FINAL RADIOLOGICAL STATUS REPORT

Ft. McClellan

Pelham Range "Burial Mound"

Allied Technology Group Inc.
1550 Bear Creek Rd.
Kingston, TN 37763

October 2002

Final Radiological Status Report
Ft. McClellan, Pelham Range "Burial Mound"
Allied Technology Group Inc.

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1.0 Background Information

Fort McClellan is comprised of three parts, the Main Post, the Choccolocco Corridor, and the Pelham Range occupying 45,679 acres adjacent to Anniston, Alabama. The Main Post encompasses 19,000 acres and contains the majority of the facilities. The Choccolocco Corridor, approximately 4,500 acres, is leased from the State of Alabama and connects the Main Post with the Talladega National Forest to the east. Pelham Range consists of approximately 22,000 acres west of the Main Post.

The Army Base Closure and Realignment Committee (BRAC) identified Fort McClellan as an installation for closure. ATG determined acceptable site-specific concentrations for use as guideline values and has developed the comprehensive methodology to effect the removal and disposal of radiologically contaminated material in the 'Burial Mound' and perform a survey for the unconditional release of the area. The mound is contaminated with Cs-137 and Co-60. Disposition of the primary and incidental secondary waste streams shall be at Envirocare of Utah, or other licensed/authorized recipient.

The history of the base included training exercises for the Army Chemical Corp. for simulated large area radioactive contamination (fallout) from the surface detonation
of a small yield (less than 0.5 kiloton) nuclear weapon. The training concept was to raise and lower sealed radioactive sources, and have students perform both ground and aerial surveys to map the radiological fallout pattern. The training facility was utilized to train Radiation Control Teams in support of nuclear weapons testing performed by the Atomic Energy Commission (AEC). There was an AEC license issued for use of the sealed sources.

The Old Rideout Field used locally fabricated Co-60 sources and higher activity commercially procured Cs-137 sources. While the Co-60 sources were used to simulate a uniform fallout pattern, the Cs-137 sources were used to simulate hot spots within the fallout pattern. An excessive number of leaking locally fabricated Co-60 sources contributed to the formation of the on-site 'Burial Mound' for use as an interim on-site disposal cell. The contaminated soil resulting from historically leaking sources was accumulated and transported to the location is now designated as the 'Burial Mound'.

2.0 Site Information

2.1 Site Description

The actual 'Burial Mound' is observed as a slight elevation standing secluded from adjacent woodlands and drainage areas by open land all around. The 'Burial Mound' is located at the northwest corner of Pelham

Range, at the northern end of the Battle Drill Area of Range 24C. The mound is oblong in shape and is approximately 25 meters long by 15 meters wide at coordinates 593300 meters East, 3732500 meters North in Universal Transverse Mercator (UTM) Grid Zone 16. Ref: Industrial Radiation Study No. 27-MH-0987-R2-97, U.S. Army Center for Health Promotion and Preventive Medicine.

The mound was an irregular pile of soil to approximately 6' elevation above the surrounding grade, and covered with light vegetation. The footprint encompasses parts of six grids (10 m x 10 m), and contamination has been observed to a depth of 12' below grade.

The area surrounding the 'Burial Mound' was utilized as a training area for students at the U.S. Army Chemical and Military Police Schools, Active Duty Units, Reserve Units and Alabama National Guard Units. Subsequent to BRAC action, the area including the present 'Burial Mound' is to be remediated and turned over to the State for use by the National Guard.

2.2 Site Conditions at the Time of the Final Survey

In order to remediated the site the "Burial Mound" and 8 associated grids were excavated to a depth of ~4 meters (12 feet) below natural grade.

All material from the excavation was processed and monitored to determine the presence of radioactive material. Processing and monitoring was accomplished by placing the soil through a shredder/conveyor system.

The soil was fed into a hopper where it was chopped, shredded and fed onto a conveyor belt. The conveyor system passed the soil under an array of ten (10) 2in x 2in NaI detectors. Details of the system are found in Reference 1.

Those materials that were identified to exceed the DCGLs were packaged in intermodal containers and shipped for disposal, and the soils that were below the DCGLs were backfilled into the excavation and the site graded.

All site grading was completed. All equipment had been removed from the site.

2.3 Identity of Contaminants

Radiological characterization of the 'Burial Mound' was performed by the U.S. Army Center for Health Promotion and Preventive Medicine (CHPPM), reference Industrial Radiation Study No. 27-MH-0987-R2-97, Pelham Range Burial Mound Site, Fort McClellan, Alabama, 29 August - 15 September 1995 and 14 - 28 January 1996. The survey followed much

of the protocols of NUREG/CR-5849, including background determination, walkover surface scans, hole logging, and sample analysis. A total of 571 systematic random and select bias samples were analyzed for radiological parameters. Both elevated Co-60 and Cs-137 were observed in surface soil samples, but only elevated Co-60 was found in subsurface samples. Surveys and analysis performed during the remediation process indicated both Cs-137 and Co-60 contamination in the excavated material.

2.4 Waste Disposal

Site remediation resulted in the generation of 17 intermodal containers of waste soil, approximately 2000 pounds of contaminated Pb, and several items with discreet points of activity that were unacceptable for disposal with the soil waste stream.

Soil was shipped to Envirocare of Utah for disposal; Pb was shipped to both NSSI in Houston, TX and Permafix in Gainesville, FL. Discreet sources that had no Pb associated with them were shipped to the Duratek consolidation facility in Barnwell, SC; those that had Pb associated with them were shipped to NSSI in Houston.

Copies of the associated shipping papers are included in Appendix G.

2.5 Temporary Storage Area

Prior to shipping, all of the intermodal containers were moved to a temporary storage area in the paved parking lot of the SOTS-A site on the "Gate 5 road" on Pelham range. The NRC approved an amendment to the site license to provide for temporary storage of the material.

The containers were moved to allow access for shipping. The safety areas established around other work that conducted onsite would have prevented access to the worksite during the shipping campaign.

Prior to movement all of the containers were surveyed for loose surface contamination and gamma dose rates. All survey results were less than the applicable DOT transportation limits.

While the material was staged the site was posted as a "Radioactive Material Storage Area" and "Radiation Area". When the shipping campaign was complete a walk over survey was performed using a 2x2 NaI detector connected to a Ludlum Model 12 survey instrument. No contamination was detected and the postings were removed from the area.

3.0 Final Status Survey Overview

3.1 Survey Objectives

The purpose of the FSS was to demonstrate that the radiological conditions at the area of the "Burial Mound" and the areas utilized in the processing and monitoring of the material excavated from the vicinity of the Burial Mound satisfy the NRC approved release limits. The area can, therefore, be released from licensing restrictions for future use without radiological controls.

3.2 Organization and Responsibilities

ATG personnel performed the surveys and sampling required to complete the FSS.

Samples were shipped to ATG laboratory personnel at ATG's radiological materials processing facilities in Richland, WA, and Oak Ridge, TN, for analysis. Duplicate and split samples were sent to independent radiological laboratories in Richland, WA (Severn Trent Labs). This analytical laboratory was evaluated by ATG and determined to satisfactorily meet Corporate Quality Assurance (QA) requirements.

Site personnel reported to the ATG Project Manager for direction and supervision during performance of the project, and were briefed on the technical requirements of the Decommissioning Plan.

3.3 Instrumentation

Reference 1 provides a description, with associated sensitivities, of the survey instruments used during the FSS. The combination of instrumentation and technique were chosen to provide detection sensitivity capable of verifying the approved release limits. All instruments were calibrated and performance checked. Calibration records are provided in Appendix B.

3.4 Survey Procedures

Survey planning and procedures were developed and conducted In Accordance With (IAW) Reference 2. Procedures are briefly described in this section, with further detail provided in Section 6 of Reference 1.

Minimum Detectable Activities (MDA) for the conveyor survey system was determined as a part of the development of reference 1 (Site D&D

plan), the relevant appendix from the approved plan is included in Appendix H.

3.4.1 Area Classification

All of the material in the 8 grids (10m x 10m) that defined the mound and the area immediately surrounding it was excavated to a depth of 12 ft (4m) and all of the excavated material was processed and monitored to determine the presence of radioactive material above the release limits.

Due to the relocation of the material previously present in the Burial Mound during the sorting process, the entire site area was designated as a Class 1 area and was gamma scanned at 100% coverage. There were no Class 2 or 3 areas in this survey.

3.4.2 Reference Grids

A reference grid system was established, IAW Reference 1, to: facilitate selection of sampling and measurement locations; link sample analytical data to locations; and enable data analysis and averaging to ensure compliance with the release limits. The grid system was laid out in the north-south and east west directions. Ten-meter square (10m x 10m) grids were used for the subject outside area grid. A survey record, designating the assignment of grid points, is provided as Appendix A.

3.4.3 Surface Scans

All onsite excavation and grading was performed prior to commencement of the FSS with the exception of the bottom of the excavation. The below grade surface at the bottom of the excavation was scanned and sampled upon completion of the excavation activities.

Soil scans were performed using Ludlum 44-10 NaI 2" x 2" detectors attached to a Ludlum Model 12 count-rate instrument. As described in Reference 1, the instruments were held within a few inches of the ground surface, with scans conducted at a probe movement rate of less than 0.5 m/s. All areas received a 100% scan.

While scanning the technician paid particular attention to the audible response from the insturment to indicate the presence of concentrated activity. The instrument count rate was recorded every 2 meters during the survey in order identify potential trends.

The MDA for the NaI scan of the site is determined in reference 4. The relevant table from NUREG 1507, showing the MDA for both Cs-137 and Co-60, is included in Appendix H.

The results of these measurements are discussed in Section 4.3.

3.4.4 Exposure Rate Measurements

Exposure-rate measurements were taken using a Ludlum Model 2221 with a 2x2 NaI detector. Measurements were taken for .5 min at the location of each sample point, at a distance of one meter (1 m) from the surface.

Section 6.8.3 of Reference 1 states that "Exposure rates in uR/h will be used as a surrogate measurement to demonstrate compliance with the concentration criteria for Co-60 and Cs-137 in surface soil." It further specifies the exposure rate readings be correlated to readings taken with a Pressurized Ion Chamber and that the results will be tested using the statistical approach specified in Ref 2 (MARSSIM).

3.4.5 Soil Sampling

Soil samples were collected daily from processed soil and in accordance with MARSSIM guidance for the FSS. The original intent of the plan was to perform much of the gamma spectroscopy analysis onsite. Upon setup onsite it was determined that the power supplied from generators and temperature shifts made operation of an onsite system gamma spectroscopy system impractical. As a result, the site decommissioning plan was amended and all soil samples were shipped offsite to the ATG laboratories in WA and TN for analysis.

3.4.6 Quality Assurance Samples

The NRC, the EPA, and the State of Alabama collected duplicate samples from Area A (bottom of the excavation).

Ten percent of the samples collected as a part of the FSS were sent to an independent laboratory for analysis.

3.5 Background Level Determinations

An extensive background investigation was performed in ref. 3. The background investigation determined the background levels for various nuclides including the contaminants Cs-137 and Co-60 and the

background dose rate for the site. Table 3-1 summarizes the results of this study.

Review of the background information shows that for the purposes determining site release both Cs-137 and Co- 60 can be assumed not to be present in background. When the FSS soil samples were evaluated against the DCGLs the background concentrations of Cs-137 and Co-60 were assumed to be zero

Table 3-1 Reconnaissance Background

Nuclide	Low pCi/g	High pCi/g	Avg pCi/g	MDA
Co-60	<MDA	<MDA	<MDA	0.2 pCi/g
Cs-137	<MDA	1.6	0.55	0.2 pCi/g

Table 3-2 Troop Assembly Area Background

Nuclide	Low pCi/g	High pCi/g	Avg pCi/g	MDA
Co-60	<MDA	<MDA	<MDA	0.2 pCi/g
Cs-137	<MDA	0.3	.12*	0.2 pCi/g

- Note: avg. activity from ref. 3. This calculated average is less than MDA for the analysis.

Table 3-3 Background Gamma Dose Rate

Location	NaI Background	NaI Avg. Background	HPIC Background	HPIC Avg. Background
Reconnaissance	3.99 – 7.53 uR/hr	5.3 uR/hr	5.8 – 11.6 uR/hr	8.24 uR/hr
Troop Assembly Area	5.65 – 5.90 uR/hr	5.7 uR/hr	7.2 – 10.2 uR/hr	8.7 uR/hr

3.6 Sample Analysis

The soil samples were packaged and shipped to ATG's radiological materials processing facilities Oak Ridge, TN, for analysis. Duplicate and split samples were sent to independent radiological laboratories in Richland WA. (Severn Trent Labs) All samples were analyzed by gamma spectrometry equipment, which had been calibrated, and performance checked using NIST-traceable sources.

3.7 Data Interpretation

Data was evaluated as it was collected by technicians in the field and was reviewed but the site supervisor. The completed final data packages were then evaluated again during the report compilation.

Reference 2 section 8.2.5 gives the following guidance. "When the data clearly shows that a survey unit meets or exceeds the release criterion, the result is often obvious without performing the formal statistical analysis." It further states in table 8.2 that if all measurements are below the DCGL that the Survey unit meets the release criterion.

Review of the soil analysis shows that all samples are less than the DCGL as determined for this site. As such the site meets the release criterion to be removed from license controls.

3.8 Records

All original survey records and associated documentation, as described herein, will be maintained by ATG, IAW applicable quality record retention requirements, until such time as authorized by the NRC for disposal.

4.0 Survey Findings and Results

Data is found in Appendices C, D, and E as described herein.

4.1 Ground Surveys

Scans

All areas of the site were surveyed by direct gamma scan using a 2x2 NaI detector attached to a Ludlum Mod 12 rate meter instrument. The scans were conducted by swinging the detector in a serpentine fashion across the

grid at ~ 0.5 m/sec while paying particular attention to the instruments audible response.

The initial scan of area A (excavation) was conducted sub grade (-4m) prior to refilling with processed soil, an additional scan was performed after the excavation was re-filled.

Review of the data shows that Area A has consistently higher readings.

No "hot spots" or areas of discrete activity were observed.

Scan results are attached in Appendix C.

Exposure Rates

Exposure rates were determined by correlating .5 min counts with a 2x2 NaI detector attached to a Ludlum model 2221 scaler/rate meter.

Data was collected at 1m above the surface at the same locations where soil samples were collected.

Efforts to develop correlation factors have identified flaws in this methodology that result in significant error in the adjusted data.

The pressurized ion chamber provides an accurate energy compensated measurement, while the NaI provides an un-compensated measurement of events.

The radionuclides of concern on the site Cs-137 and Co-60 have significantly different gamma energies (.663MeV for Cs-137 and 1.173MeV and 1.332MeV for Co-60) and as such the ratio of Cesium to Cobalt used for correlation measurements directly affects the results. After reviewing the information collected with the pressurized ion chamber it was determined that it did not provide useful data.

In addition, this protocol is commonly used to determine the condition of a site without performing extensive soil sampling. In the case of the "Burial Mound" sufficient soil samples have been collected and analyzed to determine final status of the site. This section also called for the data to be tested by the Wilcoxon Rank Sum test; however, Ref 2 section 2.2 recommends this test for contaminants that are naturally occurring. The background concentration of the two contaminants in the burial mound, Co-60 and Cs-137, is effectively zero. Cobalt-60 does not appear in background and Cs-137 appears at 3% or less of the $DCGL_{Cs137}$.

The raw count data collected in this portion of the survey is reported in Appendix E. The data does demonstrate that the general area radiation level above Area A is elevated in comparison to background and the surrounding survey units. This elevation is attributed to the residual Co-60 activity in the material used to fill the excavation. The processed soil sample data documents the presence of residual Co-60 activity at approximately 15% of the $DCGL_{Co-60}$.

The subject instruments were calibrated using NIST traceable calibration sources with calibration fields that had been verified using pressurized ion chamber instruments.

Soil Samples

Soil Samples were collected IAW reference 1. Samples collected during the FSS were collected from the first 15cm of soil and analyzed by Gamma Spectroscopy for Cs-137 and Co-60 concentrations. The derived cleanup guidelines developed for soil are **2.3 pCi/g Co-60** and **9.2 pCi/g Cs-137** as agreed upon and approved in Ref 1. These are based on a dose rate of 25 mrem/y, as stipulated in 10 CFR 20.

Review of the soil sample data shows that none of the samples collected in either the FSS or from the processed soil exceeds the DCGLs for either Co-60 or Cs-137.

In addition, application of the unity rule to all samples in all cases results in a sum of the fraction < 1. The site clearly meets the release criterion.

Sample results are provided in Appendix E.

4.2 Data Evaluation

Scans of the site indicated no "hot spots" or areas concentrated areas with elevated activity.

All soil sample concentrations are less that the DCGL's developed for the site.

General area radiation levels in Survey Unit A (excavation area) are elevated above those of the surrounding areas. Review of the processed soil sample data shows that the majority of the samples have concentrations of Co-60 and Cs-137 that exceed background. This low level of residual activity is responsible for the elevated readings in the vicinity of Area A. All sample concentrations are below the DCGL established for the site.

4.3 Residual Activity Inventory

Residual activity is present in the material used to re-fill the excavation. Based on the results of processed soil samples the average Co-60 activity in soil is 0.343pCi/g (~15% of the limit) and the average Cs-137 concentration is 0.211 pCi/g (~2% of the limit). Both of these are significantly below the DCGLs determined for this site.

5.0 Summary

The FSS of the "Burial Mound" and adjacent areas was conducted to meet the requirements of Reference 2. Results of the survey demonstrate that the decontamination actions were effective in reducing residual activity at the site to meet the limits for release for unrestricted use.

6.0 References

1. "U.S. Army Fort McClellan, Fort McClellan, Alabama HQ, IOC Project Number USA 98-046, PHASE II, 'BURIAL MOUND' DECOMMISSIONING PLAN ATG Inc., Oak Ridge, TN; March 2001

2. The Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)

3. U.S. Army Center for Health Promotion and Preventive Medicine (CHPPM), reference Industrial Radiation Study No. 27-MH-0987-R2-97, Pelham Range Burial Mound Site, Fort McClellan, Alabama, 29 August - 15 September 1995 and 14 - 28 January 1996

4. NUREG-1507 - Minimum Detectable Concentrations With Typical Radiation Survey Instruments For Various Contaminants And Field Conditions

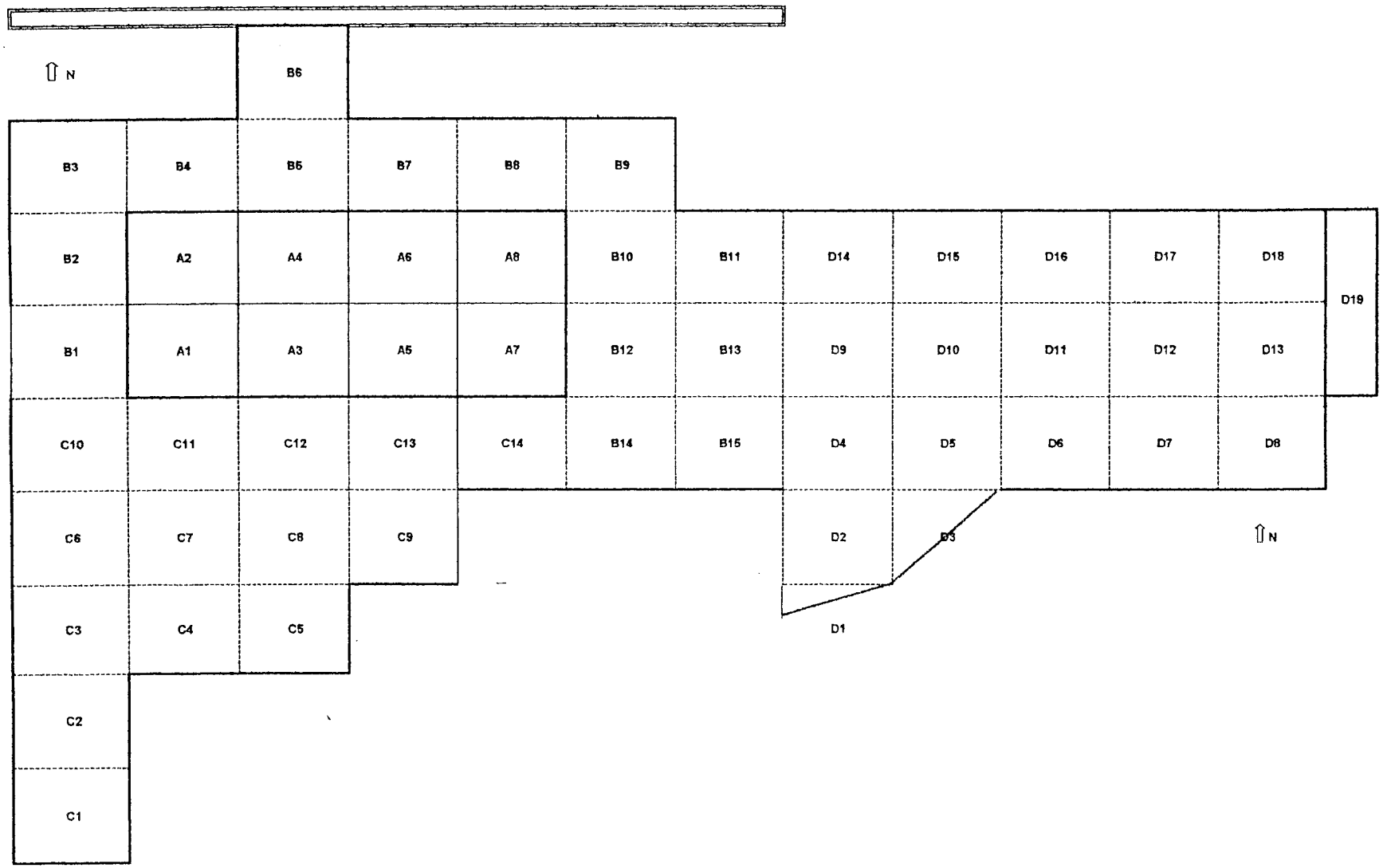
APPENDIX A

GRID MAP

ATG Burial Mound Project - Pelham Range
Final Status Survey
Performed By: J. Coleman

Overview of Site

All Grids are 10m x 10m with the exception of Grid D-19 (5m x 20m) and Two partial Grids D-1 and D-3



ATG Burial Mound Project - Pehlam Range
Final Status Survey
Performed By: J. Coleman
Instrument ID # 125241 Cal Due: 2-28-02
Detector ID # 132949 Cal Due: 2-28-02

N

Area A - Burial Mound Pit			
A2	A4	A6	A8
A1	A3	A5	A7

ATG Burial Mound Project - Pelham Range
Final Status Survey
Performed By: J. Coleman
Instrument ID # 125241 Cal Due: 2-28-02
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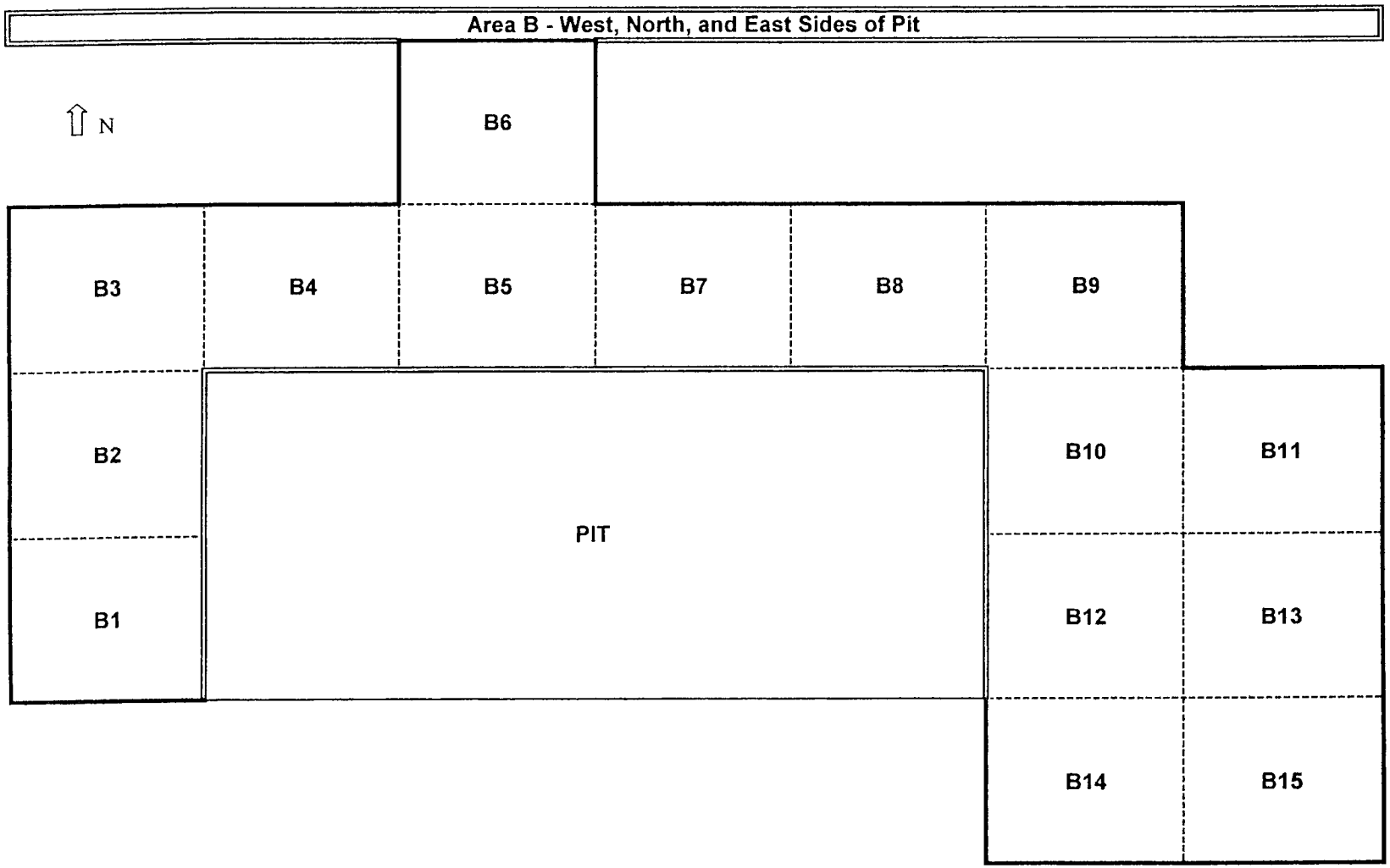


ATG Calibration Record

Inst. Number: 85723 Model: LM-177 Cal. Date: 1/1/2002

Calibration Instruments					
Type	Number	Cal. Due Date	Type	Number	Cal. Due Date
Pulser	137572	10/15/2002	Temp.	2780	3/28/2002
Voltmeter	75300255	3/26/2002	Pressure	2780	3/28/2002
O-Scope	N/A	N/A	Humidity	N/A	N/A
Timer	N/A	N/A			

Count Rate/Scaler Calibration

Temp.: 67.2 deg.F Pressure: 28.93 in Hg Humidity: N/A

Scale	Target Value	Tolerances Min.	Tolerances Max.	Measurements As Found	Measurements As Left	Percent Error As Found	Percent Error As Left
X1	100	80	120	*	100	#VALUE!	0.0%
	250	200	300	*	250	#VALUE!	0.0%
	400	320	480	*	400	#VALUE!	0.0%
X10	1,000	800	1,200	*	1,000	#VALUE!	0.0%
	2,500	2,000	3,000	*	2,500	#VALUE!	0.0%
	4,000	3,200	4,800	*	4,000	#VALUE!	0.0%
X100	10,000	8,000	12,000	*	10,000	#VALUE!	0.0%
	25,000	20,000	30,000	*	25,000	#VALUE!	0.0%
	40,000	32,000	48,000	*	40,000	#VALUE!	0.0%
X1K	100,000	80,000	120,000	*	100,000	#VALUE!	0.0%
	250,000	200,000	300,000	*	250,000	#VALUE!	0.0%
	400,000	320,000	480,000	*	400,000	#VALUE!	0.0%

Comments: * Initial use. "AsFound" not required.

Other Calibration Parameters	As Found	As Left
Zero	*	0
High Voltage	*	900
Threshold (mV)	*	10
HV Indication:	*	900
Overrange	N/A	N/A
Audio	SAT	SAT

Detector Compatibility:*
GM (SCINT.) Proport.
(Circle One)

** Use Specific Detector:
Type: 44-10
Number: 181831

* Indicate the default detector settings only if the instrument is NOT calibrated to a specific detector. Attach a limited use sticker that identifies: Threshold, Voltage, and detector that can be used with the calibration settings, as appropriate.

** A limited use sticker is required specifying the detector.

Calibrator (Print): Kevin Wright Calibrator (Signature): K Wright

Reviewed By: Scott A. Next Calibration Due: 1/1/2003

ATG Detecto etup Record

Volts	Gamma CPM	Bkgd CPM
500	40000	
550	60000	
600	80000	
650	90000	
700	100000	
750	100000	
800	100000	
850	100000	
900	110000	15000
950	110000	
1000	110000	
1050	110000	
1100	110000	
1150	110000	
1200	110000	
1250	160000	

Operating Voltage: **900**

Detector Model: **44-10**
Detector Number: **181831**

Instrument Assigned
Instrument Model: LM-177
Instrument Number: 85723

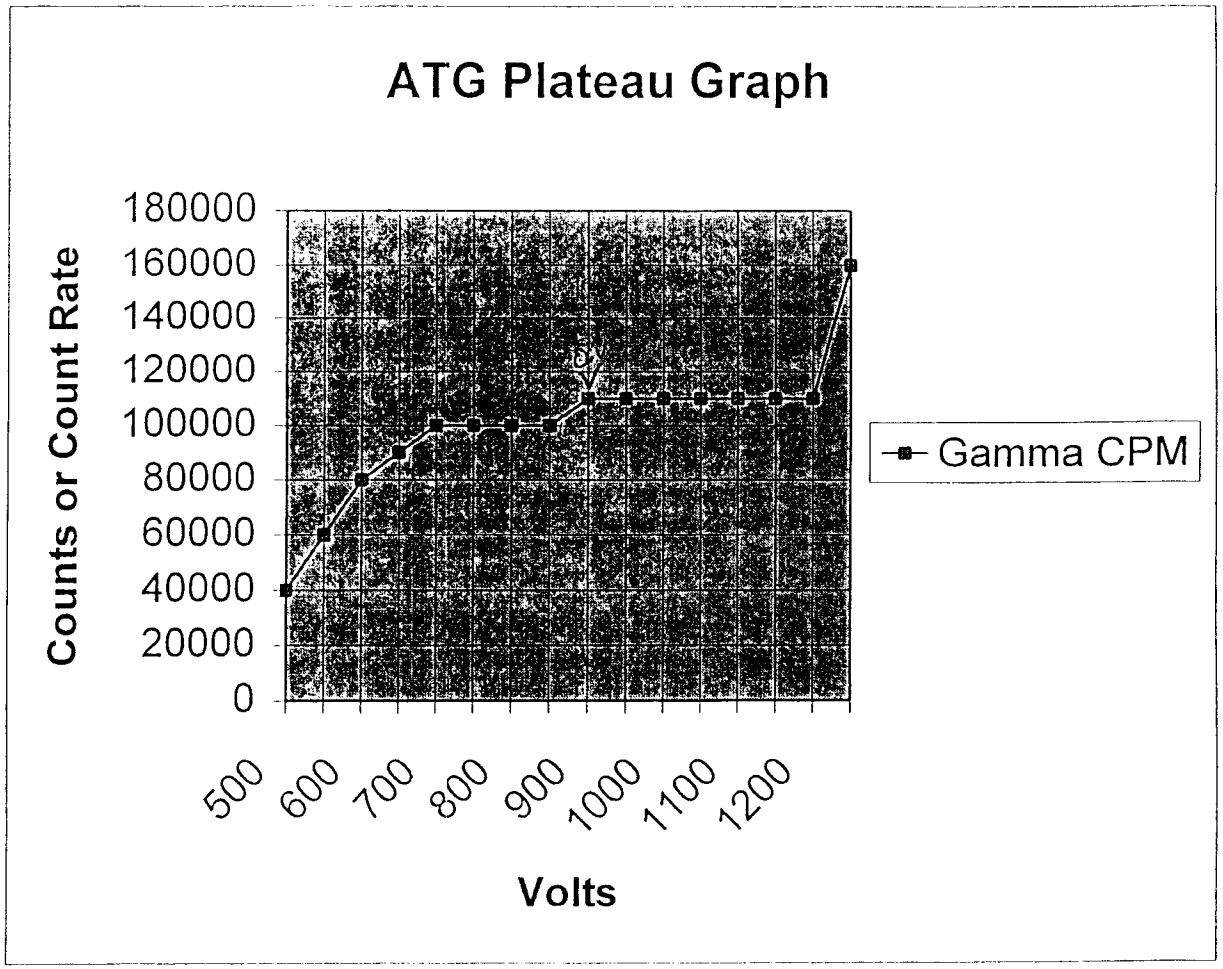
Sensitivity: **10mV**

Date: **1/1/2002**

Performed By: _____

Next Due: **1/1/2003**

Reviewed By: _____



O.V. - Operating Voltage

Gamma Source: Q96 Mixed Gamma
Activity: 5.67E+05 Gamma Emissions

Contact Efficiency: 16.8% (4 pi)

ATG Burial Mound Project - Pehlam Range
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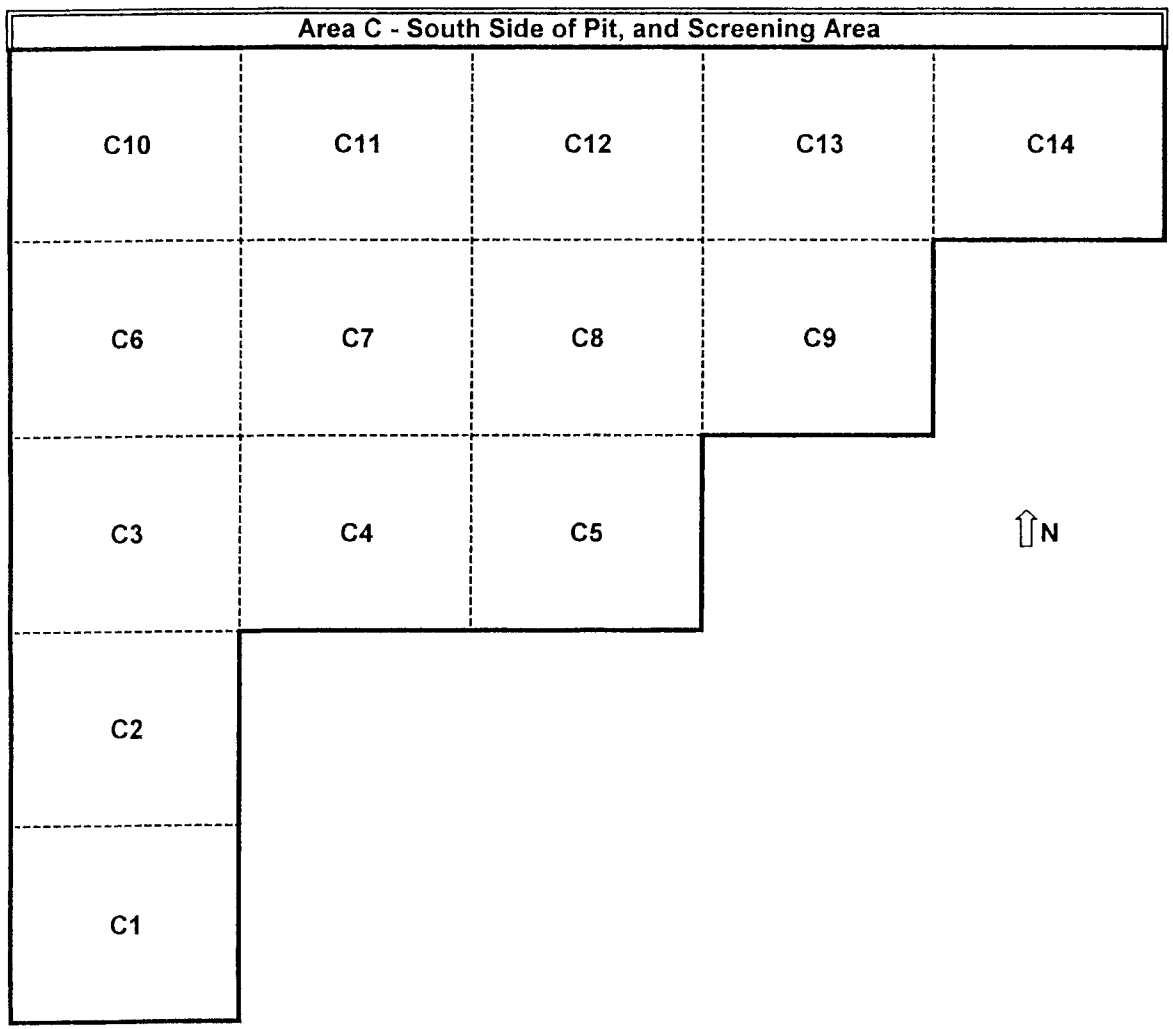
Detector ID # 132949 Cal Due: 2-28-02



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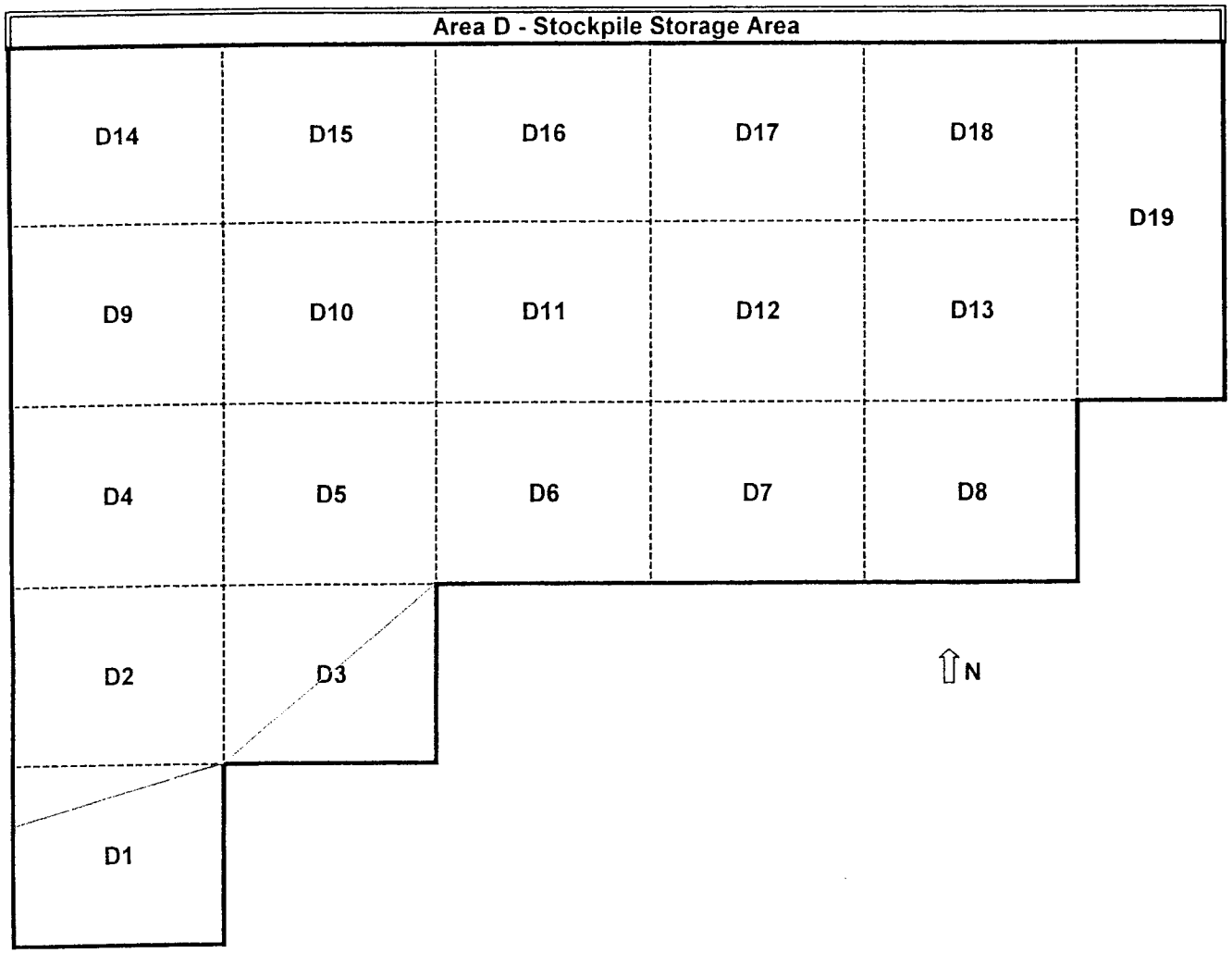


APPENDIX B

INSTRUMENT CALIBRATION RECORDS

ATG Calibration Record

Inst. Number: 93221 Model: LM-177 Cal. Date: 1/1/2002

Calibration Instruments					
Type	Number	Cal. Due Date	Type	Number	Cal. Due Date
Pulser	137572	10/15/2002	Temp.	2780	3/28/2002
Voltmeter	75300255	3/26/2002	Pressure	2780	3/28/2002
O-Scope	N/A	N/A	Humidity	N/A	N/A
Timer	N/A	N/A			

Count Rate/Scaler Calibration

Temp.: 67.2 deg.F Pressure: 28.93 in Hg Humidity: N/A

Scale	Target Value	Tolerances		Measurements		Percent Error	
		Min.	Max.	As Found	As Left	As Found	As Left
X1	100	80	120	*	100	#VALUE!	0.0%
	250	200	300	*	250	#VALUE!	0.0%
	400	320	480	*	400	#VALUE!	0.0%
X10	1,000	800	1,200	*	1,000	#VALUE!	0.0%
	2,500	2,000	3,000	*	2,500	#VALUE!	0.0%
	4,000	3,200	4,800	*	4,000	#VALUE!	0.0%
X100	10,000	8,000	12,000	*	10,000	#VALUE!	0.0%
	25,000	20,000	30,000	*	25,000	#VALUE!	0.0%
	40,000	32,000	48,000	*	40,000	#VALUE!	0.0%
X1K	100,000	80,000	120,000	*	100,000	#VALUE!	0.0%
	250,000	200,000	300,000	*	250,000	#VALUE!	0.0%
	400,000	320,000	480,000	*	400,000	#VALUE!	0.0%

Comments: * Initial use. "AsFound" not required.

Other Calibration Parameters			
	As Found	As Left	
Zero	*	0	Detector Compatibility:*
High Voltage	*	900	GM SCINT Proport.
Threshold (mV)	*	10	(Circle One)
HV Indication:	*	900	** Use Specific Detector:
Overrange	N/A	N/A	Type: 44-10
Audio	SAT	SAT	Number: 132947

* Indicate the default detector settings only if the instrument is NOT calibrated to a specific detector. Attach a limited use sticker that identifies: Threshold, Voltage, and detector that can be used with the calibration settings, as appropriate.

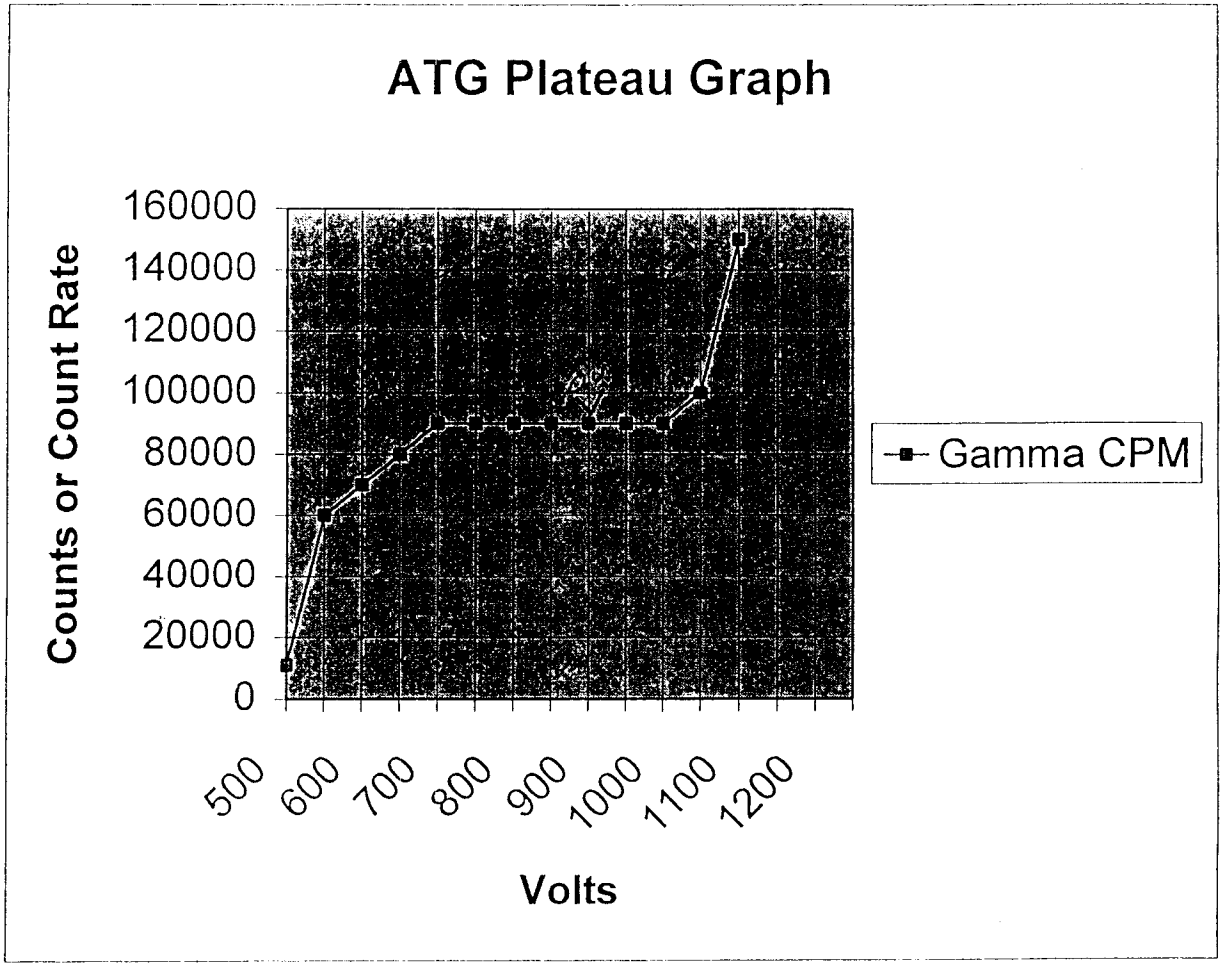
** A limited use sticker is required specifying the detector.

Calibrator (Print): Kevin Wright Calibrator (Signature): [signature]

Reviewed By: [signature] Next Calibration Due: 1/1/2003

ATG Detector Setup Record

Volts	Gamma CPM	Bkgd CPM
500	11000	
550	60000	
600	70000	
650	80000	
700	90000	
750	90000	
800	90000	
850	90000	
900	90000	18000
950	90000	
1000	90000	
1050	100000	
1100	150000	
1150		
1200		
1250		



O.V. - Operating Voltage

Operating Voltage: **900**

Detector Model:	**44-10**
Detector Number:	**132947**
Instrument Assigned	
Instrument Model:	LM-177
Instrument Number:	93221
Sensitivity:	**10mV**

Date: **1/1/2002**

Performed By: _____

Next Due: **1/1/2003**

Reviewed By: _____

Gamma Source: Q96 Mixed Gamma

Activity: 5.67E+05 Gamma Emissions

Contact Efficiency: 12.7% (4 pi)

ATG Calibration Record

Inst. Number: 93211 Model: LM-177 Cal. Date: 1/1/2002

Calibration Instruments					
Type	Number	Cal. Due Date	Type	Number	Cal. Due Date
Pulser	137572	10/15/2002	Temp.	2780	3/28/2002
Voltmeter	75300255	3/26/2002	Pressure	2780	3/28/2002
O-Scope	N/A	N/A	Humidity	N/A	N/A
Timer	N/A	N/A			

Count Rate/Scaler Calibration

Temp.: 64.4 deg.F Pressure: 28.96 in Hg Humidity: N/A

Scale	Target Value	Tolerances		Measurements		Percent Error	
		Min.	Max.	As Found	As Left	As Found	As Left
X1	100	80	120	*	100	#VALUE!	0.0%
	250	200	300	*	250	#VALUE!	0.0%
	400	320	480	*	400	#VALUE!	0.0%
X10	1,000	800	1,200	*	1,000	#VALUE!	0.0%
	2,500	2,000	3,000	*	2,500	#VALUE!	0.0%
	4,000	3,200	4,800	*	4,000	#VALUE!	0.0%
X100	10,000	8,000	12,000	*	10,000	#VALUE!	0.0%
	25,000	20,000	30,000	*	25,000	#VALUE!	0.0%
	40,000	32,000	48,000	*	40,000	#VALUE!	0.0%
X1K	100,000	80,000	120,000	*	100,000	#VALUE!	0.0%
	250,000	200,000	300,000	*	250,000	#VALUE!	0.0%
	400,000	320,000	480,000	*	400,000	#VALUE!	0.0%

Comments: * Initial use. "AsFound" not required.

Other Calibration Parameters			
	As Found	As Left	
Zero	*	0	Detector Compatibility:*
High Voltage	*	1000	GM SCINT. Proport.
Threshold (mV)	*	10	(Circle One)
HV Indication:	*	1000	** Use Specific Detector:
Overrange	N/A	N/A	Type: 44-10
Audio	SAT	SAT	Number: 130526

* Indicate the default detector settings only if the instrument is NOT calibrated to a specific detector. Attach a limited use sticker that identifies: Threshold, Voltage, and detector that can be used with the calibration settings, as appropriate.

** A limited use sticker is required specifying the detector.

Calibrator (Print): Kevin Wright Calibrator (Signature): [signature]

Reviewed By: [signature] Next Calibration Due: 1/1/2003

ATG Detectd setup Record

Volts	Gamma CPM	Bkgd CPM
500	100	
550	200	
600	500	
650	8000	
700	13000	
750	32000	
800	42000	
850	50000	
900	60000	
950	70000	
1000	80000	14000
1050	80000	
1100	80000	
1150	80000	
1200	80000	
1250	80000	

Operating Voltage: **1000**

Detector Model: **44-10**
Detector Number: **130526**

Instrument Assigned
Instrument Model: LM-177
Instrument Number: 93211

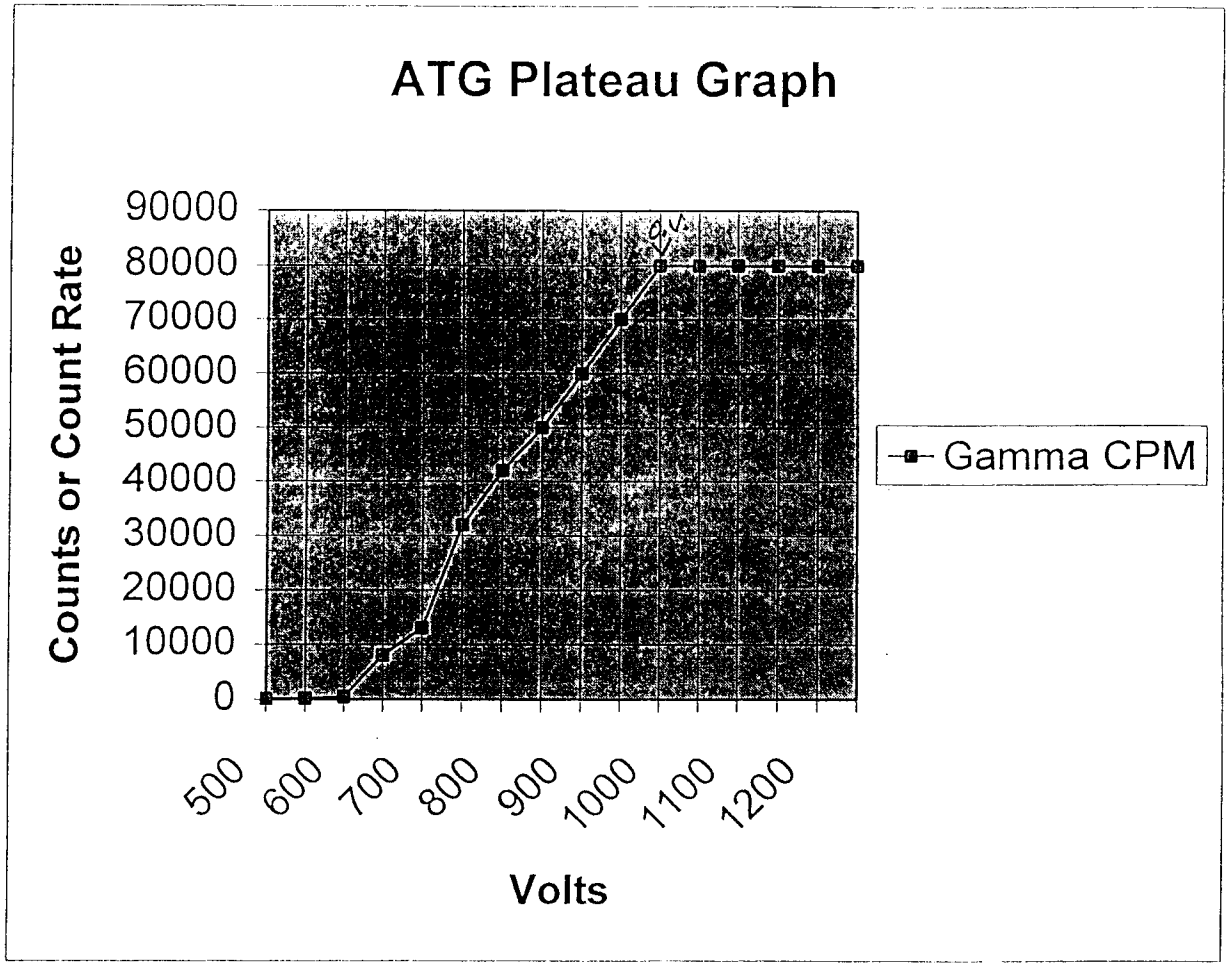
Sensitivity: **10mV**

Date: **1/1/2002**

Performed By: _____

Next Due: **1/1/2003**

Reviewed By: _____



O.V. - Operating Voltage

Gamma Source: Q96 Mixed Gamma
Activity: 5.67E+05 Gamma Emissions Contact Efficiency: 11.6% (4 pi)

ATG Calibration Record

Inst. Number: 89935 Model: LM-177 Cal. Date: 1/1/2002

Calibration Instruments					
Type	Number	Cal. Due Date	Type	Number	Cal. Due Date
Pulser	137572	10/15/2002	Temp.	2780	3/28/2002
Voltmeter	75300255	3/26/2002	Pressure	2780	3/28/2002
O-Scope	N/A	N/A	Humidity	N/A	N/A
Timer	N/A	N/A			

Count Rate/Scaler Calibration

Temp.: 64.4 deg.F Pressure: 28.96 in Hg Humidity: N/A

Scale	Target Value	Tolerances		Measurements		Percent Error	
		Min.	Max.	As Found	As Left	As Found	As Left
X1	100	80	120	*	100	#VALUE!	0.0%
	250	200	300	*	250	#VALUE!	0.0%
	400	320	480	*	400	#VALUE!	0.0%
X10	1,000	800	1,200	*	1,000	#VALUE!	0.0%
	2,500	2,000	3,000	*	2,500	#VALUE!	0.0%
	4,000	3,200	4,800	*	4,000	#VALUE!	0.0%
X100	10,000	8,000	12,000	*	10,000	#VALUE!	0.0%
	25,000	20,000	30,000	*	25,000	#VALUE!	0.0%
	40,000	32,000	48,000	*	40,000	#VALUE!	0.0%
X1K	100,000	80,000	120,000	*	100,000	#VALUE!	0.0%
	250,000	200,000	300,000	*	250,000	#VALUE!	0.0%
	400,000	320,000	480,000	*	400,000	#VALUE!	0.0%

Comments: * Initial use. "AsFound" not required.

Other Calibration Parameters			
	As Found	As Left	
Zero	*	0	
High Voltage	*	900	
Threshold (mV)	*	10	
HV Indication:	*	900	
Overrange	N/A	N/A	
Audio	SAT	SAT	

Detector Compatibility:*
GM (SCINT) Proport.
(Circle One)

** Use Specific Detector:
Type: 44-10
Number: 181829

* Indicate the default detector settings only if the instrument is NOT calibrated to a specific detector. Attach a limited use sticker that identifies: Threshold, Voltage, and detector that can be used with the calibration settings, as appropriate.

** A limited use sticker is required specifying the detector.

Calibrator (Print): Kevin Wright Calibrator (Signature): [signature]

Reviewed By: [signature] Next Calibration Due: 1/1/2003

ATG Detectd Setup Record

Volts	Gamma CPM	Bkgd CPM
500	20000	
550	50000	
600	70000	
650	90000	
700	100000	
750	100000	
800	100000	
850	110000	
900	110000	15000
950	110000	
1000	110000	
1050	110000	
1100	110000	
1150	110000	
1200	120000	
1250	130000	

Operating Voltage: 900

Detector Model:	**44-10**
Detector Number:	**181829**
Instrument Assigned	
Instrument Model:	LM-177
Instrument Number:	89935

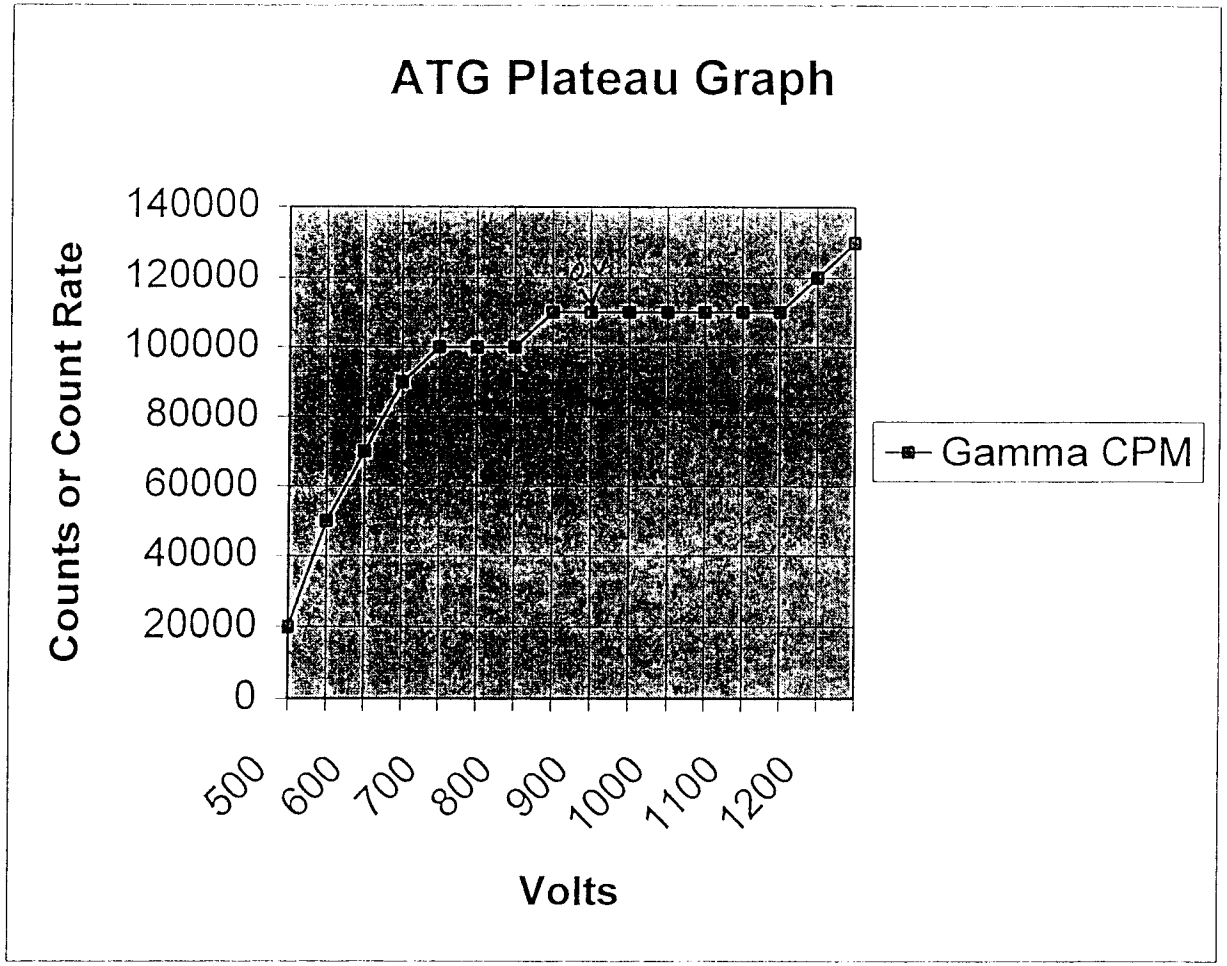
Sensitivity: **10mV**

Date: 1/1/2002

Performed By: _____

Next Due: 1/1/2003

Reviewed By: _____



O.V. - Operating Voltage

Gamma Source: Q96 Mixed Gamma

Activity: 5.67E+05 Gamma Emissions

Contact Efficiency: 16.8% (4 pi)

ATG Calibration Record

Inst. Number: 93286 Model: LM-177 Cal. Date: 1/1/2002

Calibration Instruments					
Type	Number	Cal. Due Date	Type	Number	Cal. Due Date
Pulser	137572	10/15/2002	Temp.	2780	3/28/2002
Voltmeter	75300255	3/26/2002	Pressure	2780	3/28/2002
O-Scope	N/A	N/A	Humidity	N/A	N/A
Timer	N/A	N/A			

Count Rate/Scaler Calibration

Temp.: 64.4 deg.F Pressure: 28.96 in Hg Humidity: N/A

Scale	Target Value	Tolerances		Measurements		Percent Error	
		Min.	Max.	As Found	As Left	As Found	As Left
X1	100	80	120	*	100	#VALUE!	0.0%
	250	200	300	*	250	#VALUE!	0.0%
	400	320	480	*	400	#VALUE!	0.0%
X10	1,000	800	1,200	*	1,000	#VALUE!	0.0%
	2,500	2,000	3,000	*	2,500	#VALUE!	0.0%
	4,000	3,200	4,800	*	4,000	#VALUE!	0.0%
X100	10,000	8,000	12,000	*	10,000	#VALUE!	0.0%
	25,000	20,000	30,000	*	25,000	#VALUE!	0.0%
	40,000	32,000	48,000	*	40,000	#VALUE!	0.0%
X1K	100,000	80,000	120,000	*	100,000	#VALUE!	0.0%
	250,000	200,000	300,000	*	250,000	#VALUE!	0.0%
	400,000	320,000	480,000	*	400,000	#VALUE!	0.0%

Comments: * Initial use. "AsFound" not required.

Other Calibration Parameters

	As Found	As Left
Zero	*	0
High Voltage	*	900
Threshold (mV)	*	10
HV Indication:	*	900
Overrange	N/A	N/A
Audio	SAT	SAT

Detector Compatibility:*
GM (SCINT) Proport.
(Circle One)

** Use Specific Detector:
Type: 44-10
Number: 181317

* Indicate the default detector settings only if the instrument is NOT calibrated to a specific detector. Attach a limited use sticker that identifies: Threshold, Voltage, and detector that can be used with the calibration settings, as appropriate.

** A limited use sticker is required specifying the detector.

Calibrator (Print): Kevin Wright Calibrator (Signature): K Wright

Reviewed By: Scott A. Next Calibration Due: 1/1/2003

ATG Detect(;etup Record

Volts	Gamma CPM	Bkgd CPM
500	10000	
550	35000	
600	48000	
650	70000	
700	80000	
750	90000	
800	100000	
850	100000	
900	100000	17000
950	100000	
1000	100000	
1050	100000	
1100	110000	
1150	110000	
1200	110000	
1250	130000	

Operating Voltage: **900**

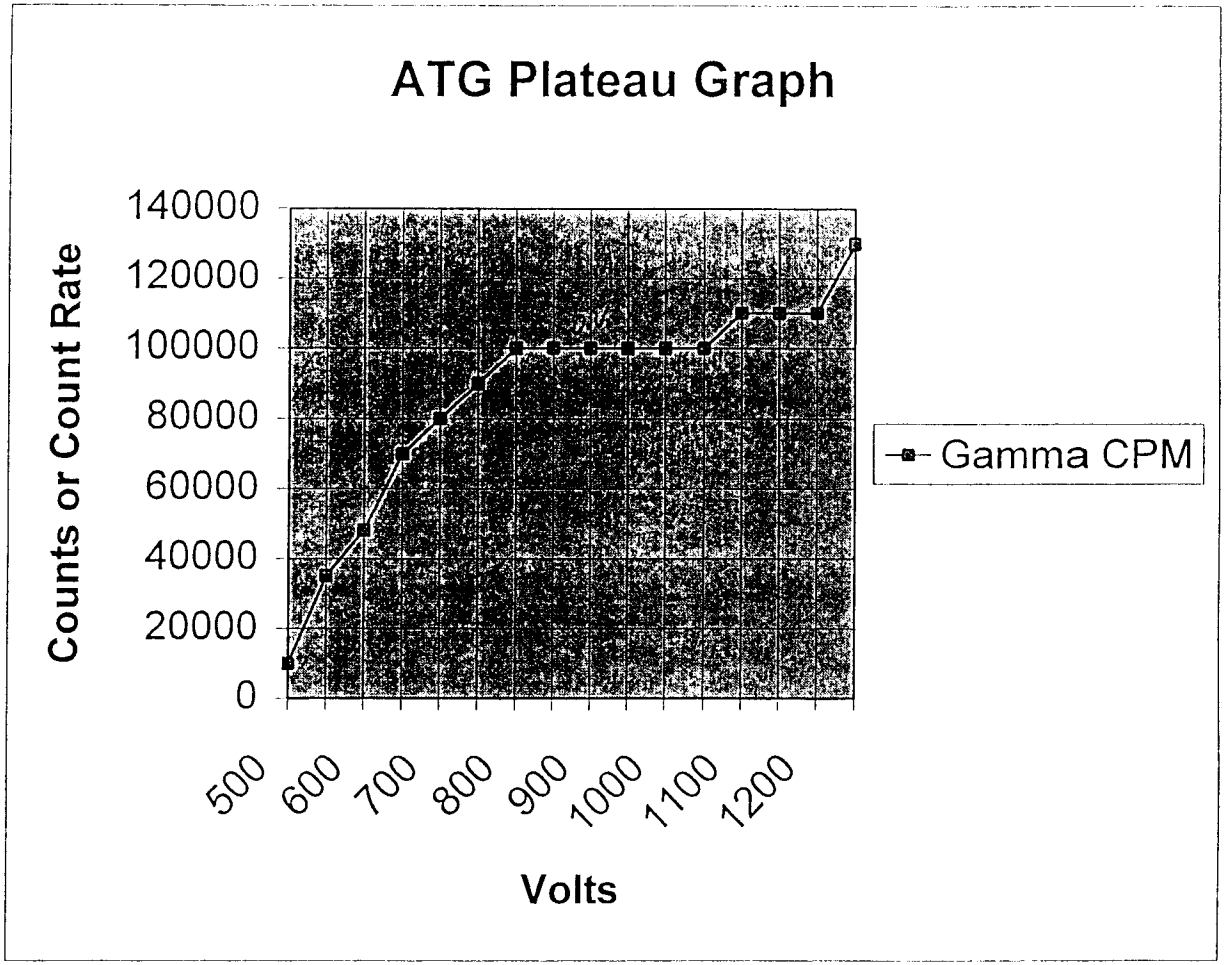
Detector Model:	**44-10**
Detector Number:	**181317**
Instrument Assigned	
Instrument Model:	LM-177
Instrument Number:	93286
Sensitivity:	**10mV**

Date: **1/1/2002**

Performed By: _____

Next Due: **1/1/2003**

Reviewed By: _____



O.V. - Operating Voltage

Gamma Source: Q96 Mixed Gamma

Activity: 5.67E+05 Gamma Emissions

Contact Efficiency: 14.6% (4 pi)

ATG Calibration Record

Inst. Number: 85662 Model: LM-177 Cal. Date: 1/1/2002

Calibration Instruments					
Type	Number	Cal. Due Date	Type	Number	Cal. Due Date
Pulser	137572	10/15/2002	Temp.	2780	3/28/2002
Voltmeter	75300255	3/26/2002	Pressure	2780	3/28/2002
O-Scope	N/A	N/A	Humidity	N/A	N/A
Timer	N/A	N/A			

Count Rate/Scaler Calibration

Temp.: 68.4 deg.F Pressure: 28.93 in Hg Humidity: N/A

Scale	Target Value	Tolerances		Measurements		Percent Error	
		Min.	Max.	As Found	As Left	As Found	As Left
X1	100	80	120	*	100	#VALUE!	0.0%
	250	200	300	*	250	#VALUE!	0.0%
	400	320	480	*	400	#VALUE!	0.0%
X10	1,000	800	1,200	*	1,000	#VALUE!	0.0%
	2,500	2,000	3,000	*	2,500	#VALUE!	0.0%
	4,000	3,200	4,800	*	4,000	#VALUE!	0.0%
X100	10,000	8,000	12,000	*	10,000	#VALUE!	0.0%
	25,000	20,000	30,000	*	25,000	#VALUE!	0.0%
	40,000	32,000	48,000	*	40,000	#VALUE!	0.0%
X1K	100,000	80,000	120,000	*	100,000	#VALUE!	0.0%
	250,000	200,000	300,000	*	250,000	#VALUE!	0.0%
	400,000	320,000	480,000	*	400,000	#VALUE!	0.0%

Comments: * Initial use. "AsFound" not required.

Other Calibration Parameters

	As Found	As Left
Zero	*	0
High Voltage	*	900
Threshold (mV)	*	10
HV Indication:	*	900
Overrange	N/A	N/A
Audio	SAT	SAT

Detector Compatibility:*
GM (SCINT) Proport.
(Circle One)

** Use Specific Detector:
Type: 44-10
Number: 130772

* Indicate the default detector settings only if the instrument is NOT calibrated to a specific detector. Attach a limited use sticker that identifies: Threshold, Voltage, and detector that can be used with the calibration settings, as appropriate.

** A limited use sticker is required specifying the detector.

Calibrator (Print): Kevin Wright Calibrator (Signature): _____

Reviewed By: _____ Next Calibration Due: 1/1/2003

ATG Detect(Setup Record

Volts	Gamma CPM	Bkgd CPM
500	3000	
550	11000	
600	29000	
650	40000	
700	50000	
750	60000	
800	70000	
850	80000	
900	80000	15000
950	80000	
1000	80000	
1050	80000	
1100	80000	
1150	80000	
1200	80000	
1250	90000	

Operating Voltage: **900**

Detector Model: 44-10
Detector Number: 130772

Instrument Assigned
Instrument Model: LM-177
Instrument Number: 85662

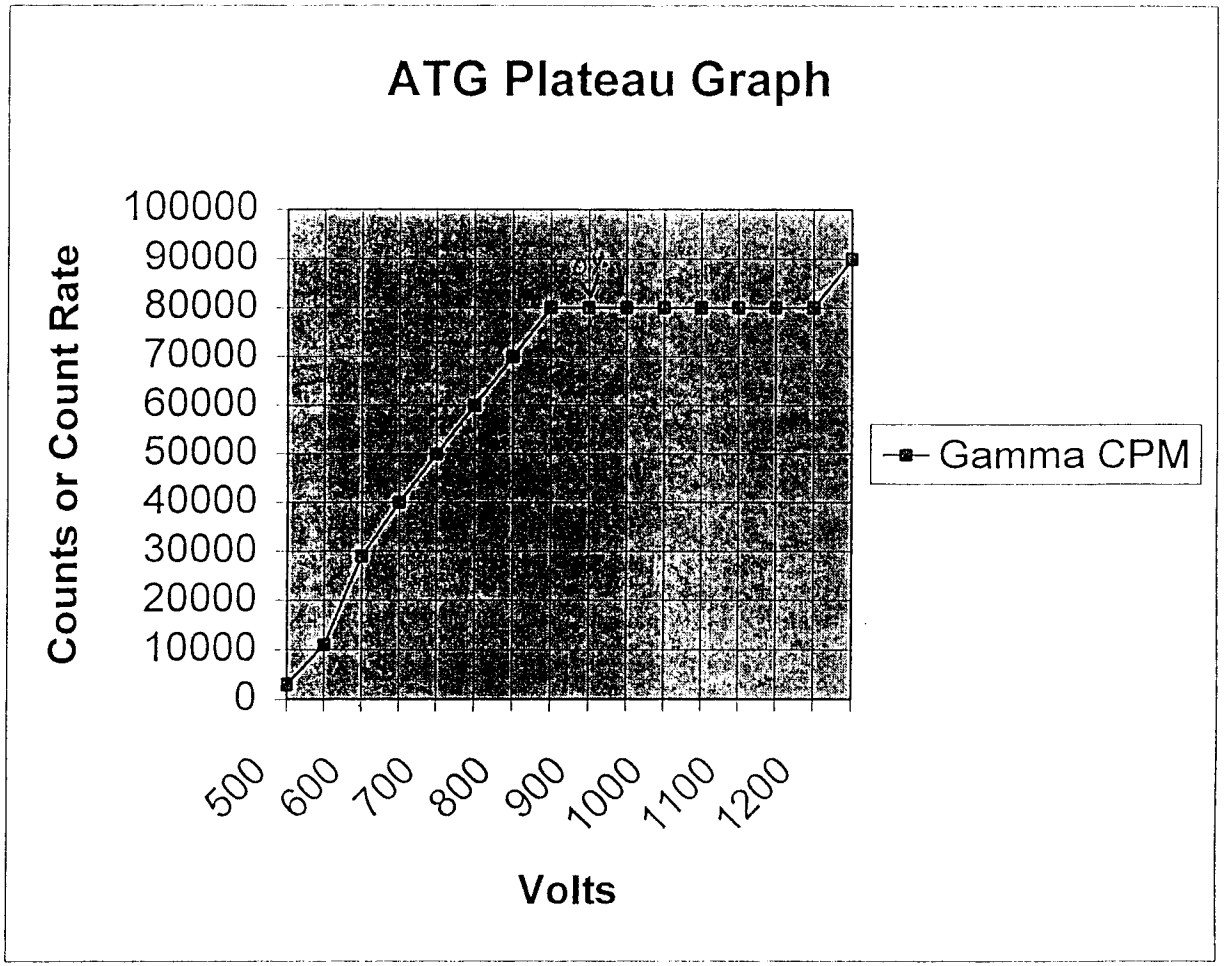
Sensitivity: **10mV**

Date: **1/1/2002**

Performed By: _____

Next Due: **1/1/2003**

Reviewed By: _____



O.V. - Operating Voltage

Gamma Source: Q96 Mixed Gamma
Activity: 5.67E+05 Gamma Emissions

Contact Efficiency: 11.5% (4 pi)

ATG Calibration Record

Inst. Number: 89868 Model: LM-177 Cal. Date: 1/1/2002

Calibration Instruments					
Type	Number	Cal. Due Date	Type	Number	Cal. Due Date
Pulser	137572	10/15/2002	Temp.	2780	3/28/2002
Voltmeter	75300255	3/26/2002	Pressure	2780	3/28/2002
O-Scope	N/A	N/A	Humidity	N/A	N/A
Timer	N/A	N/A			

Count Rate/Scaler Calibration

Temp.: 78.1 deg.F Pressure: 29.49 in Hg Humidity: N/A

Scale	Target Value	Tolerances		Measurements		Percent Error	
		Min.	Max.	As Found	As Left	As Found	As Left
X1	100	80	120	*	100	#VALUE!	0.0%
	250	200	300	*	250	#VALUE!	0.0%
	400	320	480	*	400	#VALUE!	0.0%
X10	1,000	800	1,200	*	1,000	#VALUE!	0.0%
	2,500	2,000	3,000	*	2,500	#VALUE!	0.0%
	4,000	3,200	4,800	*	4,000	#VALUE!	0.0%
X100	10,000	8,000	12,000	*	10,000	#VALUE!	0.0%
	25,000	20,000	30,000	*	25,000	#VALUE!	0.0%
	40,000	32,000	48,000	*	40,000	#VALUE!	0.0%
X1K	100,000	80,000	120,000	*	100,000	#VALUE!	0.0%
	250,000	200,000	300,000	*	250,000	#VALUE!	0.0%
	400,000	320,000	480,000	*	400,000	#VALUE!	0.0%

Comments: * Initial use. "AsFound" not required.

Other Calibration Parameters			
	As Found	As Left	
Zero	*	0	
High Voltage	*	950	
Threshold (mV)	*	10	
HV Indication:	*	950	
Overrange	N/A	N/A	
Audio	SAT	SAT	

Detector Compatibility:*
GM (SCINT) Proport.
(Circle One)

** Use Specific Detector:
Type: 44-10
Number: 124118

* Indicate the default detector settings only if the instrument is NOT calibrated to a specific detector. Attach a limited use sticker that identifies: Threshold, Voltage, and detector that can be used with the calibration settings, as appropriate.

** A limited use sticker is required specifying the detector.

Calibrator (Print): Kevin Wright Calibrator (Signature): [signature]

Reviewed By: [signature] Next Calibration Due: 1/1/2003

ATG Detect(Setup Record

Volts	Gamma CPM	Bkgd CPM
450	2500	
500	8000	
550	26000	
600	44000	
650	50000	
700	60000	
750	70000	
800	80000	
850	80000	
900	80000	
950	90000	15000
1000	90000	
1050	90000	
1100	90000	
1150	90000	
1200	110000	

Operating Voltage: **950**

Detector Model: **44-10**
Detector Number: **124118**

Instrument Assigned
Instrument Model: LM-177
Instrument Number: 89868

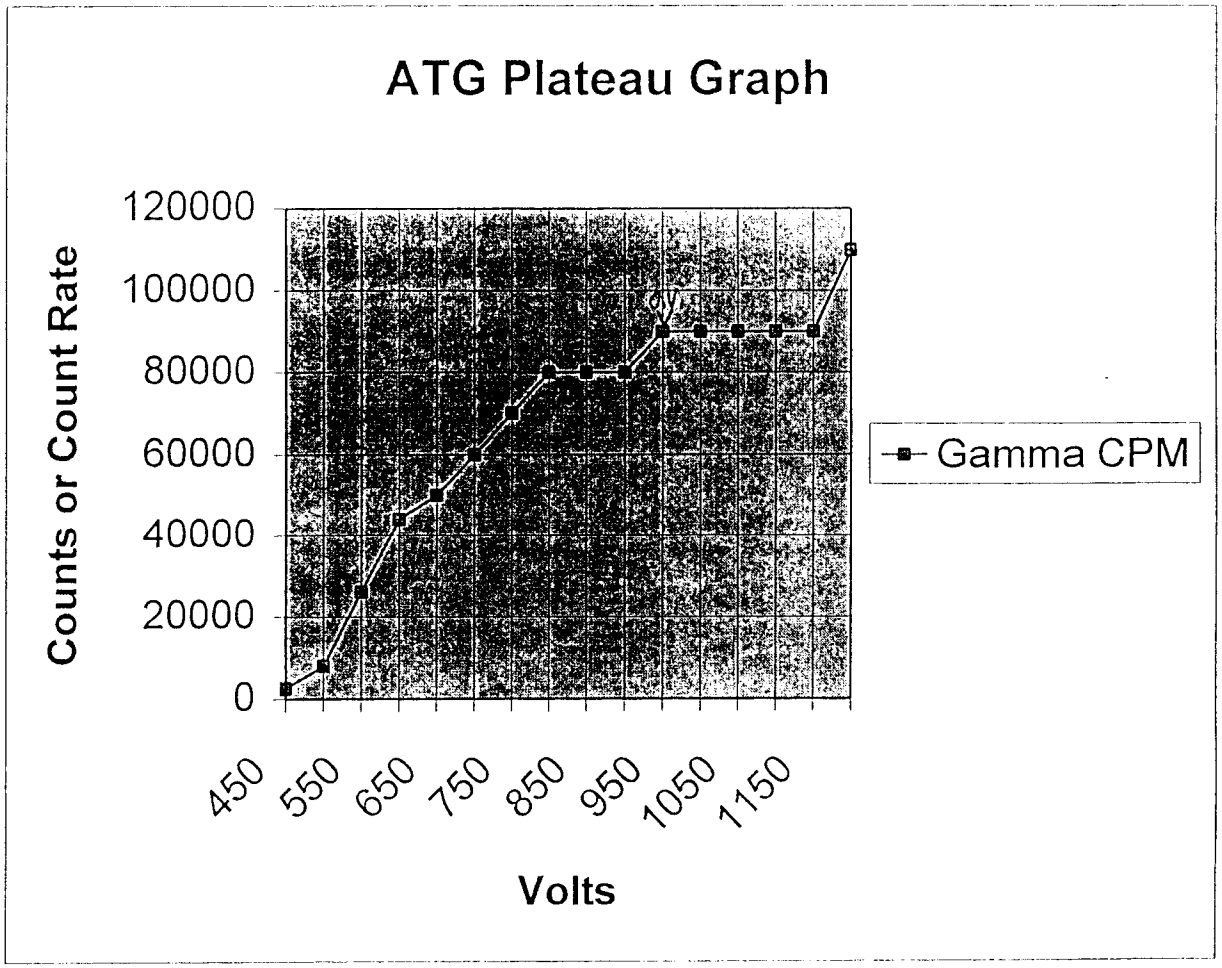
Sensitivity: **10mV**

Date: **1/1/2002**

Performed By: _____

Next Due: **1/1/2003**

Reviewed By: _____



O.V. - Operating Voltage

Gamma Source: Q96 Mixed Gamma
Activity: 5.67E+05 Gamma Emissions

Contact Efficiency: 13.2% (4 pi)

ATG Calibration Record

Inst. Number: 93253 Model: LM-177 Cal. Date: 1/1/2002

Calibration Instruments					
Type	Number	Cal. Due Date	Type	Number	Cal. Due Date
Pulser	137572	10/15/2002	Temp.	2780	3/28/2002
Voltmeter	75300255	3/26/2002	Pressure	2780	3/28/2002
O-Scope	N/A	N/A	Humidity	N/A	N/A
Timer	N/A	N/A			

Count Rate/Scaler Calibration

Temp.: 78.1 deg.F Pressure: 29.49 in Hg Humidity: N/A

Scale	Target Value	Tolerances		Measurements		Percent Error	
		Min.	Max.	As Found	As Left	As Found	As Left
X1	100	80	120	*	100	#VALUE!	0.0%
	250	200	300	*	250	#VALUE!	0.0%
	400	320	480	*	400	#VALUE!	0.0%
X10	1,000	800	1,200	*	1,000	#VALUE!	0.0%
	2,500	2,000	3,000	*	2,500	#VALUE!	0.0%
	4,000	3,200	4,800	*	4,000	#VALUE!	0.0%
X100	10,000	8,000	12,000	*	10,000	#VALUE!	0.0%
	25,000	20,000	30,000	*	25,000	#VALUE!	0.0%
	40,000	32,000	48,000	*	40,000	#VALUE!	0.0%
X1K	100,000	80,000	120,000	*	100,000	#VALUE!	0.0%
	250,000	200,000	300,000	*	250,000	#VALUE!	0.0%
	400,000	320,000	480,000	*	400,000	#VALUE!	0.0%

Comments: * Initial use. "AsFound" not required.

Other Calibration Parameters			
	As Found	As Left	
Zero	*	0	Detector Compatibility:*
High Voltage	*	900	GM SCINT. Proport.
Threshold (mV)	*	10	(Circle One)
HV Indication:	*	900	** Use Specific Detector:
Overrange	N/A	N/A	Type: 44-10
Audio	SAT	SAT	Number: 181315

* Indicate the default detector settings only if the instrument is NOT calibrated to a specific detector. Attach a limited use sticker that identifies: Threshold, Voltage, and detector that can be used with the calibration settings, as appropriate.

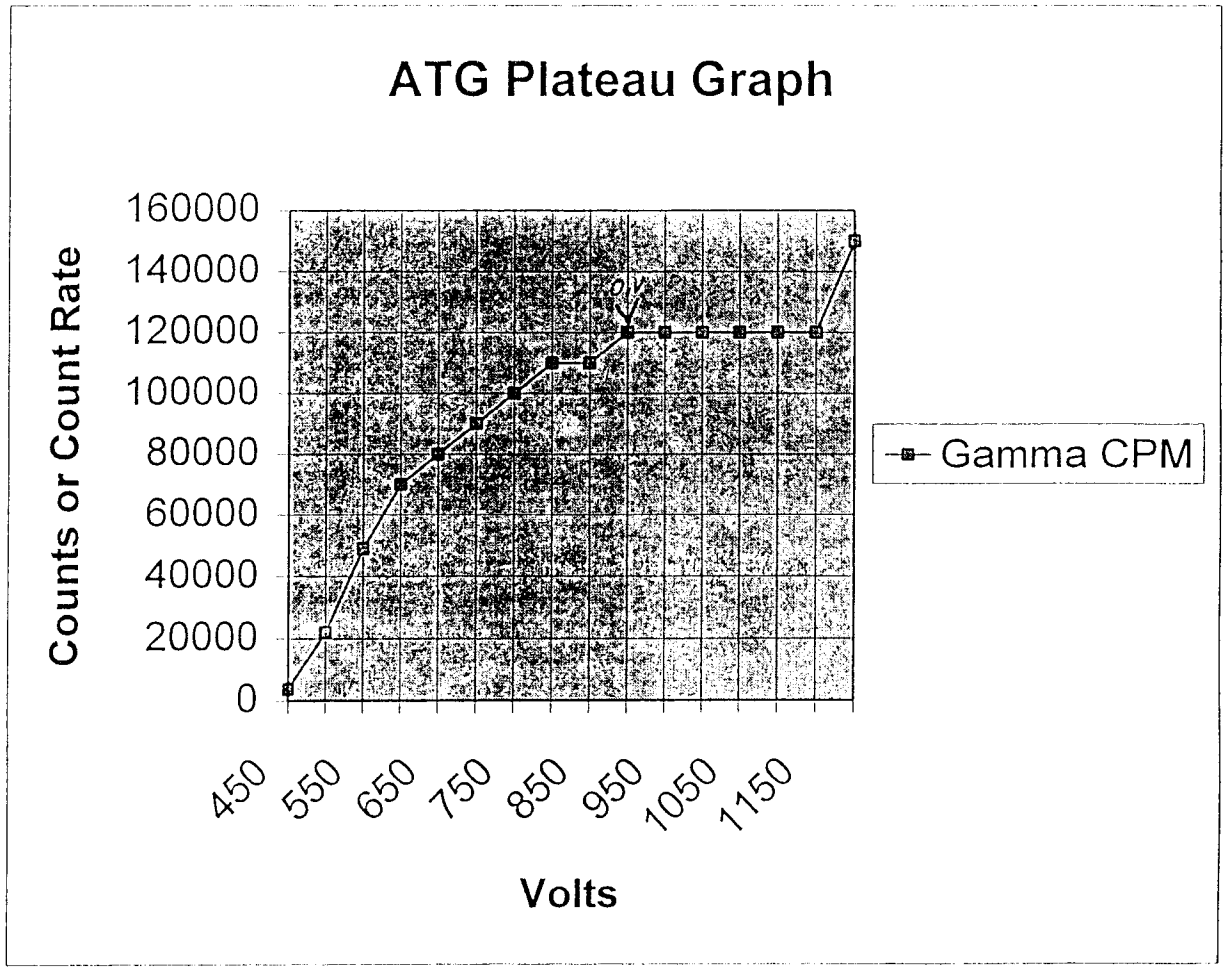
** A limited use sticker is required specifying the detector.

Calibrator (Print): Kevin Wright Calibrator (Signature):

Reviewed By: Next Calibration Due: 1/1/2003

ATG Detect Setup Record

Volts	Gamma CPM	Bkgd CPM
450	3800	
500	22000	
550	49000	
600	70000	
650	80000	
700	90000	
750	100000	
800	110000	
850	110000	
900	120000	17000
950	120000	
1000	120000	
1050	120000	
1100	120000	
1150	120000	
1200	150000	



O.V. - Operating Voltage

Operating Voltage: 900

Detector Model:	**44-10**
Detector Number:	**181315**
Instrument Assigned	
Instrument Model:	LM-177
Instrument Number:	93253

Sensitivity: **10mV**

Date: 1/1/2002

Performed By: _____

Next Due: 1/1/2003

Reviewed By: _____

Gamma Source: Q96 Mixed Gamma

Activity: 5.67E+05 Gamma Emissions

Contact Efficiency: 18.2% (4 pi)

ATG Calibration Record

Inst. Number: 89922 Model: LM-177 Cal. Date: 1/1/2002

Calibration Instruments					
Type	Number	Cal. Due Date	Type	Number	Cal. Due Date
Pulser	137572	10/15/2002	Temp.	2780	3/28/2002
Voltmeter	75300255	3/26/2002	Pressure	2780	3/28/2002
O-Scope	N/A	N/A	Humidity	N/A	N/A
Timer	N/A	N/A			

Count Rate/Scaler Calibration						
Temp.:	78.1 deg.F	Pressure:	29.49	in Hg	Humidity:	N/A

Scale	Target Value	Tolerances Min.	Tolerances Max.	Measurements As Found	Measurements As Left	Percent Error As Found	Percent Error As Left
X1	100	80	120	*	100	#VALUE!	0.0%
	250	200	300	*	250	#VALUE!	0.0%
	400	320	480	*	400	#VALUE!	0.0%
X10	1,000	800	1,200	*	1,000	#VALUE!	0.0%
	2,500	2,000	3,000	*	2,500	#VALUE!	0.0%
	4,000	3,200	4,800	*	4,000	#VALUE!	0.0%
X100	10,000	8,000	12,000	*	10,000	#VALUE!	0.0%
	25,000	20,000	30,000	*	25,000	#VALUE!	0.0%
	40,000	32,000	48,000	*	40,000	#VALUE!	0.0%
X1K	100,000	80,000	120,000	*	100,000	#VALUE!	0.0%
	250,000	200,000	300,000	*	250,000	#VALUE!	0.0%
	400,000	320,000	480,000	*	400,000	#VALUE!	0.0%

Comments: * Initial use. "AsFound" not required.

Other Calibration Parameters		
	As Found	As Left
Zero	*	0
High Voltage	*	900
Threshold (mV)	*	10
HV Indication:	*	900
Overrange	N/A	N/A
Audio	SAT	SAT

Detector Compatibility:*
GM (SCINT.) Proport.
(Circle One)

** Use Specific Detector:
Type: 44-10
Number: 181833

* Indicate the default detector settings only if the instrument is NOT calibrated to a specific detector. Attach a limited use sticker that identifies: Threshold, Voltage, and detector that can be used with the calibration settings, as appropriate.

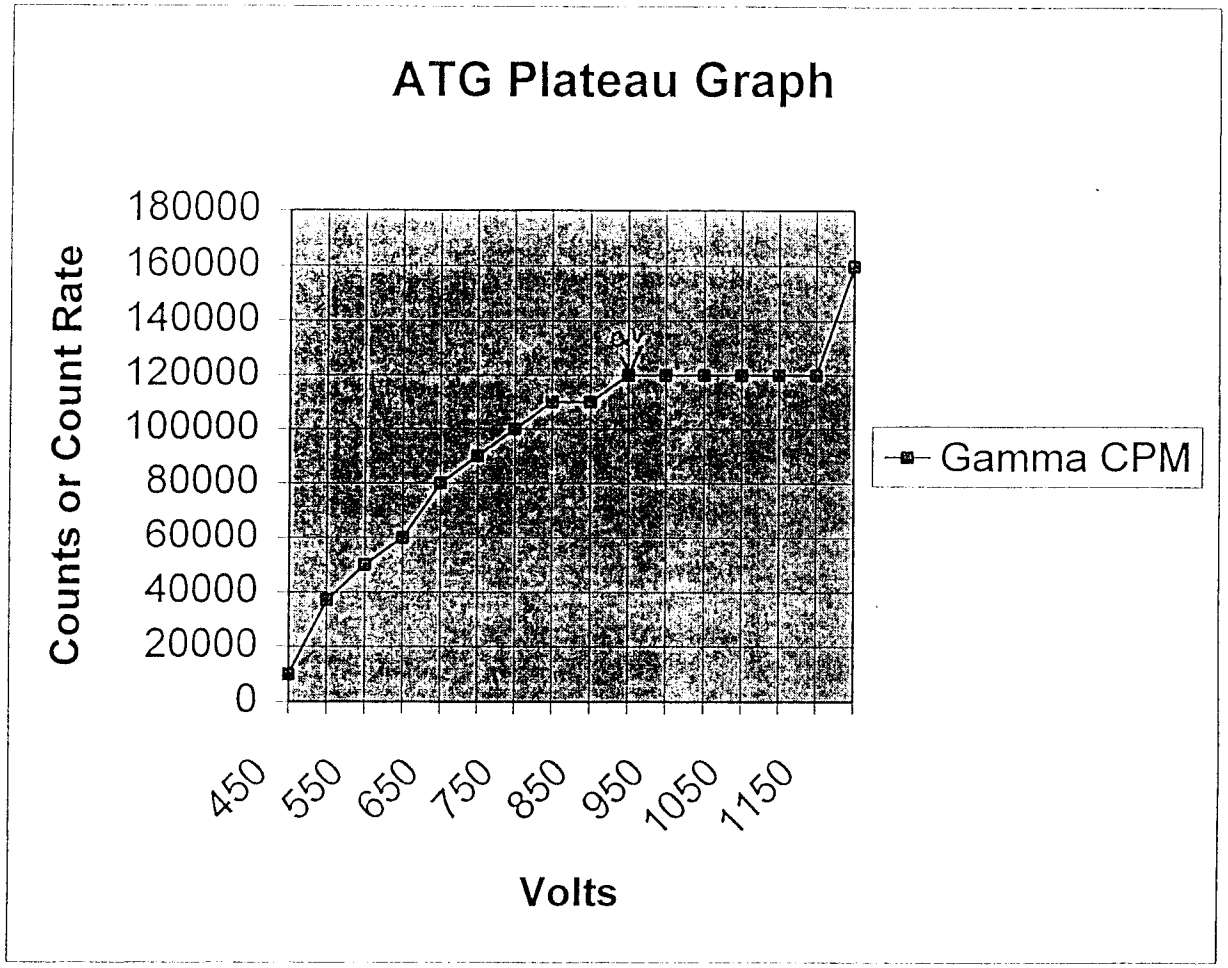
** A limited use sticker is required specifying the detector.

Calibrator (Print): Kevin Wright Calibrator (Signature): K Wright

Reviewed By: Scott Oh Next Calibration Due: 1/1/2003

ATG Detect Setup Record

Volts	Gamma CPM	Bkgd CPM
450	10000	
500	37000	
550	50000	
600	60000	
650	80000	
700	90000	
750	100000	
800	110000	
850	110000	
900	120000	17000
950	120000	
1000	120000	
1050	120000	
1100	120000	
1150	120000	
1200	160000	



O.V. - Operating Voltage

Operating Voltage: 900

Detector Model:	**44-10**
Detector Number:	**181833**
Instrument Assigned	
Instrument Model:	LM-177
Instrument Number:	89922

Sensitivity: **10mV**

Date: 1/1/2002

Performed By: _____

Next Due: 1/1/2003

Reviewed By: _____

Gamma Source: Q96 Mixed Gamma

Activity: 5.67E+05 Gamma Emissions

Contact Efficiency: 18.2% (4 pi)

ATG Calibration Record

Inst. Number: 85744 Model: LM-177 Cal. Date: 1/1/2002

Calibration Instruments					
Type	Number	Cal. Due Date	Type	Number	Cal. Due Date
Pulser	137572	10/15/2002	Temp.	2780	3/28/2002
Voltmeter	75300255	3/26/2002	Pressure	2780	3/28/2002
O-Scope	N/A	N/A	Humidity	N/A	N/A
Timer	N/A	N/A			

Count Rate/Scaler Calibration

Temp.: 78.1 deg.F Pressure: 29.49 in Hg Humidity: N/A

Scale	Target Value	Tolerances		Measurements		Percent Error	
		Min.	Max.	As Found	As Left	As Found	As Left
X1	100	80	120	*	100	#VALUE!	0.0%
	250	200	300	*	250	#VALUE!	0.0%
	400	320	480	*	400	#VALUE!	0.0%
X10	1,000	800	1,200	*	1,000	#VALUE!	0.0%
	2,500	2,000	3,000	*	2,500	#VALUE!	0.0%
	4,000	3,200	4,800	*	4,000	#VALUE!	0.0%
X100	10,000	8,000	12,000	*	10,000	#VALUE!	0.0%
	25,000	20,000	30,000	*	25,000	#VALUE!	0.0%
	40,000	32,000	48,000	*	40,000	#VALUE!	0.0%
X1K	100,000	80,000	120,000	*	100,000	#VALUE!	0.0%
	250,000	200,000	300,000	*	250,000	#VALUE!	0.0%
	400,000	320,000	480,000	*	400,000	#VALUE!	0.0%

Comments: * Initial use. "AsFound" not required.

Other Calibration Parameters			
	As Found	As Left	
Zero	*	0	Detector Compatibility:*
High Voltage	*	900	GM SCINT. Proport.
Threshold (mV)	*	10	(Circle One)
HV Indication:	*	900	** Use Specific Detector:
Overrange	N/A	N/A	Type: 44-10
Audio	SAT	SAT	Number: 181828

* Indicate the default detector settings only if the instrument is NOT calibrated to a specific detector. Attach a limited use sticker that identifies: Threshold, Voltage, and detector that can be used with the calibration settings, as appropriate.

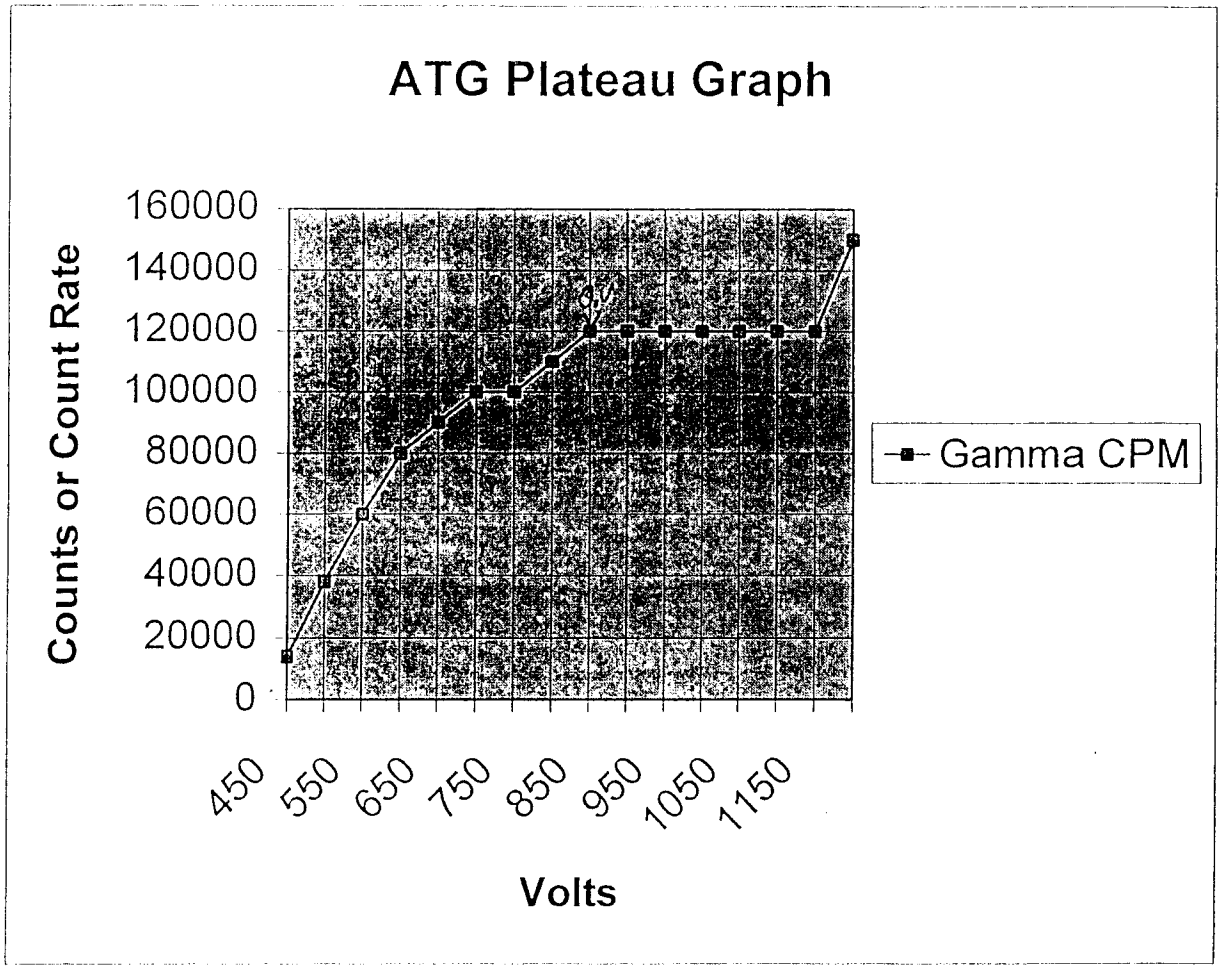
** A limited use sticker is required specifying the detector.

Calibrator (Print): Kevin Wright Calibrator (Signature): _____

Reviewed By: _____ Next Calibration Due: 1/1/2003

ATG Detecto Setup Record

Volts	Gamma CPM	Bkgd CPM
450	14000	
500	38000	
550	60000	
600	80000	
650	90000	
700	100000	
750	100000	
800	110000	
850	120000	
900	120000	17000
950	120000	
1000	120000	
1050	120000	
1100	120000	
1150	120000	
1200	150000	



O.V. - Operating Voltage

Operating Voltage: 900

Detector Model:	**44-10**
Detector Number:	**181828**
Instrument Assigned	
Instrument Model:	LM-177
Instrument Number:	85744

Sensitivity: **10mV**

Date: 1/1/2002

Performed By: _____

Next Due: 1/1/2003

Reviewed By: _____

Gamma Source: Q96 Mixed Gamma

Activity: 5.67E+05 Gamma Emissions

Contact Efficiency: 18.2% (4 pi)

Carter Enterprises

274 Harvey rd.
Kingston, Tn 37763
(865)376-1487

Terms of rental

The rental of 10 Ludlum 177's will be accommodated by Carter enterprises to ATG for the rental fee of $70.00/instrument/month.

A minimum of two (2) months rental is required with subsequent months rental at ATG's option.

All instruments will be returned to Carter enterprises at the end of the rental period in the same condition as they were received.

Repair and maintenance of the instruments will be performed at a rate of $50.00/hour by a qualified and approved vender chosen by Carter enterprises.

Replacement cost of each instrument rented, (if the return condition of rented instruments warrants complete replacement) shall be new like models or the purchase price of new like models from the manufacture at current list price.

Model # L-177	Serial # 93253	Rental fee $70.00/Month
Model # L-177	Serial # 93286	Rental fee $70.00/Month
Model # L-177	Serial # 93221	Rental fee $70.00/Month
Model # L-177	Serial # 93211	Rental fee $70.00/Month
Model # L-177	Serial # 89868	Rental fee $70.00/Month
Model # L-177	Serial # 89935	Rental fee $70.00/Month
Model # L-177	Serial # 89922	Rental fee $70.00/Month
Model # L-177	Serial # 85744	Rental fee $70.00/Month
Model # L-177	Serial # 85723	Rental fee $70.00/Month
Model # L-177	Serial # 85662	Rental fee $70.00/Month

Total/month $700.00/month

Amount due this invoice: $1,400.00 for first two months

Payment must be recieved prior to release of rental instruments payable in cash or approved check

Leasor: _____ Date 12-28-01

Leasee: _____ of (company) Allied Technical Group(ATG) Date 12-28-01

Invoice # 01-10-ATG

SOLID SAMPLE EVALUATION

SAMPLE ID: **Red Clay #1** COC: **74**

Description: **Ft McClellan Sample**

NUCLIDE	% of Mix	QUANTITY (uCi/g)	ERROR (uCi/g)	QUANTITY (pCi/g)	ERROR (pCi/g)	MDA (uCi/g)	MDA (pCi/g)
Mn-54							
Co-57							
Co-58							
Co-60	98.36%	**1.49E-02**	**1.67E-03**	14890.00	1666.00		
Zn-65							
Ag-110m							
Sb-125							
Cs-134							
Cs-137	1.64%	**2.48E-04**	**4.69E-05**	247.60	46.88		
Nb-95							
Zr-95							
			Total pCi/g:	15137.60		MDA pCi/g:	0.00

Was Container Completely filled with sample? **Y**

Above 5 pCi/g: Yes

Recount: No

Desired MDA: 5 pCi/g

SAMPLE WEIGHT: **24.9** g

VOLUME: **22** ml

DENSITY: 1.13

If activity is NOT detected, fill out the MDA section. Otherwise, record the activity quantity in uCi/ml.

Bold data was entered by the evaluator.

Radon Daughters were allowed to reach equilibrium: **No**

Natural Nuclides						
Thorium Series 100%		**Uranium Series 99.27%**		**Actinium Series 0.72%**		**K-40**
Nuclide	uCi/g	Nuclide	uCi/g	Nuclide	uCi/g	0.00E+00
Ac-228		Th-234		U-235		
Ra-224		Pa-234		Th-231		
Pb-212		Pa-234m		Pa-231		
Bi-212		U-234		Fr-223		
Tl-208		Ra-226		Th-227		
		Pb-214		Ra-223		
		Bi-214				

Unidentified Peak Resolution

Energy (keV)				Resolution			
None	N/A						
None	N/A						
None	N/A						
None	N/A						
None	N/A						
None	N/A						
None	N/A						

Evaluated by: _____ Date: 1-9-02

SOLID SAMPLE EVALUATION

SAMPLE ID: **Red Clay #2** COC: **74**

Description: **Ft McClellan Sample**

NUCLIDE	% of Mix	QUANTITY (uCi/g)	ERROR (uCi/g)	QUANTITY (pCi/g)	ERROR (pCi/g)	MDA (uCi/g)	MDA (pCi/g)
Mn-54							
Co-57							
Co-58							
Co-60	98.00%	**1.05E-02**	**1.18E-03**	10540.00	1181.00		
Zn-65							
Ag-110m							
Sb-125							
Cs-134							
Cs-137	2.00%	**2.15E-04**	**4.01E-05**	215.40	40.13		
Nb-95							
Zr-95							
			Total pCi/g:	10755.40		MDA pCi/g:	0.00

Was Container Completely filled with sample? **Y**

Above 5 pCi/g: Yes

Recount: No

Desired MDA: 5 pCi/g

SAMPLE WEIGHT: **25.2** g

VOLUME: **22** ml

DENSITY: 1.15

If activity is NOT detected, fill out the MDA section. Otherwise, record the activity quantity in uCi/ml.

Bold data was entered by the evaluator.

Radon Daughters were allowed to reach equilibrium: **No**

Natural Nuclides

Thorium Series 100%		**Uranium Series 99.27%**		**Actinium Series 0.72%**		**K-40**
Nuclide	uCi/g	Nuclide	uCi/g	Nuclide	uCi/g	0.00E+00
Ac-228		Th-234		U-235		
Ra-224		Pa-234		Th-231		
Pb-212		Pa-234m		Pa-231		
Bi-212		U-234		Fr-223		
Tl-208		Ra-226		Th-227		
		Pb-214		Ra-223		
		Bi-214				

Unidentified Peak Resolution

Energy (keV)				Resolution			
None	N/A						
None	N/A						
None	N/A						
None	N/A						
None	N/A						
None	N/A						
None	N/A						

Evaluated by: _____ Date: 1-9-02

SOLID SAMPLE EVALUATION

SAMPLE ID: **Red Clay #3** COC: **74**

Description: **Ft McClellan Sample**

NUCLIDE	% of Mix	QUANTITY (uCi/g)	ERROR (uCi/g)	QUANTITY (pCi/g)	ERROR (pCi/g)	MDA (uCi/g)	MDA (pCi/g)
Mn-54							
Co-57							
Co-58							
Co-60	98.56%	**1.61E-02**	**1.80E-03**	16050.00	1796.00		
Zn-65							
Ag-110m							
Sb-125							
Cs-134							
Cs-137	1.44%	**2.34E-04**	**4.47E-05**	234.40	44.73		
Nb-95							
Zr-95							
			Total pCi/g:	16284.40		MDA pCi/g:	0.00

Was Container Completely filled with sample? **Y**

Above 5 pCi/g: Yes

Recount: No

Desired MDA: 5 pCi/g

SAMPLE WEIGHT: **25.6** g

VOLUME: **22** ml

DENSITY: 1.16

If activity is NOT detected, fill out the MDA section. Otherwise, record the activity quantity in uCi/ml.

Bold data was entered by the evaluator.

Radon Daughters were allowed to reach equilibrium: **No**

Natural Nuclides						
Thorium Series 100%		**Uranium Series 99.27%**		**Actinium Series 0.72%**		**K-40**
Nuclide	uCi/g	Nuclide	uCi/g	Nuclide	uCi/g	0.00E+00
Ac-228		Th-234		U-235		
Ra-224		Pa-234		Th-231		
Pb-212		Pa-234m		Pa-231		
Bi-212		U-234		Fr-223		
Tl-208		Ra-226		Th-227		
		Pb-214		Ra-223		
		Bi-214				

Unidentified Peak Resolution

Energy (keV)				Resolution			
None	N/A						
None	N/A						
None	N/A						
None	N/A						
None	N/A						
None	N/A						
None	N/A						

Evaluated by: _____ Date: 1-9-02

SOLID SAMPLE EVALUATION

SAMPLE ID: **Soil #1** COC: **74**

Description: **Ft McClellan Sample**

NUCLIDE	% of Mix	QUANTITY (uCi/g)	ERROR (uCi/g)	QUANTITY (pCi/g)	ERROR (pCi/g)	MDA (uCi/g)	MDA (pCi/g)
Mn-54							
Co-57							
Co-58							
Co-60	0.50%	**9.89E-05**	**1.49E-05**	98.92	14.85		
Zn-65							
Ag-110m							
Sb-125							
Cs-134							
Cs-137	99.50%	**1.97E-02**	**3.02E-03**	19730.00	3020.00		
Nb-95							
Zr-95							
			Total pCi/g:	19828.92		MDA pCi/g:	0.00

Was Container Completely filled with sample? **Y**

Above 5 pCi/g: Yes

Recount: No

Desired MDA: 5 pCi/g

SAMPLE WEIGHT: **31** g

VOLUME: **22** ml

DENSITY: 1.41

If activity is NOT detected, fill out the MDA section. Otherwise, record the activity quantity in uCi/ml.

Bold data was entered by the evaluator.

Radon Daughters were allowed to reach equilibrium: **No**

Natural Nuclides

Thorium Series 100%		**Uranium Series 99.27%**		**Actinium Series 0.72%**		**K-40**
Nuclide	uCi/g	Nuclide	uCi/g	Nuclide	uCi/g	0.00E+00
Ac-228		Th-234		U-235		
Ra-224		Pa-234		Th-231		
Pb-212		Pa-234m		Pa-231		
Bi-212		U-234		Fr-223		
Tl-208		Ra-226		Th-227		
		Pb-214		Ra-223		
		Bi-214				

Unidentified Peak Resolution

Energy (keV)				Resolution			
None	N/A						
None	N/A						
None	N/A						
None	N/A						
None	N/A						
None	N/A						
None	N/A						

Evaluated by: _____ Date: 1-9-02

SOLID SAMPLE EVALUATION

SAMPLE ID: **Soil #2** COC: **74**

Description: **Ft McClellan Sample**

NUCLIDE	% of Mix	QUANTITY (uCi/g)	ERROR (uCi/g)	QUANTITY (pCi/g)	ERROR (pCi/g)	MDA (uCi/g)	MDA (pCi/g)
Mn-54							
Co-57							
Co-58							
Co-60	0.61%	**1.19E-04**	**1.83E-05**	118.70	18.30		
Zn-65							
Ag-110m							
Sb-125							
Cs-134							
Cs-137	99.39%	**1.93E-02**	**2.96E-03**	19300.00	2956.00		
Nb-95							
Zr-95							
			Total pCi/g:	19418.70		MDA pCi/g:	0.00

Was Container Completely filled with sample? **Y**

Above 5 pCi/g: Yes SAMPLE WEIGHT: **23.4** g

Recount: No VOLUME: **22** ml

Desired MDA: 5 pCi/g DENSITY: 1.06

If activity is NOT detected, fill out the MDA section. Otherwise, record the activity quantity in uCi/ml.

Bold data was entered by the evaluator.

Radon Daughters were allowed to reach equilibrium: **No**

Natural Nuclides						
Thorium Series 100%		**Uranium Series 99.27%**		**Actinium Series 0.72%**		**K-40**
Nuclide	uCi/g	Nuclide	uCi/g	Nuclide	uCi/g	1.22E-05
Ac-228		Th-234		U-235		
Ra-224		Pa-234		Th-231		~~**1.22E-05**~~ JU 1-9-02
Pb-212		Pa-234m		Pa-231		
Bi-212		U-234		Fr-223		
Tl-208		Ra-226		Th-227		
		Pb-214		Ra-223		
		Bi-214				

Unidentified Peak Resolution

Energy (keV)				Resolution			
None	N/A						
None	N/A						
None	N/A						
None	N/A						
None	N/A						
None	N/A						
None	N/A						

Evaluated by: _____ Date: 1-9-02

SOLID SAMPLE EVALUATION

SAMPLE ID: **Soil #3** COC: **74**

Description: **Ft McClellan Sample**

NUCLIDE	% of Mix	QUANTITY (uCi/g)	ERROR (uCi/g)	QUANTITY (pCi/g)	ERROR (pCi/g)	MDA (uCi/g)	MDA (pCi/g)
Mn-54							
Co-57							
Co-58							
Co-60	0.59%	**1.11E-04**	**1.96E-05**	111.30	19.59		
Zn-65							
Ag-110m							
Sb-125							
Cs-134							
Cs-137	99.41%	**1.86E-02**	**2.85E-03**	18620.00	2852.00		
Nb-95							
Zr-95							
			Total pCi/g:	18731.30		MDA pCi/g:	0.00

Was Container Completely filled with sample? **Y**

Above 5 pCi/g: Yes

Recount: No

Desired MDA: 5 pCi/g

SAMPLE WEIGHT: **16.4** g

VOLUME: **22** ml

DENSITY: 0.75

If activity is NOT detected, fill out the MDA section. Otherwise, record the activity quantity in uCi/ml.

Bold data was entered by the evaluator.

Radon Daughters were allowed to reach equilibrium: **No**

Natural Nuclides

Thorium Series 100%		**Uranium Series 99.27%**		**Actinium Series 0.72%**		**K-40**
Nuclide	uCi/g	Nuclide	uCi/g	Nuclide	uCi/g	1.75E-05
Ac-228		Th-234		U-235		
Ra-224		Pa-234		Th-231		
Pb-212		Pa-234m		Pa-231		
Bi-212		U-234		Fr-223		
Tl-208		Ra-226		Th-227		
		Pb-214		Ra-223		
		Bi-214				

~~1.75E-05~~ xw 1-9-02

Unidentified Peak Resolution

Energy (keV)				Resolution			
None	N/A						
None	N/A						
None	N/A						
None	N/A						
None	N/A						
None	N/A						
None	N/A						

Evaluated by: [signature] Date: 1-9-02

COPY

Safety and Ecology Corporation

2800 Solway Road

Knoxville, TN 37931

Calibration Certificate

3/21/02

Calibration Certificate for 44-10,Serial # PR164001, Bar Code # ,Property # SEC0000728

Date: 03/21/02 Date Last Cal. Expires: Technician: Shane Day

Location: 9999, Reason For Calibration: Due for Calibration

EQUIPMENT USED DURING CALIBRATION

MODEL:	2221	SERIAL #:	172035	CAL DUE:	12/19/02
MODEL:		SERIAL #:		CAL DUE:	

NIST TRACEABLE SOURCES USED

SOURCE	ISOTOPE	ACTIVITY	ASSAY DATE
99CS250-0288	Cs-137	8.8 uCi	3/18/99

AS FOUND DATA AF Instrument Condition: SAT AL Instrument Condition: SAT

Efficiency from Last Cal.: 0.70 % HV From Last Calibration: 1050 V Calibration Threshold: 10 mV

	HV	Center Count	Background Count	Probe Efficiency
AS FOUND:	1050 V	138475	4731	Cs-137 [redacted]
AS LEFT:	V	0	0	Cs-137 [redacted]

☑ Is the As Found Efficiency Within 20% of the efficiency from the last cal.?

Reproducibility: 138475 138524 138588 Average: 138529 ☑ Are the individual counts within 10% of the average?

[redacted]

PLATEAU AND SET POINT DATA (CPM)

High Voltage	Source Response	Background	HV	CENTER	Background	Efficiency
			V			Cs-137 [redacted]
						[redacted]

Comments: Married as a set with: Model: Serial #:

☑ Does Instrument Meet Final Acceptance Criteria? ☑ Calibration Sticker Attached?

Date Instrument is Due For Next Calibration: [redacted]

Performed by: Shane Day Reviewed by: Mike Parton Date: 3/21/02

Printed Name: Shane Day

Entered in Computer Inventory By: Date: 3/21/02

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SAFETY AND ECOLOGY CORPORATION

CALIBRATION CERTIFICATE FOR 2221 SERIAL# 172038

SEC0000935

SECTION 1 GENERAL INFORMATION

DATE: 11/30/01 **LOCATION:** SEC Lab

TECH: Jerry DeGroodt **DATE LAST CAL EXPIRES:**

Reason For Calibration:
- ○ Due For Calibration
- ○ Repair (See Remarks)
- ◉ Other (See Remarks)
- ○ Due and Repair (See Remarks)

EQUIPMENT USED DURING CALIBRATION

MODEL:	M-500	**SERIAL #:**	171700	**CAL. DUE:**	02/28/02
MODEL:		**SERIAL #:**		**CAL DUE:**	

SECTION 2 AS FOUND DATA

CONDITION: Sat

AF MECHANICAL ZERO: 0 **AL MECHANICAL ZERO:** 0

NEW BATTERIES: ○ Yes ◉ No **BATTERY CHECK:** Sat

HV	AS FOUND HV	AS LEFT HV
500 V:	504	A.F.
1000 V:	1002	A.F.
1500 V:	1499	A.F.

AF THRESHOLD: 10

AL THRESHOLD: 40

RATE METER						SCALER			
SCALE	RATE CPM	AS FOUND	% ERROR	AS LEFT	% ERROR	AS FOUND	% ERROR	AS LEFT	% ERROR
x.1 or x1	100	100	0.0%	A.F.					
	250	250	0.0%	A.F.		250	0.0%	A.F.	0.0%
	400	400	0.0%	A.F.					
x1 or x10	1000	1000	0.0%	A.F.					
	2500	2500	0.0%	A.F.					
	4000	4000	0.0%	A.F.					
x10 or x100	10K	10K	0.0%	A.F.					
	25K	25K	0.0%	A.F.					
	40K	40K	0.0%	A.F.					
x100 or x1000	100K	100K	0.0%	A.F.					
	250K	250K	0.0%	A.F.					
	400K	400K	0.0%	A.F.					

Is the As Found Data Within 20% of the Set Point?: ◉ Yes ○ No

SAFETY AND ECOLOGY CORPORATION

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LOG SCALE

SCALE	RATE CPM	AS FOUND	% ERROR	AS LEFT	% ERROR
Log	**200**	200	0.0%	A.F.	
	2000	2000	0.0%	A.F.	
	20K	20K	0.0%	A.F.	
	200K	195K	2.5%	A.F.	

Is the As Found Data Within 20% of the Set Point?: ◉ Yes ○ No

SECTION 3: REPRODUCIBILITY

Serial #: 172038

x.1 or x1 Scale:	250	250	250
x1 or x10 Scale:	2500	2500	2500
x10 or x100 Scale:	25K	25K	25K
x100 or x1000 Scale:	250K	250K	250K

Are the Individual Counts Within 10% of the Average?: ◉ **Yes** ○ **No**

t / Slow Response Switch Functions Properly?: ◉ **Yes** ○ **No**

Audio Response: ◉ **Sat** ○ **Unsat**

SECTION 4: FINAL ACCEPTANCE

Audio Divide: ◉ Sat ○ Unsat **Push Buttons:** ◉ Sat ○ Unsat

Lamp: ◉ Sat ○ Unsat **Scaler/Digital:** ◉ Sat ○ Unsat

Remarks: Initial calibration of new meter.

Does Instrument Meet Final Acceptance Criteria?: ◉ Yes ○ No

Calibration Sticker Attached?: ◉ Yes ○ No

Date Instrument is Due For Next Calibration: **11/30/02**

Performed by: _____ **Reviewed by:** _____ **Date:** 11/30/01

Entered in Computer Inventory By: _____ Date: 11/30/01