



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
2405 GUN SHED ROAD
JOINT BASE FORT SAM HOUSTON, TX 78234-1223

November 30, 2015

ATTN: Document Control Desk
Deputy Director, Decommissioning and Uranium Recovery Licensing Directorate
Division of Waste Management and Environmental Protection
Office of Federal and State Materials and Environmental Management Programs
Mailstop T8 F5
US Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Deputy Director:

Reference your letter, October 29, 2015, subject: Second Request for Additional Information – Technical Review of the U.S. Army's Application to Amend the Source Materials License for Depleted Uranium from Davy Crockett M101 Munitions - (SUC-1593, Docket No. 40-09083).

I enclose our response to your requests included with that letter. I also enclose a revised "M101 Impact Areas" document. It corrects the previously submitted document with the same title that mistakenly included two maps (one each for Fort Knox KY and Joint Base Lewis-McChord WA) that were not M101 impact areas.

You may reach me at (210) 466-0368 or robert.n.cherry.civ@mail.mil.

Sincerely,

A handwritten signature in cursive script, reading "Robert N. Cherry", is positioned above the printed name.

Robert N. Cherry
License Radiation Safety Officer

Enclosures

Army Responses to NRC's Second RAI, License # SUC-1593 Amendment Application

General License for three sites located at Fort Carson, Colorado

With respect to Attachment 9 of the June 1, 2015 submittal (Agencywide Documents Access and Management System [ADAMS] Accession No. ML13259A062), regarding the Fort Carson Impact Areas near Sergeants and Titus Roads:

1. What are the current and projected land uses for these areas?

Permanent facilities within these areas include:

- Colorado National Guard: Centennial Training Complex Maneuver Area Tactical Equipment Site (MATES)
- Army Reserve 88th Regional Support Command Equipment Concentration Site #42
- 4th Combat Aviation Brigade Aviation Life Support Equipment (ALSE) Shop (8 buildings and motor pool)
- Range 60, a 28-building urban operations training facility
- Range 60A, Improvised Explosives Training Lane
- Range 60B, Land Mine Detection/Mine Hound Lanes
- Range 55, a 16-lane Automated Field Fire Range
- Range 57, a 16-lane Automated Record Fire Range
- Range 71, a Land Mine Detection Course
- Department of Public Works, Hazardous Storage Facility
- Tank Trail "B" and Butts Road, military and civilian vehicle use
- Training Area 3, dismounted and mounted maneuver
- Underground and overhead utilities, electric, water, sewage, communications

In the first quarter of fiscal year 2015, approximately 35,000 Soldier-training days occurred at these ranges.¹ The training spans the spectrum from basic rifle marksmanship to special combat skills needed for deployment to areas of operation around the globe.

Projected uses include:

- Continued use and maintenance of all above-listed facilities
 - Underground sewage booster station
 - New facilities for the Colorado National Guard
- 2. Please provide the referenced document, "Fort Carson Davy Crockett Phase I, Depleted Uranium Investigation, Fort Carson, Colorado." Baltimore, Maryland: Cabrera Services, 2009.**

We have included the referenced document with this response. We apologize for its omission. We had intended to include it in the original amendment application.

¹ A training day means one Soldier using the range for one day. One hundred Soldiers using a range for one day would be 100 training days.

3. Finally, identify the radiological controls and monitoring requirements that the Army plans to require for these areas, if a general license were to be in effect.

Whether or not a general license is in effect, the Army already has established radiological controls to comply with 10 CFR 40, §40.22(b)(2)(ii) [source material waste disposal], not only in the pending amendment to source material license number SUC-1593 but also in accordance with Army regulations and guidance regarding proper disposal of low-level radioactive waste.

The Army has no plans to require special or new monitoring requirements for the two or three M101 spotting rounds that might remain in the former demonstration target area.

Existing “monitoring” requirements for discovered munitions constituents² apply. These requirements include providing safety education,³ noting and securing the location and notifying supporting explosive ordnance disposal (EOD) personnel. Responding EOD personnel, following their protocols, then identify the munitions constituents and arrange for their proper disposition. In this case of an M101 spotting round, proper disposition means collection of the round and immediately adjacent soil; temporary storage of this material in a tight, closed, properly labeled container; and subsequent disposal in accordance with NRC and Army regulations. We emphasize that the Army will follow these procedures with or without a general license for this area in place.

Should the NRC issue a general license for the Fort Carson impact areas near Sergeants and Titus Roads, the Army, of course, will comply with the conditions of that license. However the maximum activity of depleted uranium that could possibly remain in that area is less than 210 microcuries. In view of tiny risk that such a miniscule amount of radioactivity poses⁴ relative to the burden to the Army and to the NRC of whatever controls the general license might require, the NRC could choose to exempt this area from licensing under the provisions of 10 CFR 40, §40.14(a), because the exemption “will not endanger life or property or the common defense and security and [is] otherwise in the public interest.”

The NRC should also consider the high probability that the two or three M101 spotting rounds are no longer in the area. Surveys summarized in the Cabrera report (attached) and in the Archive Search Report for Fort Carson did not find any physical evidence of M101 spotting rounds in the area. Fort Carson personnel may have retrieved the rounds shortly after the demonstrations. If that did not occur, the area has been in

² The term “munitions constituents” means any materials originating from unexploded ordnance, discarded military munitions, or other military munitions, including explosive and nonexplosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions. [10 U.S. Code § 2710(e)(5)]

³ In accordance with DA PAM 385-63, paragraph 2-16, garrison commanders will provide unexploded ordnance “safety education training or information (such as, brochures) to people living on the installation ... or that work on or use the property. Such training will be based on and incorporate the Army’s 3Rs (Recognize, Retreat, Report) message and safety education material (available at <https://www.denix.osd.mil/uxosafety>). Such training will also be offered to schools on or in close proximity to the installation ... on a periodic basis.”

⁴ We note, as the NRC recognizes in 10 CFR 20, that the primary hazard of depleted uranium is due to its toxicity as a heavy metal, not to its radioactivity.

continuous use over the forty years between the times of the firepower demonstrations and the surveys. Therefore, it is likely that someone discovered one or all of the rounds during that period at which time the spotting rounds would have been properly disposed of.

Given the low number (one to three) of M101 rounds that could possibly be located in this area and the location of the potential rounds on an active Army range subject to access control measures, no danger to life or property is present. Conversely, limitations on the facilities listed above could have an adverse effect on the training and readiness activities of the Soldiers and units assigned there. Given the low to non-existent risk of the presence of M101 DU and the potential disruption to the common defense posed by the application of licensing requirements, exemption from licensing is in the public interest.

For these reasons, the Army requests that the NRC not include the Fort Carson area near Sergeants and Titus Roads in the source material license number SUC-1593 and not issue a general license for the M101 spotting rounds that may or may not be in this area.

Attachment:

"Fort Carson Davy Crockett Phase I, Depleted Uranium Investigation, Fort Carson, Colorado." Baltimore, Maryland: Cabrera Services, 2009

FINAL

TECHNICAL MEMORANDUM

**Fort Carson Davy Crockett Phase I
Depleted Uranium Investigation
Fort Carson, Colorado**

Prepared for

**Army Joint Munitions Command
Rock Island, IL**

Prepared by



103 East Mount Royal Ave, Suite 2B
Baltimore, MD 21202

May 2009

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LIST OF ACROYNMS AND ABBREVIATIONS

^{137}Cs	Cesium
^{238}U	uranium-238
^{235}U	uranium-235
^{234}U	uranium-234
ASR	Recent Archive Search Reports
BFTA	Battle Force Training Area
CABRERA	Cabrera Services Inc.
DASA/ESOH	Deputy Assistant Secretary of the Army, Environmental, Safety and Occupational Health
DU	Depleted Uranium
DC	Davy Crockett
FIDLER	Field Instrument for Detection of Low Energy Radiation
LIA	Large Impact Area
OSL	optically stimulated luminescent
PETN	pentaerythrite tetranitrate
USACE	US Army Corps of Engineers
WWII	World War II

1.0 INTRODUCTION

Fort Carson is a military training facility of approximately 138,000 acres situated in south-central Colorado within portions of El Paso, Pueblo, and Fremont counties. Colorado Springs is just north of the installation, and the city of Fountain is adjacent to the northeastern property boundary. Pueblo, Colorado is approximately five miles southeast of Fort Carson's southern boundary. The cantonment area occupies approximately 4,424 acres and is located at the northwest boundary of Fort Carson, adjacent to State Route 115. The installation is bounded by Interstate 25 and residential properties to the east, by State Highway 83 to the north, by State Route 115 to the west, and by agricultural fields and grazing land to the south. The Rocky Mountain Front Range, a mountain range on the eastern edge of the Rocky Mountains that extends from near the Wyoming-Colorado border to south-central Colorado, lies just west of the installation.

Fort Carson was established as a temporary Army training facility in 1942 (Camp Carson) shortly after the Pearl Harbor attack. At that time, Camp Carson was about 60,048 acres. Camp Carson served as a training area for over 100,000 soldiers during World War II (WWII). By 1946, activities at Camp Carson had declined, reducing the number of military personnel to approximately 600. However, the installation became a permanent post and continued to provide basic and advanced training for combat-ready troops. In 1954, Camp Carson was officially renamed Fort Carson. An additional 77,343 acres were added in 1965 to accommodate mechanized training, resulting in a total of approximately 138,000 acres.

The Davy Crockett Weapon System was first fielded in the late 1950's and was withdrawn from service in the late 1960's. The Davy Crockett weapon system consisted of two types of recoilless rifle weapons. One type was the Battle Group Atomic Weapon System M28 that was considered the light weapon. The second type was the Battle Group Atomic Weapon System M29 that was considered the heavy weapon. The M28 was a 120mm recoilless rifle with a maximum range of 2,000 meters and the M29 was a 155mm recoilless rifle with a maximum range of 4,000 meters.¹

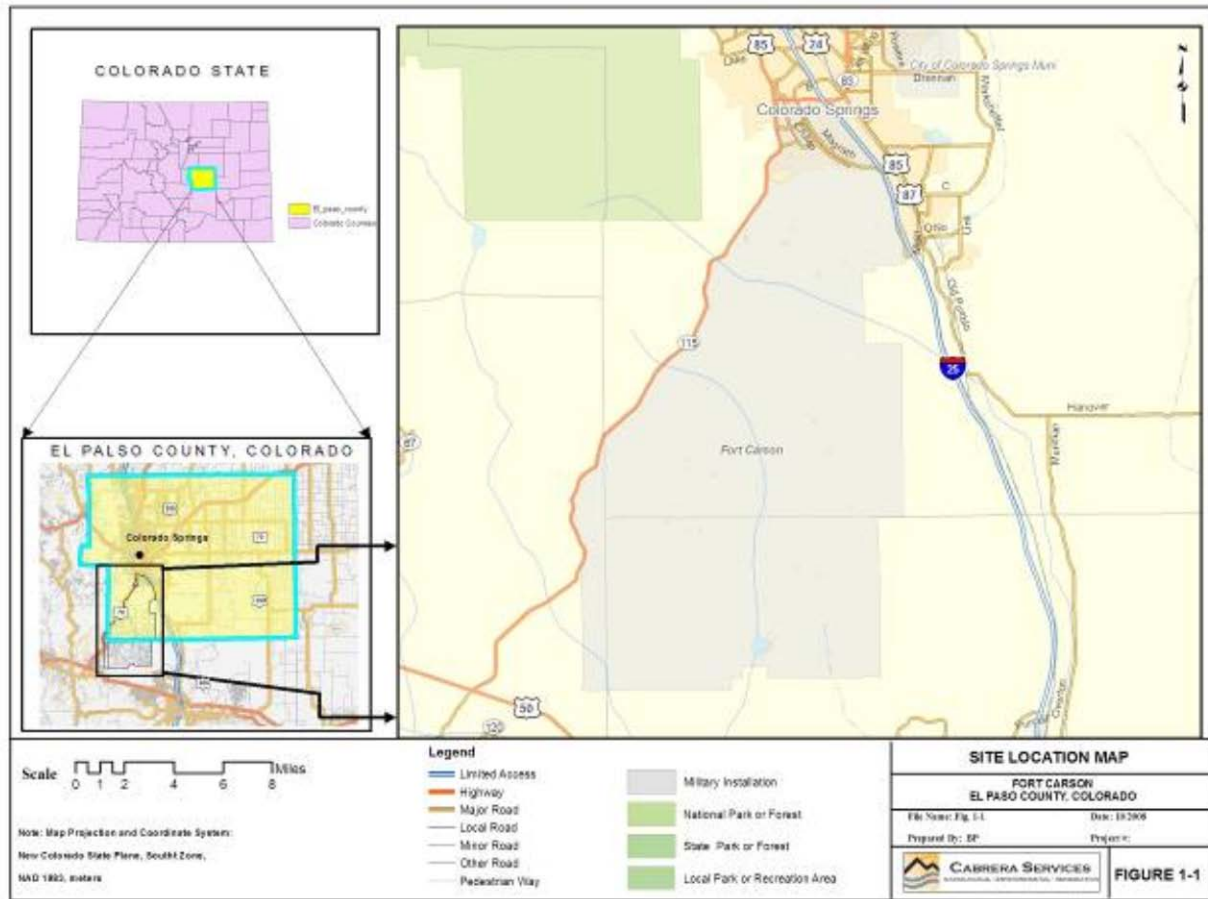
¹ Range Operations Report No. 9 (RO-9) Davy Crockett Weapon System Range, USACE St. Louis 2005

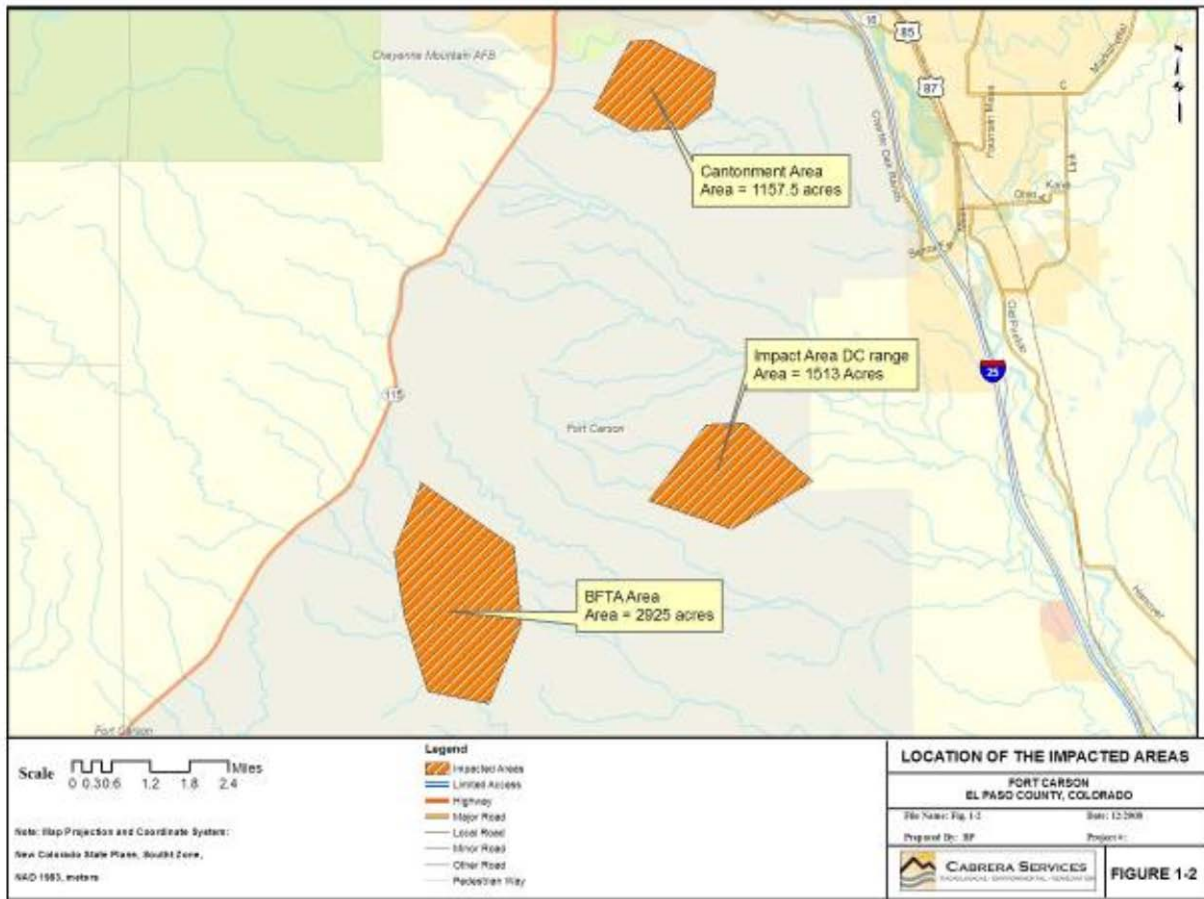
Recent Archive Search Reports (ASR) by US Army Corps of Engineers (USACE) St. Louis indicated that the Davy Crockett system was potentially deployed to Fort Carson, and may have been used for training at the installation. Three areas of concern were identified, one within the current cantonment area which is undergoing significant construction activities, one within the present Large Impact Area (LIA), and one within the Battle Force Training Area (BFTA). USACE and Fort Carson personnel conducted extensive research and range inspections during an 11-15 March 2008 site visit to determine whether Davy Crockett debris was still identifiable at the site. During the visit, the team found four M29 launch pistons at the LIA. No debris was found in the cantonment area and the team did not visit the BFTA. No radiological records were generated during the visit, and only visual data was recorded.

Of particular concern at the Fort Carson site was the use of the XM101 20mm Spotting Round (and possibly the 37mm XM145 Spotting Round). The XM101 projectile was approximately 7.5 inches long, 20mm in diameter, and weighed approximately one pound (0.45 lbs of which is the depleted uranium body). The 20mm XM101 cartridge was a low velocity cartridge used to determine the impact point for the 279mm projectile fired from the light XM28 Davy Crockett weapon system. Upon impact, the XM101 projectile emitted a puff of white smoke. The 20mm spotting rounds were fired prior to firing the XM390 projectile from the XM28 Light Weapon System. Rounds were fired and corrections made until fire was adjusted on target. The XM101 projectile body was made from D-38 uranium alloy and filled with 90 grains of incendiary mix LCOP-1 and 25 grains of pentaerythrite tetranitrate (PETN). It used an electric, point detonating fuse (M538) to detonate the projectile and produce the white smoke puff on impact.

Due to the potential presence of the depleted uranium contaminant in active construction areas of the cantonment, Cabrera Services, Inc (CABRERA) responded with three personnel to investigate the potential for persons in the area to be exposed to potentially harmful contamination.

A scoping survey of the area was conducted by contractor personnel and Fort Carson personnel during the week of 13-17 October 2008. This report summarizes the scoping survey.





2.0 SCOPE OF WORK

CABRERA has been tasked by the U.S. Army JMC to perform a scoping survey at US Army Installation, Fort Carson to determine whether DU is present in the suspect areas on the Post.

These services included:

- Site visit and survey;
- Radiological survey using handheld Field Instrument for Detection of Low Energy Radiation (FIDLER);
- Soil sampling for Uranium, using Alpha Spectroscopy for Isotopic Uranium samples collected in the field;
- Dose Rate surveys in and around the construction area sites; and a
- Summary Report of Activities.

The results of these activities will be used to develop the criteria and plans for a follow-on characterization survey of the potentially impacted areas.

3.0 SCOPING SURVEY

3.1 Survey Methodology

The Fort Carson scoping survey was carried out by CABRERA personnel the week of 13-17 October, 2008. The survey was performed to determine whether Depleted Uranium (DU) is present at Fort Carson due to the use of the Davy Crockett (DC) weapon system. The primary goal was to assess whether DU was present in areas undergoing or planned for construction where persons could come in direct contact with the material. Of subsequent interest was whether the presence of the system could be verified in the BFTA area. Due to the secure nature of the LIA, it was not surveyed as part of this project. The survey itself took place over the course of three days. The particular methods employed in each area are described below.

3.2 Cantonment Area

The cantonment area was extensively surveyed visually, instrument assisted and specifically with a dose rate meter. Visual surveys were conducted along the hillsides in potential downrange areas with crews focusing on finding dummy warheads, launch pistons and spotter round bodies. No DC debris was observed. The FIDLER probe was used during visual surveys for identifying radioactive material, (DU), associate with the DC spotter round. Soil samples and dose rates were collected in and around major construction areas (both planned and in progress).

3.3 Large Impact Area

The LIA is highly secured and restricted due to the presence of Improved Conventional Munitions (ICM). Due to this fact and the limited time frame of this project, no surveys were conducted in this area.

3.4 Battle Force Training Area

The BFTA was surveyed visually by six people. Transects through several canyons and across several mesas revealed no DC debris. The location of the DC training range is uncertain at the BFTA, warranting a more thorough visual survey of the area. Evidence of soldiers (and possibly the public) camping in the area was evident in areas surveyed. Instrument assisted transects in the area were conducted on a limited basis with no significant results noted.

3.5 Out-Brief

During the third and final day of the survey, CABRERA personnel spent the afternoon out-briefing with the Fort Carson Garrison Commander and the Deputy Assistant Secretary of the Army, Environmental, Safety and Occupational Health (DASA/ESOH). A tour of the cantonment area was also conducted.

3.6 Equipment

The scoping survey was performed using Ludlum Model 2221 and Alpha Spectra FIDLER, Ludlum Model 2360 Channel Scaler/Rate Meter with a Ludlum Model 43-93 alpha/beta Probe, and Ludlum Model 2241 with a Ludlum Model 44-9 GM Pancake Probe. Dose equivalent rates were measured using a Bicorn MicroREM Meter.

Small hand tools and latex gloves were used for sample collection and packaging. Surface soil samples were collected with a stainless steel trowel which was spray cleaned with potable bottled water, dried, and frisked with a GM pancake probe for contamination between samples. Soil samples were homogenized in a stainless steel bowl and large stones and organic matter were removed from the samples before packaging. The stainless steel bowl was also cleaned with potable water, dried, and surveyed for contamination between samples.

CABRERA personnel wore NVLAP accredited optically stimulated luminescent (OSL) dosimetry to measure any potential external radiation encountered during the surveys. No elevated doses were detected.

3.7 Quality Control Measures

All equipment used in the field was checked using a Cesium (^{137}Cs) gamma check source. All instruments used in the field passed daily quality checks.

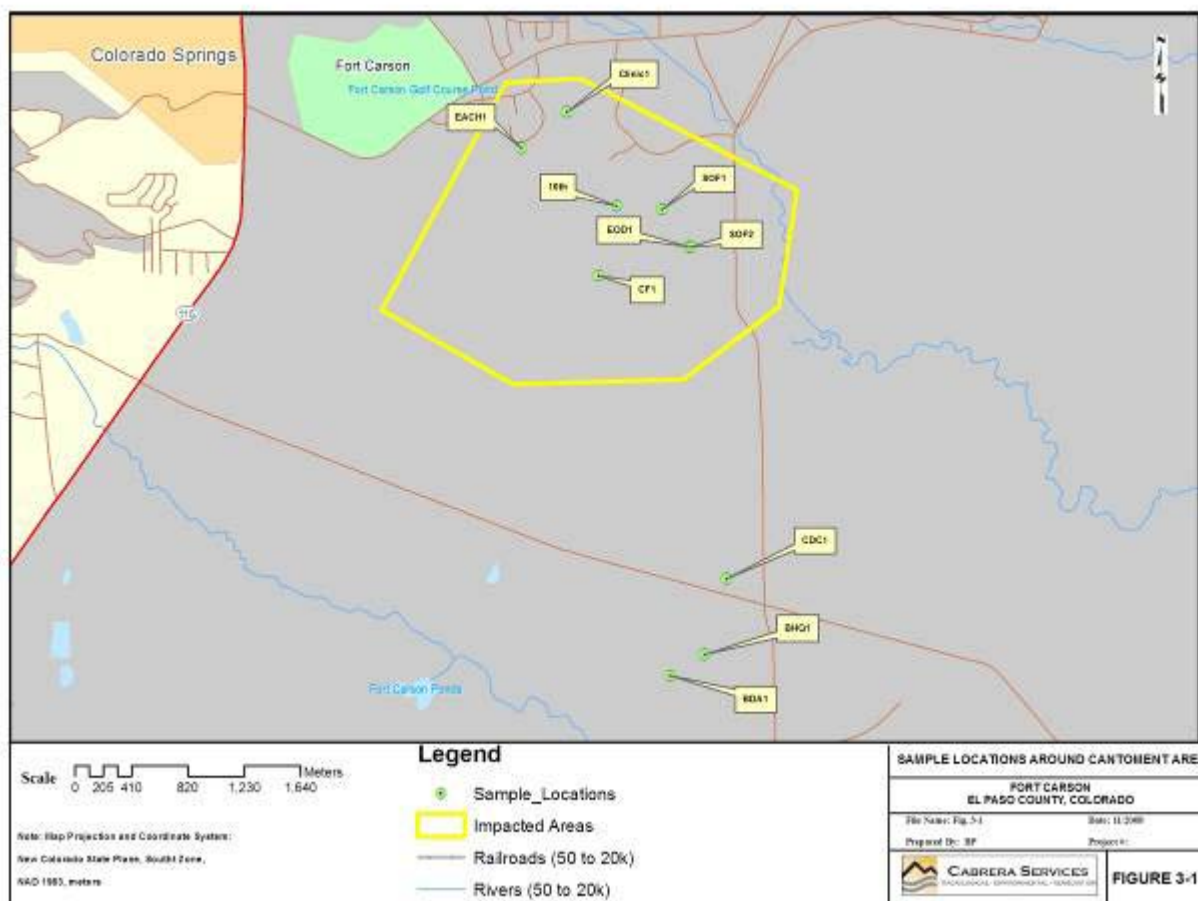
Samples were taken in the field using clean tools and gloves. All tools were scanned before and after sample collection to ensure no spread or cross contamination. Sample containers were scanned after being sealed prior to packaging for shipment to the laboratory.

3.8 Sample Collection and Analysis

CABRERA personnel collected ten soil samples (see Figure 3-1) during the scoping survey. All samples were sent to an offsite laboratory for analysis. The sample types and locations are listed in Table 1 below:

TABLE 1: SAMPLE TYPES AND LOCATIONS

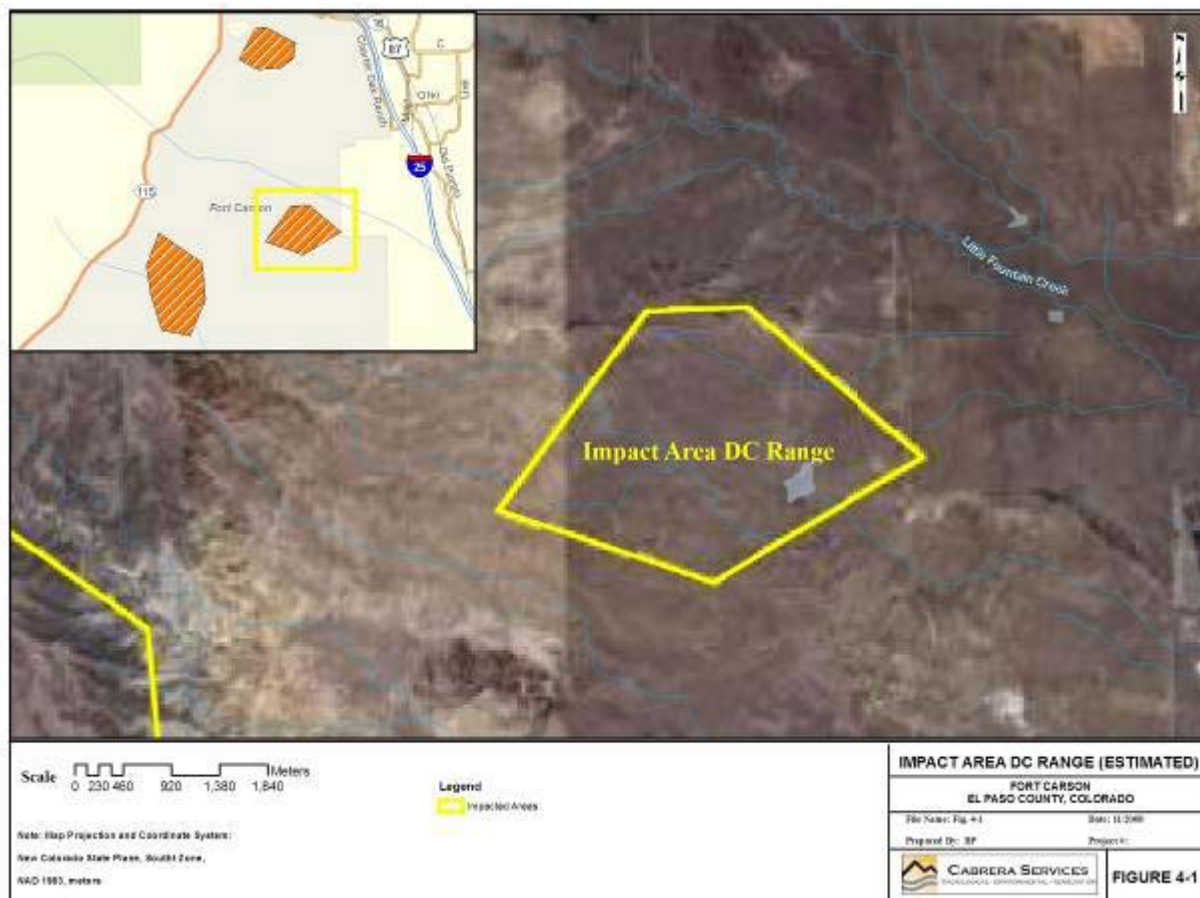
Sample Name	Description	Matrix
Background	Baseline sample	Soil
EOD1	Explosives Ordnance Disposal construction site	Soil
10 th SOF1	10 th Special Forces construction site	Soil
10 th SOF2	10 th Special Forces construction site	Soil
BDA1	Barracks development area (proposed)	Soil
CDC1	Child daycare center (proposed)	Soil
BHQ1	Battalion Headquarters (proposed)	Soil
Clinic 1	Fort Carson Medical clinic	Soil
EACH 1	Evans Army Community Hospital	Soil
CF 1	Clean fill site	Soil



4.0 RESULTS

4.1 Visual Survey Results

A visual survey for the presence of either partial Davy Crockett spotter rounds, DU yellow oxidized fragments, yellow oxides in the soil, or pistons characteristic of the weapons system was conducted. There were no visual indications of DC debris identified during the survey.



4.2 Radiological Results

All of the soil samples underwent analysis by alpha spectroscopy (Method ASTM D3972-90M) for Isotopic Uranium. Data reports generated by the analytical laboratory are provided as Attachment 1.

Alpha spectroscopy for uranium (or DU, in general) is reported by measuring the individual activities of uranium-238 (^{238}U), uranium-235 (^{235}U), and uranium-234 (^{234}U). In naturally

occurring uranium activities of ^{238}U and ^{234}U are generally equivalent. In DU, the activity of ^{234}U will be significantly lower than the ^{238}U activity as the U-234 fraction has been depleted during the extraction of the fissile U-235 material due to its closeness in mass to U-235. A summary of the ^{238}U , ^{235}U and ^{234}U data from the alpha spectroscopy analyses is provided in Table 2. It can be seen in Table 2 that the ^{238}U activity is approximately equivalent to the activity of the ^{234}U , thus the activity represents naturally occurring uranium and the absence of DU.

TABLE 2: RESULTS OF ALPHA SPECTROSCOPY ANALYSES.
ALL SAMPLES REPORTED IN PCI/G.

Sample Name	^{238}U	^{235}U	^{234}U
Background	1.76	0.079	1.85
EOD1	0.97	0.031*	1
10 th SOF1	1.03	0.062	1.14
10 th SOF2	0.76	0.067	0.68
BDA1	1.21	0.055	1.23
CDC1	0.88	0.077	0.99
BHQ1	1.06	0.051	1.15
Clinic 1	1.01	0.049*	0.96
EACH 1	1.14	0.071	1.2
CF 1	0.89	0.068	0.8

* Under the minimum detectable concentration

4.3 Dose Equivalent Rate Survey Results

Dose Equivalent Rate surveys were conducted at ten locations in and around the cantonment construction area. Measurements were taken at approximately 1 meter above ground level in the general area of each sample location. The area of each survey ranged from approximately 200 – 1000 m^2 , each of which comprised part of the footprint of the construction areas surveyed. The results are summarized in Table 3 below. The nearest sample location as given in Table 2 is given as the name for each Dose Equivalent Rate survey.

TABLE 3.RESULTS OF DOSE EQUIVALENT RATE SURVEY

Survey Location	Max $\mu\text{rem/h}$	Min $\mu\text{rem/h}$	Average $\mu\text{rem/h}$
Background	9	9	9
EOD1	10	10	10
10 th SOF1	13	10	11
10 th SOF2	15	9	10
BDA1	15	12	14
CDC1	15	11	14
BHQ1	15	11	13
Clinic 1	12	10	11
EACH 1	11	10	10
CF 1	13	10	11
10 th SOF (Non-sample location south of construction)	15	10	12

5.0 CONCLUSIONS

The scoping surveys conducted at Fort Carson provided limited information regarding the extent of DC contamination present on the Post. However, the following conclusions are offered for each potential DC Area:

5.1 Cantonment Area

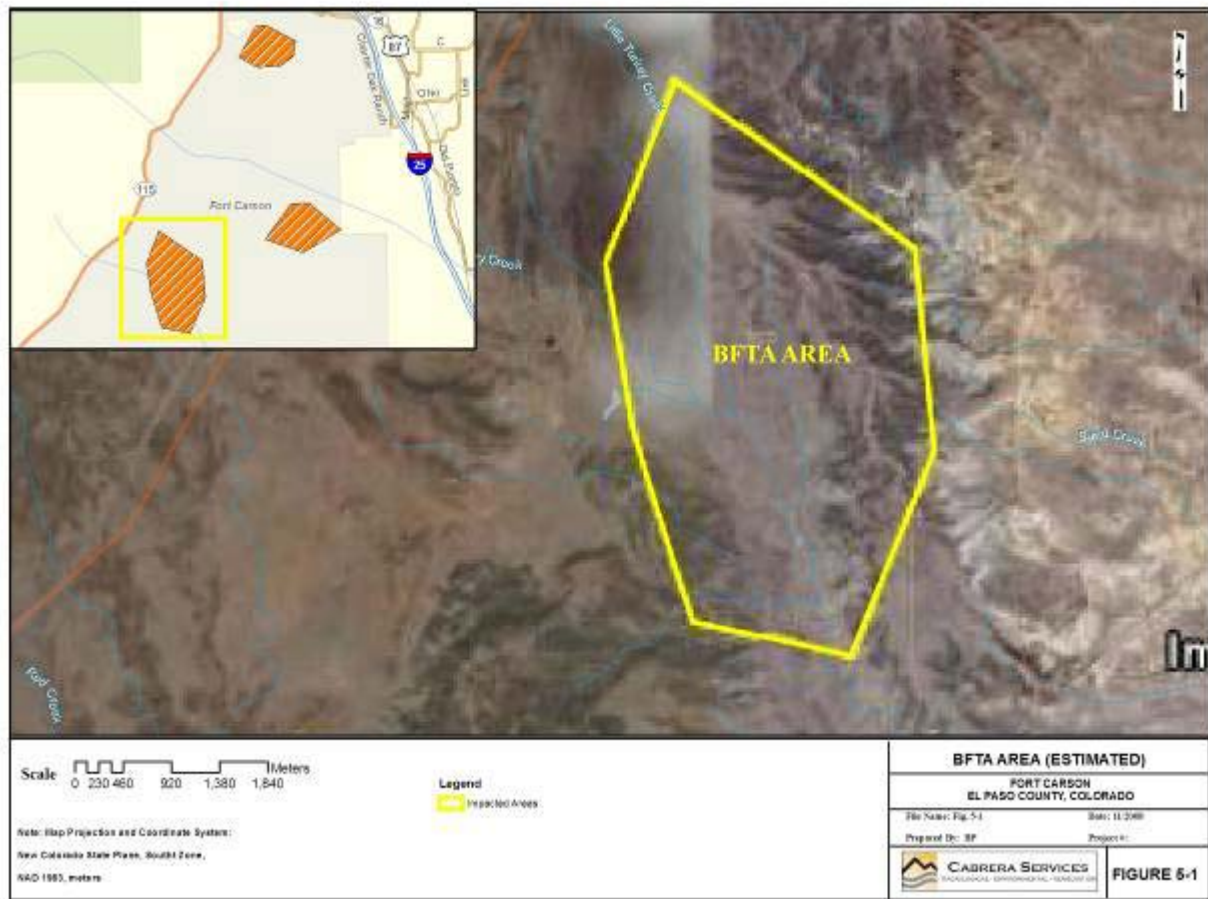
The cantonment area was extensively surveyed visually, instrument assisted and specifically with a Dose Rate meter. No evidence of DC debris, specifically DU, was observed in any manner within the cantonment area. If the DC was used in this area, the DU was likely either removed or has since been covered by existing construction or fill. Given the low usage of the area as a DC demonstration range, the risks presented in the area are extremely low. No further action is recommended in this area.

5.2 Large Impact Area

The LIA is highly secured and presently restricted due to the presence of ICM. It is highly likely that DU is present in the area from the use of the DC; however, given the restricted access, further action in the LIA is not required unless it becomes necessary for personnel to access the area and / or range construction activities begin which would potentially put workers in direct contact with the contamination.

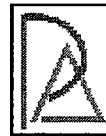
5.3 Battle Force Training Area

The potential presence of DU from the DC in this area presents the most significant potential hazard. While no DC debris was identified during the brief visual surveys, the current use of the area (dismounted training, bivouac) presents a potential risk of exposure to DU during training activities. Further reconnaissance in the area to pinpoint the DC training range is recommended. Given the terrain (hilly) and size (+30,000 acres) use of an aerial platform for initial visual surveys is recommended.



ATTACHMENT 1

ISOTOPIC URANIUM RESULTS



Paragon Analytics

Radiochemistry Case Narrative

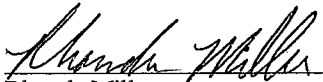
Isotopic Uranium

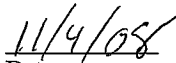
Cabrera Services, Inc.

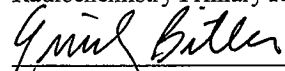
Fort Carson
PA WO 0810213

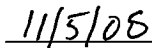
1. This report consists of the analytical results and supporting documentation for 10 soil samples received by Paragon on 10/24/08.
2. These samples were prepared according to procedures PA SOP336R0, PA SOP773R10, and PA SOP778R12. Due to potential matrix interference, a reduced aliquot of ~0.5 g was taken on all samples.
3. The samples were analyzed for the presence of isotopic uranium according to procedure PA SOP714R11. The analyses were completed on 10/31/08.
4. The isotopic analysis results for these samples are reported on a 'dry weight' basis in units of pCi/gram.
5. This analytical method quantifies U-235 alpha activity in a specific region of interest corresponding to emission energies between those of U-234 and U-238. A potential limitation of this method is that measurable amounts of U-234 in the sample may cause a small amount of characteristic activity in the U-235 region of interest due to poorly resolved alpha activity at the boundary between the two regions. To minimize the potential for a high bias in the U-235 analytical results, the U-235 region of interest has been narrowed and limited to a lower energy region. An 85.1% abundance correction has been made to the final U-235 results.
6. No anomalous situations were encountered during the preparation or analysis of these samples. All quality control criteria were met.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, Paragon Analytics certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.


Rhonda Miller
Radiochemistry Primary Reviewer


Date


Radiochemistry Final Data Review


Date

PARAGON ANALYTICS
Radiochemistry Data Package

Section 1

CHAIN OF CUSTODY

Paragon Analytics

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 0810213

Client Name: Cabrera Services, Inc.

Client Project Name: Fort Carson

Client Project Number:

Client PO Number: 09-4020

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
EOD1	0810213-1		SOIL	16-Oct-08	8:00
10th SOF 1	0810213-2		SOIL	16-Oct-08	8:15
10th SOF 2	0810213-3		SOIL	16-Oct-08	8:30
BDA 1	0810213-4		SOIL	16-Oct-08	8:45
CDC 1	0810213-5		SOIL	16-Oct-08	9:00
BHQ 1	0810213-6		SOIL	16-Oct-08	9:15
Clinic 1	0810213-7		SOIL	16-Oct-08	9:30
EACH 1	0810213-8		SOIL	16-Oct-08	9:45
CF 1	0810213-9		SOIL	16-Oct-08	10:00
Background	0810213-10		SOIL	16-Oct-08	10:15

Paragon Analytics

Chain-of-Custody

Project Name: <u>Fort Carson</u>		Sampler(s): <u>Cabrera</u>		(circle one) Turnaround Standard or Rush (Due _____)		Dispose or Return to Client	
Report To:	Phone:	Fax:	Company:	Address:			
Greg Miller	505-250-3978	845-956-0277	Cabrera Services, Inc.	5301 Montano Plaza Dr NW			
				Albuquerque, NM 87120			
Fort Carson Scoping Survey							
Date	Time *	Lab ID	Matrix	No. of Containers	VOCs	BTEX (only)	SVOCs
16-Oct	8:00	①	S	1	SW8260B E624 E524.2 OLMO	SW8021B	SW8081A E608 E508 OLMO
10th SOF 1	8:15	②			SW8151A E615		SW8141A E614
10th SOF 2	8:30	③			SW1311 8260B 8270C 8081A 8151A		SW6010B 7470 7471 E200 ILMO
BDA 1	8:45	④			SW6010B 7470 7471 E200 ILMO		SW6010B 7470 7471 E200 ILMO
CDC 1	9:00	⑤			SW6010B 7470 7471 E200 ILMO		SW6010B 7470 7471 E200 ILMO
BHQ 1	9:15	⑥			SW6010B 7470 7471 E200 ILMO		SW6010B 7470 7471 E200 ILMO
Clinic 1	9:30	⑦			SW6010B 7470 7471 E200 ILMO		SW6010B 7470 7471 E200 ILMO
EACH 1	9:45	⑧			SW6010B 7470 7471 E200 ILMO		SW6010B 7470 7471 E200 ILMO
CF1	10:00	⑨			SW6010B 7470 7471 E200 ILMO		SW6010B 7470 7471 E200 ILMO
Background	10:15	⑩			SW6010B 7470 7471 E200 ILMO		SW6010B 7470 7471 E200 ILMO
Comments:							
S=Soil							
Alpha Spec for ISO U							
Call G Miller w/ questions 505-250-3978							
Relinquished By: <u>[Signature]</u>					Relinquished By: <u>[Signature]</u>		
Printed Name <u>G. Miller</u>					Printed Name <u>[Signature]</u>		
Date <u>10/16</u> Time <u>1500</u>					Date <u>[Signature]</u> Time <u>[Signature]</u>		
Company <u>C. Cabrera</u>					Company <u>[Signature]</u>		
Received By: <u>[Signature]</u>					Received By: <u>[Signature]</u>		
Printed Name <u>Cheryl Trimble</u>					Printed Name <u>[Signature]</u>		
Date <u>10-24-08</u> Time <u>1315</u>					Date <u>[Signature]</u> Time <u>[Signature]</u>		
Company <u>Paragon</u>					Company <u>[Signature]</u>		

Paragon Analytics

Initials: CT Date: 10-24-08

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

Page 1 of 1

From: (505)792-9291
 Greg Miller
 Cabrera Services
 5301 Montano Plaza Dr NW

Albuquerque, NM 87120



CLS880 188/14/24

Ship Date: 16OCT08
 ActWgt: 20.0 LB
 CAD: 4239785/INET8091
 Account#: S *****

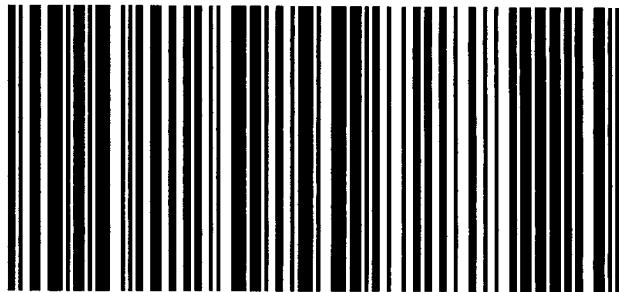
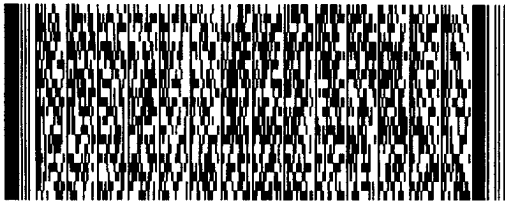
Invoice #
 Reference # Fort Carson Samples
 PO #
 Dept # Ship ID

11
 0 -

SHIP TO: (970)490-1511

Lance Steere
Paragon Analytics
225 COMMERCE DR

FORT COLLINS, CO 80524



(9612019) 3249577 10000844

GND

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of

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Prepaid

After printing this label:

1. Use the 'Print' button on this page to print your label to your laser or inkjet printer.
2. Fold the printed page along the horizontal line.
3. Place label in shipping pouch and affix it to your shipment so that the barcode portion of the label can be read and scanned.

Warning: IMPORTANT: TRANSMIT YOUR SHIPPING DATA AND PRINT A MANIFEST:

At the end of each shipping day, you should perform the FedEx Ground End of Day Close procedure to transmit your shipping data to FedEx. To do so, click on the Ground End of Day Close Button. If required, print the pickup manifest that appears. A printed manifest is required to be tendered along with your packages if they are being picked up by FedEx Ground. If you are dropping your packages off at a FedEx drop off location, the manifest is not required.

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PARAGON ANALYTICS
Radiochemistry Data Package

Section 2

**SAMPLE RESULTS
SUMMARY**

Isotopic Uranium By Alpha Spectroscopy Sample Results Summary

Client Name: Cabrera Services, Inc.
Client Project Name: Fort Carson
Client Project Number:

Laboratory Name: Paragon Analytics
PAI Work Order: 0810213

Page: 1 of 4
Reported on: Tuesday, November 04, 2008
4:08:13 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0810213-1	EOD1	Sample	U-234	1.00 +/- 0.20	0.03	pCi/g	SOIL	AS081030-3	10/31/2008	
0810213-1	EOD1	Sample	U-235	0.031 +/- 0.027	0.032	pCi/g	SOIL	AS081030-3	10/31/2008	U
0810213-1	EOD1	Sample	U-238	0.97 +/- 0.19	0.01	pCi/g	SOIL	AS081030-3	10/31/2008	
0810213-2	10th SOF 1	Sample	U-234	1.14 +/- 0.22	0.01	pCi/g	SOIL	AS081030-3	10/31/2008	
0810213-2	10th SOF 1	Sample	U-235	0.062 +/- 0.036	0.036	pCi/g	SOIL	AS081030-3	10/31/2008	LT
0810213-2	10th SOF 1	Sample	U-238	1.03 +/- 0.20	0.03	pCi/g	SOIL	AS081030-3	10/31/2008	
0810213-3	10th SOF 2	Sample	U-234	0.81 +/- 0.17	0.03	pCi/g	SOIL	AS081030-3	10/31/2008	
0810213-3	10th SOF 2	Sample	U-235	0.041 +/- 0.029	0.030	pCi/g	SOIL	AS081030-3	10/31/2008	LT
0810213-3	10th SOF 2	Sample	U-238	0.83 +/- 0.17	0.01	pCi/g	SOIL	AS081030-3	10/31/2008	

Comments:

Data Package ID: UR0810213-1

Qualifiers/Flags:
U - Result is less than the sample specific MDC.
LT - Result is less than Requested MDC, greater than sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
M - The requested MDC was not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:
TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Isotopic Uranium By Alpha Spectroscopy Sample Results Summary

Client Name: Cabrera Services, Inc.
Client Project Name: Fort Carson
Client Project Number:

Laboratory Name: Paragon Analytics
PAI Work Order: 0810213

Page: 2 of 4
Reported on: Tuesday, November 04, 2008
4:08:13 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0810213-4	BDA 1	Sample	U-234	1.23 +/- 0.23	0.01	pCi/g	SOIL	AS081030-3	10/31/2008	
0810213-4	BDA 1	Sample	U-235	0.055 +/- 0.033	0.029	pCi/g	SOIL	AS081030-3	10/31/2008	LT
0810213-4	BDA 1	Sample	U-238	1.21 +/- 0.23	0.02	pCi/g	SOIL	AS081030-3	10/31/2008	
0810213-5	CDC 1	Sample	U-234	0.99 +/- 0.19	0.03	pCi/g	SOIL	AS081030-3	10/31/2008	
0810213-5	CDC 1	Sample	U-235	0.077 +/- 0.038	0.028	pCi/g	SOIL	AS081030-3	10/31/2008	LT
0810213-5	CDC 1	Sample	U-238	0.88 +/- 0.18	0.03	pCi/g	SOIL	AS081030-3	10/31/2008	
0810213-6	BHQ 1	Sample	U-234	1.15 +/- 0.22	0.03	pCi/g	SOIL	AS081030-3	10/31/2008	
0810213-6	BHQ 1	Sample	U-235	0.051 +/- 0.029	0.011	pCi/g	SOIL	AS081030-3	10/31/2008	LT
0810213-6	BHQ 1	Sample	U-238	1.06 +/- 0.20	0.03	pCi/g	SOIL	AS081030-3	10/31/2008	

Comments:

Data Package ID: UR0810213-1

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Isotopic Uranium By Alpha Spectroscopy Sample Results Summary

Client Name: Cabrera Services, Inc.
Client Project Name: Fort Carson
Client Project Number:

Laboratory Name: Paragon Analytics
PAI Work Order: 0810213

Page: 3 of 4
Reported on: Tuesday, November 04, 2008
4:08:13 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0810213-7	Clinic 1	Sample	U-234	0.96 +/- 0.19	0.05	pCi/g	SOIL	AS081030-3	10/31/2008	
0810213-7	Clinic 1	Sample	U-235	0.049 +/- 0.041	0.058	pCi/g	SOIL	AS081030-3	10/31/2008	U
0810213-7	Clinic 1	Sample	U-238	1.01 +/- 0.20	0.04	pCi/g	SOIL	AS081030-3	10/31/2008	
0810213-8	EACH 1	Sample	U-234	1.20 +/- 0.23	0.05	pCi/g	SOIL	AS081030-3	10/31/2008	
0810213-8	EACH 1	Sample	U-235	0.071 +/- 0.036	0.011	pCi/g	SOIL	AS081030-3	10/31/2008	LT
0810213-8	EACH 1	Sample	U-238	1.14 +/- 0.22	0.04	pCi/g	SOIL	AS081030-3	10/31/2008	
0810213-9	CF 1	Sample	U-234	0.80 +/- 0.17	0.06	pCi/g	SOIL	AS081030-3	10/31/2008	
0810213-9	CF 1	Sample	U-235	0.068 +/- 0.038	0.031	pCi/g	SOIL	AS081030-3	10/31/2008	LT
0810213-9	CF 1	Sample	U-238	0.89 +/- 0.18	0.04	pCi/g	SOIL	AS081030-3	10/31/2008	

Comments:

Data Package ID: UR0810213-1

Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- LT - Result is less than Requested MDC, greater than sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 - Chemical Yield outside default limits.
- M - The requested MDC was not met.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:

- TPU - Total Propagated Uncertainty (see PAI SOP 743)
- MDC - Minimum Detectable Concentration (see PAI SOP 709)
- BDL - Below Detection Limit

Date Printed: Tuesday, November 04, 2008

Paragon Analytics
LIMS Version: 6.203A

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Isotopic Uranium By Alpha Spectroscopy Sample Results Summary

Client Name: Cabrera Services, Inc.
Client Project Name: Fort Carson
Client Project Number:

Laboratory Name: Paragon Analytics
PAI Work Order: 0810213

Page: 4 of 4
Reported on: Tuesday, November 04, 2008
4:08:13 PM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0810213-10	Background	Sample	U-234	1.85 +/- 0.34	0.03	pCi/g	SOIL	AS081030-3	10/31/2008	
0810213-10	Background	Sample	U-235	0.079 +/- 0.039	0.012	pCi/g	SOIL	AS081030-3	10/31/2008	LT
0810213-10	Background	Sample	U-238	1.76 +/- 0.32	0.03	pCi/g	SOIL	AS081030-3	10/31/2008	

Comments:

Data Package ID: UR0810213-1

Qualifiers/Flags:
U - Result is less than the sample specific MDC.
LT - Result is less than Requested MDC, greater than sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
Y2 - Chemical Yield outside default limits.
M - The requested MDC was not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

Abbreviations:
TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)
BDL - Below Detection Limit

PARAGON ANALYTICS
Radiochemistry Data Package

Section 3

**QC RESULTS
SUMMARY**

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 11

Method Blank Results

Lab Name: Paragon Analytics

Work Order Number: 0810213

Client Name: Cabrera Services, Inc.

ClientProject ID: Fort Carson

Lab ID: AS081030-3MB

Sample Matrix: SOIL

Prep SOP: PAI 778 Rev 12

Date Collected: 30-Oct-08

Date Prepared: 30-Oct-08

Date Analyzed: 31-Oct-08

Prep Batch: AS081030-3

QCBatchID: AS081030-3-1

Run ID: AS081030-3A

Count Time: 1000 minutes

Final Aliquot: 0.504 g

Result Units: pCi/g

File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.026 +/- 0.035	0.058	0.1	U
15117-96-1	U-235	-0.013 +/- 0.021	0.052	0.1	U
7440-61-1	U-238	-0.011 +/- 0.020	0.048	0.1	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	4.395	3.68	pCi/g	83.8	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Data Package ID: UR0810213-1

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 11

Laboratory Control Sample(s)

Lab Name: Paragon Analytics

Work Order Number: 0810213

Client Name: Cabrera Services, Inc.

ClientProject ID: Fort Carson

Lab ID: AS081030-3LCS

Sample Matrix: SOIL

Prep SOP: PAI 778 Rev 12

Date Collected: 30-Oct-08

Date Prepared: 30-Oct-08

Date Analyzed: 31-Oct-08

Prep Batch: AS081030-3

QCBatchID: AS081030-3-1

Run ID: AS081030-3A

Count Time: 1000 minutes

Final Aliquot: 0.504 g

Result Units: pCi/g

File Name: Spectrum #1

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
13966-29-5	U-234	4.59 +/- 0.76	0.04	4.43	103	82 - 122	P
7440-61-1	U-238	4.99 +/- 0.83	0.04	4.60	108	82 - 122	P

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	4.395	3.74	pCi/g	85.1	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS Recovery within control limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

Data Package ID: UR0810213-1

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 11

Duplicate Sample Results (DER)

Lab Name: Paragon Analytics

Work Order Number: 0810213

Client Name: Cabrera Services, Inc.

ClientProject ID: Fort Carson

Field ID: 10th SOF 2
Lab ID: 0810213-3DUP

Sample Matrix: SOIL
Prep SOP: PAI 778 Rev 12
Date Collected: 16-Oct-08
Date Prepared: 30-Oct-08
Date Analyzed: 31-Oct-08

Prep Batch: AS081030-3
QCBatchID: AS081030-3-1
Run ID: AS081030-3A
Count Time: 1000 minutes
Report Basis: Dry Weight

Final Aliquot: 0.501 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Analyte	Sample Result +/- 2s TPU	Duplicate Result +/- 2s TPU	DER	Control Limit	Lab Qualifiers
13966-29-5	U-234	0.81 +/- 0.17	0.68 +/- 0.14	0.59	2.13	
15117-96-1	U-235	0.041 +/- 0.029	0.067 +/- 0.035	0.57	2.13	LT
7440-61-1	U-238	0.83 +/- 0.17	0.76 +/- 0.15	0.34	2.13	

Comments:

Duplicate Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

LT - Result is less than Request MDC, greater than sample specific MDC

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

DER - Duplicate Error Ratio (see PAI SOP 715)

BDL - Below Detection Limit

NR - Not Reported

Data Package ID: UR0810213-1

PARAGON ANALYTICS
Radiochemistry Data Package

4

Section 4

**INDIVIDUAL
SAMPLE RESULTS**

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0810213

Client Name: Cabrera Services, Inc.

ClientProject ID: Fort Carson

Field ID:	EOD1
Lab ID:	0810213-1

Sample Matrix: SOIL
Prep SOP: PAI 778 Rev 12
Date Collected: 16-Oct-08
Date Prepared: 30-Oct-08
Date Analyzed: 31-Oct-08

Prep Batch: AS081030-3
QCBatchID: AS081030-3-1
Run ID: AS081030-3A
Count Time: 1000 minutes
Report Basis: Dry Weight

Final Aliquot: 0.504 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	1.00 +/- 0.20	0.03	0.1	
15117-96-1	U-235	0.031 +/- 0.027	0.032	0.1	U
7440-61-1	U-238	0.97 +/- 0.19	0.01	0.1	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	4.394	3.43	pCi/g	78.1	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: UR0810213-1

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0810213

Client Name: Cabrera Services, Inc.

ClientProject ID: Fort Carson

Field ID:	10th SOF 1
Lab ID:	0810213-2

Sample Matrix: SOIL
Prep SOP: PAI 778 Rev 12
Date Collected: 16-Oct-08
Date Prepared: 30-Oct-08
Date Analyzed: 31-Oct-08

Prep Batch: AS081030-3
QCBatchID: AS081030-3-1
Run ID: AS081030-3A
Count Time: 1000 minutes
Report Basis: Dry Weight

Final Aliquot: 0.505 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	1.14 +/- 0.22	0.01	0.1	
15117-96-1	U-235	0.062 +/- 0.036	0.036	0.1	LT
7440-61-1	U-238	1.03 +/- 0.20	0.03	0.1	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	4.387	3.76	pCi/g	85.8	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: UR0810213-1

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0810213

Client Name: Cabrera Services, Inc.

ClientProject ID: Fort Carson

Field ID:	10th SOF 2
Lab ID:	0810213-3

Sample Matrix: SOIL
Prep SOP: PAI 778 Rev 12
Date Collected: 16-Oct-08
Date Prepared: 30-Oct-08
Date Analyzed: 31-Oct-08

Prep Batch: AS081030-3
QCBatchID: AS081030-3-1
Run ID: AS081030-3A
Count Time: 1000 minutes
Report Basis: Dry Weight

Final Aliquot: 0.505 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.81 +/- 0.17	0.03	0.1	
15117-96-1	U-235	0.041 +/- 0.029	0.030	0.1	LT
7440-61-1	U-238	0.83 +/- 0.17	0.01	0.1	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	4.386	3.63	pCi/g	82.8	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: UR0810213-1

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 11

Sample Duplicate Results

Lab Name: Paragon Analytics

Work Order Number: 0810213

Client Name: Cabrera Services, Inc.

ClientProject ID: Fort Carson

Field ID:	10th SOF 2
Lab ID:	0810213-3DUP

Sample Matrix: SOIL

Prep SOP: PAI 778 Rev 12

Date Collected: 16-Oct-08

Date Prepared: 30-Oct-08

Date Analyzed: 31-Oct-08

Prep Batch: AS081030-3

QCBatchID: AS081030-3-1

Run ID: AS081030-3A

Count Time: 1000 minutes

Report Basis: Dry Weight

Final Aliquot: 0.501 g

Prep Basis: Dry Weight

Moisture(%): NA

Result Units: pCi/g

File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.68 +/- 0.14	0.04	0.1	
15117-96-1	U-235	0.067 +/- 0.035	0.023	0.1	LT
7440-61-1	U-238	0.76 +/- 0.15	0.04	0.1	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	4.420	4.00	pCi/g	90.5	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: UR0810213-1

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0810213

Client Name: Cabrera Services, Inc.

ClientProject ID: Fort Carson

Field ID:	BDA 1
Lab ID:	0810213-4

Sample Matrix: SOIL

Prep SOP: PAI 778 Rev 12

Date Collected: 16-Oct-08

Date Prepared: 30-Oct-08

Date Analyzed: 31-Oct-08

Prep Batch: AS081030-3

QCBatchID: AS081030-3-1

Run ID: AS081030-3A

Count Time: 1000 minutes

Report Basis: Dry Weight

Final Aliquot: 0.501 g

Prep Basis: Dry Weight

Moisture(%): NA

Result Units: pCi/g

File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	1.23 +/- 0.23	0.01	0.1	
15117-96-1	U-235	0.055 +/- 0.033	0.029	0.1	LT
7440-61-1	U-238	1.21 +/- 0.23	0.02	0.1	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	4.425	3.74	pCi/g	84.5	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: UR0810213-1

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0810213

Client Name: Cabrera Services, Inc.

ClientProject ID: Fort Carson

Field ID:	CDC 1
Lab ID:	0810213-5

Sample Matrix: SOIL
Prep SOP: PAI 778 Rev 12
Date Collected: 16-Oct-08
Date Prepared: 30-Oct-08
Date Analyzed: 31-Oct-08

Prep Batch: AS081030-3
QCBatchID: AS081030-3-1
Run ID: AS081030-3A
Count Time: 1000 minutes
Report Basis: Dry Weight

Final Aliquot: 0.506 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.99 +/- 0.19	0.03	0.1	
15117-96-1	U-235	0.077 +/- 0.038	0.028	0.1	LT
7440-61-1	U-238	0.88 +/- 0.18	0.03	0.1	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	4.378	3.86	pCi/g	88.1	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: UR0810213-1

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0810213

Client Name: Cabrera Services, Inc.

ClientProject ID: Fort Carson

Field ID:	BHQ 1
Lab ID:	0810213-6

Sample Matrix: SOIL
Prep SOP: PAI 778 Rev 12
Date Collected: 16-Oct-08
Date Prepared: 30-Oct-08
Date Analyzed: 31-Oct-08

Prep Batch: AS081030-3
QCBatchID: AS081030-3-1
Run ID: AS081030-3A
Count Time: 1000 minutes
Report Basis: Dry Weight

Final Aliquot: 0.502 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	1.15 +/- 0.22	0.03	0.1	
15117-96-1	U-235	0.051 +/- 0.029	0.011	0.1	LT
7440-61-1	U-238	1.06 +/- 0.20	0.03	0.1	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	4.414	3.84	pCi/g	87.0	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: UR0810213-1

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0810213

Client Name: Cabrera Services, Inc.

ClientProject ID: Fort Carson

Field ID:	Clinic 1
Lab ID:	0810213-7

Sample Matrix: SOIL
Prep SOP: PAI 778 Rev 12
Date Collected: 16-Oct-08
Date Prepared: 30-Oct-08
Date Analyzed: 31-Oct-08

Prep Batch: AS081030-3
QCBatchID: AS081030-3-1
Run ID: AS081030-3A
Count Time: 1000 minutes
Report Basis: Dry Weight

Final Aliquot: 0.503 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.96 +/- 0.19	0.05	0.1	
15117-96-1	U-235	0.049 +/- 0.041	0.058	0.1	U
7440-61-1	U-238	1.01 +/- 0.20	0.04	0.1	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	4.406	3.75	pCi/g	85.1	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: UR0810213-1

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0810213

Client Name: Cabrera Services, Inc.

ClientProject ID: Fort Carson

Field ID:	EACH 1
Lab ID:	0810213-8

Sample Matrix: SOIL

Prep SOP: PAI 778 Rev 12

Date Collected: 16-Oct-08

Date Prepared: 30-Oct-08

Date Analyzed: 31-Oct-08

Prep Batch: AS081030-3

QCBatchID: AS081030-3-1

Run ID: AS081030-3A

Count Time: 1000 minutes

Report Basis: Dry Weight

Final Aliquot: 0.506 g

Prep Basis: Dry Weight

Moisture(%): NA

Result Units: pCi/g

File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	1.20 +/- 0.23	0.05	0.1	
15117-96-1	U-235	0.071 +/- 0.036	0.011	0.1	LT
7440-61-1	U-238	1.14 +/- 0.22	0.04	0.1	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	4.379	3.73	pCi/g	85.1	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: UR0810213-1

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0810213

Client Name: Cabrera Services, Inc.

ClientProject ID: Fort Carson

Field ID:	CF 1
Lab ID:	0810213-9

Sample Matrix: SOIL
Prep SOP: PAI 778 Rev 12
Date Collected: 16-Oct-08
Date Prepared: 30-Oct-08
Date Analyzed: 31-Oct-08

Prep Batch: AS081030-3
QCBatchID: AS081030-3-1
Run ID: AS081030-3A
Count Time: 1000 minutes
Report Basis: Dry Weight

Final Aliquot: 0.505 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	0.80 +/- 0.17	0.06	0.1	
15117-96-1	U-235	0.068 +/- 0.038	0.031	0.1	LT
7440-61-1	U-238	0.89 +/- 0.18	0.04	0.1	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	4.390	3.70	pCi/g	84.2	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: UR0810213-1

Isotopic Uranium By Alpha Spectroscopy

PAI 714 Rev 11

Sample Results

Lab Name: Paragon Analytics

Work Order Number: 0810213

Client Name: Cabrera Services, Inc.

ClientProject ID: Fort Carson

Field ID:	Background
Lab ID:	0810213-10

Sample Matrix: SOIL
Prep SOP: PAI 778 Rev 12
Date Collected: 16-Oct-08
Date Prepared: 30-Oct-08
Date Analyzed: 31-Oct-08

Prep Batch: AS081030-3
QCBatchID: AS081030-3-1
Run ID: AS081030-3A
Count Time: 1000 minutes
Report Basis: Dry Weight

Final Aliquot: 0.505 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: Spectrum #1

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13966-29-5	U-234	1.85 +/- 0.34	0.03	0.1	
15117-96-1	U-235	0.079 +/- 0.039	0.012	0.1	LT
7440-61-1	U-238	1.76 +/- 0.32	0.03	0.1	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
U-232	4.390	3.76	pCi/g	85.6	30 - 110 %	

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: UR0810213-1

PARAGON ANALYTICS
Radiochemistry Data Package

Section 5

5

RAW DATA

Isotopic Uranium By Alpha Spectroscopy Raw Data Report

Laboratory Name: Paragon Analytics

Prep SOP: PAI 778

Reported on: Monday, November 03, 2008

PAI Work Order: 0810213

Analytical SOP: PAI 714

9:27:24 AM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QC BatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist	Samp Aliq Analy Aliq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CndDur(min) Yield	Activity +/- 2 s TPU	MDC DeclEv	ReportUnits ReportBasis	DER RPD	Spk. Recov Flags
0810213-1	U-232 SMP	10/16/2008 8:00:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.504 g 0.504 g	AlphaSpec2 9	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	1194.289 3.000	31.09% 1000	78.1% 78.1%	3.43 0.54	0.03 NA	pCi/g Dry Weight	NA NA	
0810213-1	U-234 SMP	10/16/2008 8:00:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.504 g 0.504 g	AlphaSpec2 9	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	272.096 2.000	31.09% 1000	78.1% 78.1%	1.00 0.20	0.03 NA	pCi/g Dry Weight	NA NA	
0810213-1	U-235 SMP	10/16/2008 8:00:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.504 g 0.504 g	AlphaSpec2 9	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	7.096 1.000	31.09% 1000	78.1% 78.1%	0.031 0.027	0.032 NA	pCi/g Dry Weight	NA NA	U
0810213-1	U-238 SMP	10/16/2008 8:00:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.504 g 0.504 g	AlphaSpec2 9	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	263.096 0.000	31.09% 1000	78.1% 78.1%	0.97 0.19	0.01 NA	pCi/g Dry Weight	NA NA	
0810213-2	U-232 SMP	10/16/2008 8:15:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.505 g 0.505 g	AlphaSpec2 10a	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	1327.000 0.000	31.46% 1000	85.8% 85.8%	3.76 0.59	0.01 NA	pCi/g Dry Weight	NA NA	
0810213-2	U-234 SMP	10/16/2008 8:15:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.505 g 0.505 g	AlphaSpec2 10a	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	345.000 0.000	31.46% 1000	85.8% 85.8%	1.14 0.22	0.01 NA	pCi/g Dry Weight	NA NA	
0810213-2	U-235 SMP	10/16/2008 8:15:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.505 g 0.505 g	AlphaSpec2 10a	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	16.000 2.000	31.46% 1000	85.8% 85.8%	0.062 0.036	0.036 NA	pCi/g Dry Weight	NA NA	LT
0810213-2	U-238 SMP	10/16/2008 8:15:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.505 g 0.505 g	AlphaSpec2 10a	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	313.000 2.000	31.46% 1000	85.8% 85.8%	1.03 0.20	0.03 NA	pCi/g Dry Weight	NA NA	
0810213-3	U-232 SMP	10/16/2008 8:30:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.505 g 0.505 g	AlphaSpec2 11	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	1253.000 2.000	30.77% 1000	82.8% 82.8%	3.63 0.57	0.03 NA	pCi/g Dry Weight	NA NA	
0810213-3	U-234 SMP	10/16/2008 8:30:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.505 g 0.505 g	AlphaSpec2 11	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	232.000 1.000	30.77% 1000	82.8% 82.8%	0.81 0.17	0.03 NA	pCi/g Dry Weight	NA NA	
0810213-3	U-235 SMP	10/16/2008 8:30:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.505 g 0.505 g	AlphaSpec2 11	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	10.000 1.000	30.77% 1000	82.8% 82.8%	0.041 0.029	0.030 NA	pCi/g Dry Weight	NA NA	LT

Comments:

Data Package ID: UR0810213-1

Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- W - DER is greater than Warning Limit of 1.42
- D - DER is greater than Control Limit of 2.13
- + - Duplicate RPD not within limits.
- LT - Result is less than Request MDC, greater than sample specific MDC
- * - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
- # - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'

M - Requested MDC not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

- L - LCS Recovery below lower control limit.
- H - LCS Recovery above upper control limit.
- P - LCS, Matrix Spike Recovery within control limits.
- N - Matrix Spike Recovery outside control limits
- NC - Not Calculated for duplicate results less than 5 times MDC
- B - Analyte concentration greater than MDC.
- B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

- The Tracer results are not yield corrected (i.e. activity measured not activity added).
- Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

- TR - Tracer
- TA - Target Analyte
- TPU - Total Propagated Uncertainty (see PAI SOP 743)
- MDC - Minimum Detectable Concentration (see PAI SOP 709)
- DER - Duplicate Error Ratio
- BDL - Below Detection Limit

Date Printed: Tuesday, November 04, 2008

Paragon Analytics

Isotopic Uranium By Alpha Spectroscopy Raw Data Report

Laboratory Name: Paragon Analytics

Prep SOP: PAI 778

Reported on: Monday, November 03, 2008

PAI Work Order: 0810213

Analytical SOP: PAI 714

9:27:24 AM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QC BatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist	Samp Aliq Analy Aliq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CndDur(min) Yield	Activity +/- 2 s TPU	MDC DeclLev	ReportUnits ReportBasis	DER RPD	Spk. Recov Flags
0810213-3 SMP	U-238 Trg. Analyte	10/16/2008 8:30:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.505 g 0.505 g	AlphaSpec2 11	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	238,000 0.000	30.77% 1000	1000 82.8%	0.83 0.17	0.01 NA	pCi/g Dry Weight	NA NA	
	U-232 Tracer	10/16/2008 8:30:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.501 g 0.501 g	AlphaSpec2 12	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	1356,996 0.000	30.50% 1000	1000 90.5%	4.00 0.62	0.01 NA	pCi/g Dry Weight	NA NA	
0810213-3 DUP	U-234 Trg. Analyte	10/16/2008 8:30:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.501 g 0.501 g	AlphaSpec2 12	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	209,502 5,000	30.50% 1000	1000 90.5%	0.68 0.14	0.04 NA	pCi/g Dry Weight	0.59 NA	
	U-235 Trg. Analyte	10/16/2008 8:30:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.501 g 0.501 g	AlphaSpec2 12	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	17,502 0.498	30.50% 1000	1000 90.5%	0.067 0.035	0.023 NA	pCi/g Dry Weight	0.57 NA	LT
0810213-3 DUP	U-238 Trg. Analyte	10/16/2008 8:30:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.501 g 0.501 g	AlphaSpec2 12	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	231,996 3,502	30.50% 1000	1000 90.5%	0.76 0.15	0.04 NA	pCi/g Dry Weight	0.34 NA	
	U-232 Tracer	10/16/2008 8:45:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.501 g 0.501 g	AlphaSpec2 13	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	1325,000 2,000	31.87% 1000	1000 84.5%	3.74 0.58	0.03 NA	pCi/g Dry Weight	NA NA	
0810213-4 SMP	U-234 Trg. Analyte	10/16/2008 8:45:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.501 g 0.501 g	AlphaSpec2 13	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	369,000 0.000	31.87% 1000	1000 84.5%	1.23 0.23	0.01 NA	pCi/g Dry Weight	NA NA	
	U-235 Trg. Analyte	10/16/2008 8:45:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.501 g 0.501 g	AlphaSpec2 13	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	14,000 1,000	31.87% 1000	1000 84.5%	0.055 0.033	0.029 NA	pCi/g Dry Weight	NA NA	LT
0810213-4 SMP	U-238 Trg. Analyte	10/16/2008 8:45:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.501 g 0.501 g	AlphaSpec2 13	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	361,000 1,000	31.87% 1000	1000 84.5%	1.21 0.23	0.02 NA	pCi/g Dry Weight	NA NA	
	U-232 Tracer	10/16/2008 9:00:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.506 g 0.506 g	AlphaSpec2 14	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	1346,000 0.000	31.06% 1000	1000 88.1%	3.86 0.60	0.01 NA	pCi/g Dry Weight	NA NA	
0810213-5 SMP	U-234 Trg. Analyte	10/16/2008 9:00:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.506 g 0.506 g	AlphaSpec2 14	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	303,000 2,000	31.06% 1000	1000 88.1%	0.99 0.19	0.03 NA	pCi/g Dry Weight	NA NA	
	U-235 Trg. Analyte	10/16/2008 9:00:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.506 g 0.506 g	AlphaSpec2 14	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	303,000 2,000	31.06% 1000	1000 88.1%	0.99 0.19	0.03 NA	pCi/g Dry Weight	NA NA	

Comments:

Data Package ID: UR0810213-1

Qualifiers/Flags:

- M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.
- Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.
- Abbreviations:

TR- Tracer

TA - Target Analyte

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

DER - Duplicate Error Ratio

BDL - Below Detection Limit

Date Printed: Tuesday, November 04, 2008

Isotopic Uranium By Alpha Spectroscopy Raw Data Report

Laboratory Name: Paragon Analytics

Prep SOP: PAI 778

Reported on: Monday, November 03, 2008

PAI Work Order: 0810213

Analytical SOP: PAI 714

9:27:24 AM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QC BatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist	Samp Aliq Analy Aliq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CndDur(min) Yield	Activity +/- 2 s TPU	MDC DeclEv	ReportUnits ReportBasis	DER RPD	Spk. Recov Flags
0810213-5 SMP	U-235 Trg. Analyte	10/16/2008 9:00:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.508 g 0.508 g	AlphaSpec2 14	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	20,000 1,000	31.06% 1000	1000 88.1%	0.077 0.038	0.028 NA	pCi/g Dry Weight	NA NA	LT
	U-238 Trg. Analyte	10/16/2008 9:00:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.508 g 0.508 g	AlphaSpec2 14	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	272,000 2,000	31.06% 1000	1000 88.1%	0.88 0.18	0.03 NA	pCi/g Dry Weight	NA NA	
0810213-6 SMP	U-232 Tracer	10/16/2008 9:15:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.502 g 0.502 g	AlphaSpec2 16	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	1322,000 3,000	30.92% 1000	1000 87.0%	3.84 0.60	0.03 NA	pCi/g Dry Weight	NA NA	
	U-234 Trg. Analyte	10/16/2008 9:15:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.502 g 0.502 g	AlphaSpec2 16	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	343,000 2,000	30.92% 1000	1000 87.0%	1.15 0.22	0.03 NA	pCi/g Dry Weight	NA NA	
0810213-6 SMP	U-235 Trg. Analyte	10/16/2008 9:15:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.502 g 0.502 g	AlphaSpec2 16	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	13,000 0,000	30.92% 1000	1000 87.0%	0.051 0.029	0.011 NA	pCi/g Dry Weight	NA NA	LT
	U-238 Trg. Analyte	10/16/2008 9:15:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.502 g 0.502 g	AlphaSpec2 16	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	317,000 2,000	30.92% 1000	1000 87.0%	1.06 0.20	0.03 NA	pCi/g Dry Weight	NA NA	
0810213-7 SMP	U-232 Tracer	10/16/2008 9:30:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.503 g 0.503 g	AlphaSpec2 18	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	1268,000 24,000	30.30% 1000	1000 85.1%	3.75 0.59	0.08 NA	pCi/g Dry Weight	NA NA	
	U-234 Trg. Analyte	10/16/2008 9:30:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.503 g 0.503 g	AlphaSpec2 18	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	277,000 7,000	30.30% 1000	1000 85.1%	0.96 0.19	0.05 NA	pCi/g Dry Weight	NA NA	
0810213-7 SMP	U-235 Trg. Analyte	10/16/2008 9:30:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.503 g 0.503 g	AlphaSpec2 18	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	12,000 6,000	30.30% 1000	1000 85.1%	0.049 0.041	0.058 NA	pCi/g Dry Weight	NA NA	U
	U-238 Trg. Analyte	10/16/2008 9:30:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.503 g 0.503 g	AlphaSpec2 18	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	291,000 4,000	30.30% 1000	1000 85.1%	1.01 0.20	0.04 NA	pCi/g Dry Weight	NA NA	
0810213-8 SMP	U-232 Tracer	10/16/2008 9:45:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.508 g 0.508 g	AlphaSpec2 19	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	1233,000 20,000	29.47% 1000	1000 85.1%	3.73 0.59	0.07 NA	pCi/g Dry Weight	NA NA	

Comments:

Data Package ID: UR0810213-1

Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
D - DER is greater than Control Limit of 2.13
+ - Duplicate RPD not within limits.
LT - Result is less than Request MDC, greater than sample specific MDC
* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'

M - Requested MDC not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

- L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits
NC - Not Calculated for duplicate results less than 5 times MDC
B - Analyte concentration greater than MDC.
B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

- 1) The Tracer results are not yield corrected (i.e. activity measured not activity added).
2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

- TR - Tracer TA - Target Analyte
TPU - Total Propagated Uncertainty (see PAI SOP 743)
MDC - Minimum Detectable Concentration (see PAI SOP 709)
DER - Duplicate Error Ratio
BDL - Below Detection Limit

Date Printed: Tuesday, November 04, 2008

Paragon Analytics

Isotopic Uranium By Alpha Spectroscopy Raw Data Report

Laboratory Name: Paragon Analytics

Prep SOP: PAI 778

Reported on: Monday, November 03, 2008

PAI Work Order: 0810213

Analytical SOP: PAI 714

9:27:24 AM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QC BatchID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist	Samp Aliq Analy Aliq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CndDur(min) Yield	Activity +/- 2 s TPU	MDC DeclEv	ReportUnits ReportBasis	DER RPD	Spk. Recov Flags
0810213-8 SMP	U-234 Trg. Analyte	10/16/2008 9:45:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.505 g 0.505 g	AlphaSpec2 19	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	338,000 5,000	29.47% 1000	85.1% 1000	1.20 0.23	0.05 NA	pCi/g Dry Weight	NA NA	
	U-235 Trg. Analyte	10/16/2008 9:45:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.505 g 0.505 g	AlphaSpec2 19	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	17,000 0,000	29.47% 1000	85.1% 1000	0.071 0.036	0.011 NA	pCi/g Dry Weight	NA NA	
0810213-8 SMP	U-238 Trg. Analyte	10/16/2008 9:45:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.505 g 0.505 g	AlphaSpec2 19	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	322,000 3,000	29.47% 1000	85.1% 1000	1.14 0.22	0.04 NA	pCi/g Dry Weight	NA NA	
	U-232 Tracer	10/16/2008 10:00:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.505 g 0.505 g	AlphaSpec2 21	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	1218,000 21,000	29.42% 1000	84.2% 1000	3.70 0.58	0.07 NA	pCi/g Dry Weight	NA NA	
0810213-9 SMP	U-234 Trg. Analyte	10/16/2008 10:00:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.505 g 0.505 g	AlphaSpec2 21	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	223,000 9,000	29.42% 1000	84.2% 1000	0.80 0.17	0.06 NA	pCi/g Dry Weight	NA NA	
	U-235 Trg. Analyte	10/16/2008 10:00:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.505 g 0.505 g	AlphaSpec2 21	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	16,000 1,000	29.42% 1000	84.2% 1000	0.068 0.038	0.031 NA	pCi/g Dry Weight	NA NA	
0810213-9 SMP	U-238 Trg. Analyte	10/16/2008 10:00:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.505 g 0.505 g	AlphaSpec2 21	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	246,000 4,000	29.42% 1000	84.2% 1000	0.89 0.18	0.04 NA	pCi/g Dry Weight	NA NA	
	U-232 Tracer	10/16/2008 10:15:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.505 g 0.505 g	AlphaSpec2 22	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	1181,012 8,000	28.05% 1000	85.6% 1000	3.76 0.59	0.05 NA	pCi/g Dry Weight	NA NA	
0810213-10 SMP	U-234 Trg. Analyte	10/16/2008 10:15:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.505 g 0.505 g	AlphaSpec2 22	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	498,000 2,000	28.05% 1000	85.6% 1000	1.85 0.34	0.03 NA	pCi/g Dry Weight	NA NA	
	U-235 Trg. Analyte	10/16/2008 10:15:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.505 g 0.505 g	AlphaSpec2 22	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	18,004 0,000	28.05% 1000	85.6% 1000	0.079 0.039	0.012 NA	pCi/g Dry Weight	NA NA	
0810213-10 SMP	U-238 Trg. Analyte	10/16/2008 10:15:00 AM	AS081030-3 AS081030-3-1	NA NA	NA NA	SOIL NA	0.505 g 0.505 g	AlphaSpec2 22	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	472,996 2,000	28.05% 1000	85.6% 1000	1.76 0.32	0.03 NA	pCi/g Dry Weight	NA NA	

Comments:

Data Package ID: UR0810213-1

Qualifiers/Flags:

- M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.
- Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.
- Abbreviations:

TR- Tracer

TA - Target Analyte

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

DER - Duplicate Error Ratio

BDL - Below Detection Limit

Date Printed: Tuesday, November 04, 2008

Isotopic Uranium By Alpha Spectroscopy Raw Data Report

Laboratory Name: Paragon Analytics

Prep SOP: PAI 778

Reported on: Monday, November 03, 2008

PAI Work Order: 0810213

Analytical SOP: PAI 714

9:27:24 AM

Sample ID QC Type	Nuclide Type	Sample Date/Time	Prep Batch QC Batch ID	Ingrowth Date /Time	Decay Date/Time	Matrix %Moist	Samp Aliq Analy Aliq	Inst ID Det ID	AnRunID File Name	Count Date/Time	Net Cnts Bkg Cnts	BaseEff Bkg(min)	CndDur(min) Yield	Activity +/- 2 s TPU	MDC DeclLev	ReportUnits ReportBasis	DER RPD	%Spk. Recov Flags
AS081030-3	U-232 Tracer	10/30/2008 11:30:32 AM	AS081030-3	NA	NA	SOIL	0.504 g	AlphaSpec2 23	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	1197.000 18.000	29.04% 1000	1000 83.8%	3.68 0.58	0.07 NA	pCi/g Dry Weight	NA	NA
AS081030-3	U-234 Trg. Analyte	10/30/2008 11:30:32 AM	AS081030-3	NA	NA	SOIL	0.504 g	AlphaSpec2 23	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	7.000 8.000	29.04% 1000	1000 83.8%	0.026 0.035	0.058 NA	pCi/g Dry Weight	NA	U
AS081030-3	U-235 Trg. Analyte	10/30/2008 11:30:32 AM	AS081030-3	NA	NA	SOIL	0.504 g	AlphaSpec2 23	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	-3.000 4.000	29.04% 1000	1000 83.8%	-0.013 0.021	0.052 NA	pCi/g Dry Weight	NA	U
AS081030-3	U-238 Trg. Analyte	10/30/2008 11:30:32 AM	AS081030-3	NA	NA	SOIL	0.504 g	AlphaSpec2 23	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	-3.000 5.000	29.04% 1000	1000 83.8%	-0.011 0.020	0.048 NA	pCi/g Dry Weight	NA	U
AS081030-3	U-232 Tracer	10/30/2008 11:30:32 AM	AS081030-3	NA	NA	SOIL	0.504 g	AlphaSpec2 24	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	1222.000 10.000	29.19% 1000	1000 85.1%	3.74 0.59	0.05 NA	pCi/g Dry Weight	NA	103
AS081030-3	U-234 Trg. Analyte	10/30/2008 11:30:32 AM	AS081030-3	NA	NA	SOIL	0.504 g	AlphaSpec2 24	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	1275.000 3.000	29.19% 1000	1000 85.1%	4.59 0.76	0.04 NA	pCi/g Dry Weight	NA	P
AS081030-3	U-238 Trg. Analyte	10/30/2008 11:30:32 AM	AS081030-3	NA	NA	SOIL	0.504 g	AlphaSpec2 24	AS081030-3A Spectrum #1	10/31/2008 3:21 PM	1387.000 4.000	29.19% 1000	1000 85.1%	4.99 0.83	0.04 NA	pCi/g Dry Weight	NA	P

Comments:

Data Package ID: UR0810213-1

Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- W - DER is greater than Warning Limit of 1.42
- D - DER is greater than Control Limit of 2.13
- + - Duplicate RPD not within limits.
- LT - Result is less than Request MDC, greater than sample specific MDC
- * - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
- # - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

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NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Notes:

- 1) The Tracer results are not yield corrected (i.e. activity measured not activity added).
- 2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

- TR - Tracer
- TA - Target Analyte
- TPU - Total Propagated Uncertainty (see PAI SOP 743)
- MDC - Minimum Detectable Concentration (see PAI SOP 709)
- DER - Duplicate Error Ratio
- BDL - Below Detection Limit

Date Printed: Tuesday, November 04, 2008

Paragon Analytics

Paragon Analytics

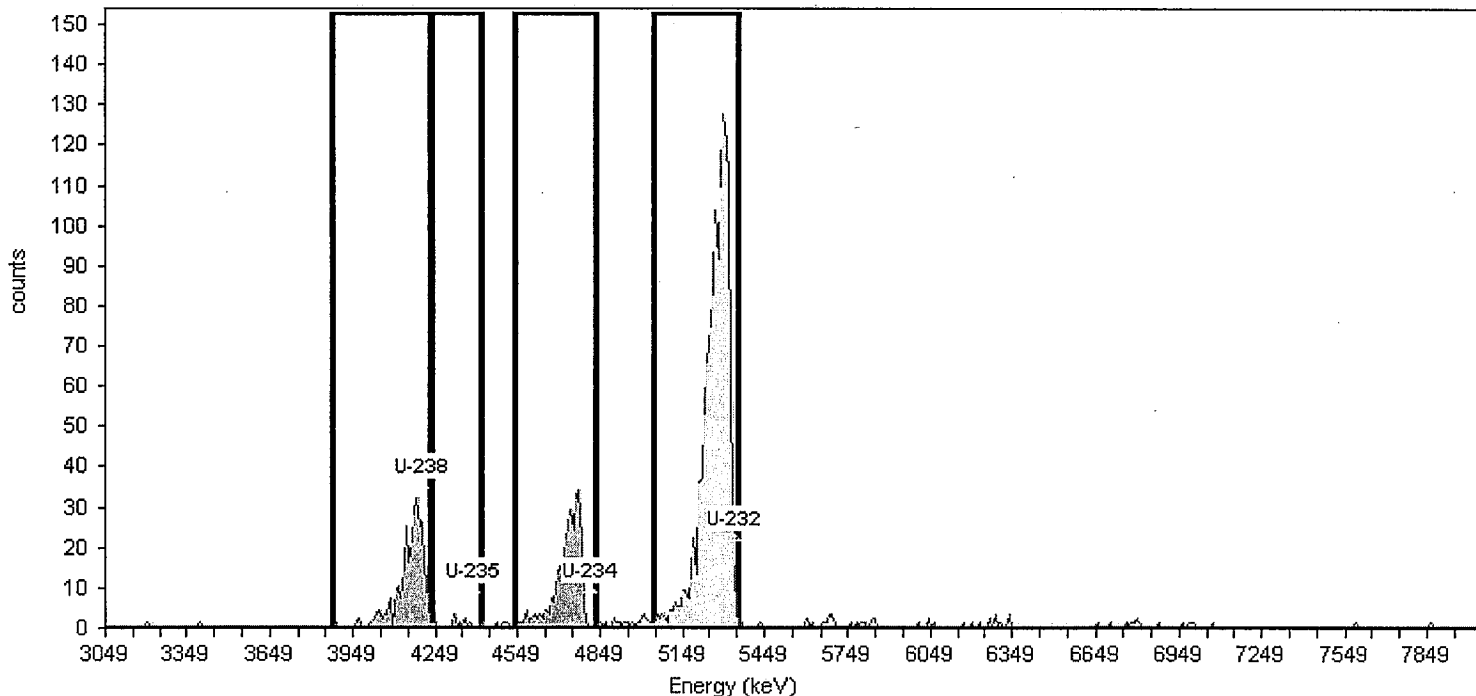
Alpha-Spectroscopy Analysis Report

Sample Sample: 0810213-1 Spectrum #1 Analysis #1	Sample Size : 0.50
---	--------------------

Acquisition Detector: 9 Batch Name: UAS081030-3_A Nuclide Library: Uranium Default Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default ROI Set: Uranium Default	Acquisition Start Date: 10/31/2008 3:21:42PM Live Time: 1,000.00 min. Real Time: 1,000.03 min. Dead Time: 0.00 %
--	---

Calibration Bkgd Info: Sample: B0810299; Det: 9; Spectrum #1; Oct-29-2008 14:42 Calibration Date: 10/28/2008 10:15:28AM Efficiency Calibration: C08102809 Efficiency: 31.09% +/- 0.20% TPU(2 sigma)	Energy Calibration: C08102809 Energy Cal: Gain = 9.8224 keV / Ch Offset = 3,039.21 keV Quadratic = 0.0000 keV / Ch ²
--	--

Tracer Tracer Name: 837.3020.100 U-232 Tracer Activity: 19.73 DPM/mL x (Vol.)0.25 mL = 4.93 DPM	Tracer Nuclide: U-232 Tracer Recovery: 79.07%
--	--



Nuclide Summary (ROI)												
Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4159.9	3875.1	4228.7	90.3	100.2	263.10	0.00	263.10	9.6E-001	1.6E-001	0.0E+000	9.9E-003
U-235	4346.5	4238.5	4415.3	25.7	99.7	8.10	1.00	7.10	2.6E-002	2.2E-002	8.6E-003	2.7E-002
U-234	4768.9	4543.0	4827.8	69.5	100.0	274.10	2.00	272.10	1.0E+000	1.7E-001	1.2E-002	3.4E-002
U-232	5299.3	5043.9	5358.3	94.1	100.1	1,197.29	3.00	1,194.29	3.5E+000	2.1E-001	1.5E-002	4.0E-002

Reviewed By:

Print Date: 11/3/2008 8:30:08AM

AlphaVision v5.3

Custom Report Iteration: 08/09/07

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Paragon Analytics

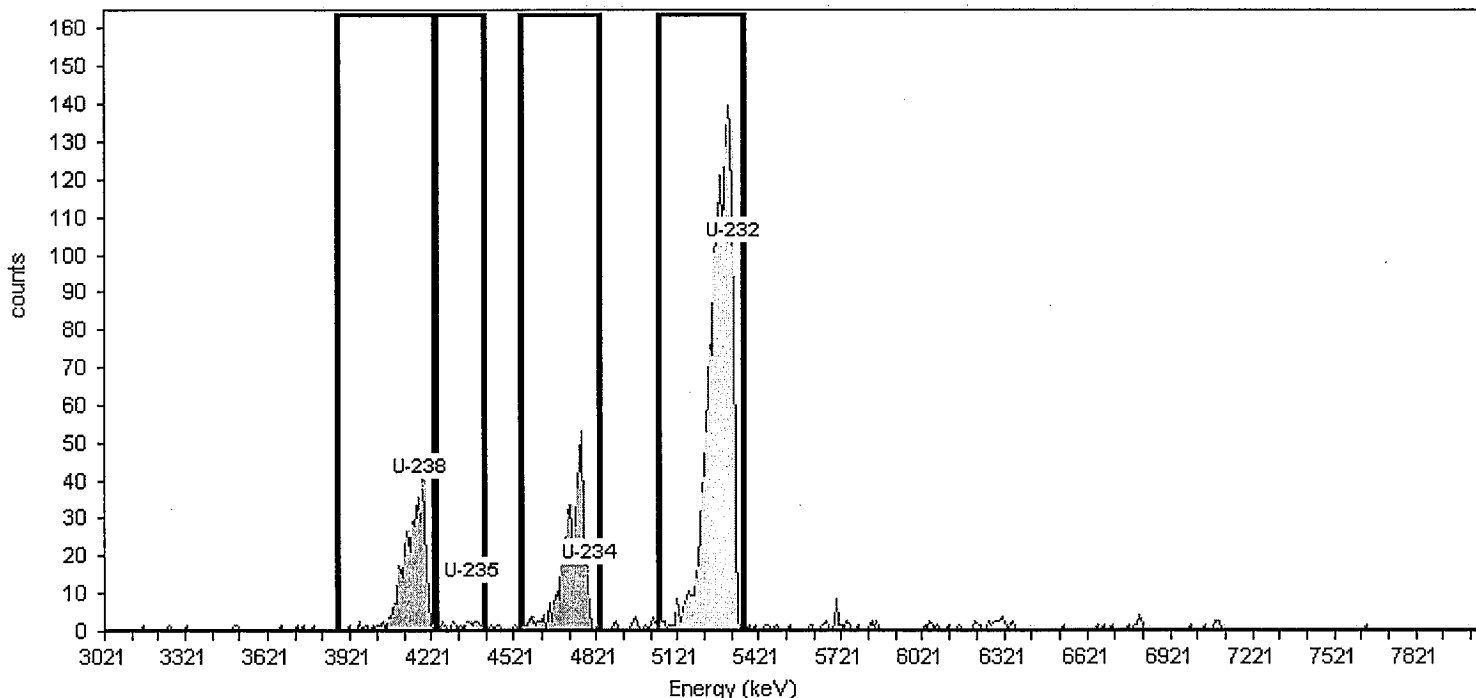
Alpha-Spectroscopy Analysis Report

Sample Sample: 0810213-2 Spectrum #1 Analysis #1	Sample Size : 0.50
---	--------------------

Acquisition Detector: 10a Batch Name: UAS081030-3_A Nuclide Library: Uranium Default Analysis Method: Absolute Interactive ROI Analysis ROI Set: Uranium Default	Acquisition Start Date: 10/31/2008 3:21:47PM Live Time: 1,000.00 min. Real Time: 1,000.03 min. Dead Time: 0.00 %
--	---

Calibration Bkgd Info: Sample: B08102910; Det: 10a; Spectrum #1; Oct-29-2008 14:42 Calibration Date: 10/28/2008 10:15:52AM Efficiency Calibration: C08102810 Efficiency: 31.46% +/- 0.15% TPU(2 sigma)	Energy Calibration: C08102810 Energy Cal: Gain = 9.9003 keV / Ch Offset = 3,011.38 keV Quadratic = 0.0000 keV / Ch ²
---	--

Tracer Tracer Name: 837.3020.100 U-232 Tracer Activity: 19.73 DPM/mL x (Vol.)0.25 mL = 4.93 DPM	Tracer Nuclide: U-232 Tracer Recovery: 86.82%
--	--



Nuclide Summary (ROI)												
Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4179.6	3872.7	4229.1	29.5	100.2	315.00	2.00	313.00	1.0E+000	1.7E-001	1.1E-002	3.1E-002
U-235	4367.7	4239.0	4417.2	155.1	99.7	18.00	2.00	16.00	5.3E-002	3.0E-002	1.1E-002	3.1E-002
U-234	4793.4	4545.9	4833.0	76.1	100.0	345.00	0.00	345.00	1.1E+000	1.8E-001	0.0E+000	8.9E-003
U-232	5328.0	5050.8	5367.6	53.1	100.1	1,327.00	0.00	1,327.00	3.9E+000	2.1E-001	0.0E+000	9.1E-003

Reviewed By: *GB* *JS*

Print Date: 11/3/2008 8:31:18AM

AlphaVision v5.3
Custom Report Iteration: 08/09/07

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Paragon Analytics

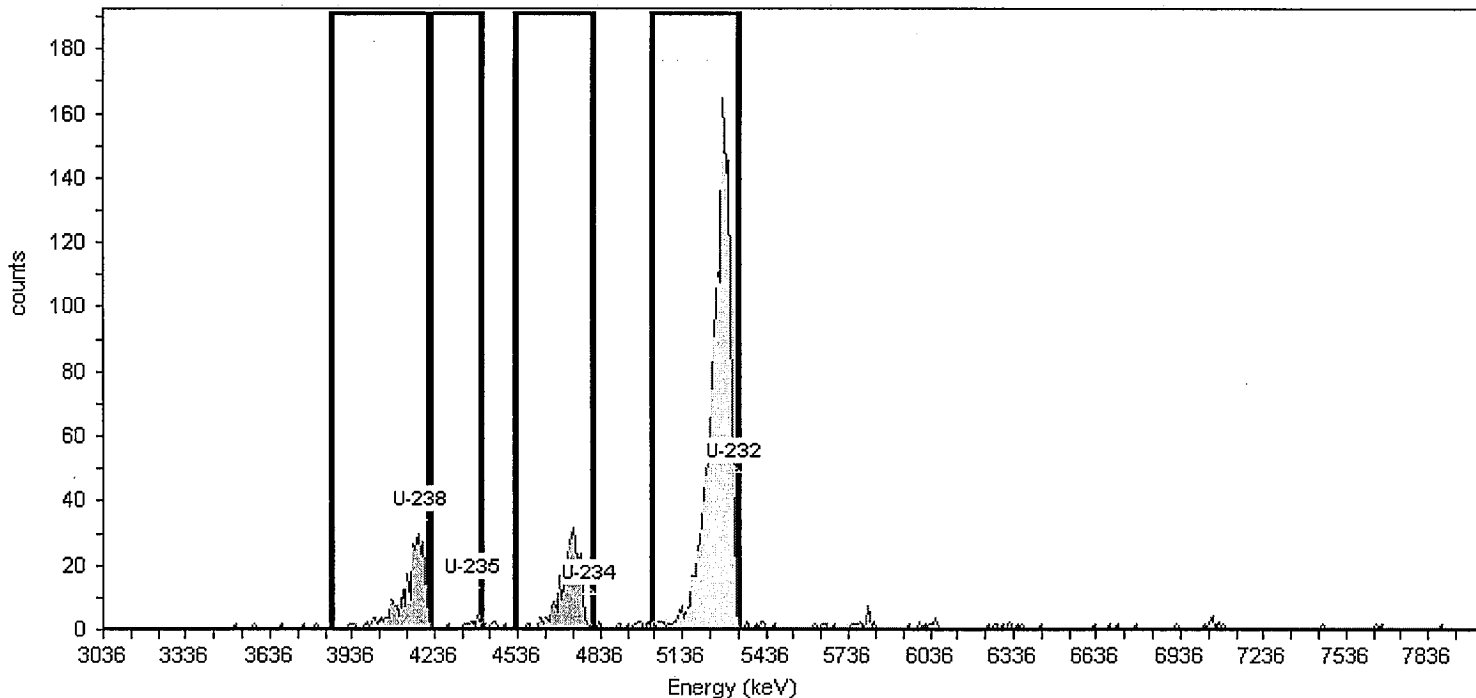
Alpha-Spectroscopy Analysis Report

Sample Sample: 0810213-3 Spectrum #1 Analysis #1	Sample Size : 0.50
---	--------------------

Acquisition Detector: 11 Batch Name: UAS081030-3_A Nuclide Library: Uranium Default Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default ROI Set: Uranium Default	Acquisition Start Date: 10/31/2008 3:21:44PM Live Time: 1,000.00 min. Real Time: 1,000.03 min. Dead Time: 0.00 %
---	---

Calibration Bkgd Info: Sample: B08102911; Det: 11; Spectrum #1; Oct-29-2008 14:42 Calibration Date: 10/28/2008 10:16:08AM Efficiency Calibration: C08102811 Efficiency: 30.77% +/- 0.16% TPU(2 sigma)	Energy Calibration: C08102811 Energy Cal: Gain = 9.8047 keV / Ch Offset = 3,026.20 keV Quadratic = 0.0000 keV / Ch ²
--	--

Tracer Tracer Name: 837.3020.100 U-232 Tracer Activity: 19.73 DPM/mL x (Vol.)0.25 mL = 4.93 DPM	Tracer Nuclide: U-232 Tracer Recovery: 83.82%
--	--



Nuclide Summary (ROI)												
Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4143.9	3859.6	4212.6	79.9	100.2	238.00	0.00	238.00	8.3E-001	1.4E-001	0.0E+000	9.4E-003
U-235	4330.2	4222.4	4398.9	33.8	99.7	11.00	1.00	10.00	3.5E-002	2.5E-002	8.2E-003	2.6E-002
U-234	4751.8	4526.3	4810.7	64.4	100.0	233.00	1.00	232.00	8.1E-001	1.4E-001	8.1E-003	2.6E-002
U-232	5281.3	5026.4	5340.1	77.7	100.1	1,255.00	2.00	1,253.00	3.7E+000	2.1E-001	1.2E-002	3.3E-002

Reviewed By: *GB* *JS*

Print Date: 11/3/2008 8:31:27AM

AlphaVision v5.3
Custom Report Iteration: 08/09/07

Paragon Analytics

Alpha-Spectroscopy Analysis Report

Sample: 0810213-3D
Spectrum #1 Analysis #1

Sample

Sample Size : 0.50

Detector: 12
Batch Name: UAS081030-3_A
Nuclide Library: Uranium Default
Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default
ROI Set: Uranium Default

Acquisition

Acquisition Start Date: 10/31/2008 3:21:44PM
Live Time: 1,000.00 min.
Real Time: 1,000.03 min.
Dead Time: 0.00 %

Calibration

Bkgd Info: Sample: B08102912; Det: 12; Spectrum #1; Oct-29-2008 14:42

Calibration Date: 10/28/2008 10:16:25AM

Efficiency Calibration: C08102812

Efficiency: 30.50% +/- 0.21% TPU(2 sigma)

Energy Calibration: C08102812

Energy Cal: Gain = 9.9003 keV / Ch

Offset = 3,021.28 keV

Quadratic = 0.0000 keV / Ch²

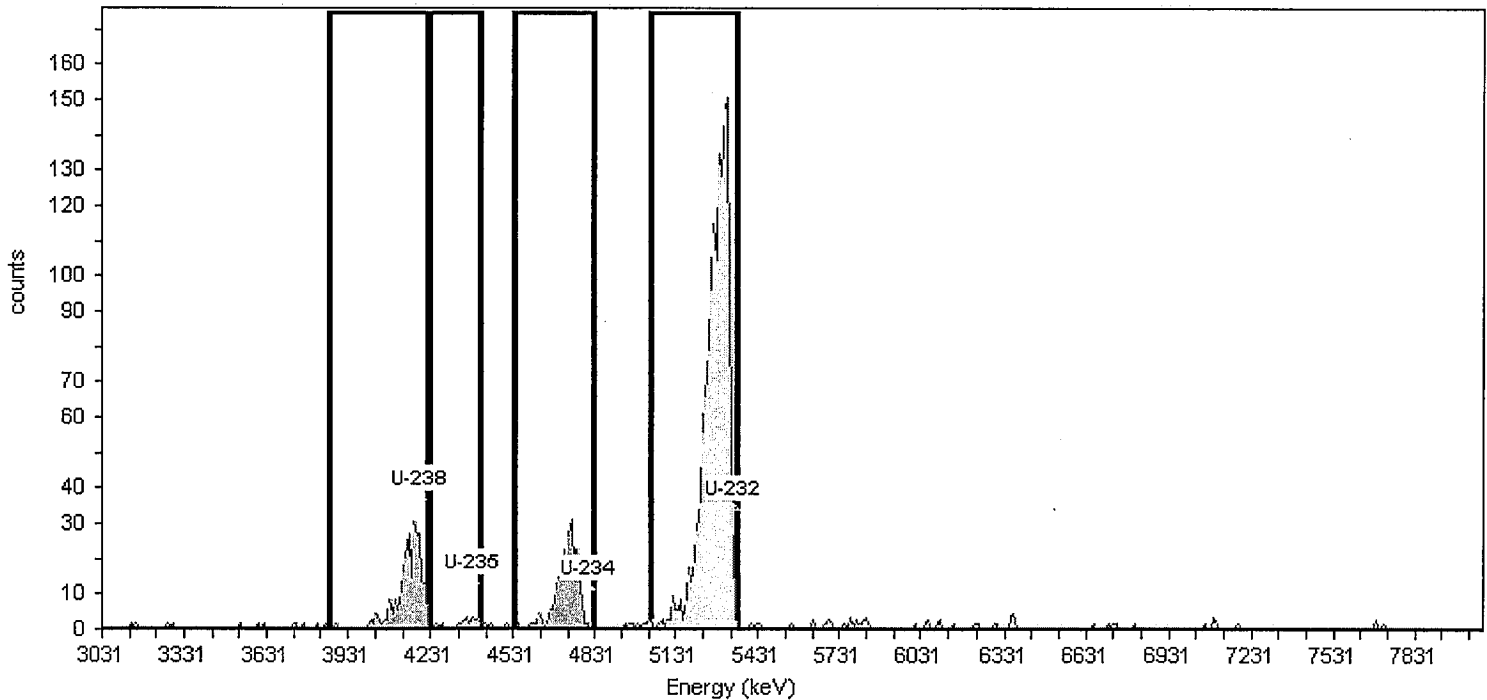
Tracer

Tracer Name: 837.3020.100 U-232

Tracer Activity: 19.73 DPM/mL x (Vol.)0.25 mL = 4.93 DPM

Tracer Nuclide: U-232

Tracer Recovery: 91.58%



Nuclide Summary (ROI)

Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4154.9	3867.8	4224.2	90.4	100.2	235.50	3.50	232.00	7.5E-001	1.3E-001	1.4E-002	3.7E-002
U-235	4343.0	4234.1	4412.3	69.3	99.7	18.00	0.50	17.50	5.7E-002	2.9E-002	5.3E-003	1.9E-002
U-234	4768.7	4541.0	4828.1	80.0	100.0	214.50	5.00	209.50	6.8E-001	1.2E-001	1.7E-002	4.2E-002
U-232	5303.3	5045.9	5362.7	90.9	100.1	1,357.00	0.00	1,357.00	4.1E+000	2.2E-001	0.0E+000	8.9E-003

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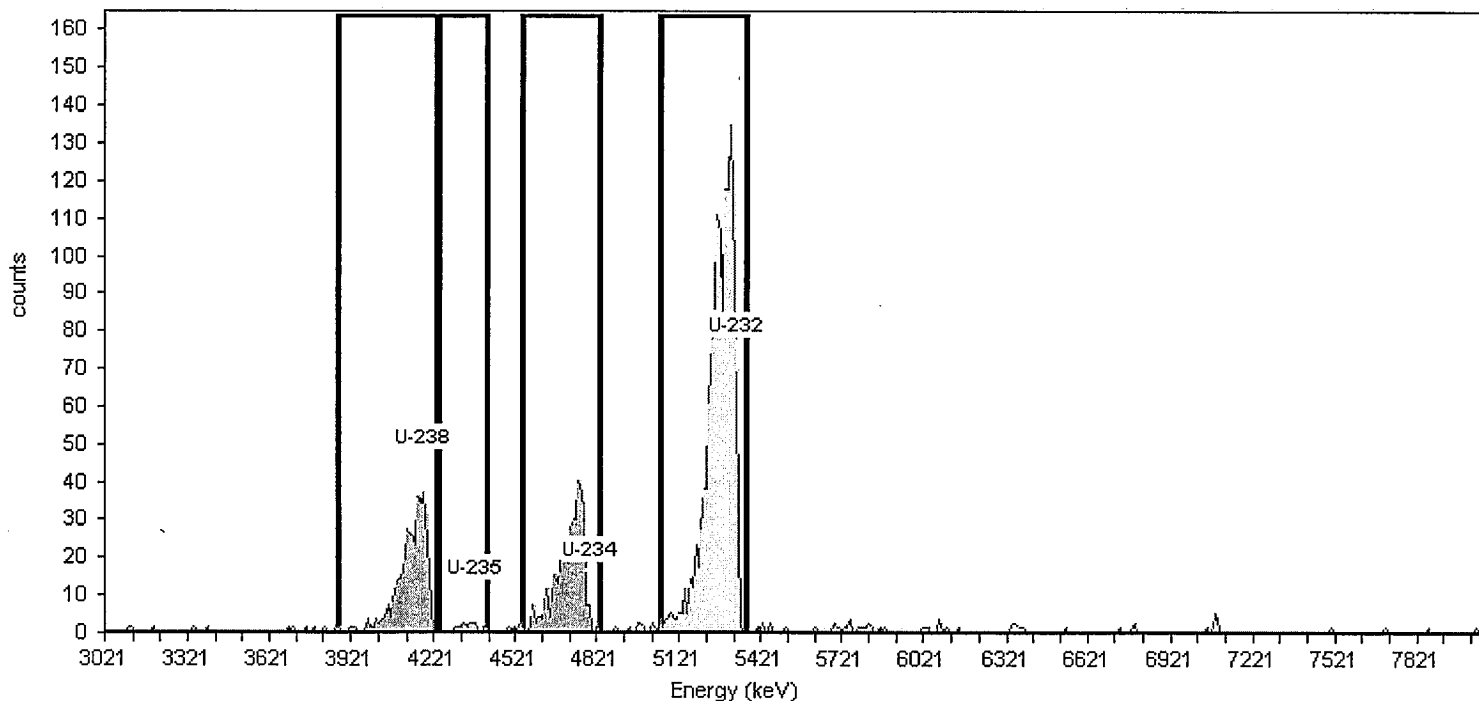
Alpha-Spectroscopy Analysis Report

Sample Sample: 0810213-4 Spectrum #1 Analysis #1	Sample Size : 0.50
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Acquisition Detector: 13 Batch Name: UAS081030-3_A Nuclide Library: Uranium Default Analysis Method: Absolute Interactive ROI Analysis ROI Set: Uranium Default	Acquisition Start Date: 10/31/2008 3:21:45PM Live Time: 1,000.00 min. Real Time: 1,000.03 min. Dead Time: 0.00 %
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Calibration Bkgd Info: Sample: B08102913; Det: 13; Spectrum #1; Oct-29-2008 14:42 Calibration Date: 10/28/2008 10:16:42AM Efficiency Calibration: C08102813 Efficiency: 31.87% +/- 0.13% TPU(2 sigma)	Energy Calibration: C08102813 Energy Cal: Gain = 9.9003 keV / Ch Offset = 3,011.38 keV Quadratic = 0.0000 keV / Ch ²
--	--

Tracer Tracer Name: 837.3020.100 U-232 Tracer Activity: 19.73 DPM/mL x (Vol.)0.25 mL = 4.93 DPM	Tracer Nuclide: U-232 Tracer Recovery: 85.56%
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Nuclide Summary (ROI)												
Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4179.6	3872.7	4229.1	28.4	100.2	362.00	1.00	361.00	1.2E+000	1.9E-001	7.7E-003	2.4E-002
U-235	4367.7	4239.0	4417.2	78.8	99.7	15.00	1.00	14.00	4.6E-002	2.7E-002	7.7E-003	2.4E-002
U-234	4793.4	4545.9	4833.0	87.8	100.0	369.00	0.00	369.00	1.2E+000	1.9E-001	0.0E+000	8.9E-003
U-232	5328.0	5050.8	5367.6	62.4	100.1	1,327.00	2.00	1,325.00	3.8E+000	2.1E-001	1.1E-002	3.1E-002

Paragon Analytics

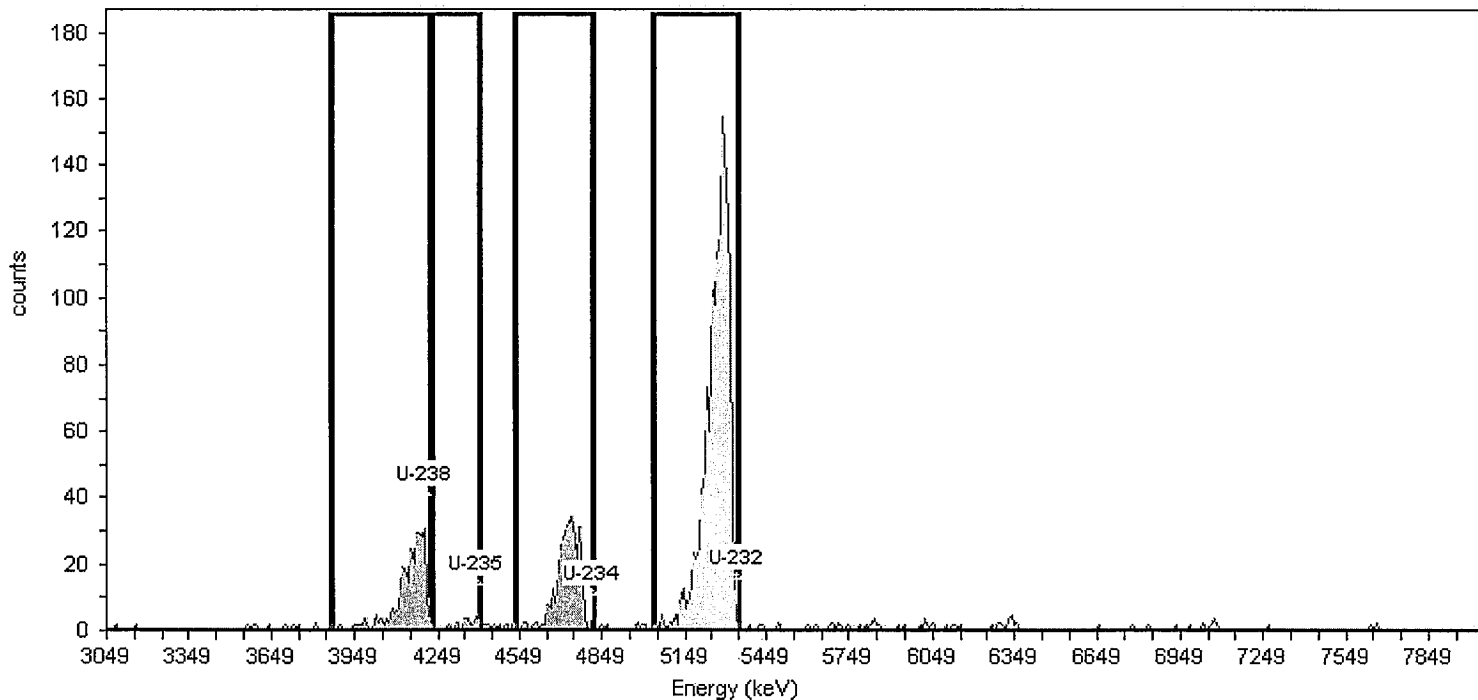
Alpha-Spectroscopy Analysis Report

Sample Sample: 0810213-5 Spectrum #1 Analysis #1	Sample Size : 0.50
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Acquisition Detector: 14 Batch Name: UAS081030-3_A Nuclide Library: Uranium Default Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default ROI Set: Uranium Default	Acquisition Start Date: 10/31/2008 3:21:36PM Live Time: 1,000.00 min. Real Time: 1,000.03 min. Dead Time: 0.00 %
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Calibration Bkgd Info: Sample: B08102914; Det: 14; Spectrum #1; Oct-29-2008 14:42 Calibration Date: 10/28/2008 10:16:57AM Efficiency Calibration: C08102814 Efficiency: 31.06% +/- 0.15% TPU(2 sigma)	Energy Calibration: C08102814 Energy Cal: Gain = 9.8224 keV / Ch Offset = 3,039.21 keV Quadratic = 0.0000 keV / Ch ²
--	--

Tracer Tracer Name: 837.3020.100 U-232 Tracer Activity: 19.73 DPM/mL x (Vol.)0.25 mL = 4.93 DPM	Tracer Nuclide: U-232 Tracer Recovery: 89.19%
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Nuclide Summary (ROI)												
Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4149.2	3864.3	4217.9	90.3	100.2	274.00	2.00	272.00	8.8E-001	1.5E-001	1.1E-002	3.0E-002
U-235	4335.8	4227.7	4404.5	66.3	99.7	21.00	1.00	20.00	6.5E-002	3.1E-002	7.6E-003	2.4E-002
U-234	4758.1	4532.2	4817.1	87.2	100.0	305.00	2.00	303.00	9.8E-001	1.6E-001	1.1E-002	3.0E-002
U-232	5288.6	5033.2	5347.5	87.2	100.1	1,346.00	0.00	1,346.00	4.0E+000	2.2E-001	0.0E+000	8.9E-003

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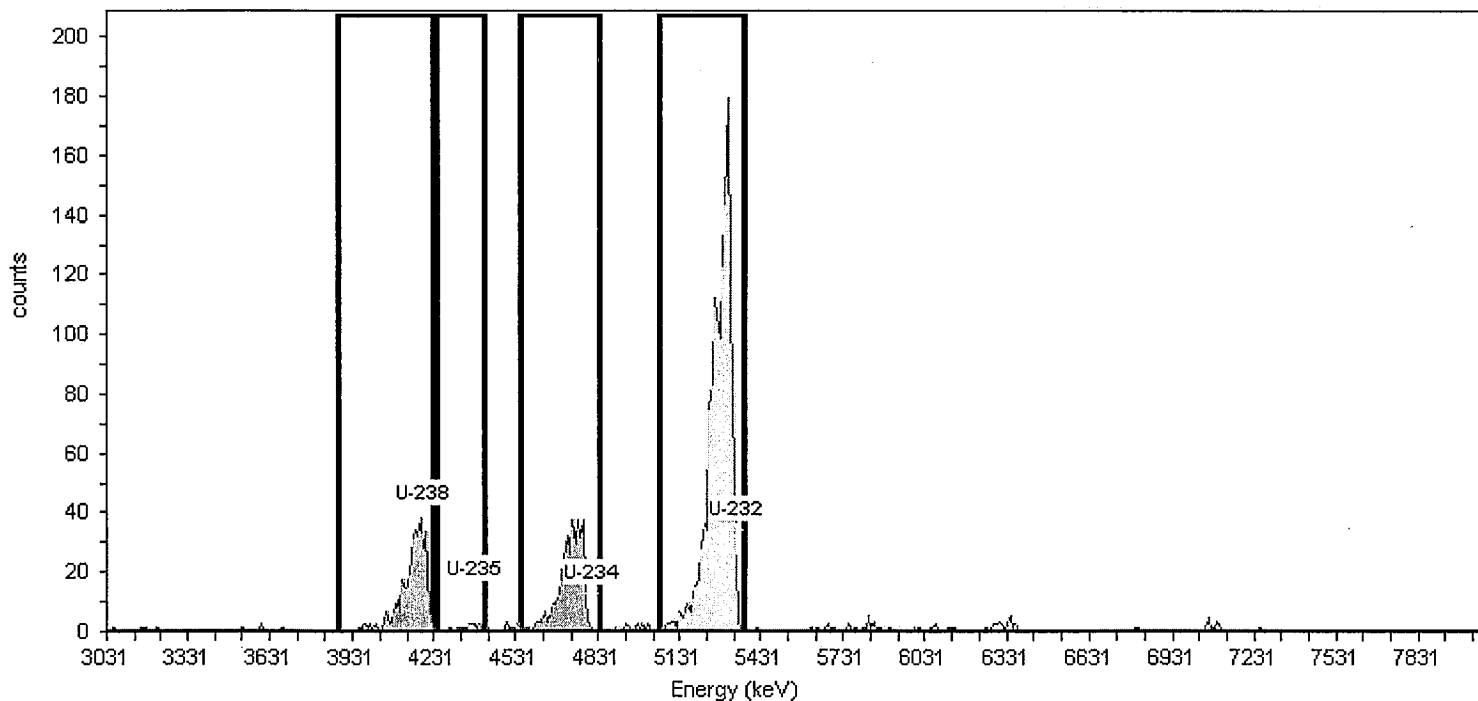
Alpha-Spectroscopy Analysis Report

Sample Sample: 0810213-6 Spectrum #1 Analysis #1	Sample Size : 0.50
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Acquisition Detector: 16 Batch Name: UAS081030-3_A Nuclide Library: Uranium Default Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default ROI Set: Uranium Default	Acquisition Start Date: 10/31/2008 3:21:36PM Live Time: 1,000.00 min. Real Time: 1,000.03 min. Dead Time: 0.00 %
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Calibration Bkgd Info: Sample: B08102916; Det: 16; Spectrum #1; Oct-29-2008 14:42 Calibration Date: 10/28/2008 10:17:30AM Efficiency Calibration: C08102816 Efficiency: 30.92% +/- 0.12% TPU(2 sigma)	Energy Calibration: C08102816 Energy Cal: Gain = 9.9003 keV / Ch Offset = 3,021.28 keV Quadratic = 0.0000 keV / Ch ²
--	--

Tracer Tracer Name: 837.3020.100 U-232 Tracer Activity: 19.73 DPM/mL x (Vol.)0.25 mL = 4.93 DPM	Tracer Nuclide: U-232 Tracer Recovery: 88.02%
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Nuclide Summary (ROI)												
Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4159.8	3872.7	4229.1	88.0	100.2	319.00	2.00	317.00	1.0E+000	1.7E-001	1.1E-002	3.1E-002
U-235	4347.9	4239.0	4417.2	73.1	99.7	13.00	0.00	13.00	4.3E-002	2.5E-002	0.0E+000	9.0E-003
U-234	4773.6	4545.9	4833.0	86.3	100.0	345.00	2.00	343.00	1.1E+000	1.8E-001	1.1E-002	3.1E-002
U-232	5308.2	5050.8	5367.6	90.9	100.1	1,325.00	3.00	1,322.00	3.9E+000	2.2E-001	1.4E-002	3.6E-002

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Paragon Analytics

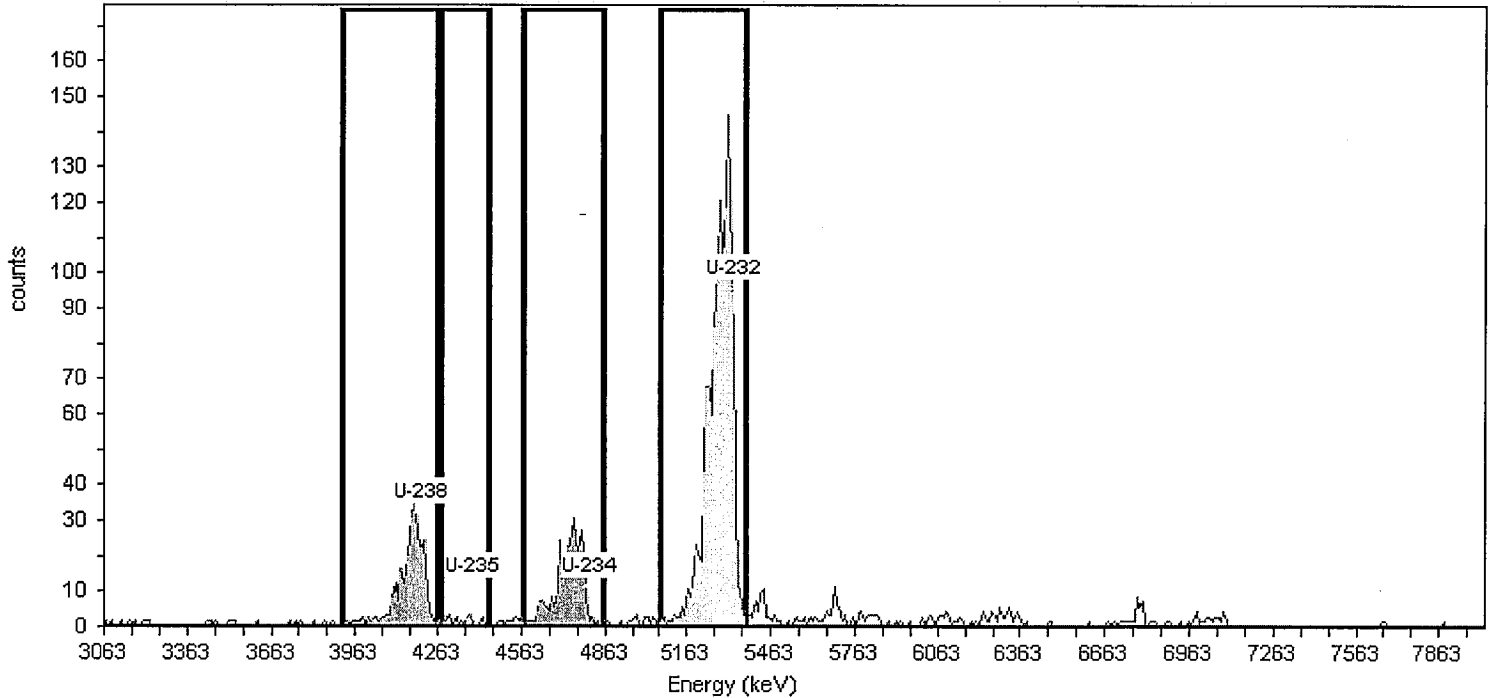
Alpha-Spectroscopy Analysis Report

Sample Sample: 0810213-7 Spectrum #1 Analysis #1	Sample Size : 0.50
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Acquisition Detector: 18 Batch Name: UAS081030-3_A Nuclide Library: Uranium Default Analysis Method: Absolute Interactive ROI Analysis ROI Set: Uranium Default	Acquisition Start Date: 10/31/2008 3:21:37PM Live Time: 1,000.00 min. Real Time: 1,000.01 min. Dead Time: 0.00 %
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Calibration Bkgd Info: Sample: B08102818; Det: 18; Spectrum #1; Oct-28-2008 14:40 Calibration Date: 10/28/2008 11:21:19AM Efficiency Calibration: C08102818 Efficiency: 30.30% +/- 0.15% TPU(2 sigma)	Energy Calibration: C08102818 Energy Cal: Gain = 9.7289 keV / Ch Offset = 3,053.57 keV Quadratic = 0.0000 keV / Ch ²
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Tracer Tracer Name: 837.3020.100 U-232 Tracer Activity: 19.73 DPM/mL x (Vol.)0.25 mL = 4.93 DPM	Tracer Nuclide: U-232 Tracer Recovery: 86.13%
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Nuclide Summary (ROI)												
Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4201.6	3909.7	4259.9	75.1	100.2	295.00	4.00	291.00	1.0E+000	1.7E-001	1.6E-002	4.1E-002
U-235	4386.4	4269.7	4444.8	144.0	99.7	18.00	6.00	12.00	4.2E-002	3.4E-002	2.0E-002	4.9E-002
U-234	4804.8	4571.3	4853.4	101.7	100.0	284.00	7.00	277.00	9.6E-001	1.6E-001	2.1E-002	5.2E-002
U-232	5330.1	5067.4	5378.8	83.2	100.1	1,292.00	24.00	1,268.00	3.8E+000	2.2E-001	4.0E-002	8.9E-002

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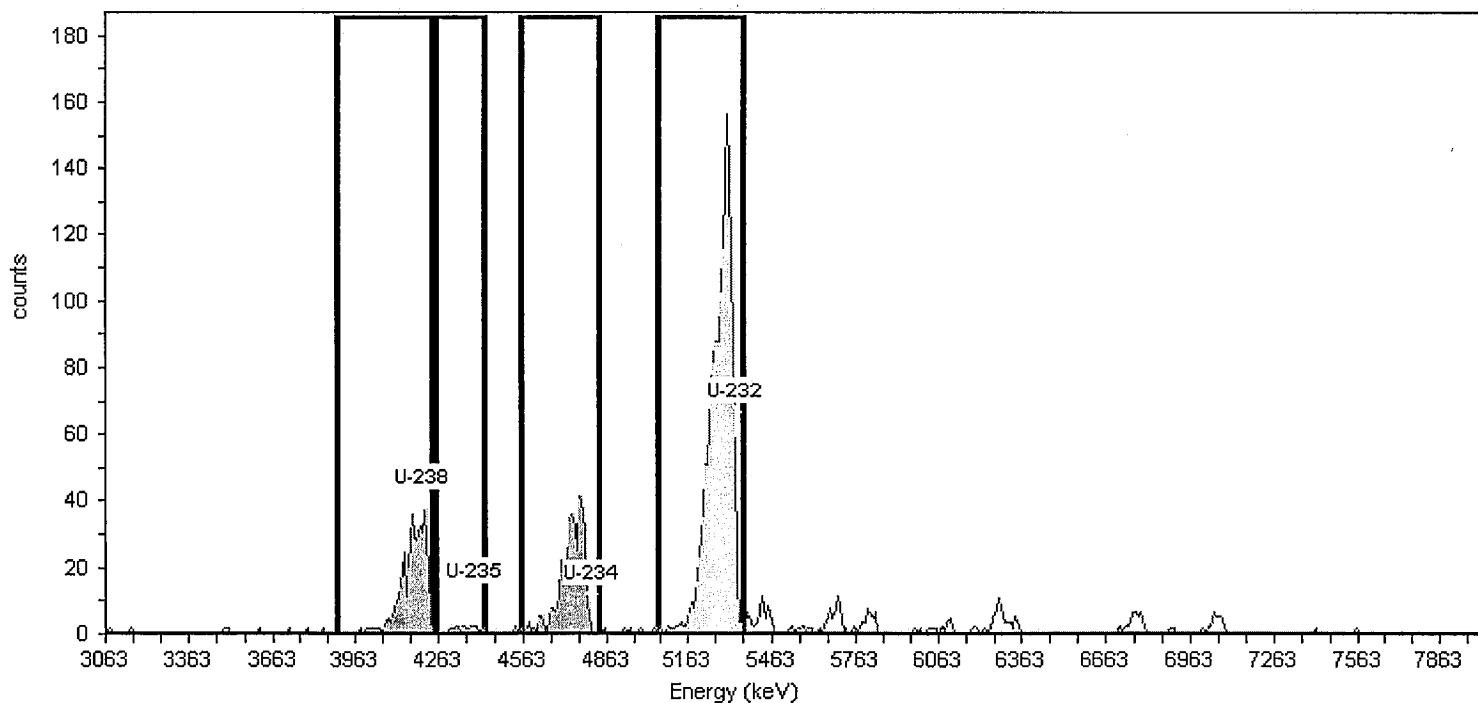
Alpha-Spectroscopy Analysis Report

Sample Sample: 0810213-8 Spectrum #1 Analysis #1	Sample Size : 0.50
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Acquisition Detector: 19 Batch Name: UAS081030-3_A Nuclide Library: Uranium Default Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default ROI Set: Uranium Default	Acquisition Start Date: 10/31/2008 3:21:38PM Live Time: 1,000.00 min. Real Time: 1,000.01 min. Dead Time: 0.00 %
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Calibration Bkgd Info: Sample: B08102819; Det: 19; Spectrum #1; Oct-28-2008 14:40 Calibration Date: 10/28/2008 11:21:38AM Efficiency Calibration: C08102819 Efficiency: 29.47% +/- 0.16% TPU(2 sigma)	Energy Calibration: C08102819 Energy Cal: Gain = 9.7289 keV / Ch Offset = 3,053.57 keV Quadratic = 0.0000 keV / Ch ²
--	--

Tracer Tracer Name: 837.3020.100 U-232 Tracer Activity: 19.73 DPM/mL x (Vol.)0.25 mL = 4.93 DPM	Tracer Nuclide: U-232 Tracer Recovery: 86.12%
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Nuclide Summary (ROI)												
Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4172.4	3890.2	4240.5	92.4	100.2	325.00	3.00	322.00	1.1E+000	1.8E-001	1.4E-002	3.8E-002
U-235	4357.2	4250.2	4425.3	88.4	99.7	17.00	0.00	17.00	6.1E-002	3.1E-002	0.0E+000	9.6E-003
U-234	4775.6	4551.8	4833.9	72.1	100.0	343.00	5.00	338.00	1.2E+000	1.9E-001	1.8E-002	4.7E-002
U-232	5300.9	5048.0	5359.3	98.0	100.1	1,253.00	20.00	1,233.00	3.8E+000	2.2E-001	3.7E-002	8.5E-002

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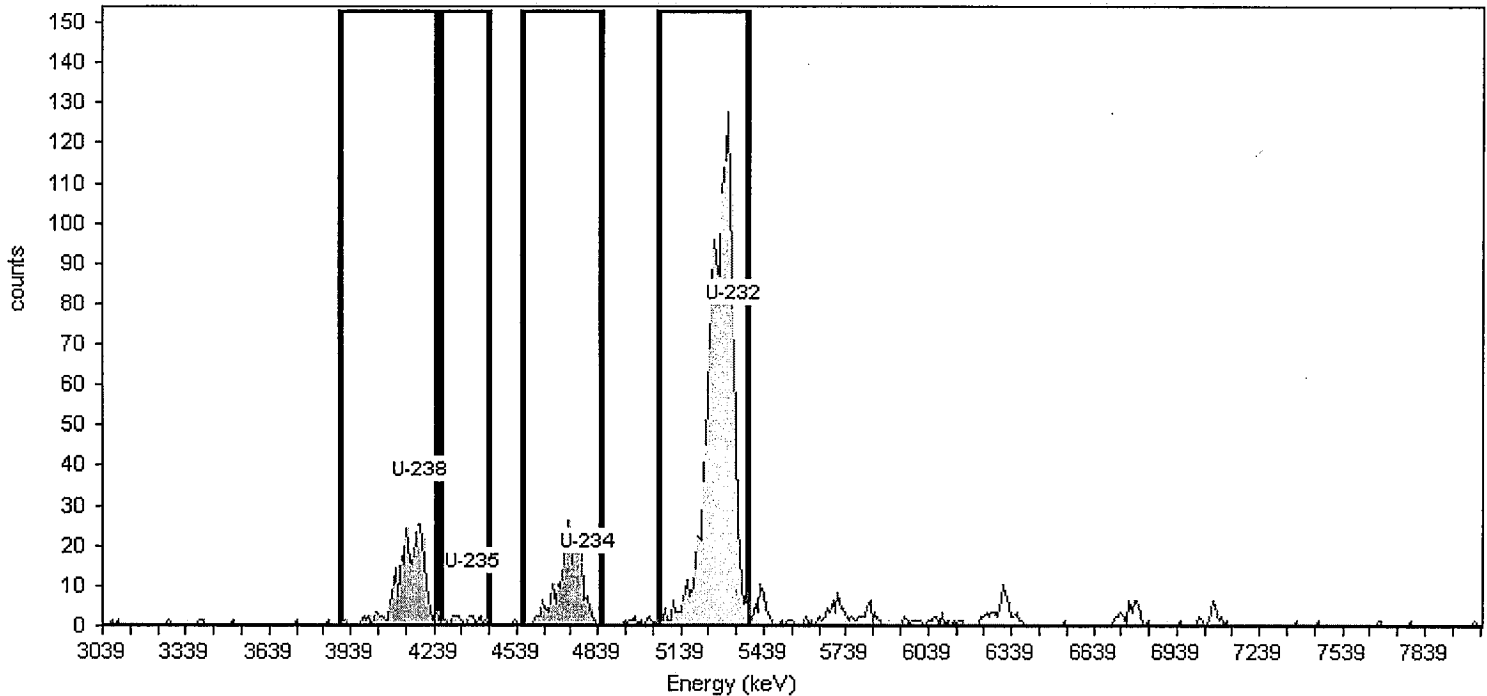
Alpha-Spectroscopy Analysis Report

Sample Sample: 0810213-9 Spectrum #1 Analysis #1	Sample Size : 0.50
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Acquisition Detector: 21 Batch Name: UAS081030-3_A Nuclide Library: Uranium Default Analysis Method: Absolute Interactive ROI Analysis ROI Set: Uranium Default	Acquisition Start Date: 10/31/2008 3:21:38PM Live Time: 1,000.00 min. Real Time: 1,000.01 min. Dead Time: 0.00 %
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Calibration Bkgd Info: Sample: B08102821; Det: 21; Spectrum #1; Oct-28-2008 14:40 Calibration Date: 10/28/2008 11:21:59AM Efficiency Calibration: C08102821 Efficiency: 29.42% +/- 0.13% TPU(2 sigma)	Energy Calibration: C08102821 Energy Cal: Gain = 9.8224 keV / Ch Offset = 3,029.39 keV Quadratic = 0.0000 keV / Ch ²
--	--

Tracer Tracer Name: 837.3020.100 U-232 Tracer Activity: 19.73 DPM/mL x (Vol.)0.25 mL = 4.93 DPM	Tracer Nuclide: U-232 Tracer Recovery: 85.21%
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Nuclide Summary (ROI)												
Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4188.4	3893.8	4247.4	58.7	100.2	250.00	4.00	246.00	8.8E-001	1.5E-001	1.7E-002	4.3E-002
U-235	4375.1	4257.2	4434.0	31.3	99.7	17.00	1.00	16.00	5.8E-002	3.1E-002	8.4E-003	2.7E-002
U-234	4797.4	4561.7	4846.5	83.4	100.0	232.00	9.00	223.00	8.0E-001	1.5E-001	2.5E-002	6.0E-002
U-232	5327.8	5062.6	5377.0	94.2	100.1	1,239.00	21.00	1,218.00	3.8E+000	2.2E-001	3.9E-002	8.8E-002

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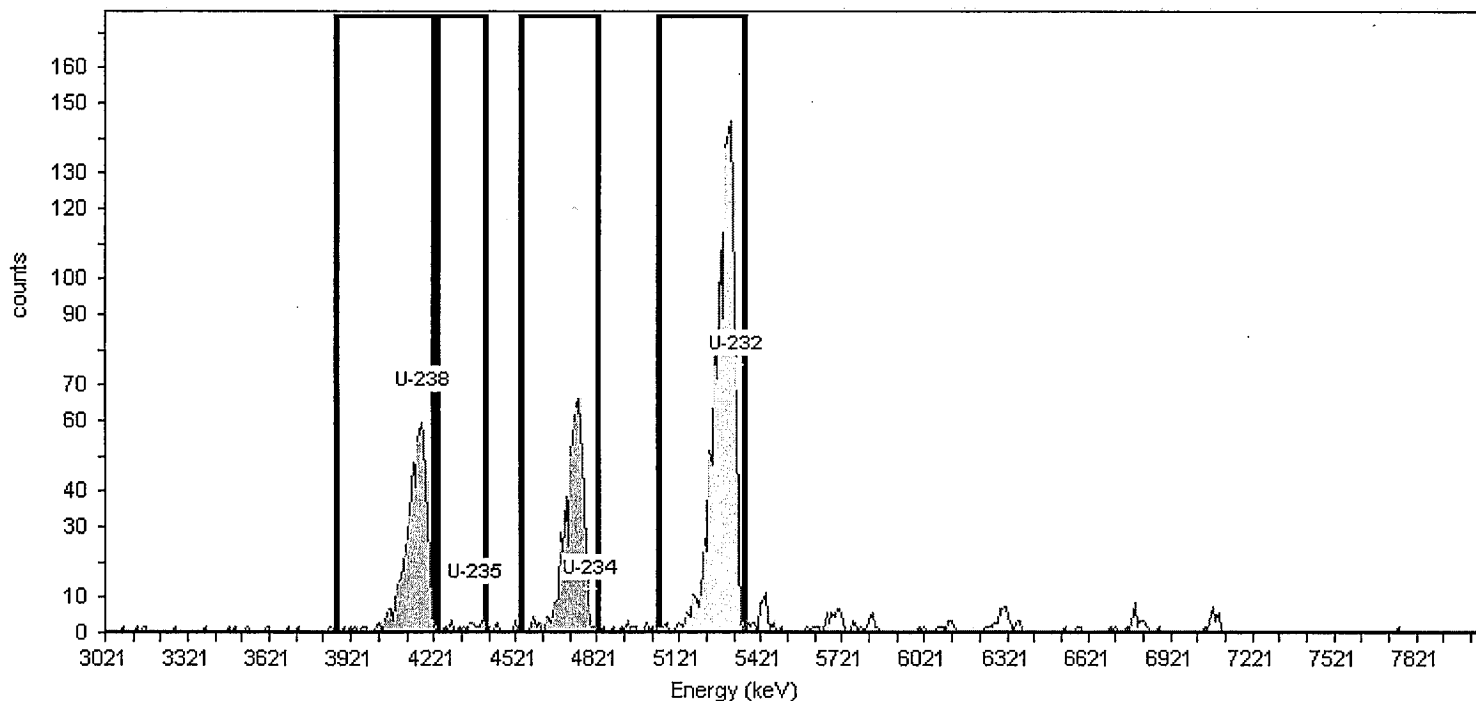
Alpha-Spectroscopy Analysis Report

Sample Sample: 0810213-10 Spectrum #1 Analysis #1	Sample Size : 0.50
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Acquisition Detector: 22 Batch Name: UAS081030-3_A Nuclide Library: Uranium Default Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default ROI Set: Uranium Default	Acquisition Start Date: 10/31/2008 3:21:39PM Live Time: 1,000.00 min. Real Time: 1,000.01 min. Dead Time: 0.00 %
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Calibration Bkgd Info: Sample: B08102822; Det: 22; Spectrum #1; Oct-28-2008 14:40 Calibration Date: 10/28/2008 11:22:20AM Efficiency Calibration: C08102822 Efficiency: 28.05% +/- 0.15% TPU(2 sigma)	Energy Calibration: C08102822 Energy Cal: Gain = 9.9003 keV / Ch Offset = 3,011.38 keV Quadratic = 0.0000 keV / Ch ²
--	--

Tracer Tracer Name: 837.3020.100 U-232 Tracer Activity: 19.73 DPM/mL x (Vol.)0.25 mL = 4.93 DPM	Tracer Nuclide: U-232 Tracer Recovery: 86.66%
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Nuclide Summary (ROI)												
Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4150.0	3862.8	4219.3	88.4	100.2	475.00	2.00	473.00	1.7E+000	2.6E-001	1.2E-002	3.4E-002
U-235	4338.1	4229.2	4407.4	75.2	99.7	18.00	0.00	18.00	6.7E-002	3.3E-002	0.0E+000	1.0E-002
U-234	4763.8	4536.1	4823.2	63.5	100.0	500.00	2.00	498.00	1.8E+000	2.7E-001	1.2E-002	3.4E-002
U-232	5298.4	5041.0	5357.8	90.1	100.1	1,189.01	8.00	1,181.01	3.9E+000	2.3E-001	2.5E-002	6.0E-002

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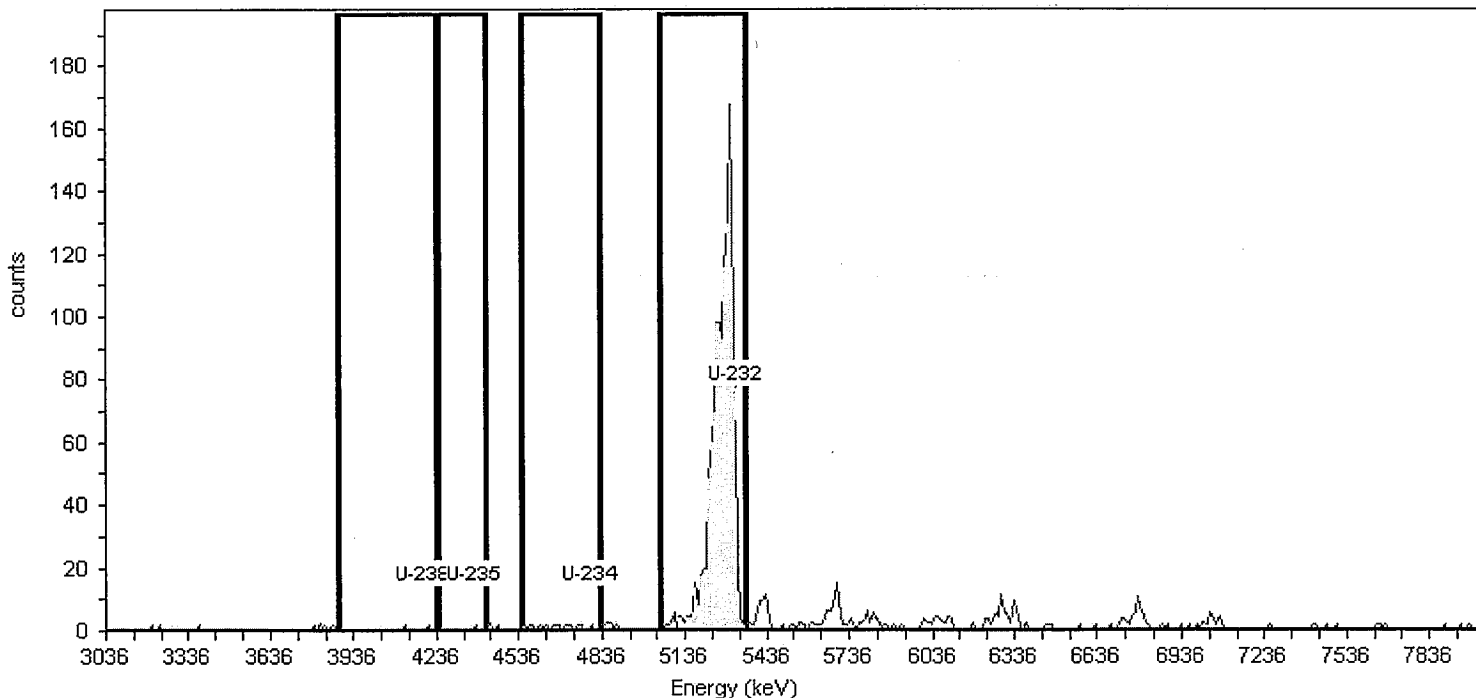
Alpha-Spectroscopy Analysis Report

Sample Sample: AS081030-3MB Spectrum #1 Analysis #1	Sample Size : 0.50
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Acquisition Detector: 23 Batch Name: UAS081030-3_A Nuclide Library: Uranium Default Analysis Method: Absolute ROI Analysis, Set Name = Uranium Default ROI Set: Uranium Default	Acquisition Start Date: 10/31/2008 3:21:40PM Live Time: 1,000.00 min. Real Time: 1,000.01 min. Dead Time: 0.00 %
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Calibration Bkgd Info: Sample: B08102823; Det: 23; Spectrum #1; Oct-28-2008 14:40 Calibration Date: 10/28/2008 11:22:34AM Efficiency Calibration: C08102823 Efficiency: 29.04% +/- 0.18% TPU(2 sigma)	Energy Calibration: C08102823 Energy Cal: Gain = 9.8047 keV / Ch Offset = 3,026.20 keV Quadratic = 0.0000 keV / Ch ²
--	--

Tracer Tracer Name: 837.3020.100 U-232 Tracer Activity: 19.73 DPM/mL x (Vol.)0.25 mL = 4.93 DPM	Tracer Nuclide: U-232 Tracer Recovery: 84.83%
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Nuclide Summary (ROI)												
Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4163.6	3879.2	4232.2	12.8	100.2	2.00	5.00	-3.00	-1.1E-002	1.9E-002	1.9E-002	4.8E-002
U-235	4349.8	4242.0	4418.5	13.2	99.7	1.00	4.00	-3.00	-1.1E-002	1.6E-002	1.7E-002	4.4E-002
U-234	4771.4	4545.9	4830.3	7.8	100.0	15.00	8.00	7.00	2.6E-002	3.5E-002	2.4E-002	5.8E-002
U-232	5300.9	5046.0	5359.7	92.8	100.1	1,215.00	18.00	1,197.00	3.8E+000	2.2E-001	3.7E-002	8.3E-002

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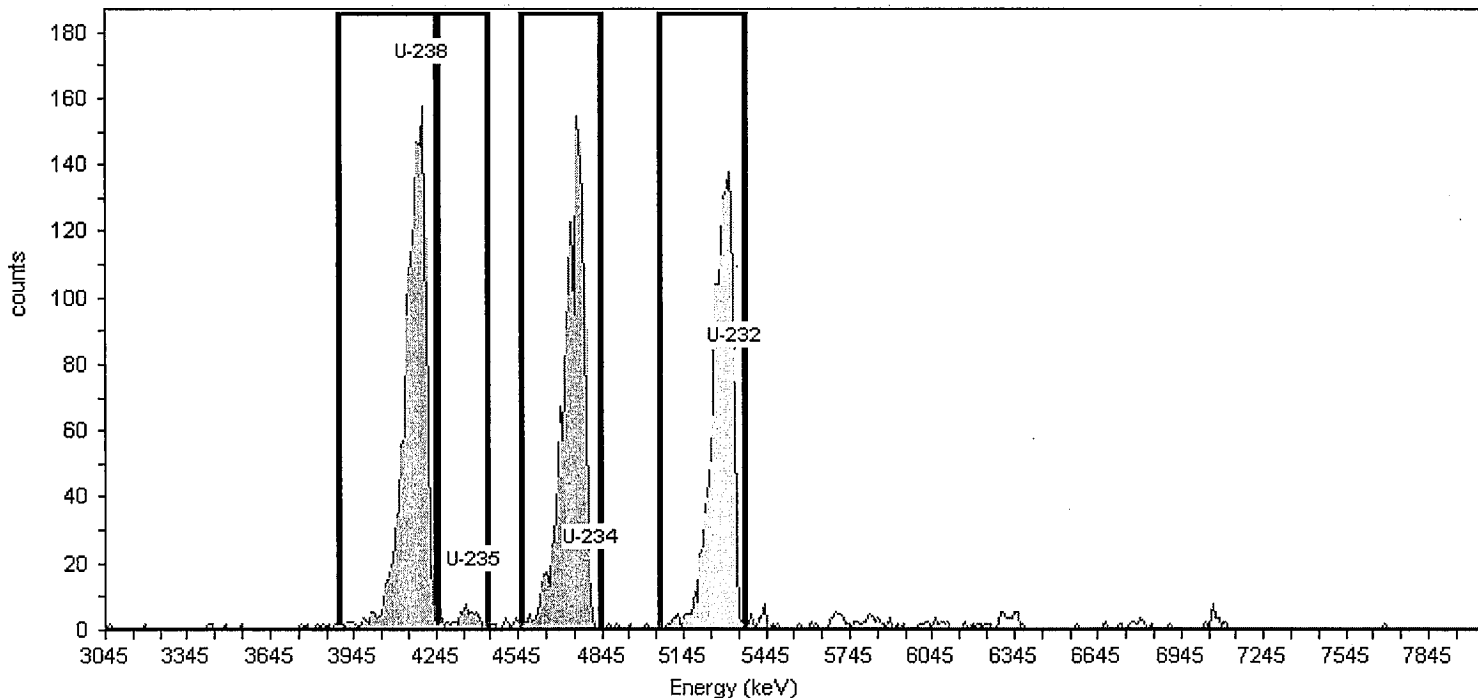
Alpha-Spectroscopy Analysis Report

Sample Sample: AS081030-3LCS Spectrum #1 Analysis #1	Sample Size : 0.50
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Acquisition Detector: 24 Batch Name: UAS081030-3_A Nuclide Library: Uranium Default Analysis Method: Absolute Interactive ROI Analysis ROI Set: Uranium Default	Acquisition Start Date: 10/31/2008 3:21:41PM Live Time: 1,000.00 min. Real Time: 1,000.01 min. Dead Time: 0.00 %
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Calibration Bkgd Info: Sample: B08102824; Det: 24; Spectrum #1; Oct-28-2008 14:40 Calibration Date: 10/28/2008 11:22:50AM Efficiency Calibration: C08102824 Efficiency: 29.19% +/- 0.12% TPU(2 sigma)	Energy Calibration: C08102824 Energy Cal: Gain = 9.8047 keV / Ch Offset = 3,036.00 keV Quadratic = 0.0000 keV / Ch ²
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Tracer Tracer Name: 837.3020.100 U-232 Tracer Activity: 19.73 DPM/mL x (Vol.)0.25 mL = 4.93 DPM	Tracer Nuclide: U-232 Tracer Recovery: 86.18%
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Nuclide Summary (ROI)												
Nuclide	Peak Energy keV	ROI Start keV	ROI End keV	FWHM keV	B.R. %	Gross Counts	Bkgd Counts	Net Counts	Activity pCi/g	2.00Sigma TPU pCi/g	Critical Level pCi/g	MDA pCi/g
U-238	4193.0	3889.0	4242.0	44.9	100.2	1,391.00	4.00	1,387.00	5.0E+000	6.3E-001	1.7E-002	4.3E-002
U-235	4379.3	4251.8	4428.3	79.0	99.7	53.00	1.00	52.00	1.9E-001	5.7E-002	8.4E-003	2.6E-002
U-234	4800.9	4555.7	4840.1	73.4	100.0	1,278.00	3.00	1,275.00	4.6E+000	5.9E-001	1.4E-002	3.9E-002
U-232	5330.3	5055.8	5369.5	56.9	100.1	1,232.00	10.00	1,222.00	3.8E+000	2.2E-001	2.7E-002	6.3E-002

Reviewed By: *GB* *DS*

Print Date: 11/3/2008 8:34:32AM

AlphaVision v5.3
Custom Report Iteration: 08/09/07

Paragon Analytics

Alpha Spectrometer Instrument Run Log

370116

Date: 10/31/08

FORM 746r.xls (10/2/07)

Detector	Batch ID	Sample ID	Iso/Matrix	Duration	Initial
1	NA5081017-3-C	0809197-2-SYS	N/S	1000	EMF
2	NA5081017-3-C	AS081017-3-MB	N/S	1000	EMF
4	L	AS081017-3-MB	N/S	1000	EMF
6	PA5081020-1-C	AS081020-1-MB	N/S	1000	EMF
54	PA5081022-1-A	0822011-1	P/S	180	EMF
33		2			
34		3			
35		4			
36		5			
37		AS081022-1-MB			
39		1 LCS			
51	PA5081029-2-A	0810238-9	P/W	300	EMF
52		AS081029-2-MB			
54		LCS			
55		LCS			
7	PA5081030-2-A	0810204-4	P/W	300	EMF
8		AS081030-2-MB			
49		LCS			
50		LCS			
9	VA5081030-3-A	0810213-1	N/S	1000	EMF
10		2			
11		3			
12		30			
13		4			
14	UAS081030-3-A	0810213-5	N/S	1000	EMF
16		6			
18		7			
19		8			
21		9			
22		10			
23		AS081030-3-MB			
24		AS081030-3-LCS			
17	RD081023-1-F	0822013-6	P/W	300	EMF

Notes:

Reviewed by: 9B

Date: 11/3/08

PARAGON ANALYTICS
Radiochemistry Data Package

Section 6

**QUALITY ASSURANCE
SUMMARY REPORTS**

6

No *NON-CONFORMANCE REPORTS* or
QUALITY ASSURANCE SUMMARY SHEETS
are included in this data package.

PARAGON ANALYTICS
Radiochemistry Data Package

Section 7

**LABORATORY
BENCH SHEETS**



Radiochemistry Instrument Worksheet

Paragon Analytics

Prep Batch: AS081030-3

Prep Procedure: UIISO

Analytical QASS / NCR? Y N NA

Prep Num	LabID	QC Type	Init Aliq	Fin Aliq	Units	Report Units	Cnt 1 File	Cnt 1 Inst/Det	Cnt 1 Pos Chk By	Cnt 2 File	Cnt 2 Inst/Det	Cnt 2 Pos Chk By	Cnt 3 File	Cnt 3 Inst/Det	Cnt 3 Pos Chk By	Notes
1	0810213-1	SMP	0.5041	0.5041	g	pCi/g	A2131	9	GB	A2131			A2131			A
1	0810213-2	SMP	0.5049	0.5049	g	pCi/g	A2132	10		A2132			A2132			
1	0810213-3	SMP	0.505	0.505	g	pCi/g	A2133	11		A2133			A2133			
1	0810213-3	DUP	0.5011	0.5011	g	pCi/g	A2133D	12		A2133D			A2133D			
1	0810213-4	SMP	0.5006	0.5006	g	pCi/g	A2134	13		A2134			A2134			
1	0810213-5	SMP	0.5059	0.5059	g	pCi/g	A2135	14		A2135			A2135			
1	0810213-6	SMP	0.5018	0.5018	g	pCi/g	A2136	16		A2136			A2136			
1	0810213-7	SMP	0.5027	0.5027	g	pCi/g	A2137	18		A2137			A2137			
1	0810213-8	SMP	0.5058	0.5058	g	pCi/g	A2138	19		A2138			A2138			
1	0810213-9	SMP	0.5046	0.5046	g	pCi/g	A2139	21		A2139			A2139			
1	0810213-10	SMP	0.5046	0.5046	g	pCi/g	A21310	22		A21310			A21310			
1	AS081030-3	MB	0.504	0.504	g	pCi/g	A303B	23		A303B			A303B			
1	AS081030-3	LCS	0.504	0.504	g	pCi/g	A303L	24		A303L			A303L			GB 11/3/08

Tracer/Carrier Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
T1	U-232	837.3020.100	19.671	DPM/ml	10/30/08	0.25	ml	AW016

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	U-234	644.3020.52	19.838	DPM/ml	10/30/08	0.25	ml	AW016
S1	U-235	644.3020.52	0.948	DPM/ml	10/30/08	0.25	ml	AW016
S1	U-238	644.3020.52	20.596	DPM/ml	10/30/08	0.25	ml	AW016

Radiochemistry Instrument Worksheet













Paragon Analytics

Prep Batch: AS081030-3

Reporting Units

LabID:	TstGrpName:	RptUnits:
0810213-1	Iso U_LCL30	pCi/g
0810213-2	Iso U_LCL30	pCi/g
0810213-3	Iso U_LCL30	pCi/g
0810213-4	Iso U_LCL30	pCi/g
0810213-5	Iso U_LCL30	pCi/g
0810213-6	Iso U_LCL30	pCi/g
0810213-7	Iso U_LCL30	pCi/g
0810213-8	Iso U_LCL30	pCi/g
0810213-9	Iso U_LCL30	pCi/g
0810213-10	Iso U_LCL30	pCi/g

Sample Barcodes

0810213-1 AS081030-3PS1		0810213-2 AS081030-3PS2	
0810213-3 AS081030-3PS3		0810213-3DUP AS081030-3PS4	
0810213-4 AS081030-3PS5		0810213-5 AS081030-3PS6	
0810213-6 AS081030-3PS7		0810213-7 AS081030-3PS8	
0810213-8 AS081030-3PS9		0810213-9 AS081030-3PS10	
0810213-10 AS081030-3PS11		AS081030-3MBR AS081030-3PS12	
AS081030-3LCS AS081030-3PS13			

2

Radiochemistry Prep Worksheet

Paragon Analytics

Prep Batch: AS081030-3

Prep Procedure: UIISO

Reviewed By: jtl *JTL* Review Date: 10/31/2008

Non-Routine Pre-Treatment? ☒ Y ☐ N Batch: *A/A*

Prep QASS / NCR? ☒ Y ☐ N *A/A*

Prep Analyst: Jeffrey T. Lee
Prep Date: 10/30/2008
Matrix Class: solid

Balance: 27
Balance:
Prep Dept: AP

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Aliq g	Fin Aliq g	Prep Basis	Micro Init	Micro Date	Standards	Prep Notes
1	1	0810213-1	SMP		0.5041	0.5041	Dry Weight	<i>57</i>	<i>10/31/08</i>	T1	
2	1	0810213-2	SMP		0.5049	0.5049	Dry Weight			T1	
3	1	0810213-3	SMP		0.505	0.505	Dry Weight			T1	
4	1	0810213-3	DUP		0.5011	0.5011	Dry Weight			T1	
5	1	0810213-4	SMP		0.5006	0.5006	Dry Weight			T1	
6	1	0810213-5	SMP		0.5059	0.5059	Dry Weight			T1	
7	1	0810213-6	SMP		0.5018	0.5018	Dry Weight			T1	
8	1	0810213-7	SMP		0.5027	0.5027	Dry Weight			T1	
9	1	0810213-8	SMP		0.5058	0.5058	Dry Weight			T1	
10	1	0810213-9	SMP		0.5046	0.5046	Dry Weight			T1	
11	1	0810213-10	SMP		0.5046	0.5046	Dry Weight			T1	
12	1	AS081030-3	MB		0.504	0.504	Dry Weight			T1	
13	1	AS081030-3	LCS		0.504	0.504	Dry Weight			S1,T1	

Comments

[Due to potential matrix interference, a reduced aliquot of ~0.5 g was taken on all samples. PEG treatment applied to all samples.]

Spiked By: Jeffrey T. Lee Date: 10/30/2008
Witnessed By: Crystal Shaeffer Date: 10/30/2008

Tracer/Carrier Solution Information						Spike Solution Information					
Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Prep Conc	Units	Prep Date	Pipet ID
T1	U-232	837.3020.100	19.671	DPM/ml	10/30/08	0.25	ml	19.838	DPM/ml	10/30/08	AW016
								0.948	DPM/ml	10/30/08	AW016
								20.596	DPM/ml	10/30/08	AW016

Radiochemistry Prep Worksheet

Prep Batch: AS081030-3

Paragon Analytics

Prep Batch Not Validated!!!

Prep Procedure: UIISO

Reviewed By:

Review Date:

Non-Routine Pre-Treatment? Y / N Batch:

Re-Prep? Y / N Batch:

Prep QASS / NCR? Y / N

Prep SOP: PAI 778 Rev: 12

Prep Analyst: Jeffrey T. Lee

Balance: 27

Prep Date: 10/30/2008

Balance:

Matrix Class: solid

Prep Dept: AP

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq g	Fin Alq g	Prep Basis	Micro Init	Micro Date	Standards	Prep Notes
1	1	0810213-1	SMP		0.5	0.5	Dry Weight			T1	0.5041
2	1	0810213-2	SMP		0.5	0.5	Dry Weight			T1	0.5049
3	1	0810213-3	SMP		0.5	0.5	Dry Weight			T1	0.5052
4	1	0810213-3	DUP		0.5	0.5	Dry Weight			T1	0.5011
5	1	0810213-4	SMP		0.5	0.5	Dry Weight			T1	0.5006
6	1	0810213-5	SMP		0.5	0.5	Dry Weight			T1	0.5059
7	1	0810213-6	SMP		0.5	0.5	Dry Weight			T1	0.5018
8	1	0810213-7	SMP		0.5	0.5	Dry Weight			T1	0.5022
9	1	0810213-8	SMP		0.5	0.5	Dry Weight			T1	0.5058
10	1	0810213-9	SMP		0.5	0.5	Dry Weight			T1	0.5046
11	1	0810213-10	SMP		0.5	0.5	Dry Weight			T1	0.5046
12	1	AS081030-3	MB		0.5	0.5	Dry Weight			T1	
13	1	AS081030-3	LCS		0.5	0.5	Dry Weight			S1,T1	

Comments

Due to potential matrix interference, a reduced aliquot of ~0.5 g was taken on all samples. PEG treatment applied to all samples.

Spiked By: SN Date: 10/30/08
Witnessed By: Caro Date: 10/30/2008

Tracer/Carrier Solution Information						
Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot Units
T1	U-232	837.3020.100	19.671	DPM/ml	10/30/08	0.25 ml
						AW016

Spike Solution Information						
Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot Units
S1	U-234	644.3020.52	19.838	DPM/ml	10/30/08	0.25 ml
						AW016
S1	U-235	644.3020.52	0.948	DPM/ml	10/30/08	0.25 ml
						AW016
S1	U-238	644.3020.52	20.596	DPM/ml	10/30/08	0.25 ml
						AW016

Texp: 4/2/09

Sexp: 1/13/09

SAMPLE CONDITION FORM (SOLIDS)

ANALYST: JD

ANALYSIS DATE: 10/30/08

METHOD: PREP

[illegible]

Radiochemistry Prep Worksheet

Paragon Analytics

Prep Batch: DG081030-2

Prep Procedure: Dry_Grind

Reviewed By: jtl 372 Review Date: 10/31/2008

Non-Routine Pre-Treatment? Y / (N) Batch: N/A

Re-Prep? Y / (N) Batch: N/A

Prep QASS / NCR? Y / (N) N/A

Prep SOP: SOP336 Rev: 0

Prep Analyst: Jeffrey T. Lee 372

Balance: 19

Oven Num: 18

Prep Date: 10/30/2008

Oven In Date: 10/30/2008 8:45:00 AM

Prep Dept: GP

Balance:

Oven Out Date: 10/30/2008 1:00:00 PM

Samp Num	Prep Num	LabID	QC Type	Dish No.	Tare g	Gross g	Net g	Prep Notes
1	1	0810213-1	SMP		98.5	126.4	27.9	Soil
2	1	0810213-2	SMP		98	125.4	27.4	Soil
3	1	0810213-3	SMP		98	124.1	26.1	Soil
4	1	0810213-4	SMP		98.3	125.3	27	Soil
5	1	0810213-5	SMP		98.3	127.6	29.3	Soil
6	1	0810213-6	SMP		98.5	128.7	30.2	Soil
7	1	0810213-7	SMP		97.9	125.8	27.9	Soil
8	1	0810213-8	SMP		98.7	128	29.3	Soil
9	1	0810213-9	SMP		97.7	128.4	30.7	Soil
10	1	0810213-10	SMP		97.4	128.7	31.3	Soil

Comments

Samples were place in Oven #18, dried for 3 hours and taken a preliminary weight. They were returned to the oven and reweighed after 1 hour. The weight change was less than 2%, therefore according to SOP 336/0, the samples were dried and ground.

Spiked By: N/A Date: N/A

Witnessed By: N/A Date: N/A

PARAGON ANALYTICS
Radiochemistry Data Package

Section 8

**STANDARDS
TRACEABILITY
DOCUMENTS**



Prepare a working level dilution of ampoule 644 to approximately 20 dpm/mL by diluting with 1M HNO₃

① Determine the density of 1M HNO₃

Mass of empty Class A volumetric flask (100mL): 68.3017g Bal 12

Mass of flask + 100mL of 1M HNO₃: 171.2390g

Mass of 100mL of 1M HNO₃: 102.9373g

Lot # 063544

$\rho = 1.0298 \text{ g/mL}$

② Transfer 644 to a ^{0.5} 12 nalgene bottle

Mass of empty nalgene w/o lid: 73.6290g Bal 12

Mass of nalgene + standard: 75.0630g

Net mass of standard transferred: 1.434g

③ Dilute with 1M HNO₃

Mass of empty nalgene w/o lid (from above): 73.6290g Bal 12

Mass of bottle, standard and 1M HNO₃: 113.9g Bal 26

Net mass of standard + 1M HNO₃: 1040.271g

④ Final Activity Calculation

U-238: $(242.0 \text{ Bq/g}) \times (60 \text{ dpm/Bq}) \times \frac{1.434 \text{ g}}{1040.271 \text{ g}} \times (1.0298 \text{ mL}) = 20.6 \text{ dpm/mL}$

U-235: 0.948 dpm/mL

U-234: 19.84 dpm/mL

Std ID: 644.3020.52

RG 2/23/07

Description: U-238

Expiration: 1/27/08

Activity: 20.60 dpm/mL

2s Uncertainty: 0.60 dpm/mL

Ref. Date: 8/1/1997

Ref Time: N/A

Prep Date: 11/28/2006 Prep by: AB

Matrix/Comp. 1M HNO₃

Half Life (y): 4.47E+09

Reverification Log

Analysis Date: 1/13/08 Initials: MC Expiration Date: 1/13/08

1/13/08 MC 1/13/08

1/13/08 MC 1/13/08

1/13/08 MC 1/13/08

1/13/08 MC 1/13/08

1/13/08 MC 1/13/08

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1/13/08 MC 1/13/08

1/13/08 MC 1/13/08

Continued on Page

Read and Understood By

AB 2/23/07

Signed

11/28/06

Date

RG 2/23/07

Signed

2/23/07

Date



National Institute of Standards & Technology

Certificate

PAT ID 0644
SEC 10-18-02

Standard Reference Material 4321C Natural Uranium Radioactivity Standard

This Standard Reference Material (SRM) consists of radioactive natural uranium nitrate and nitric acid dissolved in 5 mL of distilled water. The solution is contained in a flame-sealed NIST borosilicate-glass ampoule. The SRM is intended for the calibration of alpha-particle counting instruments and for the monitoring of radiochemical procedures.

Radiological Hazard

The SRM ampoule contains uranium-238, uranium-235, and uranium-234 with a total activity of approximately 2600 Bq. Uranium decays by alpha-particle emission. The progeny of uranium-238, uranium-235, and uranium-234 have a total activity of approximately 2600 Bq and decay by alpha- and beta-particle emission. None of the alpha or beta particles escape from the SRM ampoule. During the decay process X-rays and gamma rays with energies from 11 keV to 2.0 MeV are also emitted. Most of these photons escape from the SRM ampoule but their intensities are so small that they do not represent a radiation hazard. Approximate unshielded dose rates at several distances (as of the reference time) are given in note [a]*. The SRM should be used only by persons qualified to handle radioactive material.

Chemical Hazard

The SRM ampoule contains nitric acid (HNO_3) with a concentration of 1 mole per liter of water. The solution is corrosive and represents a health hazard if it comes in contact with eyes or skin. If the ampoule is to be opened to transfer the solution, the recommended procedure is given on page 2. The ampoule should be opened only by persons qualified to handle both radioactive material and strong acid solution.

Storage and Handling

The SRM should be stored and used at a temperature between 5 and 65 °C. The solution in an unopened ampoule should remain stable and homogeneous until at least August 2007.

The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material. If the ampoule is transported it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) both because of the radioactivity and because of the strong acid.

Preparation

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, J.M.R. Hutchinson, Group Leader. The overall technical direction and physical measurements leading to certification were provided by L.L. Lucas of the Radioactivity Group.

The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by N.M. Trahey.

Gaithersburg, Maryland 20899
November 1997

Thomas E. Gills, Chief
Standard Reference Materials Program

Recommended Procedure for Opening the SRM Ampoule

- 1) If the SRM solution is to be diluted, it is recommended that the diluting solution have a composition comparable to that of the SRM solution.
- 2) Wear eye protection, gloves, and protective clothing and work over a tray with absorbent paper in it. Work in a fume hood. In addition to the radioactive material, the solution contains strong acid and is corrosive.
- 3) Shake the ampoule to wet all of the inside surface of the ampoule. Return the ampoule to the upright position.
- 4) Check that all of the liquid has drained out of the neck of the ampoule. If necessary, gently tap the neck to speed the process.
- 5) Holding the ampoule upright, score the narrowest part of the neck with a scribe or diamond pencil.
- 6) Lightly wet the scored line. This reduces the crack propagation velocity and makes for a cleaner break.
- 7) Hold the ampoule upright with a paper towel, a wiper, or a support jig. Position the scored line away from you. Using a paper towel or wiper to avoid contamination, snap off the top of the ampoule by pressing the narrowest part of the neck away from you while pulling the tip of the ampoule towards you.
- 8) Transfer the solution from the ampoule using a pycnometer or a pipet with dispenser handle. NEVER PIPETTE BY MOUTH.
- 9) Seal any unused SRM solution in a flame-sealed glass ampoule, if possible, to minimize the evaporation loss.

See also reference [4]*.

PROPERTIES OF SRM 4321C
(Certified values are shown in bold type)

Source identification number	NIST SRM 4321C		
Physical Properties:			
Source description	Liquid in flame-sealed NIST borosilicate-glass ampoule		
Ampoule specifications	Body outside diameter	(16.5 ± 0.5) mm	
	Wall Thickness	(0.60 ± 0.04) mm	
	Barium content	Less than 2.5%	
	Lead-oxide content	Less than 0.02%	
	Other heavy elements	Trace quantities	
Solution density	(1.053 ± 0.001) g•mL ⁻¹ at 21.4 °C [b]*		
Solution mass	(5.258 ± 0.002) g [b]		
Chemical Properties:			
Solution composition	Chemical Formula	Concentration (mol•L ⁻¹)	Mass Fraction (g•g ⁻¹)
	H ₂ O	53	0.91
	HNO ₃	1.0	0.06
	UO ₂ (NO ₃) ₂	0.09	0.03
Radiological Properties:			
Radionuclide	Natural Uranium (Mixture of U-238, U-235, and U-234)		
Reference time	1200 EST, 1 August 1997		
Massic activity of the solution [c]	U-238: 242.0 Bq•g ⁻¹ U-235: 11.14 Bq•g ⁻¹ U-234: 233.1 Bq•g ⁻¹		
Relative expanded uncertainty (k=2)	U-238: 0.60% [d] [e] U-235: 0.62% [d] [e] U-234: 0.98% [d] [e]		
Mass fraction of uranium	(0.01960 ± 0.00010) g•g ⁻¹ [b]		
Photon-emitting impurities	None detected [f]		
Half lives used	Uranium-238: (4.468 ± 0.003) × 10 ⁹ a [g] Uranium-235: (7.038 ± 0.005) × 10 ⁸ a [g] Uranium-234: (2.455 ± 0.006) × 10 ⁵ a [g]		
Measuring instruments	Mass spectrometer, silicon surface-barrier detector, and 4π(α+β) liquid-scintillation counting systems.		

EVALUATION OF THE UNCERTAINTY OF THE MASSIC ACTIVITY [d]*

Input Quantity x_i , the source of uncertainty (and individual uncertainty components where appropriate)	Method Used To Evaluate $u(x_i)$, the standard uncertainty of x_i (A) denotes evaluation by statistical methods (B) denotes evaluation by other methods	Relative Uncertainty Of Input Quantity, $u(x_i)/x_i$, (%) [h]	Relative Sensitivity Factor, $ \partial y/\partial x_i \cdot$ (x_i/y) [i]	Relative Uncertainty Of Output Quantity, $u_i(y)/y$, (%) [j]
Isotopic uranium atom fraction in SRM 960	Standard deviation of the mean for repeated mass-spectrometric measurements (A)	U-238: 0.001 U-235: 0.07 U-234: 0.31	1.0 1.0 1.0	0.001 0.07 0.31
Half life	Standard uncertainty of the half life (A)	U-238: 0.07 U-235: 0.07 U-234: 0.25	1.0 1.0 1.0	0.07 0.07 0.25
Uranium mass fraction in SRM 960	Certificate value (B)	0.003	1.0	0.003
Quantitative dissolution	Estimated (B)	0.25	1.0	0.25
Gravimetric measurements	Estimated (B)	0.10	1.0	0.10
Photon-emitting impurities	Limit of detection (B) [k]	100.	0.001	0.10
Relative Combined Standard Uncertainty of the Output Quantity, $u_c(y)/y$, (%)			U-238: U-235: U-234:	0.30 0.31 0.49
Coverage Factor, k				<u>x 2</u>
Relative Expanded Uncertainty of the Output Quantity, U/y , (%)			U-238: U-235: U-234:	0.60 0.62 0.98

NOTES

- [a] The Sievert is the SI unit for dose equivalent. See reference [1]. One μSv is equal to 0.1 mrem.
 Distance from Ampoule (cm): 1 30 100
 Approximate Dose Rate ($\mu\text{Sv/h}$): <0.1 - -
- [b] The stated uncertainty is two times the standard uncertainty.
- [c] **Massic activity** is the preferred name for the quantity activity divided by the total mass of the sample. See reference [1].
- [d] The reported value, y , of massic activity (activity per unit mass) at the reference time was not measured directly but was derived from measurements and calculations of other quantities. This can be expressed as $y = f(x_1, x_2, x_3, \dots, x_n)$, where f is a mathematical function derived from the assumed model of the measurement process.
- The value, x_i , used for each input quantity i has a **standard uncertainty**, $u(x_i)$, that generates a corresponding uncertainty in y , $u_i(y) = |\partial y / \partial x_i| \cdot u(x_i)$, called a **component of combined standard uncertainty** of y .
- The **combined standard uncertainty** of y , $u_c(y)$, is the positive square root of the sum of the squares of the components of combined standard uncertainty.
- The combined standard uncertainty is multiplied by a **coverage factor** of $k = 2$ to obtain U , the **expanded uncertainty** of y .
- Since it can be assumed that the possible estimated values of the massic activity are approximately normally distributed with approximate standard deviation $u_c(y)$, the unknown value of the massic activity is believed to lie in the interval $y \pm U$ with a level of confidence of approximately 95 percent.
- For further information on the expression of uncertainties, see references [2] and [3].
- [e] The value of each standard uncertainty component, and hence the value of the expanded uncertainty itself, is a best estimate based upon all available information, but is only approximately known. That is to say, the "uncertainty of the uncertainty" is large and not well known. This is true for uncertainties evaluated by statistical methods (e.g., the relative standard deviation of the standard deviation of the mean for the massic count rate is approximately 50%) and for uncertainties evaluated by other methods (which could easily be over estimated or under estimated by substantial amounts). The unknown value of the expanded uncertainty is believed to lie in the interval $U/2$ to $2U$ (i.e., within a factor of 2 of the estimated value).
- [f] Estimated limits of detection for photon-emitting impurities are:
 1.4 $\gamma \cdot \text{s}^{-1} \cdot \text{g}^{-1}$ for energies between 8 and 59 keV,
 1.1 $\gamma \cdot \text{s}^{-1} \cdot \text{g}^{-1}$ for energies between 67 and 88 keV,
 0.5 $\gamma \cdot \text{s}^{-1} \cdot \text{g}^{-1}$ for energies between 102 and 197 keV,
 0.3 $\gamma \cdot \text{s}^{-1} \cdot \text{g}^{-1}$ for energies between 205 and 762 keV,
 0.2 $\gamma \cdot \text{s}^{-1} \cdot \text{g}^{-1}$ for energies between 770 and 996 keV, and
 0.1 $\gamma \cdot \text{s}^{-1} \cdot \text{g}^{-1}$ for energies between 1006 and 1900 keV,
 provided that the photons are separated in energy by 4 keV or more from photons emitted in the decay of uranium-238, uranium-235, uranium-234, or their progeny.
- [g] The stated uncertainty is the standard uncertainty. See reference [5].

- [h] Relative standard uncertainty of the input quantity x_i .
- [i] The relative change in the output quantity y divided by the relative change in the input quantity x_i . If $|\partial y/\partial x_i| \cdot (x_i/y) = 1.0$, then a 1% change in x_i results in a 1% change in y . If $|\partial y/\partial x_i| \cdot (x_i/y) = 0.05$, then a 1% change in x_i results in a 0.05% change in y .
- [j] Relative component of combined standard uncertainty of output quantity y , rounded to two significant figures or less. The relative component of combined standard uncertainty of y is given by $u_i(y)/y \equiv |\partial y/\partial x_i| \cdot u(x_i)/y = |\partial y/\partial x_i| \cdot (x_i/y) \cdot u(x_i)/x_i$. The numerical values of $u(x_i)/x_i$, $|\partial y/\partial x_i| \cdot (x_i/y)$, and $u_i(y)/y$, all dimensionless quantities, are listed in columns 3, 4, and 5, respectively. Thus, the value in column 5 is equal to the value in column 4 multiplied by the value in column 3. The input quantities are independent, or very nearly so. Hence the covariances are zero or negligible.
- [k] The standard uncertainty for each undetected impurity that might reasonably be expected to be present is estimated to be equal to the estimated limit of detection for that impurity, i.e. $u(x_i)/x_i = 100\%$. $|\partial y/\partial x_i| \cdot (x_i/y) = \{(\text{response per Bq of impurity})/(\text{response per Bq of U-238})\} \cdot \{(\text{Bq of impurity})/(\text{Bq of U-238})\}$. Thus $u_i(y)/y$ is the relative change in y if the impurity were present with a massic activity equal to the estimated limit of detection.

REFERENCES

- [1] International Organization for Standardization (ISO), *ISO Standards Handbook - Quantities and Units*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900.
- [2] International Organization for Standardization (ISO), *Guide to the Expression of Uncertainty in Measurement*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900. (Listed under ISO miscellaneous publications as "ISO Guide to the Expression 1993".)
- [3] B. N. Taylor and C. E. Kuyatt, *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*, NIST Technical Note 1297, 1994. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20407, U.S.A.
- [4] National Council on Radiation Protection and Measurements Report No. 58, *A Handbook of Radioactivity Measurements Procedures*, Second Edition, 1985. Available from the National Council on Radiation Protection and Measurements, 7910 Woodmont Avenue, Bethesda, MD 20814 U.S.A.
- [5] Evaluated Nuclear Structure Data File (ENSDF), August 1997.

Prepare a working dilution of U-232 at ~20.0 dpm/ml
from 837.3020.72.

1) Density calculation of diluent 1M HNO₃

Mass of volumetric flask, (100 ml)	68.3001 g	bal #
Mass of flask and 100 ml 1M HNO ₃	171.1164 g	12
Net Mass of Acid	102.8163 g	↓
p =	1.02816 g/ml	

2) Mass of Intermediate Transferred

Mass of Empty 1000 ml Nalgene (No lid)	74.9385 g	12
Mass of Nalgene and Std	78.0288 g	↓
Net Mass of Std Transferred	3.0903 g	

3) Diluent w/ 1 N HNO₃

Mass of Std, bottle, diluent	1146.5 g	26
Mass of empty Nalgene	74.9385 g	
Net Mass of New dilution	1071.5615 g	

Final Activity Calculation

$$\frac{(6745.123 \frac{\text{dpm}}{\text{g}})(3.0903 \text{ g})(1.02816 \frac{\text{g}}{\text{ml}})}{(1071.5615 \text{ g})} = 20.00 \frac{\text{dpm}}{\text{ml}}$$

Std ID: 837.3020.100

Description: U-232

Expiration: 4/2/2009

Activity: 20.00 dpm/mL

2s Uncertainty: 1.00 dpm/mL

Ref. Date: 3/7/2007

Ref Time: N/A

Prep Date: 4/1/2008 Prep by: JDD

Matrix/Comp. 1 M HNO₃

Half Life (y): 6.89E+01

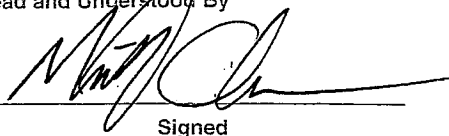
Reverification Log		
Analysis Date	Initials	Expiration Date

Continued on Page

Read and Understood By


Signed

4/1/08
Date


Signed

7/13/08
Date

Prepare a primary dilution of U-232, RSO #837, by diluting Contents (#74682-307) to a final volume of approx 40 ml.

1) Prepare a 1.0 M HNO_3 solution by diluting 63 ml conc HNO_3 , Fischer lot # 065460, in 1 L DI water.

2) Determine density of ^{1.0 M}_{5.3 M} HNO_3 lot # 065460 (Bal 12)
Mass of 100 ml volumetric flask: 62.4704 g
Mass of flask + acid: 165.3413 g
Net mass of acid: 102.8709 g
% 100 ml = density of 1.0 M HNO_3 : 1.029 g/ml

3) Transfer contents of vial to a 40 ml VOA vial (Bal 12)
Mass of VOA vial (w/ lid): 24.7623 g
Mass of VOA vial + std: 29.9487 g
Net mass of std transferred: 5.1864 g

4) Dilute with 1.0 M HNO_3 (Bal 12)
Mass of vial + std + acid: 63.2324 g
Mass of vial from above: 24.7623 g
Net mass of primary std: 38.4701 g

5) Final Activity Calculation:

$$\frac{4375 \text{ cps (60 s/min)} (5.1864 \text{ g})}{(5.24665 \text{ g}) (38.4701 \text{ g})} = 6745.123 \text{ dpm/g}$$

Continued on Page

Read and Understood By

Kupat Brown
Signed3/28/07
DateRenee Vallejos
Signed4/11/07
Date 66



Eckert & Ziegler

Analytics

RSO # 837
Rec'd 3/14/07 MNP

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318
Tel 404-352-8677
Fax 404-352-2837
www.analyticsinc.com

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

74682-307

U-232 5 mL Liquid in Flame Sealed Vial

This standard radionuclide source was prepared gravimetrically from a calibrated master solution. The master solution was calibrated by the Department Des Applications Et De La Metrologie Des Rayonnements Ionisants (DAMRI), Paris, France, as Number 23236.

Radionuclide purity and calibration were checked with a germanium gamma spectrometer system. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	U-232
ACTIVITY (Bq):	4.375 E3
HALF-LIFE:	68.9 years
CALIBRATION DATE:	March 7, 2007 12:00 EST
RELATIVE EXPANDED UNCERTAINTY (k=2):	5.0%

Impurities: γ -impurities <0.1%
U-233 <0.3%
Am-241 <0.15%

5.24665 grams 1M HNO₃ solution.

PO NUMBER 72905, Item 1

SOURCE PREPARED BY: M. D. Dimitrova
M. D. Dimitrova, Radiochemist

Q A APPROVED:

M. M. J. 3-8-07

PARAGON ANALYTICS
Radiochemistry Data Package

Section 9

**ADDITIONAL
SUPPORTING
DOCUMENTATION**

9

Alpha Spectroscopy

Quality Control Data

Weekly Background, Energy, and Efficiency
Calibrations

Calibration Data Summary

Laboratory Name: Paragon Analytics
PAI Work Order: 0810213

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Monday, November 03, 2008
9:27:24 AM

Lab Sample ID Spectrum Analysis Date	QC Type	Batch ID Analysis Run	Test Name	Detector Id	Eff Spectrum Bkg Spectrum Egy Spectrum	Eff Date Bkg Date Egy Date	RESULTS %Efficiency Bkg CPM Energy keV	FLAGS Efficiency Background Energy	LCL %Efficiency Bkg CPM Energy keV	LWL %Efficiency Bkg CPM Energy keV	UWL %Efficiency Bkg CPM Energy keV	UCL %Efficiency Bkg CPM Energy keV
0810213-1 Spectrum #1 10/31/2008	SMP	AS081030-3 AS081030-3A	UI50	9	C08102809 B0810299 C08102809	10/28/2008 10/29/2008 10/28/2008	31.09 0.0960 5553.8	Pass Pass Pass	29.48 0.0000 5496.0	30.00 0.0498 5506.0	32.06 0.4980 5586.0	32.58 0.7500 5596.0
0810213-2 Spectrum #1 10/31/2008	SMP	AS081030-3 AS081030-3A	UI50	10a	C08102810 B08102910 C08102810	10/28/2008 10/29/2008 10/28/2008	31.46 0.0890 5545.9	Pass Pass Pass	29.79 0.0000 5486.2	30.31 0.0498 5496.2	32.41 0.4980 5576.2	32.93 0.7500 5586.2
0810213-3 Spectrum #1 10/31/2008	SMP	AS081030-3 AS081030-3A	UI50	11	C08102811 B08102911 C08102811	10/28/2008 10/29/2008 10/28/2008	30.77 0.0510 5536.2	Pass Pass Pass	29.69 0.0000 5497.0	30.21 0.0498 5507.0	32.29 0.4980 5587.0	32.81 0.7500 5597.0
0810213-3 Spectrum #1 10/31/2008	DUP	AS081030-3 AS081030-3A	UI50	12	C08102812 B08102912 C08102812	10/28/2008 10/29/2008 10/28/2008	30.50 0.0690 5555.8	Pass Pass Pass	29.29 0.0000 5507.7	29.80 0.0498 5517.7	31.86 0.4980 5597.7	32.37 0.7500 5607.7
0810213-4 Spectrum #1 10/31/2008	SMP	AS081030-3 AS081030-3A	UI50	13	C08102813 B08102913 C08102813	10/28/2008 10/29/2008 10/28/2008	31.87 0.0540 5545.9	Pass Pass Pass	30.25 0.0000 5486.2	30.78 0.0498 5496.2	32.90 0.4980 5576.2	33.43 0.7500 5586.2
0810213-5 Spectrum #1 10/31/2008	SMP	AS081030-3 AS081030-3A	UI50	14	C08102814 B08102914 C08102814	10/28/2008 10/29/2008 10/28/2008	31.06 0.0760 5553.8	Pass Pass Pass	29.51 0.0000 5486.5	30.02 0.0498 5496.5	32.10 0.4980 5576.5	32.61 0.7500 5586.5
0810213-6 Spectrum #1 10/31/2008	SMP	AS081030-3 AS081030-3A	UI50	16	C08102816 B08102916 C08102816	10/28/2008 10/29/2008 10/28/2008	30.92 0.0570 5555.8	Pass Pass Pass	29.39 0.0000 5494.4	29.91 0.0498 5504.4	31.97 0.4980 5584.4	32.49 0.7500 5594.4
0810213-7 Spectrum #1 10/31/2008	SMP	AS081030-3 AS081030-3A	UI50	18	C08102818 B08102918 C08102818	10/28/2008 10/28/2008 10/28/2008	30.30 0.3960 5544.2	Pass Pass Pass	28.65 0.0000 5496.0	29.15 0.0498 5506.0	31.17 0.4980 5586.0	31.67 0.7500 5596.0
0810213-8 Spectrum #1 10/31/2008	SMP	AS081030-3 AS081030-3A	UI50	19	C08102819 B08102919 C08102819	10/28/2008 10/28/2008 10/28/2008	29.47 0.3300 5544.2	Pass Pass Pass	27.99 0.0000 5496.0	28.48 0.0498 5506.0	30.44 0.4980 5586.0	30.93 0.7500 5596.0

Data Package ID: UR0810213-1

Abbreviations:	Eff - Efficiency Egy - Energy	Bkg - Background CPM - Counts per Minute	LCL - Lower Control Limit LWL - Lower Warning Limit	UWL - Upper Warning Limit UCL - Upper Control Limit	CI - The Analysis Date exceeds the Calibration Date by more than 7 days.
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Date Printed: Tuesday, November 04, 2008

Paragon Analytics
LIMS Version: 6.203A

Calibration Data Summary

Laboratory Name: Paragon Analytics
PAI Work Order: 0810213

Prep SOP: PAI 778
Analytical SOP: PAI 714

Reported on: Monday, November 03, 2008
9:27:24 AM

Lab Sample ID Spectrum Analysis Date	QC Type	Batch ID Analysis Run	Test Name	Detector Id	Eff Spectrum Bkg Spectrum Egy Spectrum	Eff Date Bkg Date Egy Date	RESULTS %Efficiency Bkg CPM Energy keV	FLAGS Efficiency Background Energy	LCL %Efficiency Bkg CPM Energy keV	LWL %Efficiency Bkg CPM Energy keV	UWL %Efficiency Bkg CPM Energy keV	UCL %Efficiency Bkg CPM Energy keV
0810213-9 Spectrum #1 10/31/2008	SMP	AS081030-3 AS081030-3A	UI50	21	C08102821 B08102821 C08102821	10/28/2008 10/28/2008 10/28/2008	29.42 0.3050 5543.9	Pass Pass Pass	27.48 0.0000 5496.0	27.97 0.0498 5506.0	29.89 0.4980 5586.0	30.38 0.7500 5596.0
0810213-10 Spectrum #1 10/31/2008	SMP	AS081030-3 AS081030-3A	UI50	22	C08102822 B08102822 C08102822	10/28/2008 10/28/2008 10/28/2008	28.05 0.2390 5545.9	Pass Pass Pass	26.66 0.0000 5494.2	27.12 0.0498 5504.2	29.00 0.4980 5584.2	29.46 0.7500 5594.2
AS081030-3 Spectrum #1 10/31/2008	MB	AS081030-3 AS081030-3A	UI50	23	C08102823 B08102823 C08102823	10/28/2008 10/28/2008 10/28/2008	29.04 0.3660 5536.2	Pass Pass Pass	27.37 0.0000 5503.7	27.85 0.0498 5513.7	29.77 0.4980 5593.7	30.25 0.7500 5603.7
AS081030-3 Spectrum #1 10/31/2008	LCS	AS081030-3 AS081030-3A	UI50	24	C08102824 B08102824 C08102824	10/28/2008 10/28/2008 10/28/2008	29.19 0.2070 5546.0	Pass Pass Pass	28.06 0.0000 5491.8	28.56 0.0498 5501.8	30.52 0.4980 5581.8	31.02 0.7500 5591.8

Data Package ID: UR0810213-1

Abbreviations:	Eff - Efficiency	Bkg - Background	LCL - Lower Control Limit	UWL - Upper Warning Limit
	Egy - Energy	CPM - Counts per Minute	LWL - Lower Warning Limit	UCL - Upper Control Limit
				CI - The Analysis Date exceeds the Calibration Date by more than 7 days.

Date Printed: Tuesday, November 04, 2008

Paragon Analytics
LIMS Version: 6.203A

Alpha Spec Calibration Source Re-Certification

Recalibration performed by Isotope Products Laboratories

Primary Certified Source

Source PA ID: 190

Planchet Label: 9

Recalibrated on: 6/1/2007

Received by PA on: 6/6/2007

Values from certificate

Source ID: 92MIX223027

Total Activity: 3780.5962 dpm

Ref. Date: 6/1/07

Nuclide	Act (Bq)	Act (dpm)	Half-Life (yrs)	Decay Corrected
U-234:	49.81	2894.6	2.48E+05	2894.59 dpm
U-235:	1.10	65.94	7.04E+08	65.94 dpm
Am-241:	12.00	720	432.17	718.88 dpm
TOTAL		3779.41 dpm		

Efficiency Determination for Detector: 25

Source Serial#	PA ID	Sequential #	Count Date	Am-241 net cts	U-234 net cts	U-235 net cts	count dur (s)	Total cpm	Known dpm	Detector efficiency
92MIX223027	190	97-19-103-09	5/20/08	7113	29841	789	2100	1078.37	3779.41	28.53%

Sources 1 through 8 activity determination

Source Serial#	PA ID	Sequential #	Count Date	Am-241 net cts	U-234 net cts	U-235 net cts	count dur (s)	Detector Efficiency	Am-241 dpm	U-234 dpm	U-235 dpm	Combined dpm
92MIX223028	182	97-19-103-01	5/20/08	12417	73969	1678	2100	28.53%	1243.38	7408.92	168.03	8818.33
92MIX223028	183	97-19-103-02	5/20/08	14459	141741	3156	2100	28.53%	1447.86	14193.30	316.03	15957.19
92MIX223028	184	97-19-103-03	5/20/08	60052	68294	1480	2100	28.53%	6838.65	6814.16	148.20	13801.00
92MIX223021	185	97-19-103-04	5/20/08	20822	58470	1507	2100	28.53%	2086.02	5854.92	160.90	8090.85
92MIX223025	186	97-19-103-05	5/20/08	94084	114792	2491	2100	28.53%	9421.15	11494.75	249.44	21165.34
92MIX223022	187	97-19-103-06	5/20/08	71430	75977	1693	2100	28.53%	7162.68	7597.98	166.53	14917.18
92MIX223023	188	97-19-103-07	5/20/08	41741	65445	1420	2100	28.53%	4178.76	6553.37	142.19	10875.31
92MIX223029	189	97-19-103-08	5/20/08	31922	200052	4643	2100	28.53%	3186.62	20032.30	464.93	23693.76

Efficiency Verification

Source Serial#	PA ID	Sequential #	Count Date	Am-241 net cts	U-234 net cts	U-235 net cts	Count dur (s)	Total cpm	Known dpm	Detector efficiency	RPD	FLAG
92MIX223027	190	97-19-103-09	5/2/08	6867	28575	781	2100	1068.37	3779.41	28.22%	1.12%	PASS

Sources 1 through 8 activity re-verification

Source Serial#	PA ID	Sequential #	Combined Observed dpm	Combined Certified dpm*	Percent Difference %	Within 5% of Certified value?
92MIX223026	182	97-19-103-01	8816.33	8867.05	-0.55%	Yes
92MIX223028	183	97-19-103-02	15957.19	16011.39	-0.34%	Yes
92MIX223028	184	97-19-103-03	13601.00	13588.11	0.09%	Yes
92MIX223021	185	97-19-103-04	8090.85	8188.77	-1.20%	Yes
92MIX223025	186	97-19-103-05	21165.34	21096.48	0.33%	Yes
92MIX223022	187	97-19-103-06	14917.18	15382.14	-3.02%	Yes
92MIX223023	188	97-19-103-07	10875.31	10781.48	0.87%	Yes
92MIX223029	189	97-19-103-08	23693.76	24636.41	-0.24%	Yes

* Certificate values decay corrected to the count date

Data from certificates

Reference Date	U-234 (Bq)	U-234 (dpm)	U-235 (Bq)	U-235 (dpm)	Am-241 (Bq)	Am-241 (dpm)
5/1/2003	124.10	7446.00	2.43	145.74	21.43	1285.80
5/1/2003	238.30	14358.00	4.20	252.00	23.55	1413.00
5/1/2003	119.40	7164.00	1.93	115.56	106.00	6360.00
4/1/2003	101.00	6060.00	1.26	75.84	34.50	2070.00
4/1/2003	203.00	12180.00	3.41	204.72	146.40	8784.00
4/1/2003	132.90	7974.00	3.17	189.96	121.30	7278.00
4/1/2003	107.10	6426.00	0.93	55.94	72.26	4335.60
5/1/2003	334.80	20088.00	6.55	393.18	53.02	3181.20

OK
MC
6/5/08

Analyst: ORTEC

Detector: 25

190 98 5/21/08

Calibration

Energy Calibration: RSO (Source 9)

Description:

Analysis Date: 5/20/2008 11:57:30AM

Calibration Type: Energy And Efficiency

Certificate ID: A9 RSO#190

Prepared by: IPL

Description:

Source Info

Certification Date: 6/1/2007 12:00:00PM

Acquisition

Detector: 25, SN:

Acquisition Start Date: 5/20/2008 10:43:22AM

Live Time: 35.00 min.

Real Time: 35.01 min.

Efficiency Calibration Name: RSO (Source 9)

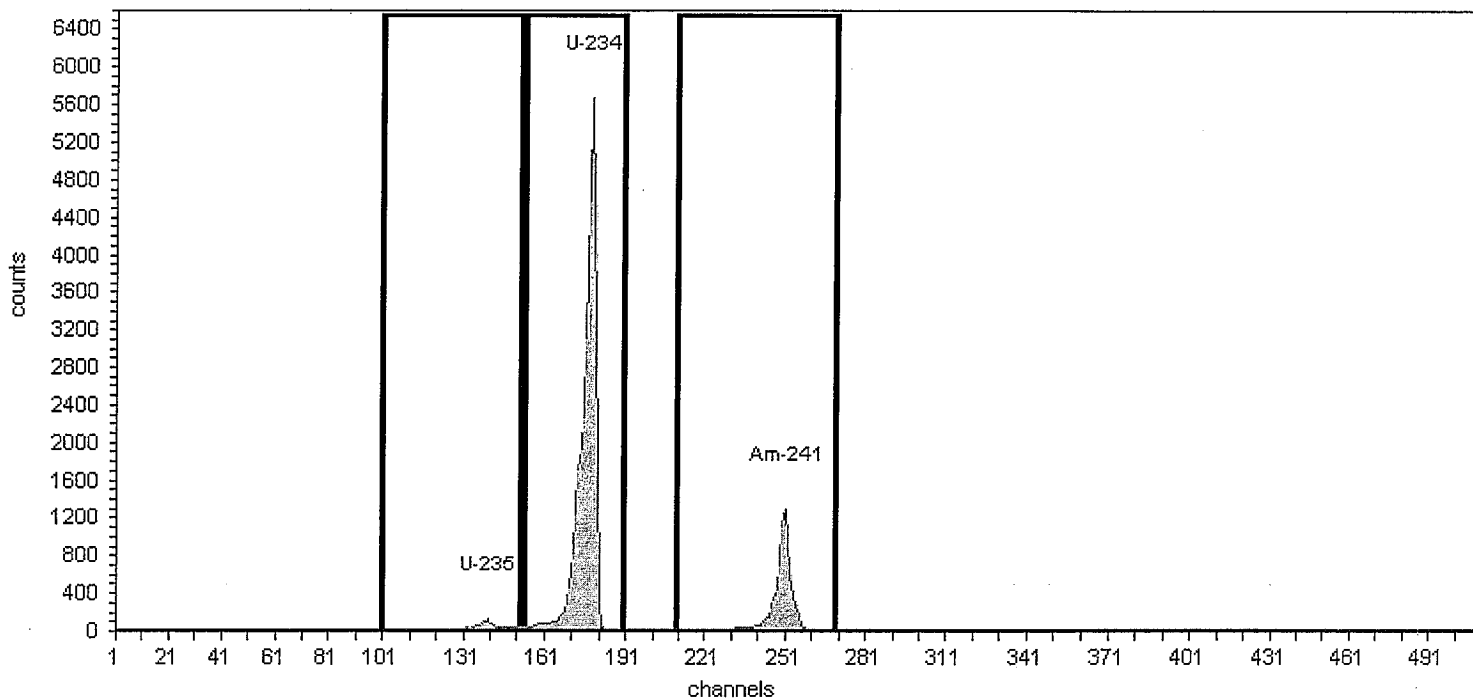
Energy Calibration Equation:

Gain = 9.8047 keV / Ch

Offset = 3,026.20 keV

Quadratic = 0.0000 keV / Ch²

Efficiency: 28.47% +/- 0.30% TPU(2 sigma)



Method: Interactive ROI

Initial Calibration: No

Algorithm: Linear

Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	789.00	22.54
U-234	178	4.78	153	190	29,841.00	852.60
Am-241	251	5.49	210	270	7,113.00	203.23

Analyst: ORTEC

Detector: 25

Energy Calibration: RSO 182 (Source 1)

Description:

Certificate ID: A1 RSO#182

Prepared by: IPL

Description:

Calibration
 Analysis Date: 5/20/2008 12:25:48PM
 Calibration Type: Energy And Efficiency
Source Info

Certification Date: 5/1/2003 12:00:45PM

Acquisition

Detector: 25, SN:

Acquisition Start Date: 5/20/2008 11:35:12AM

Live Time: 35.00 min.

Real Time: 35.03 min.

Efficiency Calibration Name: RSO 182 (Source 1)

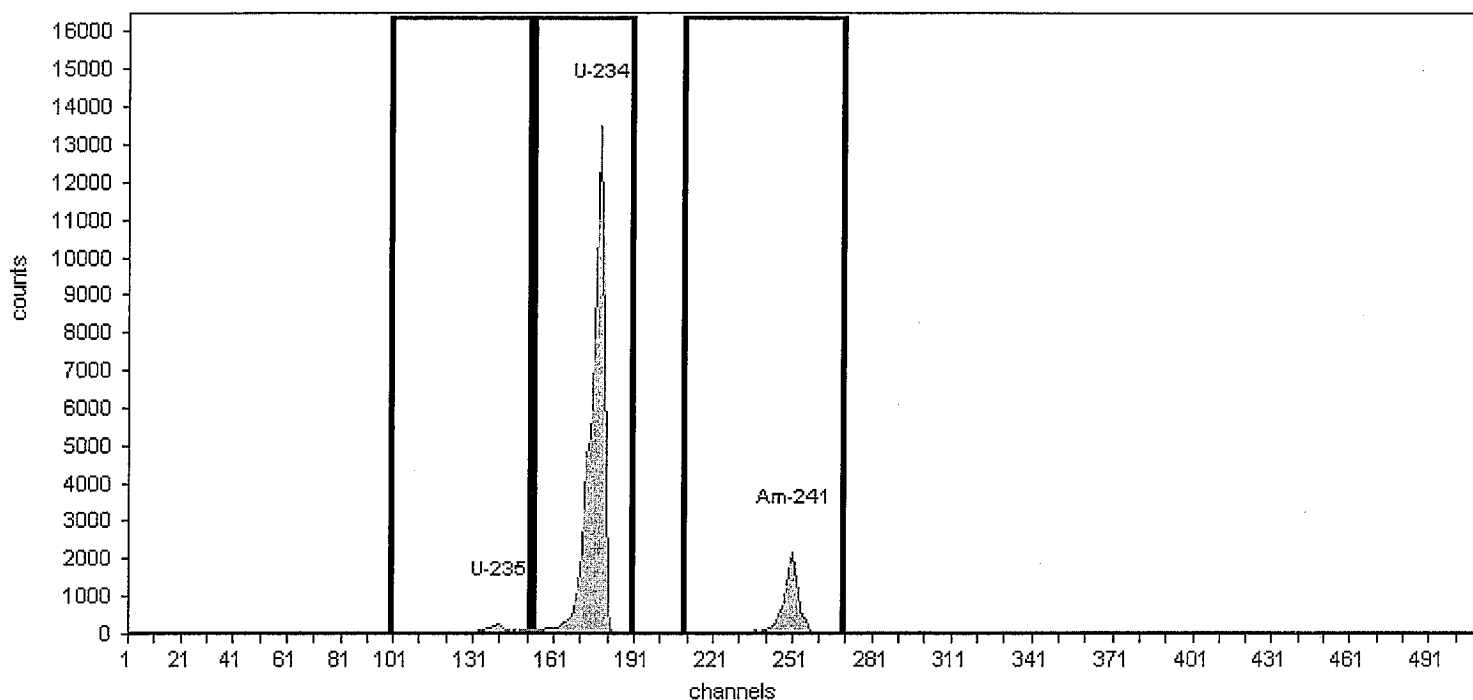
Energy Calibration Equation:

Gain = 9.8047 keV / Ch

Offset = 3,026.20 keV

Quadratic = 0.0000 keV / Ch²

Efficiency: 28.35% +/- 0.19% TPU(2 sigma)



Method: Interactive ROI

Algorithm: Linear

Initial Calibration: No

Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	1,678.00	47.94
U-234	178	4.78	153	190	73,969.00	2,113.40
Am-241	251	5.49	210	270	12,417.00	354.77

Analyst: ORTEC

Detector: 25

Energy Calibration: RSO 183 (Source 2)

Description:

Certificate ID: A2 RSO#183

Prepared by: IPL

Description:

CalibrationAnalysis Date: 5/20/2008 1:05:28PM
Calibration Type: Energy And Efficiency**Source Info**

Certification Date: 5/1/2003 12:00:00PM

Acquisition

Detector: 25, SN:

Acquisition Start Date: 5/20/2008 12:26:40PM

Live Time: 35.00 min.

Real Time: 35.05 min.

Efficiency Calibration Name: RSO 183 (Source 2)

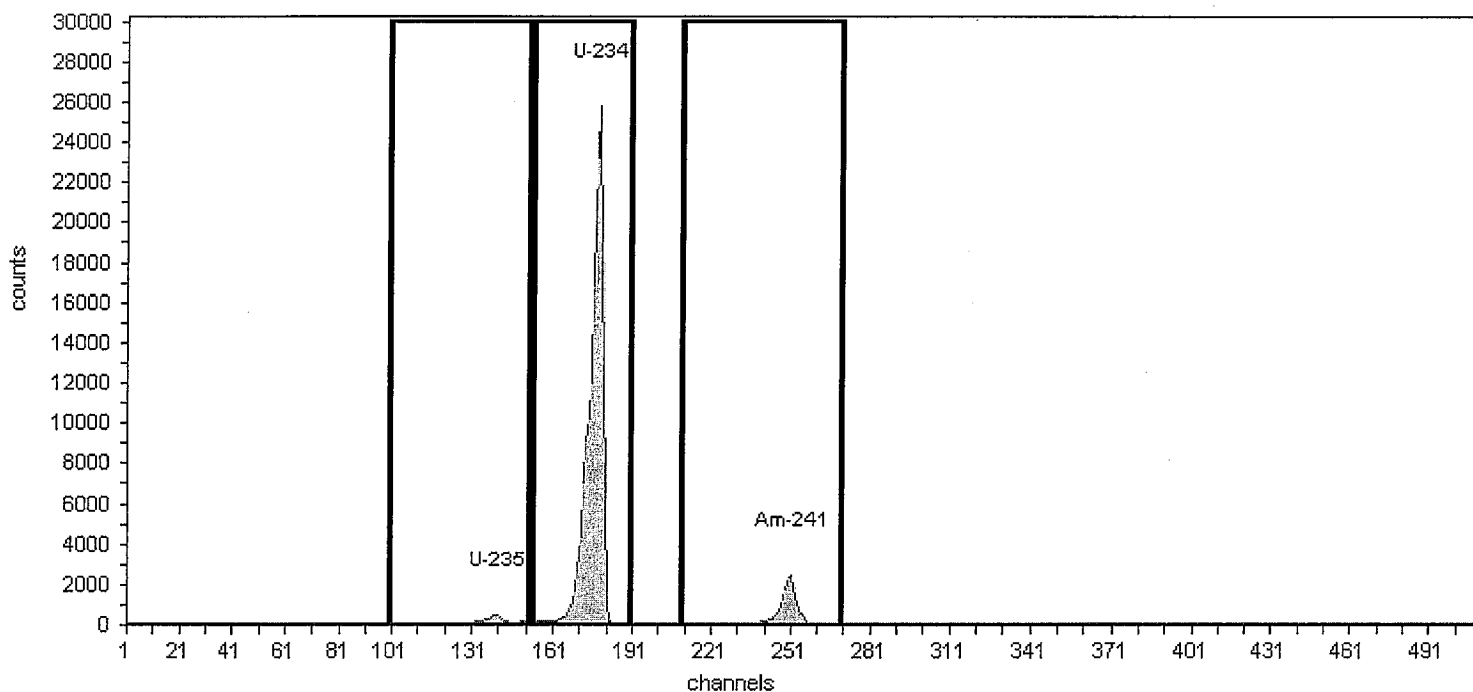
Energy Calibration Equation:

Gain = 9.8047 keV / Ch

Offset = 3,026.20 keV

Quadratic = 0.0000 keV / Ch²

Efficiency: 28.38% +/- 0.14% TPU(2 sigma)



Method: Interactive ROI

Algorithm: Linear

Initial Calibration: No

Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	3,156.00	90.17
U-234	178	4.78	153	190	141,741.00	4,049.74
Am-241	251	5.49	210	270	14,459.00	413.11

Analyst: ORTEC

Detector: 25

Energy Calibration: RSO 184 (Source 3)

Description:

Calibration

Analysis Date: 5/20/2008 1:45:22PM

Calibration Type: Energy And Efficiency

Source Info

Certificate ID: A3 RSO#184

Prepared by: IPL

Description:

Certification Date: 5/1/2003 12:00:00PM

Acquisition

Detector: 25, SN:

Acquisition Start Date: 5/20/2008 1:06:02PM

Live Time: 35.00 min.

Real Time: 35.04 min.

Efficiency Calibration Name: RSO 184 (Source 3)

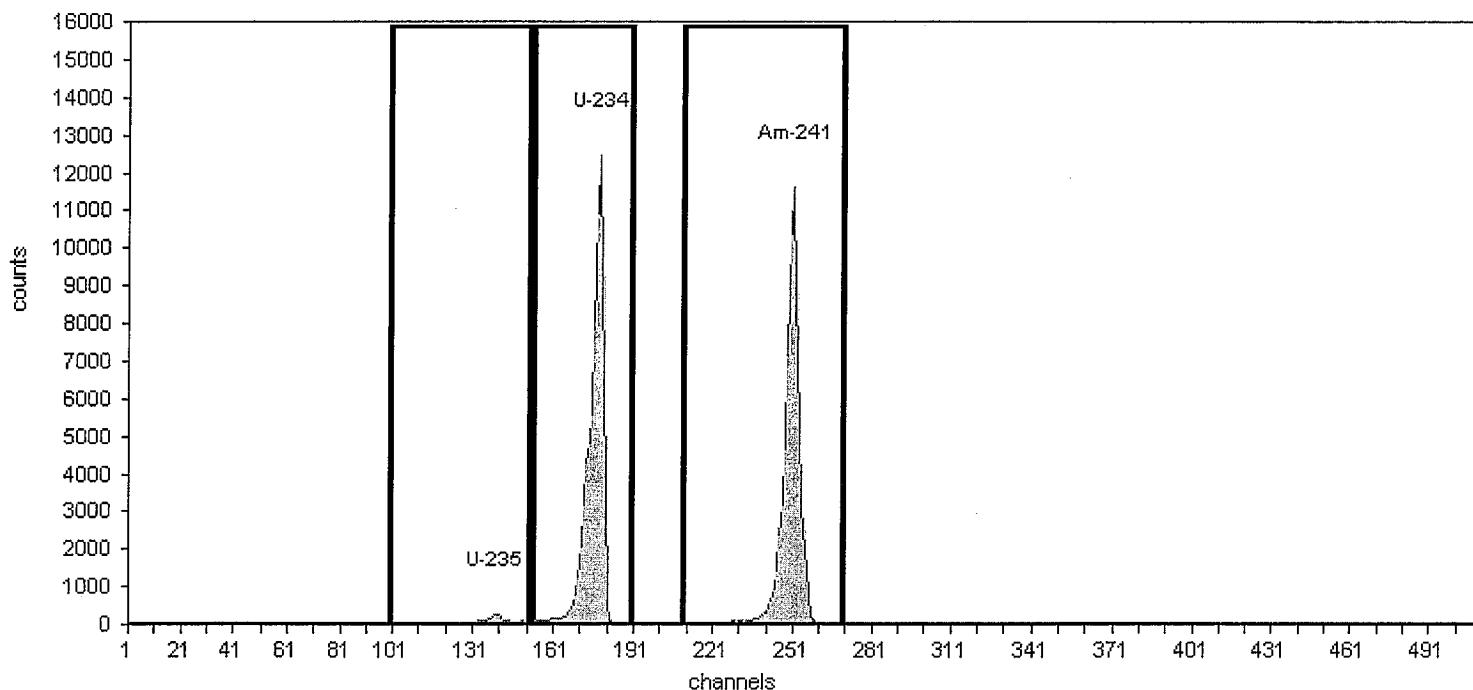
Energy Calibration Equation:

Gain = 9.7289 keV / Ch

Offset = 3,043.84 keV

Quadratic = 0.0000 keV / Ch²

Efficiency: 28.45% +/- 0.16% TPU(2 sigma)



Method: Interactive ROI

Algorithm: Linear

Initial Calibration: No

Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	139	4.40	100	152	1,480.00	42.29
U-234	178	4.78	153	190	68,294.00	1,951.26
Am-241	251	5.49	210	270	66,052.00	1,887.20

Analyst: ORTEC

Detector: 25

Energy Calibration: RSO 185 (Source 4)

Description:

Certificate ID: A4 RSO#185

Prepared by: IPL

Description:

Calibration

Analysis Date: 5/20/2008 2:41:04PM

Calibration Type: Energy And Efficiency

Source Info

Certification Date: 4/1/2003 12:00:00PM

Acquisition

Detector: 25, SN:

Acquisition Start Date: 5/20/2008 1:45:05PM

Live Time: 35.00 min.

Real Time: 35.02 min.

Efficiency Calibration Name: RSO 185 (Source 4)

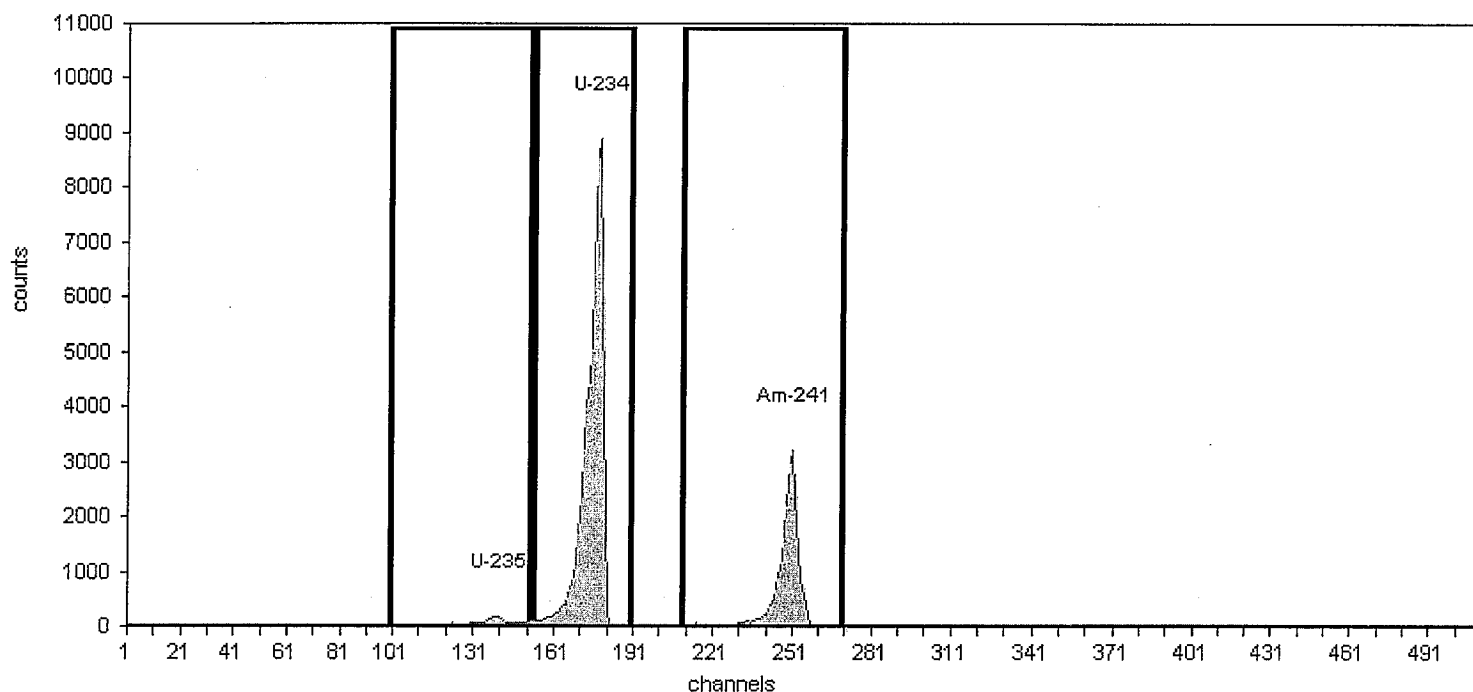
Energy Calibration Equation:

Gain = 9.8047 keV / Ch

Offset = 3,026.20 keV

Quadratic = 0.0000 keV / Ch²

Efficiency: 27.92% +/- 0.20% TPU(2 sigma)



Method: Interactive ROI

Algorithm: Linear

Initial Calibration: No

Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	1,507.00	43.06
U-234	178	4.78	153	190	58,470.00	1,670.57
Am-241	251	5.49	210	270	20,822.00	594.91

Analyst: ORTEC

Detector: 25

Energy Calibration: RSO 186 (Source 5)

Description:

Certificate ID: A5 RSO#186

Prepared by: IPL

Description:

Calibration
 Analysis Date: 5/20/2008 3:26:01PM
 Calibration Type: Energy And Efficiency
Source Info

Certification Date: 4/1/2003 12:00:00PM

Acquisition

Detector: 25, SN:

Acquisition Start Date: 5/20/2008 2:41:31PM

Live Time: 35.00 min.

Real Time: 35.06 min.

Efficiency Calibration Name: RSO 186 (Source 5)

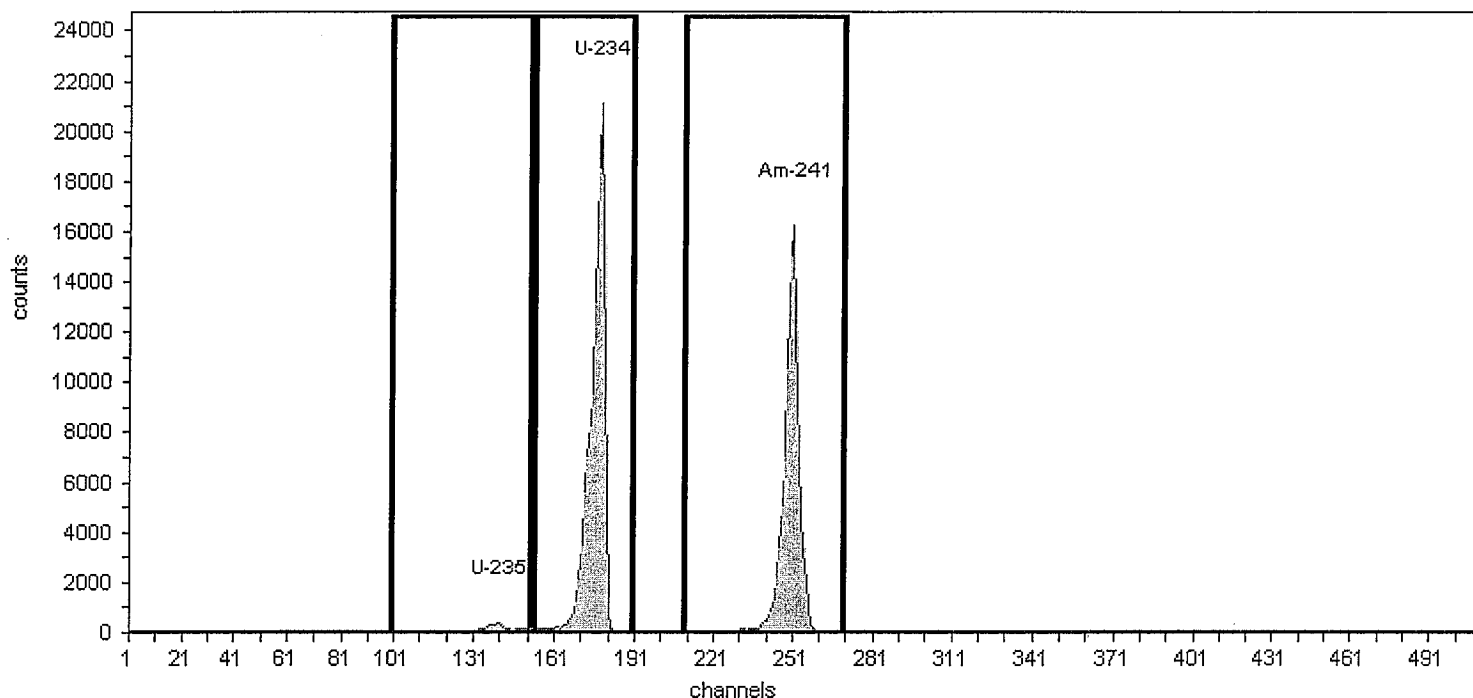
Energy Calibration Equation:

Gain = 9.8047 keV / Ch

Offset = 3,026.20 keV

Quadratic = 0.0000 keV / Ch²

Efficiency: 28.47% +/- 0.13% TPU(2 sigma)



Method: Interactive ROI

Algorithm: Linear

Initial Calibration: No

Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	2,491.00	71.17
U-234	178	4.78	153	190	114,792.00	3,279.77
Am-241	251	5.49	210	270	94,084.00	2,688.11

Analyst: ORTEC

Detector: 25

Energy Calibration: RSO 187 (Source 6)

Description:

Certificate ID: A6 RSO#187

Prepared by: IPL

Description:

Calibration
 Analysis Date: 5/20/2008 4:02:57PM
 Calibration Type: Energy And Efficiency
Source Info

Certification Date: 4/1/2003 12:00:00PM

Acquisition

Detector: 25, SN:

Acquisition Start Date: 5/20/2008 3:26:48PM

Live Time: 35.00 min.

Real Time: 35.05 min.

Efficiency Calibration Name: RSO 187 (Source 6)

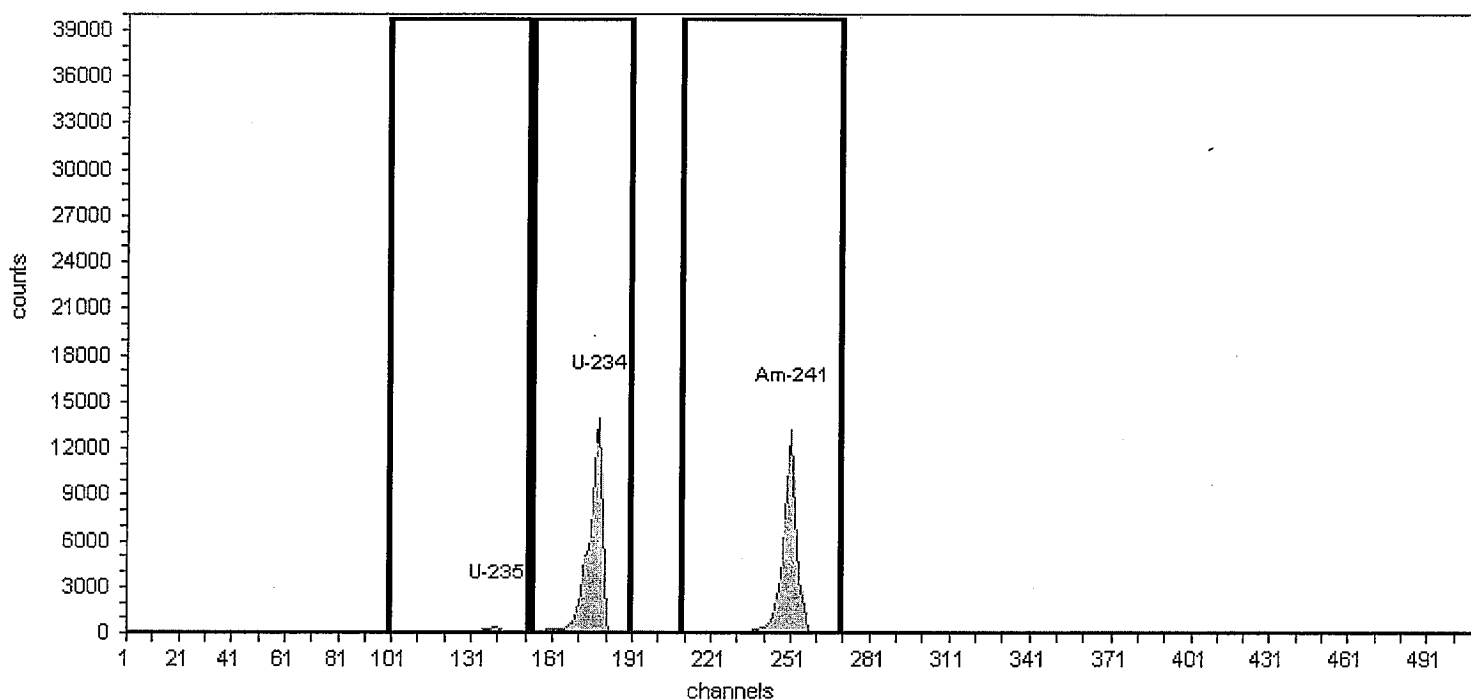
Energy Calibration Equation:

Gain = 9.8047 keV / Ch

Offset = 3,026.20 keV

Quadratic = 0.0000 keV / Ch²

Efficiency: 27.69% +/- 0.14% TPU(2 sigma)



Method: Interactive ROI

Algorithm: Linear

Initial Calibration: No

Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	1,663.00	47.51
U-234	178	4.78	153	190	75,877.00	2,167.91
Am-241	251	5.49	210	270	71,430.00	2,040.86

Analyst: ORTEC

Detector: 25

Energy Calibration: RSO 188 (Source 7)

Description:

Certificate ID: A7 RSO#188

Prepared by: IPL

Description:

Calibration

Analysis Date: 5/20/2008 4:41:56PM

Calibration Type: Energy And Efficiency

Source Info

Certification Date: 4/1/2003 12:00:00PM

Acquisition

Detector: 25, SN:

Acquisition Start Date: 5/20/2008 4:03:54PM

Live Time: 35.00 min.

Real Time: 35.03 min.

Efficiency Calibration Name: RSO 188 (Source 7)

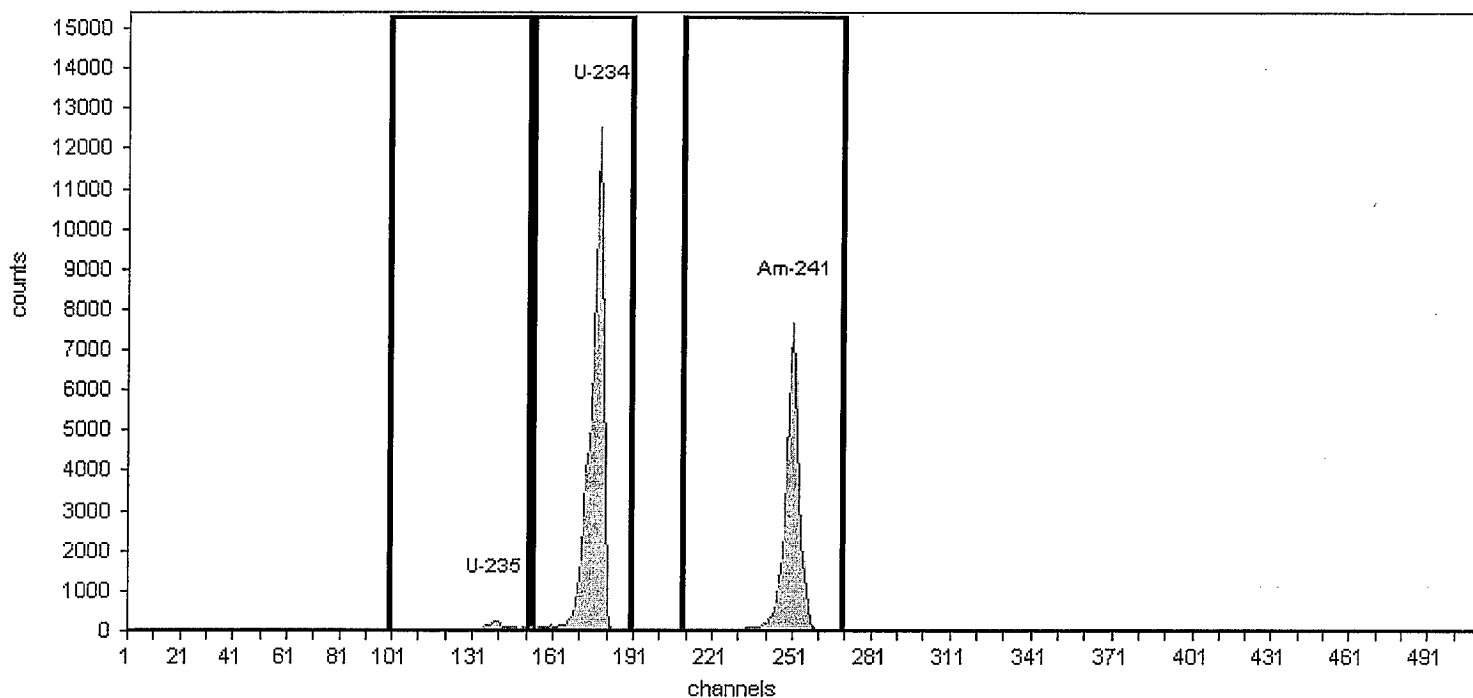
Energy Calibration Equation:

Gain = 9.7289 keV / Ch

Offset = 3,043.84 keV

Quadratic = 0.0000 keV / Ch²

Efficiency: 28.55% +/- 0.18% TPU(2 sigma)



Method: Interactive ROI

Algorithm: Linear

Initial Calibration: No

Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	139	4.40	100	152	1,420.00	40.57
U-234	178	4.78	153	190	65,445.00	1,869.86
Am-241	251	5.49	210	270	41,741.00	1,192.60

Analyst: ORTEC

Detector: 25

Energy Calibration: RSO 189 (Source 8)

Description:

Certificate ID: A8 RSO#189

Prepared by: IPL

Description:

Calibration

Analysis Date: 5/21/2008 8:30:29AM

Calibration Type: Energy And Efficiency

Source Info

Certification Date: 4/1/2003 12:00:00PM

Acquisition

Detector: 25, SN:

Acquisition Start Date: 5/20/2008 4:42:28PM

Live Time: 35.00 min.

Real Time: 35.07 min.

Efficiency Calibration Name: RSO 189 (Source 8)

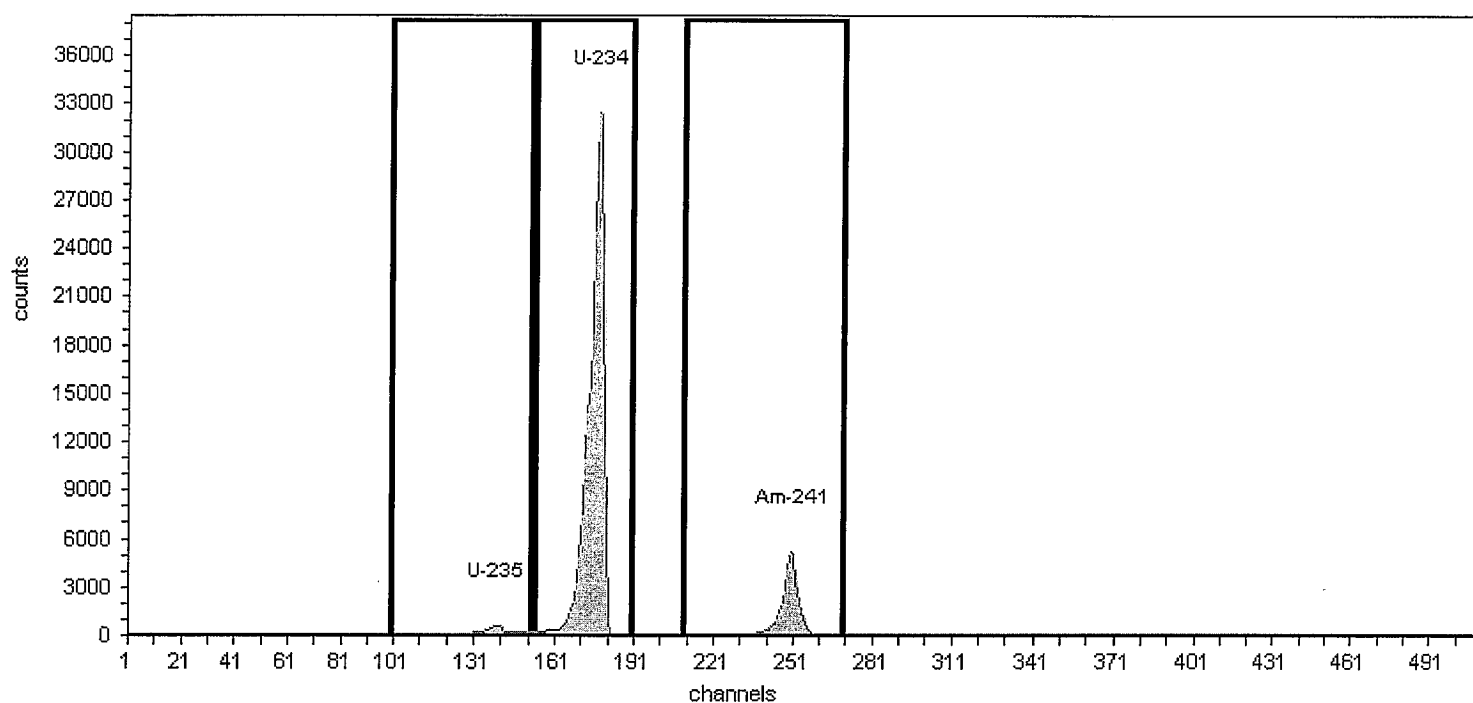
Energy Calibration Equation:

Gain = 9.8047 keV / Ch

Offset = 3,036.00 keV

Quadratic = 0.0000 keV / Ch²

Efficiency: 28.59% +/- 0.12% TPU(2 sigma)



Method: Interactive ROI

Algorithm: Linear

Initial Calibration: No

Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	139	4.40	100	152	4,643.00	132.66
U-234	177	4.78	153	190	200,052.00	5,715.77
Am-241	250	5.49	210	270	31,922.00	912.06

Analyst: ORTEC

Detector: 25

Energy Calibration: RSO 190 (Source 9)

Description:

Certificate ID: A9 RSO#190

Prepared by: IPL

Description:

Calibration

Analysis Date: 5/21/2008 9:08:00AM

Calibration Type: Energy And Efficiency

Source Info

Certification Date: 6/1/2007 12:00:00PM

Acquisition

Detector: 25, SN:

Acquisition Start Date: 5/21/2008 8:31:01AM

Live Time: 35.00 min.

Real Time: 35.01 min.

Efficiency Calibration Name: RSO 190 (Source 9)

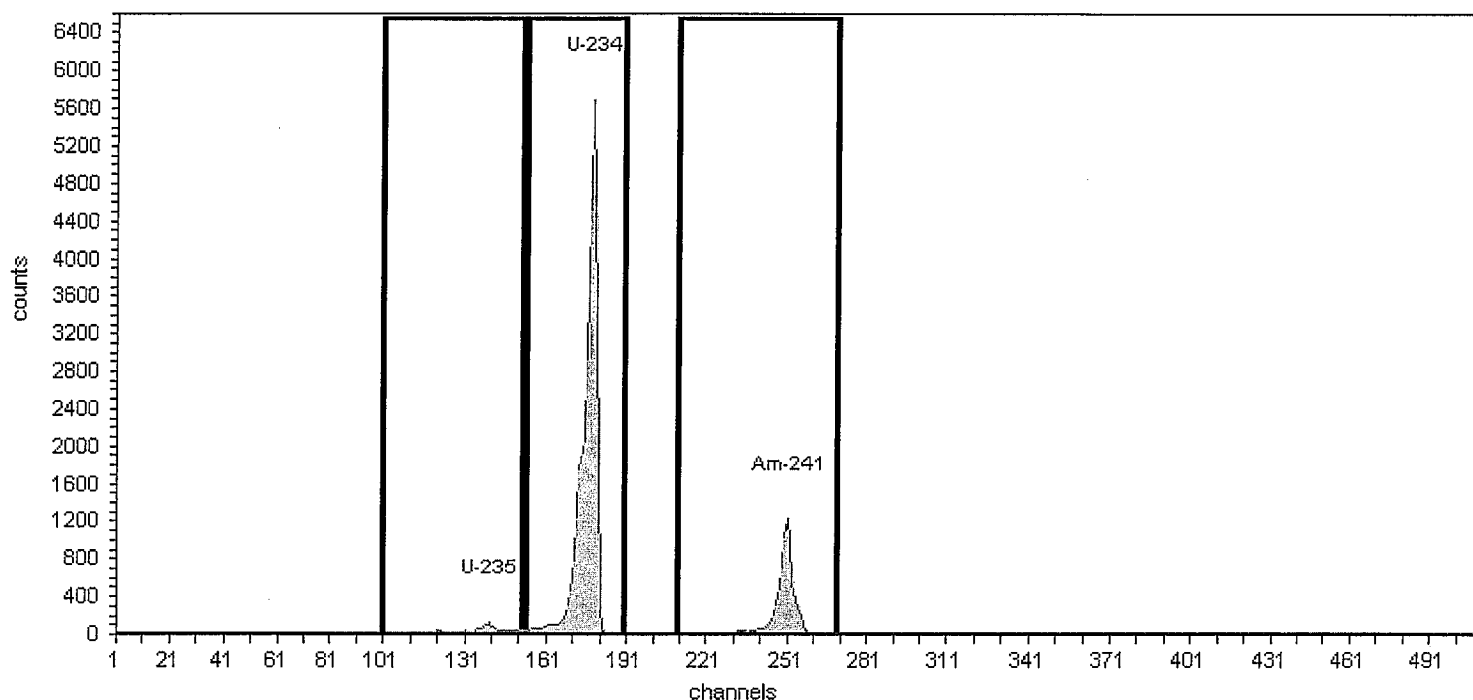
Energy Calibration Equation:

Gain = 9.8047 keV / Ch

Offset = 3,026.20 keV

Quadratic = 0.0000 keV / Ch²

Efficiency: 28.16% +/- 0.30% TPU(2 sigma)



Method: Interactive ROI

Algorithm: Linear

Initial Calibration: No

Shelf: 1

Nuclide Activity Summary

Nuclide	Peak Channel	Peak Energy MeV	ROI Start Channel	ROI End Channel	Gross Counts	Net Count Rate (cpm)
U-235	140	4.40	100	152	781.00	22.31
U-234	178	4.78	153	190	29,575.00	845.00
Am-241	251	5.49	210	270	6,967.00	199.06

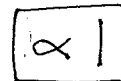


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expires 5/20/09

*PAT 1873
recalibrated 4-15-03*

CERTIFICATE OF CALIBRATION MIXED ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): $(2.454 \pm 0.006)E+05$ years
Half Life (U-235): $(7.037 \pm 0.011)E+08$ years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW040203/R2193
Catalog No.: MISC-STD
Reference Date: 1-May-03 12:00 PST
Source No.: 92MIX2203026

Contained Radioactivity:

U-234:	3.354 nCi (124.1 Bq)	Am-241:	0.5793 nCi (21.43 Bq)
U-235:	0.06566 nCi (2.429 Bq)	Total Activity:	3.999 nCi (148.0 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Mar 1998.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	$\pm 0.7\%$
B. Type B (systematic) uncertainty:	$\pm 3.0\%$
C. Uncertainty in aliquot weighing:	$\pm 0.0\%$
D. Total uncertainty at the 99% confidence level:	$\pm 3.1\%$

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 4483 α /min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7

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$\alpha 2$

reverified 5/20/08
expires 5/20/09

PAT 183
Recalibrated 4-15-03

CERTIFICATE OF CALIBRATION MIXED ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): $(2.454 \pm 0.006)E+05$ years
Half Life (U-235): $(7.037 \pm 0.011)E+08$ years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW040203/R2193
Catalog No.: MISC-STD
Reference Date: 1-May-03 12:00 PST
Source No.: 92MIX2203028

Contained Radioactivity:

U-234:	6.467 nCi (239.3 Bq)	Am-241:	0.6366 nCi (23.55 Bq)
U-235:	0.1135 nCi (4.200 Bq)	Total Activity:	7.217 nCi (267.1 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	$\pm 0.7\%$
B. Type B (systematic) uncertainty:	$\pm 3.0\%$
C. Uncertainty in aliquot weighing:	$\pm 0.0\%$
D. Total uncertainty at the 99% confidence level:	$\pm 3.1\%$

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 8091 α/min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7

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$\alpha 3$

reverified 5/20/08
expires 5/20/09

PAT I.D. 184
recalibrated 4-15-03

CERTIFICATE OF CALIBRATION MIXED ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): $(2.454 \pm 0.006)E+05$ years
Half Life (U-235): $(7.037 \pm 0.011)E+08$ years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW040203/R2193
Catalog No.: MISC-STD
Reference Date: 1-May-03 12:00 PST
Source No.: 92MIX2203024

Contained Radioactivity:

U-234: 3.227 nCi (119.4 Bq)
U-235: 0.05205 nCi (1.926 Bq)

Am-241: 2.866 nCi (106.0 Bq)
Total Activity: 6.145 nCi (227.3 Bq)

Physical description:

A. Capsule type: Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit: Electrodeposited and diffusion bonded oxides
C. Active Diameter: 19 mm
D. Backing: Stainless steel
E. Cover: None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty: $\pm 0.6\%$
B. Type B (systematic) uncertainty: $\pm 3.0\%$
C. Uncertainty in aliquot weighing: $\pm 0.0\%$
D. Total uncertainty at the 99% confidence level: $\pm 3.1\%$

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 6889 α /min in 2π on 11 Apr 03.

Daniel James Van Dalsem
Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7

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expires 5/20/09
 $\alpha 4$
PAI ID 00185
rec'd from recalibration
3-28-03

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): $(2.454 \pm 0.006)E+05$ years
Half Life (U-235): $(7.037 \pm 0.011)E+08$ years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW030603/R2155
Catalog No.: MISC-STD
Reference Date: 1-Apr-03 12:00 PST
Source No.: 92MIX2203021

Contained Radioactivity:

U-234:	2.731 nCi (101.0 Bq)	Am-241:	0.9325 nCi (34.50 Bq)
U-235:	0.03416 nCi (1.264 Bq)	Total Activity:	3.698 nCi (136.8 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	$\pm 0.8\%$
B. Type B (systematic) uncertainty:	$\pm 3.1\%$
C. Uncertainty in aliquot weighing:	$\pm 0.0\%$
D. Total uncertainty at the 99% confidence level:	$\pm 3.2\%$

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 4145 α /min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

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reverified 5/20/08
expires 5/20/09
α 5
PAI ID 00186
recalibration
received 186
3-28-03

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): $(2.454 \pm 0.006)E+05$ years
Half Life (U-235): $(7.037 \pm 0.011)E+08$ years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW030603/R2155
Catalog No.: MISC-STD
Reference Date: 1-Apr-03 12:00 PST
Source No.: 92MIX2203025

Contained Radioactivity:

U-234:	5.486 nCi (203.0 Bq)	Am-241:	3.958 nCi (146.4 Bq)
U-235:	0.09221 nCi (3.412 Bq)	Total Activity:	9.536 nCi (352.8 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.8%
B. Type B (systematic) uncertainty:	± 3.1%
C. Uncertainty in aliquot weighing:	± 0.0%
D. Total uncertainty at the 99% confidence level:	± 3.2%

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 10690 α/min in 2π on 18 Mar 03.

Daniel James Van Dalsen
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

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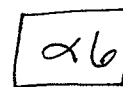


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reverified 5/20/08
expires 5/20/09

PAID 00187
rec'd for recalibration
3-28-03

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): $(2.454 \pm 0.006)E+05$ years
Half Life (U-235): $(7.037 \pm 0.011)E+08$ years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW030603/R2155
Catalog No.: MISC-STD
Reference Date: 1-Apr-03 12:00 PST
Source No.: 92MIX2203022

Contained Radioactivity:

U-234:	3.592 nCi (132.9 Bq)	Am-241:	3.279 nCi (121.3 Bq)
U-235:	0.08556 nCi (3.166 Bq)	Total Activity:	6.957 nCi (257.4 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	$\pm 0.8\%$
B. Type B (systematic) uncertainty:	$\pm 3.1\%$
C. Uncertainty in aliquot weighing:	$\pm 0.0\%$
D. Total uncertainty at the 99% confidence level:	$\pm 3.2\%$

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 7799 α /min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

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$\alpha 7$

reverified 5/20/08
expires 5/20/09

PAID 188
rec'd for recalibration
3-28-03

CERTIFICATE OF CALIBRATION ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): $(2.454 \pm 0.006)E+05$ years
Half Life (U-235): $(7.037 \pm 0.011)E+08$ years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW030603/R2155
Catalog No.: MISC-STD
Reference Date: 1-Apr-03 12:00 PST
Source No.: 92MIX2203023

Contained Radioactivity:

U-234:	2.895 nCi (107.1 Bq)	Am-241:	1.953 nCi (72.26 Bq)
U-235:	0.02502 nCi (0.9257 Bq)	Total Activity:	4.873 nCi (180.3 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Aug 1992.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	$\pm 0.8\%$
B. Type B (systematic) uncertainty:	$\pm 3.1\%$
C. Uncertainty in aliquot weighing:	$\pm 0.0\%$
D. Total uncertainty at the 99% confidence level:	$\pm 3.2\%$

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 5463 α /min in 2π on 18 Mar 03.

Daniel James Van Dalsem
Quality Control

19-Mar-03
Date Signed

IPL Ref. No.: 987-2

ISO 9001 CERTIFIED

Medical Imaging Laboratory

24937 Avenue Tibbitts Valencia, California 91355

Industrial Gauging Laboratory

1800 North Keystone Street Burbank, California 91504



Isotope Products Laboratories

An Eckert & Ziegler Company

24937 Avenue Tibbitts
Valencia, California 91355

Tel 661•309•1010
Fax 661•257•8303

α 8

reverified 5/20/08
expires 5/20/09

PAI ID 189
recd 4-21-03
recalibrated 4-15-03

CERTIFICATE OF CALIBRATION MIXED ALPHA STANDARD SOURCE

Radionuclide A: U-234
Radionuclide B: U-235
Radionuclide C: Am-241
Half Life (U-234): $(2.454 \pm 0.006)E+05$ years
Half Life (U-235): $(7.037 \pm 0.011)E+08$ years
Half Life (Am-241): 432.17 ± 0.66 years

Customer: PARAGON ANALYTICS, INC.
P.O. No.: EW040203/R2193
Catalog No.: MISC-STD
Reference Date: 1-May-03 12:00 PST
Source No.: 92MIX2203029

Contained Radioactivity:

U-234:	9.048 nCi (334.8 Bq)	Am-241:	1.433 nCi (53.02 Bq)
U-235:	0.1771 nCi (6.553 Bq)	Total Activity:	10.66 nCi (394.4 Bq)

Physical description:

A. Capsule type:	Disk (22 mm OD X 0.79 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxides
C. Active Diameter:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

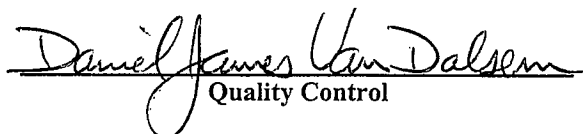
This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in Mar 1998.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	$\pm 0.5\%$
B. Type B (systematic) uncertainty:	$\pm 3.0\%$
C. Uncertainty in aliquot weighing:	$\pm 0.0\%$
D. Total uncertainty at the 99% confidence level:	$\pm 3.0\%$

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (As in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 11950 α /min in 2π on 11 Apr 03.


Quality Control

15-Apr-03
Date Signed

IPL Ref. No.: 987-7

ISO 9001 CERTIFIED



Eckert & Ziegler

Isotope Products

24937 Avenue Tibbitts
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Fax 661•257•8303

RSD # 190

Rec'd 6/6/07 GW

Recertification 6/11/07

CERTIFICATE OF CALIBRATION MIXED ALPHA STANDARD SOURCE

29

Radionuclide:	U-234	Customer:	PARAGON ANALYTICS, INC.
Radionuclide:	U-235	P.O. No.:	73179/R3768
Radionuclide:	Am-241	Catalog No.:	MISC-STD
Half-life (U-234):	(2.454 ± 0.006)E+05 years	Reference Date:	1-Jun-07 12:00 PST
Half-life (U-235):	(7.037 ± 0.011)E+08 years	Source No.:	92MIX223027
Half-life (Am-241):	432.17 ± 0.66 years		

Contained Radioactivity:

U-234:	1.349	nCi,	49.91	Bq	Am-241:	0.3243	nCi,	12.00	Bq
U-235:	0.02970	nCi,	1.099	Bq	Total Activity:	1.703	nCi,	63.01	Bq

Physical Description:

A. Capsule type:	Disk (47 mm OD x 0.76 mm THK)
B. Nature of active deposit:	Electrodeposited and diffusion bonded oxide
C. Active diameter/volume:	19 mm
D. Backing:	Stainless steel
E. Cover:	None

Radioimpurities: Not determined

Method of Calibration:

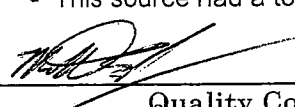
This source was assayed using a windowless internal gas flow proportional counter for total alpha activity. Individual nuclide ratios were taken from those determined in May 2001.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.9 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 3.1 %

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from "Table of Radioactive Isotopes", edited by Virginia Shirley, 1986.
- This source has a working life of 2 years.
- This source had a total alpha surface emission rate of 1909 α/min in 2π on 22-May-07


Quality Control

24 May 07
Date

IPL Ref. No.: 1143-19

ISO 9001 CERTIFIED

Medical Imaging Laboratory

24937 Avenue Tibbitts Valencia, California 91355

Industrial Gauging Laboratory

1800 North Keystone Street Burbank, California 91504

STDEDDtbl

DPID	RRunNum	AnalRunID	LabID	QCTyp	IndTestNar	AnalMetho	QCBatchID	ColumnNu
UR081021	0	AS081030	0810213-1	SMP	U-232	714R11	AS081030	1
UR081021	0	AS081030	0810213-1	SMP	U-234	714R11	AS081030	1
UR081021	0	AS081030	0810213-1	SMP	U-235	714R11	AS081030	1
UR081021	0	AS081030	0810213-1	SMP	U-238	714R11	AS081030	1
UR081021	0	AS081030	0810213-10	SMP	U-232	714R11	AS081030	1
UR081021	0	AS081030	0810213-10	SMP	U-234	714R11	AS081030	1
UR081021	0	AS081030	0810213-10	SMP	U-235	714R11	AS081030	1
UR081021	0	AS081030	0810213-10	SMP	U-238	714R11	AS081030	1
UR081021	0	AS081030	0810213-2	SMP	U-232	714R11	AS081030	1
UR081021	0	AS081030	0810213-2	SMP	U-234	714R11	AS081030	1
UR081021	0	AS081030	0810213-2	SMP	U-235	714R11	AS081030	1
UR081021	0	AS081030	0810213-2	SMP	U-238	714R11	AS081030	1
UR081021	0	AS081030	0810213-3	DUP	U-232	714R11	AS081030	1
UR081021	0	AS081030	0810213-3	DUP	U-234	714R11	AS081030	1
UR081021	0	AS081030	0810213-3	DUP	U-235	714R11	AS081030	1
UR081021	0	AS081030	0810213-3	DUP	U-238	714R11	AS081030	1
UR081021	0	AS081030	0810213-3	SMP	U-232	714R11	AS081030	1
UR081021	0	AS081030	0810213-3	SMP	U-234	714R11	AS081030	1
UR081021	0	AS081030	0810213-3	SMP	U-235	714R11	AS081030	1
UR081021	0	AS081030	0810213-3	SMP	U-238	714R11	AS081030	1
UR081021	0	AS081030	0810213-4	SMP	U-232	714R11	AS081030	1
UR081021	0	AS081030	0810213-4	SMP	U-234	714R11	AS081030	1
UR081021	0	AS081030	0810213-4	SMP	U-235	714R11	AS081030	1
UR081021	0	AS081030	0810213-4	SMP	U-238	714R11	AS081030	1
UR081021	0	AS081030	0810213-5	SMP	U-232	714R11	AS081030	1
UR081021	0	AS081030	0810213-5	SMP	U-234	714R11	AS081030	1
UR081021	0	AS081030	0810213-5	SMP	U-235	714R11	AS081030	1
UR081021	0	AS081030	0810213-5	SMP	U-238	714R11	AS081030	1
UR081021	0	AS081030	0810213-6	SMP	U-232	714R11	AS081030	1
UR081021	0	AS081030	0810213-6	SMP	U-234	714R11	AS081030	1
UR081021	0	AS081030	0810213-6	SMP	U-235	714R11	AS081030	1
UR081021	0	AS081030	0810213-6	SMP	U-238	714R11	AS081030	1
UR081021	0	AS081030	0810213-7	SMP	U-232	714R11	AS081030	1
UR081021	0	AS081030	0810213-7	SMP	U-234	714R11	AS081030	1
UR081021	0	AS081030	0810213-7	SMP	U-235	714R11	AS081030	1
UR081021	0	AS081030	0810213-7	SMP	U-238	714R11	AS081030	1
UR081021	0	AS081030	0810213-8	SMP	U-232	714R11	AS081030	1
UR081021	0	AS081030	0810213-8	SMP	U-234	714R11	AS081030	1
UR081021	0	AS081030	0810213-8	SMP	U-235	714R11	AS081030	1
UR081021	0	AS081030	0810213-8	SMP	U-238	714R11	AS081030	1
UR081021	0	AS081030	0810213-9	SMP	U-232	714R11	AS081030	1
UR081021	0	AS081030	0810213-9	SMP	U-234	714R11	AS081030	1
UR081021	0	AS081030	0810213-9	SMP	U-235	714R11	AS081030	1
UR081021	0	AS081030	0810213-9	SMP	U-238	714R11	AS081030	1
UR081021	0	AS081030	AS081030	LCS	U-232	714R11	AS081030	1
UR081021	0	AS081030	AS081030	LCS	U-234	714R11	AS081030	1
UR081021	0	AS081030	AS081030	LCS	U-238	714R11	AS081030	1
UR081021	0	AS081030	AS081030	MB	U-232	714R11	AS081030	1
UR081021	0	AS081030	AS081030	MB	U-234	714R11	AS081030	1
UR081021	0	AS081030	AS081030	MB	U-235	714R11	AS081030	1
UR081021	0	AS081030	AS081030	MB	U-238	714R11	AS081030	1

STDEDDtbl

[illegible]

STDEDDtbl

ConcMeth	ExtractMet	%Moist	FinalResult	Flag	EPAQual	MDL	IDL	PRL
714R11	778R12		3.43					0.03
714R11	778R12		1					0.03
714R11	778R12		0.031	U				0.032
714R11	778R12		0.97					0.01
714R11	778R12		3.76					0.05
714R11	778R12		1.85					0.03
714R11	778R12		0.079	LT				0.012
714R11	778R12		1.76					0.03
714R11	778R12		3.76					0.01
714R11	778R12		1.14					0.01
714R11	778R12		0.062	LT				0.036
714R11	778R12		1.03					0.03
714R11	778R12		4					0.01
714R11	778R12		0.68					0.04
714R11	778R12		0.067	LT	NC			0.023
714R11	778R12		0.76					0.04
714R11	778R12		3.63					0.03
714R11	778R12		0.81					0.03
714R11	778R12		0.041	LT				0.03
714R11	778R12		0.83					0.01
714R11	778R12		3.74					0.03
714R11	778R12		1.23					0.01
714R11	778R12		0.055	LT				0.029
714R11	778R12		1.21					0.02
714R11	778R12		3.86					0.01
714R11	778R12		0.99					0.03
714R11	778R12		0.077	LT				0.028
714R11	778R12		0.88					0.03
714R11	778R12		3.84					0.03
714R11	778R12		1.15					0.03
714R11	778R12		0.051	LT				0.011
714R11	778R12		1.06					0.03
714R11	778R12		3.75					0.08
714R11	778R12		0.96					0.05
714R11	778R12		0.049	U				0.058
714R11	778R12		1.01					0.04
714R11	778R12		3.73					0.07
714R11	778R12		1.2					0.05
714R11	778R12		0.071	LT				0.011
714R11	778R12		1.14					0.04
714R11	778R12		3.7					0.07
714R11	778R12		0.8					0.06
714R11	778R12		0.068	LT				0.031
714R11	778R12		0.89					0.04
714R11	778R12		3.74					0.05
714R11	778R12		4.59	P				0.04
714R11	778R12		4.99	P				0.04
714R11	778R12		3.68					0.07
714R11	778R12		0.026	U				0.058
714R11	778R12		-0.013	U				0.052
714R11	778R12		-0.011	U				0.048

STDEDDtbl

SpkAmt	%Rec	RPD	UpperLim	LowerLim	RPDLim	TestType	FieldID	ClientName
4.394	78.1		110	30		TR	EOD1	Cabrera_N
						TA	EOD1	Cabrera_N
						TA	EOD1	Cabrera_N
						TA	EOD1	Cabrera_N
4.39	85.6		110	30		TR	Background	Cabrera_N
						TA	Background	Cabrera_N
						TA	Background	Cabrera_N
						TA	Background	Cabrera_N
4.387	85.8		110	30		TR	10th SOF 1	Cabrera_N
						TA	10th SOF 1	Cabrera_N
						TA	10th SOF 1	Cabrera_N
						TA	10th SOF 1	Cabrera_N
4.42	90.5		110	30		TR	10th SOF 2	Cabrera_N
						TA	10th SOF 2	Cabrera_N
						TA	10th SOF 2	Cabrera_N
						TA	10th SOF 2	Cabrera_N
4.386	82.8		110	30		TR	10th SOF 2	Cabrera_N
						TA	10th SOF 2	Cabrera_N
						TA	10th SOF 2	Cabrera_N
						TA	10th SOF 2	Cabrera_N
4.425	84.5		110	30		TR	BDA 1	Cabrera_N
						TA	BDA 1	Cabrera_N
						TA	BDA 1	Cabrera_N
						TA	BDA 1	Cabrera_N
4.378	88.1		110	30		TR	CDC 1	Cabrera_N
						TA	CDC 1	Cabrera_N
						TA	CDC 1	Cabrera_N
						TA	CDC 1	Cabrera_N
4.414	87		110	30		TR	BHQ 1	Cabrera_N
						TA	BHQ 1	Cabrera_N
						TA	BHQ 1	Cabrera_N
						TA	BHQ 1	Cabrera_N
4.406	85.1		110	30		TR	Clinic 1	Cabrera_N
						TA	Clinic 1	Cabrera_N
						TA	Clinic 1	Cabrera_N
						TA	Clinic 1	Cabrera_N
4.379	85.1		110	30		TR	EACH 1	Cabrera_N
						TA	EACH 1	Cabrera_N
						TA	EACH 1	Cabrera_N
						TA	EACH 1	Cabrera_N
4.39	84.2		110	30		TR	CF 1	Cabrera_N
						TA	CF 1	Cabrera_N
						TA	CF 1	Cabrera_N
						TA	CF 1	Cabrera_N
4.395	85.1		110	30		TR	LABQC	LABQC
4.433	103		122	82		TA	LABQC	LABQC
4.602	108		122	82		TA	LABQC	LABQC
4.395	83.8		110	30		TR	LABQC	LABQC
						TA	LABQC	LABQC
						TA	LABQC	LABQC
						TA	LABQC	LABQC

STDEDDtbl

[illegible]

STDEDDtbl

Suite	TPU	DER	DERLIM	MDC	REQMDC	TIC	CASNO	FRACTYP
	0.54			0.03		FALSE	14158-29-3	TO
	0.2			0.03	0.1	FALSE	13966-29-5	TO
	0.027			0.032	0.1	FALSE	15117-96-1	TO
	0.19			0.01	0.1	FALSE	7440-61-1	TO
	0.59			0.05		FALSE	14158-29-3	TO
	0.34			0.03	0.1	FALSE	13966-29-5	TO
	0.039			0.012	0.1	FALSE	15117-96-1	TO
	0.32			0.03	0.1	FALSE	7440-61-1	TO
	0.59			0.01		FALSE	14158-29-3	TO
	0.22			0.01	0.1	FALSE	13966-29-5	TO
	0.036			0.036	0.1	FALSE	15117-96-1	TO
	0.2			0.03	0.1	FALSE	7440-61-1	TO
	0.62			0.01		FALSE	14158-29-3	TO
	0.14	0.59	2.13	0.04	0.1	FALSE	13966-29-5	TO
	0.035	0.572	2.13	0.023	0.1	FALSE	15117-96-1	TO
	0.15	0.337	2.13	0.04	0.1	FALSE	7440-61-1	TO
	0.57			0.03		FALSE	14158-29-3	TO
	0.17			0.03	0.1	FALSE	13966-29-5	TO
	0.029			0.03	0.1	FALSE	15117-96-1	TO
	0.17			0.01	0.1	FALSE	7440-61-1	TO
	0.58			0.03		FALSE	14158-29-3	TO
	0.23			0.01	0.1	FALSE	13966-29-5	TO
	0.033			0.029	0.1	FALSE	15117-96-1	TO
	0.23			0.02	0.1	FALSE	7440-61-1	TO
	0.6			0.01		FALSE	14158-29-3	TO
	0.19			0.03	0.1	FALSE	13966-29-5	TO
	0.038			0.028	0.1	FALSE	15117-96-1	TO
	0.18			0.03	0.1	FALSE	7440-61-1	TO
	0.6			0.03		FALSE	14158-29-3	TO
	0.22			0.03	0.1	FALSE	13966-29-5	TO
	0.029			0.011	0.1	FALSE	15117-96-1	TO
	0.2			0.03	0.1	FALSE	7440-61-1	TO
	0.59			0.08		FALSE	14158-29-3	TO
	0.19			0.05	0.1	FALSE	13966-29-5	TO
	0.041			0.058	0.1	FALSE	15117-96-1	TO
	0.2			0.04	0.1	FALSE	7440-61-1	TO
	0.59			0.07		FALSE	14158-29-3	TO
	0.23			0.05	0.1	FALSE	13966-29-5	TO
	0.036			0.011	0.1	FALSE	15117-96-1	TO
	0.22			0.04	0.1	FALSE	7440-61-1	TO
	0.58			0.07		FALSE	14158-29-3	TO
	0.17			0.06	0.1	FALSE	13966-29-5	TO
	0.038			0.031	0.1	FALSE	15117-96-1	TO
	0.18			0.04	0.1	FALSE	7440-61-1	TO
	0.59			0.05		FALSE	14158-29-3	
	0.76		2.13	0.04	0.1	FALSE	13966-29-5	
	0.83		2.13	0.04	0.1	FALSE	7440-61-1	
	0.58			0.07		FALSE	14158-29-3	
	0.035			0.058	0.1	FALSE	13966-29-5	
	0.021			0.052	0.1	FALSE	15117-96-1	
	0.02			0.048	0.1	FALSE	7440-61-1	

ATTACHMENT 2

FIELD NOTES

Not to scale

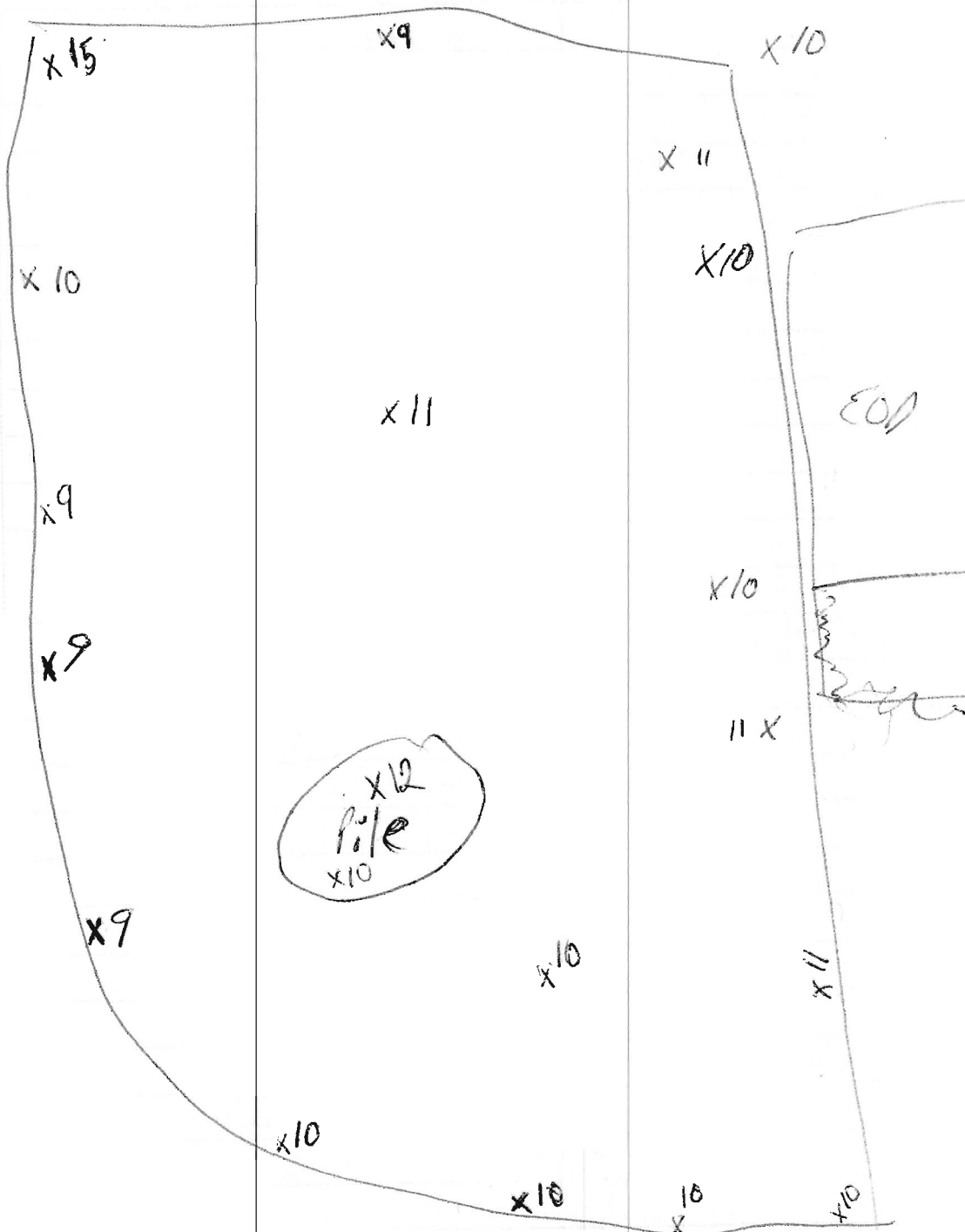
ASOS

TN

prem/hr

10/14/08 4:30 PM

Site ID ASOS ~~Reading~~ Dose Rates



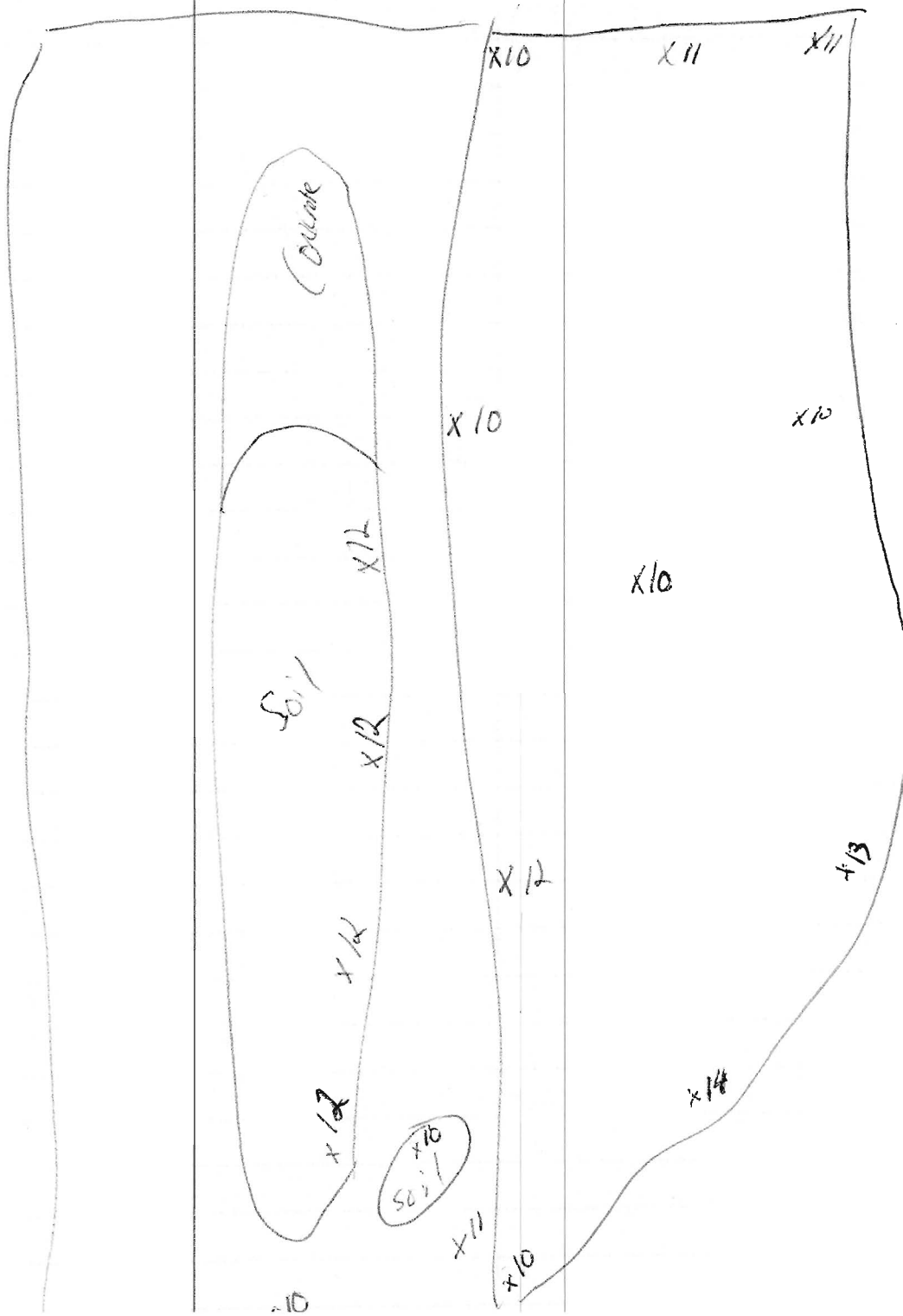
Paradise
Tower

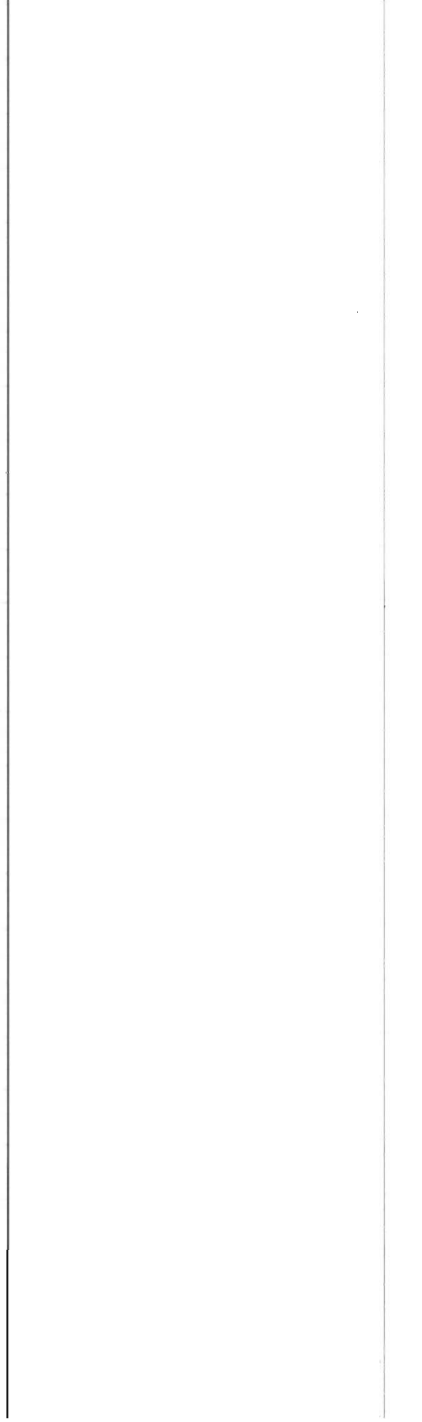
prem/hr

N

10/14/88 Espn.

Site ID - 10 in Special Frags Construction





NC
N7

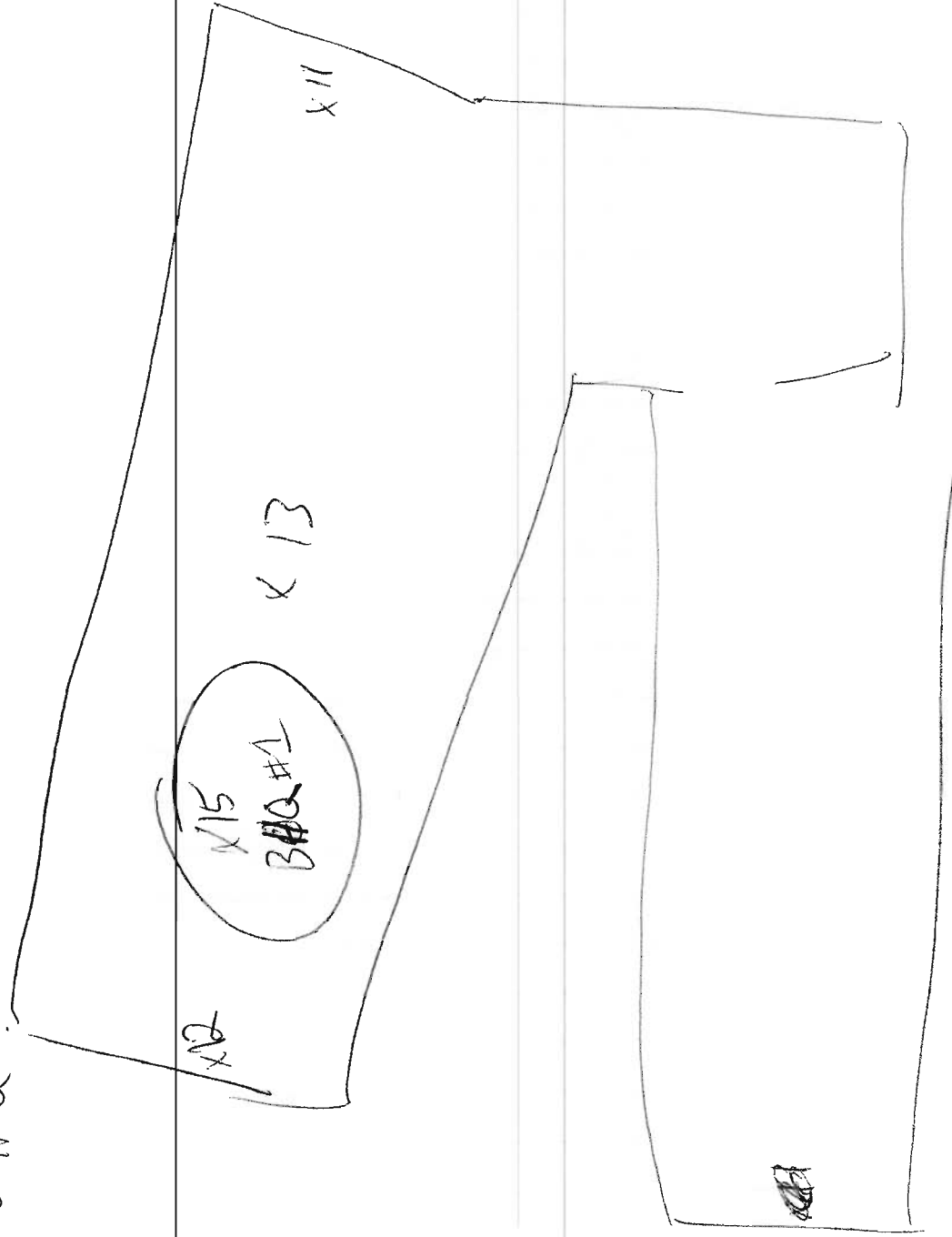


Barracks Development Area



Brigade HQ

↑ N



1050F Construction

x10

x1080F

1050F
x12
1050F
x12
1050F
x12

x11
x10 14:11

x15

x17

x10

ROAD

Field south of 10th St Construction

N



ROAD

XE001

Clear Fill

100-100

CF1
+10

10

Clear Fill Site

EACH

X/D
EACH

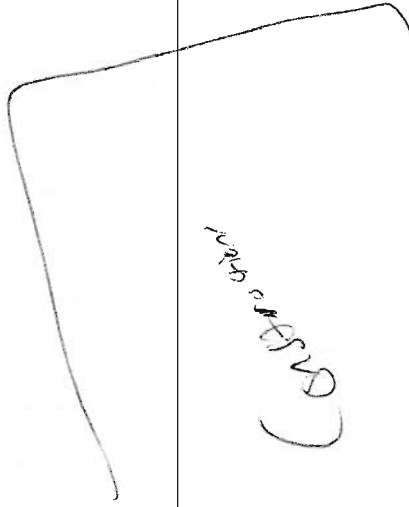
Row

XII

$\frac{1}{\sqrt{2}}$

H62(56)

Clinic



(overhead)

xl
Clinic 1



Road

x10

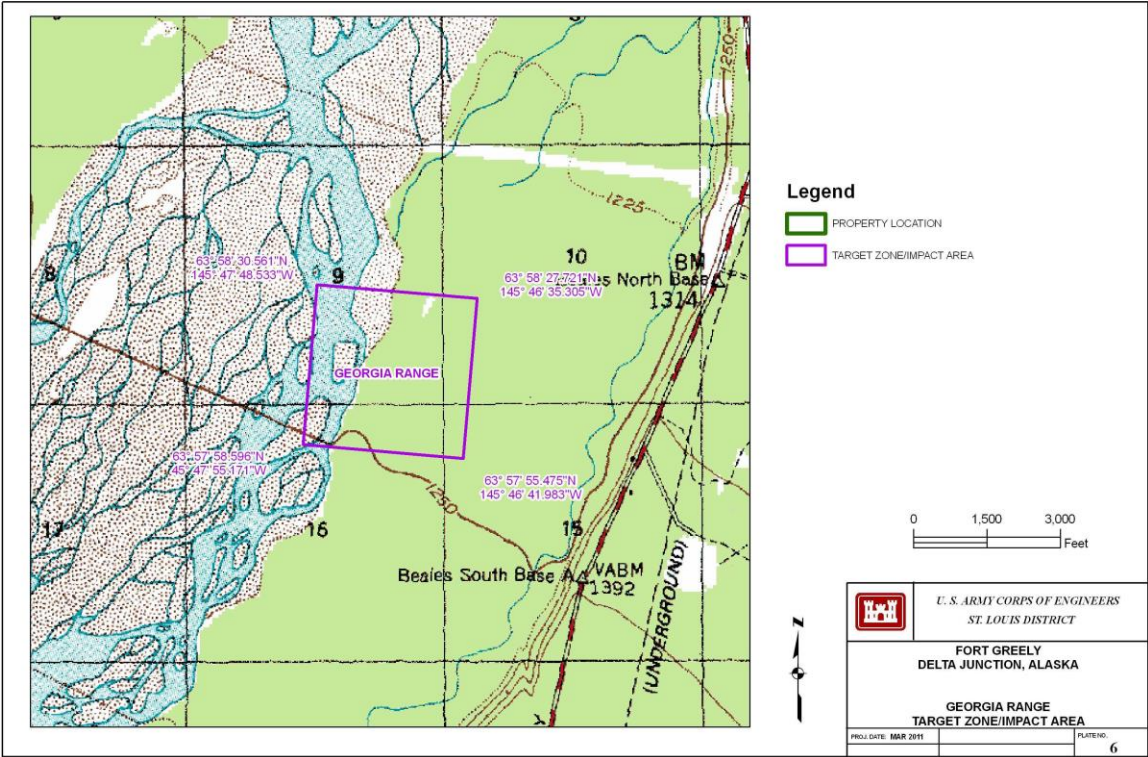
Parking Lot

C/Box

Contents

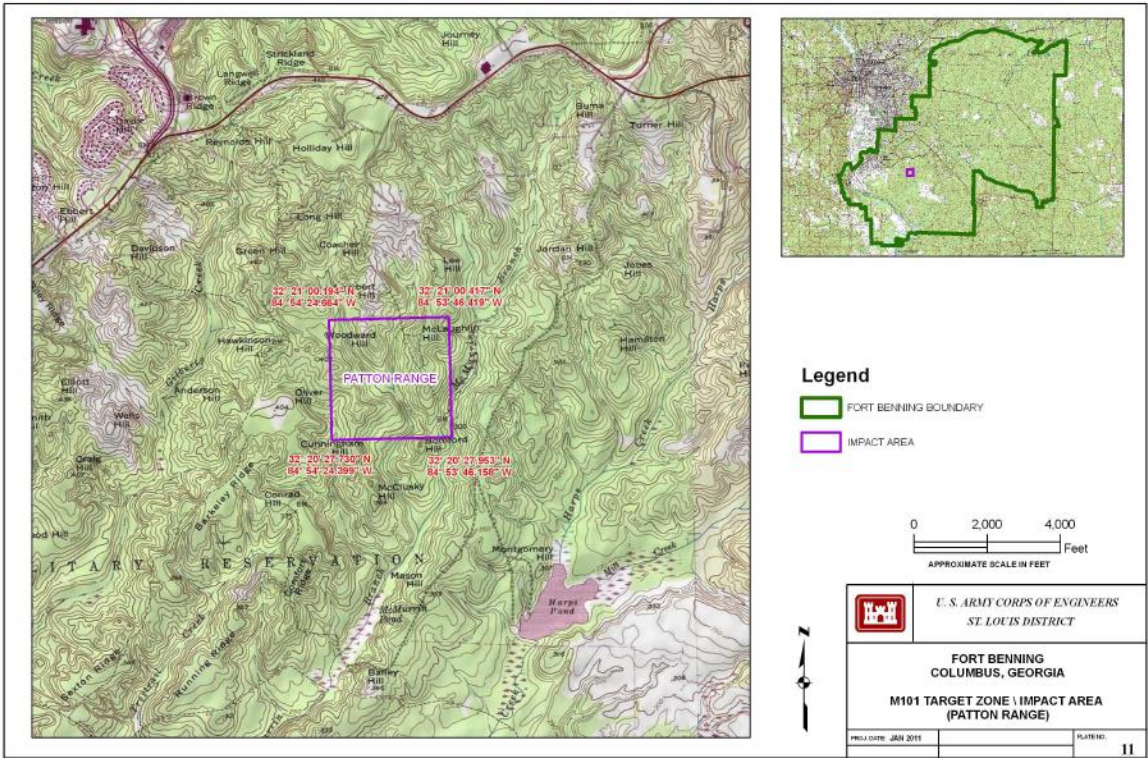
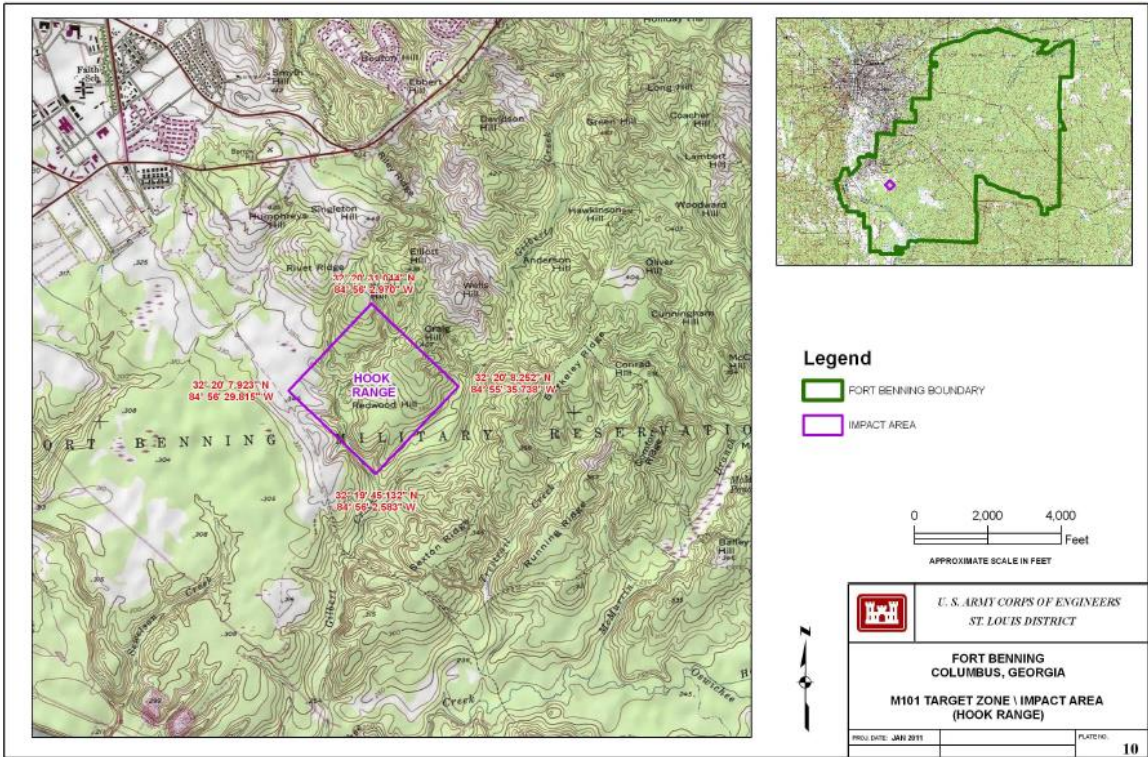
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Donnelly Training Area, Fort Wainwright AK

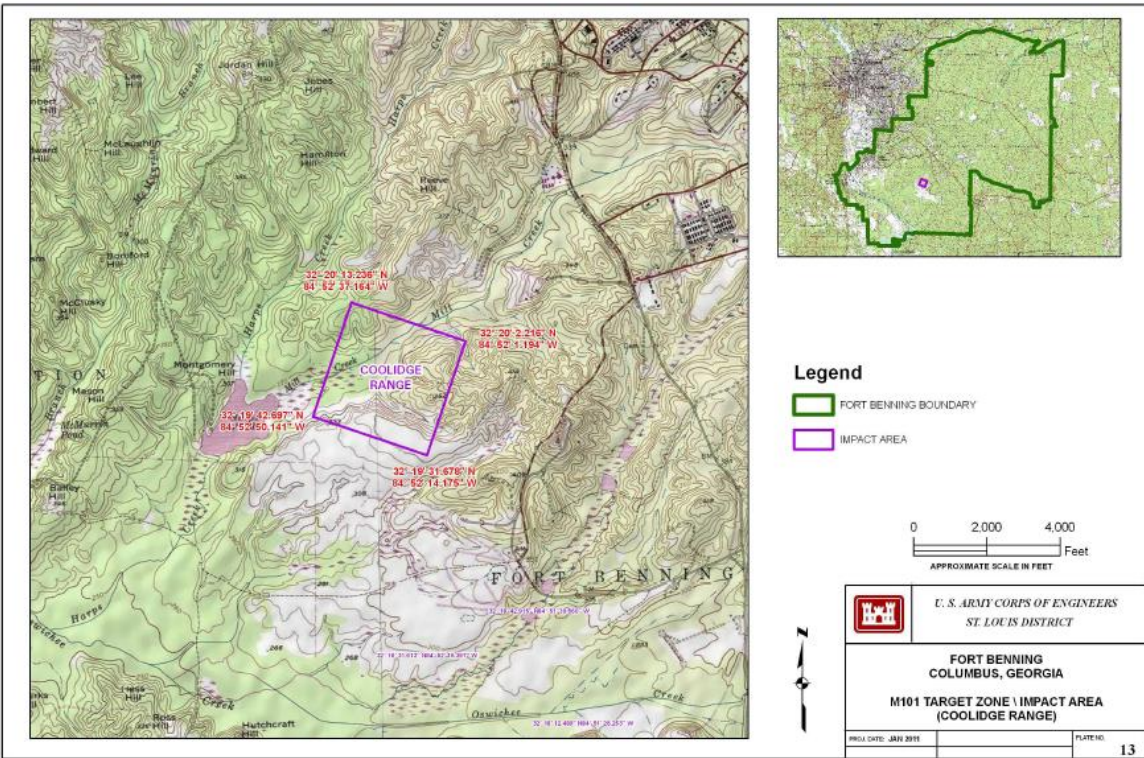
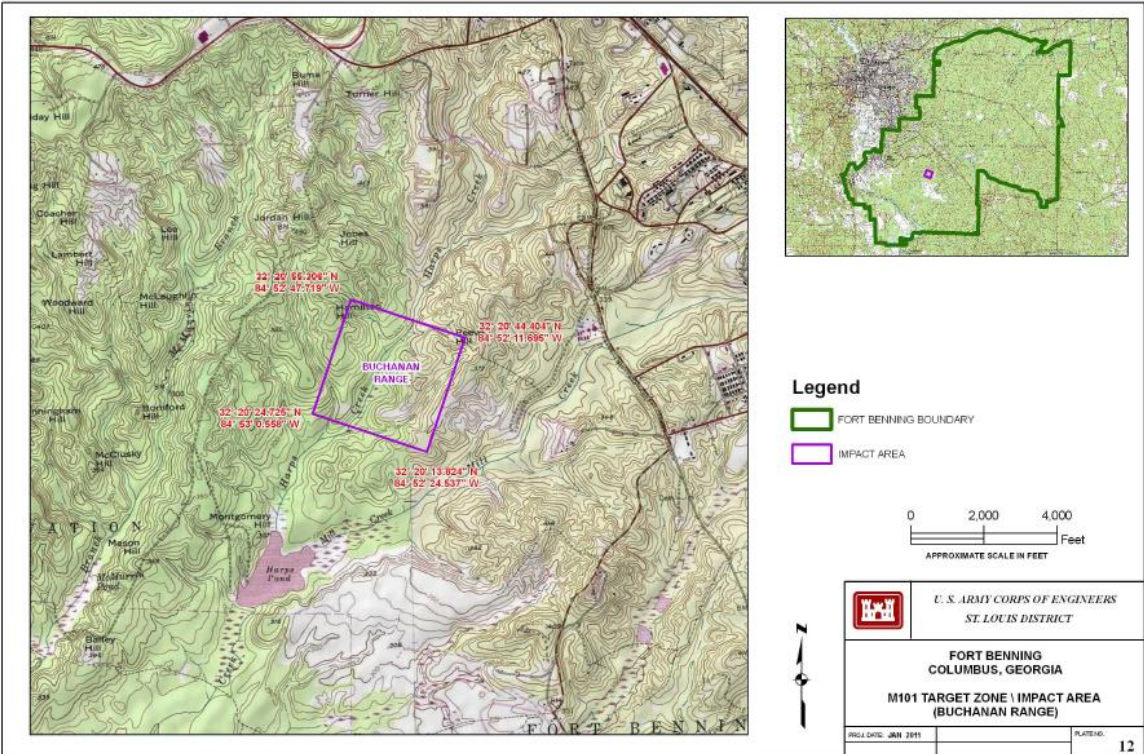


Area formerly part of Fort Greely, now under administrative control of Fort Wainwright

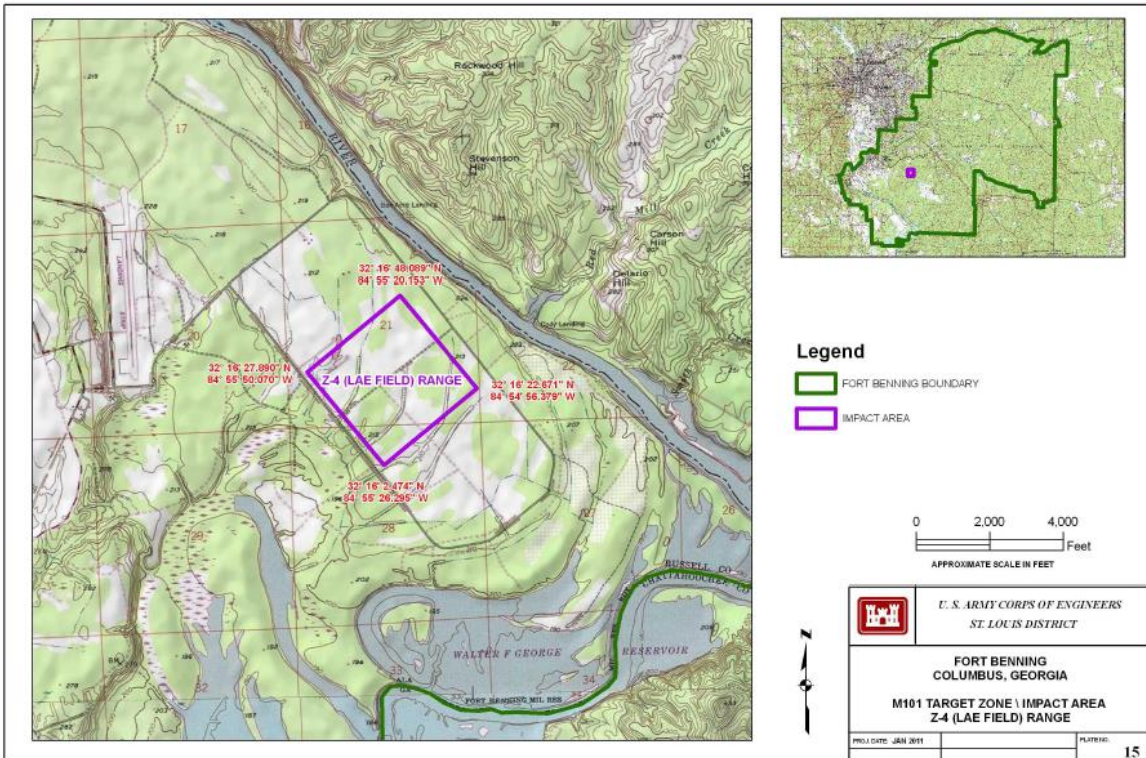
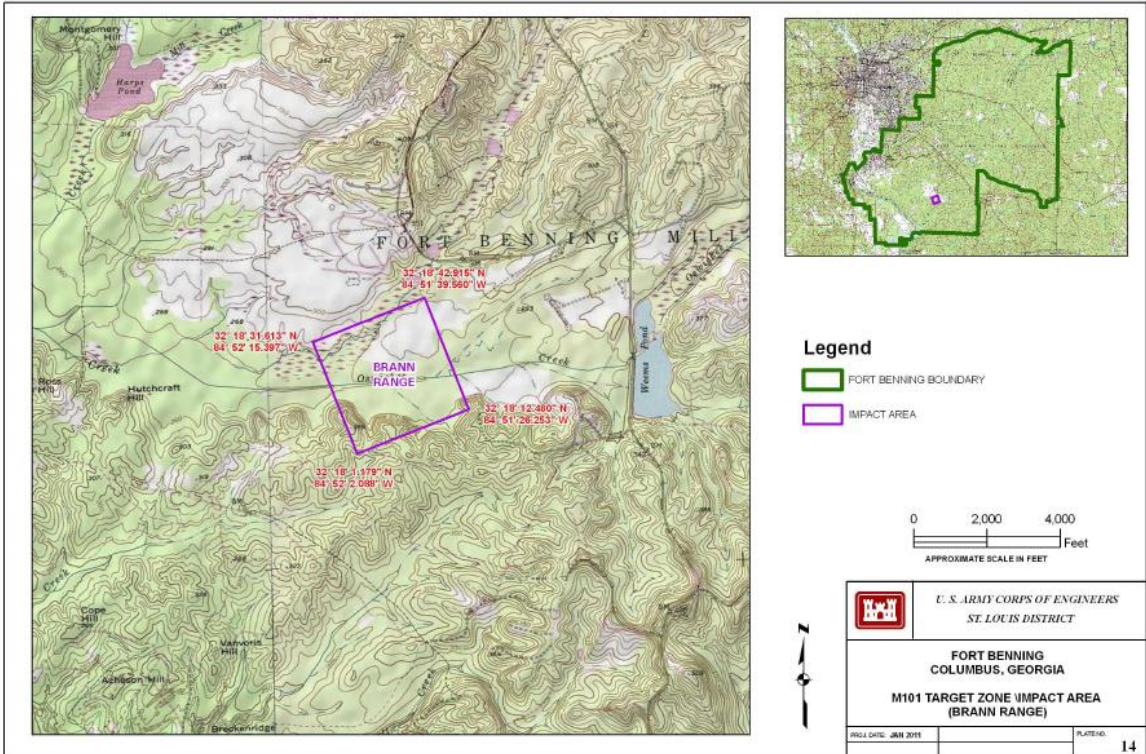
Fort Benning GA



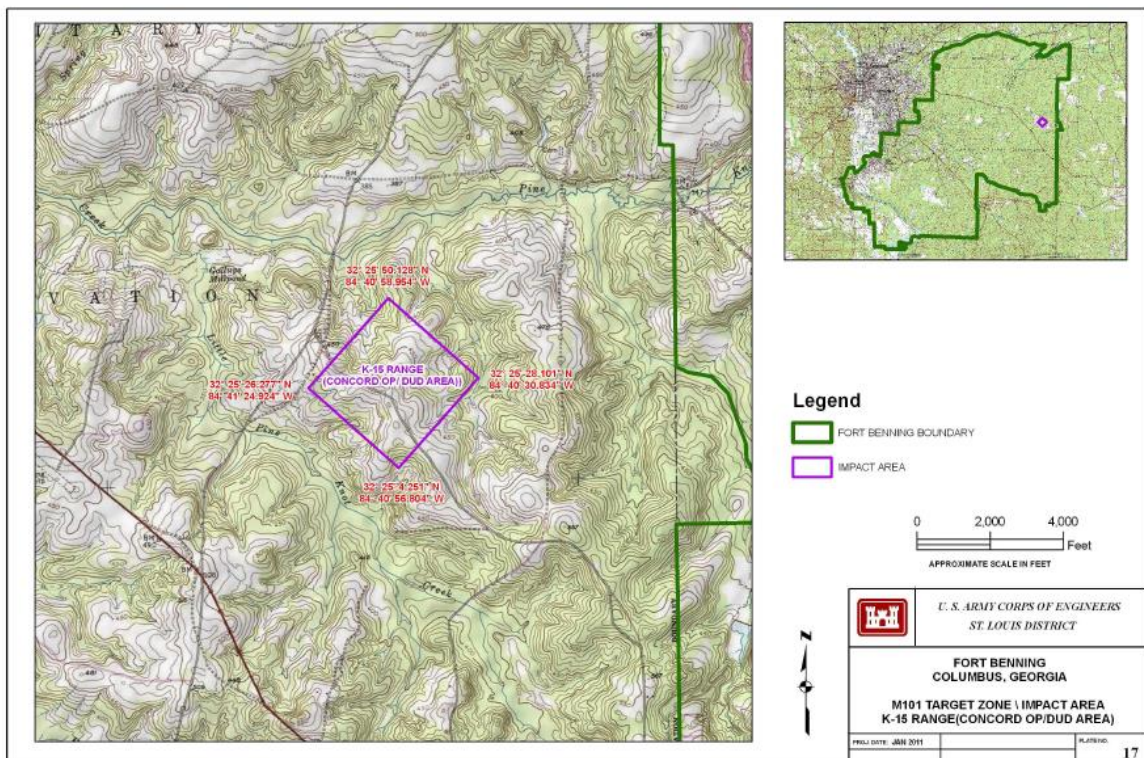
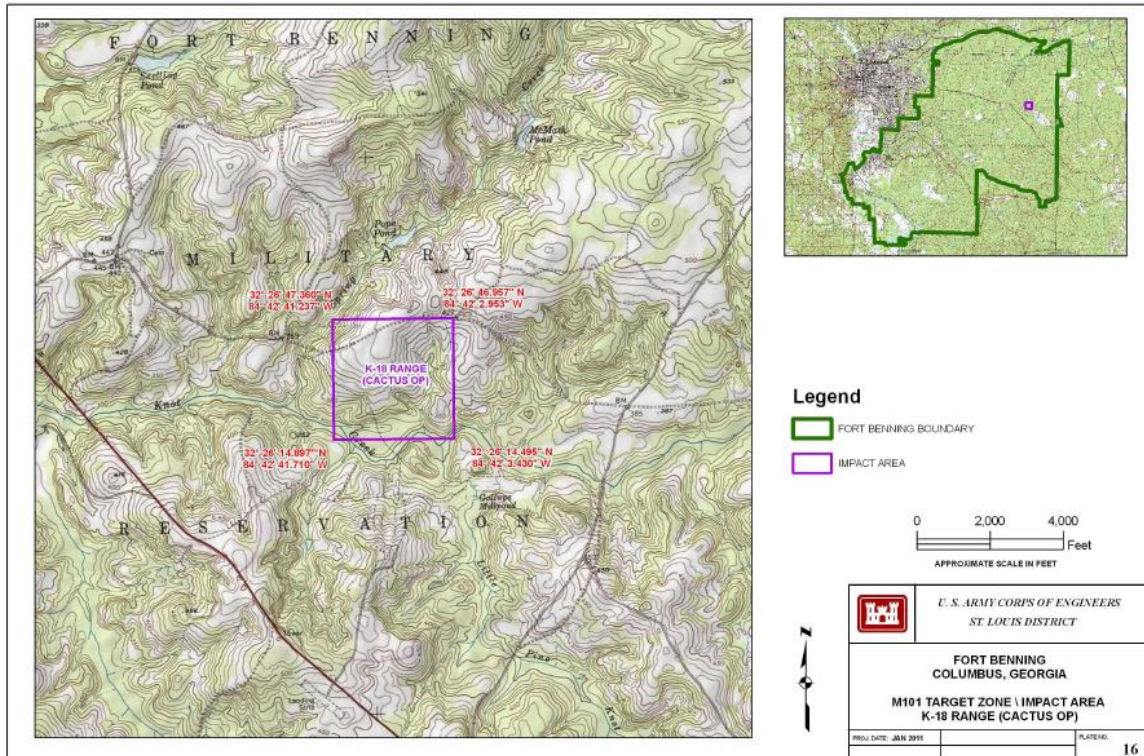
M101 Impact Areas

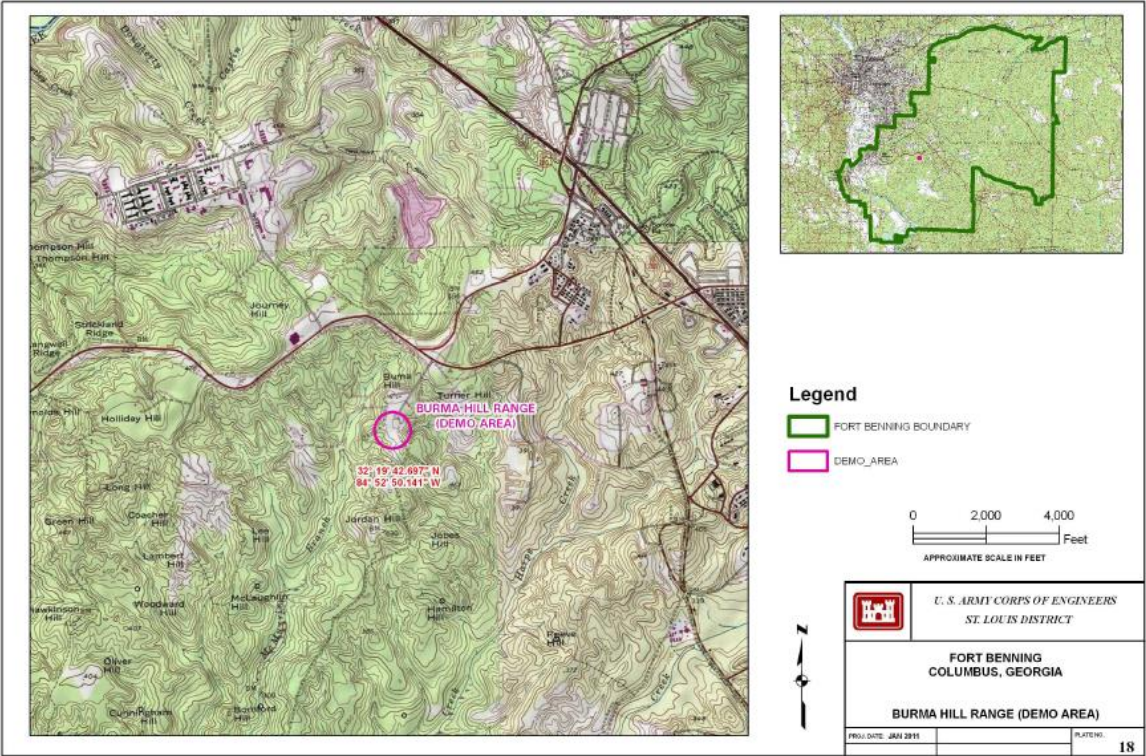


M101 Impact Areas

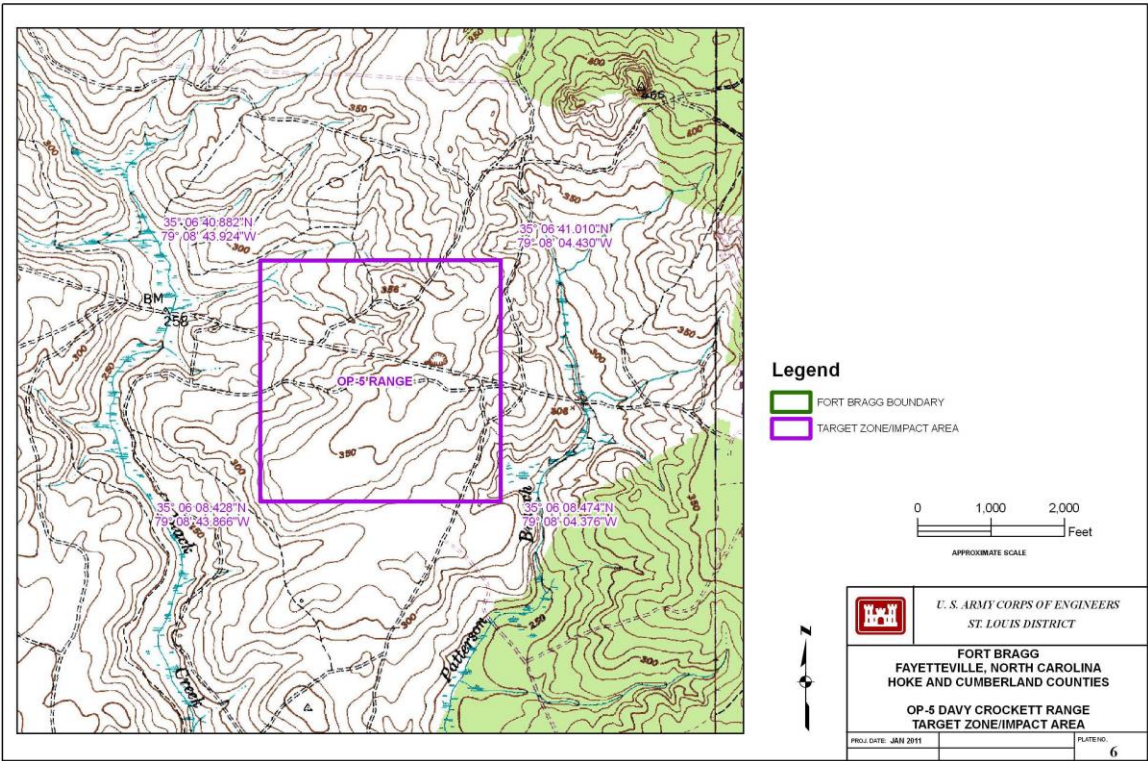


M101 Impact Areas

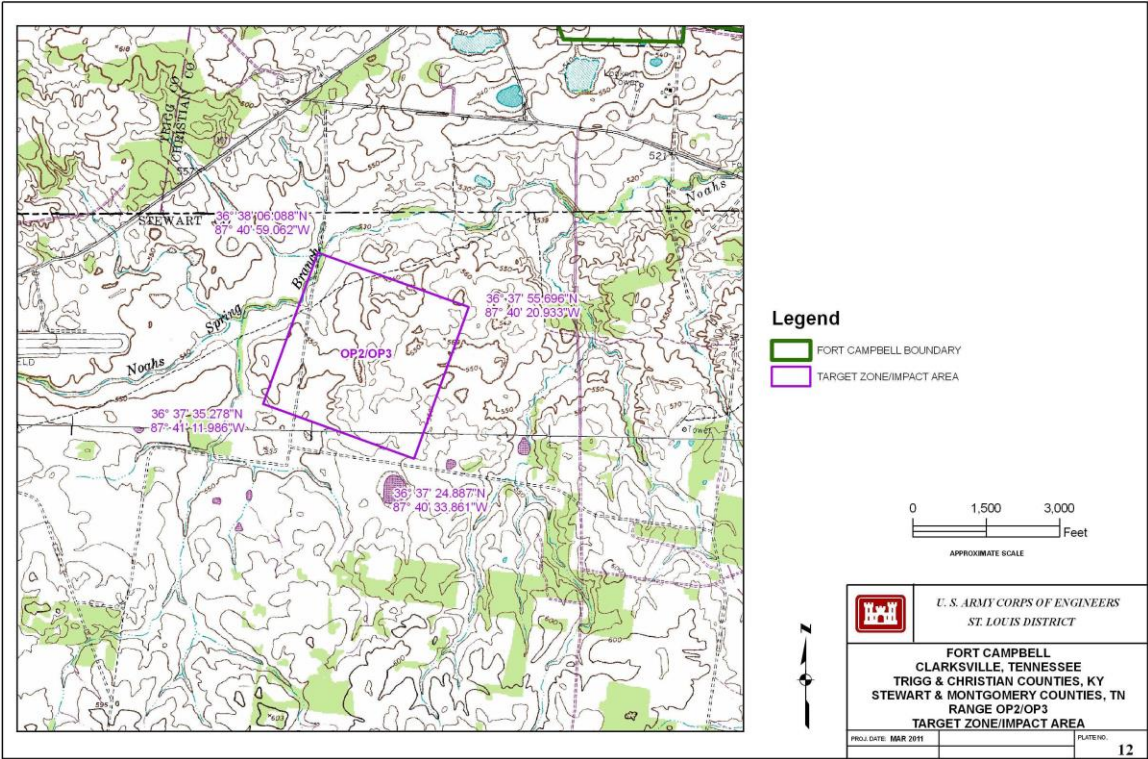




Fort Bragg NC

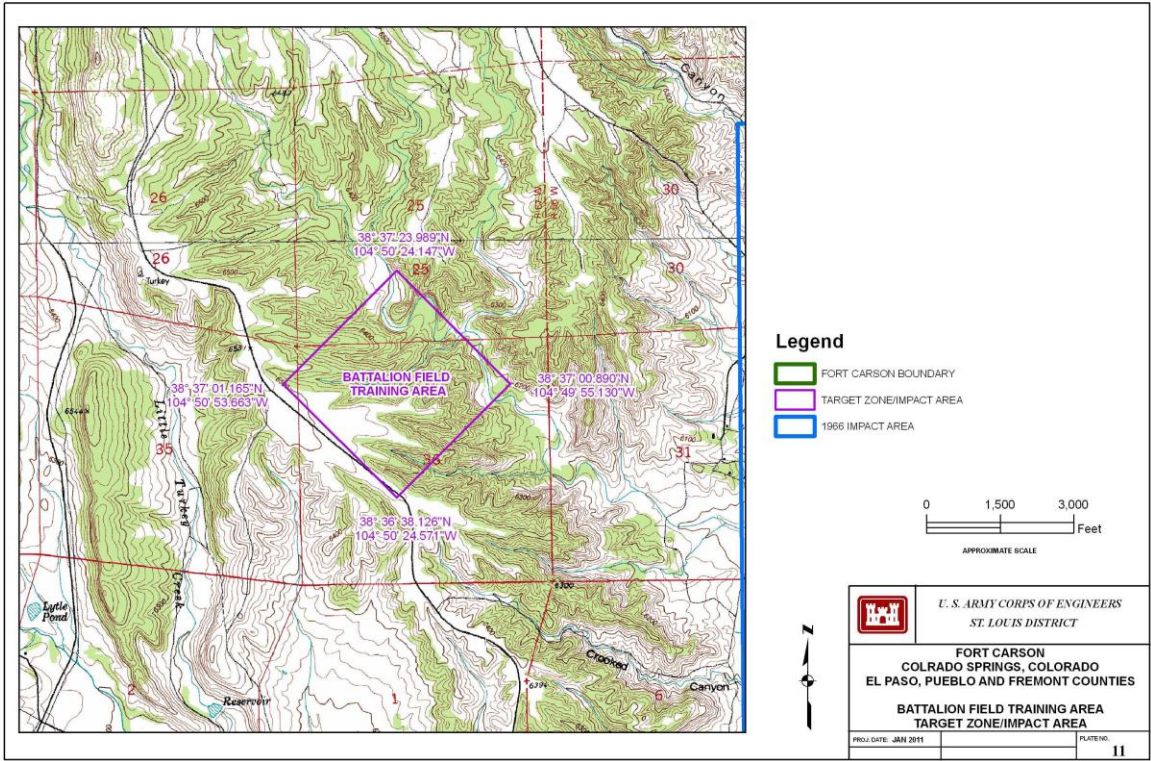
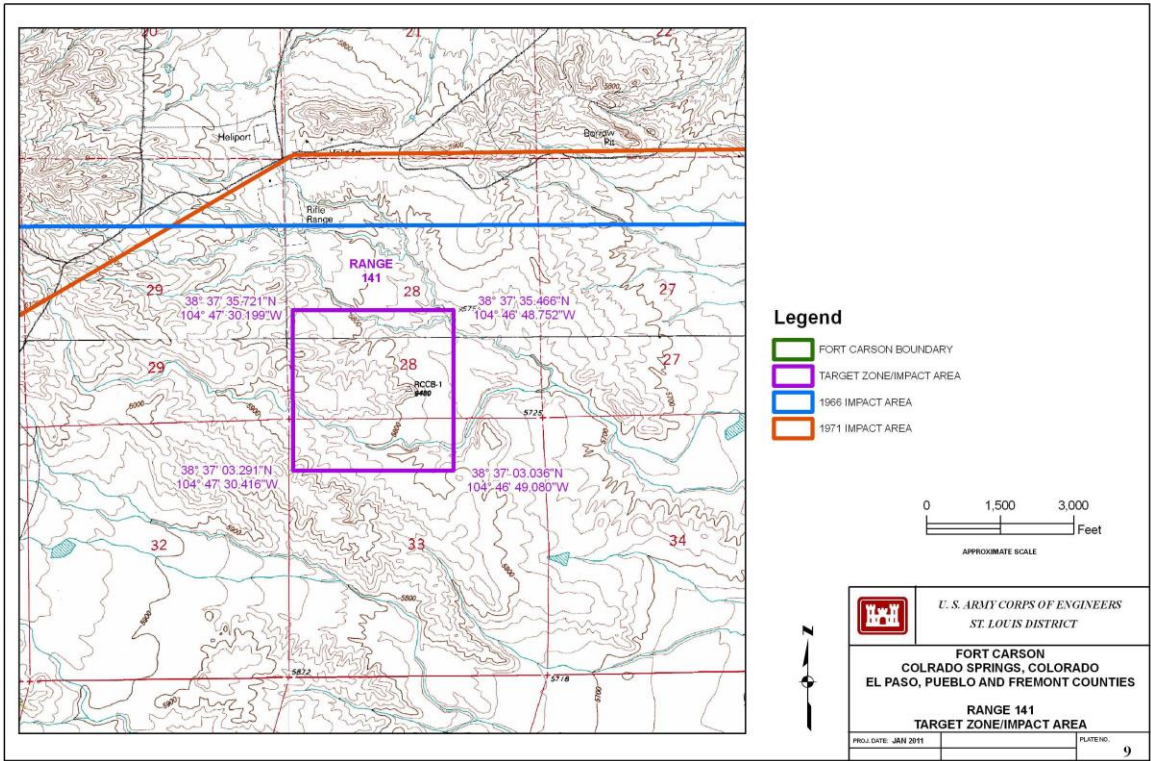


Fort Campbell KY

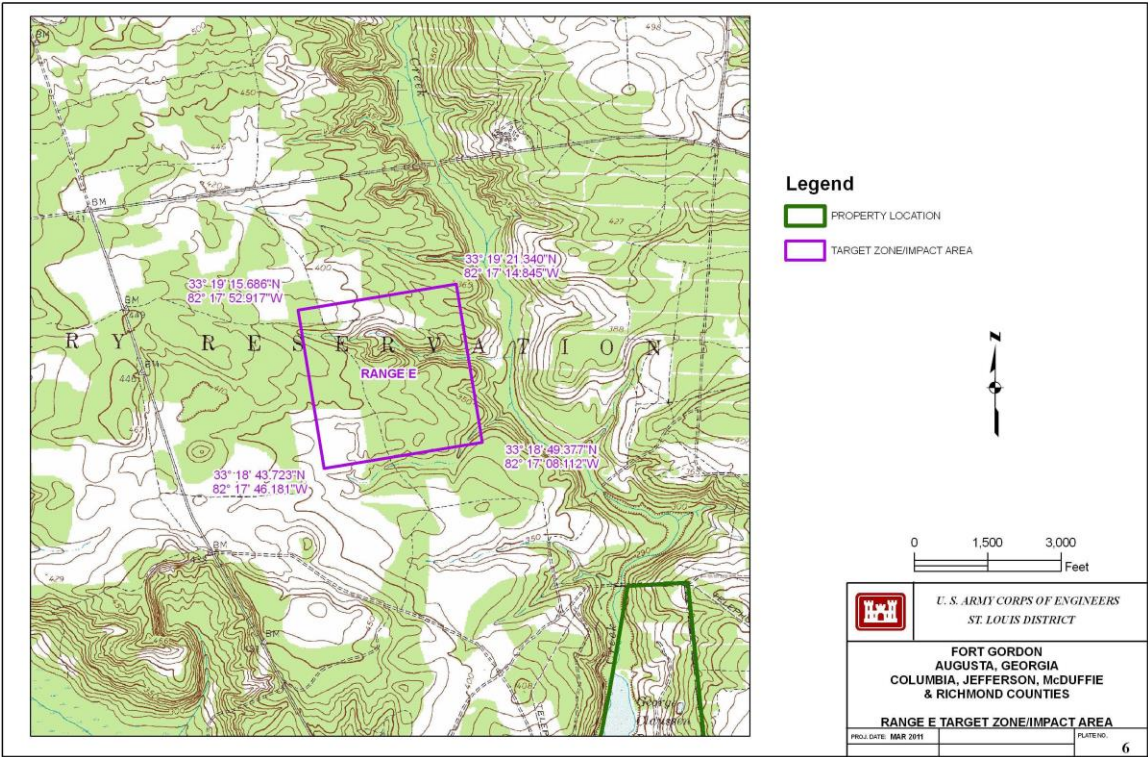


The M101 target zone/impact area is in Tennessee

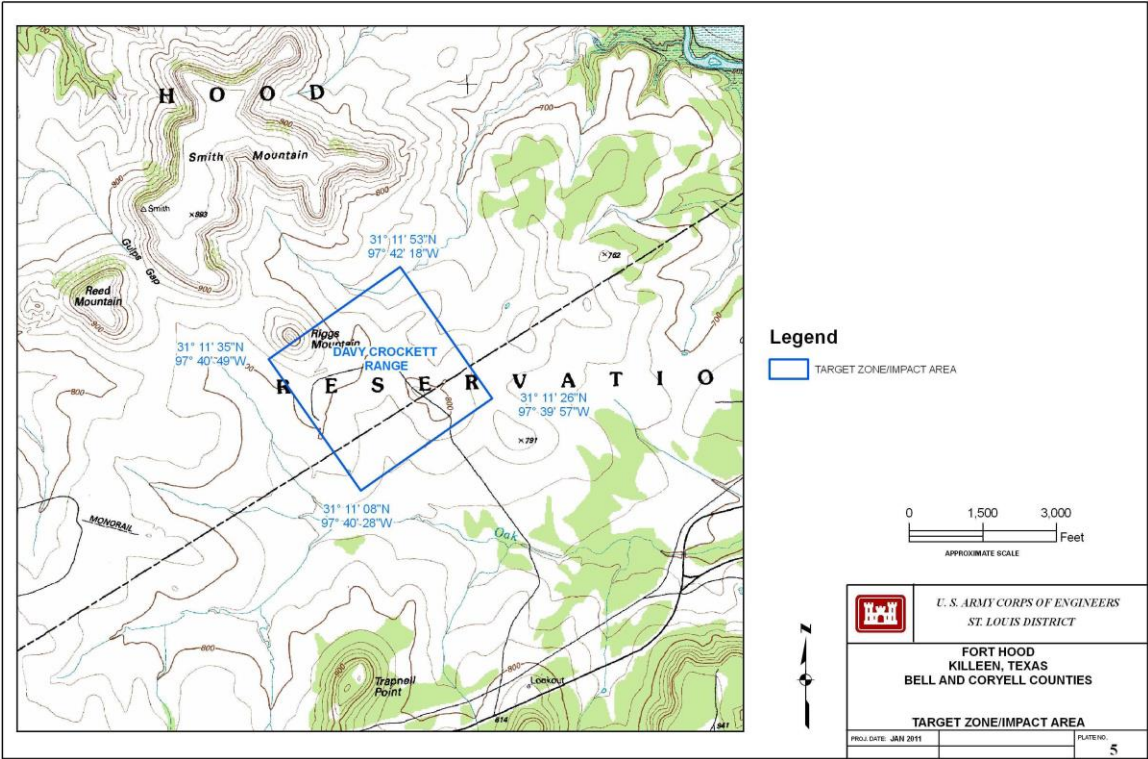
Fort Carson CO



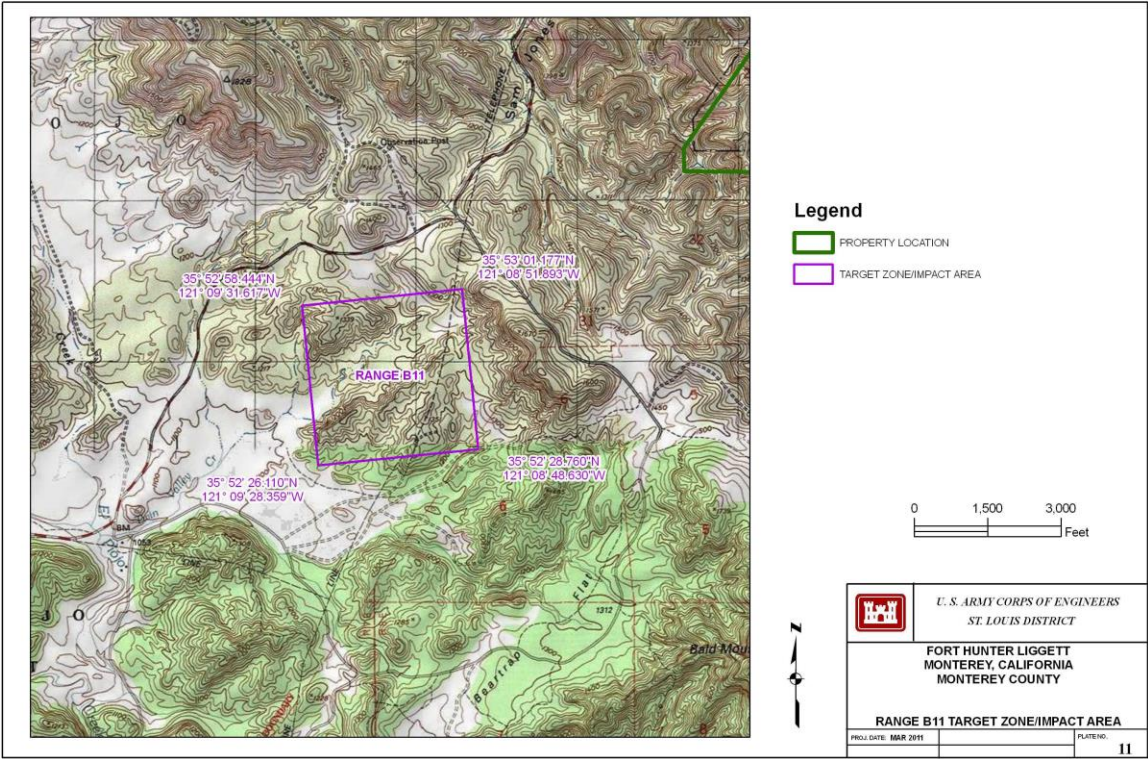
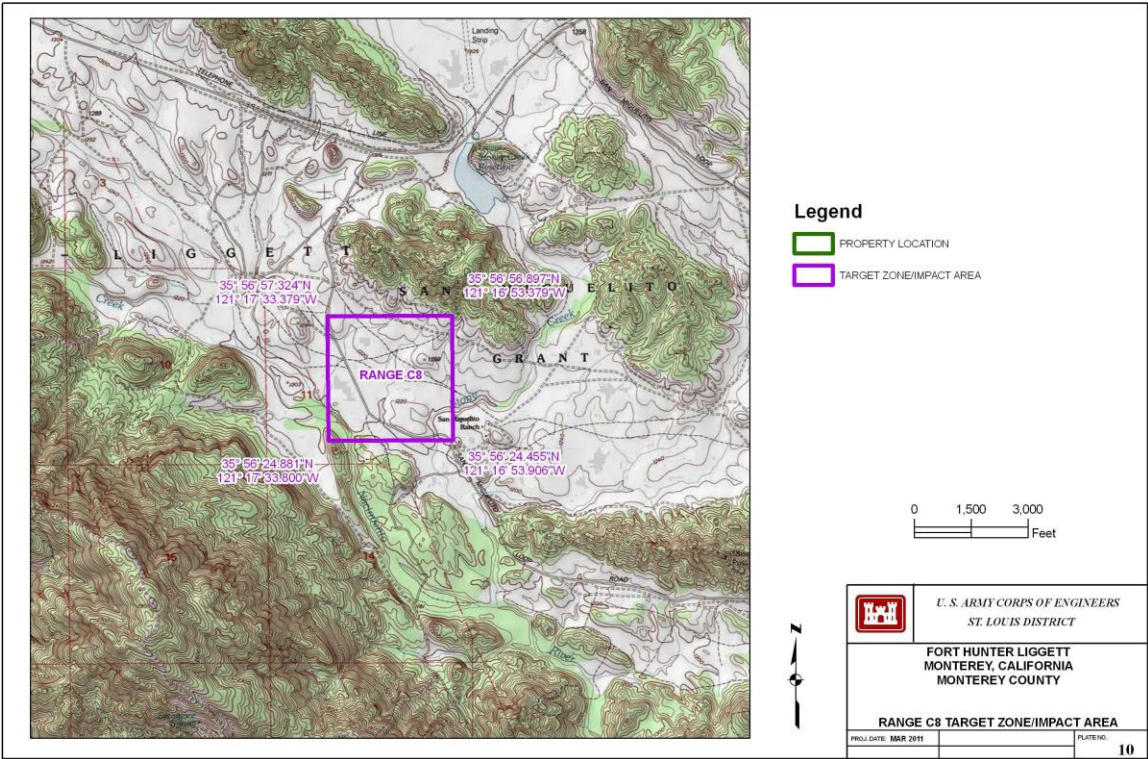
Fort Gordon GA

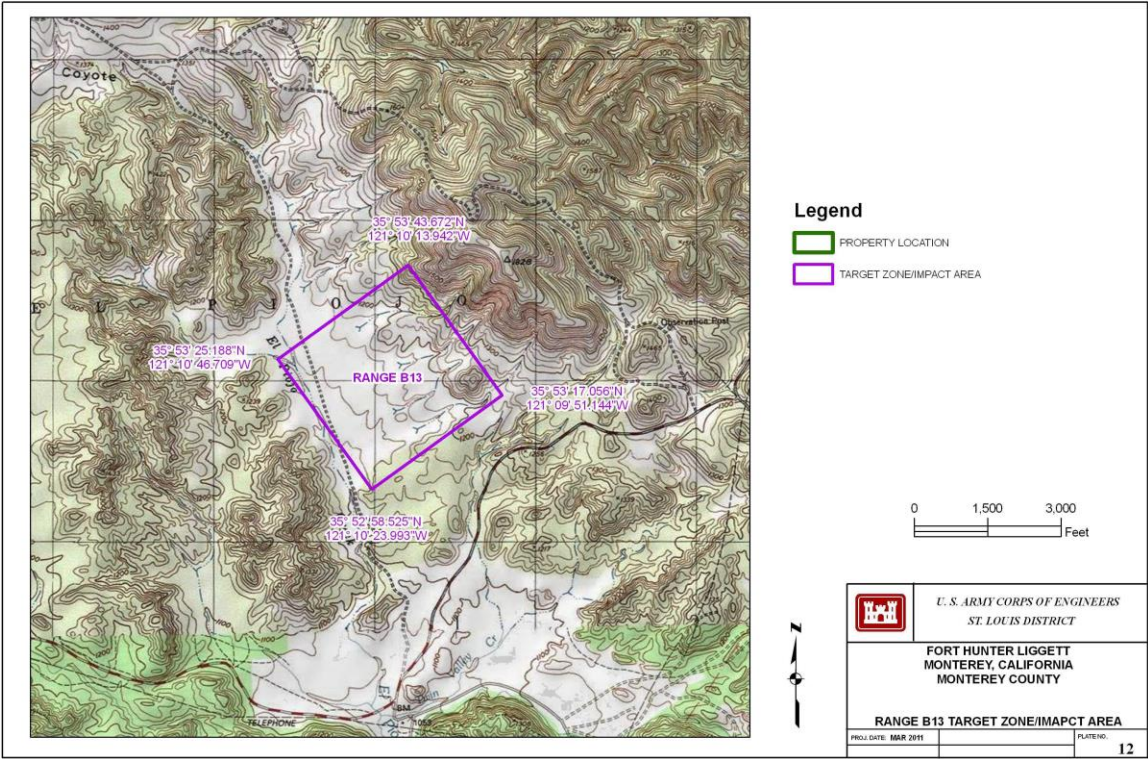


Fort Hood TX

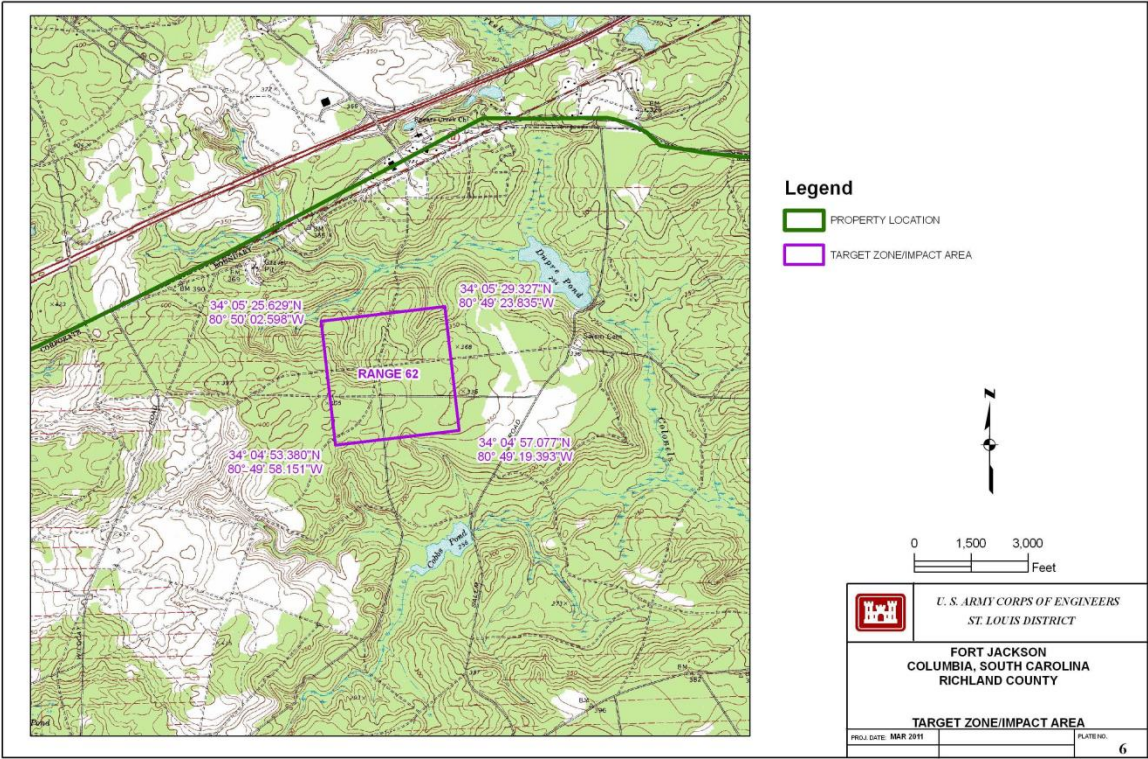


Fort Hunter Liggett CA

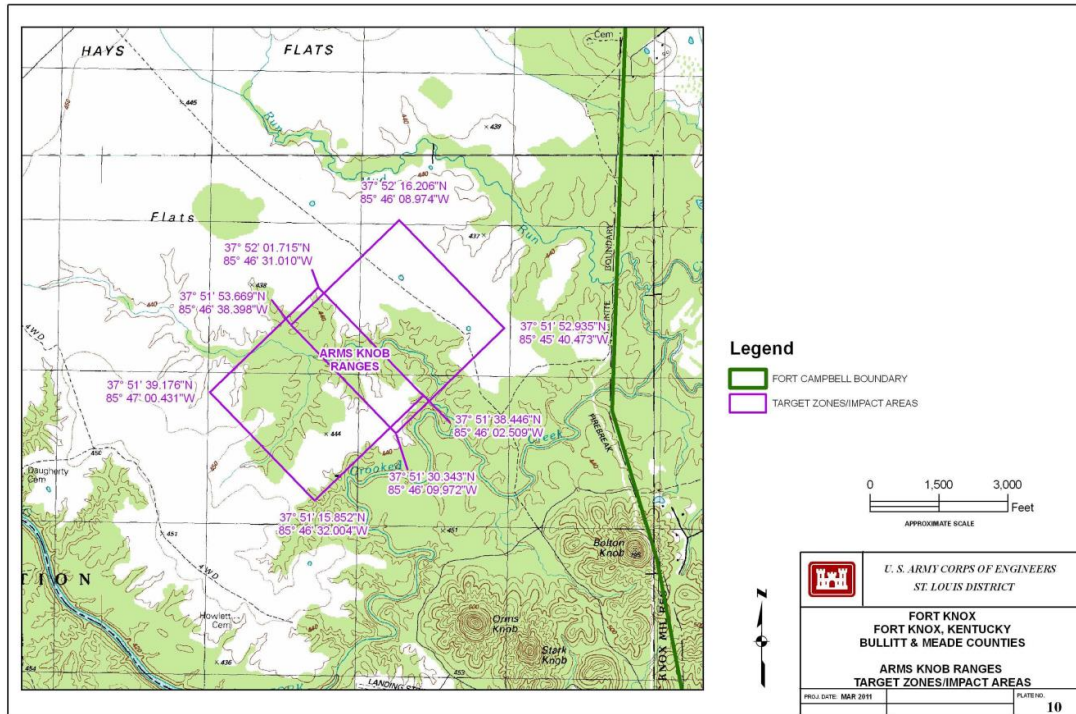




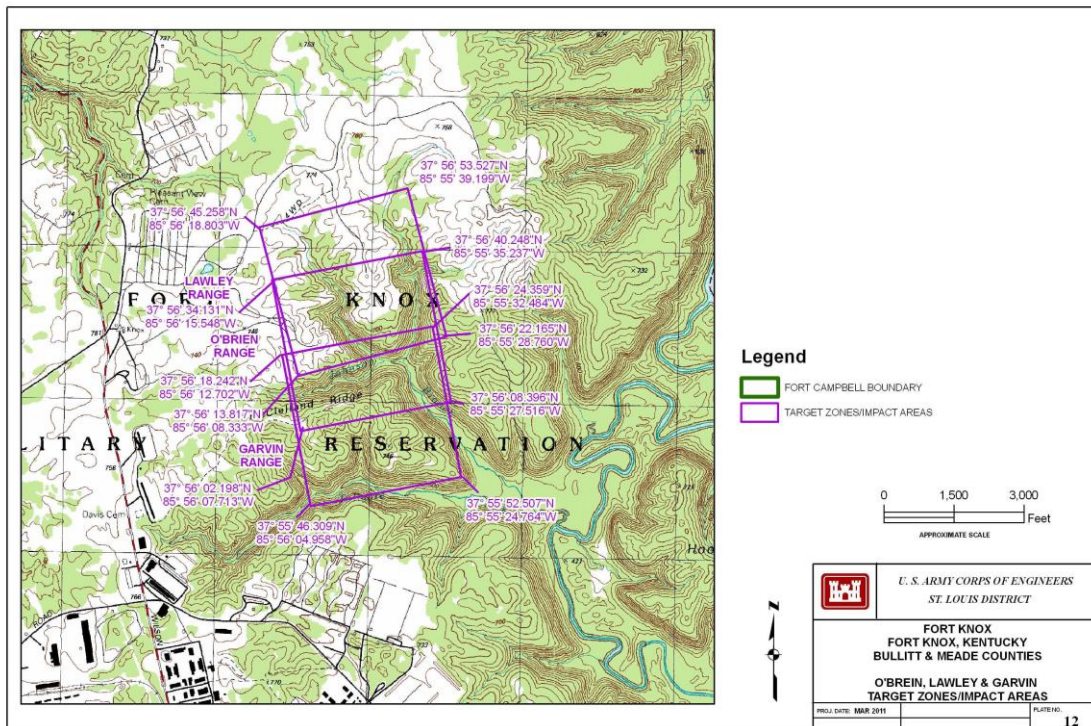
Fort Jackson SC



Fort Knox KY

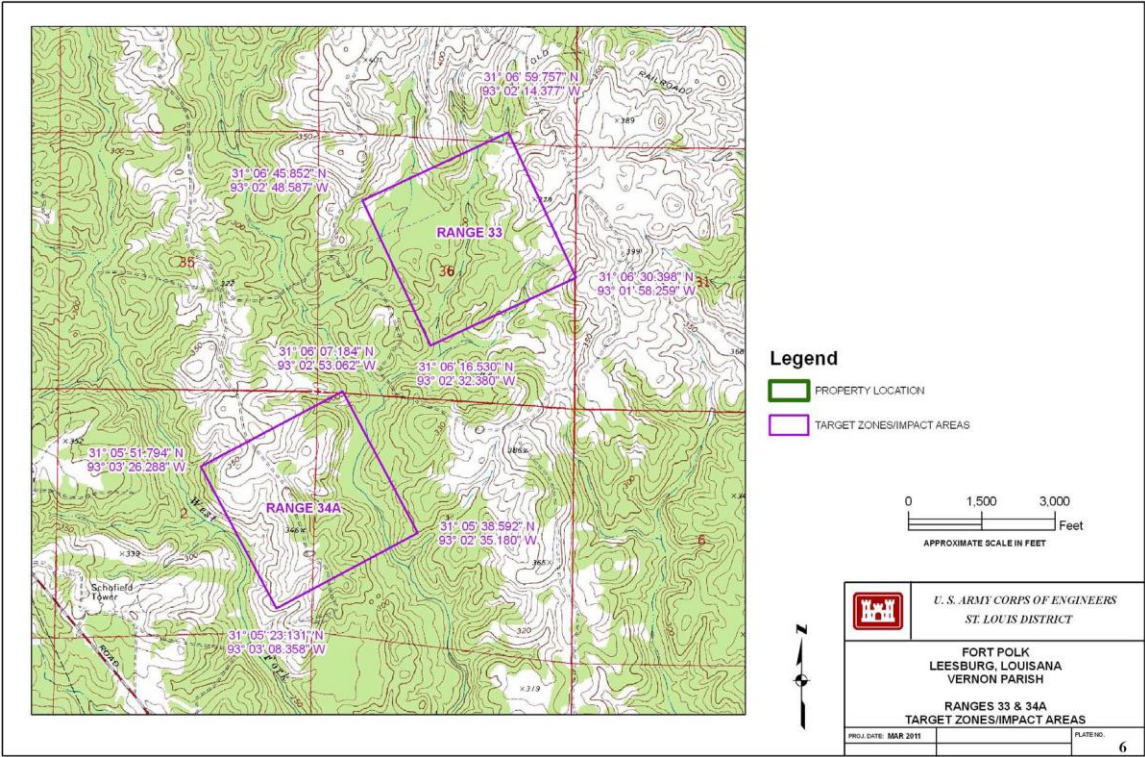


The legend should read "FORT KNOX BOUNDARY"



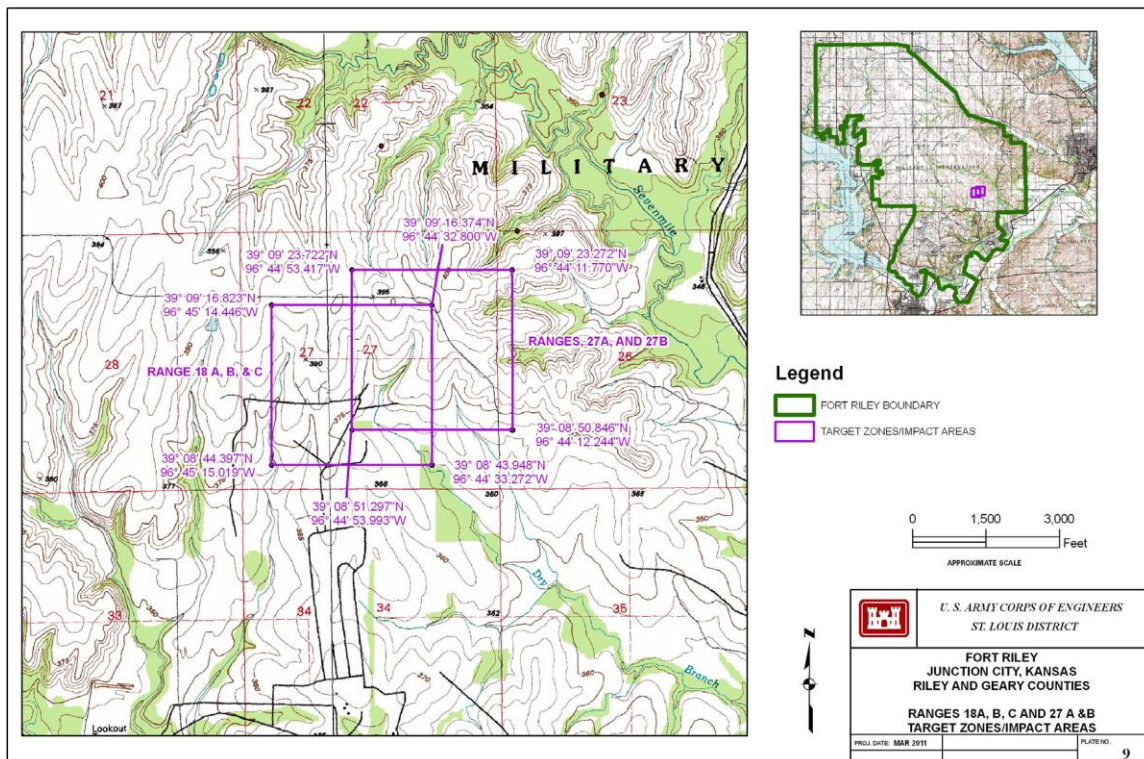
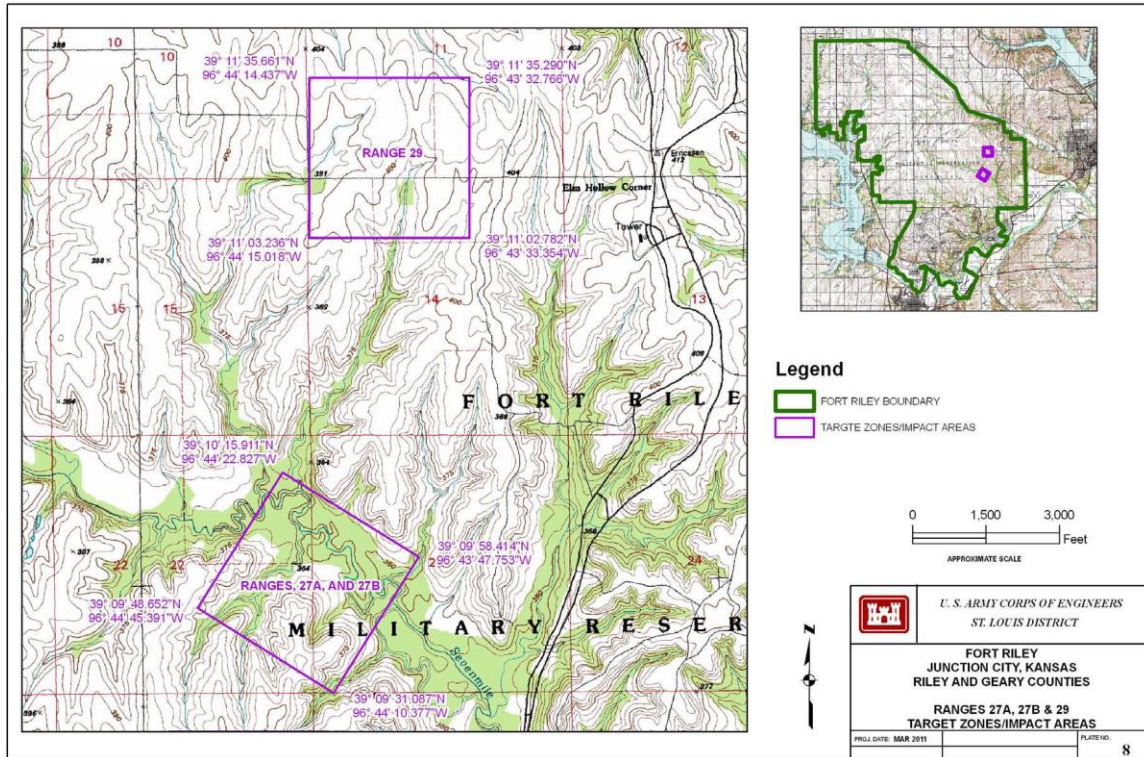
M101 firing was on the O'Brien (aka O'Brein) Range.
The legend should read "FORT KNOX BOUNDARY."

Fort Polk LA

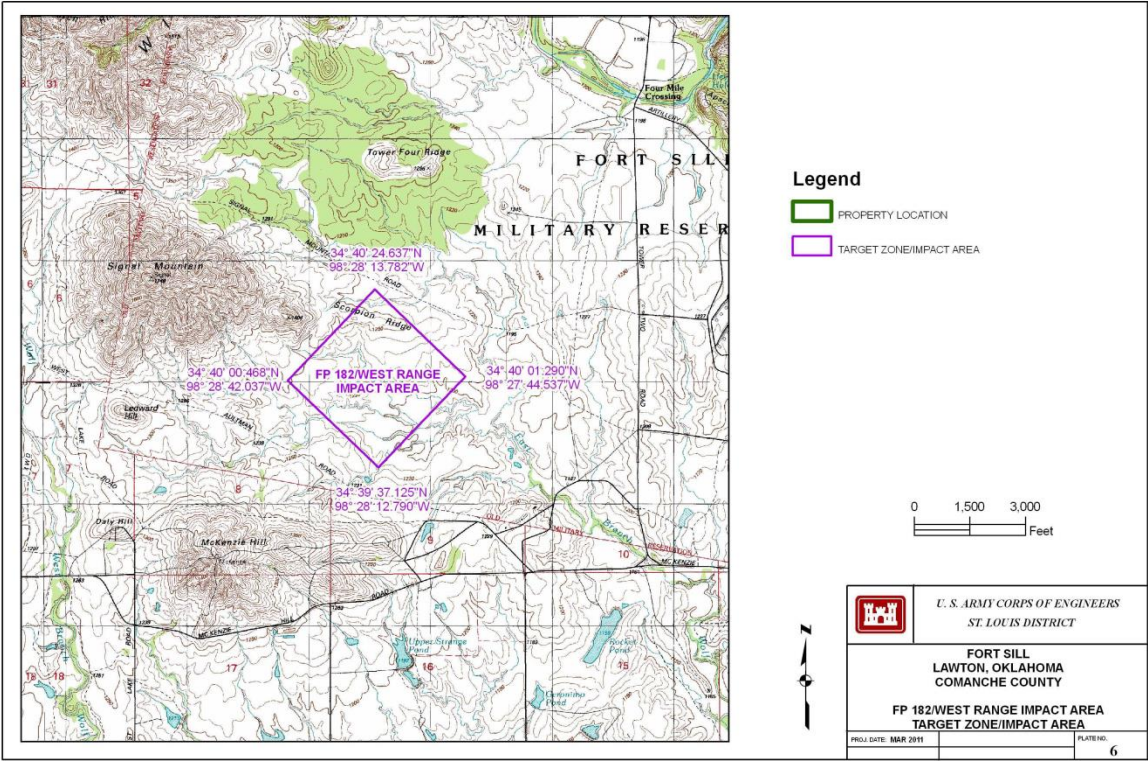


M101 Impact Areas

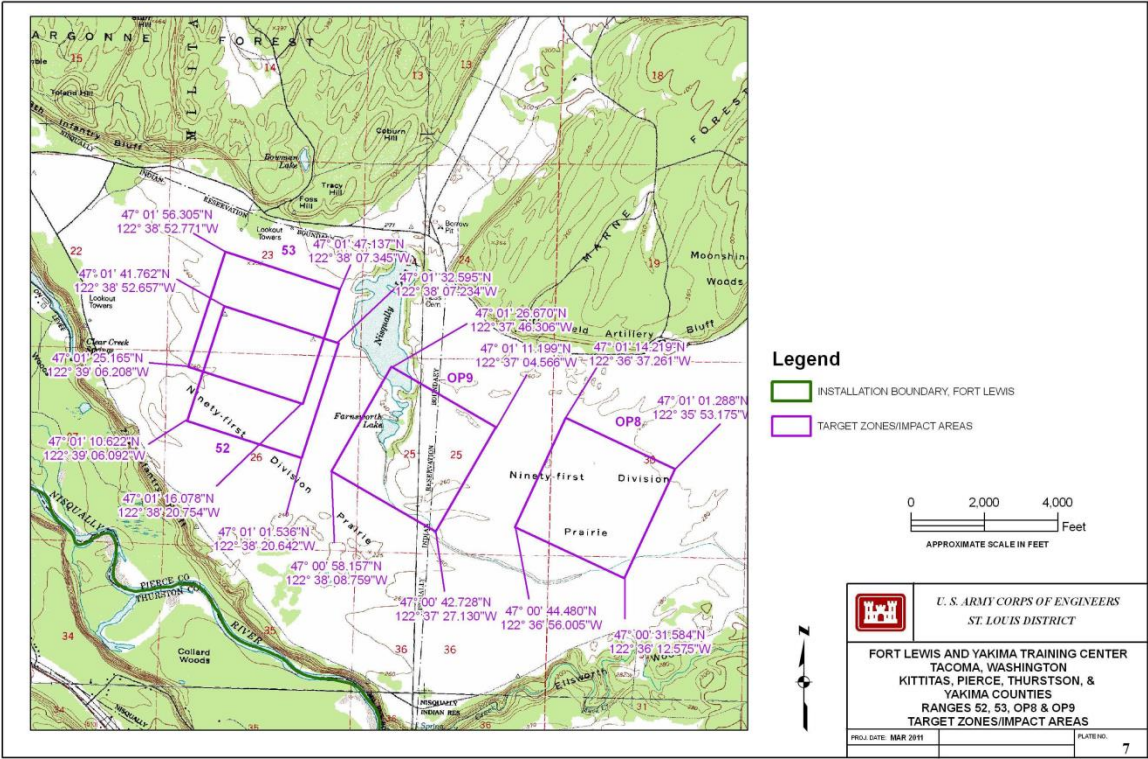
Fort Riley KS



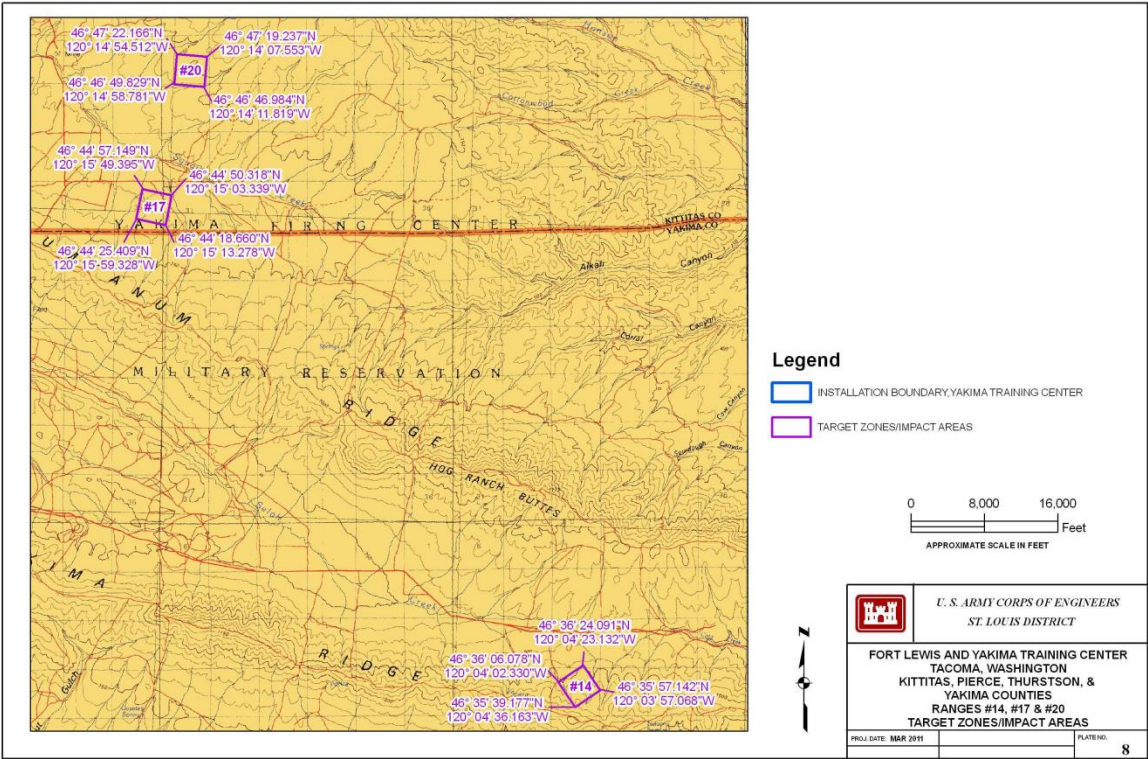
Fort Sill OK



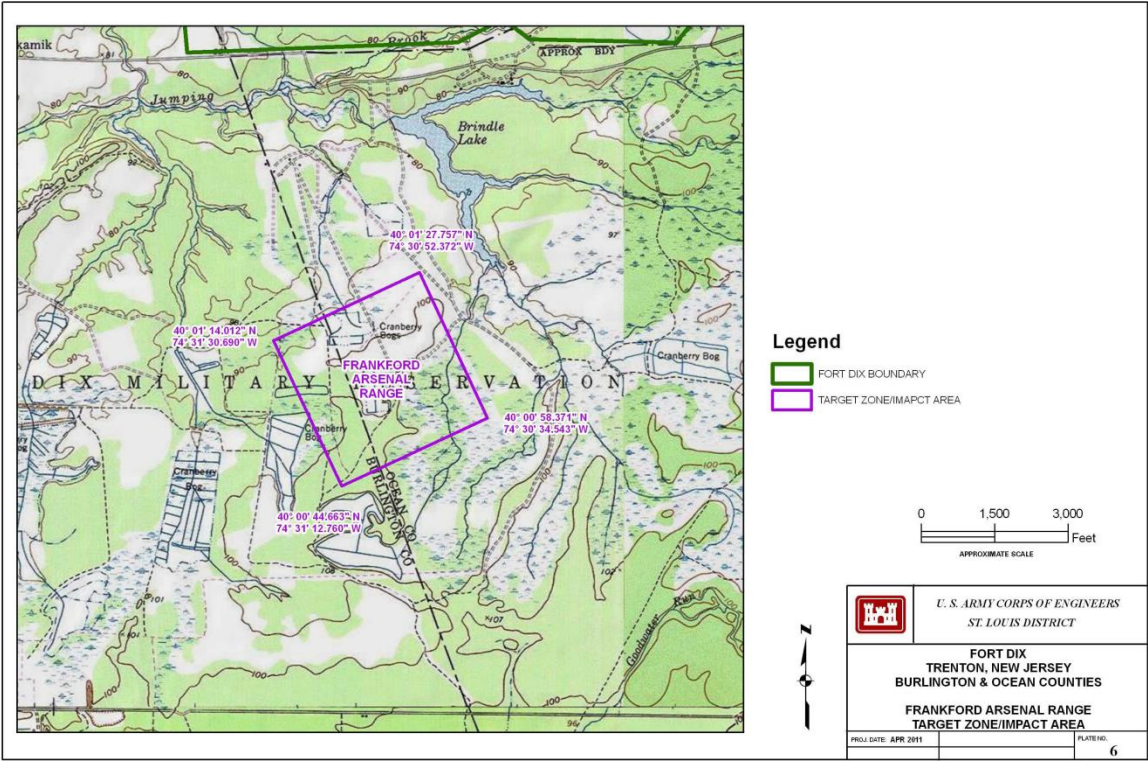
Joint Base Lewis-McChord/Yakima Training Center WA



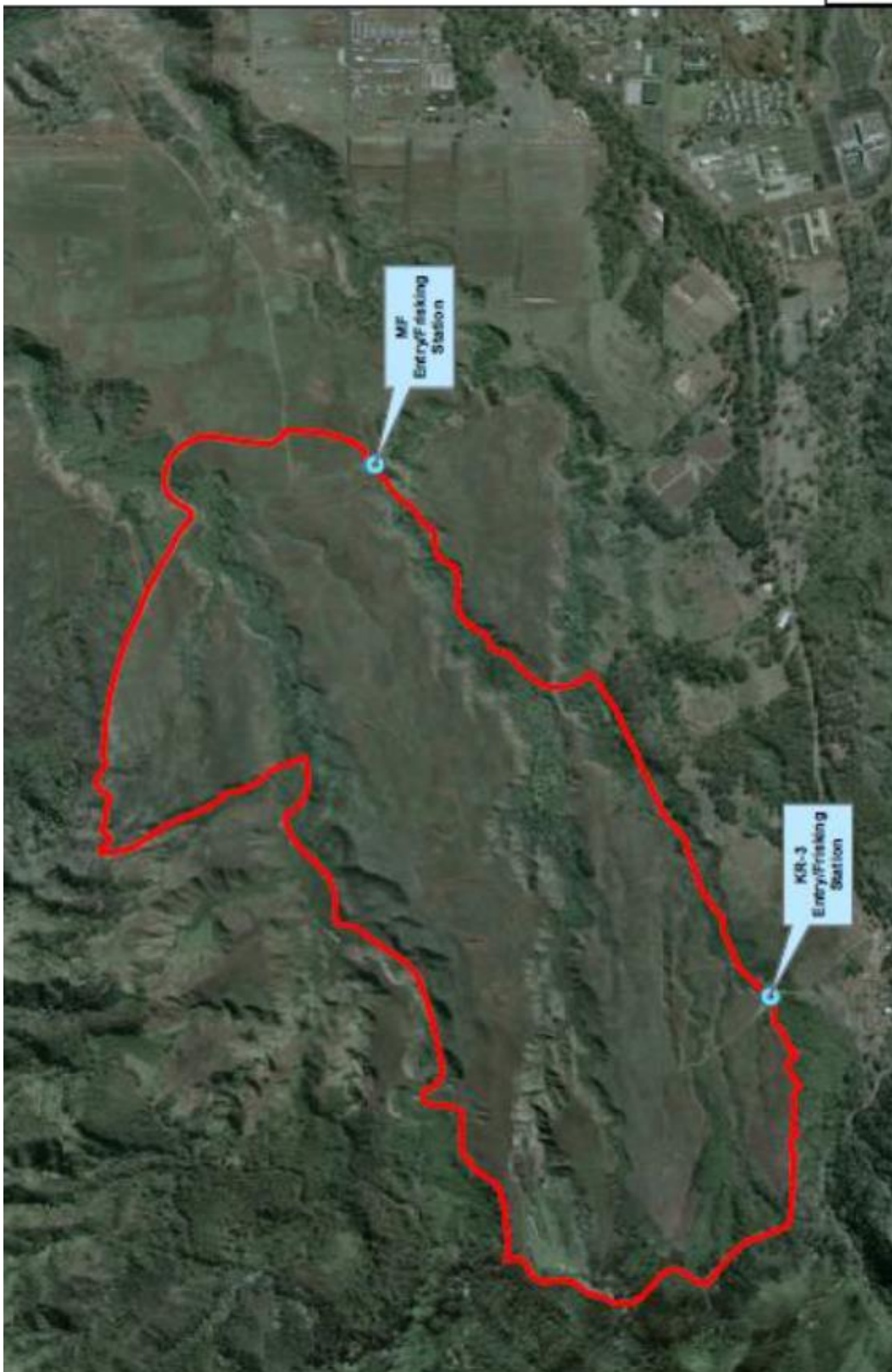
Range 53 is not an M101 impact area; range 52, OP8 and OP9 are M101 impact areas



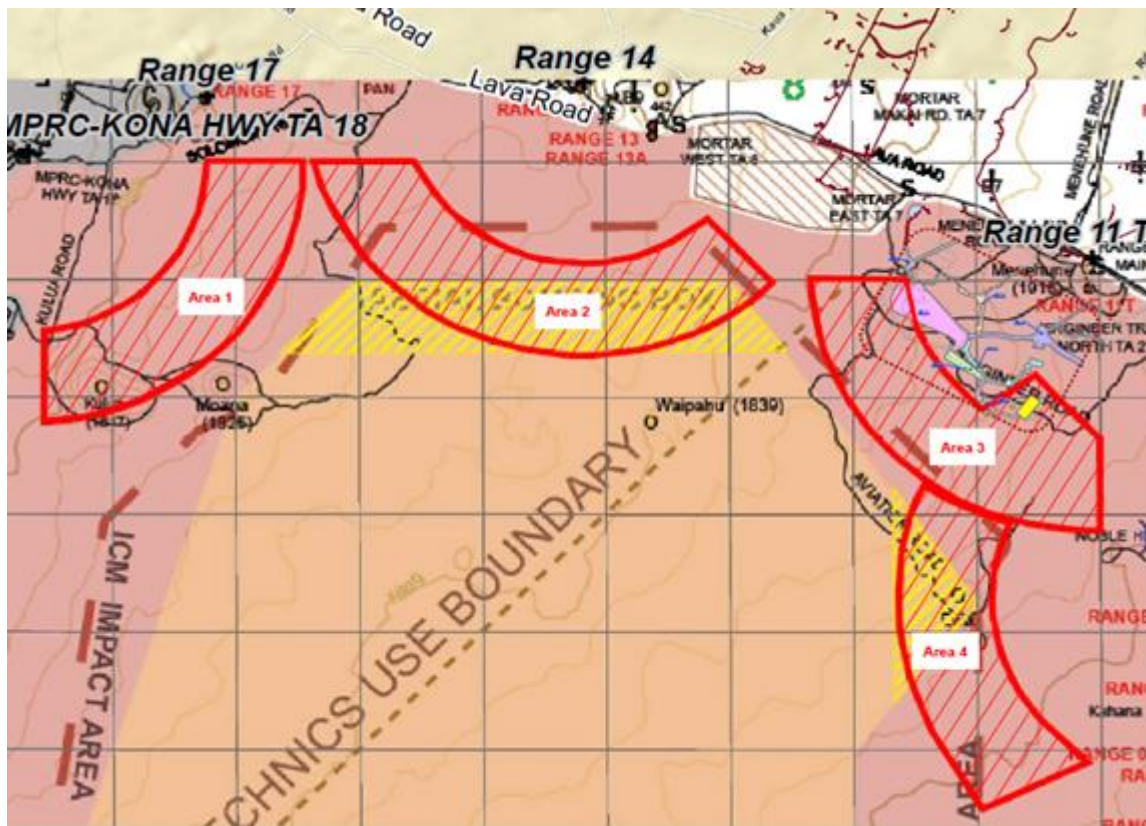
Joint Base McGuire-Dix-Lakehurst NJ



Schofield Barracks/Pohakuloa Training Area HI



M101 Impact Area at Schofield Barracks



M101 Impact Areas at Pohakuloa Training Area