 | 258189 | 10 | 0.500 G | | 0.0388 | 12.89 G | 22 | |
| 16495 | 258190 | 11 | 0.500 G | | 0.0160 | 31.25 G | 23 | |
| LCSWR1, | LCSWR33 | 12 | 0.250 mL | | 0.2500 | 1.00 mL | 27 | |
| 16495 | 258181D | 13 | 0.500 G | | 0.0210 | 23.85 G | 28 | |
| 16495 | 258191 | 14 | 0.500 G | | 0.0187 | 26.73 G | 30 | |
| 16495 | 258192 | 15 | 0.500 G | | 0.0226 | 22.14 G | 31 | |
| 16495 | 258193 | 16 | 0.500 G | | 0.0256 | 19.51 G | 32 | |
| 16495 | 258194 | 17 | 0.500 G | | 0.0087 | 57.35 G | 4 | |
| 16495 | 258195 | 18 | 0.500 G | | 0.0217 | 23.07 G | 5 | |
| 16495 | 258196 | 19 | 0.500 G | | 0.0353 | 14.16 G | 14 | |
| 16495 | 258197 | 20 | 0.500 G | | 0.0146 | 34.21 G | ~~17~~ 15 BT 4/13/99 | |
| 16495 | 258198 | 21 | 0.500 G | | 0.0139 | 36.09 G | 17 | |
| 16495 | 258199 | 22 | 0.500 G | | 0.0267 | 18.72 G | 18 | |
| 16495 | 258200 | 23 | 0.500 G | | 0.0480 | 10.41 G | 21 | |
| 16495 | 258201 | 24 | 0.500 G | | 0.0640 | 7.81 G | 22 | |
| 16495 | 258202 | 25 | 0.500 G | | 0.1163 | 4.30 G | 23 | |
| 16495 | 258203 | 26 | 0.500 G | | 0.0277 | 18.08 G | 27 | |
| 16495 | 258191D | 27 | 0.500 G | | 0.0187 | 26.73 G | 28 | |
| LCSWR1, | LCSWR33 | 28 | 0.250 mL | | 0.2500 | 1.00 mL | 30 | |
| | PB | 29 | 1 SA | | 1.0000 | 1 SA | 31 | |
| | | 30 | | | | | | |

**Comments and Actual conditions:**

Start of digestion: 3/31/99

Automatic pipets calibrated in accord with QC-6 on balance # 9

*SAMPLE ALIQUOT = FRACTION OF TOTAL SAMPLE USED FOR ANALYSIS

OK
09
4-6-99

QCed 4/6/99 SBB

256

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:40:28



Spectral File: ND_AMS_ARCHIVE_R:R_99032745$PBA_UU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | PBA |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: 1.000E+00 | sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 032 |
| ACQ DATE: | 5-APR-1999 08:23 | AVERAGE EFFICIENCY: | 25.8% |
| ELAPSED LIVE TIME: | 80001. | RECOVERY: | 76.97% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 65.61 |
| LAMBDA VALUE: | 250. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:01 | EFF CAL DATE: | 30-MAR-1999 07:01 |
| BKG FILENAME: | B_032_30MAR99 | | |

NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ | sa | TPU/ERROR 2-SIGMA | MDC dpm/ | sa | CRIT LEVEL dpm/ | sa |
|---|---|---|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 7033.80 | 5.20 | 99.8 | 2.660E+01 | | 9.263E-01 | 5.033E-02 | | 3.029E-02 | |
| U-234 | 4761.5 | 9.00 | 6.00 | 99.8 | 3.402E-02 | | 3.157E-02 | 5.330E-02 | | 3.178E-02 | |
| U-235 | 4385.5 | 3.00 | 4.00 | 80.9 | 1.399E-02 | | 2.736E-02 | 5.601E-02 | | 3.432E-02 | |
| U-238 | 4184.4 | 8.80 | 3.20 | 100.2 | 3.313E-02 | | 2.747E-02 | 4.151E-02 | | 2.586E-02 | |

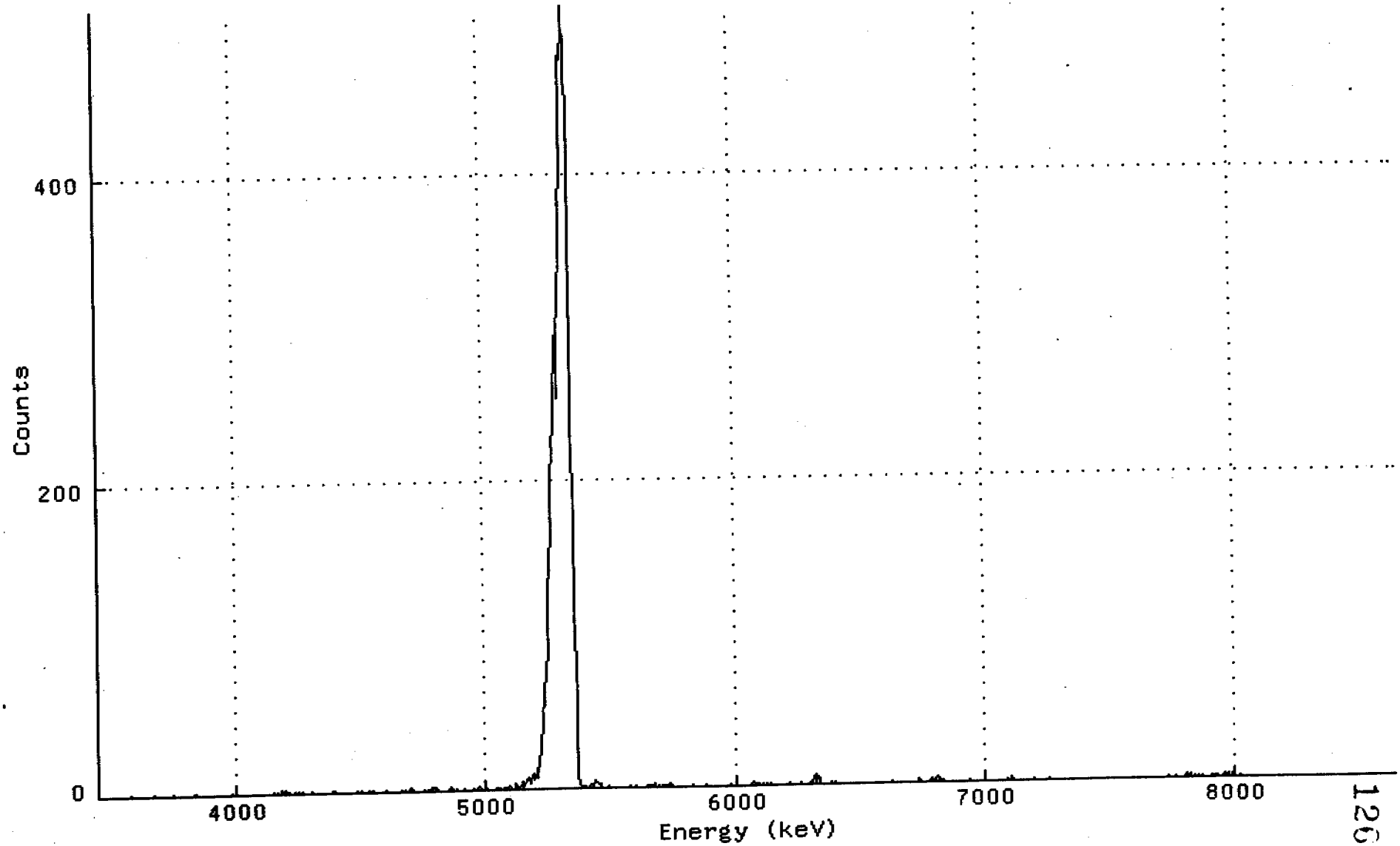
*** POSITIVE ***

-257

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.R]R_99032745$PBA_UU.CNF;3
Title : 032
Sample Title:
Start Time: 5-APR-1999 08:23:
Real Time : 0 22:13:21.00
Live Time : 0 22:13:21.00

Sample Time: 31-MAR-1999 00:00
Sample ID : PBA
Sample Type: UU

Energy Offset: 3.43918E+03
Energy Slope : 5.08113E+00
Energy Quad : 0.00000E+00




126

258

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:42:51

127

Spectral File: ND_AMS_ARCHIVE_S:S_99032745$258181_UU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | 258181 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.100E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 032 |
| ACQ DATE: | 3-APR-1999 13:49 | AVERAGE EFFICIENCY: | 25.8% |
| ELAPSED LIVE TIME: | 80000. | RECOVERY: | 74.12% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 45.51 |
| LAMBDA VALUE: | 250. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:01 | EFF CAL DATE: | 30-MAR-1999 07:01 |
| BKG FILENAME: | B_032_30MAR99 | | |

NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ | sa | TPU/ERROR 2-SIGMA | MDC dpm/ | sa | CRIT LEVEL dpm/ | sa |
|---|---|---|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 6773.80 | 5.20 | 99.8 | 1.266E+03 | | 4.451E+01 | 2.489E+00 | | 1.498E+00 | |
| U-234 | 4761.5 | 647.00 | 6.00 | 99.8 | 1.210E+02 | | 1.091E+01 | 2.636E+00 | | 1.571E+00 | |
| U-235 | 4385.5 | 26.00 | 4.00 | 80.9 | 5.996E+00 | | 2.606E+00 | 2.770E+00 | | 1.697E+00 | |
| U-238 | 4184.4 | 601.80 | 3.20 | 100.2 | 1.120E+02 | | 1.037E+01 | 2.053E+00 | | 1.279E+00 | |

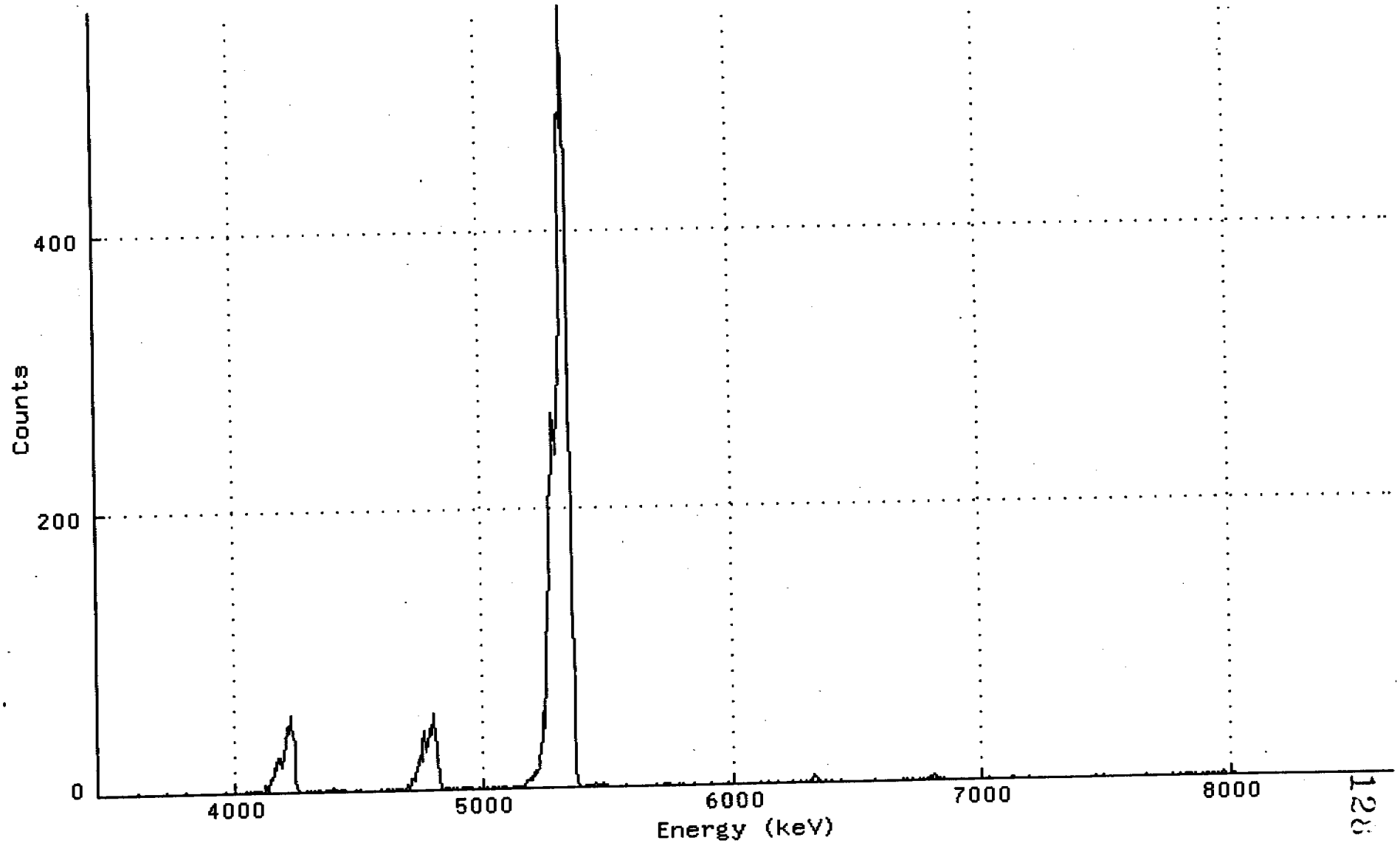
*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

259

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99032745$258181_UU.CNF;3
Title : 032
Sample Title:
Start Time: 3-APR-1999 13:49:
Real Time : 0 22:13:21.00
Live Time : 0 22:13:20.00

Sample Time: 31-MAR-1999 00:00
Sample ID : 258181
Sample Type: UU

Energy Offset: 3.43918E+03
Energy Slope : 5.08113E+00
Energy Quad : 0.00000E+00




128

260

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:44:18



Spectral File: ND_AMS_ARCHIVE_S:S_99032745$258182_UU.CNF

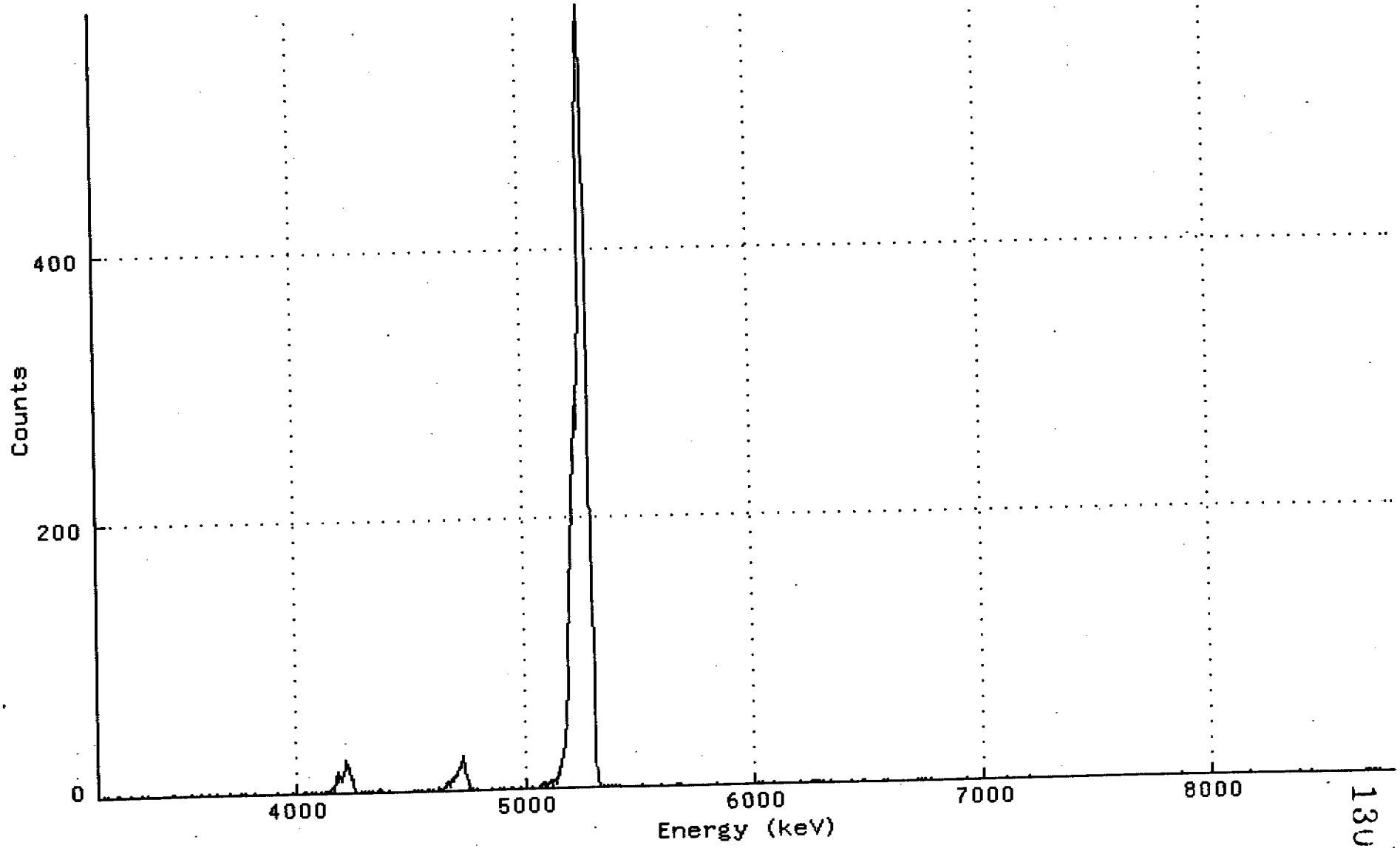
| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | 258182 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.870E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 004 |
| ACQ DATE: | 2-APR-1999 14:31 | AVERAGE EFFICIENCY: | 26.2% |
| ELAPSED LIVE TIME: | 80003. | RECOVERY: | 71.71% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 45.98 |
| LAMBDA VALUE: | 250. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 06:36 | EFF CAL DATE: | 30-MAR-1999 06:36 |
| BKG FILENAME: | B_004_30MAR99 | | |

NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ | ACTIVITY sa | TPU/ERROR 2-SIGMA | MDC dpm/ | MDC sa | CRIT LEVEL dpm/ | CRIT LEVEL sa |
|---|---|---|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 6655.80 | 5.20 | 99.8 | 1.422E+03 | | 5.010E+01 | 2.845E+00 | | 1.712E+00 | |
| U-234 | 4761.5 | 219.00 | 2.00 | 99.8 | 4.679E+01 | | 6.680E+00 | 1.984E+00 | | 1.282E+00 | |
| U-235 | 4385.5 | 12.60 | 6.40 | 80.9 | 3.321E+00 | | 2.452E+00 | 3.815E+00 | | 2.265E+00 | |
| U-238 | 4184.4 | 212.20 | 2.80 | 100.2 | 4.514E+01 | | 6.554E+00 | 2.232E+00 | | 1.404E+00 | |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99032745$258182_UU.CNF;2
Title : 004
Sample Title:
Start Time: 2-APR-1999 14:31:
Real Time : 0 22:13:24.00
Live Time : 0 22:13:23.00
Sample Time: 31-MAR-1999 00:00
Sample ID : 258182
Sample Type: UU
Energy Offset: 3.12134E+03
Energy Slope : 5.53351E+00
Energy Quad : 0.00000E+00




13U

262

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:45:01



Spectral File: ND_AMS_ARCHIVE_S:S_99032745$258183_UU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | 258183 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.560E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 005 |
| ACQ DATE: | 2-APR-1999 14:31 | AVERAGE EFFICIENCY: | 25.9% |
| ELAPSED LIVE TIME: | 80003. | RECOVERY: | 74.97% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 44.45 |
| LAMBDA VALUE: | 250. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 06:37 | EFF CAL DATE: | 30-MAR-1999 06:37 |
| BKG FILENAME: | B_005_30MAR99 | | |

NUCLIDE ACTIVITY SUMMARY

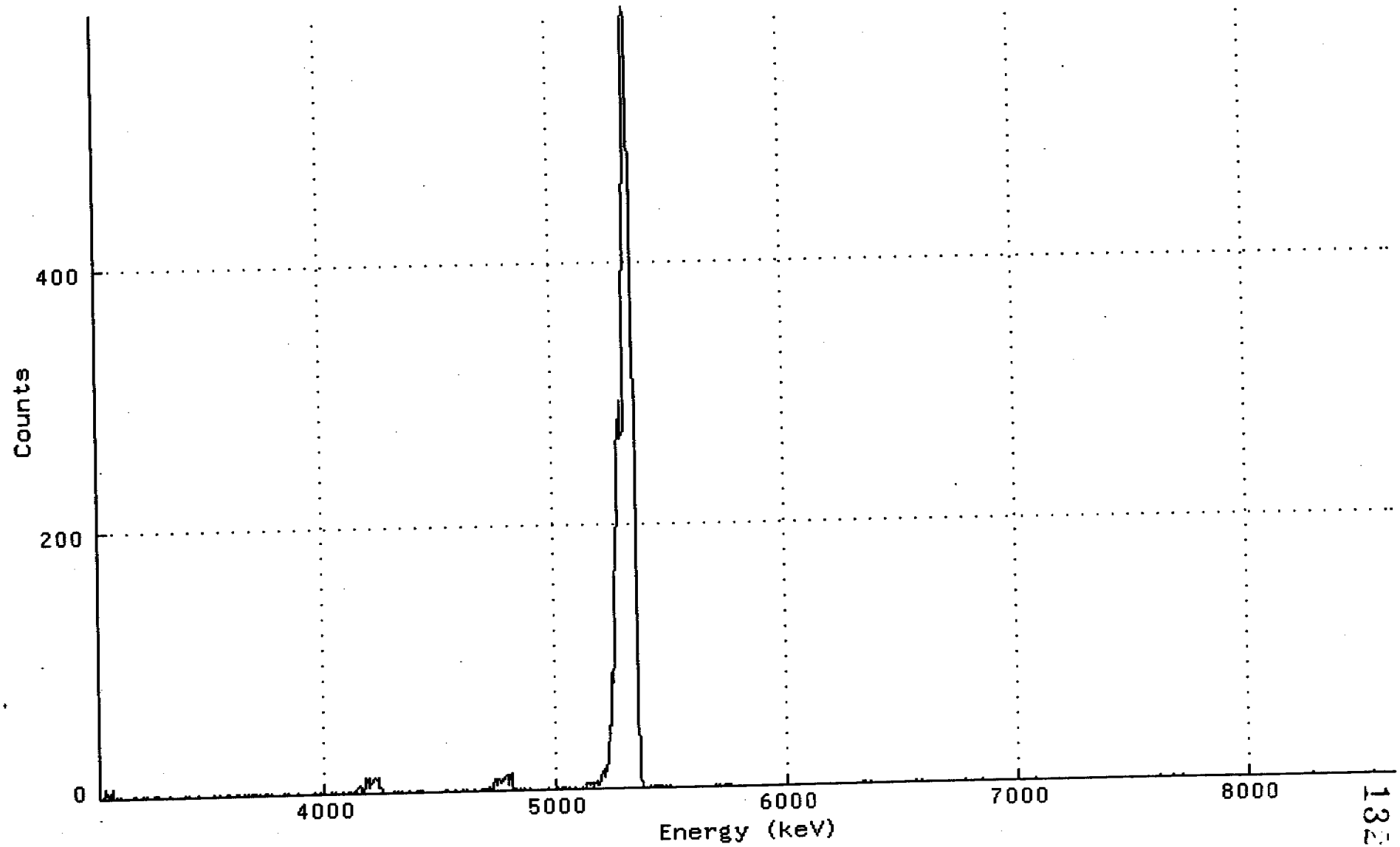
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 6875.20 | 4.80 | 99.8 | 1.705E+03 | 5.978E+01 | 3.198E+00 | 1.935E+00 |
| U-234 | 4761.5 | 143.60 | 2.40 | 99.8 | 3.560E+01 | 6.206E+00 | 2.458E+00 | 1.565E+00 |
| U-235 | 4385.5 | 4.00 | 8.00 | 80.9 | 1.223E+00 | 2.386E+00 | 4.852E+00 | 2.840E+00 |
| U-238 | 4184.4 | 139.00 | 4.00 | 100.2 | 3.432E+01 | 6.121E+00 | 2.965E+00 | 1.817E+00 |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99032745$258183_UU.CNF;2
Title : 005
Sample Title:
Start Time: 2-APR-1999 14:31:
Real Time : 0 22:13:23.00
Live Time : 0 22:13:23.00

Sample Time: 31-MAR-1999 00:00
Sample ID : 258183
Sample Type: UU

Energy Offset: 3.01948E+03
Energy Slope : 5.47315E+00
Energy Quad : 0.00000E+00




264

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:45:28



**********
Spectral File: ND_AMS_ARCHIVE_S:S_99032745$258184_UU.CNF
**********

| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | 258184 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.350E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 014 |
| ACQ DATE: | 2-APR-1999 14:21 | AVERAGE EFFICIENCY: | 26.3% |
| ELAPSED LIVE TIME: | 80000. | RECOVERY: | 75.18% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 43.48 |
| LAMBDA VALUE: | 250. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 06:42 | EFF CAL DATE: | 30-MAR-1999 06:42 |
| BKG FILENAME: | B_014_30MAR99 | | |

**********

NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 7001.20 | 18.80 | 99.8 | 1.970E+03 | 6.879E+01 | 6.435E+00 | 3.599E+00 |
| U-234 | 4761.5 | 277.40 | 9.60 | 99.8 | 7.805E+01 | 1.017E+01 | 4.816E+00 | 2.789E+00 |
| U-235 | 4385.5 | 8.40 | 7.60 | 80.9 | 2.916E+00 | 3.032E+00 | 5.390E+00 | 3.165E+00 |
| U-238 | 4184.4 | 282.40 | 3.60 | 100.2 | 7.911E+01 | 1.010E+01 | 3.231E+00 | 1.995E+00 |

**********

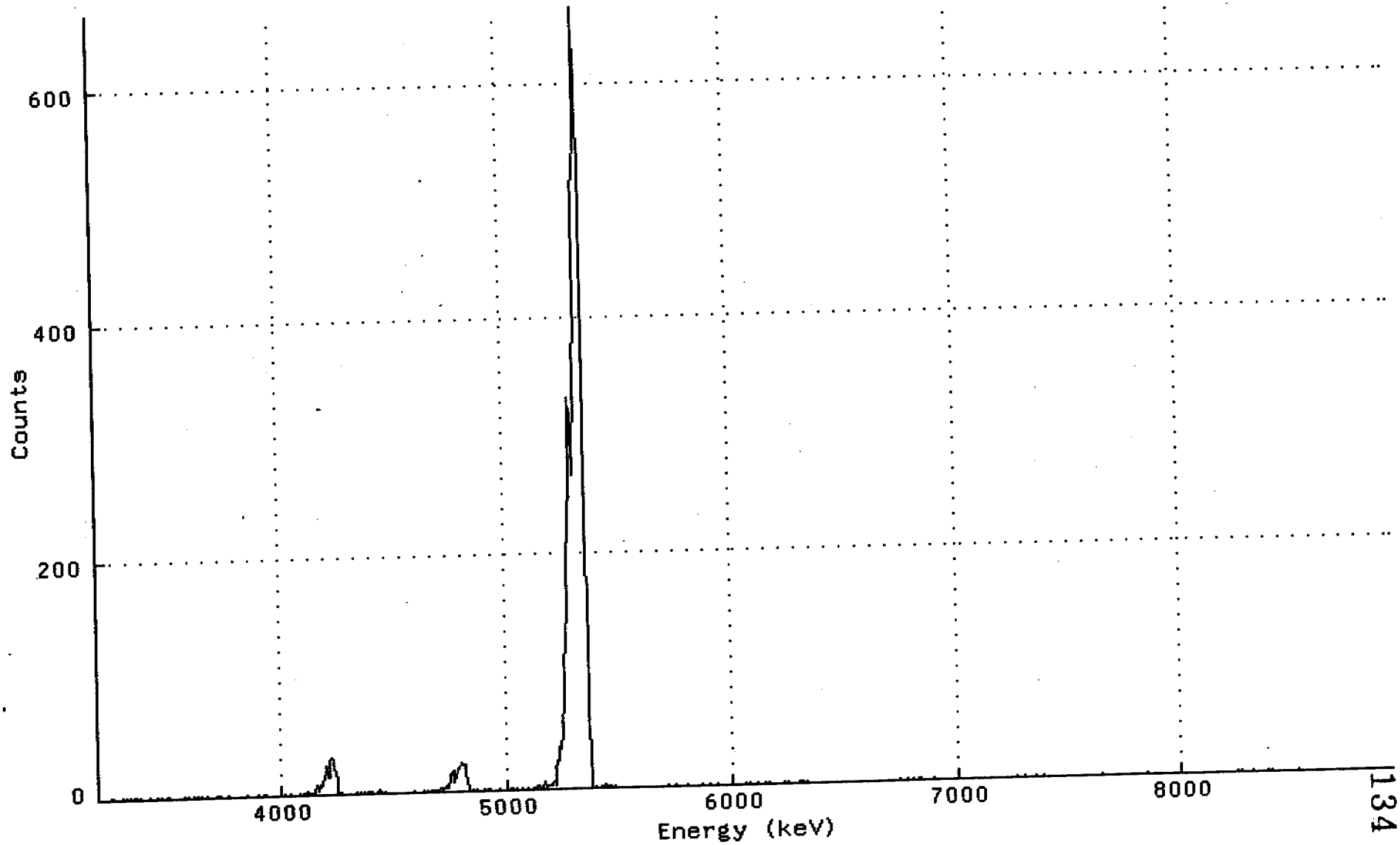
*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

265

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99032745$258184_UU.CNF;2
Title : 014
Sample Title:
Start Time: 2-APR-1999 14:21:
Real Time : 0 22:13:21.00
Live Time : 0 22:13:20.00

Sample Time: 31-MAR-1999 00:00
Sample ID : 258184
Sample Type: UU

Energy Offset: 3.17108E+03
Energy Slope : 5.62526E+00
Energy Quad : 0.00000E+00






266

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:45:48



Spectral File: ND_AMS_ARCHIVE_S:S_99032745$258185_UU.CNF

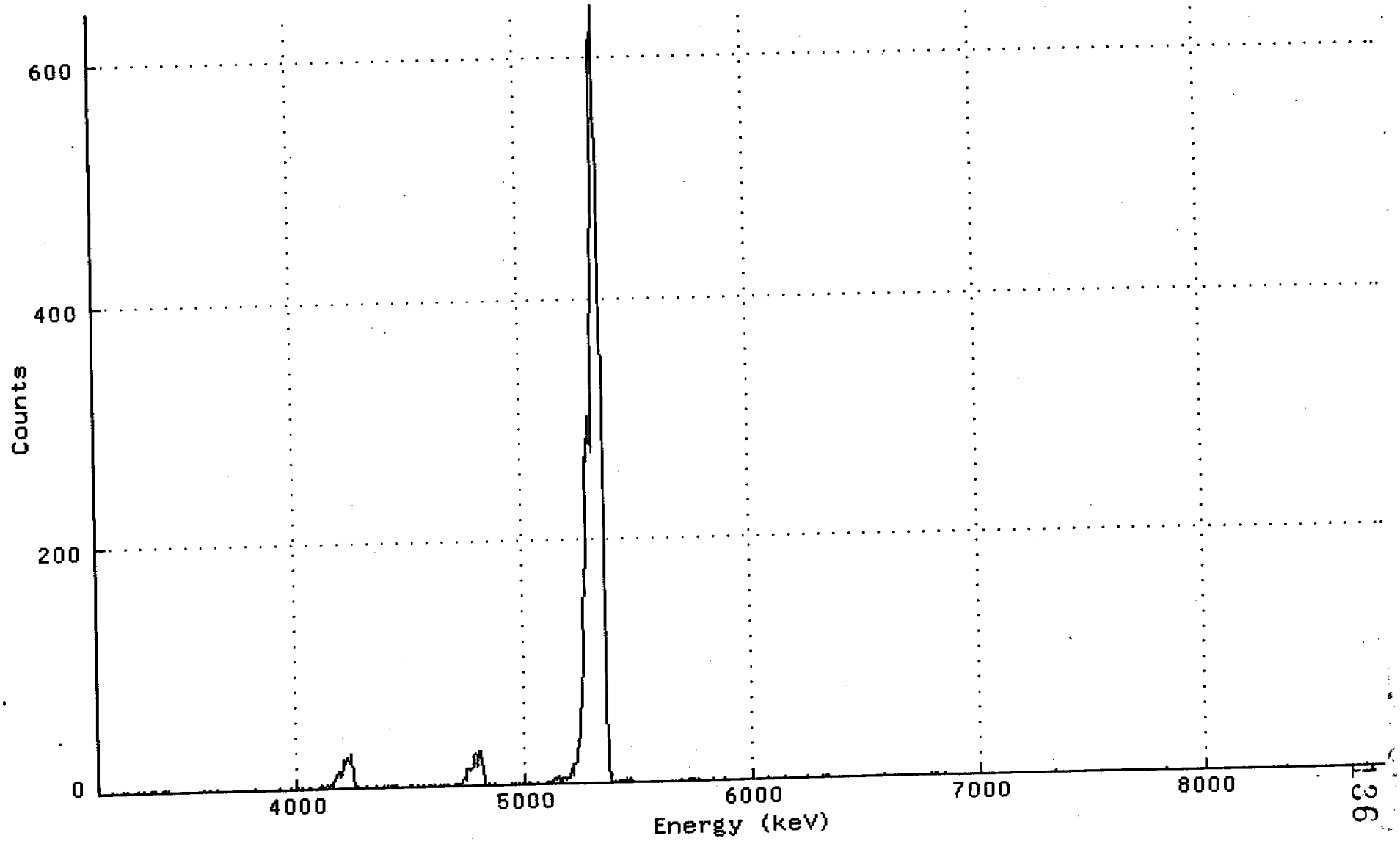
| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | 258185 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.690E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 015 |
| ACQ DATE: | 2-APR-1999 14:21 | AVERAGE EFFICIENCY: | 26.7% |
| ELAPSED LIVE TIME: | 80006. | RECOVERY: | 75.00% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 44.62 |
| LAMBDA VALUE: | 250. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 06:44 | EFF CAL DATE: | 30-MAR-1999 06:44 |
| BKG FILENAME: | B_015_30MAR99 | | |

NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 7087.80 | 5.20 | 99.8 | 1.574E+03 | 5.464E+01 | 2.956E+00 | 1.779E+00 |
| U-234 | 4761.5 | 291.20 | 4.80 | 99.8 | 6.465E+01 | 8.152E+00 | 2.863E+00 | 1.733E+00 |
| U-235 | 4385.5 | 15.60 | 2.40 | 80.9 | 4.272E+00 | 2.392E+00 | 2.715E+00 | 1.729E+00 |
| U-238 | 4184.4 | 281.20 | 2.80 | 100.2 | 6.216E+01 | 7.929E+00 | 2.319E+00 | 1.459E+00 |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99032745$258185_UU.CNF;2
Title : 015
Sample Title:
Start Time: 2-APR-1999 14:21: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.11279E+03
Real Time : 0 22:13:26.00 Sample ID : 258185 Energy Slope : 5.52977E+00
Live Time : 0 22:13:26.00 Sample Type: UU Energy Quad : 0.00000E+00




136

268

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:46:03

137

**********
Spectral File: ND_AMS_ARCHIVE_S:S_99032745$258186_UU.CNF
**********

| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | 258186 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.480E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 017 |
| ACQ DATE: | 2-APR-1999 14:21 | AVERAGE EFFICIENCY: | 26.7% |
| ELAPSED LIVE TIME: | 80000. | RECOVERY: | 73.27% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 46.45 |
| LAMBDA VALUE: | 250. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 06:45 | EFF CAL DATE: | 30-MAR-1999 06:45 |
| BKG FILENAME: | B_017_30MAR99 | | |

**********

NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 6932.20 | 2.80 | 99.8 | 1.072E+03 | 3.737E+01 | 1.623E+00 | 1.021E+00 |
| U-234 | 4761.5 | 408.60 | 6.40 | 99.8 | 6.320E+01 | 6.882E+00 | 2.239E+00 | 1.329E+00 |
| U-235 | 4385.5 | 11.00 | 6.00 | 80.9 | 2.099E+00 | 1.683E+00 | 2.691E+00 | 1.604E+00 |
| U-238 | 4184.4 | 430.40 | 3.60 | 100.2 | 6.629E+01 | 7.032E+00 | 1.776E+00 | 1.097E+00 |

**********

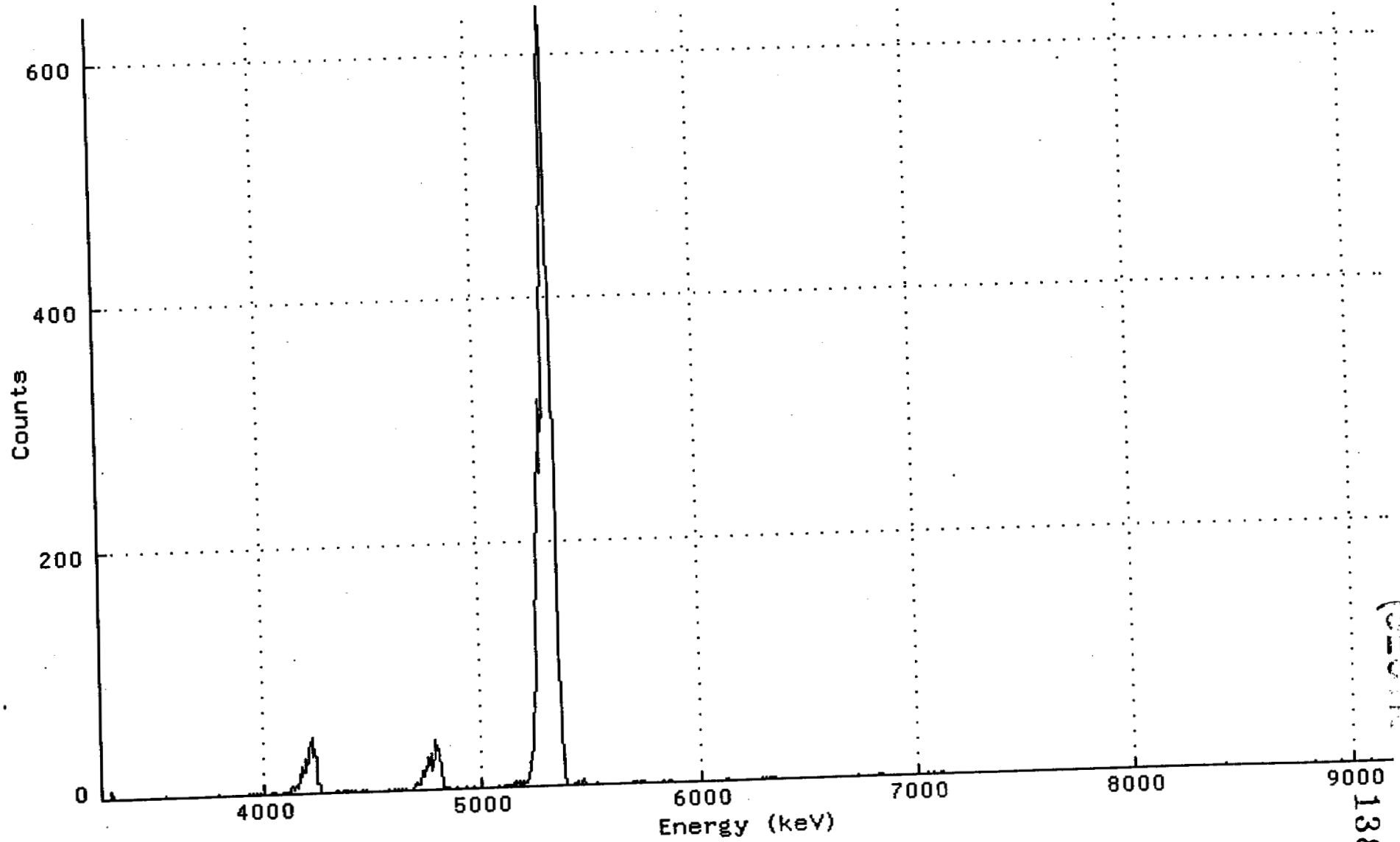
** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

269

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99032745$258186_UU.CNF;2
Title : 017
Sample Title:
Start Time: 2-APR-1999 14:21:
Real Time : 0 22:13:20.00
Live Time : 0 22:13:20.00

Sample Time: 31-MAR-1999 00:00
Sample ID : 258186
Sample Type: UU

Energy Offset: 3.24030E+03
Energy Slope : 5.78723E+00
Energy Quad : 0.00000E+00




138

270

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:46:25



Spectral File: ND_AMS_ARCHIVE_S:S_99032745$258187_UU.CNF

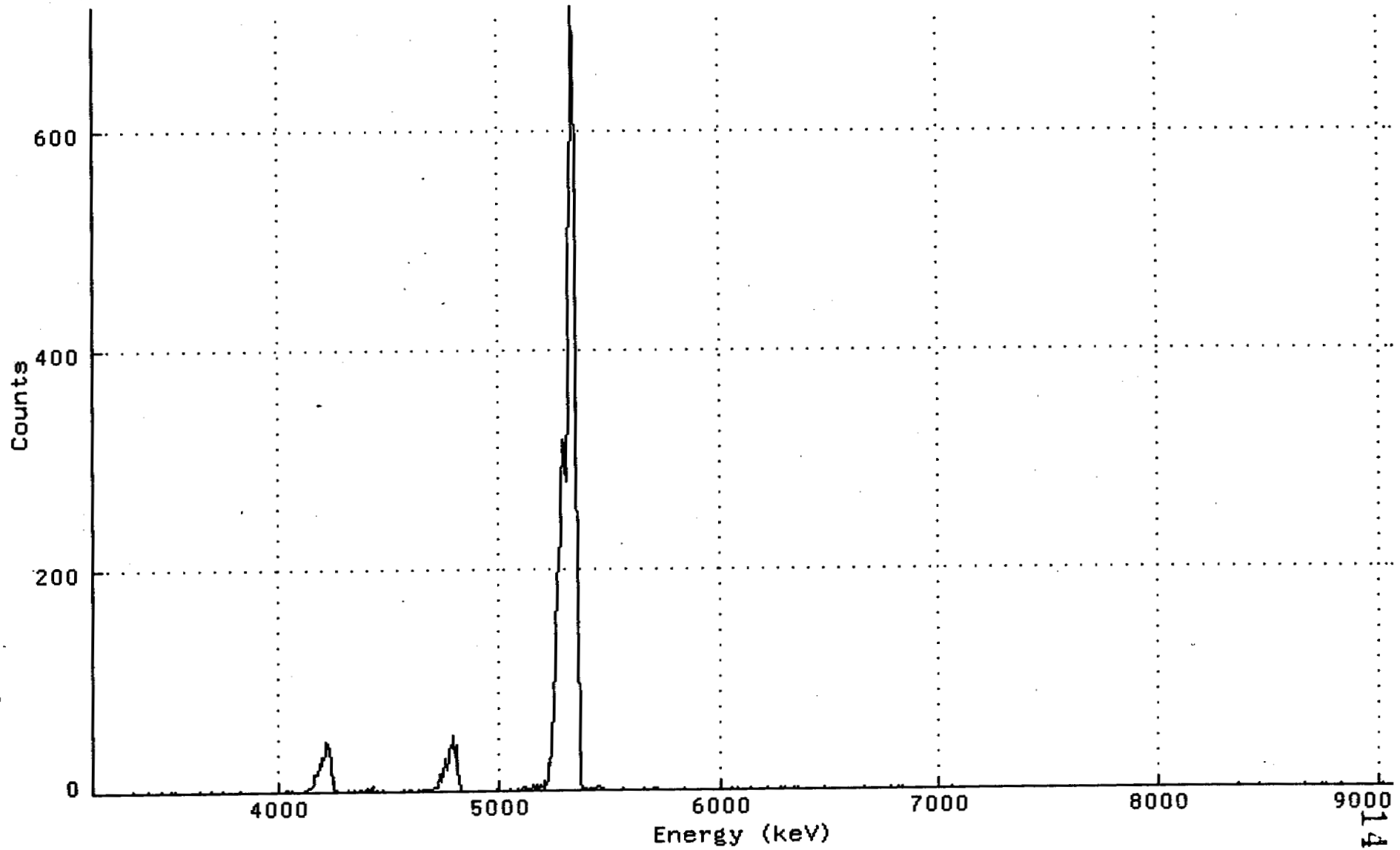
| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | 258187 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.830E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 018 |
| ACQ DATE: | 2-APR-1999 14:22 | AVERAGE EFFICIENCY: | 26.7% |
| ELAPSED LIVE TIME: | 80002. | RECOVERY: | 74.75% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 40.73 |
| LAMBDA VALUE: | 250. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 06:47 | EFF CAL DATE: | 30-MAR-1999 06:47 |
| BKG FILENAME: | B_018_30MAR99 | | |

NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ | sa | TPU/ERROR 2-SIGMA | MDC dpm/ | sa | CRIT LEVEL dpm/ | sa |
|---|---|---|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 7066.60 | 2.40 | 99.8 | 9.398E+02 | | 3.260E+01 | 1.318E+00 | | 8.393E-01 | |
| U-234 | 4761.5 | 450.00 | 4.00 | 99.8 | 5.984E+01 | | 6.230E+00 | 1.597E+00 | | 9.787E-01 | |
| U-235 | 4385.5 | 20.40 | 3.60 | 80.9 | 3.346E+00 | | 1.661E+00 | 1.892E+00 | | 1.168E+00 | |
| U-238 | 4184.4 | 429.00 | 2.00 | 100.2 | 5.680E+01 | | 6.018E+00 | 1.230E+00 | | 7.942E-01 | |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99032745$258187_UU.CNF;2
Title : 018
Sample Title:
Start Time: 2-APR-1999 14:22: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.14422E+03
Real Time : 0 22:13:23.00 Sample ID : 258187 Energy Slope : 5.77093E+00
Live Time : 0 22:13:22.00 Sample Type: UU Energy Quad : 0.00000E+00




140

272

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:46:46



Spectral File: ND_AMS_ARCHIVE_S:S_99032745$258188_UU.CNF

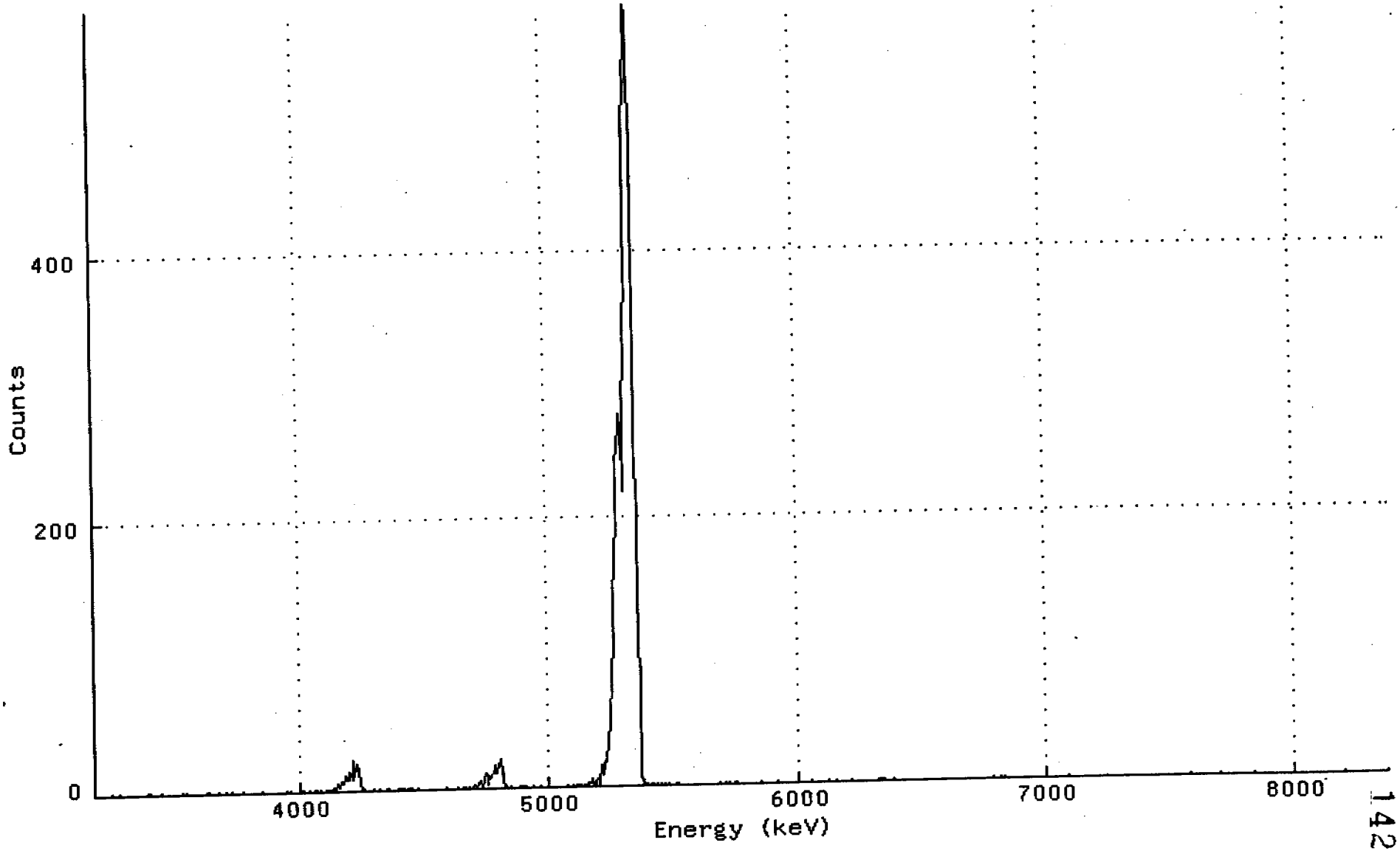
| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | 258188 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.890E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 021 |
| ACQ DATE: | 2-APR-1999 14:22 | AVERAGE EFFICIENCY: | 26.9% |
| ELAPSED LIVE TIME: | 80000. | RECOVERY: | 75.13% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 46.33 |
| LAMBDA VALUE: | 250. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 06:49 | EFF CAL DATE: | 30-MAR-1999 06:49 |
| BKG FILENAME: | B_021_30MAR99 | | |

NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 7144.20 | 2.80 | 99.8 | 1.407E+03 | 4.874E+01 | 2.066E+00 | 1.300E+00 |
| U-234 | 4761.5 | 213.20 | 0.80 | 99.8 | 4.199E+01 | 6.041E+00 | 1.353E+00 | 9.433E-01 |
| U-235 | 4385.5 | 13.20 | 2.80 | 80.9 | 3.207E+00 | 2.015E+00 | 2.549E+00 | 1.604E+00 |
| U-238 | 4184.4 | 210.40 | 1.60 | 100.2 | 4.126E+01 | 5.987E+00 | 1.685E+00 | 1.108E+00 |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99032745$258188_UU.CNF;2
Title : 021
Sample Title:
Start Time: 2-APR-1999 14:22: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.16215E+03
Real Time : 0 22:13:21.00 Sample ID : 258188 Energy Slope : 5.08534E+00
Live Time : 0 22:13:20.00 Sample Type: UU Energy Quad : 0.00000E+00




142

274

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:47:09

SECTION D
143

**********
Spectral File: ND_AMS_ARCHIVE_S:S_99032745$258189_UU.CNF
**********

| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | 258189 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 3.880E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 022 |
| ACQ DATE: | 2-APR-1999 14:22 | AVERAGE EFFICIENCY: | 25.8% |
| ELAPSED LIVE TIME: | 80005. | RECOVERY: | 78.24% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 64.89 |
| LAMBDA VALUE: | 250. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 06:50 | EFF CAL DATE: | 30-MAR-1999 06:50 |
| BKG FILENAME: | B_022_30MAR99 | | |

**********

NUCLIDE ACTIVITY SUMMARY

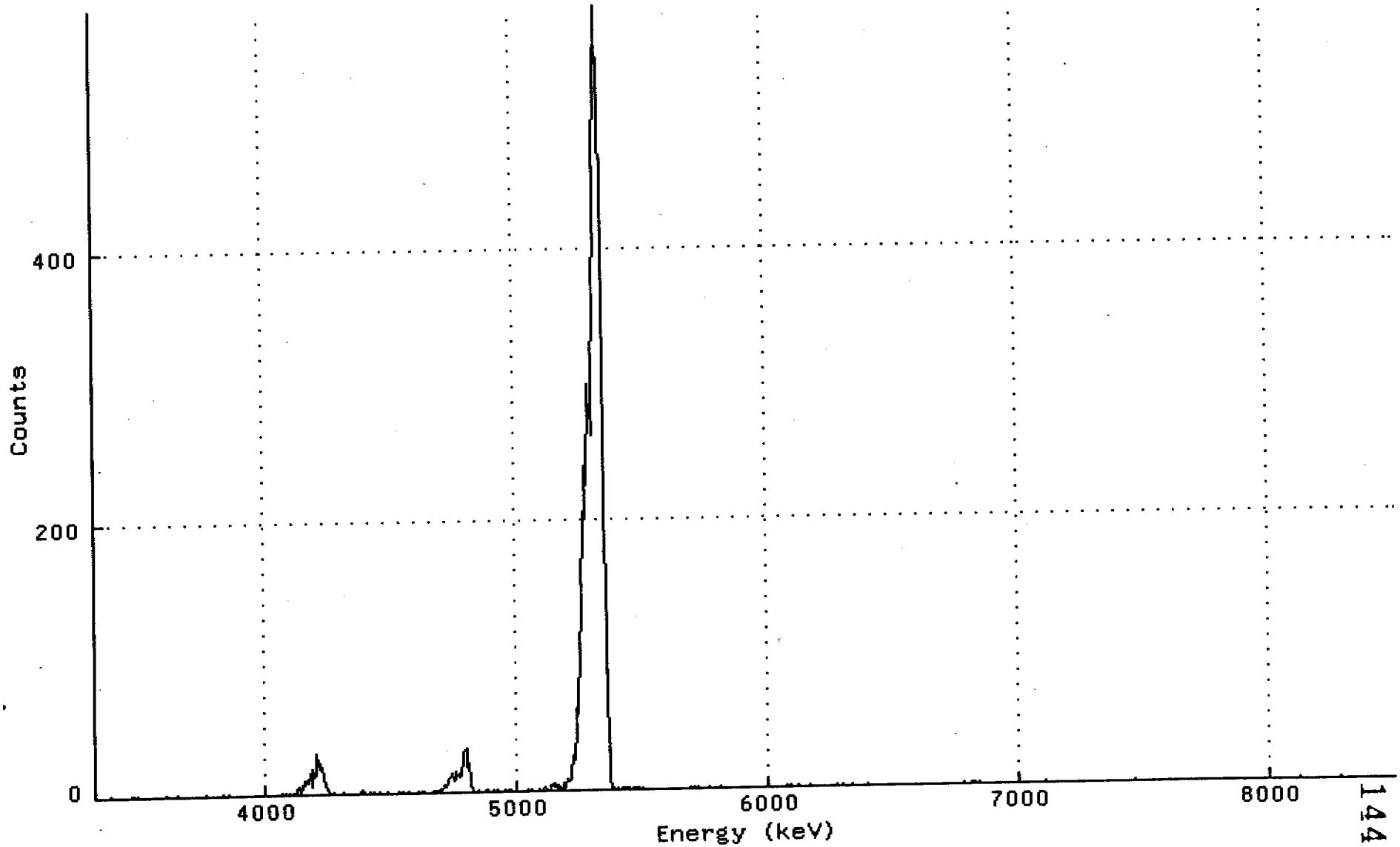
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 7151.60 | 4.40 | 99.8 | 6.854E+02 | 2.382E+01 | 1.195E+00 | 7.271E-01 |
| U-234 | 4761.5 | 337.20 | 2.80 | 99.8 | 3.232E+01 | 3.804E+00 | 1.005E+00 | 6.326E-01 |
| U-235 | 4385.5 | 13.20 | 2.80 | 80.9 | 1.561E+00 | 9.807E-01 | 1.240E+00 | 7.804E-01 |
| U-238 | 4184.4 | 288.60 | 2.40 | 100.2 | 2.754E+01 | 3.470E+00 | 9.460E-01 | 6.023E-01 |

**********

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

275

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99032745$258189_UU.CNF;2
Title : 022
Sample Title:
Start Time: 2-APR-1999 14:22: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.31268E+03
Real Time : 0 22:13:25.00 Sample ID : 258189 Energy Slope : 5.06150E+00
Live Time : 0 22:13:25.00 Sample Type: UU Energy Quad : 0.00000E+00






276

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:47:51



Spectral File: ND_AMS_ARCHIVE_S:S_99032745$258190_UU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | 258190 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.600E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 023 |
| ACQ DATE: | 2-APR-1999 14:22 | AVERAGE EFFICIENCY: | 26.7% |
| ELAPSED LIVE TIME: | 80002. | RECOVERY: | 74.86% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 41.05 |
| LAMBDA VALUE: | 250. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 06:53 | EFF CAL DATE: | 30-MAR-1999 06:53 |
| BKG FILENAME: | B_023_30MAR99 | | |

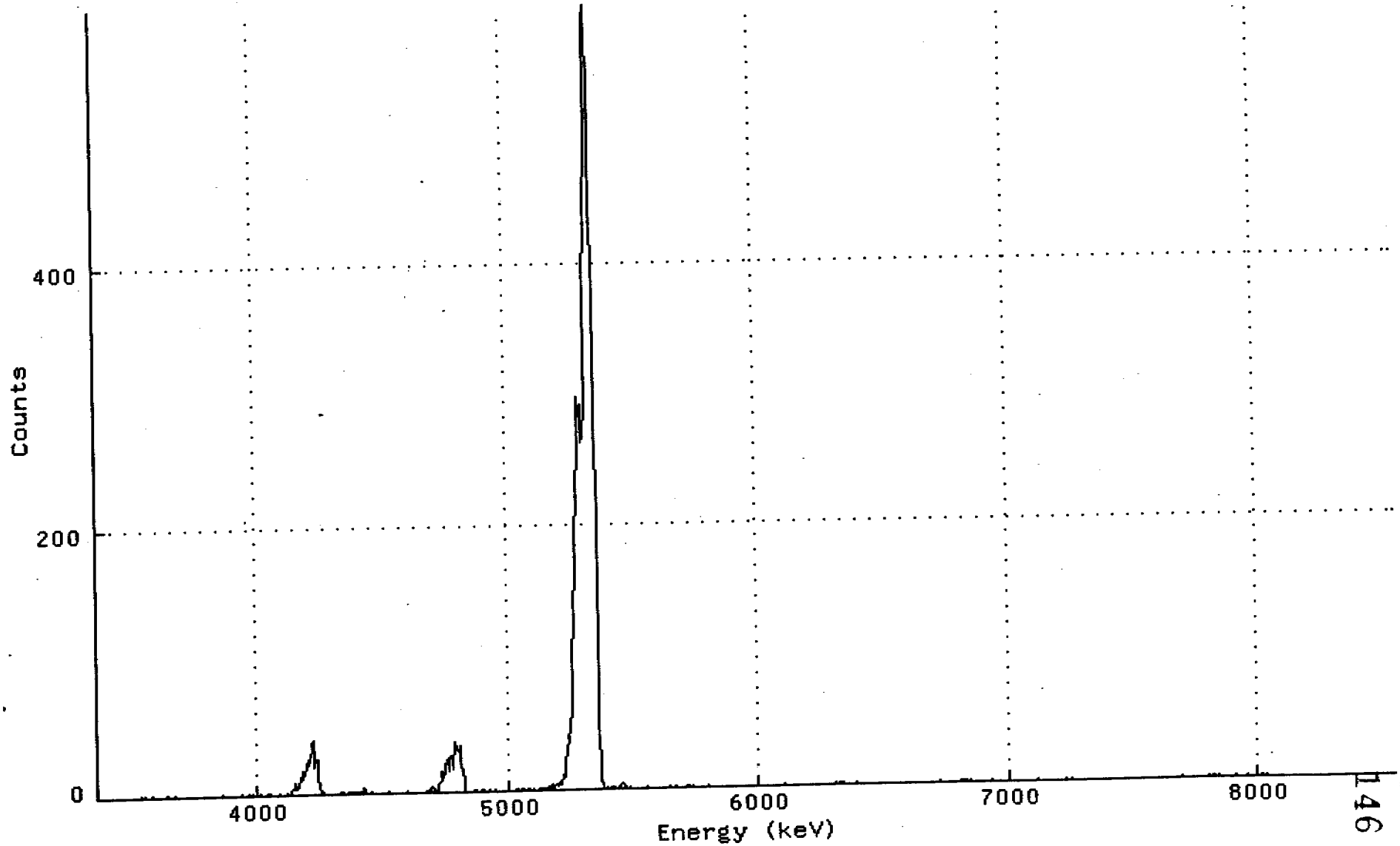
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 7069.60 | 6.40 | 99.8 | 1.662E+03 | 5.783E+01 | 3.403E+00 | 2.020E+00 |
| U-234 | 4761.5 | 437.00 | 4.00 | 99.8 | 1.027E+02 | 1.084E+01 | 2.824E+00 | 1.730E+00 |
| U-235 | 4385.5 | 22.20 | 0.80 | 80.9 | 6.439E+00 | 2.815E+00 | 1.992E+00 | 1.389E+00 |
| U-238 | 4184.4 | 386.80 | 5.20 | 100.2 | 9.055E+01 | 1.008E+01 | 3.117E+00 | 1.876E+00 |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

277

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99032745$258190_UU.CNF;2
Title : 023
Sample Title:
Start Time: 2-APR-1999 14:22:
Real Time : 0 22:13:22.00
Live Time : 0 22:13:22.00
Sample Time: 31-MAR-1999 00:00
Sample ID : 258190
Sample Type: UU
Energy Offset: 3.34174E+03
Energy Slope : 5.08500E+00
Energy Quad : 0.00000E+00




146

278

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:38:16



Spectral File: ND_AMS_ARCHIVE_C:C_99032745$LCSWR1A_UU.CNF

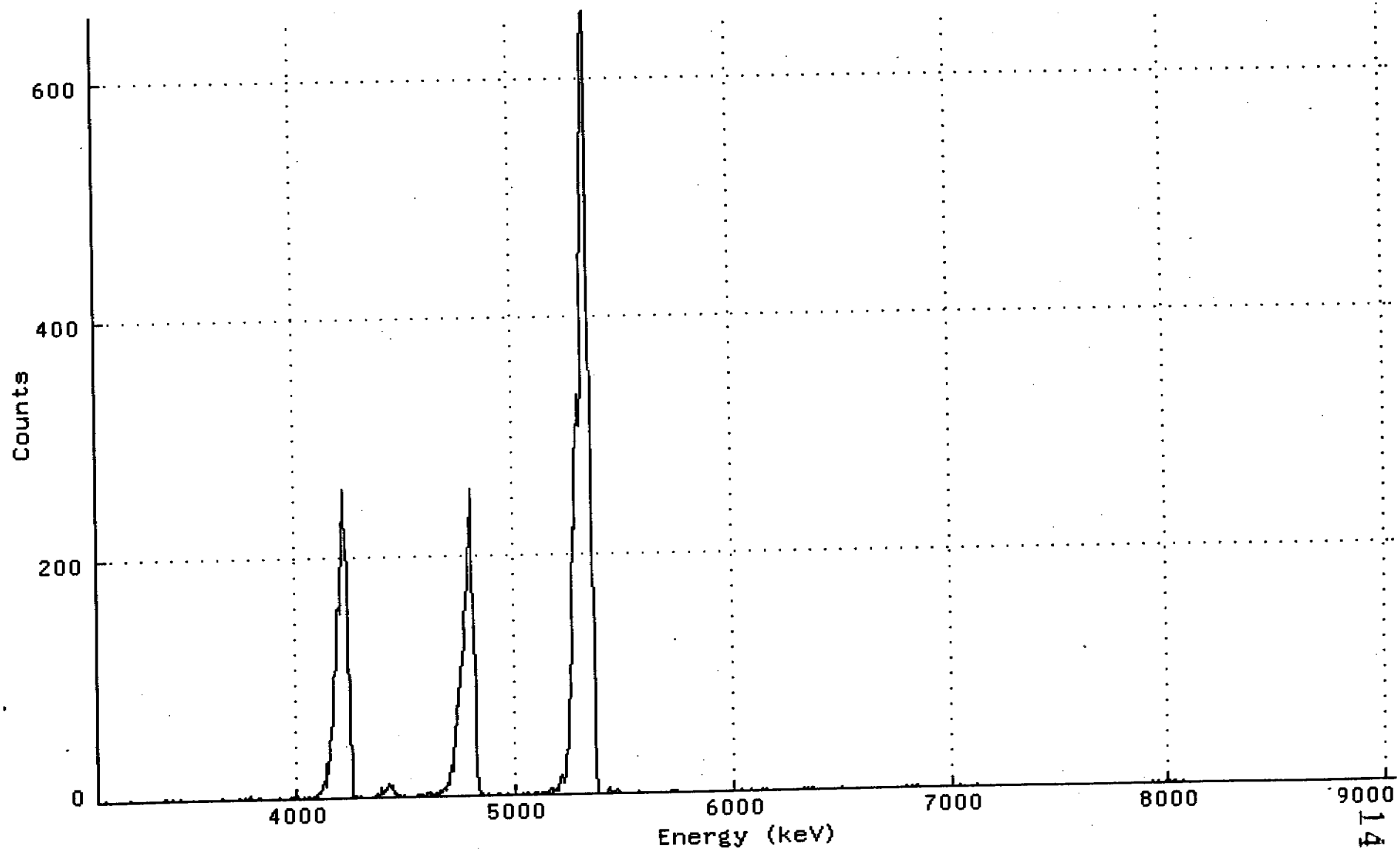
| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | LCSWR1A |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.500E-01 L |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 027 |
| ACQ DATE: | 2-APR-1999 14:24 | AVERAGE EFFICIENCY: | 27.6% |
| ELAPSED LIVE TIME: | 80004. | RECOVERY: | 73.94% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 45.60 |
| LAMBDA VALUE: | 250. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 06:55 | EFF CAL DATE: | 30-MAR-1999 06:55 |
| BKG FILENAME: | B_027_30MAR99 | | |

NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY pCi/ L | TPU/ERROR 2-SIGMA | MDC pCi/ L | CRIT LEVEL pCi/ L |
|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 7211.00 | 4.00 | 99.8 | 4.792E+01 | 1.657E+00 | 7.980E-02 | 4.891E-02 |
| U-234 | 4761.5 | 2467.80 | 3.20 | 99.8 | 1.640E+01 | 9.646E-01 | 7.328E-02 | 4.564E-02 |
| U-235 | 4385.5 | 100.40 | 3.60 | 80.9 | 8.230E-01 | 1.720E-01 | 9.454E-02 | 5.838E-02 |
| U-238 | 4184.4 | 2596.00 | 6.00 | 100.2 | 1.718E+01 | 9.989E-01 | 9.329E-02 | 5.561E-02 |

*** POSITIVE ***

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.C]C_99032745$LCSWR1A_UU.CNF;2
Title : 027
Sample Title:
Start Time: 2-APR-1999 14:24: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.07566E+03
Real Time : 0 22:13:25.00 Sample ID : LCSWR1A Energy Slope : 5.81769E+00
Live Time : 0 22:13:24.00 Sample Type: UU Energy Quad : 0.00000E+00




148

280

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:42:12



**********
Spectral File: ND_AMS_ARCHIVE_S:S_99032745$258181D_UU.CNF
**********

| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | 258181D |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.100E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 028 |
| ACQ DATE: | 2-APR-1999 14:24 | AVERAGE EFFICIENCY: | 27.0% |
| ELAPSED LIVE TIME: | 80001. | RECOVERY: | 73.90% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 47.48 |
| LAMBDA VALUE: | 250. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 06:56 | EFF CAL DATE: | 30-MAR-1999 06:56 |
| BKG FILENAME: | B_028_30MAR99 | | |

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NUCLIDE ACTIVITY SUMMARY

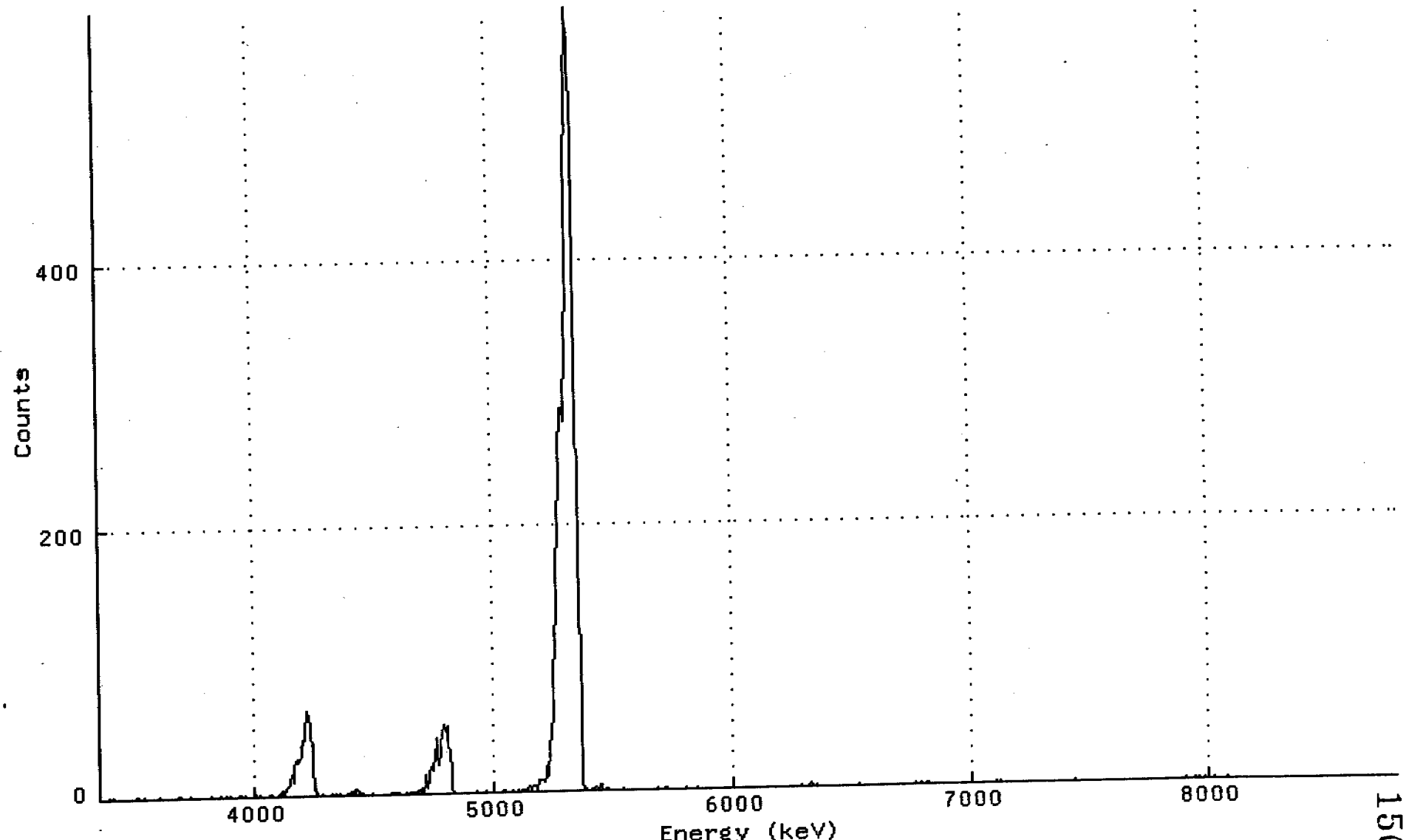
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 7056.00 | 6.00 | 99.8 | 1.266E+03 | 4.406E+01 | 2.531E+00 | 1.508E+00 |
| U-234 | 4761.5 | 646.00 | 4.00 | 99.8 | 1.159E+02 | 1.043E+01 | 2.155E+00 | 1.321E+00 |
| U-235 | 4385.5 | 29.60 | 2.40 | 80.9 | 6.553E+00 | 2.558E+00 | 2.195E+00 | 1.397E+00 |
| U-238 | 4184.4 | 677.00 | 2.00 | 100.2 | 1.210E+02 | 1.067E+01 | 1.659E+00 | 1.072E+00 |

**********

** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

281

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99032745$258181D_UU.CNF;2
Title : 028
Sample Title:
Start Time: 2-APR-1999 14:24:
Real Time : 0 22:13:21.00
Live Time : 0 22:13:21.00
Sample Time: 31-MAR-1999 00:00
Sample ID : 258181D
Sample Type: UU
Energy Offset: 3.33599E+03
Energy Slope : 5.31274E+00
Energy Quad : 0.00000E+00






282

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:48:33



Spectral File: ND_AMS_ARCHIVE_S:S_99032745$258191_UU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | 258191 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.870E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 030 |
| ACQ DATE: | 2-APR-1999 14:24 | AVERAGE EFFICIENCY: | 26.4% |
| ELAPSED LIVE TIME: | 80002. | RECOVERY: | 74.14% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 40.32 |
| LAMBDA VALUE: | 250. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 06:58 | EFF CAL DATE: | 30-MAR-1999 06:58 |
| BKG FILENAME: | B_030_30MAR99 | | |

NUCLIDE ACTIVITY SUMMARY

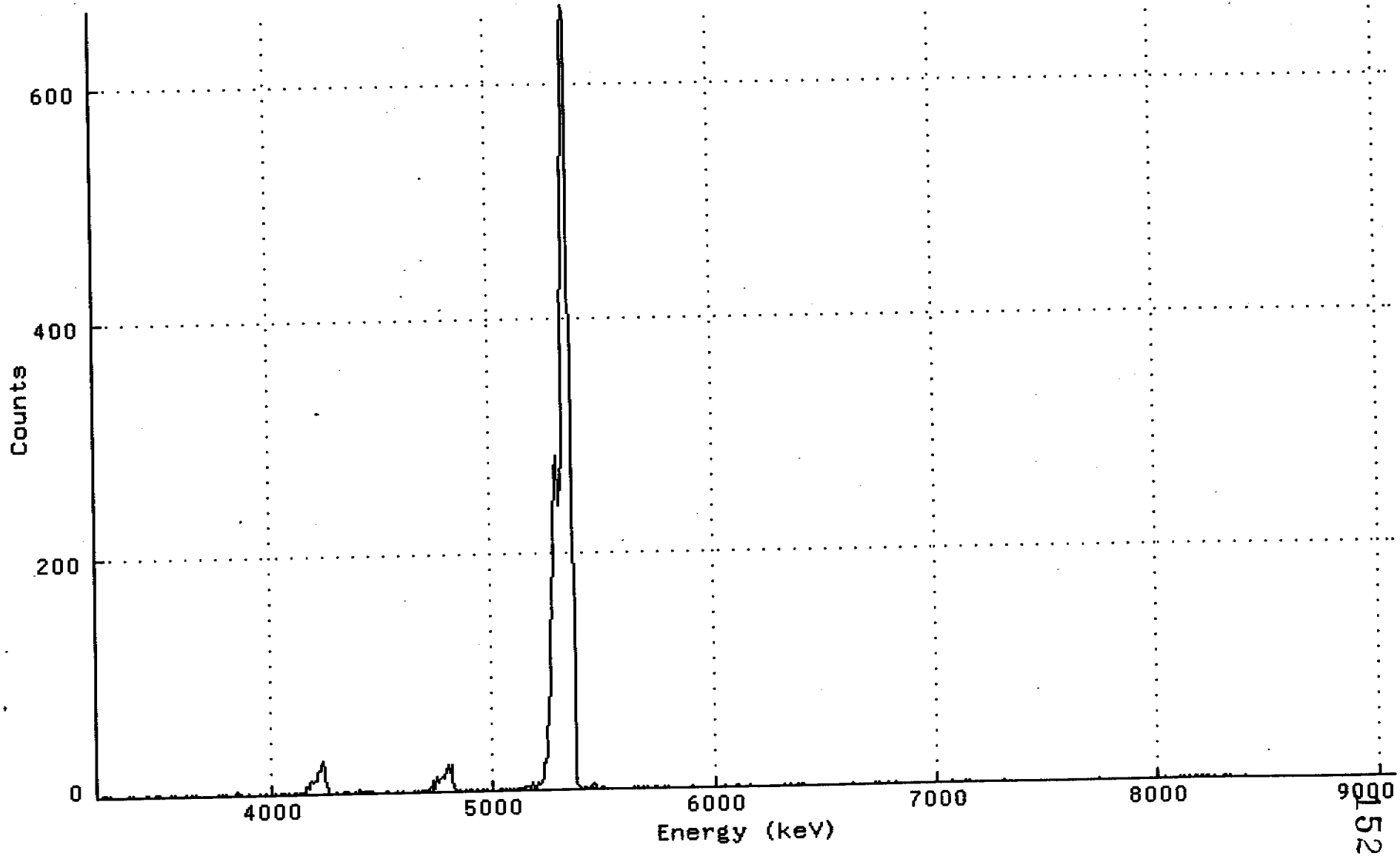
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 6924.80 | 5.20 | 99.8 | 1.422E+03 | 4.954E+01 | 2.734E+00 | 1.645E+00 |
| U-234 | 4761.5 | 238.40 | 3.60 | 99.8 | 4.896E+01 | 6.745E+00 | 2.368E+00 | 1.462E+00 |
| U-235 | 4385.5 | 12.00 | 8.00 | 80.9 | 3.040E+00 | 2.444E+00 | 4.019E+00 | 2.353E+00 |
| U-238 | 4184.4 | 232.80 | 5.20 | 100.2 | 4.760E+01 | 6.659E+00 | 2.722E+00 | 1.638E+00 |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99032745$258191_UU.CNF;2
Title : 030
Sample Title:
Start Time: 2-APR-1999 14:24:
Real Time : 0 22:13:22.00
Live Time : 0 22:13:22.00

Sample Time: 31-MAR-1999 00:00
Sample ID : 258191
Sample Type: UU

Energy Offset: 3.19644E+03
Energy Slope : 5.72570E+00
Energy Quad : 0.00000E+00




152

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WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:49:01

(SECTION III)

153

Spectral File: ND_AMS_ARCHIVE_S:S_99032745$258192_UU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | 258192 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.260E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 031 |
| ACQ DATE: | 2-APR-1999 14:25 | AVERAGE EFFICIENCY: | 27.0% |
| ELAPSED LIVE TIME: | 80002. | RECOVERY: | 74.07% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 78.04 |
| LAMBDA VALUE: | 250. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 06:59 | EFF CAL DATE: | 30-MAR-1999 06:59 |
| BKG FILENAME: | B_031_30MAR99 | | |

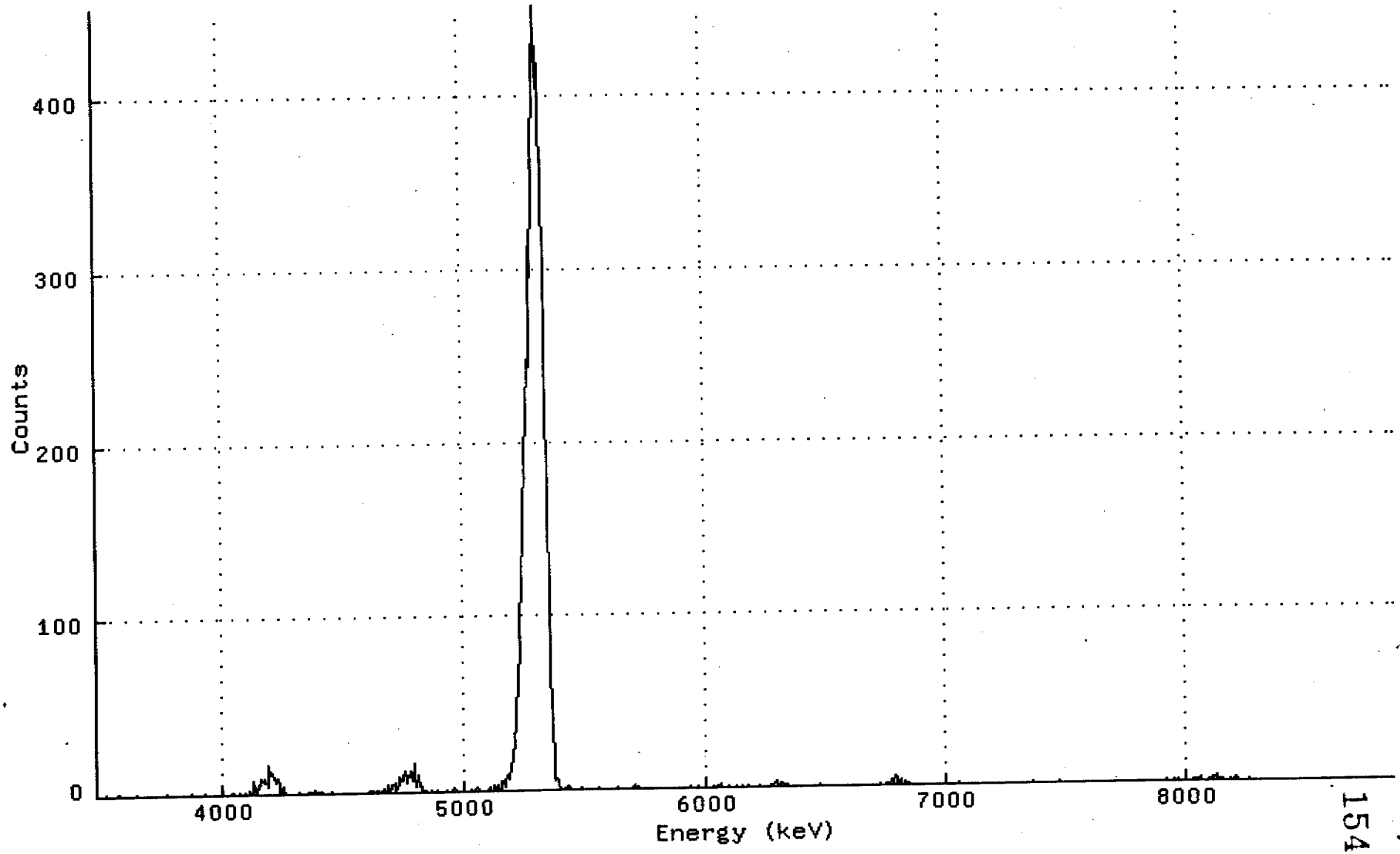
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 7080.80 | 9.20 | 99.8 | 1.177E+03 | 4.074E+01 | 2.795E+00 | 1.622E+00 |
| U-234 | 4761.5 | 175.40 | 7.60 | 99.8 | 2.915E+01 | 4.702E+00 | 2.581E+00 | 1.516E+00 |
| U-235 | 4385.5 | 5.80 | 3.20 | 80.9 | 1.189E+00 | 1.316E+00 | 2.261E+00 | 1.408E+00 |
| U-238 | 4184.4 | 168.40 | 1.60 | 100.2 | 2.786E+01 | 4.484E+00 | 1.422E+00 | 9.351E-01 |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

285

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99032745$258192_UU.CNF;2
Title : 031
Sample Title:
Start Time: 2-APR-1999 14:25: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.46320E+03
Real Time : 0 22:13:22.00 Sample ID : 258192 Energy Slope : 5.26969E+00
Live Time : 0 22:13:22.00 Sample Type: UU Energy Quad : 0.00000E+00




154

286

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:49:26

(SECTION II)

155

Spectral File: ND_AMS_ARCHIVE_S:S_99032745$258193_UU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | 258193 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.560E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 032 |
| ACQ DATE: | 2-APR-1999 14:25 | AVERAGE EFFICIENCY: | 25.8% |
| ELAPSED LIVE TIME: | 80000. | RECOVERY: | 74.42% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 69.29 |
| LAMBDA VALUE: | 250. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 07:01 | EFF CAL DATE: | 30-MAR-1999 07:01 |
| BKG FILENAME: | B_032_30MAR99 | | |

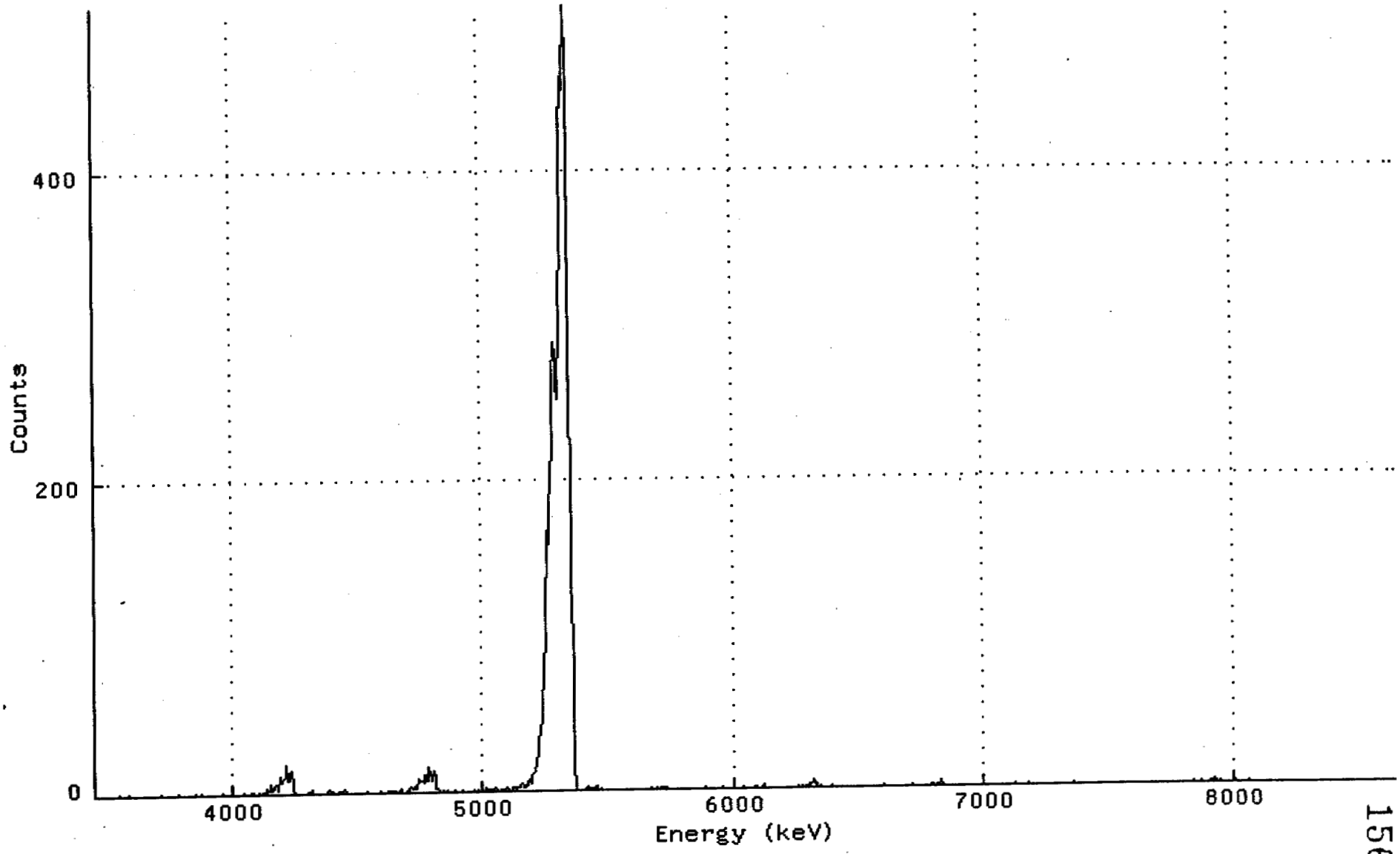
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 6801.80 | 5.20 | 99.8 | 1.039E+03 | 3.647E+01 | 2.033E+00 | 1.224E+00 |
| U-234 | 4761.5 | 166.00 | 6.00 | 99.8 | 2.535E+01 | 4.181E+00 | 2.153E+00 | 1.284E+00 |
| U-235 | 4385.5 | 9.00 | 4.00 | 80.9 | 1.696E+00 | 1.442E+00 | 2.263E+00 | 1.387E+00 |
| U-238 | 4184.4 | 168.80 | 3.20 | 100.2 | 2.567E+01 | 4.155E+00 | 1.677E+00 | 1.045E+00 |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

287

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99032745$258193_UU.CNF;2
Title : 032
Sample Title:
Start Time: 2-APR-1999 14:25: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.43918E+03
Real Time : 0 22:13:20.00 Sample ID : 258193 Energy Slope : 5.08113E+00
Live Time : 0 22:13:20.00 Sample Type: UU Energy Quad : 0.00000E+00




156

288

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:49:48

SECTION D

157

Spectral File: ND_AMS_ARCHIVE_S:S_99032745$258194_UU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | 258194 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 8.700E-03 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 004 |
| ACQ DATE: | 3-APR-1999 13:45 | AVERAGE EFFICIENCY: | 26.2% |
| ELAPSED LIVE TIME: | 80006. | RECOVERY: | 72.11% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 74.68 |
| LAMBDA VALUE: | 250. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 06:36 | EFF CAL DATE: | 30-MAR-1999 06:36 |
| BKG FILENAME: | B_004_30MAR99 | | |

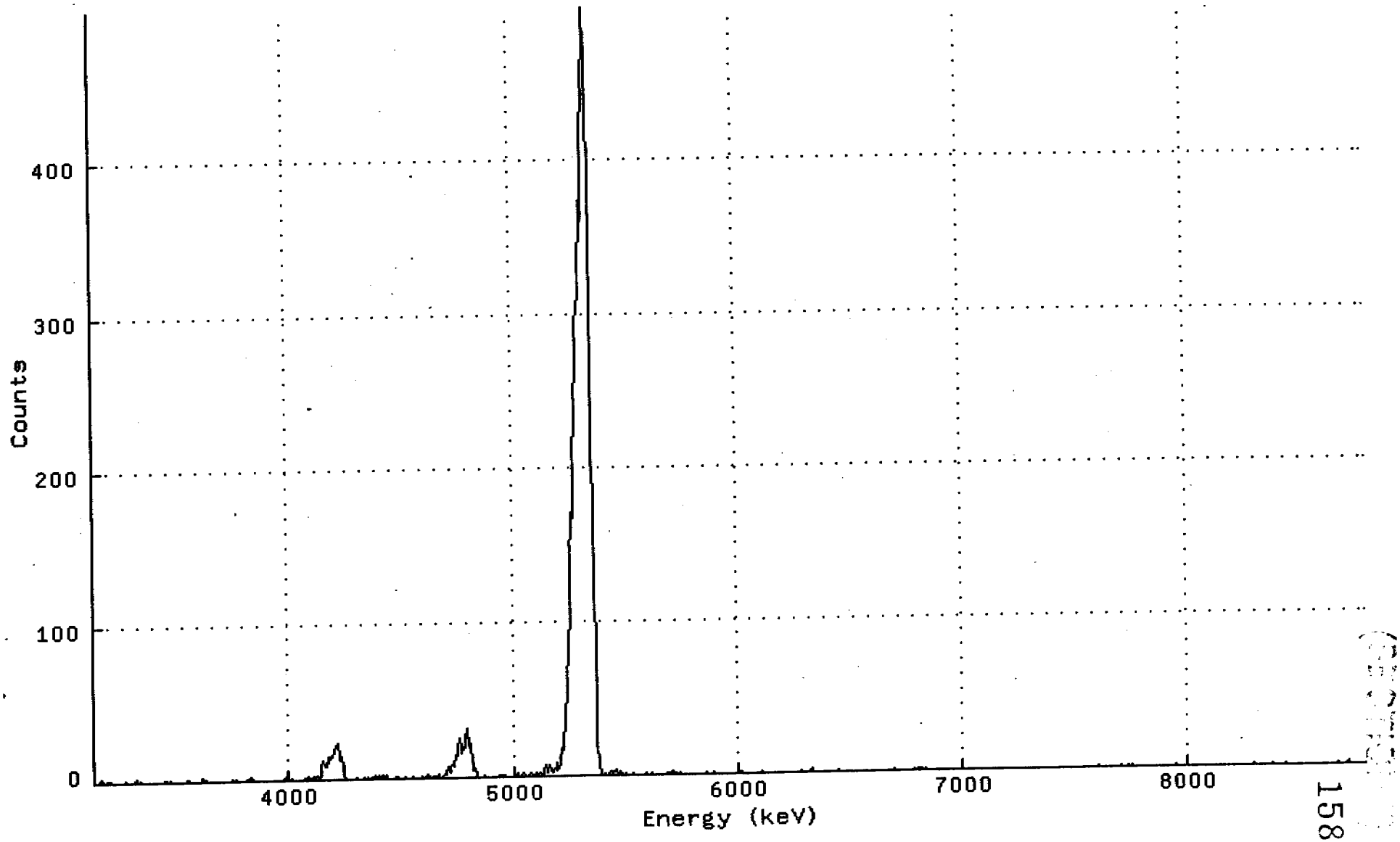
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 6692.80 | 5.20 | 99.8 | 3.057E+03 | 1.075E+02 | 6.080E+00 | 3.659E+00 |
| U-234 | 4761.5 | 349.40 | 1.60 | 99.8 | 1.596E+02 | 1.847E+01 | 3.924E+00 | 2.581E+00 |
| U-235 | 4385.5 | 15.20 | 6.80 | 80.9 | 8.563E+00 | 5.615E+00 | 8.359E+00 | 4.943E+00 |
| U-238 | 4184.4 | 267.80 | 3.20 | 100.2 | 1.218E+02 | 1.591E+01 | 5.015E+00 | 3.124E+00 |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

289

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99032745$258194_UU.CNF;2
Title : 004
Sample Title:
Start Time: 3-APR-1999 13:45: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.12134E+03
Real Time : 0 22:13:26.00 Sample ID : 258194 Energy Slope : 5.53351E+00
Live Time : 0 22:13:26.00 Sample Type: UU Energy Quad : 0.00000E+00

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WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:50:42

(SECTION 1)

159

**********
Spectral File: ND_AMS_ARCHIVE_S:S_99032745$258195_UU.CNF
**********

| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | 258195 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.170E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 005 |
| ACQ DATE: | 3-APR-1999 13:45 | AVERAGE EFFICIENCY: | 25.9% |
| ELAPSED LIVE TIME: | 80004. | RECOVERY: | 72.53% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 65.73 |
| LAMBDA VALUE: | 250. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 06:37 | EFF CAL DATE: | 30-MAR-1999 06:37 |
| BKG FILENAME: | B_005_30MAR99 | | |

**********

NUCLIDE ACTIVITY SUMMARY

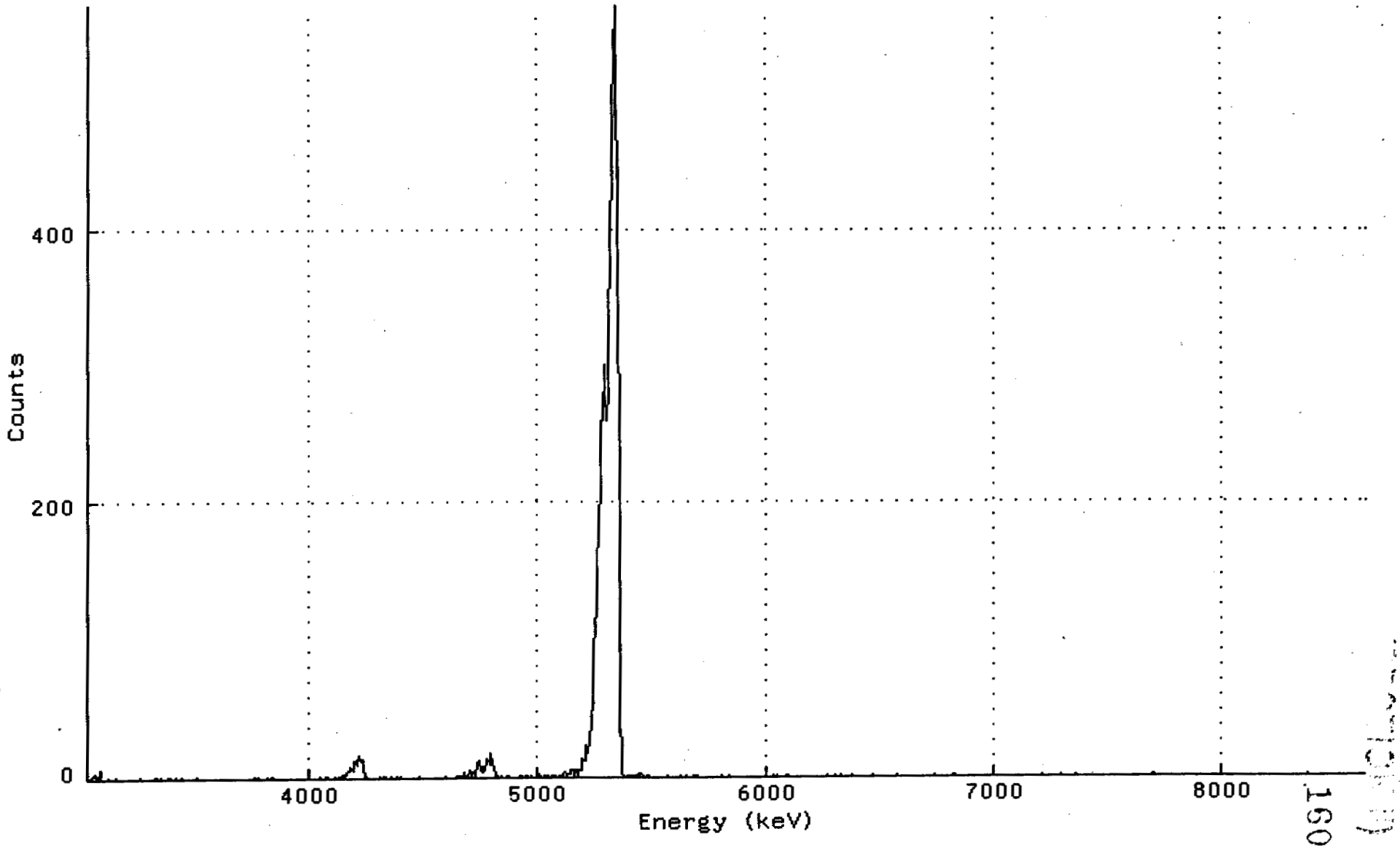
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 6651.20 | 4.80 | 99.8 | 1.226E+03 | 4.332E+01 | 2.376E+00 | 1.438E+00 |
| U-234 | 4761.5 | 181.60 | 2.40 | 99.8 | 3.346E+01 | 5.219E+00 | 1.827E+00 | 1.163E+00 |
| U-235 | 4385.5 | 0.00 | 8.00 | 80.9 | -4.552E-05 | 1.521E+00 | 3.605E+00 | 2.111E+00 |
| U-238 | 4184.4 | 155.00 | 4.00 | 100.2 | 2.844E+01 | 4.812E+00 | 2.203E+00 | 1.350E+00 |

**********

** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

291

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99032745$258195_UU.CNF;2
Title : 005
Sample Title:
Start Time: 3-APR-1999 13:45: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.01948E+03
Real Time : 0 22:13:24.00 Sample ID : 258195 Energy Slope : 5.47315E+00
Live Time : 0 22:13:24.00 Sample Type: UU Energy Quad : 0.00000E+00

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292

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:51:33

161

Spectral File: ND_AMS_ARCHIVE_S:S_99032745$258196_UU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | 258196 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 3.530E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 014 |
| ACQ DATE: | 3-APR-1999 13:46 | AVERAGE EFFICIENCY: | 26.3% |
| ELAPSED LIVE TIME: | 80002. | RECOVERY: | 72.72% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 71.37 |
| LAMBDA VALUE: | 250. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 06:42 | EFF CAL DATE: | 30-MAR-1999 06:42 |
| BKG FILENAME: | B_014_30MAR99 | | |

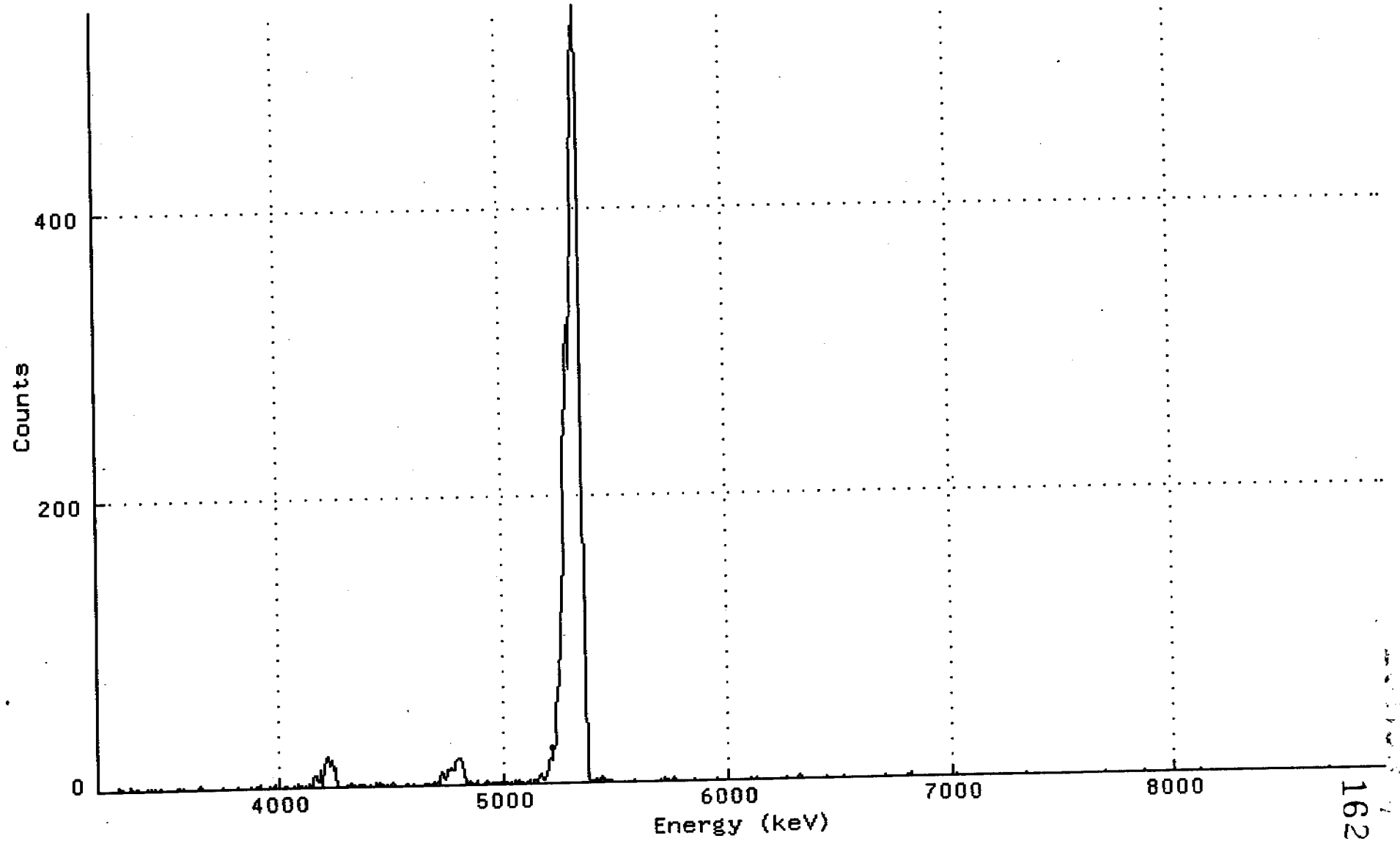
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 6772.20 | 18.80 | 99.8 | 7.534E+02 | 2.652E+01 | 2.544E+00 | 1.423E+00 |
| U-234 | 4761.5 | 228.40 | 9.60 | 99.8 | 2.541E+01 | 3.631E+00 | 1.904E+00 | 1.103E+00 |
| U-235 | 4385.5 | 19.40 | 7.60 | 80.9 | 2.662E+00 | 1.509E+00 | 2.131E+00 | 1.251E+00 |
| U-238 | 4184.4 | 233.40 | 3.60 | 100.2 | 2.585E+01 | 3.600E+00 | 1.277E+00 | 7.888E-01 |

** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

293

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99032745$258196_UU.CNF;2
Title : 014
Sample Title:
Start Time: 3-APR-1999 13:46: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.17108E+03
Real Time : 0 22:13:22.00 Sample ID : 258196 Energy Slope : 5.62526E+00
Live Time : 0 22:13:22.00 Sample Type: UU Energy Quad : 0.00000E+00

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WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:52:05



Spectral File: ND_AMS_ARCHIVE_S:S_99032745$258197_UU.CNF

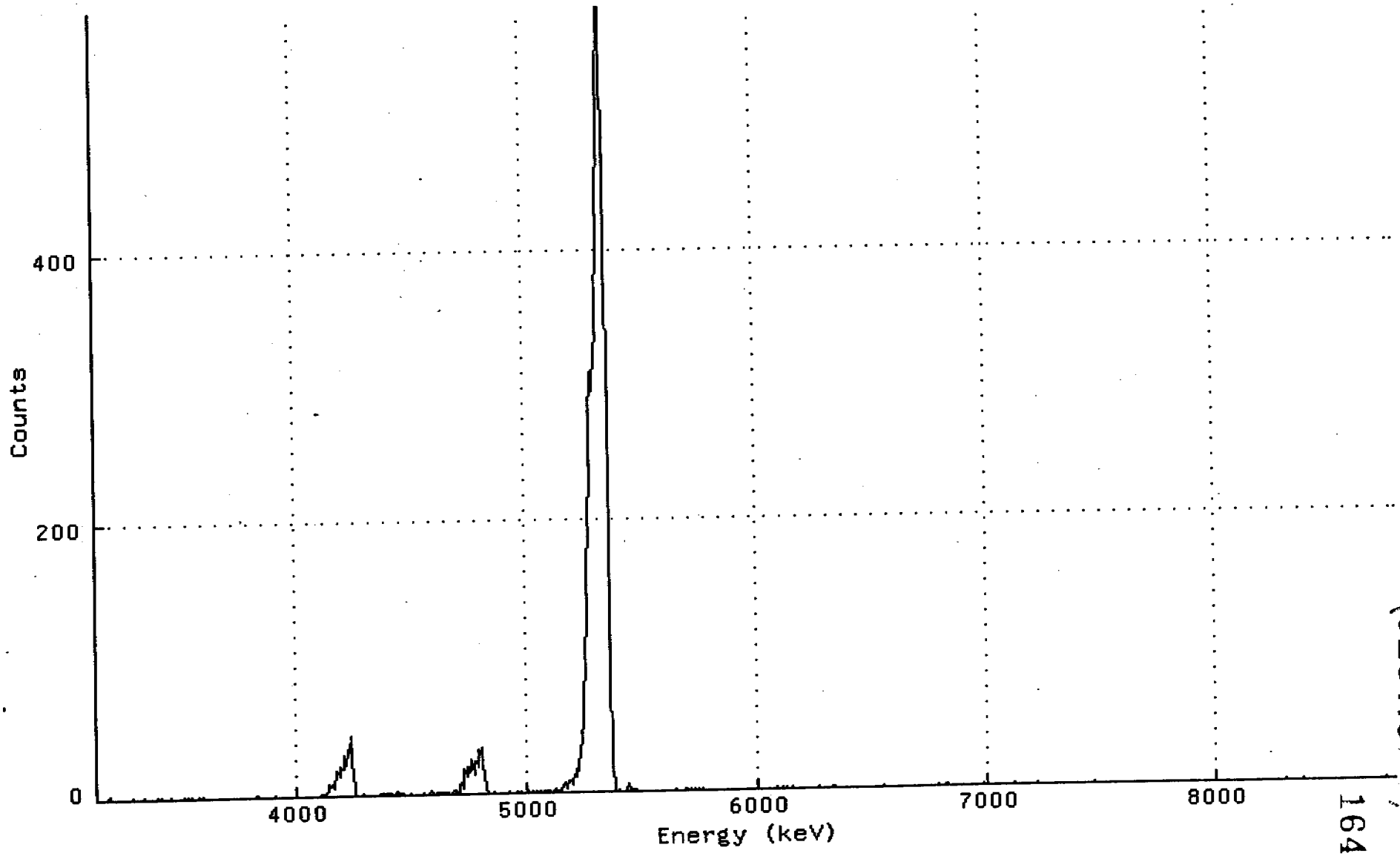
| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | 258197 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.460E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 015 |
| ACQ DATE: | 3-APR-1999 13:46 | AVERAGE EFFICIENCY: | 26.7% |
| ELAPSED LIVE TIME: | 80005. | RECOVERY: | 76.85% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 73.12 |
| LAMBDA VALUE: | 250. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 06:44 | EFF CAL DATE: | 30-MAR-1999 06:44 |
| BKG FILENAME: | B_015_30MAR99 | | |

NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 7261.80 | 5.20 | 99.8 | 1.822E+03 | 6.289E+01 | 3.339E+00 | 2.010E+00 |
| U-234 | 4761.5 | 404.20 | 4.80 | 99.8 | 1.014E+02 | 1.106E+01 | 3.235E+00 | 1.957E+00 |
| U-235 | 4385.5 | 19.60 | 2.40 | 80.9 | 6.064E+00 | 2.977E+00 | 3.068E+00 | 1.953E+00 |
| U-238 | 4184.4 | 413.20 | 2.80 | 100.2 | 1.032E+02 | 1.112E+01 | 2.620E+00 | 1.648E+00 |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99032745$258197_UU.CNF;2
Title : 015
Sample Title:
Start Time: 3-APR-1999 13:46: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.11279E+03
Real Time : 0 22:13:25.00 Sample ID : 258197 Energy Slope : 5.52977E+00
Live Time : 0 22:13:25.00 Sample Type: UU Energy Quad : 0.00000E+00

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296

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:52:42

(SECTI

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Spectral File: ND_AMS_ARCHIVE_S:S_99032745$258198_UU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | 258198 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: 1.390E-02 | sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 017 |
| ACQ DATE: | 3-APR-1999 13:46 | AVERAGE EFFICIENCY: | 26.7% |
| ELAPSED LIVE TIME: | 80000. | RECOVERY: | 76.13% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 77.29 |
| LAMBDA VALUE: | 250. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 06:45 | EFF CAL DATE: | 30-MAR-1999 06:45 |
| BKG FILENAME: | B_017_30MAR99 | | |

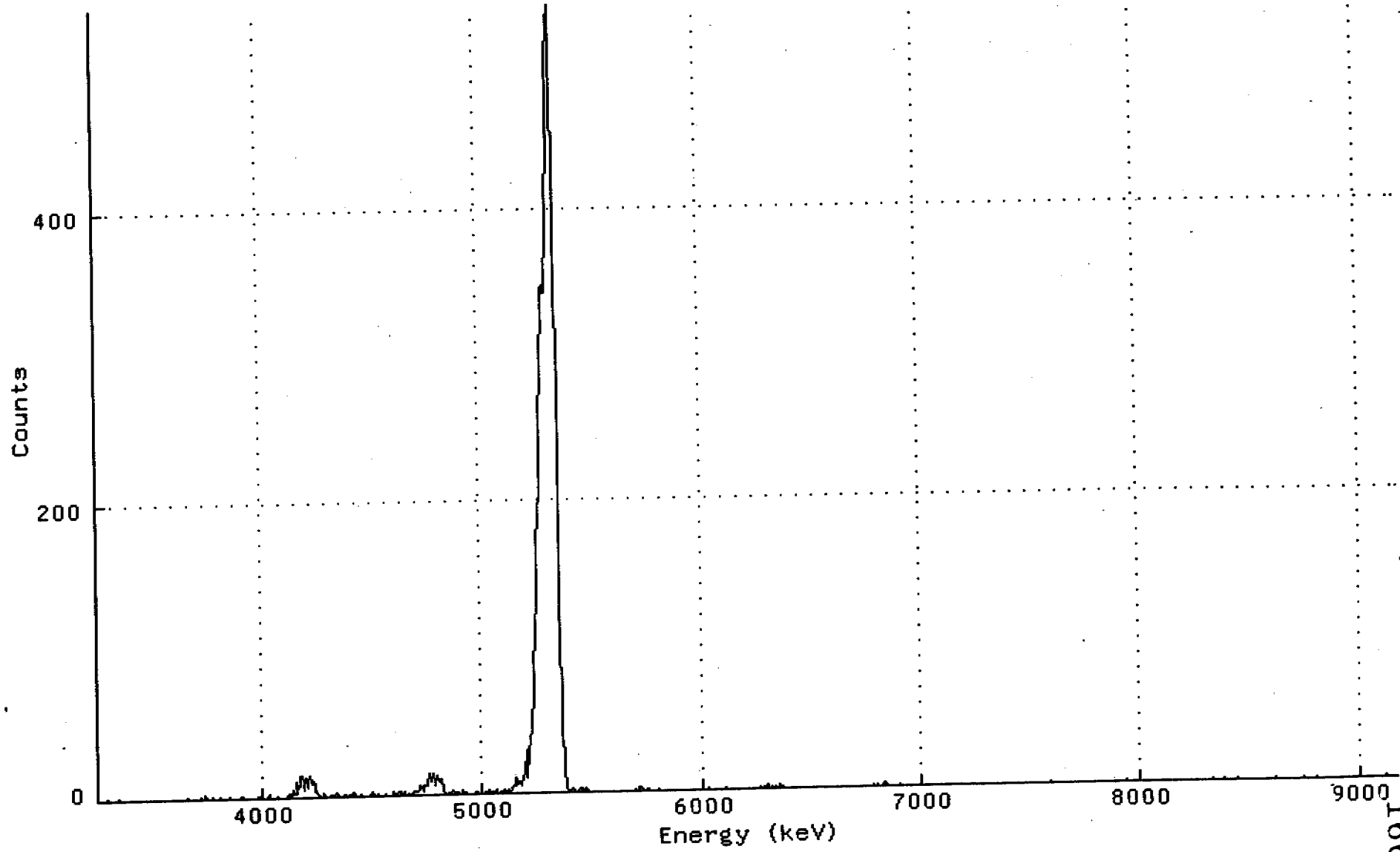
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 7203.20 | 2.80 | 99.8 | 1.913E+03 | 6.607E+01 | 2.786E+00 | 1.753E+00 |
| U-234 | 4761.5 | 169.60 | 6.40 | 99.8 | 4.504E+01 | 7.355E+00 | 3.844E+00 | 2.282E+00 |
| U-235 | 4385.5 | 12.00 | 6.00 | 80.9 | 3.932E+00 | 2.964E+00 | 4.620E+00 | 2.754E+00 |
| U-238 | 4184.4 | 175.40 | 3.60 | 100.2 | 4.639E+01 | 7.376E+00 | 3.050E+00 | 1.883E+00 |

** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

297

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99032745$258198_UU.CNF;2
Title : 017
Sample Title:
Start Time: 3-APR-1999 13:46:
Real Time : 0 22:13:20.00
Live Time : 0 22:13:20.00
Sample Time: 31-MAR-1999 00:00
Sample ID : 258198
Sample Type: UU
Energy Offset: 3.24030E+03
Energy Slope : 5.78723E+00
Energy Quad : 0.00000E+00

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298

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:53:07



Spectral File: ND_AMS_ARCHIVE_S:S_99032745$258199_UU.CNF

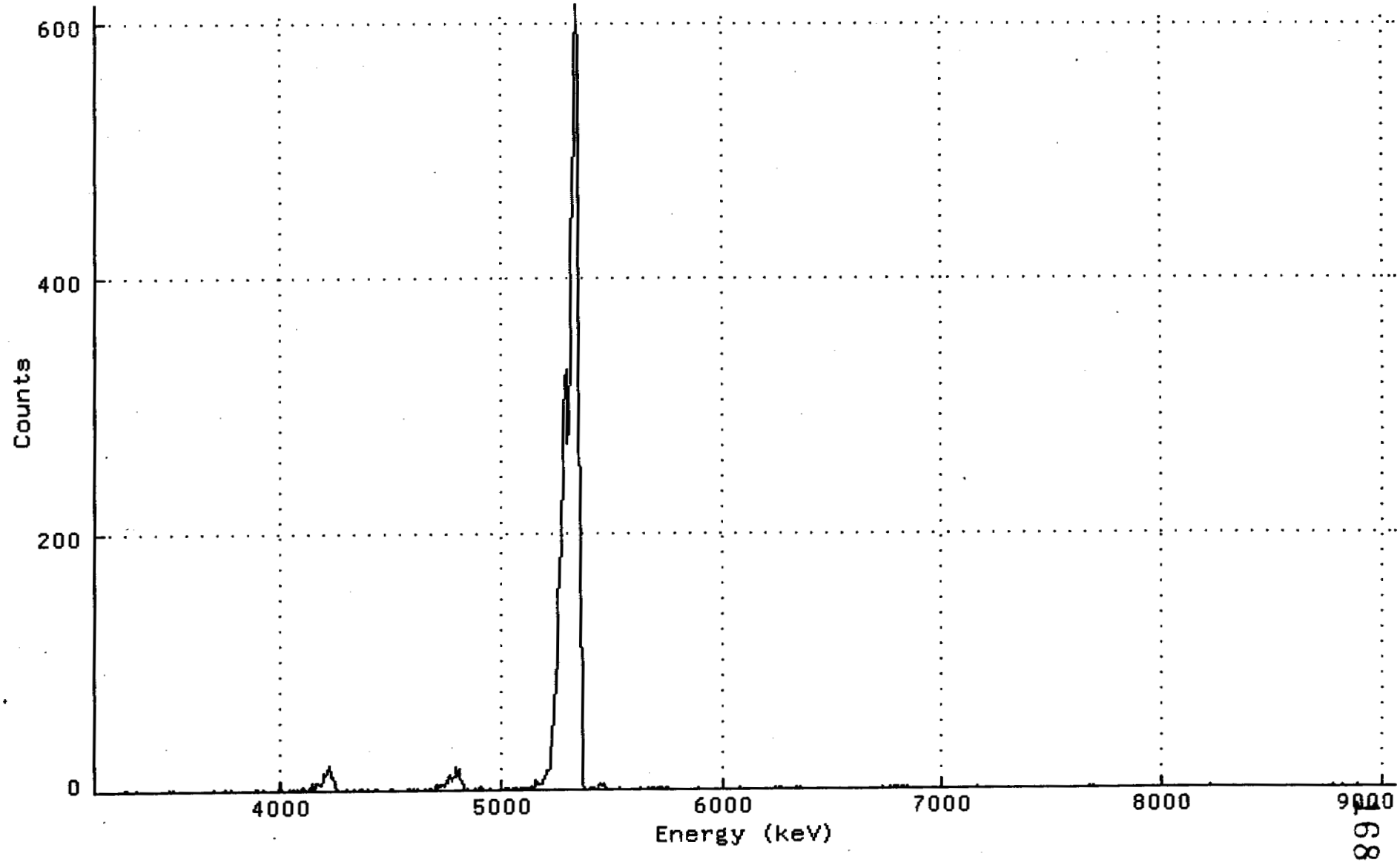
| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | 258199 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.670E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 018 |
| ACQ DATE: | 3-APR-1999 13:46 | AVERAGE EFFICIENCY: | 26.7% |
| ELAPSED LIVE TIME: | 80004. | RECOVERY: | 71.88% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 66.75 |
| LAMBDA VALUE: | 250. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 06:47 | EFF CAL DATE: | 30-MAR-1999 06:47 |
| BKG FILENAME: | B_018_30MAR99 | | |

NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 6795.60 | 2.40 | 99.8 | 9.961E+02 | 3.488E+01 | 1.453E+00 | 9.251E-01 |
| U-234 | 4761.5 | 164.00 | 4.00 | 99.8 | 2.404E+01 | 3.956E+00 | 1.760E+00 | 1.079E+00 |
| U-235 | 4385.5 | 12.40 | 3.60 | 80.9 | 2.242E+00 | 1.513E+00 | 2.085E+00 | 1.288E+00 |
| U-238 | 4184.4 | 174.00 | 2.00 | 100.2 | 2.539E+01 | 4.033E+00 | 1.355E+00 | 8.753E-01 |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99032745$258199_UU.CNF;2
Title : 018
Sample Title:
Start Time: 3-APR-1999 13:46: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.14422E+03
Real Time : 0 22:13:24.00 Sample ID : 258199 Energy Slope : 5.77093E+00
Live Time : 0 22:13:24.00 Sample Type: UU Energy Quad : 0.00000E+00

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WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:53:27



Spectral File: ND_AMS_ARCHIVE_S:S_99032745$258200_UU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | 258200 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 4.800E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 021 |
| ACQ DATE: | 3-APR-1999 13:47 | AVERAGE EFFICIENCY: | 26.9% |
| ELAPSED LIVE TIME: | 80007. | RECOVERY: | 77.39% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 43.69 |
| LAMBDA VALUE: | 250. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 06:49 | EFF CAL DATE: | 30-MAR-1999 06:49 |
| BKG FILENAME: | B_021_30MAR99 | | |

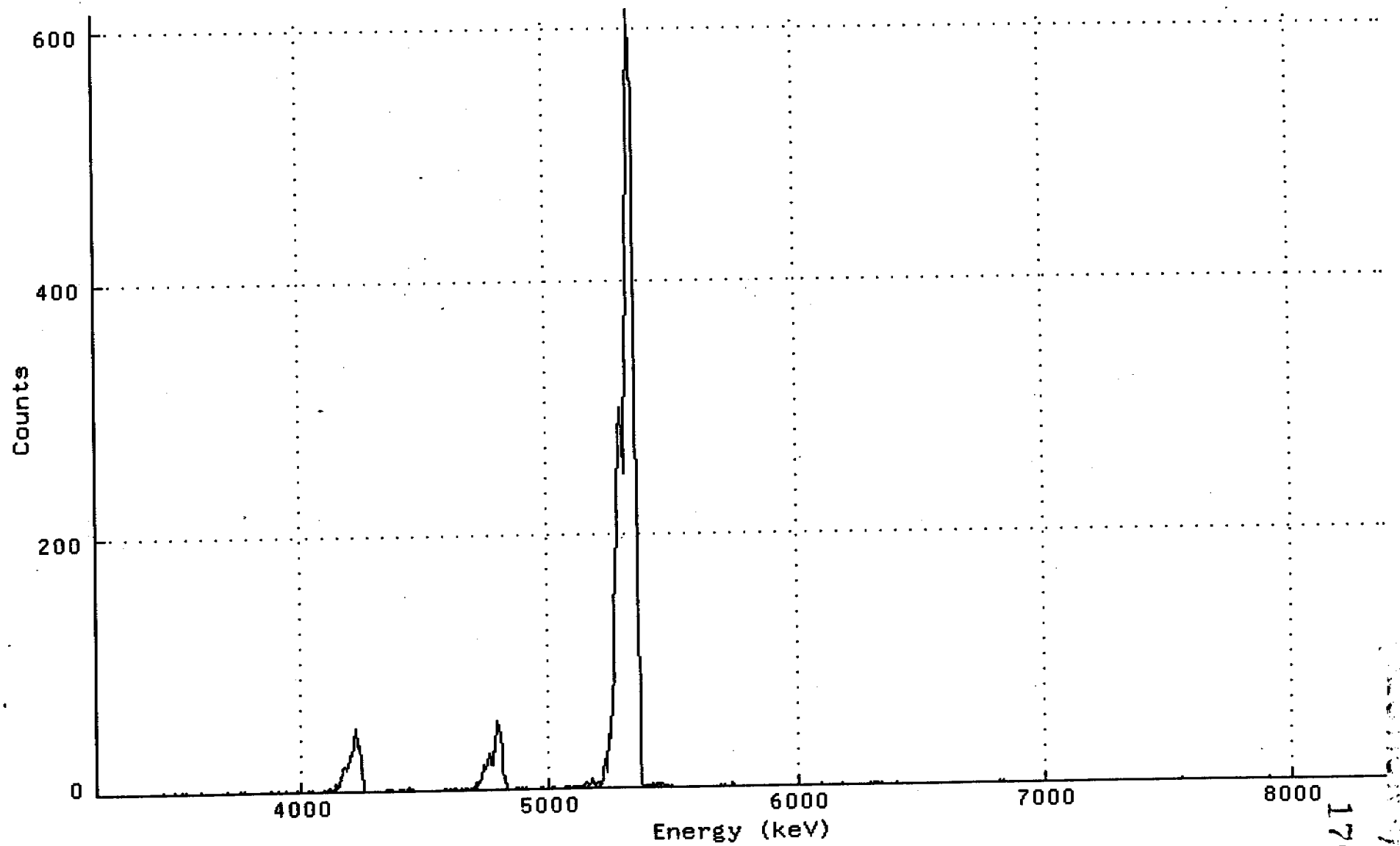
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 7359.20 | 2.80 | 99.8 | 5.541E+02 | 1.906E+01 | 7.898E-01 | 4.969E-01 |
| U-234 | 4761.5 | 547.20 | 0.80 | 99.8 | 4.119E+01 | 3.940E+00 | 5.171E-01 | 3.606E-01 |
| U-235 | 4385.5 | 21.20 | 2.80 | 80.9 | 1.969E+00 | 9.347E-01 | 9.743E-01 | 6.130E-01 |
| U-238 | 4184.4 | 502.40 | 1.60 | 100.2 | 3.766E+01 | 3.732E+00 | 6.440E-01 | 4.236E-01 |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

301

Spectrum : WIZARD$OKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99032745$258200_UU.CNF;2
Title : 021
Sample Title:
Start Time: 3-APR-1999 13:47: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.16215E+03
Real Time : 0 22:13:28.00 Sample ID : 258200 Energy Slope : 5.08534E+00
Live Time : 0 22:13:27.00 Sample Type: UU Energy Quad : 0.00000E+00

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302

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:53:47

(SECTION

171

**********
Spectral File: ND_AMS_ARCHIVE_S:S_99032745$258201_UU.CNF
**********

| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | 258201 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 6.400E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 022 |
| ACQ DATE: | 3-APR-1999 13:47 | AVERAGE EFFICIENCY: | 25.8% |
| ELAPSED LIVE TIME: | 80002. | RECOVERY: | 75.75% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 46.45 |
| LAMBDA VALUE: | 250. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 06:50 | EFF CAL DATE: | 30-MAR-1999 06:50 |
| BKG FILENAME: | B_022_30MAR99 | | |

**********

NUCLIDE ACTIVITY SUMMARY

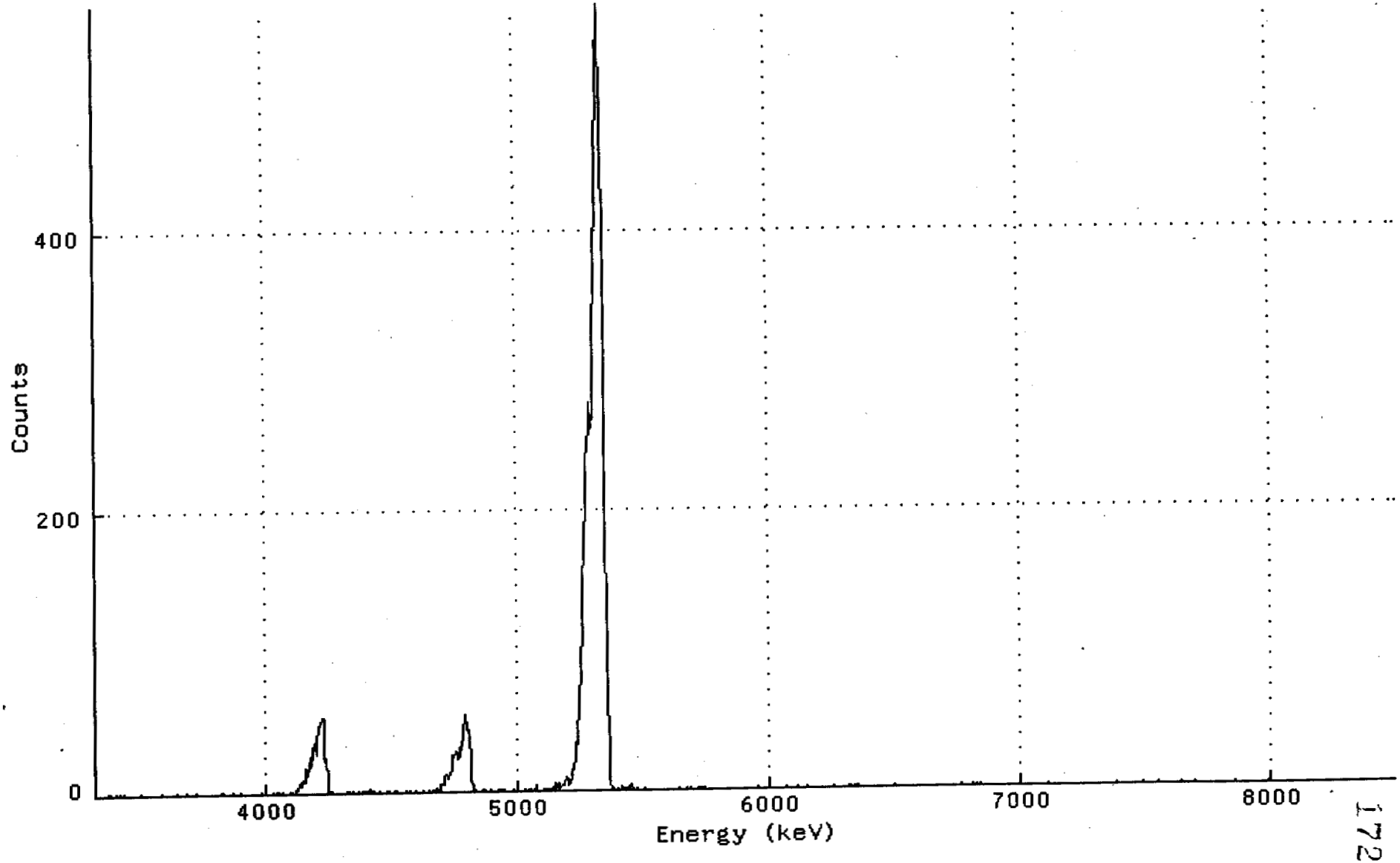
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 6923.60 | 4.40 | 99.8 | 4.155E+02 | 1.455E+01 | 7.480E-01 | 4.553E-01 |
| U-234 | 4761.5 | 617.20 | 2.80 | 99.8 | 3.704E+01 | 3.394E+00 | 6.296E-01 | 3.961E-01 |
| U-235 | 4385.5 | 24.20 | 2.80 | 80.9 | 1.792E+00 | 7.890E-01 | 7.767E-01 | 4.887E-01 |
| U-238 | 4184.4 | 603.60 | 2.40 | 100.2 | 3.607E+01 | 3.333E+00 | 5.924E-01 | 3.772E-01 |

**********

*** POSITIVE ***

303

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99032745$258201_UU.CNF;2
Title : 022
Sample Title:
Start Time: 3-APR-1999 13:47: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.31268E+03
Real Time : 0 22:13:22.00 Sample ID : 258201 Energy Slope : 5.06150E+00
Live Time : 0 22:13:22.00 Sample Type: UU Energy Quad : 0.00000E+00

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WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:54:02



Spectral File: ND_AMS_ARCHIVE_S:S_99032745$258202_UU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | 258202 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.163E-01 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 023 |
| ACQ DATE: | 3-APR-1999 13:47 | AVERAGE EFFICIENCY: | 26.7% |
| ELAPSED LIVE TIME: | 80006. | RECOVERY: | 76.22% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 65.23 |
| LAMBDA VALUE: | 250. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 06:53 | EFF CAL DATE: | 30-MAR-1999 06:53 |
| BKG FILENAME: | B_023_30MAR99 | | |

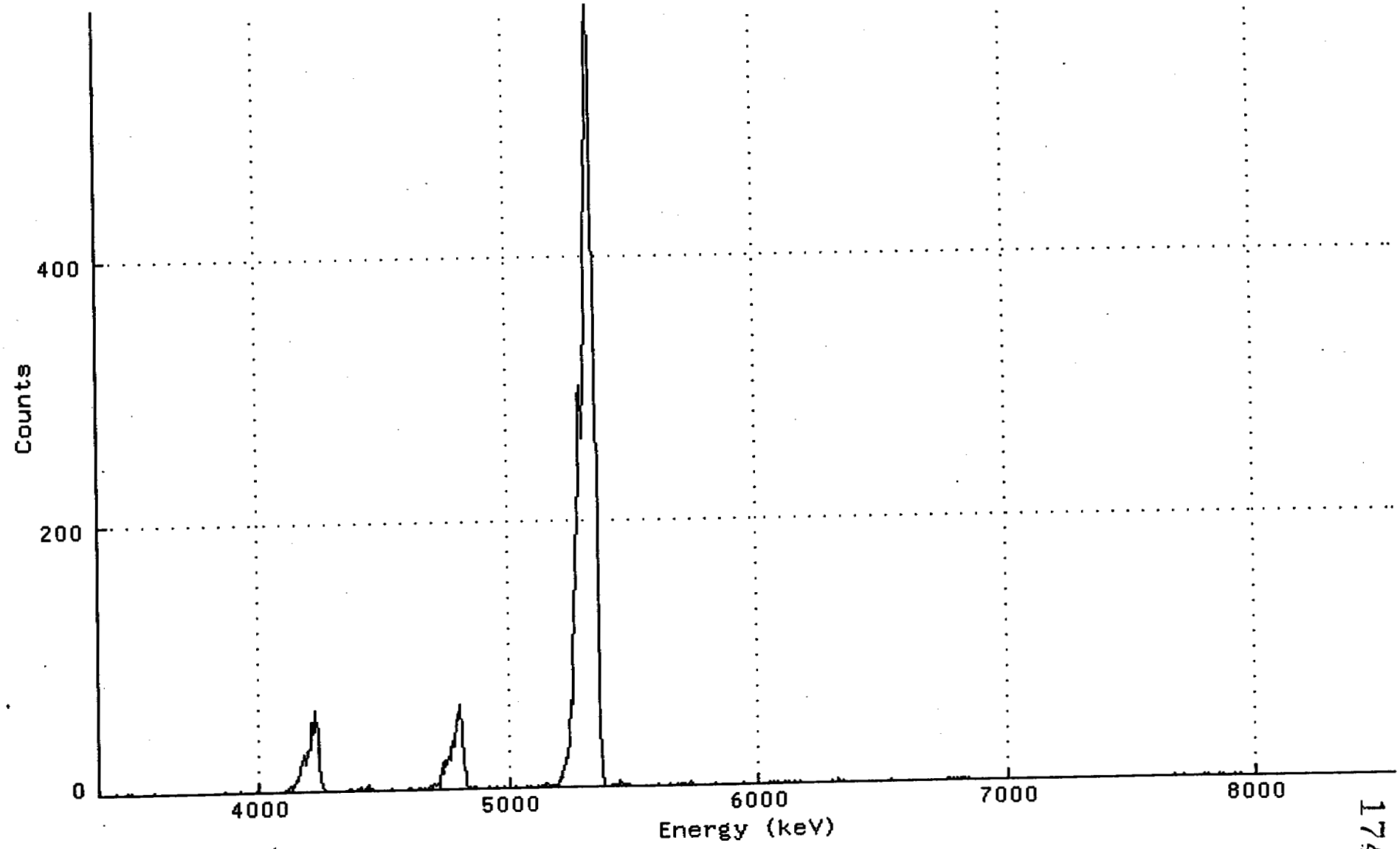
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 7197.60 | 6.40 | 99.8 | 2.287E+02 | 7.923E+00 | 4.598E-01 | 2.730E-01 |
| U-234 | 4761.5 | 648.00 | 4.00 | 99.8 | 2.059E+01 | 1.849E+00 | 3.815E-01 | 2.338E-01 |
| U-235 | 4385.5 | 23.20 | 0.80 | 80.9 | 9.092E-01 | 3.885E-01 | 2.692E-01 | 1.877E-01 |
| U-238 | 4184.4 | 627.80 | 5.20 | 100.2 | 1.986E+01 | 1.808E+00 | 4.211E-01 | 2.534E-01 |

*** POSITIVE ***

305

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99032745$258202_UU.CNF;2
Title : 023
Sample Title:
Start Time: 3-APR-1999 13:47: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.34174E+03
Real Time : 0 22:13:26.00 Sample ID : 258202 Energy Slope : 5.08500E+00
Live Time : 0 22:13:26.00 Sample Type: UU Energy Quad : 0.00000E+00




174

306

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:54:22

175

**********
Spectral File: ND_AMS_ARCHIVE_S:S_99032745$258203_UU.CNF
**********

| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | 258203 |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.770E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 027 |
| ACQ DATE: | 3-APR-1999 13:47 | AVERAGE EFFICIENCY: | 27.6% |
| ELAPSED LIVE TIME: | 80003. | RECOVERY: | 76.04% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 44.19 |
| LAMBDA VALUE: | 250. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 06:55 | EFF CAL DATE: | 30-MAR-1999 06:55 |
| BKG FILENAME: | B_027_30MAR99 | | |

**********

NUCLIDE ACTIVITY SUMMARY

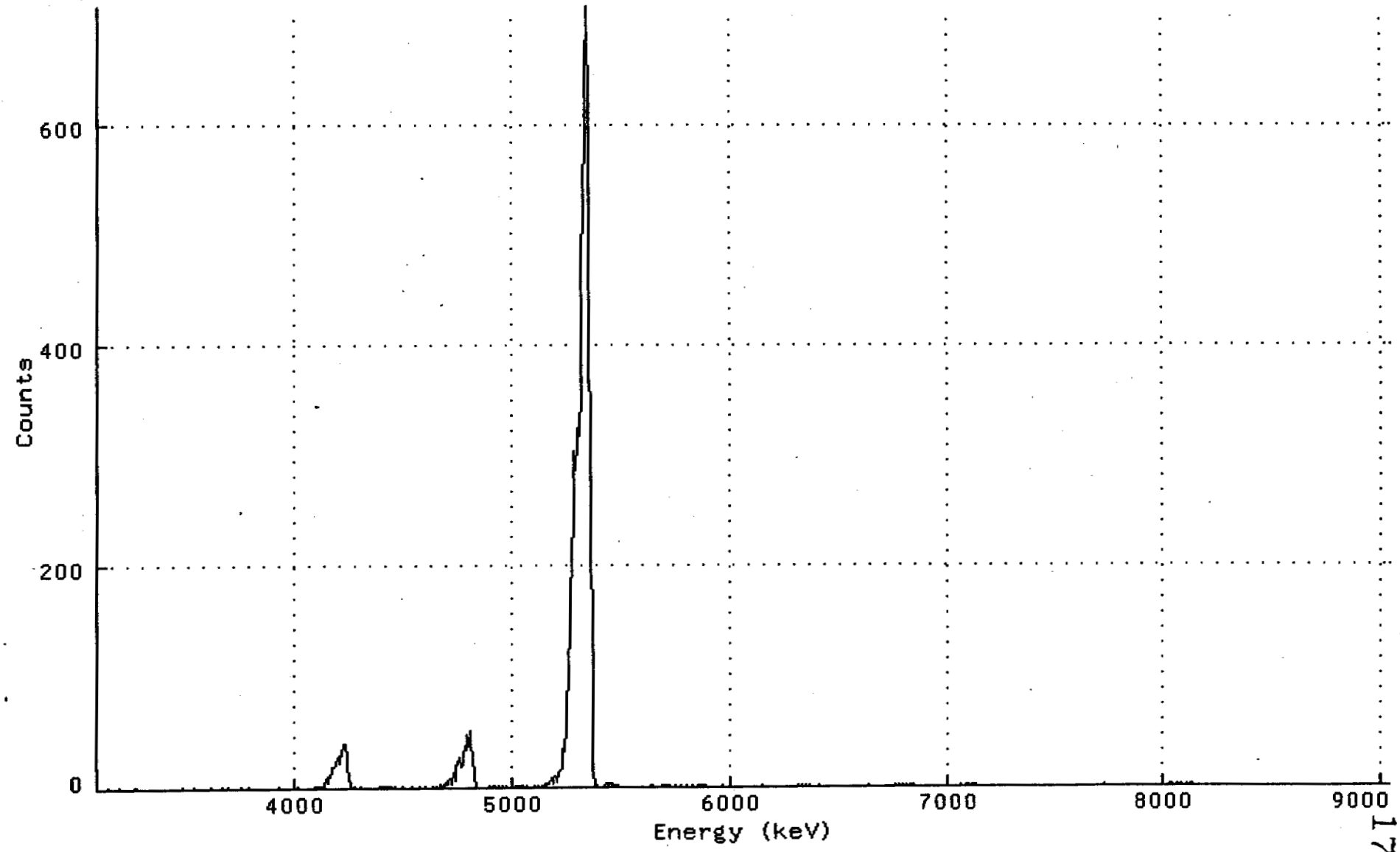
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 7416.00 | 4.00 | 99.8 | 9.601E+02 | 3.299E+01 | 1.555E+00 | 9.528E-01 |
| U-234 | 4761.5 | 521.80 | 3.20 | 99.8 | 6.755E+01 | 6.602E+00 | 1.428E+00 | 8.892E-01 |
| U-235 | 4385.5 | 12.40 | 3.60 | 80.9 | 1.980E+00 | 1.336E+00 | 1.842E+00 | 1.137E+00 |
| U-238 | 4184.4 | 429.00 | 6.00 | 100.2 | 5.530E+01 | 5.885E+00 | 1.817E+00 | 1.083E+00 |

**********

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

307

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99032745$258203_UU.CNF;2
Title : 027
Sample Title:
Start Time: 3-APR-1999 13:47: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.07566E+03
Real Time : 0 22:13:23.00 Sample ID : 258203 Energy Slope : 5.81769E+00
Live Time : 0 22:13:23.00 Sample Type: UU Energy Quad : 0.00000E+00




176

308

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:48:13



Spectral File: ND_AMS_ARCHIVE_S:S_99032745$258191D_UU.CNF

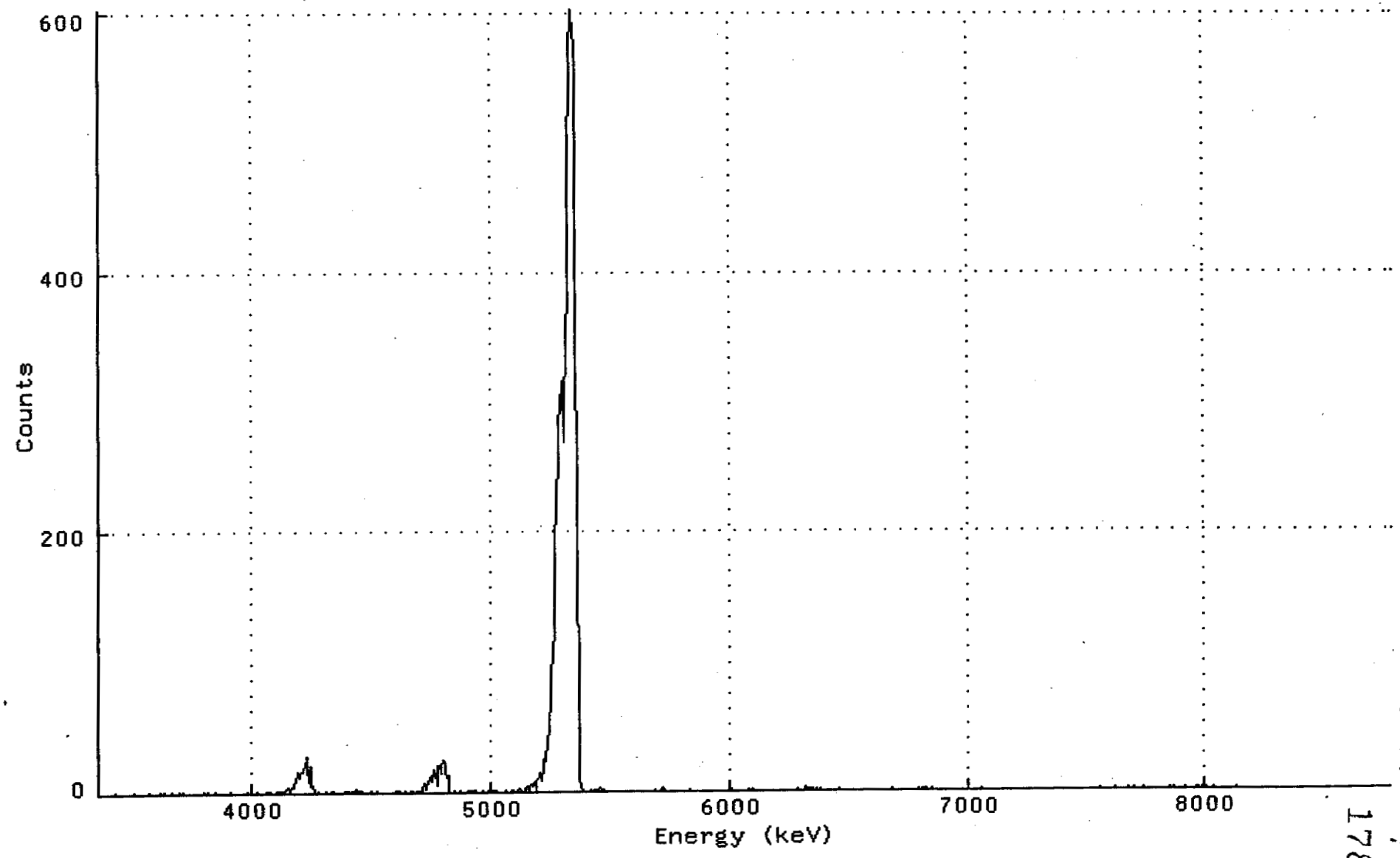
| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | 258191D |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.870E-02 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 028 |
| ACQ DATE: | 3-APR-1999 13:47 | AVERAGE EFFICIENCY: | 27.0% |
| ELAPSED LIVE TIME: | 80005. | RECOVERY: | 79.47% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 64.01 |
| LAMBDA VALUE: | 250. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 06:56 | EFF CAL DATE: | 30-MAR-1999 06:56 |
| BKG FILENAME: | B_028_30MAR99 | | |

NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 7588.00 | 6.00 | 99.8 | 1.422E+03 | 4.866E+01 | 2.643E+00 | 1.575E+00 |
| U-234 | 4761.5 | 278.00 | 4.00 | 99.8 | 5.210E+01 | 6.691E+00 | 2.251E+00 | 1.379E+00 |
| U-235 | 4385.5 | 16.60 | 2.40 | 80.9 | 3.838E+00 | 2.072E+00 | 2.292E+00 | 1.459E+00 |
| U-238 | 4184.4 | 258.00 | 2.00 | 100.2 | 4.814E+01 | 6.366E+00 | 1.733E+00 | 1.119E+00 |

*** POSITIVE ***
*** RECOUNT SAMPLE CL > 0.500 ***

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.S]S_99032745$258191D_UU.CNF;2
Title : 028
Sample Title:
Start Time: 3-APR-1999 13:47: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.33599E+03
Real Time : 0 22:13:26.00 Sample ID : 258191D Energy Slope : 5.31274E+00
Live Time : 0 22:13:25.00 Sample Type: UU Energy Quad : 0.00000E+00




178

310

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:39:21

179

**********
Spectral File: ND_AMS_ARCHIVE_C:C_99032745$LCSWR1B_UU.CNF
**********

| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | LCSWR1B |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 2.500E-01 L |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 030 |
| ACQ DATE: | 3-APR-1999 13:48 | AVERAGE EFFICIENCY: | 26.4% |
| ELAPSED LIVE TIME: | 80005. | RECOVERY: | 74.81% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 48.40 |
| LAMBDA VALUE: | 250. | ROI TYPE: | MANUAL |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 06:58 | EFF CAL DATE: | 30-MAR-1999 06:58 |
| BKG FILENAME: | B_030_30MAR99 | | |

**********

NUCLIDE ACTIVITY SUMMARY

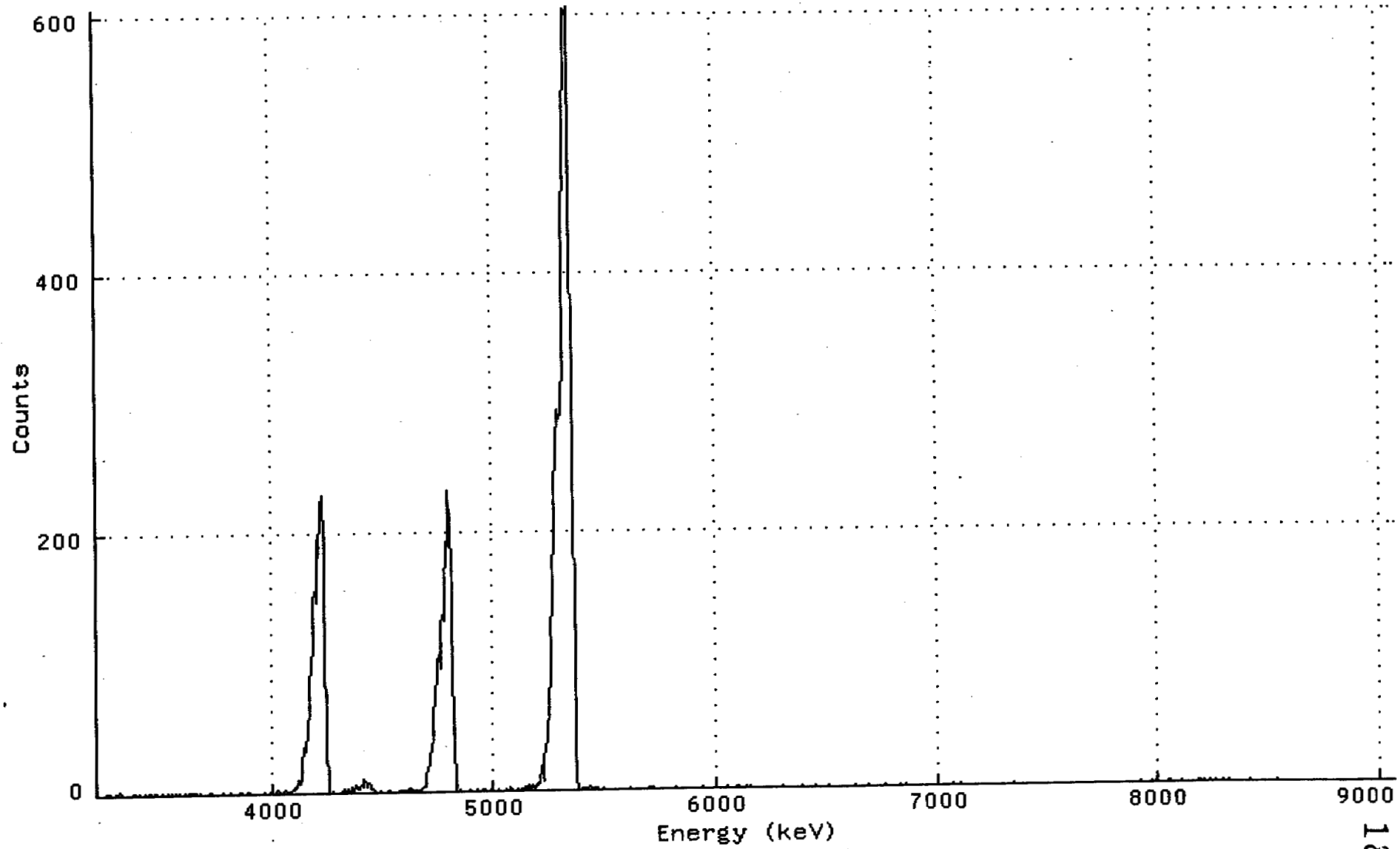
| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY pCi/ L | TPU/ERROR 2-SIGMA | MDC pCi/ L | CRIT LEVEL pCi/ L |
|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 6987.80 | 5.20 | 99.8 | 4.792E+01 | 1.665E+00 | 9.129E-02 | 5.494E-02 |
| U-234 | 4761.5 | 2372.40 | 3.60 | 99.8 | 1.627E+01 | 9.668E-01 | 7.908E-02 | 4.883E-02 |
| U-235 | 4385.5 | 98.00 | 8.00 | 80.9 | 8.290E-01 | 1.803E-01 | 1.342E-01 | 7.855E-02 |
| U-238 | 4184.4 | 2439.80 | 5.20 | 100.2 | 1.666E+01 | 9.837E-01 | 9.090E-02 | 5.470E-02 |

**********

*** POSITIVE ***

311

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.C]C_99032745$LCSWR1B_UU.CNF;2
Title : 030
Sample Title:
Start Time: 3-APR-1999 13:48: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.19644E+03
Real Time : 0 22:13:25.00 Sample ID : LCSWR1B Energy Slope : 5.72570E+00
Live Time : 0 22:13:25.00 Sample Type: UU Energy Quad : 0.00000E+00




180

3/2

WASTREN -- GRAND JUNCTION, CO
ALPHA SPECTROSCOPY REPORT
6-APR-1999 07:41:42

181

Spectral File: ND_AMS_ARCHIVE_R:R_99032745$PBB_UU.CNF

| | | | |
|---|---|---|---|
| BATCH ID: | 99032745 | SAMPLE ID: | PBB |
| SAMPLE DATE: | 31-MAR-1999 00:00 | ALIQUOT: | 1.000E+00 sa |
| SAMPLE TITLE: | | DETECTOR NUMBER: | 031 |
| ACQ DATE: | 3-APR-1999 13:49 | AVERAGE EFFICIENCY: | 27.0% |
| ELAPSED LIVE TIME: | 80003. | RECOVERY: | 77.62% |
| TRACER ID: | U232_82-76-3 | TRACER FWHM (kev): | 68.28 |
| LAMBDA VALUE: | 250. | ROI TYPE: | STANDARD |
| CORRECTED TRACER DPM: | 26.595 | CONFIDENCE LEVEL: | 4.65 |
| SAMPLE MATRIX: | SOIL | LLD CONSTANT: | 2.71 |
| ENERGY CAL DATE: | 30-MAR-1999 06:59 | EFF CAL DATE: | 30-MAR-1999 06:59 |
| BKG FILENAME: | B_031_30MAR99 | | |

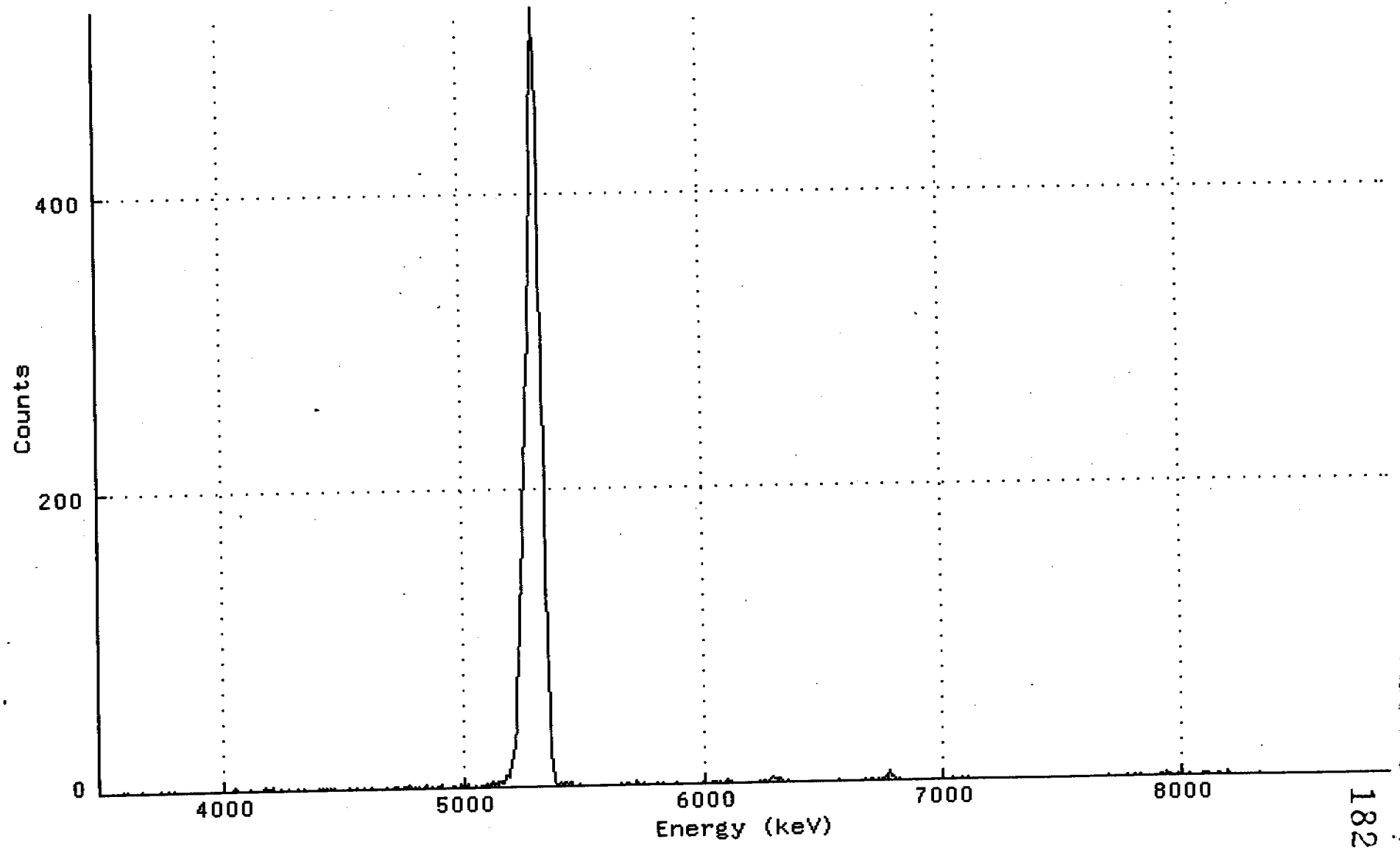
NUCLIDE ACTIVITY SUMMARY

| NUCLIDE | ENERGY | NET AREA | BKG | %ABN | ACTIVITY dpm/ sa | TPU/ERROR 2-SIGMA | MDC dpm/ sa | CRIT LEVEL dpm/ sa |
|---|---|---|---|---|---|---|---|---|
| U232 | 5302.5 | 7419.80 | 9.20 | 99.8 | 2.660E+01 | 9.107E-01 | 6.027E-02 | 3.499E-02 |
| U-234 | 4761.5 | 5.40 | 7.60 | 99.8 | 1.934E-02 | 2.872E-02 | 5.566E-02 | 3.269E-02 |
| U-235 | 4385.5 | 6.80 | 3.20 | 80.9 | 3.006E-02 | 2.973E-02 | 4.877E-02 | 3.037E-02 |
| U-238 | 4184.4 | 10.40 | 1.60 | 100.2 | 3.711E-02 | 2.542E-02 | 3.066E-02 | 2.017E-02 |

*** POSITIVE ***

313

Spectrum : WIZARD$DKC200:[ALPHA.ALUSR.ARCHIVE.R]R_99032745$PBB_UU.CNF;2
Title : 031
Sample Title:
Start Time: 3-APR-1999 13:49: Sample Time: 31-MAR-1999 00:00 Energy Offset: 3.46320E+03
Real Time : 0 22:13:23.00 Sample ID : PBB Energy Slope : 5.26969E+00
Live Time : 0 22:13:23.00 Sample Type: UU Energy Quad : 0.00000E+00






314

# Sample Weights for Req 16495



Chemist: [signature] 4/1/99

Sample Type: Misc.

| Req # | Sample ID | # | Sample Size (g) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 16495 | 258181 | 1 | 23.85 | | | | | | | |
| 16495 | 258182 | 2 | 26.67 | | | | | | | |
| 16495 | 258183 | 3 | 32.07 | | | | | | | |
| 16495 | 258184 | 4 | 37.17 | | | | | | | |
| 16495 | 258185 | 5 | 29.63 | | | | | | | |
| 16495 | 258186 | 6 | 20.14 | | | | | | | |
| 16495 | 258187 | 7 | 17.64 | | | | | | | |
| 16495 | 258188 | 8 | 26.45 | | | | | | | |
| 16495 | 258189 | 9 | 12.89 | | | | | | | |
| 16495 | 258190 | 10 | 31.25 | | | | | | | |
| 16495 | 258191 | 11 | 26.73 | | | | | | | |
| 16495 | 258192 | 12 | 22.14 | | | | | | | |
| 16495 | 258193 | 13 | 19.51 | | | | | | | |
| 16495 | 258194 | 14 | 57.35 | | | | | | | |
| 16495 | 258195 | 15 | 23.07 | | | | | | | |
| 16495 | 258196 | 16 | 14.16 | | | | | | | |
| 16495 | 258197 | 17 | 34.21 | | | | | | | |
| 16495 | 258198 | 18 | 36.09 | | | | | | | |
| 16495 | 258199 | 19 | 18.72 | | | | | | | |
| 16495 | 258200 | 20 | 10.41 | | | | | | | |
| 16495 | 258201 | 21 | 7.81 | | | | | | | |
| 16495 | 258202 | 22 | 4.30 | | | | | | | |
| 16495 | 258203 | 23 | 18.08 | | | | | | | |
| | | 24 | | | | | | | | |
| | | 25 | | | | | | | | |
| | | 26 | | | | | | | | |
| | | 27 | | | | | | | | |
| | | 28 | | | | | | | | |
| | | 29 | | | | | | | | |
| | | 30 | | | | | | | | |
| | | 31 | | | | | | | | |
| | | 32 | | | | | | | | |
| | | 33 | | | | | | | | |
| | | 34 | | | | | | | | |
| | | 35 | | | | | | | | |
| | | 36 | | | | | | | | |
| | | 37 | | | | | | | | |
| | | 38 | | | | | | | | |
| | | 39 | | | | | | | | |
| | | 40 | | | | | | | | |

Additional Comments: Sample fractions were transferred to clean, tared 50 ml centrifuge tubes.
After weighing, samples were milled (~~ground~~ BDT 4/7/99 ground) for analysis.

Sample Prep Procedure: N/A

Analysis Procedure: N/A

Date of sample prep: 3/30/99

Time of sample prep: N/A

Balance ID(s): ~~8~~ 8 BDT 3/30/99

99042866 SEB 4/7/99

Were all automatic pipets calibrated in accord with QC-6? Yes

315

(SECTION III)

# RECEIVING DOCUMENTATION INDEX

Requisition Number 16495

| RECEIVING DOCUMENTATION: | FROM | TO |
|---|---|---|
| Sample Login Sheet | 1 | |
| Request for Analytical Services | 2 | |
| Chain of Sample Custody | 3 | 4 |
| Lab Sample Tracking Record | 5 | |

Grand Junction Office Analytical Laboratory

Sample Login Sheet

(SECTION III)

Received by (Print Name): L. M DAVIS

Received by (Signature): L. M. Davis

Requisition/Case #: 16495

Page 1 of 1 V2.08

Login date: 3-30-99

Requestor: JEFF LIVELY

Project number: 332302001

1. Custody Seal(s):
   Shipping Container: Absent/Intact/Broken
   Sample Container: Absent/Intact/Broken
2. Custody Seal No(s): NA
3. Chain of Custody Recs: Present/Absent
4. Traffic Rpt, Pack Lst, Analytical Req.: Present/Absent
5. Freight Bill: Airbill/Sticker Present/Absent
6. Freight Bill No(s).: Hand delivered
7. Sample Tags: Present/Absent
8. Sample Labels on Chain of Cust.: Listed/Not listed
9. Does information on custody records, traffic reports & sample labels agree?: Yes/No
10. Shipping Cont. Temp.: NA
    and Condition: Good
11. Sample pH: Accept/Not Accept Not Applicable

-------Analysis Requested - Data Due ----------

| Test-Due Date |
|---|
| 1 AM241-09APR99 |
| 2 PUISO-09APR99 |
| UISO -09APR99 |

| No. | Ticket | Customer ID | Lab # | ST | Date Sampled | Condition Received | Date Rec'd |
|---|---|---|---|---|---|---|---|
| 1 | MED0000102 | IVP0000102 | 258181 | MS | 29MAR99 | GOOD | 30MAR99 |
| 2 | MED0000103 | IVP0000103 | 258182 | MS | 29MAR99 | GOOD | 30MAR99 |
| 3 | MED0000104 | IVP0000104 | 258183 | MS | 29MAR99 | GOOD | 30MAR99 |
| 4 | MED0000105 | IVP0000105 | 258184 | MS | 29MAR99 | GOOD | 30MAR99 |
| 5 | MED0000106 | IVP0000106 | 258185 | MS | 29MAR99 | GOOD | 30MAR99 |
| 6 | MED0000107 | IVP0000107 | 258186 | MS | 29MAR99 | GOOD | 30MAR99 |
| 7 | MED0000108 | IVP0000108 | 258187 | MS | 29MAR99 | GOOD | 30MAR99 |
| 8 | MED0000109 | IVP0000109 | 258188 | MS | 29MAR99 | GOOD | 30MAR99 |
| 9 | MED0000110 | IVP0000110 | 258189 | MS | 27MAR99 | GOOD | 30MAR99 |
| 10 | MED0000111 | IVP0000111 | 258190 | MS | 29MAR99 | GOOD | 30MAR99 |
| 11 | MED0000112 | IVP0000112 | 258191 | MS | 29MAR99 | GOOD | 30MAR99 |
| 12 | MED0000113 | IVP0000113 | 258192 | MS | 27MAR99 | GOOD | 30MAR99 |
| 13 | MED0000114 | IVP0000114 | 258193 | MS | 29MAR99 | GOOD | 30MAR99 |
| 14 | MED0000115 | IVP0000115 | 258194 | MS | 29MAR99 | GOOD | 30MAR99 |
| 15 | MED0000116 | IVP0000116 | 258195 | MS | 27MAR99 | GOOD | 30MAR99 |
| 16 | MED0000117 | IVP0000117 | 258196 | MS | 29MAR99 | GOOD | 30MAR99 |
| 17 | MED0000118 | IVP0000118 | 258197 | MS | 29MAR99 | GOOD | 30MAR99 |
| 18 | MED0000119 | IVP0000119 | 258198 | MS | 29MAR99 | GOOD | 30MAR99 |
| 19 | MED0000120 | IVP0000120 | 258199 | MS | 27MAR99 | GOOD | 30MAR99 |
| 20 | MED0000121 | IVP0000121 | 258200 | MS | 27MAR99 | GOOD | 30MAR99 |
| 21 | MED0000125 | IVP0000125 | 258201 | MS | 27MAR99 | GOOD | 30MAR99 |
| 22 | MED0000127 | IVP0000127 | 258202 | MS | 27MAR99 | GOOD | 30MAR99 |
| 23 | MED0000129 | IVP0000129 | 258203 | MS | 27MAR99 | GOOD | 30MAR99 |

Reviewed by: Sue Lynch

Date: 3/31/99

317

(SECTION III)

# Request for Analytical Services

2

Project Title RFETS-IV

Project Number 332302001

* Date Required 4 / 16 / 99

Date Submitted 3 / 30 / 99

Authorized by Paul Wetherstein

Send Final Report to Jeff Lively

**For Lab Use**

Requisition No. 16495

Date Received 3 / 30 / 99

| Sample ID | ANALYSES: Alpha Isotopic | Matrix: SOIL | WATER | FILTER | SEE INST |
|---|---|---|---|---|---|
| MED000102 | X | | | | X |
| 103 | | | | | |
| 104 | | | | | |
| 105 | | | | | |
| 106 | | | | | |
| 107 | | | | | |
| 108 | | | | | |
| 109 | | | | | |
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| 118 | | | | | |
| 119 | | | | | |
| 120 | | | | | |
| 121 | | | | | |
| 125 | | | | | |
| 127 | | | | | |
| 129 | | | | | |

Special Instructions * Preliminary results required by 4-9-99

Alpha Isotopic = Pu-238, Pu-239, Pu-240
Am-241
U-234, U-235, U-238

Sample media = Chipped paint, concrete, and cinder block

GJPO 1500
9/91

**Grand Junction Office**
2597 B 3/4 Road
Grand Junction, Colorado 81503
Telephone (970) 248-6000

# Chain-of-Sample Custody

1. Page 1 of 2
2. Date 3-29-99

3. Project Name RFETS - IVP
4. Site Location Survey UNIT 729-01
5. Sampler (print name) P. Wetherstein

| 6. Sample No. | 7. ~~Date~~ Time | 8. ~~Time~~ Date | 9. Sample Location | 10. Sample Matrix | 11. Containers: Paper + Plastic Envelopes | | | | | | 12. Remarks | 13. Condition Received |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| me00000102 | 1430 | 3-29-99 | IVP0000102 | Surface media | 1 | | | | | | | |
| 103 | 1410 | | 103 | | 1 | | | | | | | |
| 104 | 1350 | | 104 | | 1 | | | | | | | |
| 105 | 1325 | | 105 | | 1 | | | | | | | |
| 106 | 1225 | | 106 | | 1 | | | | | | | |
| 107 | 1145 | | 107 | | 1 | | | | | | | |
| 108 | 1213 | | 108 | | 1 | | | | | | | |
| 109 | 1025 | | 109 | | 1 | | | | | | | |
| 110 | 1545 | 3-27-99 | 110 | | 1 | | | | | | | |
| 111 | 1005 | 3-29-99 | 111 | | 1 | | | | | | | |
| 112 | 0945 | | 112 | | 1 | | | | | | | |
| 113 | 1634 | 3-27-99 | 113 | | 1 | | | | | | | |
| 114 | 0842 | 3-29-99 | 114 | | 1 | | | | | | | |

| 14. Relinquished by (signature) | Date | Time | Relinquished by (signature) | Date | Time | Relinquished by (signature) | Date | Time |
|---|---|---|---|---|---|---|---|---|
| Paul Wetherstein | 3-30-99 | 0915 | | | | | | |
| **Received by (signature)** | **Date** | **Time** | **Received by (signature)** | **Date** | **Time** | **Received by (signature)** | **Date** | **Time** |
| L M Davis | 3-30-99 | 0915 | | | | | | |

| 15. Method of Shipment | 16. Laboratory/Destination | 17. Airbill or Receipt Number |
|---|---|---|
| | | |

18. For Contract Laboratories Only—Receiver to sign, date, and return form by mail or with analytical data package

Company Name _____ Received by _____ Date _____

3

GJO 1512
5/97

Preparation instructions on back of form.

Distribution: Original accompanies shipment, copies to relinquisher.

BY

# Chain-of-Sample Custody

1. **Page_____of_____:** Indicates sequence and total number of pages.
2. **Date:** Date the chain-of-custody record was prepared.
3. **Project Name:** The project name or title.
4. **Site Location:** The location of the project site.
5. **Sampler:** The printed name of the person who collected the samples.
6. **Sample No.:** The unique three-letter, three-digit number generated by GJO.
7. **Date:** Date the sample was collected.
8. **Time:** The time the sample was collected.
9. **Sample Location:** The location at which the sample was taken; e.g., well number, grid location, or survey coordinate.
10. **Sample Matrix:** The sample matrix, e.g., soil, sludge, water, air, or filter.
11. **Container:** The type of container; e.g., write 40-mL glass in the slanted column. Write the number of containers of a given type on the corresponding horizontal line.
12. **Remarks:** Any remarks, as appropriate; preservation method required, e.g., acidified < 2 pH.
13. **Condition Received:** For use by laboratory personnel, to note any damage to sample or container.
14. **Relinquished by/Received by:** Signatures of relinquishers and receivers, with date and time of sample transfer.
15. **Method of Shipment:** The method of shipment, e.g., Federal Express, bus line, etc.
16. **Laboratory/Destination:** The place the samples were shipped for analysis, storage, or other purposes.
17. **Airbill or Receipt Number:** For use with airbills or receipts from contract shippers.
18. **For Use by Contract Laboratories Only:** For use by laboratories other than the Grand Junction Office (GPO). Receiver to sign, date, and return this form to GJO by mail or with analytical data package.

**General:** The purpose of this form is to document sample custody and receipt. GJO assumes no responsibility for samples not in the custody of GJO personnel.

The users of this form are responsible for completing the form by using a waterproof, reproducible ink.

The users of this form are responsible for legibility of all entries.

All information blocks must be completed or marked as "NA" for "Not Applicable." Unused portions of the form must be lined out with a single line, initialed, and dated.

**Grand Junction Office**
2597 B 3/4 Road
Grand Junction, Colorado 81503
Telephone (970) 248-6000

# Chain-of-Sample Custody

1. Page 2 of 2
2. Date 3-29-99

3. Project Name RFETS-IVP
4. Site Location Survey UNIT 729-01
5. Sampler (print name) P. Wetherstein

| 6. Sample No. | 7. Date | 8. Time | 9. Sample Location | 10. Sample Matrix | 11. Containers: Paper + Plastic Envelopes | | | | | | 12. Remarks | 13. Condition Received |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MED0000115 | 3-29-99 | 1048 | IVP0000115 | Surface media | 1 | | | | | | | |
| 116 | 3-27-99 | 1701 | 116 | | 1 | | | | | | | |
| 117 | 3-29-99 | 0925 | 117 | | 1 | | | | | | | |
| 118 | 3-29-99 | 1110 | 118 | | 1 | | | | | | | |
| 119 | 3-29-99 | 0855 | 119 | | 1 | | | | | | | |
| 120 | 3-27-99 | 1646 | 120 | | 1 | | | | | | | |
| 121 | | 1526 | 121 | | 1 | | | | | | | |
| 125 | | 1510 | 125 | | 1 | | | | | | | |
| 127 | | 1230 | 127 | | 1 | | | | | | | |
| 129 | | 1444 | 129 | | 1 | | | | | | | |
| | PGW 3-29-99 | | | | | | | | | | | |

| 14. Relinquished by (signature) | Date | Time | Relinquished by (signature) | Date | Time | Relinquished by (signature) | Date | Time |
|---|---|---|---|---|---|---|---|---|
| Paul Wetherstein | 3-30-99 | 0915 | | | | | | |
| **Received by (signature)** | **Date** | **Time** | **Received by (signature)** | **Date** | **Time** | **Received by (signature)** | **Date** | **Time** |
| L M Davis | 3-30-99 | 0915 | | | | | | |

| 15. Method of Shipment | 16. Laboratory/Destination | 17. Airbill or Receipt Number |
|---|---|---|
| | | |

18. For Contract Laboratories Only—Receiver to sign, date, and return form by mail or with analytical data package

Company Name _____ Received by _____ Date _____

GJO 1512
5/97

Preparation Instructions on back of form.

Distribution: Original accompanies shipment, copies to relinquisher.

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# Chain-of-Sample Custody

1. **Page_____of_____:** Indicates sequence and total number of pages.
2. **Date:** Date the chain-of-custody record was prepared.
3. **Project Name:** The project name or title.
4. **Site Location:** The location of the project site.
5. **Sampler:** The printed name of the person who collected the samples.
6. **Sample No.:** The unique three-letter, three-digit number generated by GJO.
7. **Date:** Date the sample was collected.
8. **Time:** The time the sample was collected.
9. **Sample Location:** The location at which the sample was taken; e.g., well number, grid location, or survey coordinate.
10. **Sample Matrix:** The sample matrix, e.g., soil, sludge, water, air, or filter.
11. **Container:** The type of container; e.g., write 40-mL glass in the slanted column. Write the number of containers of a given type on the corresponding horizontal line.
12. **Remarks:** Any remarks, as appropriate; preservation method required, e.g., acidified < 2 pH.
13. **Condition Received:** For use by laboratory personnel, to note any damage to sample or container.
14. **Relinquished by/Received by:** Signatures of relinquishers and receivers, with date and time of sample transfer.
15. **Method of Shipment:** The method of shipment, e.g., Federal Express, bus line, etc.
16. **Laboratory/Destination:** The place the samples were shipped for analysis, storage, or other purposes.
17. **Airbill or Receipt Number:** For use with airbills or receipts from contract shippers.
18. **For Use by Contract Laboratories Only:** For use by laboratories other than the Grand Junction Office (GPO). Receiver to sign, date, and return this form to GJO by mail or with analytical data package.

**General:** The purpose of this form is to document sample custody and receipt. GJO assumes no responsibility for samples not in the custody of GJO personnel.

The users of this form are responsible for completing the form by using a waterproof, reproducible ink.

The users of this form are responsible for legibility of all entries.

All information blocks must be completed or marked as "NA" for "Not Applicable." Unused portions of the form must be lined out with a single line, initialed, and dated.

LAB SAMPLE TRACKING RECORD

REQUISITION 16495 SUBMITTER: 332302001 REQUESTOR: JEFF LIVELY BUILDING 20 RECEIVED 30MAR99

| RCVD FROM | RCVD BY | DATE | STORAGE LOCATION | FOR | SAMPLES | CHECKOUT DATE | INIT | CHECKIN DATE | INIT | RETURN LOCATION | TYPE O | D | E | C | DISPOSAL INIT | DATE | D | C | W |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ZD | Cma | 3-30-99 | RM 12 | AM241 | 258181-258203 | 3/31/99 | BPT | 4/7/99 | BPT | 3H4 | 4 | | | | | | | | |
| | | | | PUISO | 258181-258203 | | | | | | 4 | | | | | | | | |
| | | | | UISO | 258181-258203 | | | | | | 4 | | | | | | | | |

TYPE CODES: O=ORIGINAL D=DIGEST E=EXTRACT C=CONSUMED DISPOSAL CODES: D=DISCARD C=CUSTOMER W=WASTE MGT

SAMPLES RETURNED: BPT / SL / 4/7/99
To Sample Plant BY TO DATE

SAMPLE DISPOSITION: __ D __ C __ W ____ / ____
BY DATE

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(SECTION III)

REQUISITION 16495

REQUISITION 16495

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# ANALYTICAL REPORT

TO: JEFF LIVELY

PROJECT: 332302001

DATE: Monday, April 5, 1999

REQUISITION(S): 16496

PREPARED BY:

GRAND JUNCTION OFFICE ANALYTICAL LABORATORY
2597 B 3/4 ROAD
GRAND JUNCTION, COLORADO 81503
(970-248-6165)

# ANALYTICAL REPORT INDEX

This report is the final data package for Requisition 16496 generated by the Analytical Laboratory for the RFETS-IV project. It is the official record, and requestors are responsible for proper record-keeping in compliance with project requirements.

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, expressed or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, project, or process disclosed in this report, or represents that its use would not infringe privately owned rights. Reference therein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

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Sample Cross Reference

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Analytical Data Summary and Quality Control Summary

**Section II**
Radiochemical Supporting Documentation

**Section III**
Receiving Documentation

# ANALYTICAL SUMMARY

This report contains the results for thirty-five smear samples received on March 30, 1999, under Project No. 332302001 and Requisition No. 16496.

The determination of gross alpha activity was done by gas proportional counting according to the Grand Junction Office Analytical Laboratory Standard Operating Procedure (SOP) RC-8. Although not requested, gross beta results are included in this report because gross beta activity is determined concurrently with gross alpha activity.

All applicable laboratory quality control parameters were met.

RELEASE OF THE DATA CONTAINED IN THIS REPORT HAS BEEN AUTHORIZED BY THE LABORATORY MANAGER OR THE MANAGER'S DESIGNEE

Steve Donivan RSC 4-6-99
LABORATORY MANAGER DATE

Susan Spatz 4/6/99
PREPARED BY DATE

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SAMPLE CROSS REFERENCE V2.05

GRAND JUNCTION OFFICE ANALYTICAL LABORATORY

REQUISITION(S): 16496

| CUSTOMER ID | TICKET | LAB ID |
|---|---|---|
| IVP0000101 | SMR0000101 | 258204 |
| IVP0000102 | SMR0000102 | 258205 |
| IVP0000103 | SMR0000103 | 258206 |
| IVP0000104 | SMR0000104 | 258207 |
| IVP0000105 | SMR0000105 | 258208 |
| IVP0000106 | SMR0000106 | 258209 |
| IVP0000107 | SMR0000107 | 258210 |
| IVP0000108 | SMR0000108 | 258211 |
| IVP0000109 | SMR0000109 | 258212 |
| IVP0000110 | SMR0000110 | 258213 |
| IVP0000111 | SMR0000111 | 258214 |
| IVP0000112 | SMR0000112 | 258215 |
| IVP0000113 | SMR0000113 | 258216 |
| IVP0000114 | SMR0000114 | 258217 |
| IVP0000115 | SMR0000115 | 258218 |
| IVP0000116 | SMR0000116 | 258219 |
| IVP0000117 | SMR0000117 | 258220 |
| IVP0000118 | SMR0000118 | 258221 |
| IVP0000119 | SMR0000119 | 258222 |
| IVP0000120 | SMR0000120 | 258223 |
| IVP0000121 | SMR0000121 | 258224 |
| IVP0000122 | SMR0000122 | 258225 |
| IVP0000123 | SMR0000123 | 258226 |
| IVP0000124 | SMR0000124 | 258227 |
| IVP0000125 | SMR0000125 | 258228 |
| IVP0000126 | SMR0000126 | 258229 |
| IVP0000127 | SMR0000127 | 258230 |
| IVP0000128 | SMR0000128 | 258231 |
| IVP0000129 | SMR0000129 | 258232 |
| IVP0000591 | SMR0000591 | 258233 |
| IVP0000592 | SMR0000592 | 258234 |
| IVP0000593 | SMR0000593 | 258235 |
| IVP0000594 | SMR0000594 | 258236 |
| IVP0000595 | SMR0000595 | 258237 |
| IVP0000596 | SMR0000596 | 258238 |

(SECTION I)

# ANALYTICAL DATA SUMMARY

This section contains 38 pages, not including this page.

Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS (SECTION I)

Customer ID: IVP0000101
Ticket ID: SMR0000101

Date: April 5, 1999
Lab ID: 258204

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 26, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.31 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |
| Gross Beta | <3.68 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |

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Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000102
Ticket ID: SMR0000102

Date: April 5, 1999
Lab ID: 258205

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 26, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.32 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |
| Gross Beta | <3.62 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |

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# ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000103
Ticket ID: SMR0000103

Date: April 5, 1999
Lab ID: 258206

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 26, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.33 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |
| Gross Beta | <3.65 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |

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Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS (SECTION I)

Customer ID: IVP0000104
Ticket ID: SMR0000104

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Date: April 5, 1999
Lab ID: 258207

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 26, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.31 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |
| Gross Beta | <3.65 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |

Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS

SECTION I)

Customer ID: IVP0000105
Ticket ID: SMR0000105

Date: April 5, 1999
Lab ID: 258208

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 26, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.31 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |
| Gross Beta | <3.62 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |

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Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000106
Ticket ID: SMR0000106

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Date: April 5, 1999
Lab ID: 258209

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 26, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.33 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |
| Gross Beta | <3.65 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |

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Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS (SECTION I)

Customer ID: IVP0000107
Ticket ID: SMR0000107

Date: April 5, 1999
Lab ID: 258210

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 26, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.30 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |
| Gross Beta | <3.65 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |

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Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS (SECTION I)

Customer ID: IVP0000108
Ticket ID: SMR0000108

Date: April 5, 1999
Lab ID: 258211

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 26, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.32 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |
| Gross Beta | <3.62 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |

Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS (SECTION I)

Customer ID: IVP0000109
Ticket ID: SMR0000109

Date: April 5, 1999
Lab ID: 258212

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 26, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.32 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |
| Gross Beta | <3.62 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |

Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000110
Ticket ID: SMR0000110

Date: April 5, 1999
Lab ID: 258213

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 26, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.31 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |
| Gross Beta | <3.65 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |

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Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000111
Ticket ID: SMR0000111

Date: April 5, 1999
Lab ID: 258214

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 26, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.33 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |
| Gross Beta | <3.65 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |

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Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS (SECTION I)

Customer ID: IVP0000112
Ticket ID: SMR0000112

Date: April 5, 1999
Lab ID: 258215

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 26, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.33 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |
| Gross Beta | <3.65 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |

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Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS (SECTION I)

Customer ID: IVP0000113
Ticket ID: SMR0000113

Date: April 5, 1999
Lab ID: 258216

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 26, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.32 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |
| Gross Beta | <3.74 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |

Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS

(SECTION 1)

Customer ID: IVP0000114
Ticket ID: SMR0000114

Date: April 5, 1999
Lab ID: 258217

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 26, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.32 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |
| Gross Beta | <3.65 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |

Grand Junction Office Analytical Laboratory

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# ANALYTICAL RESULTS

(SECTION I

Customer ID: IVP0000115
Ticket ID: SMR0000115

Date: April 5, 1999
Lab ID: 258218

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 26, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.31 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |
| Gross Beta | <3.68 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |

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Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS

SECTION II

Customer ID: IVP0000116
Ticket ID: SMR0000116

Date: April 5, 1999
Lab ID: 258219

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 26, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.33 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |
| Gross Beta | <3.65 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |

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Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000117
Ticket ID: SMR0000117

Date: April 5, 1999
Lab ID: 258220

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 26, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.30 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |
| Gross Beta | <3.68 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |

Grand Junction Office Analytical Laboratory

/1.01

ANALYTICAL RESULTS (SECTION I)

Customer ID: IVP0000118
Ticket ID: SMR0000118

Date: April 5, 1999
Lab ID: 258221

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 26, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.32 | | NA | pCi/SA | 04/01/99 | RC-6 R03 |
| Gross Beta | <3.65 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |

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Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS (SECTION I)

Customer ID: IVP0000119
Ticket ID: SMR0000119

Date: April 5, 1999
Lab ID: 258222

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 26, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.31 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |
| Gross Beta | <3.62 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |

Grand Junction Office Analytical Laboratory

V1.01

ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000120
Ticket ID: SMR0000120

Date: April 5, 1999
Lab ID: 258223

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 26, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.30 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |
| Gross Beta | <3.65 | | NA | pCi/SA | 04/01/99 | RC-8 R03 |

Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000121
Ticket ID: SMR0000121

Date: April 5, 1999
Lab ID: 258224

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 27, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.30 | | NA | pCi/SA | 04/05/99 | RC-8 R03 |
| Gross Beta | <3.62 | | NA | pCi/SA | 04/05/99 | RC-8 R03 |

Grand Junction Office Analytical Laboratory

/1.01

ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000122
Ticket ID: SMR0000122

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Date: April 5, 1999
Lab ID: 258225

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 27, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.31 | | NA | pCi/SA | 04/05/99 | RC-8 R03 |
| Gross Beta | <3.68 | | NA | pCi/SA | 04/05/99 | RC-6 R03 |

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Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS

SECTION I

Customer ID: IVP0000123
Ticket ID: SMR0000123

Date: April 5, 1999
Lab ID: 258226

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 27, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.32 | | NA | pCi/SA | 04/05/99 | RC-8 R03 |
| Gross Beta | <3.68 | | NA | pCi/SA | 04/05/99 | RC-8 R03 |

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Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000124
Ticket ID: SMR0000124

Date: April 5, 1999
Lab ID: 258227

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 27, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.33 | | NA | pCi/SA | 04/05/99 | RC-8 R03 |
| Gross Beta | <3.65 | | NA | pCi/SA | 04/05/99 | RC-8 R03 |

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Grand Junction Office Analytical Laboratory

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## ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000125
Ticket ID: SMR0000125

Date: April 5, 1999
Lab ID: 258228

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 27, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.30 | | NA | pCi/SA | 04/05/99 | RC-8 R03 |
| Gross Beta | <3.68 | | NA | pCi/SA | 04/05/99 | RC-8 R03 |

Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000126
Ticket ID: SMR0000126

Date: April 5, 1999
Lab ID: 258229

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 27, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.32 | | NA | pCi/SA | 04/05/99 | RC-8 R03 |
| Gross Beta | <3.65 | | NA | pCi/SA | 04/05/99 | RC-8 R03 |

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Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS

SECTION D

Customer ID: IVP0000127
Ticket ID: SMR0000127

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Date: April 5, 1999
Lab ID: 258230

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 27, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.33 | | NA | pCi/SA | 04/05/99 | RC-8 R03 |
| Gross Beta | <3.68 | | NA | pCi/SA | 04/05/99 | RC-8 R03 |

Grand Junction Office Analytical Laboratory

V1.01

ANALYTICAL RESULTS

SECTION I

Customer ID: IVP0000128
Ticket ID: SMR0000128

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Date: April 5, 1999
Lab ID: 258231

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 27, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.30 | | NA | pCi/SA | 04/05/99 | RC-8 R03 |
| Gross Beta | <3.65 | | NA | pCi/SA | 04/05/99 | RC-8 R03 |

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Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000129
Ticket ID: SMR0000129

Date: April 5, 1999
Lab ID: 258232

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 27, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.31 | | NA | pCi/SA | 04/05/99 | RC-8 R03 |
| Gross Beta | <3.62 | | NA | pCi/SA | 04/05/99 | RC-8 R03 |

Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000591
Ticket ID: SMR0000591

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Date: April 5, 1999
Lab ID: 258233

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 29, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | 24.29 | | 5.83 | pCi/SA | 04/05/99 | RC-8 R03 |
| Gross Beta | <5.22 | | NA | pCi/SA | 04/05/99 | RC-8 R03 |

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Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000592
Ticket ID: SMR0000592

Date: April 5, 1999
Lab ID: 258234

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 29, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | 7.12 | | 3.21 | pCi/SA | 04/05/99 | RC-8 R03 |
| Gross Beta | <4.18 | | NA | pCi/SA | 04/05/99 | RC-8 R03 |

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Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000593
Ticket ID: SMR0000593

Date: April 5, 1999
Lab ID: 258235

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 29, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | 2.56 | | 2.03 | pCi/SA | 04/05/99 | RC-8 R03 |
| Gross Beta | <3.85 | | NA | pCi/SA | 04/05/99 | RC-8 R03 |

Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS

(SECTION I)

Customer ID: IVP0000594
Ticket ID: SMR0000594

Date: April 5, 1999
Lab ID: 258236

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 29, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.30 | | NA | pCi/SA | 04/05/99 | RC-8 R03 |
| Gross Beta | <3.62 | | NA | pCi/SA | 04/05/99 | RC-8 R03 |

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Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS

SECTION I

Customer ID: IVP0000595
Ticket ID: SMR0000595

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Date: April 5, 1999
Lab ID: 258237

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 29, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.33 | | NA | pCi/SA | 04/05/99 | RC-8 R03 |
| Gross Beta | <3.62 | | NA | pCi/SA | 04/05/99 | RC-8 R03 |

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Grand Junction Office Analytical Laboratory

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ANALYTICAL RESULTS

SECTION D

Customer ID: IVP0000596
Ticket ID: SMR0000596

Date: April 5, 1999
Lab ID: 258238

Requestor: J. LIVELY
Sample Matrix: SMEAR
Project Number: 332302001

Case: 16496
Date Received: Mar 30, 1999
Date Collected: Mar 29, 1999

| ANALYSIS REQUESTED | RESULTS | QUALI's | ERROR | UNITS | DATE ANALYZED | METHOD OF ANALYSIS |
|---|---|---|---|---|---|---|
| Gross Alpha | <2.31 | | NA | pCi/SA | 04/05/99 | RC-8 R03 |
| Gross Beta | <3.62 | | NA | pCi/SA | 04/05/99 | RC-8 R03 |

(SECTION I)

# QUALITY CONTROL SUMMARY

LCS QC REPORT V1.02

SECTION I

Lab Name: GJO Analytical Laboratory CASE: 16496

| Analyte | Date | Result | Known Value | Units | Acceptance Low | Acceptance High |
|---|---|---|---|---|---|---|
| Gross Alpha | 04/01/99 | 218.81 | 214 | pCi/SA | 153.00 | 302.00 |
| Gross Alpha | 04/05/99 | 38.54 | 42.8 | pCi/SA | 30.6 | 60.5 |

BLANKS QC REPORT

V1.02

Lab Name: GJO Analytical Laboratory

SECTION I

CASE: 16496

| Analyte | Date | Calibration Blanks Result | Units | Result | Units | Prep Blank Result | Units |
|---|---|---|---|---|---|---|---|
| Gross Alpha | 04/01/99 | | | | | 0.10 | pCi/SA |
| Gross Alpha | 04/05/99 | | | | | 0.10 | pCi/SA |
| Gross Beta | 04/01/99 | | | | | 1.26 | pCi/SA |
| Gross Beta | 04/05/99 | | | | | 0.75 | pCi/SA |

COMMENTS:

2de

SECTION II

# RADIOCHEMICAL

# SUPPORTING DOCUMENTATION

Requisition No. 16496

The following section contains the analytical supporting documentation for the radiochemical analyses performed on this request. Commonly used laboratory codes in this section include:

## PROCEDURE:

RC-8: Gross Alpha/Beta Analysis

## QUALITY CONTROL PREFIXES

| | |
|---|---|
| PB: | Blank |
| LCS: | Laboratory Control Sample |
| CCV: | Continuing Calibration Verification |

This section contains 15 pages numbered 1 through 15.

# Determination of Gross Alpha & Gross Beta

Worklist ID: 99042841

Chemist ID: G40349 Gretchen K Ben

04-05-99

| Req # | Sample ID | # | Alpha Activity (pCi/SA) | Alpha Uncert. +/- | Alpha MDA | Alpha Gross Counts | Alpha Net Counts | Alpha Reference Date | Beta Activity (pCi/SA) | Beta Uncert. +/- | Beta MDA | Beta Gross Counts | Beta Net Counts | Beta Reference Date | Count Time (min.) | Start Count Date | Start Count Time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PB | 1 | 0.10 | 0.90 | 2.33 | 1 | 0.3 | 04/01/99 | 1.26 | 2.09 | 3.65 | 11 | 4.9 | 04/01/99 | 6.0 | 04/01/99 | 09:39 |
| | LCS | 2 | 218.81 | 18.47 | 4.04 | 627 | 623.4 | 04/01/99 | 171.94 | 15.01 | 11.42 | 748 | 667.8 | 04/01/99 | 6.0 | 04/01/99 | 09:46 |
| 16496 | 258204 | 3 | 0.46 | 1.13 | 2.31 | 2 | 1.3 | 04/01/99 | 0.46 | 1.90 | 3.68 | 8 | 1.8 | 04/01/99 | 6.0 | 04/01/99 | 09:52 |
| 16496 | 258205 | 4 | -0.25 | 0.58 | 2.32 | 0 | -0.7 | 04/01/99 | 1.04 | 2.02 | 3.62 | 10 | 4.0 | 04/01/99 | 6.0 | 04/01/99 | 09:59 |
| 16496 | 258206 | 5 | 0.10 | 0.90 | 2.33 | 1 | 0.3 | 04/01/99 | 1.78 | 2.21 | 3.65 | 13 | 6.9 | 04/01/99 | 6.0 | 04/01/99 | 10:05 |
| 16496 | 258207 | 6 | 0.11 | 0.90 | 2.31 | 1 | 0.3 | 04/01/99 | 0.49 | 1.89 | 3.65 | 8 | 1.9 | 04/01/99 | 6.0 | 04/01/99 | 10:11 |
| 16496 | 258208 | 7 | -0.24 | 0.57 | 2.31 | 0 | -0.7 | 04/01/99 | 0.01 | 1.75 | 3.62 | 6 | 0.0 | 04/01/99 | 6.0 | 04/01/99 | 10:18 |
| 16496 | 258209 | 8 | 0.10 | 0.90 | 2.33 | 1 | 0.3 | 04/01/99 | 1.78 | 2.21 | 3.65 | 13 | 6.9 | 04/01/99 | 6.0 | 04/01/99 | 10:24 |
| 16496 | 258210 | 9 | 0.11 | 0.89 | 2.30 | 1 | 0.3 | 04/01/99 | -0.28 | 1.68 | 3.65 | 5 | -1.1 | 04/01/99 | 6.0 | 04/01/99 | 10:30 |
| 16496 | 258211 | 10 | -0.25 | 0.58 | 2.32 | 0 | -0.7 | 04/01/99 | 0.78 | 1.95 | 3.62 | 9 | 3.0 | 04/01/99 | 6.0 | 04/01/99 | 10:37 |
| 16496 | 258212 | 11 | -0.25 | 0.58 | 2.32 | 0 | -0.7 | 04/01/99 | 0.78 | 1.95 | 3.62 | 9 | 3.0 | 04/01/99 | 6.0 | 04/01/99 | 10:43 |
| 16496 | 258213 | 12 | 0.11 | 0.90 | 2.31 | 1 | 0.3 | 04/01/99 | 0.23 | 1.83 | 3.65 | 7 | 0.9 | 04/01/99 | 6.0 | 04/01/99 | 10:49 |
| 16496 | 258214 | 13 | 0.10 | 0.90 | 2.33 | 1 | 0.3 | 04/01/99 | 1.52 | 2.15 | 3.65 | 12 | 5.9 | 04/01/99 | 6.0 | 04/01/99 | 10:56 |
| 16496 | 258215 | 14 | 0.10 | 0.90 | 2.33 | 1 | 0.3 | 04/01/99 | 1.78 | 2.21 | 3.65 | 13 | 6.9 | 04/01/99 | 6.0 | 04/01/99 | 11:02 |
| 16496 | 258216 | 15 | 1.16 | 1.49 | 2.32 | 4 | 3.3 | 04/01/99 | 0.66 | 1.98 | 3.74 | 9 | 2.5 | 04/01/99 | 6.0 | 04/01/99 | 11:09 |
| 16496 | 258217 | 16 | 0.10 | 0.90 | 2.32 | 1 | 0.3 | 04/01/99 | 0.75 | 1.96 | 3.65 | 9 | 2.9 | 04/01/99 | 6.0 | 04/01/99 | 11:15 |
| 16496 | 258218 | 17 | 0.46 | 1.13 | 2.31 | 2 | 1.3 | 04/01/99 | 0.46 | 1.90 | 3.68 | 8 | 1.8 | 04/01/99 | 6.0 | 04/01/99 | 11:21 |
| 16496 | 258219 | 18 | 0.10 | 0.90 | 2.33 | 1 | 0.3 | 04/01/99 | 1.26 | 2.09 | 3.65 | 11 | 4.9 | 04/01/99 | 6.0 | 04/01/99 | 11:28 |
| 16496 | 258220 | 19 | 0.46 | 1.13 | 2.30 | 2 | 1.3 | 04/01/99 | -0.31 | 1.69 | 3.68 | 5 | -1.2 | 04/01/99 | 6.0 | 04/01/99 | 11:34 |
| 16496 | 258221 | 20 | 0.10 | 0.90 | 2.32 | 1 | 0.3 | 04/01/99 | 0.75 | 1.96 | 3.65 | 9 | 2.9 | 04/01/99 | 6.0 | 04/01/99 | 11:40 |
| 16496 | 258222 | 21 | -0.24 | 0.57 | 2.31 | 0 | -0.7 | 04/01/99 | 0.01 | 1.75 | 3.62 | 6 | 0.0 | 04/01/99 | 6.0 | 04/01/99 | 11:47 |
| 16496 | 258223 | 22 | 0.11 | 0.89 | 2.30 | 1 | 0.3 | 04/01/99 | -0.80 | 1.52 | 3.65 | 3 | -3.1 | 04/01/99 | 6.0 | 04/01/99 | 11:53 |
| | CCV | 23 | 976.51 | 47.00 | 9.48 | 2781 | 2754.3 | 12/15/92 | 1632.04 | 55.55 | 22.61 | 6674 | 6339.0 | 04/01/99 | 6.0 | 04/01/99 | 12:00 |
| | | 24 | | | | | | | | | | | | | 6.0 | | |
| | | 25 | | | | | | | | | | | | | 6.0 | | |
| | | 26 | | | | | | | | | | | | | 6.0 | | |
| | | 27 | | | | | | | | | | | | | 6.0 | | |
| | | 28 | | | | | | | | | | | | | 6.0 | | |
| | | 29 | | | | | | | | | | | | | 6.0 | | |
| | | 30 | | | | | | | | | | | | | 6.0 | | |
| | | 31 | | | | | | | | | | | | | 6.0 | | |
| | | 32 | | | | | | | | | | | | | 6.0 | GKB 4/5/99 | |

Sample prep. procedure: RC8 R03
Analysis procedure: RC-8 R03
Date of sample prep.: 04/01/99

**Instrument Conditions**
Instrument: CAN2404
High Voltage: 1525

**Calibration Data**

| | Alpha | Beta |
|---|---|---|
| Efficiency: | 0.2139 | 0.2916 |
| RSD (%): | 2.78 | 2.04 |
| N: | 6 | 6 |
| **Uncertainty (%): | 2.00 | 1.49 |
| Background CPM: | 0.115 | 1.01 |
| Count time of background (min): | 60.0 | 60.0 |
| Halflife for decay correction(y): | 432.7 | 28.6 |
| Crosstalk (%): | 0.39 | 11.83 |

** Uncertainty of the calibration standard activity.

Uncertainty is calculated with 1.96 sigma.
MDA is Minimal Detectable Activity.

CCV is #6 of calibration.

CCV % recovery = $\frac{976.51}{1000}$ = 97.7%

Calculations by: GABAF v1

Supervisor Review: OK DG 4-5-99

Q.C. Review: Sue Lopata 4/5/99

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**Gross Alpha & Gross Beta**



Worklist ID: 99042841
Instrument: CAN2404
Sample Type: SWIPES

Chemist: [illegible] 4/1/99

| # | Req # | Sample ID | Carrier # | Control Acceptance Range | Comments |
|---|---|---|---|---|---|
| 1 | | PB | | | |
| 2 | | LCS * | | α: 153.0 – 302.5 pCi | |
| 3 | 16496 | 258204 | | | |
| 4 | 16496 | 258205 | | | |
| 5 | 16496 | 258206 | | | |
| 6 | 16496 | 258207 | | | |
| 7 | 16496 | 258208 | | | |
| 8 | 16496 | 258209 | | | |
| 9 | 16496 | 258210 | | | |
| 10 | 16496 | 258211 | | | |
| 11 | 16496 | 258212 | | | |
| 12 | 16496 | 258213 | | | |
| 13 | 16496 | 258214 | | | |
| 14 | 16496 | 258215 | | | |
| 15 | 16496 | 258216 | | | |
| 16 | 16496 | 258217 | | | |
| 17 | 16496 | 258218 | | | |
| 18 | 16496 | 258219 | | | |
| 19 | 16496 | 258220 | | | |
| 20 | 16496 | 258221 | | | |
| 21 | 16496 | 258222 | | | |
| 22 | 16496 | 258223 | | | |
| 23 | | CCV | | α: 900 – 1100 pCi | |
| 24 | | | | | |
| 25 | | | | | |
| 26 | | | | | |
| 27 | | | | | |
| 28 | | | | | |
| 29 | | | | | |
| 30 | | | | | |
| 31 | | | | | |
| 32 | | | | | |

Additional Comments:

Sample Prep Procedure: RC8 R03
Analysis Procedure: RC8 R03

Date of sample prep: 04-01-1999

* LCS = 5.0 ml of LCSWR24 known value = 214.0 pCi alpha

WORKLIST 99042841

PROGRAM NAME: GRB

SAMPLE #:3. COLLECT TIME:6.00 PB
09:45:55,04-01-1999

ALPHA RESULT: .27 +/- 0 pCi
ALPHA GROSS COUNT: 1.
ALPHA NET COUNT: .16 +/- 0

BETA RESULT: 2.46 pCi
BETA GROSS COUNT: 11.
BETA NET COUNT: 1.83 +/- 0

SAMPLE #:4. COLLECT TIME:6.00 LCS
09:52:17,04-01-1999

ALPHA RESULT: 170.55 +/- 0 pCi
ALPHA GROSS COUNT: 627.
ALPHA NET COUNT: 104.50 +/- 0

BETA RESULT: 167.63 pCi
BETA GROSS COUNT: 748.
BETA NET COUNT: 124.66 +/- 0

SAMPLE #:5. COLLECT TIME:6.00 258204
09:58:39,04-01-1999

ALPHA RESULT: .54 +/- 0 pCi
ALPHA GROSS COUNT: 2.
ALPHA NET COUNT: .33 +/- 0

BETA RESULT: 1.79 pCi
BETA GROSS COUNT: 8.
BETA NET COUNT: 1.33 +/- 0

SAMPLE #:6. COLLECT TIME:6.00 258205
10:05:01,04-01-1999

ALPHA RESULT: 0 +/- 0 pCi
ALPHA GROSS COUNT: 0
ALPHA NET COUNT: 0 +/- 0

BETA RESULT: 2.24 pCi
BETA GROSS COUNT: 10.
BETA NET COUNT: 1.66 +/- 0

SAMPLE #:7. COLLECT TIME:6.00 258206
10:11:23,04-01-1999

ALPHA RESULT: .27 +/- 0 pCi
ALPHA GROSS COUNT: 1.
ALPHA NET COUNT: .16 +/- 0

BETA RESULT: 2.91 pCi
BETA GROSS COUNT: 13.
BETA NET COUNT: 2.16 +/- 0

SAMPLE #:8. COLLECT TIME:6.00 258207
10:17:45,04-01-1999

ALPHA RESULT: .27 +/- 0 pCi
ALPHA GROSS COUNT: 1.
ALPHA NET COUNT: .16 +/- 0

BETA RESULT: 1.79 pCi
BETA GROSS COUNT: 8.
BETA NET COUNT: 1.33 +/- 0

SAMPLE #:9. COLLECT TIME:6.00 258208
10:24:07,04-01-1999

ALPHA RESULT: 0 +/- 0 pCi
ALPHA GROSS COUNT: 0
ALPHA NET COUNT: 0 +/- 0

BETA RESULT: 1.34 pCi
BETA GROSS COUNT: 6.
BETA NET COUNT: 1.00 +/- 0

SAMPLE #:10. COLLECT TIME:6.00 258209
10:30:29,04-01-1999

ALPHA RESULT: .27 +/- 0 pCi
ALPHA GROSS COUNT: 1.
ALPHA NET COUNT: .16 +/- 0

BETA RESULT: 2.91 pCi
BETA GROSS COUNT: 13.
BETA NET COUNT: 2.16 +/- 0

SAMPLE #:11. COLLECT TIME:6.00 258210
10:36:51,04-01-1999

ALPHA RESULT: .27 +/- 0 pCi
ALPHA GROSS COUNT: 1.
ALPHA NET COUNT: .16 +/- 0

BETA RESULT: 1.12 pCi
BETA GROSS COUNT: 5.
BETA NET COUNT: .83 +/- 0

SAMPLE #:12. COLLECT TIME:6.00 258211
10:43:13,04-01-1999

ALPHA RESULT: 0 +/- 0 pCi
ALPHA GROSS COUNT: 0
ALPHA NET COUNT: 0 +/- 0

BETA RESULT: 2.01 pCi
BETA GROSS COUNT: 9.
BETA NET COUNT: 1.50 +/- 0

SAMPLE #:13. COLLECT TIME:6.00 258212
10:49:35,04-01-1999

ALPHA RESULT: 0 +/- 0 pCi
ALPHA GROSS COUNT: 0
ALPHA NET COUNT: 0 +/- 0

BETA RESULT: 2.01 pCi
BETA GROSS COUNT: 9.
BETA NET COUNT: 1.50 +/- 0

SAMPLE #:14. COLLECT TIME:6.00 258213
10:55:57,04-01-1999

ALPHA RESULT: .27 +/- 0 pCi
ALPHA GROSS COUNT: 1.
ALPHA NET COUNT: .16 +/- 0

BETA RESULT: 1.56 pCi
BETA GROSS COUNT: 7.
BETA NET COUNT: 1.16 +/- 0

SAMPLE #:15. COLLECT TIME:6.00 258214
11:02:19,04-01-1999

ALPHA RESULT: .27 +/- 0 pCi
ALPHA GROSS COUNT: 1.
ALPHA NET COUNT: .16 +/- 0

BETA RESULT: 2.68 pCi
BETA GROSS COUNT: 12.
BETA NET COUNT: 2.00 +/- 0

SAMPLE #:16. COLLECT TIME:6.00 258215
11:08:41,04-01-1999

ALPHA RESULT: .27 +/- 0 pCi
ALPHA GROSS COUNT: 1.
ALPHA NET COUNT: .16 +/- 0

BETA RESULT: 2.91 pCi
BETA GROSS COUNT: 13.
BETA NET COUNT: 2.16 +/- 0

SAMPLE #:17. COLLECT TIME:6.00 258216
11:15:03,04-01-1999

ALPHA RESULT: 1.08 +/- 0 pCi
ALPHA GROSS COUNT: 4.
ALPHA NET COUNT: .66 +/- 0

BETA RESULT: 2.01 pCi
BETA GROSS COUNT: 9.
BETA NET COUNT: 1.50 +/- 0

SAMPLE #:18. COLLECT TIME:6.00 258217
11:21:25,04-01-1999

ALPHA RESULT: .27 +/- 0 pCi
ALPHA GROSS COUNT: 1.
ALPHA NET COUNT: .16 +/- 0

BETA RESULT: 2.01 pCi
BETA GROSS COUNT: 9.
BETA NET COUNT: 1.50 +/- 0

SAMPLE #:19. COLLECT TIME:6.00 258218
11:27:47,04-01-1999

ALPHA RESULT: .54 +/- 0 pCi
ALPHA GROSS COUNT: 2.
ALPHA NET COUNT: .33 +/- 0

BETA RESULT: 1.79 pCi
BETA GROSS COUNT: 8.
BETA NET COUNT: 1.33 +/- 0

SAMPLE #:20. COLLECT TIME:6.00 258219
11:34:09,04-01-1999

ALPHA RESULT: .27 +/- 0 pCi
ALPHA GROSS COUNT: 1.
ALPHA NET COUNT: .16 +/- 0

BETA RESULT: 2.46 pCi
BETA GROSS COUNT: 11.
BETA NET COUNT: 1.83 +/- 0

SAMPLE #:21. COLLECT TIME:6.00 258220
11:40:31,04-01-1999

ALPHA RESULT: .54 +/- 0 pCi
ALPHA GROSS COUNT: 2.
ALPHA NET COUNT: .33 +/- 0

BETA RESULT: 1.12 pCi
BETA GROSS COUNT: 5.
BETA NET COUNT: .83 +/- 0

SAMPLE #:22. COLLECT TIME:6.00 258221
11:46:53,04-01-1999

ALPHA RESULT: .27 +/- 0 pCi
ALPHA GROSS COUNT: 1.
ALPHA NET COUNT: .16 +/- 0

BETA RESULT: 2.01 pCi
BETA GROSS COUNT: 9.
BETA NET COUNT: 1.50 +/- 0

SAMPLE #:23. COLLECT TIME:6.00 258222
11:53:15,04-01-1999

ALPHA RESULT: 0 +/- 0 pCi
ALPHA GROSS COUNT: 0
ALPHA NET COUNT: 0 +/- 0

BETA RESULT: 1.34 pCi
BETA GROSS COUNT: 6.
BETA NET COUNT: 1.00 +/- 0

SAMPLE #:24. COLLECT TIME:6.00 258223
11:59:37,04-01-1999

ALPHA RESULT: .27 +/- 0 pCi
ALPHA GROSS COUNT: 1.
ALPHA NET COUNT: .16 +/- 0

BETA RESULT: .67 pCi
BETA GROSS COUNT: 3.
BETA NET COUNT: .50 +/- 0

SAMPLE #:25. COLLECT TIME:6.00 CCV
12:06:00,04-01-1999

ALPHA RESULT: 756.46 +/- 0 pCi
ALPHA GROSS COUNT: 2781.
ALPHA NET COUNT: 463.50 +/- 0

BETA RESULT: 1495.67 pCi
BETA GROSS COUNT: 6674.
BETA NET COUNT: 1112.33 +/- 0

**Alpha & Beta Efficiency Calibration**



Instrument: **CAN2404**

Chemist: Gretchen R. Bear 4/1/99

| Alpha Standard | | Beta Standard | |
|---|---|---|---|
| Isotope(s): | Am-241 | Isotope(s): | Sr-90/Y-90 |
| ID: | 82-49-1 | ID: | 82-22-4 |
| Standard Activity: | 1000.0 pCi/mL | Standard Activity: | 2010.0 pCi/mL |
| Standard Uncertainty: | 2.00 % | Standard Uncertainty: | 1.49 % |
| Reference Date: | 12/15/92 | Reference Date: | 02/01/92 |
| Half-life: | 432.7 years | Half-life: | 28.6 years |

**Alpha Efficiency Calibration:**

| # | Aliquot Size (mL) | Gross Counts | Net Counts | Alpha Standard Activity (pCi) | Efficiency |
|---|---|---|---|---|---|
| 1 | 1.00 | 28788 | 28508.8 | 990.0 | 0.2162 |
| 2 | 1.00 | 29747 | 29464.5 | 990.0 | 0.2234 |
| 3 | 1.00 | 28374 | 28100.7 | 990.0 | 0.2131 |
| 4 | 1.00 | 28012 | 27736.7 | 990.0 | 0.2103 |
| 5 | 1.00 | 28579 | 28300.1 | 990.0 | 0.2146 |
| 6 | 1.00 | 27400 | 27133.2 | 990.0 | 0.2058 |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 10 | | | | | |
| | | | | Average = | 0.2139 |
| | | | | % RSD = | 2.78 |
| | | | | N = | 6 |

Alpha Background CPM: 0.115
Count time: 60 min
Date Samples Counted: 03/31/99
Crosstalk of Beta into Alpha: 0.39 %

**Beta Efficiency Calibration:**

| # | Aliquot Size (mL) | Gross Counts | Net Counts | Beta Standard Activity (pCi) | Efficiency |
|---|---|---|---|---|---|
| 1 | 1.00 | 69870 | 66404.6 | 1689.6 | 0.2951 |
| 2 | 1.00 | 70735 | 67156.1 | 1689.6 | 0.2984 |
| 3 | 1.00 | 68359 | 64942.6 | 1689.6 | 0.2886 |
| 4 | 1.00 | 68888 | 65514.4 | 1689.6 | 0.2911 |
| 5 | 1.00 | 69801 | 66360.3 | 1689.6 | 0.2949 |
| 6 | 1.00 | 66692 | 63390.8 | 1689.6 | 0.2817 |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 10 | | | | | |
| | | | | Average = | 0.2916 |
| | | | | % RSD = | 2.04 |
| | | | | N = | 6 |

Beta Background CPM: 1.01
Count time: 60 min
Date Samples Counted: 03/31/99
Crosstalk of Alpha into Beta: 11.83 %

Calculations by Excel: GABAF v1

Determination of Gross Alpha & Gross Beta

Worklist ID: 99042842

Chemist ID: G40349 Heather R. Barr 04-05-99

| Req # | Sample ID | # | Alpha Activity (pCi/SA) | Alpha Uncert. +/- | Alpha MDA | Alpha Gross Counts | Alpha Net Counts | Alpha Reference Date | Beta Activity (pCi/SA) | Beta Uncert. +/- | Beta MDA | Beta Gross Counts | Beta Net Counts | Beta Reference Date | Count Time (min.) | Start Count Date | Start Count Time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PB | 1 | 0.10 | 0.90 | 2.32 | 1 | 0.3 | 04/05/99 | 0.75 | 1.96 | 3.65 | 9 | 2.9 | 04/05/99 | 6.0 | 04/05/99 | 08:30 |
| | LCS | 2 | 38.54 | 7.38 | 2.72 | 111 | 109.8 | 04/05/99 | 29.06 | 6.24 | 5.93 | 132 | 112.9 | 04/05/99 | 6.0 | 04/05/99 | 08:36 |
| 16496 | 258224 | 3 | -0.24 | 0.57 | 2.30 | 0 | -0.7 | 04/05/99 | -0.25 | 1.67 | 3.62 | 5 | -1.0 | 04/05/99 | 6.0 | 04/05/99 | 08:43 |
| 16496 | 258225 | 4 | 0.46 | 1.13 | 2.31 | 2 | 1.3 | 04/05/99 | 0.20 | 1.83 | 3.68 | 7 | 0.8 | 04/05/99 | 6.0 | 04/05/99 | 08:49 |
| 16496 | 258226 | 5 | 0.45 | 1.13 | 2.32 | 2 | 1.3 | 04/05/99 | 0.97 | 2.03 | 3.68 | 10 | 3.8 | 04/05/99 | 6.0 | 04/05/99 | 08:56 |
| 16496 | 258227 | 6 | 0.10 | 0.90 | 2.33 | 1 | 0.3 | 04/05/99 | 1.52 | 2.15 | 3.65 | 12 | 5.9 | 04/05/99 | 6.0 | 04/05/99 | 09:02 |
| 16496 | 258228 | 7 | 0.46 | 1.13 | 2.30 | 2 | 1.3 | 04/05/99 | -0.31 | 1.69 | 3.68 | 5 | -1.2 | 04/05/99 | 6.0 | 04/05/99 | 09:08 |
| 16496 | 258229 | 8 | 0.10 | 0.90 | 2.32 | 1 | 0.3 | 04/05/99 | 1.00 | 2.02 | 3.65 | 10 | 3.9 | 04/05/99 | 6.0 | 04/05/99 | 09:15 |
| 16496 | 258230 | 9 | 0.45 | 1.13 | 2.33 | 2 | 1.3 | 04/05/99 | 1.49 | 2.15 | 3.68 | 12 | 5.8 | 04/05/99 | 6.0 | 04/05/99 | 09:21 |
| 16496 | 258231 | 10 | 0.11 | 0.89 | 2.30 | 1 | 0.3 | 04/05/99 | -0.28 | 1.68 | 3.65 | 5 | -1.1 | 04/05/99 | 6.0 | 04/05/99 | 09:27 |
| 16496 | 258232 | 11 | -0.24 | 0.57 | 2.31 | 0 | -0.7 | 04/05/99 | 0.01 | 1.75 | 3.62 | 6 | 0.0 | 04/05/99 | 6.0 | 04/05/99 | 09:34 |
| 16496 | 258233 | 12 | 24.29 | 5.83 | 2.41 | 70 | 69.2 | 04/05/99 | 4.82 | 3.47 | 5.22 | 33 | 18.7 | 04/05/99 | 6.0 | 04/05/99 | 09:40 |
| 16496 | 258234 | 13 | 7.12 | 3.21 | 2.34 | 21 | 20.3 | 04/05/99 | 1.43 | 2.39 | 4.18 | 14 | 5.5 | 04/05/99 | 6.0 | 04/05/99 | 09:46 |
| 16496 | 258235 | 14 | 2.56 | 2.03 | 2.33 | 8 | 7.3 | 04/05/99 | 1.05 | 2.14 | 3.85 | 11 | 4.1 | 04/05/99 | 6.0 | 04/05/99 | 09:53 |
| 16496 | 258236 | 15 | -0.24 | 0.57 | 2.30 | 0 | -0.7 | 04/05/99 | -0.25 | 1.67 | 3.62 | 5 | -1.0 | 04/05/99 | 6.0 | 04/05/99 | 09:59 |
| 16496 | 258237 | 16 | -0.25 | 0.58 | 2.33 | 0 | -0.7 | 04/05/99 | 1.81 | 2.20 | 3.62 | 13 | 7.0 | 04/05/99 | 6.0 | 04/05/99 | 10:06 |
| 16496 | 258238 | 17 | -0.24 | 0.57 | 2.31 | 0 | -0.7 | 04/05/99 | 0.52 | 1.89 | 3.62 | 8 | 2.0 | 04/05/99 | 6.0 | 04/05/99 | 10:12 |
| | CCV | 18 | 957.07 | 46.37 | 9.62 | 2727 | 2699.4 | 12/15/92 | 1692.64 | 56.93 | 22.40 | 6903 | 6574.4 | 04/05/99 | 6.0 | 04/05/99 | 10:18 |
| | | 19 | | | | | | | | | | | | | | | |
| | | 20 | | | | | | | | | | | | | | | |
| | | 21 | | | | | | | | | | | | | | | |
| | | 22 | | | | | | | | | | | | | | | |
| | | 23 | | | | | | | | | | | | | | | |
| | | 24 | | | | | | | | | | | | | | | |
| | | 25 | | | | | | | | | | | | | | | |
| | | 26 | | | | | | | | | | | | | | | |
| | | 27 | | | | | | | | | | | | | | | |
| | | 28 | | | | | | | | | | | | | | | |
| | | 29 | | | | | | | | | | | | | | | |
| | | 30 | | | | | | | | | | | | | | | |
| | | 31 | | | | | | | | | | | | | | | |
| | | 32 | | | | | | | | | | | | | | | |

Sample prep. procedure: RC8 R03
Analysis procedure: RC-8 R03
Date of sample prep.: 04/01/99

Instrument Conditions
Instrument: CAN2404
High Voltage: 1525

Calibration Data

| | Alpha | Beta |
|---|---|---|
| Efficiency: | 0.2139 | 0.2916 |
| RSD (%): | 2.78 | 2.04 |
| N: | 6 | 6 |
| **Uncertainty (%): | 2.00 | 1.49 |
| Background CPM: | 0.115 | 1.01 |
| Count time of background (min): | 60.0 | 60.0 |
| Halflife for decay correction(y): | 432.7 | 28.6 |
| Crosstalk (%): | 0.39 | 11.83 |

** Uncertainty of the calibration standard activity.

Uncertainty is calculated with 1.96 sigma.
MDA is Minimal Detectable Activity.

CCV is #6 of calibration.

CCV α recovery = $\frac{957.07}{1000}$ = 95.7%

Calculations by: GABAF v1

Supervisor Review: [illegible] 4-5-99

Q.C. Review: [illegible] 4/5/99

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**Gross Alpha & Gross Beta**



Worklist ID: 99042842
Instrument: CAN2404
Sample Type: SWIPES

Chemist: [illegible] 4/1/99

| # | Req # | Sample ID | Carrier # | Control Acceptance Range | Comments |
|---|---|---|---|---|---|
| 1 | | PB | | | |
| 2 | | LCS * | | α: 30.6 - 60.5 pCi | |
| 3 | 16496 | 258224 | | | |
| 4 | 16496 | 258225 | | | |
| 5 | 16496 | 258226 | | | |
| 6 | 16496 | 258227 | | | |
| 7 | 16496 | 258228 | | | |
| 8 | 16496 | 258229 | | | |
| 9 | 16496 | 258230 | | | |
| 10 | 16496 | 258231 | | | |
| 11 | 16496 | 258232 | | | |
| 12 | 16496 | 258233 | | | |
| 13 | 16496 | 258234 | | | |
| 14 | 16496 | 258235 | | | |
| 15 | 16496 | 258236 | | | |
| 16 | 16496 | 258237 | | | |
| 17 | 16496 | 258238 | | | |
| 18 | | CCV | | α: 900 - 1100 pCi | |
| 19 | | | | | |
| 20 | | | | | |
| 21 | | | | | |
| 22 | | | | | |
| 23 | | | | | |
| 24 | | | | | |
| 25 | | | | | |
| 26 | | | | | |
| 27 | | | | | |
| 28 | | | | | |
| 29 | | | | | |
| 30 | | | | | |
| 31 | | | | | |
| 32 | | | | | |

Additional Comments:

Sample Prep Procedure: RC8 R03
Analysis Procedure: RC8 R03

Date of sample prep: 04-01-1999

*LCS = 1.0ml of LCSWK24. Known value = 42.8pCi alpha

WORKLIST 99042842

PROGRAM NAME: GRB

SAMPLE #:3. COLLECT TIME:6.00 PB
08:36:34,04-05-1999

ALPHA RESULT: .27 +/- 0 pCi
ALPHA GROSS COUNT: 1.
ALPHA NET COUNT: .16 +/- 0

BETA RESULT: 2.01 pCi
BETA GROSS COUNT: 9.
BETA NET COUNT: 1.50 +/- 0

SAMPLE #:4. COLLECT TIME:6.00 LCS
08:42:56,04-05-1999

ALPHA RESULT: 30.19 +/- 0 pCi
ALPHA GROSS COUNT: 111.
ALPHA NET COUNT: 18.50 +/- 0

BETA RESULT: 29.58 pCi
BETA GROSS COUNT: 132.
BETA NET COUNT: 22.00 +/- 0

SAMPLE #:5. COLLECT TIME:6.00 258224
08:49:18,04-05-1999

ALPHA RESULT: 0 +/- 0 pCi
ALPHA GROSS COUNT: 0
ALPHA NET COUNT: 0 +/- 0

BETA RESULT: 1.12 pCi
BETA GROSS COUNT: 5.
BETA NET COUNT: .83 +/- 0

SAMPLE #:6. COLLECT TIME:6.00 258225
08:55:40,04-05-1999

ALPHA RESULT: .54 +/- 0 pCi
ALPHA GROSS COUNT: 2.
ALPHA NET COUNT: .33 +/- 0

BETA RESULT: 1.56 pCi
BETA GROSS COUNT: 7.
BETA NET COUNT: 1.16 +/- 0

SAMPLE #:7. COLLECT TIME:6.00 258226
09:02:02,04-05-1999

ALPHA RESULT: .54 +/- 0 pCi
ALPHA GROSS COUNT: 2.
ALPHA NET COUNT: .33 +/- 0

BETA RESULT: 2.24 pCi
BETA GROSS COUNT: 10.
BETA NET COUNT: 1.66 +/- 0

SAMPLE #:8. COLLECT TIME:6.00 258227
09:08:24,04-05-1999

ALPHA RESULT: .27 +/- 0 pCi
ALPHA GROSS COUNT: 1.
ALPHA NET COUNT: .16 +/- 0

BETA RESULT: 2.68 pCi
BETA GROSS COUNT: 12.
BETA NET COUNT: 2.00 +/- 0

SAMPLE #:9. COLLECT TIME:6.00 258228
09:14:46,04-05-1999

ALPHA RESULT: .54 +/- 0 pCi
ALPHA GROSS COUNT: 2.
ALPHA NET COUNT: .33 +/- 0

BETA RESULT: 1.12 pCi
BETA GROSS COUNT: 5.
BETA NET COUNT: .83 +/- 0

SAMPLE #:10. COLLECT TIME:6.00 258229
09:21:08,04-05-1999

ALPHA RESULT: .27 +/- 0 pCi
ALPHA GROSS COUNT: 1.
ALPHA NET COUNT: .16 +/- 0

BETA RESULT: 2.24 pCi
BETA GROSS COUNT: 10.
BETA NET COUNT: 1.66 +/- 0

SAMPLE #:11. COLLECT TIME:6.00 258230
09:27:30,04-05-1999

ALPHA RESULT: .54 +/- 0 pCi
ALPHA GROSS COUNT: 2.
ALPHA NET COUNT: .33 +/- 0

BETA RESULT: 2.68 pCi
BETA GROSS COUNT: 12.
BETA NET COUNT: 2.00 +/- 0

SAMPLE #:12. COLLECT TIME:6.00 258231
09:33:52,04-05-1999

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ALPHA RESULT: .27 +/- 0 pCi
ALPHA GROSS COUNT: 1.
ALPHA NET COUNT: .16 +/- 0

BETA RESULT: 1.12 pCi
BETA GROSS COUNT: 5.
BETA NET COUNT: .83 +/- 0

SAMPLE #:13. COLLECT TIME:6.00 258232
09:40:14,04-05-1999

ALPHA RESULT: 0 +/- 0 pCi
ALPHA GROSS COUNT: 0
ALPHA NET COUNT: 0 +/- 0

BETA RESULT: 1.34 pCi
BETA GROSS COUNT: 6.
BETA NET COUNT: 1.00 +/- 0

SAMPLE #:14. COLLECT TIME:6.00 258233
09:46:36,04-05-1999

ALPHA RESULT: 19.04 +/- 0 pCi
ALPHA GROSS COUNT: 70.
ALPHA NET COUNT: 11.66 +/- 0

BETA RESULT: 7.39 pCi
BETA GROSS COUNT: 33.
BETA NET COUNT: 5.50 +/- 0

SAMPLE #:15. COLLECT TIME:6.00 258234
09:52:58,04-05-1999

ALPHA RESULT: 5.71 +/- 0 pCi
ALPHA GROSS COUNT: 21.
ALPHA NET COUNT: 3.50 +/- 0

BETA RESULT: 3.13 pCi
BETA GROSS COUNT: 14.
BETA NET COUNT: 2.33 +/- 0

SAMPLE #:16. COLLECT TIME:6.00 258235
09:59:21,04-05-1999

ALPHA RESULT: 2.17 +/- 0 pCi
ALPHA GROSS COUNT: 8.
ALPHA NET COUNT: 1.33 +/- 0

BETA RESULT: 2.46 pCi
BETA GROSS COUNT: 11.
BETA NET COUNT: 1.83 +/- 0

SAMPLE #:17. COLLECT TIME:6.00 258236
10:05:43,04-05-1999

ALPHA RESULT: 0 +/- 0 pCi
ALPHA GROSS COUNT: 0
ALPHA NET COUNT: 0 +/- 0

BETA RESULT: 1.12 pCi
BETA GROSS COUNT: 5.
BETA NET COUNT: .83 +/- 0

SAMPLE #:18. COLLECT TIME:6.00 258237
10:12:05,04-05-1999

ALPHA RESULT: 0 +/- 0 pCi
ALPHA GROSS COUNT: 0
ALPHA NET COUNT: 0 +/- 0

BETA RESULT: 2.91 pCi
BETA GROSS COUNT: 13.
BETA NET COUNT: 2.16 +/- 0

SAMPLE #:19. COLLECT TIME:6.00 258238
10:18:27,04-05-1999

ALPHA RESULT: 0 +/- 0 pCi
ALPHA GROSS COUNT: 0
ALPHA NET COUNT: 0 +/- 0

BETA RESULT: 1.79 pCi
BETA GROSS COUNT: 8.
BETA NET COUNT: 1.33 +/- 0

SAMPLE #:20. COLLECT TIME:6.00 CCV
10:24:50,04-05-1999

ALPHA RESULT: 741.77 +/- 0 pCi
ALPHA GROSS COUNT: 2727.
ALPHA NET COUNT: 454.50 +/- 0

BETA RESULT: 1546.99 pCi
BETA GROSS COUNT: 6903.
BETA NET COUNT: 1150.50 +/- 0

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## Alpha & Beta Efficiency Calibration



Instrument: **CAN2404**

Chemist: Nicholas R. Baer 4/1/99

| Alpha Standard | | Beta Standard | |
|---|---|---|---|
| Isotope(s): | Am-241 | Isotope(s): | Sr-90/Y-90 |
| ID: | 82-49-1 | ID: | 82-22-4 |
| Standard Activity: | 1000.0 pCi/mL | Standard Activity: | 2010.0 pCi/mL |
| Standard Uncertainty: | 2.00 % | Standard Uncertainty: | 1.49 % |
| Reference Date: | 12/15/92 | Reference Date: | 02/01/92 |
| Half-life: | 432.7 years | Half-life: | 28.6 years |

### Alpha Efficiency Calibration:

| # | Aliquot Size (mL) | Gross Counts | Net Counts | Alpha Standard Activity (pCi) | Efficiency |
|---|---|---|---|---|---|
| 1 | 1.00 | 28788 | 28508.8 | 990.0 | 0.2162 |
| 2 | 1.00 | 29747 | 29464.5 | 990.0 | 0.2234 |
| 3 | 1.00 | 28374 | 28100.7 | 990.0 | 0.2131 |
| 4 | 1.00 | 28012 | 27736.7 | 990.0 | 0.2103 |
| 5 | 1.00 | 28579 | 28300.1 | 990.0 | 0.2146 |
| 6 | 1.00 | 27400 | 27133.2 | 990.0 | 0.2058 |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 10 | | | | | |
| | | | | Average = | 0.2139 |
| | | | | % RSD = | 2.78 |
| | | | | N = | 6 |

| | |
|---|---|
| Alpha Background CPM: | 0.115 |
| Count time: | 60 min |
| Date Samples Counted: | 03/31/99 |
| Crosstalk of Beta into Alpha: | 0.39 % |

### Beta Efficiency Calibration:

| # | Aliquot Size (mL) | Gross Counts | Net Counts | Beta Standard Activity (pCi) | Efficiency |
|---|---|---|---|---|---|
| 1 | 1.00 | 69870 | 66404.6 | 1689.6 | 0.2951 |
| 2 | 1.00 | 70735 | 67156.1 | 1689.6 | 0.2984 |
| 3 | 1.00 | 68359 | 64942.6 | 1689.6 | 0.2886 |
| 4 | 1.00 | 68888 | 65514.4 | 1689.6 | 0.2911 |
| 5 | 1.00 | 69801 | 66360.3 | 1689.6 | 0.2949 |
| 6 | 1.00 | 66692 | 63390.8 | 1689.6 | 0.2817 |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |
| 10 | | | | | |
| | | | | Average = | 0.2916 |
| | | | | % RSD = | 2.04 |
| | | | | N = | 6 |

| | |
|---|---|
| Beta Background CPM: | 1.01 |
| Count time: | 60 min |
| Date Samples Counted: | 03/31/99 |
| Crosstalk of Alpha into Beta: | 11.83 % |

Calculations by Excel: GABAF v1

SECTION III

# RECEIVING DOCUMENTATION INDEX

Requisition No. 16496


| RECEIVING DOCUMENTATION: | FROM | TO |
|---|---|---|
| · Sample Log-in Sheet | 1 | |
| · Request for Analytical Services | 2 | 3 |
| · Chain of Sample Custody | 4 | 6 |
| · Release Evaluation Form | 7 | 8 |
| · Lab Sample Tracking Record | 9 | |

Grand Junction Office Analytical Laboratory

Sample Login Sheet

(SECTION III)

Received by (Print Name): L.M. DAVIS

Received by (Signature): L.M. Davis

Requisition/Case #: 16496

Page 1 of 1 V2.08

Login date: 3-30-99

Requestor: JEFF LIVELY

Project number: 332302001

1. Custody Seal(s):
   Shipping Container: Absent/Intact/Broken
   Sample Container: Absent/Intact/Broken
2. Custody Seal No(s): NA
3. Chain of Custody Recs: Present/Absent
4. Traffic Rpt, Pack Lst, Analytical Req.: Present/Absent
5. Freight Bill: Airbill/Sticker Present/Absent
6. Freight Bill No(s).: Hand delivered
7. Sample Tags: Present/Absent
8. Sample Labels on Chain of Cust.: Listed/Not listed
9. Does information on custody records, traffic reports & sample labels agree?: Yes/No
10. Shipping Cont. Temp.: NA
    and Condition: Good
11. Sample pH: Accept/Not Accept Not Applicable

-------Analysis Requested - Data Due ----------
Test-Due Date
==========
GAB -09APR99

| No. | Ticket | Customer ID | Lab # | ST | Date Sampled | Condition Received | Date Rec'd |
|---|---|---|---|---|---|---|---|
| 1 | SMR0000101 | IVP0000101 | 258204 | SM | 26MAR99 | GOOD | 30MAR99 |
| 2 | SMR0000102 | IVP0000102 | 258205 | SM | 26MAR99 | GOOD | 30MAR99 |
| 3 | SMR0000103 | IVP0000103 | 258206 | SM | 26MAR99 | GOOD | 30MAR99 |
| 4 | SMR0000104 | IVP0000104 | 258207 | SM | 26MAR99 | GOOD | 30MAR99 |
| 5 | SMR0000105 | IVP0000105 | 258208 | SM | 26MAR99 | GOOD | 30MAR99 |
| 6 | SMR0000106 | IVP0000106 | 258209 | SM | 26MAR99 | GOOD | 30MAR99 |
| 7 | SMR0000107 | IVP0000107 | 258210 | SM | 26MAR99 | GOOD | 30MAR99 |
| 8 | SMR0000108 | IVP0000108 | 258211 | SM | 26MAR99 | GOOD | 30MAR99 |
| 9 | SMR0000109 | IVP0000109 | 258212 | SM | 26MAR99 | GOOD | 30MAR99 |
| 10 | SMR0000110 | IVP0000110 | 258213 | SM | 26MAR99 | GOOD | 30MAR99 |
| 11 | SMR0000111 | IVP0000111 | 258214 | SM | 26MAR99 | GOOD | 30MAR99 |
| 12 | SMR0000112 | IVP0000112 | 258215 | SM | 26MAR99 | GOOD | 30MAR99 |
| 13 | SMR0000113 | IVP0000113 | 258216 | SM | 26MAR99 | GOOD | 30MAR99 |
| 14 | SMR0000114 | IVP0000114 | 258217 | SM | 26MAR99 | GOOD | 30MAR99 |
| 15 | SMR0000115 | IVP0000115 | 258218 | SM | 26MAR99 | GOOD | 30MAR99 |
| 16 | SMR0000116 | IVP0000116 | 258219 | SM | 26MAR99 | GOOD | 30MAR99 |
| 17 | SMR0000117 | IVP0000117 | 258220 | SM | 26MAR99 | GOOD | 30MAR99 |
| 18 | SMR0000118 | IVP0000118 | 258221 | SM | 26MAR99 | GOOD | 30MAR99 |
| 19 | SMR0000119 | IVP0000119 | 258222 | SM | 26MAR99 | GOOD | 30MAR99 |
| 20 | SMR0000120 | IVP0000120 | 258223 | SM | 26MAR99 | GOOD | 30MAR99 |
| 21 | SMR0000121 | IVP0000121 | 258224 | SM | 27MAR99 | GOOD | 30MAR99 |
| 22 | SMR0000122 | IVP0000122 | 258225 | SM | 27MAR99 | GOOD | 30MAR99 |
| 23 | SMR0000123 | IVP0000123 | 258226 | SM | 27MAR99 | GOOD | 30MAR99 |
| 24 | SMR0000124 | IVP0000124 | 258227 | SM | 27MAR99 | GOOD | 30MAR99 |
| 25 | SMR0000125 | IVP0000125 | 258228 | SM | 27MAR99 | GOOD | 30MAR99 |
| 26 | SMR0000126 | IVP0000126 | 258229 | SM | 27MAR99 | GOOD | 30MAR99 |
| 27 | SMR0000127 | IVP0000127 | 258230 | SM | 27MAR99 | GOOD | 30MAR99 |
| 28 | SMR0000128 | IVP0000128 | 258231 | SM | 27MAR99 | GOOD | 30MAR99 |
| 29 | SMR0000129 | IVP0000129 | 258232 | SM | 27MAR99 | GOOD | 30MAR99 |
| 30 | SMR0000591 | IVP0000591 | 258233 | SM | 29MAR99 | GOOD | 30MAR99 |
| 31 | SMR0000592 | IVP0000592 | 258234 | SM | 29MAR99 | GOOD | 30MAR99 |
| 32 | SMR0000593 | IVP0000593 | 258235 | SM | 29MAR99 | GOOD | 30MAR99 |
| 33 | SMR0000594 | IVP0000594 | 258236 | SM | 29MAR99 | GOOD | 30MAR99 |
| 34 | SMR0000595 | IVP0000595 | 258237 | SM | 29MAR99 | GOOD | 30MAR99 |
| 35 | SMR0000596 | IVP0000596 | 258238 | SM | 29MAR99 | GOOD | 30MAR99 |

Reviewed by: Sue Ingalls

Date: 3/30/99

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SECTION III, 1 of 2

2

# Request for Analytical Services

For Lab Use
Requisition No. 16496
Date Received 3 / 30 / 99

Project Title RFETS-IV

Project Number 332302001

* Date Required 4 / 16 / 99

Date Submitted 3 / 30 / 99

Authorized by Paul Wetherstein

Send Final Report to Jeff Lively

| Sample ID | Gross Alpha | Matrix: SOIL | WATER | FILTER | SEE INST |
|---|---|---|---|---|---|
| SMR0000 101 | X | | | | X |
| 102 | | | | | |
| 103 | | | | | |
| 104 | | | | | |
| 105 | | | | | |
| 106 | | | | | |
| 107 | | | | | |
| 108 | | | | | |
| 109 | | | | | |
| 110 | | | | | |
| 111 | | | | | |
| 112 | | | | | |
| 113 | | | | | |
| 114 | | | | | |
| 115 | | | | | |
| 116 | | | | | |
| 117 | | | | | |
| 118 | | | | | |
| 119 | | | | | |
| 120 | | | | | |
| 121 | | | | | |
| 122 | | | | | |
| 123 | | | | | |
| 124 | | | | | |
| 125 | | | | | |
| 126 | | | | | |

Special Instructions * Preliminary results required by 4-9-99

Smear samples

GJPO 1500

SECTION III

2 of 7

3

# Request for Analytical Services

Project Title RFETS-IV

Project Number 332302001

* Date Required 4 / 16 / 99

Date Submitted 3 / 30 / 99

Authorized by Paul Wetherstein

Send Final Report to Jeff Lively

**For Lab Use**

Requisition No. 16996

Date Received 3 / 30 / 99

| Sample ID | ANALYSES: Gross Alpha | Matrix: SOIL | WATER | FILTER | SEE INST |
|---|---|---|---|---|---|
| SMR0000127 | X | | | | X |
| 128 | | | | | |
| 129 | | | | | |
| 591 | | | | | |
| 592 | | | | | |
| 593 | | | | | |
| 594 | | | | | |
| 595 | | | | | |
| 596 | | | | | |

Special Instructions * Preliminary results required by 4-9-99

Smear samples

GJPO 1500
9/91

386

**Grand Junction Office**
2597 B 3/4 Road
Grand Junction, Colorado 81503
Telephone (970) 248-6000

# Chain-of-Sample Custody

1. Page 1 of 3
2. Date 3-29-99

3. Project Name RFETS- IVP

4. Site Location Survey UNIT 729-01

5. Sampler (print name) Paul Wetherstein

| 6. Sample No. | 7. Date | 8. Time | 9. Sample Location | 10. Sample Matrix | 11. Containers: Paper & Plastic Envelopes | 12. Remarks | 13. Condition Received |
|---|---|---|---|---|---|---|---|
| SmR0000101 | 3-26-99 | 1415 | IVP0000101 | Smear R | 1 | | |
| SmR0000102 | ↓ | 1420 | IVP0000102 | ↓ | 1 | | |
| SmR0000103 | | 1425 | IVP0000103 | | 1 | | |
| SmR0000104 | | 1429 | IVP0000104 | | 1 | | |
| SmR0000105 | | 1430 | IVP0000105 | | 1 | | |
| SmR0000106 | | 1433 | IVP0000106 | | 1 | | |
| SmR0000107 | | 1434 | IVP0000107 | | 1 | | |
| SmR0000108 | | 1436 | IVP0000108 | | 1 | | |
| SmR0000109 | | 1438 | IVP0000109 | | 1 | | |
| SmR0000110 | | 1440 | IVP0000110 | | 1 | | |
| SmR0000111 | | 1441 | IVP0000111 | | 1 | | |
| SmR0000112 | | 1443 | IVP0000112 | | 1 | | |
| SmR0000113 | | 1444 | IVP0000113 | | 1 | | |

| 14. Relinquished by (signature) | Date | Time | Relinquished by (signature) | Date | Time | Relinquished by (signature) | Date | Time |
|---|---|---|---|---|---|---|---|---|
| Paul Wetherstein | 3-30-99 | 0915 | | | | | | |
| **Received by (signature)** | **Date** | **Time** | **Received by (signature)** | **Date** | **Time** | **Received by (signature)** | **Date** | **Time** |
| L M Davis | 3-30-99 | 0915 | | | | | | |

15. Method of Shipment

16. Laboratory/Destination

17. Airbill or Receipt Number

18. For Contract Laboratories Only—Receiver to sign, date, and return form by mail or with analytical data package

Company Name _____ Received by _____ Date _____

GJO 1512
5/97

Preparation instructions on back of form.

Distribution: Original accompanies shipment, copies to relinquisher.

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# Chain-of-Sample Custody

1. **Page_____of_____:** Indicates sequence and total number of pages.
2. **Date:** Date the chain-of-custody record was prepared.
3. **Project Name:** The project name or title.
4. **Site Location:** The location of the project site.
5. **Sampler:** The printed name of the person who collected the samples.
6. **Sample No.:** The unique three-letter, three-digit number generated by GJO.
7. **Date:** Date the sample was collected.
8. **Time:** The time the sample was collected.
9. **Sample Location:** The location at which the sample was taken; e.g., well number, grid location, or survey coordinate.
10. **Sample Matrix:** The sample matrix, e.g., soil, sludge, water, air, or filter.
11. **Container:** The type of container; e.g., write 40-mL glass in the slanted column. Write the number of containers of a given type on the corresponding horizontal line.
12. **Remarks:** Any remarks, as appropriate; preservation method required, e.g., acidified < 2 pH.
13. **Condition Received:** For use by laboratory personnel, to note any damage to sample or container.
14. **Relinquished by/Received by:** Signatures of relinquishers and receivers, with date and time of sample transfer.
15. **Method of Shipment:** The method of shipment, e.g., Federal Express, bus line, etc.
16. **Laboratory/Destination:** The place the samples were shipped for analysis, storage, or other purposes.
17. **Airbill or Receipt Number:** For use with airbills or receipts from contract shippers.
18. **For Use by Contract Laboratories Only:** For use by laboratories other than the Grand Junction Office (GPO). Receiver to sign, date, and return this form to GJO by mail or with analytical data package.

**General:** The purpose of this form is to document sample custody and receipt. GJO assumes no responsibility for samples not in the custody of GJO personnel.

The users of this form are responsible for completing the form by using a waterproof, reproducible ink.

The users of this form are responsible for legibility of all entries.

All information blocks must be completed or marked as "NA" for "Not Applicable." Unused portions of the form must be lined out with a single line, initialed, and dated.

**Grand Junction Office**
2597 B 3/4 Road
Grand Junction, Colorado 81503
Telephone (970) 248-6000

# Chain-of-Sample Custody

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1. Page 2 of 3
2. Date 3-29-99

3. Project Name RFETS-IVP
4. Site Location Survey unit 729-01
5. Sampler (print name) Paul Wetherstein

| 6. Sample No. | 7. Date | 8. Time | 9. Sample Location | 10. Sample Matrix | 11. Containers: Paper & Plastic Envelopes | 12. Remarks | 13. Condition Received |
|---|---|---|---|---|---|---|---|
| SMR0000114 | 3-26-99 | 1445 | IVP0000114 | Smear | 1 | | |
| SMR0000115 | | 1447 | 115 | | 1 | | |
| 116 | | 1448 | 116 | | 1 | | |
| 117 | | 1449 | 117 | | 1 | | |
| 118 | | 1451 | 118 | | 1 | | |
| 119 | | 1452 | 119 | | 1 | | |
| 120 | | 1453 | 120 | | 1 | | |
| 121 | 3-27-99 | 1014 | 121 | | 1 | | |
| 122 | | 1050 | 122 | | 1 | | |
| 123 | | 1100 | 123 | | 1 | | |
| 124 | | 1254 | 124 | | 1 | | |
| 125 | | 1042 | 125 | | 1 | | |
| 126 | | 1310 | 126 | | 1 | | |

| 14. Relinquished by (signature) | Date | Time | Relinquished by (signature) | Date | Time | Relinquished by (signature) | Date | Time |
|---|---|---|---|---|---|---|---|---|
| Paul Wetherstein | 3-30-99 | 0915 | | | | | | |
| **Received by (signature)** | **Date** | **Time** | **Received by (signature)** | **Date** | **Time** | **Received by (signature)** | **Date** | **Time** |
| F M Davis | 3-30-99 | 0915 | | | | | | |

15. Method of Shipment
16. Laboratory/Destination
17. Airbill or Receipt Number

18. For Contract Laboratories Only—Receiver to sign, date, and return form by mail or with analytical data package

Company Name _____ Received by _____ Date _____

GJO 1512
5/97

Preparation instructions on back of form.

Distribution: Original accompanies shipment, copies to relinquisher.

C11

389.

# Chain-of-Sample Custody

1. **Page_____of_____:** Indicates sequence and total number of pages.
2. **Date:** Date the chain-of-custody record was prepared.
3. **Project Name:** The project name or title.
4. **Site Location:** The location of the project site.
5. **Sampler:** The printed name of the person who collected the samples.
6. **Sample No.:** The unique three-letter, three-digit number generated by GJO.
7. **Date:** Date the sample was collected.
8. **Time:** The time the sample was collected.
9. **Sample Location:** The location at which the sample was taken; e.g., well number, grid location, or survey coordinate.
10. **Sample Matrix:** The sample matrix, e.g., soil, sludge, water, air, or filter.
11. **Container:** The type of container; e.g., write 40-mL glass in the slanted column. Write the number of containers of a given type on the corresponding horizontal line.
12. **Remarks:** Any remarks, as appropriate; preservation method required, e.g., acidified < 2 pH.
13. **Condition Received:** For use by laboratory personnel, to note any damage to sample or container.
14. **Relinquished by/Received by:** Signatures of relinquishers and receivers, with date and time of sample transfer.
15. **Method of Shipment:** The method of shipment, e.g., Federal Express, bus line, etc.
16. **Laboratory/Destination:** The place the samples were shipped for analysis, storage, or other purposes.
17. **Airbill or Receipt Number:** For use with airbills or receipts from contract shippers.
18. **For Use by Contract Laboratories Only:** For use by laboratories other than the Grand Junction Office (GPO). Receiver to sign, date, and return this form to GJO by mail or with analytical data package.

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Grand Junction, Colorado 81503
Telephone (970) 248-6000

[redacted]

1. Page 3 of 3

2. Date 3-29-99

3. Project Name RFETS -IVP

4. Site Location Survey UNIT 729-01

5. Sampler (print name) Paul Wetherstein

| 6. Sample No. | 7. Date | 8. Time | 9. Sample Location | 10. Sample Matrix | 11. Containers: Paper & Plastic Envelopes | | | | | | 12. Remarks | 13. Condition Received |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SMR0000127 | 3-27-99 | 1211 | IVP0000127 | Smear | 1 | | | | | | | |
| 128 | | 1034 | 128 | | 1 | | | | | | | |
| 129 | | 1027 | 129 | | 1 | | | | | | | |
| 591 | 3-29-99 | 1023 | 591 | | 1 | | | | | | | |
| 592 | | 1000 | 592 | | 1 | | | | | | | |
| 593 | | 1045 | 593 | | 1 | | | | | | | |
| 594 | | 1141 | 594 | | 1 | | | | | | | |
| 595 | | 1315 | 595 | | 1 | | | | | | | |
| 596 | | 1420 | 596 | | 1 | | | | | | | |
| | PGW | 3-29-99 | | | | | | | | | | |

| 14. Relinquished by (signature) | Date | Time | Relinquished by (signature) | Date | Time | Relinquished by (signature) | Date | Time |
|---|---|---|---|---|---|---|---|---|
| Paul Wetherstein | 3-30-99 | 0915 | | | | | | |
| **Received by (signature)** | **Date** | **Time** | **Received by (signature)** | **Date** | **Time** | **Received by (signature)** | **Date** | **Time** |
| [illegible] | 3-30-99 | 0915 | | | | | | |

15. Method of Shipment

16. Laboratory/Destination

17. Airbill or Receipt Number

18. For Contract Laboratories Only—Receiver to sign, date, and return form by mail or with analytical data package

Company Name _____ Received by _____ Date _____

GJO 1512
5/97

Preparation instructions on back of form.

Distribution: Original accompanies shipment, copies to relinquisher.

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# Chain-of-Sample Custody

1. **Page_____of_____:** Indicates sequence and total number of pages.
2. **Date:** Date the chain-of-custody record was prepared.
3. **Project Name:** The project name or title.
4. **Site Location:** The location of the project site.
5. **Sampler:** The printed name of the person who collected the samples.
6. **Sample No.:** The unique three-letter, three-digit number generated by GJO.
7. **Date:** Date the sample was collected.
8. **Time:** The time the sample was collected.
9. **Sample Location:** The location at which the sample was taken; e.g., well number, grid location, or survey coordinate.
10. **Sample Matrix:** The sample matrix, e.g., soil, sludge, water, air, or filter.
11. **Container:** The type of container; e.g., write 40-mL glass in the slanted column. Write the number of containers of a given type on the corresponding horizontal line.
12. **Remarks:** Any remarks, as appropriate; preservation method required, e.g., acidified < 2 pH.
13. **Condition Received:** For use by laboratory personnel, to note any damage to sample or container.
14. **Relinquished by/Received by:** Signatures of relinquishers and receivers, with date and time of sample transfer.
15. **Method of Shipment:** The method of shipment, e.g., Federal Express, bus line, etc.
16. **Laboratory/Destination:** The place the samples were shipped for analysis, storage, or other purposes.
17. **Airbill or Receipt Number:** For use with airbills or receipts from contract shippers.
18. **For Use by Contract Laboratories Only:** For use by laboratories other than the Grand Junction Office (GPO). Receiver to sign, date, and return this form to GJO by mail or with analytical data package.

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(SECTION III)

RSFORMS-09.01-01

~~ORIGINAL DOCUMENT~~

*If this stamp is in color*

**COPY**

☐ Property ☐ Waste ☒ Sample

# RELEASE EVALUATION FORM

Page 1 of ___

Release Evaluation No.: 990329-00779-001 EXTENDED: Yes EXPIRES: 12/31/99 Charge No.: n/a

**PART I** **SENDER/CUSTODIAN ACKNOWLEDGEMENT**

Description of Property/Waste/Sample To Be Released/Transferred:

Surface media samples and smears

Current Location: B7779 Cluster

Destination: GJO Analytical Chemistry Laboratory, Grand Junction CO.

New Recipient/Custodian: Ron Chessmore 970-248-6166

History/Process Knowledge: Surface media samples and smears obtained for independent verification.

Has the specified material ever been in an RMMA/RBA/CA or contacted DOE controlled radioactive materials? Yes, B729 was considered an RMMA because of contamination located in the plenums.

1) By signing below, I certify information provided in Part I of this release evaluation to be true and accurate.
2) By signing below, I agree to comply with the specific requirements noted in Part II of this release evaluation.

Sender/Custodian: Jeff Lively Employee No [redacted] Date: 3/29/99 Ext 2863 Pager N/A

**PART II** **RADIOLOGICAL ENGINEERING**

**SPECIFIC REQUIREMENTS AND/OR COMMENTS:**

Based on the fact that all final survey surface media samples obtained in B729 met the unrestricted release criteria, these additional independent verification surface media samples may be released for unrestricted use with no rad screening required. In addition to the fact that all final survey surface media samples have met the unrestricted release criteria, all final survey measurements obtained to date indicate no alpha contamination above the unrestricted release limits of 20 dpm/100 cm² removable or 100 dpm/100 cm² total exists in B729. Therefore the independent verification smears obtained may be free released as well.

Evaluated: Mike Grube Emp. No [redacted] Date: 3/29/99 Ext: 2863 Page 212-4696
Radiological Engineer

**APPROVAL FOR TRANSFER/SHIPMENT**

Approved: Mike Grube Emp. No: [redacted] Date: 3/29/99 Ext: 2863 Page 212-4696
Radiological Engineer

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Rev 08/98

# PROPERTY/WASTE RELEASE EVALUATION SIGNATURE REQUIREMENTS

**Release Evaluation #: 990329-00779-001 Page 2 of __**

**Release Evaluation for Waste:**

A Release Evaluation for Waste requires an evaluation and unrestricted release approval signature. The evaluation signature is by the Radiological Engineer (RE) providing the methods or criteria for unrestricted release (i.e., survey requirements, analytical requirements, no survey required, etc.). The unrestricted release approval signature for a Release Evaluation for Waste shall be a RE authorized to provide unrestricted release approval. In addition, the evaluation and unrestricted release approval signatures shall not be the same RE. The intent of this provision is to provide peer review of the evaluation and method of unrestricted release. It is important the RE take the peer review process seriously and not become a "rubber stamp" for their fellow engineer.

**Release Evaluation for Property:**

A Release Evaluation for Property requires an evaluation and unrestricted release approval signature. For a Release Evaluation for Property, the evaluation and unrestricted release signature may be the same RE. In the past, only one signature was required for property for which a RE could provide an unrestricted release on the basis of process knowledge/history.

**Release Evaluation for Samples:**

Samples are any waste or material that is being shipped to an off-site facility for analysis. Samples that may be provided with an unrestricted release using process knowledge/history or standard contamination survey techniques may be authorized for shipment to an off-site facility using the signatory requirements specified for property. Samples which cannot be provided with an unrestricted release using process knowledge/history or standard contamination survey techniques shall be authorized for shipment from the Site using the methodology specified for waste, i.e., second signature being provided by a RE authorized to perform peer review and approval for shipment.

The approval for transfer/shipment section of a Sample Release Evaluation (SRE) shall be revised as noted below for samples which cannot be provide with an unrestricted release.

| |
|---|
| "The samples specified in Part 1 of this release evaluation are being provided with authorization for transport as non-radioactive materials in accordance with Department of Transportation (49 CFR) regulation. This authorization for shipment does not constitute an unrestricted release." |

**Additional Documentation:**

Number of lines per section may be modified or additional pages attached to ensure adequate documentation of information necessary to perform release evaluation.

Additional pages or attachments to a release evaluation shall have the evaluation number, Page __ of __, initials of Radiological Engineer signing approval for transfer/shipment and date.

LAB SAMPLE TRACKING RECORD

REQUISITION 16496 SUBMITTER: 332302001 REQUESTOR: JEFF LIVELY BUILDING 20 RECEIVED 30MAR99

| RCVD FROM | RCVD BY | DATE | STORAGE LOCATION | FOR | SAMPLES | CHECKOUT DATE | INIT | CHECKIN DATE | INIT | RETURN LOCATION | TYPE O | D | E | C | DISPOSAL INIT | DATE | D | C | W |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | Cno | 3-30-99 | 362 | GAB | 258204-258238 | 4/1 | KRB | 4/6 | KRB | 3HS | X | | | | | | | | |

TYPE CODES: O=ORIGINAL D=DIGEST E=EXTRACT C=CONSUMED DISPOSAL CODES: D=DISCARD C=CUSTOMER W=WASTE MGT

SAMPLES RETURNED: To Sample Plant DEB / SR / 4/6/99 (BY / TO / DATE)

SAMPLE DISPOSITION: ___ D ___ C ___ W ___ / ___ (BY / DATE)

(SECTION III)

REQUISITION 16496

REQUISITION 16496

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# Appendix D

# Background Sample Data

# INDEPENDENT VERIFICATION INSTRUMENT BACKGROUND DATA SHEET



Survey Location: RFETS, 779 Cluster / Building

Survey Unit: 729-01

Date: 3/26/99

Instrument Model Number: Eberline, E 600

Detector Probe Type: Eberline, HP-100

Operator Name: P. WETHERSTEIN

Instrument ID Number: #303, S15620

Probe ID Number: #140

Signature: Paul Wetherstein

Calibration Expires: 8/~~10~~ 7/99

Calibration Expires: 2/25/99

Time HP-100 Due for Gas Purge: N/A

| Sample IDNo. (Affix or record Background Bar Code) | Time | Measurement Type | Static Count Time (minutes) | GROSS Instrument Reading (dpm/100 cm²) | Comments (Include reason for background measurement) |
|---|---|---|---|---|---|
| BACKGROUND | 1232 | Direct Static Measurement | 1.5 Minute | 12.7 | BEGIN SURVEY |
| BACKGROUND | 1238 | Direct Static Measurement | 1.5 Minute | 9.79 | BEGIN SURVEY |
| BACKGROUND | 1302 | Direct Static Measurement | 1.5 Minute | 21.6 | PERIODIC |
| BACKGROUND | 1340 | Direct Static Measurement | 1.5 Minute | 16.13 | PERIODIC |
| BACKGROUND | 1405 | Direct Static Measurement | 1.5 Minute | 16.41 | END of SURVEY |
| | | Direct Static Measurement | 1.5 Minute | | |
| | | Direct Static Measurement | 1.5 Minute | | |
| | | Direct Static Measurement | 1.5 Minute | BLANK | |
| | | Direct Static Measurement | 1.5 Minute | | |

Form IVP-1001, February 1999

Supervisory Review: J. LIVELY (Print Name), [signature] (Signature), 3/28/99 (Date)

File Index Number

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# INDEPENDENT VERIFICATION INSTRUMENT BACKGROUND DATA SHEET

Survey Location: RFETS, 779 Cluster / Building

Survey Unit: 729-01

Date: 3/27/99

Instrument Model Number: Eberline, E 600

Detector Probe Type: Eberline, HP-100

Operator Name: P. WETHERSTEIN

Instrument ID Number: #303, S15620

Probe ID Number: (#142), (140), (107)

Signature: Paul Wetherstein

Calibration Expires: 8/17/99

Calibration Expires: (2/25/00)(2/25/00)(2/26/00)

Time HP-100 Due for Gas Purge: N/A

| Sample IDNo. (Affix or record Background Bar | Time | Measurement Type | Static Count Time (minutes) | GROSS Instrument Reading (dpm/100 cm²) | Comments (Include reason for background measurement) |
|---|---|---|---|---|---|
| BACKGROUND | 0925 | Direct Static Measurement | 1.5 Minute | 9.1 | BEGIN SURVEY |
| BACKGROUND | 0927 | Direct Static Measurement | 1.5 Minute | 3.01 | BEGIN SURVEY |
| BACKGROUND | 11:05 | Direct Static Measurement | 1.5 Minute | 36.2 | Periodic - Suspect probe noise |
| BACKGROUND | 1108 | Direct Static Measurement | 1.5 Minute | 36.2 | Periodic - Suspect probe noise |
| BACKGROUND | 1124 | Direct Static Measurement | 1.5 Minute | 7.17 | Periodic |
| BACKGROUND | 1126 | Direct Static Measurement | 1.5 Minute | 4.17 | Periodic |
| BACKGROUND | 1413 | Direct Static Measurement | 1.5 Minute | 21.3 | Periodic |
| BACKGROUND | 1417 | Direct Static Measurement | 1.5 Minute | 32.8 | Periodic |
| BACKGROUND | 1421 | Direct Static Measurement | 1.5 Minute | 18.47 | Periodic |

Form IVP-1001, February 1999

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Supervisory Review: JEFFREY LIVELY (Print Name) [signature] (Signature), 3/29/99 (Date)

File Index Number

# [redacted]DE[redacted]DE[redacted]ER[redacted]ATI[redacted]INS[redacted]UME[redacted]BA[redacted]GRO[redacted]D D[redacted]A SH[redacted]T [redacted] [redacted]Page [redacted] 2 [redacted]

Survey Location: RFETS, 779 Cluster / Building

Survey Unit:

Date: 3/27/99

Instrument Model Number: Eberline, E 600

Detector Probe Type: Eberline, HP-100

Operator Name:

Instrument ID Number:

Probe ID Number:

Signature:

Calibration Expires:

Calibration Expires:

Time HP-100 Due for Gas Purge:

| Sample IDNo. (Affix or record Background Bar | Time | Measurement Type | Static Count Time (minutes) | GROSS Instrument Reading (dpm/100 cm²) | Comments (Include reason for background measurement) |
|---|---|---|---|---|---|
| BACKGROUND | 1556 | Direct Static Measurement | 1.5 Minute | 4.33 | Periodic |
| BACKGROUND | 1606 | Direct Static Measurement | 1.5 Minute | 36.5 | Periodic |
| BACKGROUND | 1610 | Direct Static Measurement | 1.5 Minute | 18.23 | Periodic |
| BACKGROUND | 1710 | Direct Static Measurement | 1.5 Minute | 21.4 | Periodic |
| BACKGROUND | 1714 | Direct Static Measurement | 1.5 Minute | 24.4 | Periodic |
| | | Direct Static Measurement | 1.5 Minute | | |
| | | Direct Static Measurement | 1.5 Minute | | |
| | | Direct Static Measurement | 1.5 Minute | BLANK | |
| | | Direct Static Measurement | 1.5 Minute | | |

Form IVP-1001, February 1999

Supervisory Review: _____ / _____ / _____

Print Name Signature Date

File Index Number

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# INDEPENDENT VERIFICATION INSTRUMENT BACKGROUND DATA SHEET

Survey Location: RFETS, 779 Cluster / Building
Survey Unit: 729-01
Date: 3/29/99

Instrument Model Number: Eberline, E 600
Detector Probe Type: Eberline, HP-100
Operator Name: LIVELY

Instrument ID Number: S15620 (#303)
Probe ID Number: S15349 (#107)
Signature: [signature]

Calibration Expires: 8/~~10~~9/99
Calibration Expires: 2/26/2000
Time HP-100 Due for Gas Purge: N/A

| Sample IDNo. (Affix or record Background Bar Code) | Time | Measurement Type | Static Count Time (minutes) | GROSS Instrument Reading (dpm/100 cm²) | Comments (include reason for background measurement) |
|---|---|---|---|---|---|
| BACKGROUND | 0951 | Direct Static Measurement | 1.5 Minute | 3.67 | BEGIN SHIFT |
| BACKGROUND | 0953 | Direct Static Measurement | 1.5 Minute | 6.22 | BEGIN SHIFT |
| BACKGROUND | 1053 | Direct Static Measurement | 1.5 Minute | 12.33 | PERIODIC |
| BACKGROUND | 1055 | Direct Static Measurement | 1.5 Minute | 9.23 | PERIODIC |
| BACKGROUND | 1203 | Direct Static Measurement | 1.5 Minute | 12.03 | PERIODIC |
| BACKGROUND | 1205 | Direct Static Measurement | 1.5 Minute | 3.30 | PERIODIC |
| BACKGROUND | 1330 | Direct Static Measurement | 1.5 Minute | 9.36 | PERIODIC |
| BACKGROUND | 1332 | Direct Static Measurement | 1.5 Minute | 5.90 | PERIODIC |
| BACKGROUND | 1450 | Direct Static Measurement | 1.5 Minute | 18.54 | PERIODIC |

400 ... February 1999

Supervisory Review: J. LIVELY (Print Name), [signature] (Signature), 4/3/99 (Date)

File Index Number

# INDEPENDENT VERIFICATION INSTRUMENT BACKGROUND DATA SHEET



Survey Location: RFETS, 779 Cluster / Building

Survey Unit:

Date:

Instrument Model Number: Eberline, E 600

Detector Probe Type: Eberline, HP-100

Operator Name:

Instrument ID Number:

Probe ID Number:

Signature:

Calibration Expires:

Calibration Expires:

Time HP-100 Due for Gas Purge:

| Sample IDNo. (Affix or record Background Bar Code) | Time | Measurement Type | Static Count Time (minutes) | GROSS Instrument Reading (dpm/100 cm²) | Comments (Include reason for background measurement) |
|---|---|---|---|---|---|
| BACKGROUND | 1452 | Direct Static Measurement | 1.5 Minute | 6.32 | PERIODIC |
| BACKGROUND | 1520 | Direct Static Measurement | 1.5 Minute | 9.36 | PERIODIC / END OF SURVEY |
| BACKGROUND | 1522 | Direct Static Measurement | 1.5 Minute | 9.26 | PERIODIC / END OF SURVEY |
| | | Direct Static Measurement | 1.5 Minute | | |
| | | Direct Static Measurement | 1.5 Minute | | |
| | | Direct Static Measurement | 1.5 Minute | | |
| | | Direct Static Measurement | 1.5 Minute | BLANK | |
| | | Direct Static Measurement | 1.5 Minute | | |
| | | Direct Static Measurement | 1.5 Minute | | |

Form IVP-1001, February 1999

Supervisory Review: _____ / _____ / _____

Print Name Signature Date

File Index Number _____

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# INDEPENDENT VERIFICATION SURVEY DATA SHEET

Survey Location: RFETS, 779 Cluster / Building
Survey Unit: 729-01
Date: 3/26/99

Instrument Model Number: Eberline, E 600
Detector Probe Type: Eberline, HP-100
Operator Name: PAUL WETHERSTIEN

Instrument ID Number: S15620 (303)
Probe ID Number: S16338 (140)
Signature: Paul Wetherstein

Calibration Expires: 8/7/99
Calibration Expires: 2/25/00
Time HP-100 Due for Gas Purge: N/A

| Sample Location No. (Affix or record Bar Code #) | Time | Sample or Measurement Type | Corresponding Sample ID# for Lab Analysis (Affix or record Bar Code #) | Static Count Time | GROSS Instrument Reading (dpm/100 cm²) | Comments (Include description of surface characteristics and media composition, as applicable) |
|---|---|---|---|---|---|---|
| IVP0000101 | 1244 | Direct Static Measurement | N/A | 1.5 Minute | 17.72 | CEILING, BARE CONCRETE NO SURFACE RESIDUE |
| | 1415 | Smear | SMR0000101 | NA | | |
| | | Surface Media | | NA | | |
| IVP0000102 | 1246 | Direct Static Measurement | N/A | 1.5 Minute | 3.37 | FLOOR, HEAVY GRAY FLOOR PAINT |
| | 1420 | Smear | SMR0000102 | NA | | |
| | 3/29/99 1430 | Surface Media | MED0000102 | NA | | |
| IVP0000103 | 1248 | Direct Static Measurement | N/A | 1.5 Minute | 18.08 | CINDER BLOCK WALL, LIGHT WHITE PAINT |
| | 1425 | Smear | SMR0000103 | NA | | |
| | 3-29-99 1410 | Surface Media | MED0000103 | NA | | |

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402 Supervisory Review: J. LIVELY (Print Name), [signature] (Signature), 4/3/99 (Date)

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# INDEPENDENT VERIFICATION SURVEY DATA SHEET - *(Continued)*



| Sample Location No. (Affix or record Bar Code #) | Time | Sample or Measurement Type | Corresponding Sample ID# for Lab Analysis (Affix or record Bar Code #) | Static Count Time (minutes) | GROSS Instrument Reading (dpm/100 cm²) | Comments (Include description of surface characteristics and media composition, as applicable) |
|---|---|---|---|---|---|---|
| IVP0000104 | 1252 | Direct Static Measurement | N/A | 1.5 Minute | 12.38 | CINDER BLOCK WALL, THIN WHITE PAINT |
| | 1429 | Smear | SMR0000104 | NA | | |
| | 3-29-99 1350 | Surface Media | MED0000104 | NA | | |
| IVP0000105 | 1249 | Direct Static Measurement | N/A | 1.5 Minute | 9.67 | CINDER BLOCK WALL, THIN WHITE PAINT. |
| | 1430 | Smear | SMR0000105 | NA | | |
| | 3-29-99 1325 | Surface Media | MED0000105 | NA | | |
| IVP0000106 | 1257 | Direct Static Measurement | N/A | 1.5 Minute | 23.9 | CINDER BLOCK WALL, THIN WHITE PAINT |
| | 1433 | Smear | SMR0000106 | NA | | |
| | 3/29/99 1225 | Surface Media | MED0000106 | NA | | |
| IVP0000107 | 1300 | Direct Static Measurement | N/A | 1.5 Minute | 9.28 | HORIZONTAL CONCRETE BLOG SUPPORT BEAM, THIN WHITE PAINT |
| | 1434 | Smear | SMR0000107 | NA | | |
| | 3-29-99 1145 | Surface Media | MED0000107 | NA | | |



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# INDEPENDENT VERIFICATION SURVEY DATA SHEET

Survey Location: RFETS, 779 Cluster / Building

Survey Unit: ~~779~~ 729-01

Date: 3/26/99

Instrument Model Number: Eberline, E 600

Detector Probe Type: Eberline, HP-100

Operator Name: P. WETHERSTIEN

Instrument ID Number: S15620 (303)

Probe ID Number: ~~S15620~~ (140) S16338

Signature: Paul Wetherstein

Calibration Expires: 8/7/99

Calibration Expires: 2/25/00

Time HP-100 Due for Gas Purge: N/A

| Sample Location No. (Affix or record Bar Code #) | Time | Sample or Measurement Type | Corresponding Sample ID# for Lab Analysis (Affix or record Bar Code #) | Static Count Time | GROSS Instrument Reading (dpm/100 cm²) | Comments (Include description of surface characteristics and media composition, as applicable) |
|---|---|---|---|---|---|---|
| IVP0000108 | 1305 | Direct Static Measurement | N/A | 1.5 Minute | 9.42 | CONCRETE BUILDING SUPPORT BEAM, BEHIND OLD CONDUIT LINE. |
| | 1436 | Smear | SMR0000108 | NA | | |
| | 3/29/99 1213 | Surface Media | MED0000108 | NA | | |
| IVP0000109 | 1307 | Direct Static Measurement | N/A | 1.5 Minute | 9.68 | CONCRETE FLOOR, HEAVY GRAY PAINT ON SURFACE |
| | 1438 | Smear | SMR0000109 | NA | | |
| | 3/29/99 1035 | Surface Media | MED0000109 | NA | | |
| IVP0000110 | 1311 | Direct Static Measurement | N/A | 1.5 Minute | 6.96 | White Paint Cinder Block Wall |
| | 1440 | Smear | SMR0000110 | NA | | |
| | 3-27-99 1545 | Surface Media | MED0000110 | NA | | |

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Supervisory Review: J. LIVELY (Print Name), [signature] (Signature), 4/3/99 (Date)

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# INDEPENDENT VERIFICATION SURVEY DATA SHEET - *(Continued)*



| Sample Location No. (Affix or record Bar Code #) | Time | Sample or Measurement Type | Corresponding Sample ID# for Lab Analysis (Affix or record Bar Code #) | Static Count Time (minutes) | GROSS Instrument Reading (dpm/100 cm²) | Comments (Include description of surface characteristics and media composition, as applicable) |
|---|---|---|---|---|---|---|
| IVP0000111 | 1313 | Direct Static Measurement | N/A | 1.5 Minute | 6.60 | RAISED CONCRETE PEDESTAL HEAVY GRAY PAINT. |
| | 1441 | Smear | SMR0000111 | NA | | |
| | 3/29/99 1005 | Surface Media | MED0000111 | NA | | |
| IVP0000112 | 1318 | Direct Static Measurement | N/A | 1.5 Minute | 1.12 | CONCRETE FLOOR, HEAVY GRAY PAINT, CORNER NEAR PEDESTAL |
| | 1443 | Smear | SMR0000112 | NA | | |
| | 3/29/99 0945 | Surface Media | MED0000112 | NA | | |
| IVP0000113 | 1321 | Direct Static Measurement | N/A | 1.5 Minute | 6.87 | CINDER WALL BLOCK, THIN WHITE PAINT. |
| | 1444 | Smear | SMR0000113 | NA | | |
| | 3-27-99 1634 | Surface Media | MED0000113 | NA | | |
| IVP0000114 | 1325 | Direct Static Measurement | N/A | 1.5 Minute | 9.9 | CINDER BLOCK WALL, THIN WHITE PAINT |
| | 1445 | Smear | SMR0000114 | NA | | |
| | 3/29 0842 | Surface Media | MED0000114 | NA | | |



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# INDEPENDENT VERIFICATION SURVEY DATA SHEET



Survey Location: RFETS, 779 Cluster / Building

Survey Unit: 729-01

Date: 3-26-99

Instrument Model Number: Eberline, E 600

Detector Probe Type: Eberline, HP-100

Operator Name: P. WETHERSTIEN

Instrument ID Number: S15620 (303)

Probe ID Number: S16338 (140)

Signature: Paul Wetherstein

Calibration Expires: 8/7/99

Calibration Expires: 2/25/99

Time HP-100 Due for Gas Purge: N/A

| Sample Location No. (Affix or record Bar Code #) | Time | Sample or Measurement Type | Corresponding Sample ID# for Lab Analysis (Affix or record Bar Code #) | Static Count Time | GROSS Instrument Reading (dpm/100 cm²) | Comments (Include description of surface characteristics and media composition, as applicable) |
|---|---|---|---|---|---|---|
| 1VP0000115 | 1328 | Direct Static Measurement | N/A | 1.5 Minute | 9.8 | CONCRETE, HEAVY GRAY PAINT |
| | 1447 | Smear | SMR0000115 | NA | | |
| | 3/29/99 1048 | Surface Media | MED0000115 | NA | | |
| 1VP0000116 | 1332 | Direct Static Measurement | N/A | 1.5 Minute | 18.74 | CINDER BLOCK, THIN WHITE PAINT |
| | 1448 | Smear | SMR0000116 | NA | | |
| | 3-27-99 1701 | Surface Media | MED0000116 | NA | | |
| 1VP0000117 | 1334 | Direct Static Measurement | N/A | 1.5 Minute | 9.87 | CONCRETE FLOOR, HEAVY GRAY PAINT |
| | 1449 | Smear | SMR0000117 | NA | | |
| | 3/29/99 0925 | Surface Media | MED0000117 | NA | | |

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# INDEPENDENT VERIFICATION SURVEY DATA SHEET - *(Continued)*



| Sample Location No. (Affix or record Bar Code #) | Time | Sample or Measurement Type | Corresponding Sample ID# for Lab Analysis (Affix or record Bar Code #) | Static Count Time (minutes) | GROSS Instrument Reading (dpm/100 cm²) | Comments (Include description of surface characteristics and media composition, as applicable) |
|---|---|---|---|---|---|---|
| IVP0000118 | 1350 | Direct Static Measurement | N/A | 1.5 Minute | 32.8 | RELOCATED SAMPLE TO WEST PIT ORIGINAL LOCATION IS STEEL LINED CONFINED SPACE. THIS LOCATION IS BARE SCABBLED CONCRETE. |
| | 1451 | Smear | SMR0000118 | NA | | |
| | 3-29-99 1110 | Surface Media | MED0000118 | NA | | |
| IVP0000119 | 1353 | Direct Static Measurement | N/A | 1.5 Minute | ~~4.5~~ / 7.26 | CINDER BLOCK WALL, RESCANNED DUE TO LOGGING ERROR. |
| | 1452 | Smear | SMR0000119 | NA | | |
| | 3/29 0855 | Surface Media | MED0000119 | NA | | |
| IVP0000120 | 1359 | Direct Static Measurement | N/A | 1.5 Minute | 7.4 | WHITE CINDER BLOCK WALL |
| | 1453 | Smear | SMR0000120 | NA | | |
| | 3-27-99 1646 | Surface Media | MED0000120 | NA | | |
| | | Direct Static Measurement | | 1.5 Minute | | |
| | | Smear | BLANK | NA | | |
| | | Surface Media | | NA | | |



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# INDEPENDENT VERIFICATION SURVEY DATA SHEET

Survey Location: RFETS, 779 Cluster / Building

Survey Unit: 729-01

Date: 3-27-99

Instrument Model Number: Eberline, E 600

Detector Probe Type: Eberline, HP-100

Operator Name: P. WETHERSTIEN

Instrument ID Number: S15620 (303)

Probe ID Number: (107)(140)(142)

Signature: Paul Wetherstien

Calibration Expires: 8/7/99

Calibration Expires: (2/26/00)(2/25/00)(2/25/00)

Time HP-100 Due for Gas Purge: N/A

| Sample Location No. (Affix or record Bar Code #) | Time | Sample or Measurement Type | Corresponding Sample ID# for Lab Analysis (Affix or record Bar Code #) | Static Count Time | GROSS Instrument Reading (dpm/100 cm²) | Comments (Include description of surface characteristics and media composition, as applicable) |
|---|---|---|---|---|---|---|
| IVP0000121 | *10:12 / 11:42 | Direct Static Measurement | | 1.5 Minute | *42.2 / 23.4 | Concrete beam no paint * Suspect probe noise on first reading - changed probe |
| A | 10:14 | Smear | SMR0000121 | NA | | |
| | 3-27-99 1526 | Surface Media | MED0000121 | NA | | |
| IVP0000122 | 10:49 / *1147 | Direct Static Measurement | | 1.5 Minute | 6.03 / *6.28 | Concrete, no paint * Different probe |
| B | 10:50 | Smear | SMR0000122 | NA | | |
| | | Surface Media | | NA | | |
| IVP0000123 | *10:59 / 1133 | Direct Static Measurement | | 1.5 Minute | *33.1 / 14.86 | West side of concrete flange, no paint. * Suspect probe noise on first reading - changed probe |
| C | 11:00 | Smear | SMR0000123 | NA | | |
| | | Surface Media | | NA | | |

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Supervisory Review: JEFFREY LIVEY (Print Name), [signature] (Signature), 4/3/99 (Date)

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# INDEPENDENT VERIFICATION SURVEY DATA SHEET - *(Continued)*



| Sample Location No. (Affix or record Bar Code #) | Time | Sample or Measurement Type | Corresponding Sample ID# for Lab Analysis (Affix or record Bar Code #) | Static Count Time (minutes) | GROSS Instrument Reading (dpm/100 cm²) | Comments (Include description of surface characteristics and media composition, as applicable) |
|---|---|---|---|---|---|---|
| IVP0000124 | 1253 | Direct Static Measurement | | 1.5 Minute | 20.8 | Concrete, no paint |
| | 1254 | Smear | SMR0000124 | NA | | |
| | | Surface Media | | NA | | |
| IVP0000125 | 10:41 *1152 | Direct Static Measurement | | 1.5 Minute | 27.1 *29.2 | Concrete, no paint *Different probe |
| | 10:42 | Smear | SMR0000125 | NA | | |
| | 3-27-99 1510 | Surface Media | MED0000125 | NA | | |
| IVP0000126 | 1308 | Direct Static Measurement | | 1.5 Minute | 21.1 | Concrete, no paint |
| | 1310 | Smear | SMR0000126 | NA | | |
| | | Surface Media | | NA | | |
| IVP0000127 | 1210 | Direct Static Measurement | | 1.5 Minute | 40.8 | Concrete, No paint |
| | 1211 | Smear | SMR0000127 | NA | | |
| | 3-27-99 1230 | Surface Media | MED0000127 | NA | | |



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# INDEPENDENT VERIFICATION SURVEY DATA SHEET

Survey Location: RFETS, 779 Cluster / Building
Survey Unit: 729-01
Date: 3-27-99

Instrument Model Number: Eberline, E 600
Detector Probe Type: Eberline, HP-100
Operator Name: P. WETHERSTEIN

Instrument ID Number: S15620(303)
Probe ID Number: (107) (140) (142)
Signature: Paul Wetherstein

Calibration Expires: 8/7/99
Calibration Expires: (2/26/00)(2/25/00)(2/25/00)
Time HP-100 Due for Gas Purge: N/A

| Sample Location No. (Affix or record Bar Code #) | Time | Sample or Measurement Type | Corresponding Sample ID# for Lab Analysis (Affix or record Bar Code #) | Static Count Time | GROSS Instrument Reading (dpm/100 cm²) | Comments (Include description of surface characteristics and media composition, as applicable) |
|---|---|---|---|---|---|---|
| IVP0000128 | 10:33 *~~14~~ 1158 | Direct Static Measurement | | 1.5 Minute | 12.06 *14.92 | West side of concrete flange, no paint *Different probe |
| | 10:34 | Smear | SMR0000128 | NA | | |
| H | | Surface Media | | NA | | |
| IVP0000129 | 10:22 *1135 | Direct Static Measurement | | 1.5 Minute | 30.1 *26.4 | Concrete beam, no paint *Different probe |
| | 10:27 | Smear | SMR0000129 | NA | | |
| I | 3-27-99 1444 | Surface Media | MED0000129 | NA | | |
| | | Direct Static Measurement | | 1.5 Minute | | |
| | | Smear | BLANK | NA | | |
| | | Surface Media | | NA | | |

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Supervisory Review: J. LIVELY (Print Name), [signature] (Signature), 4/3/99 (Date)

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# INDEPENDENT VERIFICATION SURVEY DATA SHEET - *(Continued)*



| Sample Location No. (Affix or record Bar Code #) | Time | Sample or Measurement Type | Corresponding Sample ID# for Lab Analysis (Affix or record Bar Code #) | Static Count Time (minutes) | GROSS Instrument Reading (dpm/100 cm²) | Comments (include description of surface characteristics and media composition, as applicable) |
|---|---|---|---|---|---|---|
| IVP0000129 | 1447 | Direct Static Measurement | | 1.5 Minute | 26.4 | Post media sample reading |
| | | Smear | | NA | | |
| | | Surface Media | | NA | | |
| IVP0000127 | 1453 | Direct Static Measurement | | 1.5 Minute | 20.4 | Post media sample reading |
| | | Smear | | NA | | |
| | | Surface Media | | NA | | |
| IVP0000125 | 1512 | Direct Static Measurement | | 1.5 Minute | 17.66 | Post media sample reading |
| | | Smear | | NA | | |
| | | Surface Media | | NA | | |
| IVP0000121 | 1529 | Direct Static Measurement | | 1.5 Minute | 17.98 | Post media sample reading |
| | | Smear | | NA | | |
| | | Surface Media | | NA | | |

# INDEPENDENT VERIFICATION SURVEY DATA SHEET

Survey Location: RFETS, 779 Cluster / Building
Survey Unit: 729-01
Date: 3-27-99
Instrument Model Number: Eberline, E 600
Detector Probe Type: Eberline, HP-100
Operator Name: P. WETHERSTIEN
Instrument ID Number: 515620 (303)
Probe ID Number: (107)(140)(142)
Signature: Paul Wetherstein
Calibration Expires: 8/7/99
Calibration Expires: (2/26/00)(2/25/00)(2/25/00)
Time HP-100 Due for Gas Purge: N/A

| Sample Location No. (Affix or record Bar Code #) | Time | Sample or Measurement Type | Corresponding Sample ID# for Lab Analysis (Affix or record Bar Code #) | Static Count Time | GROSS Instrument Reading (dpm/100 cm²) | Comments (Include description of surface characteristics and media composition, as applicable) |
|---|---|---|---|---|---|---|
| IVP0000110 | 1547 | Direct Static Measurement | | 1.5 Minute | 3.77 | Post media sample reading |
| | | Smear | | NA | | |
| | | Surface Media | | NA | | ~~Post media sample reading~~ PGW |
| IVP0000113 | 1637 | Direct Static Measurement | | 1.5 Minute | 4.7 | Post media sample reading |
| | | Smear | | NA | | |
| | | Surface Media | | NA | | |
| IVP0000120 | 1649 | Direct Static Measurement | | 1.5 Minute | 10.95 | Post media sample reading |
| | | Smear | | NA | | |
| | | Surface Media | | NA | | |

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Supervisory Review: J. LIVELY (Print Name), [signature] (Signature), 4/3/99 (Date)

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# INDEPENDENT VERIFICATION SURVEY DATA SHEET - *(Continued)*



| Sample Location No. (Affix or record Bar Code #) | Time | Sample or Measurement Type | Corresponding Sample ID# for Lab Analysis (Affix or record Bar Code #) | Static Count Time (minutes) | GROSS Instrument Reading (dpm/100 cm²) | Comments (Include description of surface characteristics and media composition, as applicable) |
|---|---|---|---|---|---|---|
| IVP0000116 | 1704 | Direct Static Measurement | | 1.5 Minute | 17,24 | Post media sample reading |
| | | Smear | | NA | | |
| | | Surface Media | | NA | | |
| | | Direct Static Measurement | | 1.5 Minute | | |
| | | Smear | | NA | | |
| | | Surface Media | | NA | | |
| | | Direct Static Measurement | | 1.5 Minute | | |
| | | Smear | BLANK | NA | | |
| | | Surface Media | | NA | | |
| | | Direct Static Measurement | | 1.5 Minute | | |
| | | Smear | | NA | | |
| | | Surface Media | | NA | | |

# INDEPENDENT VERIFICATION SURVEY DATA SHEET

Survey Location: RFETS, 779 Cluster / Building

Survey Unit: 729-01

Date: 3/29/99

Instrument Model Number: Eberline, E 600

Detector Probe Type: Eberline, HP-100

Operator Name: P. WETHERSTIEN

Instrument ID Number: S15620 (303)

Probe ID Number: (107) (140) (142)

Signature: Paul Wetherstein

Calibration Expires: 8/7/99

Calibration Expires: (2/26/99) (2/25/00) (2/25/00)

Time HP-100 Due for Gas Purge: N/A

| Sample Location No. (Affix or record Bar Code #) | Time | Sample or Measurement Type | Corresponding Sample ID# for Lab Analysis (Affix or record Bar Code #) | Static Count Time | GROSS Instrument Reading (dpm/100 cm²) | Comments (Include description of surface characteristics and media composition, as applicable) |
|---|---|---|---|---|---|---|
| IVP0000112 | 1013 | Direct Static Measurement | N/A | 1.5 Minute | 7.84 | POST PAINT SAMPLE |
| | | Smear | | NA | | |
| | | Surface Media | | NA | | |
| IVP0000111 | 1024 | Direct Static Measurement | | 1.5 Minute | 7.52 | POST PAINT SAMPLE |
| | 1103 | ~~Smear~~ DIRECT STATIC MEASUREMENT | | NA | 8.05 | DUPLICATE |
| | | Surface Media | | NA | | |
| IVP0000009 | 1039 | Direct Static Measurement | | 1.5 Minute | 11.19 | POST PAINT SAMPLE |
| | | Smear | | NA | | |
| | | Surface Media | | NA | | |

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Supervisory Review: J. LIVEN (Print Name) [signature] (Signature), 4/3/99 (Date)

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# INDEPENDENT VERIFICATION SURVEY DATA SHEET - *(Continued)*



| Sample Location No. (Affix or record Bar Code #) | Time | Sample or Measurement Type | Corresponding Sample ID# for Lab Analysis (Affix or record Bar Code #) | Static Count Time (minutes) | GROSS Instrument Reading (dpm/100 cm²) | Comments (Include description of surface characteristics and media composition, as applicable) |
|---|---|---|---|---|---|---|
| IVP0000 114 | 1044 | Direct Static Measurement | N/A | 1.5 Minute | 2.45 | POST PAINT SAMPLE |
| | | Smear | | NA | | |
| | | Surface Media | | NA | | |
| IVP 0000 117 | 1046 | Direct Static Measurement | N/A | 1.5 Minute | 11.40 | POST PAINT SAMPLE |
| | | Smear | | NA | | |
| | | Surface Media | | NA | | |
| IVP0000 119 | 1049 | Direct Static Measurement | N/A | 1.5 Minute | 5.00 | POST PAINT SAMPLE. |
| | | ~~Smear~~ DUP STATIC MEASURE | N/A | NA | 5.01 | DUPLICATE |
| | | Surface Media | | NA | | |
| IVP 0000 115 | 1057 | Direct Static Measurement | N/A | 1.5 Minute | 13.98 | POST PAINT SAMPLE |
| | | Smear | | NA | | |
| | | Surface Media | | NA | | |



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# INDEPENDENT VERIFICATION SURVEY DATA SHEET

Survey Location: RFETS, 779 Cluster / Building
Survey Unit: 729-01
Date: 3/29/99

Instrument Model Number: Eberline, E 600
Detector Probe Type: Eberline, HP-100
Operator Name: P. WETHERSTIEN

Instrument ID Number: 515620 (303)
Probe ID Number: (107) (140) (142)
Signature: Paul Wetherstien

Calibration Expires: 8/7/99
Calibration Expires: (2/26/00) (2/25/00) (2/25/00)
Time HP-100 Due for Gas Purge: N/A

| Sample Location No. (Affix or record Bar Code #) | Time | Sample or Measurement Type | Corresponding Sample ID# for Lab Analysis (Affix or record Bar Code #) | Static Count Time | GROSS Instrument Reading (dpm/100 cm²) | Comments (Include description of surface characteristics and media composition, as applicable) |
|---|---|---|---|---|---|---|
| IVP0000 118 | 1413 | Direct Static Measurement | | 1.5 Minute | 26.0 | POST SURFACE MEDIA SAMPLE |
| | 1418 | ~~Smear~~ DIRECT STATIC MEASUREMENT | | NA | 19.59 | DUPLICATE |
| | | Surface Media | | NA | | |
| IVP0000 108 | 1442 | Direct Static Measurement | | 1.5 Minute | 13.44 | POST PAINT SAMPLE |
| | | Smear | | NA | | |
| | | Surface Media | | NA | | |
| IVP0000 107 | 1448 | Direct Static Measurement | | 1.5 Minute | 22.9 | POST PAINT SAMPLE |
| | | Smear | | NA | | |
| | | Surface Media | | NA | | |

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# INDEPENDENT VERIFICATION SURVEY DATA SHEET - *(Continued)*



| Sample Location No. (Affix or record Bar Code #) | Time | Sample or Measurement Type | Corresponding Sample ID# for Lab Analysis (Affix or record Bar Code #) | Static Count Time (minutes) | GROSS Instrument Reading (dpm/100 cm²) | Comments (Include description of surface characteristics and media composition, as applicable) |
|---|---|---|---|---|---|---|
| IVP0000 106 | 1502 | Direct Static Measurement | | 1.5 Minute | 14.29 | POST PAINT |
| | | Smear | | NA | | |
| | | Surface Media | | NA | | |
| IVP0000 105 | 1504 | Direct Static Measurement | | 1.5 Minute | 5.17 | POST PAINT |
| | | Smear | | NA | | |
| | | Surface Media | | NA | | |
| IVP0000 104 | 1506 | Direct Static Measurement | | 1.5 Minute | 11.50 | POST PAINT |
| | 1508 | JB 3-29-99 ~~Smear~~ DIRECT MEASUREMENT | | NA | 10.94 | DUPLICATE |
| | | Surface Media | | NA | | |
| IVP0000 102 | JB 3/29/99 ~~1508~~ 1510 | Direct Static Measurement | | 1.5 Minute | 17.36 | POST PAINT |
| | | Smear | | NA | | |
| | | Surface Media | | NA | | |

# INDEPENDENT VERIFICATION SURVEY DATA SHEET

Survey Location: RFETS, 779 Cluster / Building

Survey Unit: 729-01

Date: 3/29/99

Instrument Model Number: Eberline, E 600

Detector Probe Type: Eberline, HP-100

Operator Name: P. WETHERSTEIN

Instrument ID Number: S15620 (303)

Probe ID Number: (107)(140)(142)

Signature: Paul Wetherstein

Calibration Expires: 8/7/99

Calibration Expires: (2/25/00)(2/25/00)(2/25/00)

Time HP-100 Due for Gas Purge: N/A

| Sample Location No. (Affix or record Bar Code #) | Time | Sample or Measurement Type | Corresponding Sample ID# for Lab Analysis (Affix or record Bar Code #) | Static Count Time | GROSS Instrument Reading (dpm/100 cm²) | Comments (Include description of surface characteristics and media composition, as applicable) |
|---|---|---|---|---|---|---|
| IVP0000 103 | 1510 | Direct Static Measurement | | 1.5 Minute | 8,10 | POST PAINT SAMPLE |
| | | Smear | | NA | | |
| | | Surface Media | | NA | | |
| | | Direct Static Measurement | | 1.5 Minute | | |
| | | Smear | BLANK | NA | | |
| | | Surface Media | | NA | | |
| | | Direct Static Measurement | | 1.5 Minute | | |
| | | Smear | | NA | | |
| | | Surface Media | | NA | | |

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Supervisory Review: J. LIVELY (Print Name), [signature] (Signature), 4/3/99 (Date)

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# Appendix E

# Background Data Set

# Background Data, Building 729, Survey Unit 729-01

| Sample Location | Date | Time | E600 Serial # | Probe Serial # | Instrument Operating Mode | Channel Selected | Background Compensation Mode | Recorded Value | Units | Instrument Efficiency | Instrument raw count rate (cpm) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BACKGROUND | 3/26/99 | 13:26:00 | 303 | 140 | Scaler | Alpha | Gross | 12.7 | dpm/100cm2 | 0.231 | 2.7 |
| BACKGROUND | 3/26/99 | 13:30:00 | 303 | 140 | Scaler | Alpha | Gross | 9.8 | dpm/100cm2 | 0.231 | 2.1 |
| BACKGROUND | 3/26/99 | 13:54:00 | 303 | 140 | Scaler | Alpha | Gross | 21.7 | dpm/100cm2 | 0.231 | 4.7 |
| BACKGROUND | 3/26/99 | 14:30:00 | 303 | 140 | Scaler | Alpha | Gross | 16.1 | dpm/100cm2 | 0.231 | 3.5 |
| BACKGROUND | 3/26/99 | 14:58:00 | 303 | 140 | Scaler | Alpha | Gross | 16.4 | dpm/100cm2 | 0.231 | 3.8 |
| BACKGROUND | 3/27/99 | 10:22:00 | 303 | 142 | Scaler | Alpha | Gross | 9.1 | dpm/100cm2 | 0.221 | 2.0 |
| BACKGROUND | 3/27/99 | 10:23:00 | 303 | 142 | Scaler | Alpha | Gross | 3.0 | dpm/100cm2 | 0.221 | 0.7 |
| BACKGROUND | 3/27/99 | 11:56:00 | 303 | 142 | Scaler | Alpha | Gross | 36.2 | dpm/100cm2 | 0.221 | 8.0 |
| BACKGROUND | 3/27/99 | 11:59:00 | 303 | 142 | Scaler | Alpha | Gross | 36.2 | dpm/100cm2 | 0.221 | 8.0 |
| BACKGROUND | 3/27/99 | 12:14:00 | 303 | 140 | Scaler | Alpha | Gross | 7.2 | dpm/100cm2 | 0.231 | 1.7 |
| BACKGROUND | 3/27/99 | 12:17:00 | 303 | 140 | Scaler | Alpha | Gross | 4.2 | dpm/100cm2 | 0.231 | 1.0 |
| BACKGROUND | 3/27/99 | 15:06:00 | 303 | 140 | Scaler | Alpha | Gross | 21.4 | dpm/100cm2 | 0.231 | 4.9 |
| BACKGROUND | 3/27/99 | 15:08:00 | 303 | 140 | Scaler | Alpha | Gross | 32.9 | dpm/100cm2 | 0.231 | 7.6 |
| BACKGROUND | 3/27/99 | 15:11:00 | 303 | 140 | Scaler | Alpha | Gross | 18.5 | dpm/100cm2 | 0.231 | 4.3 |
| BACKGROUND | 3/27/99 | 16:44:00 | 303 | 140 | Scaler | Alpha | Gross | 4.3 | dpm/100cm2 | 0.231 | 1.0 |
| BACKGROUND | 3/27/99 | 16:59:00 | 303 | 107 | Scaler | Alpha | Gross | 36.5 | dpm/100cm2 | 0.2145 | 7.8 |
| BACKGROUND | 3/27/99 | 17:00:00 | 303 | 107 | Scaler | Alpha | Gross | 18.2 | dpm/100cm2 | 0.2145 | 3.9 |
| BACKGROUND | 3/27/99 | 18:01:00 | 303 | 107 | Scaler | Alpha | Gross | 21.4 | dpm/100cm2 | 0.2145 | 4.6 |
| BACKGROUND | 3/27/99 | 18:04:00 | 303 | 107 | Scaler | Alpha | Gross | 24.4 | dpm/100cm2 | 0.2145 | 5.2 |
| BACKGROUND | 3/29/99 | 10:40:00 | 303 | 107 | Scaler | Alpha | Gross | 3.7 | dpm/100cm2 | 0.2145 | 0.8 |
| BACKGROUND | 3/29/99 | 10:42:00 | 303 | 107 | Scaler | Alpha | Gross | 6.2 | dpm/100cm2 | 0.2145 | 1.3 |
| BACKGROUND | 3/29/99 | 11:45:00 | 303 | 107 | Scaler | Alpha | Gross | 12.3 | dpm/100cm2 | 0.2145 | 2.6 |
| BACKGROUND | 3/29/99 | 11:47:00 | 303 | 107 | Scaler | Alpha | Gross | 9.2 | dpm/100cm2 | 0.2145 | 2.0 |
| BACKGROUND | 3/29/99 | 12:56:00 | 303 | 107 | Scaler | Alpha | Gross | 12.8 | dpm/100cm2 | 0.2145 | 2.7 |
| BACKGROUND | 3/29/99 | 12:58:00 | 303 | 107 | Scaler | Alpha | Gross | 3.3 | dpm/100cm2 | 0.2145 | 0.7 |
| BACKGROUND | 3/29/99 | 14:23:00 | 303 | 107 | Scaler | Alpha | Gross | 9.4 | dpm/100cm2 | 0.2145 | 2.0 |
| BACKGROUND | 3/29/99 | 14:25:00 | 303 | 107 | Scaler | Alpha | Gross | 5.9 | dpm/100cm2 | 0.2145 | 1.3 |
| BACKGROUND | 3/29/99 | 15:40:00 | 303 | 107 | Scaler | Alpha | Gross | 18.5 | dpm/100cm2 | 0.2145 | 4.0 |
| BACKGROUND | 3/29/99 | 15:44:00 | 303 | 107 | Scaler | Alpha | Gross | 6.3 | dpm/100cm2 | 0.2145 | 1.4 |
| BACKGROUND | 3/29/99 | 16:11:00 | 303 | 107 | Scaler | Alpha | Gross | 9.4 | dpm/100cm2 | 0.2145 | 2.0 |
| BACKGROUND | 3/29/99 | 16:13:00 | 303 | 107 | Scaler | Alpha | Gross | 9.3 | dpm/100cm2 | 0.2145 | 2.0 |

Summary Statistics

| | |
|---|---|
| Number of Measurements | 31 |
| Mean | 14.7 |
| Log Normal Mean | 11.572185 |
| Median | 12.3 |
| Std. Deviation | 10.128251 |
| CV | 0.6879098 |

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# Direct Static Surface Contamination Measurements, Building 729, Survey Unit 729-01

| Sample Location | Date | Time | E600 Serial # | Probe Serial # | Instrument Operating Mode | Channel Selected | Background Compensation Mode | Recorded Value | Units | Stored Bkg | Bkg Units | Instrument Efficiency | Instrument raw count rate (cpm) | Count Time (seconds) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IVP0000101 | 3/26/99 | 13:35:00 | 303 | 140 | Scaler | Alpha | Gross | 17.7 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 4.1 | 90 |
| IVP0000102 | 3/26/99 | 13:38:00 | 303 | 140 | Scaler | Alpha | Gross | 3.4 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 0.8 | 90 |
| IVP0000103 | 3/26/99 | 13:40:00 | 303 | 140 | Scaler | Alpha | Gross | 18.1 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 4.2 | 90 |
| IVP0000104 | 3/26/99 | 13:45:00 | 303 | 140 | Scaler | Alpha | Gross | 12.4 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 2.9 | 90 |
| IVP0000105 | 3/26/99 | 13:47:00 | 303 | 140 | Scaler | Alpha | Gross | 9.7 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 2.2 | 90 |
| IVP0000106 | 3/26/99 | 13:50:00 | 303 | 140 | Scaler | Alpha | Gross | 24.0 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 5.5 | 90 |
| IVP0000107 | 3/26/99 | 13:52:00 | 303 | 140 | Scaler | Alpha | Gross | 9.3 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 2.1 | 90 |
| IVP0000108 | 3/26/99 | 13:57:00 | 303 | 140 | Scaler | Alpha | Gross | 9.4 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 2.2 | 90 |
| IVP0000109 | 3/26/99 | 14:00:00 | 303 | 107 | Scaler | Alpha | Gross | 9.7 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 2.2 | 90 |
| IVP0000110 | 3/26/99 | 13:11:00 | 303 | 140 | Scaler | Alpha | Gross | 7.0 | dpm/100cm3 | 0 | dpm/100cm2 | 0.2145 | 1.5 | 90 |
| IVP0000111 | 3/26/99 | 14:06:00 | 303 | 140 | Scaler | Alpha | Gross | 6.6 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 1.5 | 90 |
| IVP0000112 | 3/26/99 | 14:11:00 | 303 | 140 | Scaler | Alpha | Gross | 1.1 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 0.3 | 90 |
| IVP0000113 | 3/26/99 | 14:14:00 | 303 | 140 | Scaler | Alpha | Gross | 6.9 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 1.6 | 90 |
| IVP0000114 | 3/26/99 | 14:17:00 | 303 | 140 | Scaler | Alpha | Gross | 9.9 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 2.3 | 90 |
| IVP0000115 | 3/26/99 | 14:20:00 | 303 | 140 | Scaler | Alpha | Gross | 9.8 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 2.3 | 90 |
| IVP0000116 | 3/26/99 | 13:32:00 | 303 | 140 | Scaler | Alpha | Gross | 18.7 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 4.3 | 90 |
| IVP0000117 | 3/26/99 | 14:26:00 | 303 | 140 | Scaler | Alpha | Gross | 9.9 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 2.3 | 90 |
| IVP0000118 | 3/26/99 | 14:42:00 | 303 | 140 | Scaler | Alpha | Gross | 32.8 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 7.6 | 90 |
| IVP0000119 | 3/26/99 | 14:48:00 | 303 | 140 | Scaler | Alpha | Gross | 7.3 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 1.7 | 90 |
| IVP0000120 | 3/26/99 | 14:51:00 | 303 | 140 | Scaler | Alpha | Gross | 7.4 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 1.7 | 90 |
| IVP0000121 | 3/27/99 | 12:33:00 | 303 | 140 | Scaler | Alpha | Gross | 23.5 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 5.4 | 90 |
| IVP0000122(M) | 3/27/99 | 12:39:00 | 303 | 140 | Scaler | Alpha | Gross | 6.2 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 1.4 | 90 |
| IVP0000123 | 3/27/99 | 12:24:00 | 303 | 140 | Scaler | Alpha | Gross | 14.9 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 3.4 | 90 |
| IVP0000124 | 3/27/99 | 13:44:00 | 303 | 140 | Scaler | Alpha | Gross | 20.9 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 4.8 | 90 |
| IVP0000125(M) | 3/27/99 | 12:43:00 | 303 | 140 | Scaler | Alpha | Gross | 28.2 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 6.5 | 90 |
| IVP0000126 | 3/27/99 | 14:00:00 | 303 | 140 | Scaler | Alpha | Gross | 21.2 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 4.9 | 90 |
| IVP0000127 | 3/27/99 | 13:01:00 | 303 | 140 | Scaler | Alpha | Gross | 40.8 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 9.4 | 90 |
| IVP0000128(M) | 3/27/99 | 12:49:00 | 303 | 140 | Scaler | Alpha | Gross | 13.5 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 3.1 | 90 |
| IVP0000129(M) | 3/27/99 | 12:46:00 | 303 | 140 | Scaler | Alpha | Gross | 28.3 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 6.5 | 90 |

*Duplicate Measurement*

# Post Surface Media Sampling Direct Static Surface Measurements, Building 729, Survey Unit 729-01

| Sample Location | Date | Time | E600 Serial # | Probe Serial # | Instrument Operating Mode | Channel Selected | Background Compensation Mode | Recorded Value | Units | Stored Bkg | Bkg Units | Instrument Efficiency | Instrument raw count rate (cpm) | Count Time (seconds) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IVP0000102 | 3/29/99 | 16:00:00 | 303 | 107 | Scaler | Alpha | Gross | 17.4 | dpm/100cm2 | 0 | dpm/100cm2 | 0.2145 | 3.7 | 90 |
| IVP0000103 | 3/29/99 | 16:03:00 | 303 | 107 | Scaler | Alpha | Gross | 8.1 | dpm/100cm2 | 0 | dpm/100cm2 | 0.2145 | 1.7 | 90 |
| IVP0000104(M) | 3/29/99 | | 303 | 107 | Scaler | Alpha | Gross | 11.2 | dpm/100cm2 | 0 | dpm/100cm2 | 0.2145 | 2.4 | 90 |
| IVP0000105 | 3/29/99 | 15:54:00 | 303 | 107 | Scaler | Alpha | Gross | 5.2 | dpm/100cm2 | 0 | dpm/100cm2 | 0.2145 | 1.1 | 90 |
| IVP0000106 | 3/29/99 | 15:51:00 | 303 | 107 | Scaler | Alpha | Gross | 14.3 | dpm/100cm2 | 0 | dpm/100cm2 | 0.2145 | 3.1 | 90 |
| IVP0000107 | 3/29/99 | 15:38:00 | 303 | 107 | Scaler | Alpha | Gross | 23.0 | dpm/100cm2 | 0 | dpm/100cm2 | 0.2145 | 4.9 | 90 |
| IVP0000108 | 3/29/99 | 15:35:00 | 303 | 107 | Scaler | Alpha | Gross | 13.4 | dpm/100cm2 | 0 | dpm/100cm2 | 0.2145 | 2.9 | 90 |
| IVP0000109 | 3/29/99 | 11:32:00 | 303 | 107 | Scaler | Alpha | Gross | 11.2 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 2.4 | 90 |
| IVP0000110 | 3/27/99 | 16:38:00 | 303 | 140 | Scaler | Alpha | Gross | 3.7 | dpm/100cm2 | 0 | dpm/100cm2 | 0.2145 | 0.9 | 90 |
| IVP0000111(M) | 3/29/99 | | 303 | 107 | Scaler | Alpha | Gross | 7.8 | dpm/100cm2 | 0 | dpm/100cm2 | 0.2145 | 1.7 | 90 |
| IVP0000112 | 3/29/99 | 11:03:00 | 303 | 107 | Scaler | Alpha | Gross | 7.8 | dpm/100cm2 | 0 | dpm/100cm2 | 0.2145 | 1.7 | 90 |
| IVP0000113 | 3/27/99 | 17:28:00 | 303 | 107 | Scaler | Alpha | Gross | 4.7 | dpm/100cm2 | 0 | dpm/100cm2 | 0.2145 | 1.0 | 90 |
| IVP0000114 | 3/29/99 | 11:36:00 | 303 | 107 | Scaler | Alpha | Gross | 2.5 | dpm/100cm2 | 0 | dpm/100cm2 | 0.2145 | 0.5 | 90 |
| IVP0000115 | 3/29/99 | 11:50:00 | 303 | 107 | Scaler | Alpha | Gross | 14.0 | dpm/100cm2 | 0 | dpm/100cm2 | 0.2145 | 3.0 | 90 |
| IVP0000116 | 3/27/99 | 17:55:00 | 303 | 107 | Scaler | Alpha | Gross | 17.2 | dpm/100cm2 | 0 | dpm/100cm2 | 0.2145 | 3.7 | 90 |
| IVP0000117 | 3/29/99 | 11:38:00 | 303 | 107 | Scaler | Alpha | Gross | 11.4 | dpm/100cm2 | 0 | dpm/100cm2 | 0.2145 | 2.4 | 90 |
| IVP0000118(M) | 3/29/99 | | 303 | 107 | Scaler | Alpha | Gross | 22.8 | dpm/100cm2 | 0 | dpm/100cm2 | 0.2145 | 4.9 | 90 |
| IVP0000119(M) | 3/29/99 | 11:41:00 | 303 | 107 | Scaler | Alpha | Gross | 5.0 | dpm/100cm2 | 0 | dpm/100cm2 | 0.2145 | 1.1 | 90 |
| IVP0000120 | 3/27/99 | 16:49:00 | 303 | 107 | Scaler | Alpha | Gross | 11.0 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 2.3 | 90 |
| IVP0000121 | 3/27/99 | 16:20:00 | 303 | 140 | Scaler | Alpha | Gross | 18.0 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 4.2 | 90 |
| IVP0000125 | 3/27/99 | 16:03:00 | 303 | 140 | Scaler | Alpha | Gross | 17.7 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 4.1 | 90 |
| IVP0000127 | 3/27/99 | 15:44:00 | 303 | 140 | Scaler | Alpha | Gross | 20.4 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 4.7 | 90 |
| IVP0000129 | 3/27/99 | 15:38:00 | 303 | 140 | Scaler | Alpha | Gross | 26.4 | dpm/100cm2 | 0 | dpm/100cm2 | 0.231 | 6.1 | 90 |
| **Mean of Replicate Measurements** | | | | | | | | | | | | | | |

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## Surface Media Sample Data, Building 729, Survey Unit 729-01
## Alpha Isotopic Analysis

| Sample Location | Sample ID# | Lab Sample ID# | Sample Weight | Date Collected | Time Collected | Units | Am-241 | | Pu-239/240 | | Pu-238 | | U-238 | U-235 | | U-234 | Total Transuranic Activity | Total Uranium Activity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (grams) | MM/DD/YY | | | Reported Value | Reported Value (w/ samples less than MDA @ 0.5 MDA) | Reported Value | Reported Value (w/ samples less than MDA @ 0.5 MDA) | Reported Value | Reported Value (w/ samples less than MDA @ 0.5 MDA) | Reported Value | Reported Value | Reported Value (w/ samples less than MDA @ 0.5 MDA) | Reported Value | dpm/100 cm$^2$ | dpm/100 cm$^2$ |
| IVP0000102 | MED0000102 | 258181 | 23.85 | 03/29/99 | 14:30 | dpm/100 cm$^2$ | 2.32 | 2.32 | 2.46 | 1.22 | 1.13 | 0.57 | 112.00 | 6.00 | 6.00 | 121.00 | 4.11 | 239.00 |
| IVP0000103 | MED0000103 | 258182 | 26.87 | 03/29/99 | 14:10 | dpm/100 cm$^2$ | 2.33 | 2.33 | 1.66 | 0.83 | 1.06 | 0.53 | 45.14 | 3.82 | 1.91 | 48.79 | 3.99 | 93.84 |
| IVP0000104 | MED0000104 | 258183 | 32.07 | 03/29/99 | 13:50 | dpm/100 cm$^2$ | 4.31 | 4.31 | 2.10 | 1.00 | 1.58 | 0.79 | 34.32 | 4.85 | 2.43 | 35.80 | 6.19 | 72.35 |
| IVP0000105 | MED0000105 | 258184 | 37.17 | 03/29/99 | 13:25 | dpm/100 cm$^2$ | 4.14 | 4.14 | 2.15 | 1.00 | 2.16 | 1.08 | 79.11 | 5.39 | 2.70 | 78.05 | 6.29 | 159.86 |
| IVP0000106 | MED0000106 | 258185 | 29.63 | 03/29/99 | 12:25 | dpm/100 cm$^2$ | 2.50 | 2.50 | 2.26 | 1.13 | 1.98 | 0.99 | 62.16 | 4.27 | 4.27 | 64.65 | 4.82 | 131.06 |
| IVP0000107 | MED0000107 | 258186 | 20.14 | 03/29/99 | 11:45 | dpm/100 cm$^2$ | 2.55 | 2.55 | 1.96 | 0.98 | 1.62 | 0.81 | 86.29 | 2.69 | 1.35 | 63.20 | 4.35 | 130.84 |
| IVP0000108 | MED0000108 | 258187 | 17.64 | 03/29/99 | 12:13 | dpm/100 cm$^2$ | 1.98 | 1.98 | 1.28 | 0.64 | 1.16 | 0.58 | 56.80 | 3.35 | 3.35 | 59.84 | 3.20 | 119.99 |
| IVP0000109 | MED0000109 | 258188 | 26.45 | 03/29/99 | 10:25 | dpm/100 cm$^2$ | 1.91 | 1.91 | 2.68 | 1.34 | 1.82 | 0.91 | 41.26 | 3.21 | 3.21 | 41.99 | 4.16 | 86.46 |
| IVP0000110 | MED0000110 | 258189 | 12.89 | 03/27/99 | 15:45 | dpm/100 cm$^2$ | 0.94 | 0.47 | 0.90 | 0.45 | 0.90 | 0.45 | 27.54 | 1.56 | 1.56 | 32.32 | 1.37 | 61.42 |
| IVP0000111 | MED0000111 | 258190 | 31.25 | 03/29/99 | 10:05 | dpm/100 cm$^2$ | 2.50 | 2.50 | 1.52 | 0.76 | 2.09 | 1.05 | 90.55 | 6.44 | 6.44 | 102.70 | 4.30 | 199.89 |
| IVP0000112 | MED0000112 | 258191 | 26.73 | 03/29/99 | 9:45 | dpm/100 cm$^2$ | 4.11 | 4.11 | 2.68 | 1.34 | 1.45 | 0.72 | 47.80 | 4.02 | 2.01 | 48.96 | 6.18 | 98.57 |
| IVP0000113 | MED0000113 | 258192 | 22.14 | 03/27/99 | 16:34 | dpm/100 cm$^2$ | 1.43 | 0.72 | 1.54 | 0.77 | 1.54 | 0.77 | 27.86 | 2.26 | 1.13 | 29.15 | 2.26 | 58.14 |
| IVP0000114 | MED0000114 | 258193 | 19.51 | 03/29/99 | 8:42 | dpm/100 cm$^2$ | 3.77 | 3.77 | 1.75 | 0.87 | 0.51 | 0.26 | 25.87 | 2.26 | 1.13 | 25.35 | 4.90 | 52.15 |
| IVP0000115 | MED0000115 | 258194 | 57.35 | 03/29/99 | 10:48 | dpm/100 cm$^2$ | 4.41 | 4.41 | 4.03 | 4.03 | 2.28 | 1.14 | 121.80 | 8.56 | 8.56 | 150.80 | 8.57 | 289.96 |
| IVP0000116 | MED0000116 | 258195 | 23.07 | 03/27/99 | 17:01 | dpm/100 cm$^2$ | 1.85 | 1.85 | 2.41 | 1.21 | 1.30 | 0.65 | 28.44 | 3.61 | 1.80 | 33.46 | 3.70 | 63.70 |
| IVP0000117 | MED0000117 | 258196 | 14.16 | 03/29/99 | 9:25 | dpm/100 cm$^2$ | 0.69 | 0.35 | 0.79 | 0.79 | 0.76 | 0.38 | 25.85 | 2.66 | 2.66 | 25.41 | 1.52 | 53.92 |
| IVP0000118 | MED0000118 | 258197 | 34.21 | 03/29/99 | 11:10 | dpm/100 cm$^2$ | 10.11 | 10.11 | 74.09 | 74.09 | 2.81 | 2.81 | 103.20 | 6.06 | 6.06 | 101.40 | 67.01 | 210.66 |
| IVP0000119 | MED0000119 | 258198 | 36.09 | 03/29/99 | 8:55 | dpm/100 cm$^2$ | 4.87 | 4.87 | 2.01 | 1.01 | 2.61 | 1.61 | 46.38 | 4.82 | 2.31 | 45.04 | 6.86 | 93.74 |
| IVP0000120 | MED0000120 | 258199 | 18.72 | 03/27/99 | 16:46 | dpm/100 cm$^2$ | 1.47 | 1.47 | 1.23 | 0.61 | 1.08 | 0.54 | 25.39 | 2.24 | 2.24 | 24.04 | 2.82 | 51.67 |
| IVP0000121 | MED0000121 | 258200 | 10.41 | 03/27/99 | 15:26 | dpm/100 cm$^2$ | 0.78 | 0.39 | 0.97 | 0.48 | 0.79 | 0.40 | 37.66 | 1.97 | 1.97 | 41.19 | 1.27 | 80.82 |
| IVP0000125 | MED0000125 | 258201 | 7.81 | 03/27/99 | 15:10 | dpm/100 cm$^2$ | 0.49 | 0.24 | 0.57 | 0.28 | 0.52 | 0.26 | 36.07 | 1.79 | 1.79 | 37.04 | 0.79 | 74.90 |
| IVP0000127 | MED0000127 | 258202 | 4.3 | 03/27/99 | 12:30 | dpm/100 cm$^2$ | 0.29 | 0.15 | 0.38 | 0.19 | 0.26 | 0.13 | 19.86 | 0.91 | 0.91 | 20.58 | 0.47 | 41.36 |
| IVP0000129 | MED0000129 | 258203 | 18.08 | 03/27/99 | 14:44 | dpm/100 cm$^2$ | 1.50 | 1.50 | 1.17 | 0.59 | 1.17 | 0.59 | 55.30 | 1.96 | 1.96 | 67.55 | 2.67 | 124.83 |

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# Appendix F

# Duplicate Sample Data

FAX NO. 303 966 2864

LIBRARY LDF 706



## Surface Media Survey Results

| Survey Unit | Sample Location | Other Sample Results: Total Activity (dpm/100 cm²) | Removable Activity (dpm/100 cm²) | MDA |
|---|---|---|---|---|
| 72901 | 1C | N/A | 0.0 | 4.1 |
| 72901 | 2C | N/A | 4.5 | 4.1 |
| 72901 | 3C | N/A | 0.0 | 4.1 |
| 72901 | 6C | N/A | 1.5 | 4.1 |
| 72901 | 8C | N/A | 28.5 | 4.1 |
| 72901 | 10C | N/A | 57.0 | 4.1 |
| | | | | |
| | | | | |
| | | | | |

SAC-4
#1407
Bkg = 0.0 cpm
MDA = 4.1
EFF = 33.3%
Cal due date
9/25/99

**Data Entered By:** JOHN R. HORTON [redacted] 4/5/99

Printed Name | Employee # | Signature | Date

**Data Reviewed By:** Michael Grube [redacted] 4/5/99

Printed Name | Employee # | Signature | Date

**Post-It™** brand fax transmittal memo 7671 | # of pages ▸ 1

| | |
|---|---|
| To Steve Rima | From Mike Grube |
| Co. | Co. |
| Dept. | Phone # (303) 966-2863 |
| Fax # 970-248-6725 | Fax # (303) 966-2864 |

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*Cross Reference Table for Blank and Spiked Samples for Survey Unit 729–01*

| Sample Location (Contractor) | Sample Ticket Number (IVC) | Date Transferred | Smear Number |
|---|---|---|---|
| 1C | NED–428 | 03/29/99 | 1 |
| 2C | NED–429 | 03/29/99 | 2 |
| 3C | NED–430 | 03/29/99 | 3 |
| 6C | NDL–289 | 03/29/99 | 6 |
| 8C | NDL–291 | 03/29/99 | 8 |
| 10C | NDL–293 | 03/29/99 | 10 |
| SMR0000591 | NDL–299 | 03/29/99 | |
| SMR0000592 | NDL–297 | 03/29/99 | |
| SMR0000593 | NDL–295 | 03/29/99 | |
| SMR0000594 | | 03/29/99 | |
| SMR0000595 | | 03/29/99 | |
| SMR0000596 | | 03/29/99 | |

The Chain-of-Sample Custody forms will be included with a later report.

# Appendix G

# Instrument Calibration Data

Probe HP-100 107 continued...

Channel 1

| | |
|---|---|
| Channel Type | : Alpha |
| Rate Units | : dpm/100cm2 |
| Response Times | : 22,10,3 secs |
| High Voltage | : 1553 Vdc |
| Lower Threshold | : 1.00 mV |
| Upper Threshold | : 27.1 mV |
| Selected Window | : Upper |
| Upper Cal. Constant | : 0.2145 counts/disint. |
| Scaler Time | : 90 secs |
| Lower to Upper Crossover | : 0.0020 |
| Upper to Lower Crossover | : 0.0740 |

Channel 2

| | |
|---|---|
| Channel Type | : Beta |
| Rate Units | : dpm/100cm2 |
| Response Times | : 22,10,3 secs |
| High Voltage | : 1553 Vdc |
| Lower Threshold | : 1.00 mV |
| Upper Threshold | : 27.1 mV |
| Selected Window | : Lower |
| Lower Cal. Constant | : 0.3183 counts/disint. |
| Scaler Time | : 90 secs |
| Lower to Upper Crossover | : 0.0020 |
| Upper to Lower Crossover | : 0.0740 |

Channel 3

| | |
|---|---|
| Channel Type | : Alpha/Beta |
| Rate Units | : dpm/100cm2 |
| Response Times | : 22,10,3 secs |
| High Voltage | : 1553 Vdc |
| Lower Threshold | : 1.00 mV |
| Upper Threshold | : 27.1 mV |
| Selected Window | : Both |
| Lower Cal. Constant | : 0.3183 counts/disint. |
| Upper Cal. Constant | : 0.2145 counts/disint. |
| Scaler Time | : 90 secs |
| Lower to Upper Crossover | : 0.0020 |
| Upper to Lower Crossover | : 0.0822 |

Cable Length: 60 inches

Signature: [illegible] Date: 2/26/99

# EBERLINE E-600 CALIBRATION REPORT

03/29/99 15:36:42

| | | |
|---|---|---|
| E-600 Serial Number | : | 303 (#15620) |
| Program Version | : | E600 V3.12 |
| Calibration Date/Due Date | : | 08/07/98 to 08/07/99 |
| Scaler Precision | : | 10% |
| Lower Threshold Slope | : | 0.9048 |
| Lower Threshold Intercept | : | -0.0857 mV |
| Upper Threshold Slope | : | 1.06 |
| Upper Threshold Intercept | : | -0.5185 mV |
| Alarm Editing | : | Enabled |
| Latching Alarms | : | Enabled |
| Auto Ranging | : | Disabled |
| Beep on Auto-Range | : | No |
| Ignore E-600 Cal. Date | : | No |
| Ignore Probe Cal. Date | : | No |
| Ratemeter Mode Support | : | Enabled |
| Integrate Mode Support | : | Enabled |
| Scaler Mode Support | : | Enabled |
| Peak Hold Mode Support | : | Enabled |
| Background Update Mode Support | : | Enabled |
| Log ID Source | : | Internal/Aux. |
| Star Key Ratemeter Function | : | Zero Display |
| Star Key Integrate Function | : | Zero Display |
| Scaler Display Units | : | Rate |
| Scaler Counting Mode | : | Fixed Time |
| Smart Probe Serial Number | : | 107 (#15349) |
| Type | : | HP-100 |
| Calibration Date/Due Date | : | 02/26/99 to 02/26/00 |
| Dead Time | : | 7.50 usec |
| Surface Area | : | 100 cm2 |
| Max High Voltage | : | 1900 Vdc |
| Overrange | : | 80000 cps |

EBERLINE E-600 CALIBRATION REPORT

03/26/99 11:55:28

| | |
|---|---|
| E-600 Serial Number | : 303 (#15620) |
| Program Version | : E600 V3.12 |
| Calibration Date/Due Date | : 08/07/98 to 08/07/99 |
| Scaler Precision | : 10% |
| Lower Threshold Slope | : 0.9048 |
| Lower Threshold Intercept | : -0.0857 mV |
| Upper Threshold Slope | : 1.06 |
| Upper Threshold Intercept | : -0.5185 mV |
| Alarm Editing | : Enabled |
| Latching Alarms | : Enabled |
| Auto Ranging | : Disabled |
| Beep on Auto-Range | : No |
| Ignore E-600 Cal. Date | : No |
| Ignore Probe Cal. Date | : No |
| Ratemeter Mode Support | : Enabled |
| Integrate Mode Support | : Enabled |
| Scaler Mode Support | : Enabled |
| Peak Hold Mode Support | : Enabled |
| Background Update Mode Support | : Enabled |
| Log ID Source | : Internal/Aux. |
| Star Key Ratemeter Function | : Zero Display |
| Star Key Integrate Function | : Zero Display |
| Scaler Display Units | : Rate |
| Scaler Counting Mode | : Fixed Time |
| Smart Probe Serial Number | : 140 (#16338) |
| Type | : HP-100 |
| Calibration Date/Due Date | : 02/25/99 to 02/25/00 |
| Dead Time | : 7.50 usec |
| Surface Area | : 100 cm2 |
| Max High Voltage | : 1900 Vdc |
| Overrange | : 80000 cps |

RECORD COPY

430

Probe HP-100 140 continued...

Channel 1

| | |
|---|---|
| Channel Type | : Alpha |
| Rate Units | : dpm/100cm2 |
| Response Times | : 22,10,3 secs |
| High Voltage | : 1572 Vdc |
| Lower Threshold | : 1.00 mV |
| Upper Threshold | : 27.1 mV |
| Selected Window | : Upper |
| Upper Cal. Constant | : 0.2310 counts/disint. |
| Scaler Time | : 90 secs |
| Lower to Upper Crossover | : 0.0010 |
| Upper to Lower Crossover | : 0.0860 |

Channel 2

| | |
|---|---|
| Channel Type | : Beta |
| Rate Units | : dpm/100cm2 |
| Response Times | : 22,10,3 secs |
| High Voltage | : 1572 Vdc |
| Lower Threshold | : 1.00 mV |
| Upper Threshold | : 27.1 mV |
| Selected Window | : Lower |
| Lower Cal. Constant | : 0.3174 counts/disint. |
| Scaler Time | : 90 secs |
| Lower to Upper Crossover | : 0.0010 |
| Upper to Lower Crossover | : 0.0860 |

Channel 3

| | |
|---|---|
| Channel Type | : Alpha/Beta |
| Rate Units | : dpm/100cm2 |
| Response Times | : 22,10,3 secs |
| High Voltage | : 1572 Vdc |
| Lower Threshold | : 1.00 mV |
| Upper Threshold | : 27.1 mV |
| Selected Window | : Both |
| Lower Cal. Constant | : 0.3174 counts/disint. |
| Upper Cal. Constant | : 0.2310 counts/disint. |
| Scaler Time | : 90 secs |
| Lower to Upper Crossover | : 0.0010 |
| Upper to Lower Crossover | : 0.0859 |

Cable Length: 60 inches

Signature: LIVERY Date: 2/25/99

EBERLINE E-600 CALIBRATION REPORT

03/27/99 08:06:37

| | |
|---|---|
| E-600 Serial Number | : 303 (#15620) |
| Program Version | : E600 V3.12 |
| Calibration Date/Due Date | : 08/07/98 to 08/07/99 |
| Scaler Precision | : 10% |
| Lower Threshold Slope | : 0.9048 |
| Lower Threshold Intercept | : -0.0857 mV |
| Upper Threshold Slope | : 1.06 |
| Upper Threshold Intercept | : -0.5185 mV |
| Alarm Editing | : Enabled |
| Latching Alarms | : Enabled |
| Auto Ranging | : Disabled |
| Beep on Auto-Range | : No |
| Ignore E-600 Cal. Date | : No |
| Ignore Probe Cal. Date | : No |
| Ratemeter Mode Support | : Enabled |
| Integrate Mode Support | : Enabled |
| Scaler Mode Support | : Enabled |
| Peak Hold Mode Support | : Enabled |
| Background Update Mode Support | : Enabled |
| Log ID Source | : Internal/Aux. |
| Star Key Ratemeter Function | : Zero Display |
| Star Key Integrate Function | : Zero Display |
| Scaler Display Units | : Rate |
| Scaler Counting Mode | : Fixed Time |

| | |
|---|---|
| Smart Probe Serial Number | : 142 (#16339) |
| Type | : HP-100 |
| Calibration Date/Due Date | : 02/25/99 to 02/25/00 |
| Dead Time | : 7.50 usec |
| Surface Area | : 100 cm2 |
| Max High Voltage | : 1900 Vdc |
| Overrange | : 80000 cps |

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432

Probe HP-100 142 continued...

Channel 1

| | |
|---|---|
| Channel Type | : Alpha |
| Rate Units | : dpm/100cm2 |
| Response Times | : 22,10,3 secs |
| High Voltage | : 1533 Vdc |
| Lower Threshold | : 1.00 mV |
| Upper Threshold | : 27.1 mV |
| Selected Window | : Upper |
| Upper Cal. Constant | : 0.2210 counts/disint. |
| Scaler Time | : 90 secs |
| Lower to Upper Crossover | : 0.0 |
| Upper to Lower Crossover | : 0.1120 |

Channel 2

| | |
|---|---|
| Channel Type | : Beta |
| Rate Units | : dpm/100cm2 |
| Response Times | : 22,10,3 secs |
| High Voltage | : 1533 Vdc |
| Lower Threshold | : 1.00 mV |
| Upper Threshold | : 27.1 mV |
| Selected Window | : Lower |
| Lower Cal. Constant | : 0.2512 counts/disint. |
| Scaler Time | : 90 secs |
| Lower to Upper Crossover | : 0.0 |
| Upper to Lower Crossover | : 0.1120 |

Channel 3

| | |
|---|---|
| Channel Type | : Alpha/Beta |
| Rate Units | : dpm/100cm2 |
| Response Times | : 22,10,3 secs |
| High Voltage | : 1533 Vdc |
| Lower Threshold | : 1.00 mV |
| Upper Threshold | : 27.1 mV |
| Selected Window | : Both |
| Lower Cal. Constant | : 0.2512 counts/disint. |
| Upper Cal. Constant | : 0.2210 counts/disint. |
| Scaler Time | : 90 secs |
| Lower to Upper Crossover | : 0.0 |
| Upper to Lower Crossover | : 0.1117 |

Cable Length: 60 inches

Signature: [signature] Date: 2/25/99

# After-Calibration Source Response Check Data Sheet

Location RFETS, BLD. 729, 779 CLUSTER
Month MAR Day 27 Year 1999

**Survey Instrument Data**

Manufacturer EBERLINE
Model No. E600
Government Property No. S15620 (303)
Calibration Due Date 8-~~10~~-99 ~~8~~ 7

**Detector/Probe Data** *(if applicable)*

Manufacturer EBERLINE
Model No. HP-100
Government Property No. S15349 (107)
Calibration Due Date 2-26-00

**Check Source Data**

Isotope Pu-238
Source I.D. No. ER-716 / RS-3911
ASSAY = 194400 dpm

| Instrument Scale | Source Detector Distance | Shielding/Geometry | Instrument Response | -20% | +20% | Scale Units |
|---|---|---|---|---|---|---|
| AUTO | 1/4" | Source Centered under Detector | 180,200 | 144,160 | 216,240 | dpm/100 cm² |
| | | | | | | |
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| | | | | | | |

Comments:

JEFFREY LIVELY
Performed by (print)

[signature]
Performed by (signature)

3/27/99
Date

Steve Rima
Reviewed by (print)

[signature]
Reviewed by (signature)

5/24/99
Date

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11/98

File Index No. _____

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# Daily Instrument Response Check Data Sheet

Page 2 of ___

Source ID No. ER-716 Isotope Pu-238 Scale Units dpm/100 cm² Property No. S15349

Detector Model E600 Property No. S15620 Probe Model HP-100

Month MARCH Year 1999 Month ___ Year ___

**Initial below and on the Instrument Response Check Sticker if daily response check is satisfactory**

| Day | Response (Scale or Decade) | | | | | Initials |
|---|---|---|---|---|---|---|
| 1 | 1614 | | 179,900 | | | PGW |
| 2 | | PGW | ~~179,900~~ ~~177,000~~ | | | |
| 3 | 1617 | | 179,000 | | | PGW |
| 4 | 1715 | | 179,100 | | | PGW |
| 5 | 1717 | | 179,000 | | | PGW |
| 6 | 0955 | | 177,500 | | | JB/[illegible] |
| 7 | 0958 | | 177,000 | | | JB/[illegible] |
| 8 | 1000 | | 175,900 | | | JB/[illegible] |
| 9 | 1032 | | 178,100 | | | [illegible] |
| 10 | 1035 | | 177,200 | | | [illegible] |
| 11 | 1208 | | 174,000 | | | [illegible] |
| 12 | 1210 | | 174,300 | | | [illegible] |
| 13 | 1335 | | 178,800 | | | JB/[illegible] |
| 14 | 1337 | | 179,700 | | | JB/[illegible] |
| 15 | 1455 | | 177,500 | | | JB/[illegible] |
| 16 | 1457 | | 178,200 | | | JB/[illegible] |
| 17 | 1515 | | 177,800 | | | JB/[illegible] |
| 18 | 1517 | | 178,100 | | | JB/[illegible] |
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| 31 | | | | | | |

**Initial below and on the Instrument Response Check Sticker if daily response check is satisfactory**

| Day | Response (Scale or Decade) | | | | | Initials |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
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Steve Rima / [signature]
Reviewed by (print and sign)

5/24/99
Date

Reviewed by (print and sign)

Date

File Index No. ___

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11/98

# After-Calibration Source Response Check Data Sheet

Location RFETS, BLDG 729, 779 CLUSTER

Month MAR Day 26 Year 1999

**Survey Instrument Data**

Manufacturer EBERLINE

Model No. E 600

Government Property No. S15620 (303)

Calibration Due Date 8/~~10~~7/99

**Detector/Probe Data** *(if applicable)*

Manufacturer EBERLINE

Model No. HP-100

Government Property No. S16338 (140)

Calibration Due Date 2/25/2000

**Check Source Data**

Isotope Pu-238

Source I.D. No. ER-716 / RS-3911

ASSAY = 194400 dpm

| Instrument Scale | Source Detector Distance | Shielding/Geometry | Instrument Response | -20% | +20% | Scale Units |
|---|---|---|---|---|---|---|
| AUTO | 1/4" | SOURCE CENTERED UNDER DETECTOR | 186,300 | 149,040 | 223,560 | dpm/100 cm² |
| | | | | | | |
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Comments:

JEFFREY LIVELY — Performed by (print)

[signature] — Performed by (signature)

3/26/99 — Date

Steve Rima — Reviewed by (print)

[signature] — Reviewed by (signature)

5/24/99 — Date

File Index No. _____

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11/98

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# Daily Instrument Response Check Data Sheet

Page 2 of ___

Source ID No. ER-716 Isotope Pu-238 Scale Units dpm/100 cm² Property No. $16338

Detector Model E600 Property No. $15620 Probe Model HP-100 Year ___

Month MARCH Year 1999 Month ___

Initial below and on the Instrument Response Check Sticker if daily response check is satisfactory

| Day | Response (Scale or Decade) | | | | | Initials |
|---|---|---|---|---|---|---|
| 1 | 1220 | | 186,000 | | | [illegible] |
| 2 | 1345 | | 171,000 | | | [illegible] |
| 3 | 1402 | | 168,400 | | | [illegible] |
| 4 | 1403 | | 170,100 | | | [illegible] |
| 5 | 1117 | | 176,700 | | | PGW |
| 6 | 1119 | | 179,900 | | | PGW |
| 7 | 1120 | | 180,200 | | | PGW |
| 8 | 1245 | | 177,300 | | | PGW |
| 9 | 1316 | | 174,800 | | | PGW |
| 10 | 1318 | | 174,600 | | | PGW |
| 11 | 1405 | | 179,300 | | | PGW |
| 12 | 1406 | | 179,300 | | | PGW |
| 13 | 1551 | | 176,900 | | | PGW |
| 14 | | PGW | | | | PGW |
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Initial below and on the Instrument Response Check Sticker if daily response check is satisfactory

| Day | Response (Scale or Decade) | | | | | Initials |
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Steve Rima

Reviewed by (print and sign)

5/24/99

Date

Reviewed by (print and sign)

Date

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11/98

# After-Calibration Source Response Check Data Sheet

Location RFETS (BUILDING CLUSTER 779)
Month MARCH Day 27 Year 1999

**Survey Instrument Data**

Manufacturer EBERLINE
Model No. E600
Government Property No. $15620 (303)
Calibration Due Date 8/27/99

**Detector/Probe Data** *(if applicable)*

Manufacturer EBERLINE
Model No. HP-100
Government Property No. $16339 (142)
Calibration Due Date 2/25/99

**Check Source Data**

Isotope Pu-238
Source I.D. No. ER-716 (RS-3911)

| Instrument Scale | Source Detector Distance | Shielding/Geometry | Instrument Response | -20% | +20% | Scale Units |
|---|---|---|---|---|---|---|
| AUTO | 0.25" | SOURCE IN CARDBOARD JIG | 186,700 | 149,360 | 224,040 | dpm/100cm² |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Comments:

JEFFREY LIVELY — Performed by (print)
[signature] — Performed by (signature)
3/27/99 — Date

Steve Rima — Reviewed by (print)
[signature] — Reviewed by (signature)
5/24/99 — Date

File Index No. _____

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11/98

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# Daily Instrument Response Check Data Sheet

Source ID No. ER-716 Isotope Pu-238 Scale Units dpm/100 cm² Page 2 of ___

Detector Model E600 Property No. 315620 Probe Model HP-100 Property No. 316339

Month MARCH Year 1999 Month ___ Year ___

| | Day | Response (Scale or Decade) | | | | | Initials |
|---|---|---|---|---|---|---|---|
| | | Initial below and on the Instrument Response Check Sticker if daily response check is satisfactory | | | | | |
| 27 | 1 | 0835 | | 185,700 | | | [illegible] |
| 27 | 2 | 0838 | | 185,100 | | | [illegible] |
| 27 | 3 | 0840 | | 186,100 | | | [illegible] |
| 27 | 4 | 0940 | | 188,100 | | | [illegible] |
| 27 | 5 | 0943 | | 187,400 | | | [illegible] |
| 27 | 6 | 1110 | | 186,900 | | | PGW |
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| | 31 | | | | | | |

| Day | Response (Scale or Decade) | | | | | Initials |
|---|---|---|---|---|---|---|
| | Initial below and on the Instrument Response Check Sticker if daily response check is satisfactory | | | | | |
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Steve Rima / [illegible]
Reviewed by (print and sign)

5/24/99
Date

Reviewed by (print and sign)

Date

File Index No. ___

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11/98

# Appendix H

# Raw Data

This appendix contains the raw ASCI text file data downloaded directly from the E600 instruments' memories without modification, sorting, or data reduction of any kind. The data are actually contained in three separate ASCI files, one file corresponding to each data in which information was collected. One unique aspect of this data presentation is that the data is presented exactly in the chronological order in which it was collected in the field. This provides an electronic time stamp permitting verification that time criteria included in the field operating procedures associated with the IV SAP were met.

"Survey Location","Log Date","Log Time","Probe S/N","Log Mode","Channel Type","Reading","Gross/Net","Units","E-600 S/N","E-600 Address","Stored Bkg","Bkg Units","Status"

"BACKGROUND","03/26/99","13:26:00","140","Scaler","Alpha",1.27E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"BACKGROUND","03/26/99","13:30:00","140","Scaler","Alpha",9.80E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000101","03/26/99","13:35:00","140","Scaler","Alpha",1.77E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000102","03/26/99","13:38:00","140","Scaler","Alpha",3.38E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000103","03/26/99","13:40:00","140","Scaler","Alpha",1.81E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000104","03/26/99","13:45:00","140","Scaler","Alpha",1.24E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000105","03/26/99","13:47:00","140","Scaler","Alpha",9.67E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000106","03/26/99","13:50:00","140","Scaler","Alpha",2.40E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000107","03/26/99","13:52:00","140","Scaler","Alpha",9.29E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"BACKGROUND","03/26/99","13:54:00","140","Scaler","Alpha",2.17E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000108","03/26/99","13:57:00","140","Scaler","Alpha",9.42E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000109","03/26/99","14:00:00","140","Scaler","Alpha",9.68E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000111","03/26/99","14:06:00","140","Scaler","Alpha",6.60E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000112","03/26/99","14:11:00","140","Scaler","Alpha",1.12E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000113","03/26/99","14:14:00","140","Scaler","Alpha",6.87E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000114","03/26/99","14:17:00","140","Scaler","Alpha",9.90E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000115","03/26/99","14:20:00","140","Scaler","Alpha",9.81E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000117","03/26/99","14:26:00","140","Scaler","Alpha",9.87E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"BACKGROUND","03/26/99","14:30:00","140","Scaler","Alpha",1.61E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000118","03/26/99","14:42:00","140","Scaler","Alpha",3.28E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000119","03/26/99","14:48:00","140","Scaler","Alpha",7.26E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000120","03/26/99","14:51:00","140","Scaler","Alpha",7.41E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"BACKGROUND","03/26/99","14:58:00","140","Scaler","Alpha",1.64E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"

"Survey Location","Log Date","Log Time","Probe S/N","Log Mode","Channel Type","Reading","Gross/Net","Units","E-600 S/N","E-600 Address","Stored Bkg","Bkg Units","Status"
"BACKGROUND","03/27/99","10:22:00","142","Scaler","Alpha",9.05E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"BACKGROUND","03/27/99","10:23:00","142","Scaler","Alpha",3.02E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000121","03/27/99","11:03:00","142","Scaler","Alpha",4.22E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000129","03/27/99","11:14:00","142","Scaler","Alpha",3.02E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000128","03/27/99","11:24:00","142","Scaler","Alpha",1.21E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000125","03/27/99","11:32:00","142","Scaler","Alpha",2.72E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000122","03/27/99","11:40:00","142","Scaler","Alpha",6.03E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000123","03/27/99","11:50:00","142","Scaler","Alpha",3.32E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"BACKGROUND","03/27/99","11:56:00","142","Scaler","Alpha",3.62E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"BACKGROUND","03/27/99","11:59:00","142","Scaler","Alpha",3.62E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"BACKGROUND","03/27/99","12:14:00","140","Scaler","Alpha",7.17E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"BACKGROUND","03/27/99","12:17:00","140","Scaler","Alpha",4.17E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000123","03/27/99","12:24:00","140","Scaler","Alpha",1.49E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000121","03/27/99","12:33:00","140","Scaler","Alpha",2.35E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000122","03/27/99","12:39:00","140","Scaler","Alpha",6.29E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000125","03/27/99","12:43:00","140","Scaler","Alpha",2.92E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000129","03/27/99","12:46:00","140","Scaler","Alpha",2.64E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000128","03/27/99","12:49:00","140","Scaler","Alpha",1.49E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000127","03/27/99","13:01:00","140","Scaler","Alpha",4.08E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000124","03/27/99","13:44:00","140","Scaler","Alpha",2.09E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000126","03/27/99","14:00:00","140","Scaler","Alpha",2.12E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"BACKGROUND","03/27/99","15:06:00","140","Scaler","Alpha",2.14E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"BACKGROUND","03/27/99","15:08:00","140","Scaler","Alpha",3.29E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"BACKGROUND","03/27/99","15:11:00","140","Scaler","Alpha",1.85E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"48","03/27/99","15:38:00","140","Scaler","Alpha",2.64E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000129","03/27/99","15:38:00","140","Scaler","Alpha",2.64E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000127","03/27/99","15:44:00","140","Scaler","Alpha",2.04E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000125","03/27/99","16:03:00","140","Scaler","Alpha",1.77E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000121","03/27/99","16:20:00","140","Scaler","Alpha",1.80E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000110","03/27/99","16:38:00","140","Scaler","Alpha",3.71E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"BACKGROUND","03/27/99","16:44:00","140","Scaler","Alpha",4.33E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"BACKGROUND","03/27/99","16:59:00","107","Scaler","Alpha",3.65E+01,"Gross","dpm/100cm2",303,0,3.96E-17,"dpm/100cm2","Normal"
"BACKGROUND","03/27/99","17:00:00","107","Scaler","Alpha",1.82E+01,"Gross","dpm/100cm2",303,0,3.96E-17,"dpm/100cm2","Normal"
"IVP0000113","03/27/99","17:28:00","107","Scaler","Alpha",4.71E+00,"Gross","dpm/100cm2",303,0,3.96E-17,"dpm/100cm2","Normal"
"IVP0000116","03/27/99","17:55:00","107","Scaler","Alpha",1.72E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"BACKGROUND","03/27/99","18:01:00","107","Scaler","Alpha",2.14E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"BACKGROUND","03/27/99","18:04:00","107","Scaler","Alpha",2.44E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"

"Survey Location","Log Date","Log Time","Probe S/N","Log Mode","Channel Type","Reading","Gross/Net","Units","E-600 S/N","E-600 Address","Stored Bkg","Bkg Units","Status"

"BACKGROUND","03/29/99","10:40:00","107","Scaler","Alpha",3.67E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"BACKGROUND","03/29/99","10:42:00","107","Scaler","Alpha",6.23E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000112","03/29/99","11:03:00","107","Scaler","Alpha",7.84E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000111","03/29/99","11:10:00","107","Scaler","Alpha",7.52E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000109","03/29/99","11:32:00","107","Scaler","Alpha",1.12E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000114","03/29/99","11:36:00","107","Scaler","Alpha",2.46E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000117","03/29/99","11:38:00","107","Scaler","Alpha",1.14E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000119","03/29/99","11:41:00","107","Scaler","Alpha",5.00E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"BACKGROUND","03/29/99","11:45:00","107","Scaler","Alpha",1.23E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"BACKGROUND","03/29/99","11:47:00","107","Scaler","Alpha",9.23E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000115","03/29/99","11:50:00","107","Scaler","Alpha",1.40E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000119","03/29/99","11:53:00","107","Scaler","Alpha",5.02E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000111","03/29/99","11:56:00","107","Scaler","Alpha",8.06E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"BACKGROUND","03/29/99","12:56:00","107","Scaler","Alpha",1.28E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"BACKGROUND","03/29/99","12:58:00","107","Scaler","Alpha",3.31E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"BACKGROUND","03/29/99","14:23:00","107","Scaler","Alpha",9.37E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"BACKGROUND","03/29/99","14:25:00","107","Scaler","Alpha",5.91E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000118","03/29/99","15:10:00","107","Scaler","Alpha",2.60E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000118","03/29/99","15:12:00","107","Scaler","Alpha",1.96E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000108","03/29/99","15:35:00","107","Scaler","Alpha",1.34E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000107","03/29/99","15:38:00","107","Scaler","Alpha",2.30E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"BACKGROUND","03/29/99","15:40:00","107","Scaler","Alpha",1.85E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"BACKGROUND","03/29/99","15:44:00","107","Scaler","Alpha",6.33E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000106","03/29/99","15:51:00","107","Scaler","Alpha",1.43E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000105","03/29/99","15:54:00","107","Scaler","Alpha",5.17E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000104","03/29/99","15:56:00","107","Scaler","Alpha",1.15E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000104","03/29/99","15:58:00","107","Scaler","Alpha",1.09E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000102","03/29/99","16:00:00","107","Scaler","Alpha",1.74E+01,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"IVP0000103","03/29/99","16:03:00","107","Scaler","Alpha",8.11E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"BACKGROUND","03/29/99","16:11:00","107","Scaler","Alpha",9.37E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"
"BACKGROUND","03/29/99","16:13:00","107","Scaler","Alpha",9.26E+00,"Gross","dpm/100cm2",303,0,0.0,"dpm/100cm2","Normal"