

ADDENDUM 2.9-B
BASELINE GAMMA RADIATION SURVEY
AND SOIL RADIUM-226 CORRELATION REPORT

Baseline Gamma Radiation Survey and Soil Radium-226 Correlation Report

for the

Ross Proposed *In-Situ* Uranium Recovery Site

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PROFESSIONAL DECLARATION

This report was prepared by Tetra Tech, Inc. under the professional supervision of H. Robert Meyer. The findings, recommendations, specifications and professional opinions presented in this report have been prepared in accordance with generally accepted professional radiation protection and measurements practice, as constrained by project scope. There is no warranty, either expressed or implied.

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1.0 INTRODUCTION

This report was developed on behalf of SENES Consultants Ltd. for Strata Energy Inc./Peninsula Minerals Ltd. This *Baseline Gamma Radiation Survey and Soil Radium-226 Correlation Report* supports an application for a U.S. Nuclear Regulatory Commission (NRC) license and Wyoming Department of Environmental Quality/Land Quality Division (WDEQ/LQD) uranium recovery permit to construct and operate its proposed Ross *in situ* recovery (ISR) project. The NRC source and byproduct materials license is required to recover uranium by ISR extraction techniques under the provisions of Title 10, U.S. Code of Federal Regulations, Part 40 (10 CFR Part 40), "Domestic Licensing of Source Material." This report is specific to radiation scanning and correlation soil sampling work performed on the site during 2010.

This initial section summarizes site characteristics and the overall study process. Later sections present radiological baseline results for the Ross Project area.

Baseline radiological studies were conducted by Tetra Tech from July 19 through 22, 2010. Tetra Tech used NRC's Regulatory Guide 4.14, "Radiological Effluent and Environmental Monitoring at Uranium Mills" (NRC, 1980) as guidance to conduct the studies for pre-licensing data collection. Although the Guide does not address certain considerations associated with ISR uranium recovery sites, the NRC and the WDEQ/LQD recommend its use for baseline surveys of ISR sites. Tetra Tech modified aspects of the guidance for this project, to take advantage of technology developed since the Guide was written in the 1970s. However, all applicable guidance elements are covered.

1.1 Site Characteristics

The Ross project site (Figure 1, below) consists of approximately 1,800 acres located in the Lance District (near Oshoto), Crook County, Wyoming (herein referred to as the Site).

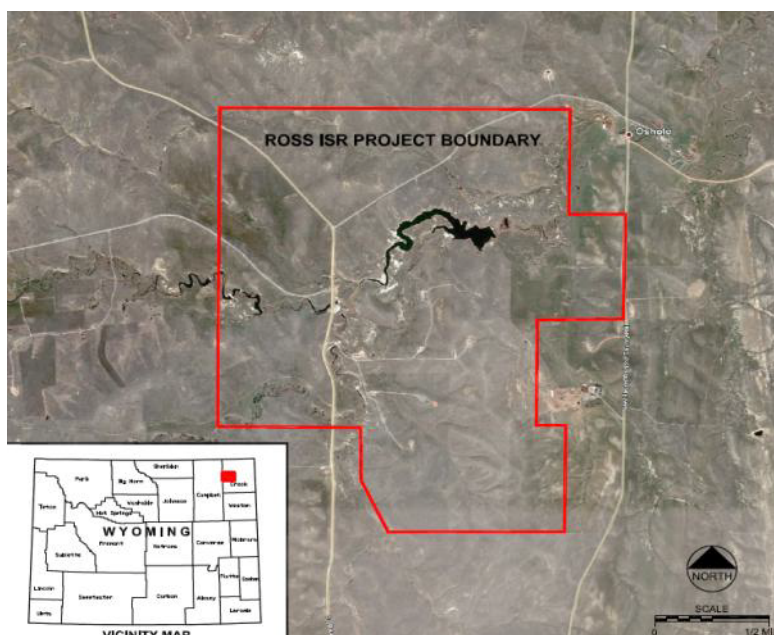


Figure 1. Ross ISR project boundary

Topography at the Site consists primarily of low rolling hills, flat areas, basins and cuts, drainage basins, and ponds. Vegetation includes mixed-grass prairie species, sagebrush, and some wetland-associated grasses. Oshoto Reservoir lies near the center of the Site. Figure 2, below, shows selected photographs of the Site.



Figure 2. Photos from the Ross Site

The dominant land uses at the Site include livestock grazing, hay cultivation, and oil and gas extraction activities.

2.0 BASELINE RADIOLOGICAL INVESTIGATION

2.1 Objectives

The objective of the baseline investigation was to assess existing conditions at the Site, including the spatial distribution of gamma radiation exposure rates, dose rates and soil radionuclide concentrations, prior to the commencement of new ISR uranium extraction activities.

2.2 Survey Methods

The gamma radiation survey is the primary component of the baseline radiological investigation. The survey includes the collection of a large set of gamma radiation exposure rate measurements using a computerized survey system.

Tetra Tech staff performed a field investigation from July 19 through 22, 2010. Figure 1 shows the area to be scanned. Activities included collection of baseline gamma exposure rates, correlation with measured dose rates, and collection of soil samples to develop a correlation between radiation levels and soil radium-226 concentrations.

The gamma radiation scanning survey system uses vehicle- or backpack-mounted equipment to traverse the Site, allowing navigation of rough terrain and sagebrush with minimal environmental impact. Tetra Tech used Yamaha® Rhino ATV and Jeep® Rubicon vehicles for the project. Both vehicles are specially configured to minimize terrain damage during such work. Figure 3 is a photograph of the scanning vehicles utilized for this project.



Figure 3. Project scanning vehicles at Strata headquarters

Both the Jeep® and Rhino® vehicles employ adjustable systems to carry Ludlum 44-10 2-inch sodium iodide (NaI) gamma radiation detectors and paired Global Positioning System (GPS) receivers, set away from the vehicles. The two-inch NaI detectors are coupled to Ludlum 2350-1 rate meters. The permanently paired systems are factory calibrated by Ludlum and report exposure rate ($\mu\text{R/h}$) as a function of detector count rate. The detector systems are factory calibrated using a Cs-137 source. Because sodium iodide systems exhibit energy-dependent response characteristics (Figure 4), the detectors over-estimate exposure rates from lower-energy radiation generally predominant at an ISR site. Bicron micro-rem detector characteristics are less energy-dependent; such an instrument may be used to develop Site-specific corrections for this characteristic, as discussed later in this report. Simultaneous GPS and gamma radiation exposure rate data are transmitted every second for each system. Data are recorded on netbook PCs using proprietary software (CommReader®, Tetra Tech, 2007). System configuration includes 8-foot spacing between radiation detectors, with each detector positioned roughly 3.5 feet above the ground to avoid obstructions.

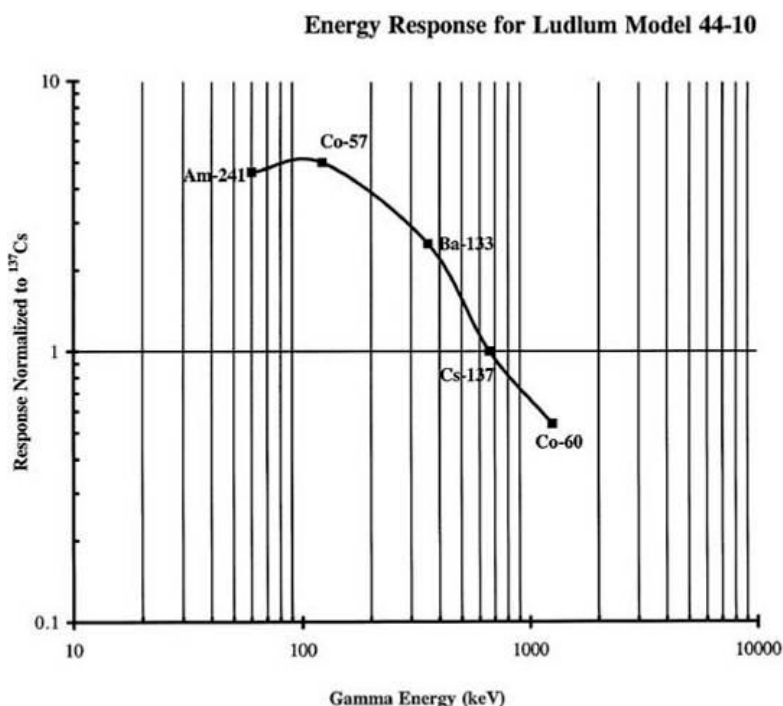


Figure 4. Ludlum model 44-10 NaI detector energy response

The 44-10 gamma detector response to ground-surface above-background radiation sources extends outward roughly 1.5 meter (m), giving each detector an estimated “field of view” roughly 3 m in diameter at ground surface. The track width for each vehicle’s two-detector system, therefore, is about 14 feet across. Vehicle scanning speeds ranged between 2 and 10 miles per hour (mph) for this Site, depending on the roughness of the terrain, with an average speed of approximately 5 mph.

One hundred-meter vehicle spacing was the targeted scan coverage, although difficult considerations such as steep terrain and natural obstructions often influenced the actual course maintained by a vehicle. Target tracks were embedded in geographic information system shape

files and used to direct real-time vehicle scanning. Near unsafe terrain, vehicles scanned near these planned lines while maintaining safe courses. In one area, landowner interactions precluded scanning as planned. In specific areas of interest defined by the client, 50 m scan vehicle spacing was employed to increase detail.

Data sets were downloaded daily into a project database, backed up and plotted with proprietary mapping software (GammaViewer®, Tetra Tech, 2006). In addition to daily quality control checks of instrument performance, results were reviewed daily using GammaViewer® to help identify problems that may have occurred during data acquisition.

2.3 Gamma Radiation Exposure Rate vs. Dose Rate: Correlation Methods

Because gamma radiation exposure rates as measured by NaI detectors exhibit significant energy response variations, comparing these measurements to those from, for example, a Bicorn® micro-rem meter may be useful. Because the Bicorn® system's sensitivity to low-level radiation is insufficient for rapid field scanning, onsite cross-correlation against NaI-based measurements were made at 10 areas on the Site. The developed correlation allows the large NaI-detector-based exposure rate data set to be re-mapped using Site-specific Bicorn®-based dose rate measurements.

As noted, gamma radiation scan results are useful for proposed ISR mining sites because they can demonstrate differences between pre- and post-operational gamma radiation exposure rate conditions. However, because the same equipment and scanning geometry may not be used during pre- and post-operational surveys, the Bicorn correlations may also be useful to normalize the NaI detector data to a second instrument basis. Onsite cross-correlation helps to ensure that future radiation surveys are useful when compared to baseline data. It is also reasonable to expect that specific onsite correlation locations may remain undisturbed during future operations. These locations may provide useful baseline comparisons during eventual facility closure work. Until completion of Site uranium extraction operations, it is not possible to identify which Site correlation locations may remain undisturbed.

To perform NaI/Bicorn® cross-correlations, comparison measurements were taken at locations covering a range of exposure rates representative of the Site. These locations were the same as those used for gamma radiation/radium-226 soil correlation plot measurements. At each location, 10 to 15 Bicorn® meter readings were averaged. The same areas were scanned at high density using one of the NaI detector systems. Mean NaI exposure rates were plotted against the Bicorn® micro-rem meter readings for each location. GPS-based locations of the correlation plots are provided in Section 3 of this report.

2.4 Gamma Radiation/Soil Radionuclide Correlation Methods

Regulatory Guide 4.14 recommends that 41 baseline surface soil samples be collected at 5-cm depths, at 300 m intervals on 8 compass direction radials out to 1.5 kilometers from the center of the milling area (defined as being between the proposed mill structure and tailings pond). Additional 1-m depth sample groups should be collected at the Site's air monitoring stations. This guidance cannot be applied directly to a proposed ISR site (with no tailings pond, and a variety of uranium extraction structures spread over the Site), and therefore requires interpretation. This need, combined with the large size of the typical ISR site and the availability of new technologies including the Global Positioning System and highly portable personal computers, encourages the use of gamma radiation scanning combined with soil radionuclide correlation sampling to define baseline conditions. Rather than attempting to describe the

current Site with a small set of point measurements, it is now feasible to map gamma radiation levels over an entire site at many thousands of individual locations, then use correlation soil sampling to map the Site for estimated Ra-226 concentrations.

Correlation soil sampling was conducted via composite sampling over 100 square meter plots (10 m by 10 m). Figure 5, below, shows the composite sampling layout. The sampling locations were selected by inspection of the Site gamma radiation survey data, to cover the measured exposure rate range. Within each plot, nine sub-samples were collected to a soil depth of 15 centimeters, then composited into a single sample representative of the plot. GPS coordinates were taken at the center of each sampling plot. Samples were sent to ALS Laboratory in Fort Collins, Colorado and analyzed for radium-226 via gamma radiation spectrometry after radon daughter equilibration. Samples were dried and homogenized prior to equilibration.

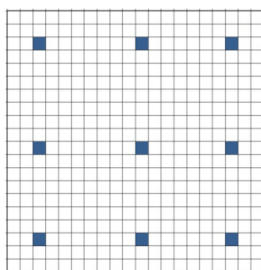


Figure 5. Correlation plot soil extraction locations

Following methods similar to those described in Johnson et al. (2006), each 100 m² soil sampling plot was also scanned at high density using a NaI system. One difference from the method described in Johnson et al. (2006) was that the NaI detectors used for this survey were non-shielded (non-collimated). This increases the overall sensitivity of the systems, at the expense of more precise location of small-area radiation sources. The average NaI gamma radiation reading over each plot was calculated and recorded, to pair with the corresponding radium-226 soil concentrations. Results are presented in Section 3 of this report.

2.5 Data Quality Assurance/Quality Control Methods

Radiological characterization projects conducted by Tetra Tech incorporate specific data quality assurance/quality control (QA)/QC protocols. In general, QA includes qualitative factors that provide confidence in the results, while QC involves quantitative evidence that supports the validity of results (data accuracy and precision).

Data quality assurance factors for this project include the following:

- All detectors used for gamma radiation scanning at the Site were calibrated by the manufacturer within the last 12 months.
- Chain-of-custody protocols were followed for soil sampling and contract laboratory radium-226 soil analyses.
- Tetra Tech's Radiological Protection and Measurements staff members possess extensive, pertinent qualifications and experience.

- Tetra Tech's radiological survey methods and results have been published in peer reviewed journals and conference proceedings (Johnson et al., 2006; Meyer et al., 2005a; Meyer et al., 2005b; Whicker et al., 2006).

2.5.1 Quality Control Data Documentation for this Project

Prior to the gamma radiation survey, instrument comparison QC measurements were performed for all NaI detectors potentially used to survey the Site. Sets of individual, background QC measurements were compared under the same counting geometries. Instruments also meeting onsite field test criteria are designated qualified to replace instruments that fail in the field. Data developed using any qualified instrument are interchangeable with data collected using other field-qualified instruments. The distribution of daily background and field strip data may be evaluated via the histogram presented as Figure 6.

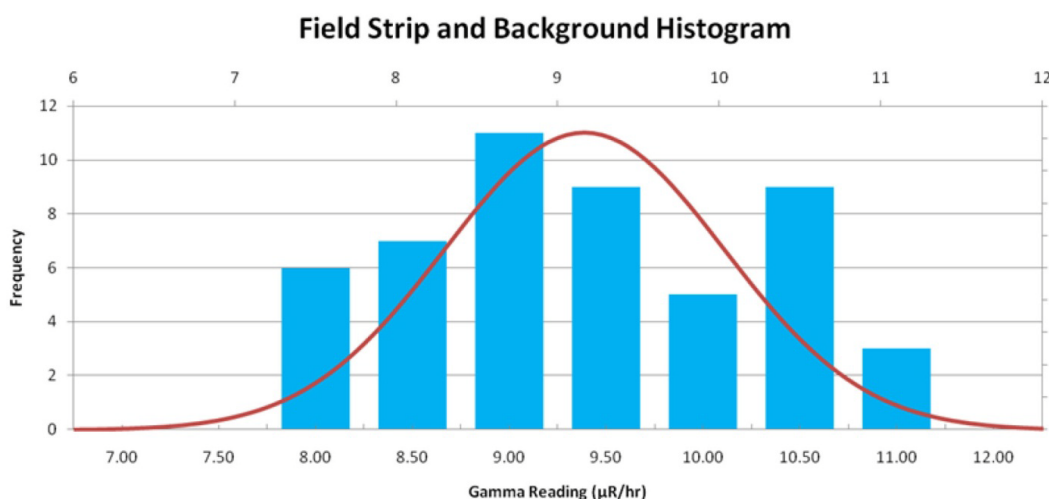


Figure 6. Ross Site Instrument Background Data Distribution

2.5.2 Field Check Results

For normally distributed data, over 99 percent of measurements are expected to fall within ± 3 standard deviations from the mean. Background, field strip, and Cs-137 test source (field check source) standard deviation values are re-calculated twice daily; daily plots incorporate results to date. An instrument with a QC result falling outside ± 3 standard deviations from the mean of all QC measurements is replaced with a pre-qualified spare detector and sent back to the manufacturer for evaluation, repair and recalibration.

QC measurements, including a background check, a field strip check and a source check, were performed twice daily at the Site for each scanning system in use. These checks were performed outdoors at standard locations. The daily field strip check, during which data are collected along the same 100-meter strip morning and evening, provides an indication of total measurement uncertainty for the systems. The Ludlum 2350 datalogger system employs a calibration factor to internally convert detector counts per minute to exposure rate. The calculated exposure rate, directly proportional to the measured count rate, is transmitted by the data logger to the scanning system portable PC. No record of count rate is retained by the

system, but count rate can be calculated using the instrument-specific calibration factor. Factory calibration sheets for each instrument used on the Ross project are provided in Appendix A.

Figures 7 through 9 summarize key QC data acquired during the Ross survey work. All instrument QC results during this project met the acceptability criterion. The daily count rate variations within these limits, seen below, are functions of several likely variables including exact placement of detector systems during daily checks, and variations in barometric pressure. The low detector count rates at very low background gamma exposure rates also contribute to variability. Differences in detector internal characteristics, including minor NaI crystal issues or photomultiplier tube optical interface inconsistencies, may also be responsible for the observed variations in background (low) and check source (high) count rates. For the Ross Site, only the background and field strip QC data are of real interest, given the Site's low radiation levels.

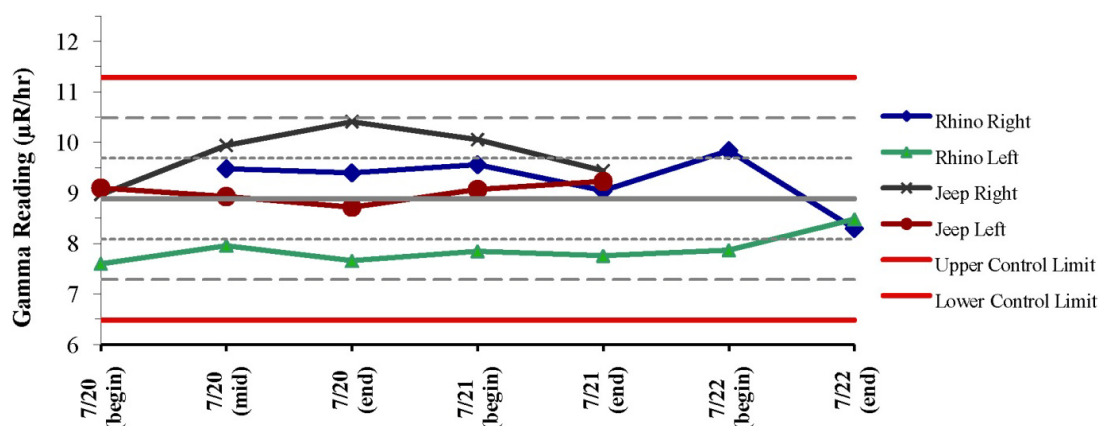


Figure 7. Background exposure rate control chart for scan systems used at Ross; background measurements were collected on site near the main office

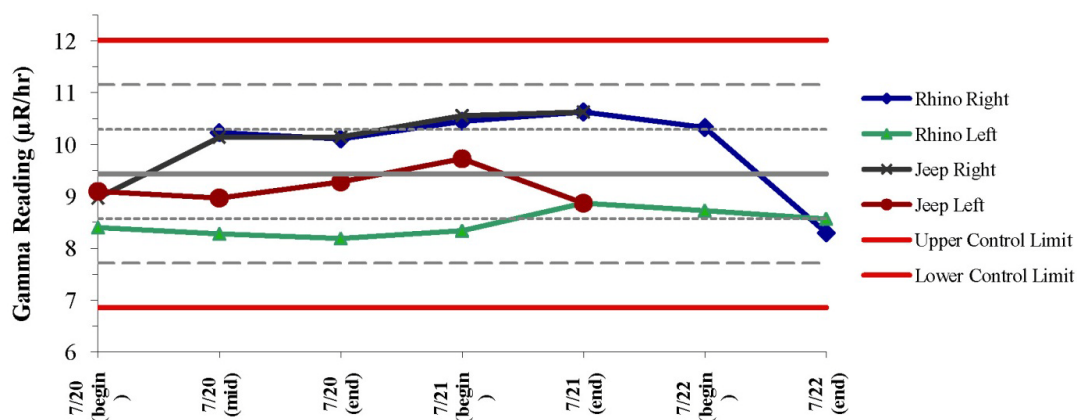


Figure 8. Field strip control chart for scan systems used at Ross; field strip measurements were collected on site near the main office

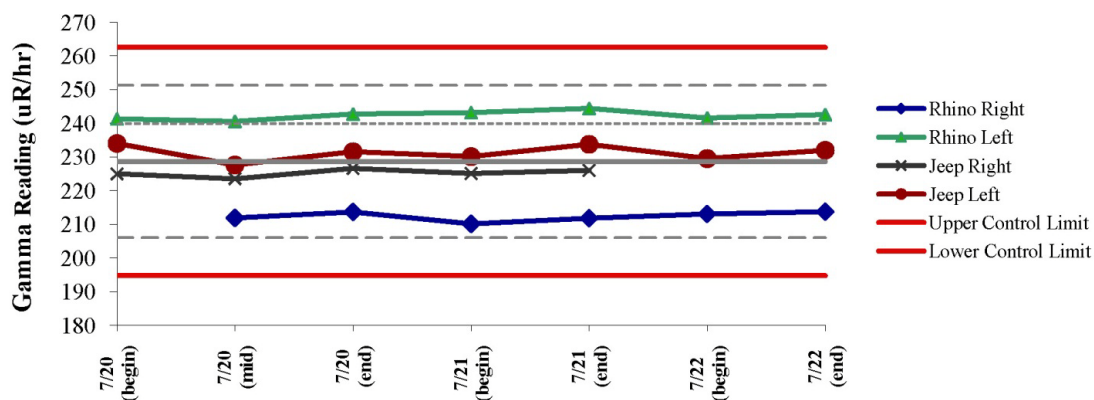


Figure 9. Source check control chart for scan systems used at Ross; source checks were performed with a Cs-137 source at the same location as background checks

3.0 BASELINE RADIOLOGICAL INVESTIGATION RESULTS

3.1 Survey Results

A total of 80,833 valid gamma radiation exposure rate data points, paired with Wide Area Augmentation System (WAAS)-corrected GPS data, were collected over the 1,800-acre Site. Summary statistics and a relative frequency histogram showing the distribution of the gamma radiation exposure data are provided in Figure 10.

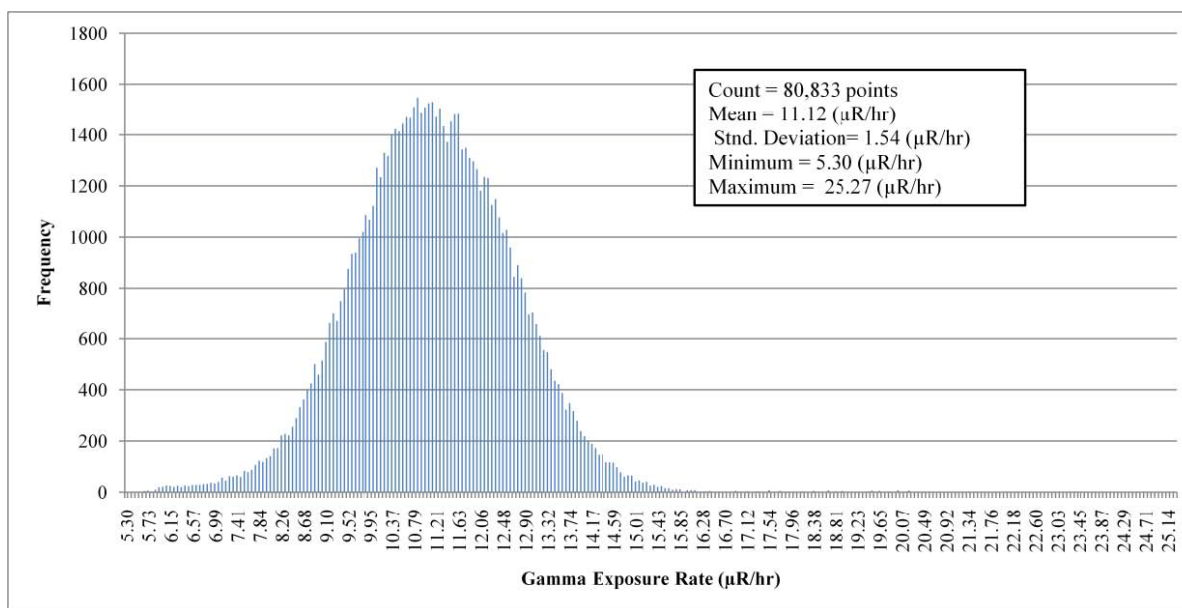


Figure 10. Frequency histogram of gamma radiation exposure data at Ross Site

The histogram shows that the data are normally distributed. The gamma radiation exposure rates on site ranged from 5.3 to 25.3 $\mu\text{R/hr}$, with a standard deviation of 1.54 $\mu\text{R/hr}$.

A map of the site's gamma radiation exposure rates is presented as Figure 11. The final data set used to develop this figure has been transmitted to Mr. Ron Stager of SENES, allowing manipulation at will to analyze specific areas of interest. The lowest gamma radiation exposure rates (5 to 6 $\mu\text{R/hr}$) on the site were observed along D-Road, running near the western property boundary. An important result of this study is that relatively high exposure rates were observed on site on County Road (CR) 193 (Oshoto Road), in the range of 14 to 16 $\mu\text{R/hr}$.

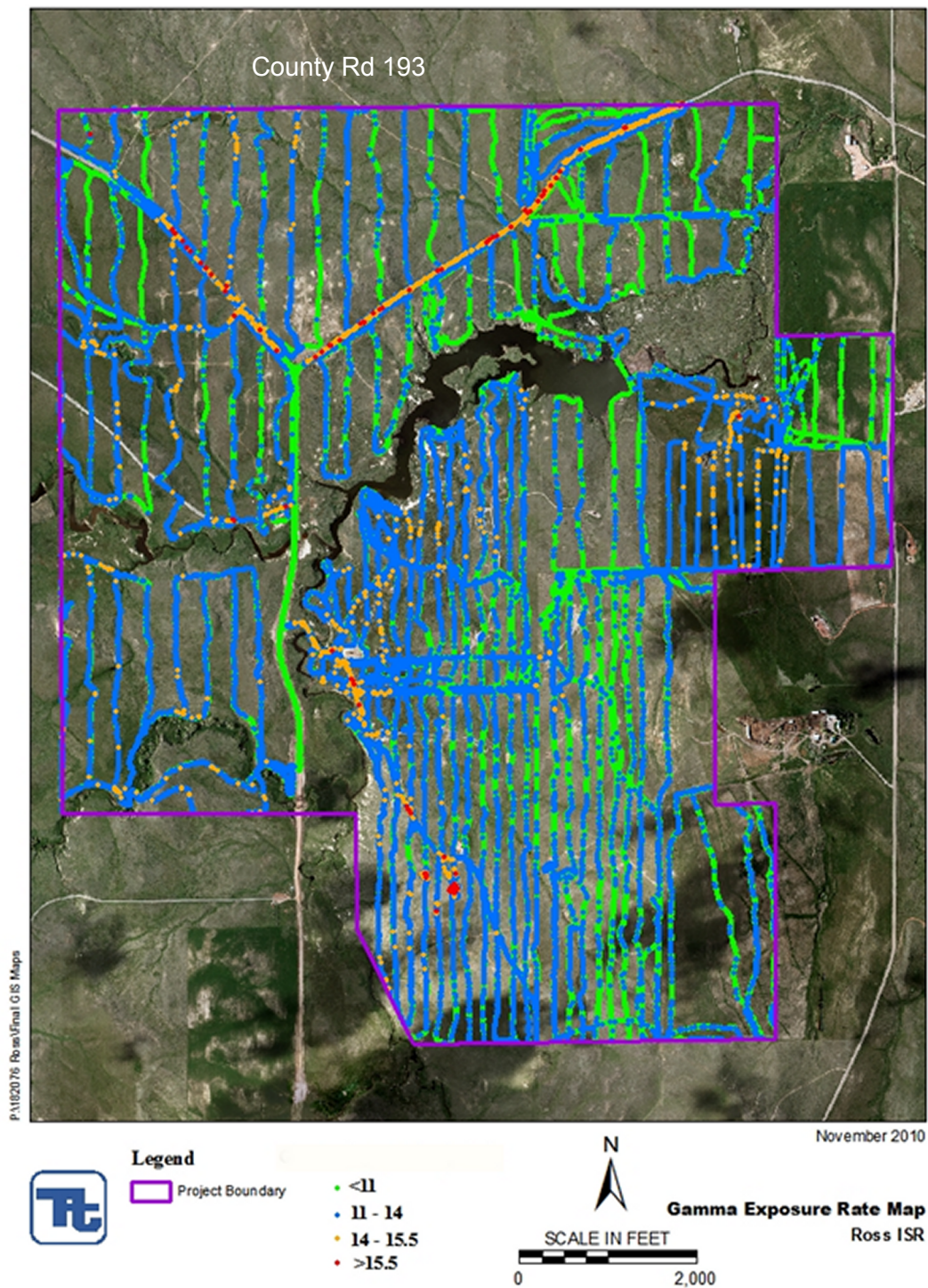


Figure 11. Ross site gamma radiation exposure rates

The highest exposure rates found on the Site were observed in a small area in the southern section, visible in Figure 11. Strata staff noted during our survey that this area exhibits unusual characteristics, perhaps including natural materials that may have concentrated uranium-bearing materials.

Other areas of note in Figure 11 are discussed below:

1. The low density of scanning performed in an area in the SE corner of the site was the result of interactions with the property owner. This area was cut for hay during our site work; windrows were in place for drying, and access was discouraged by the owner. Data that were collected in that portion of the site indicate a likelihood of low exposure rates throughout the segment.
2. Collection of scan data in the area west of the reservoir was restricted by steep slopes, marshland and a stream. Similarly, access to the area east of the reservoir was restricted by marshland and streambed.
3. A section of land just south of the widest portion of the reservoir (the east end) is of interest, showing, upon careful inspection, low gamma exposure rates relative to adjacent sections immediately east and west. The lower-exposure-rate section is Bureau of Land Management (BLM) land, fenced and presumably untouched in terms of ranching operations for perhaps a century or more. Several other adjacent areas on site show notable differences in exposure rate, but without such apparent differences in their history or use characteristics.
4. The segment of the main roads on site, forming the base of the "Y" that includes CR 193, shows a significantly lower exposure rate than CR 193. Material used to construct that portion of the road must have origins different from material used to construct the upper two segments.
5. The narrow, elongated area of higher exposure rates seen slightly to the west of south-center of Figure 11 may be associated with pre-ISR test project activities performed at this site by previous lease holders. The area adjacent to that location and to the east, said to have contained a pond associated with the historical activities at this site, does not show similar higher exposure rates.

3.2 Soil Radium-226 Concentrations: Correlation With Gamma Radiation Results

As discussed previously, soil samples were composited at 10 locations selected to cover the range of exposure rates found on site. Correlation locations are shown in Figures 12 and 13, and Table 1 summarizes the contract laboratory's soil analysis results, included in Appendix C. At most other pre-licensing uranium ISR sites where we have performed similar correlation work, the range of soil radium concentrations and related gamma radiation exposure rates was significantly larger than found at this site. Other sites also allowed the collection of soil samples at locations spread reasonably uniformly over the range of measured exposure rates. The Ross site offered few sample locations at higher exposure rates.

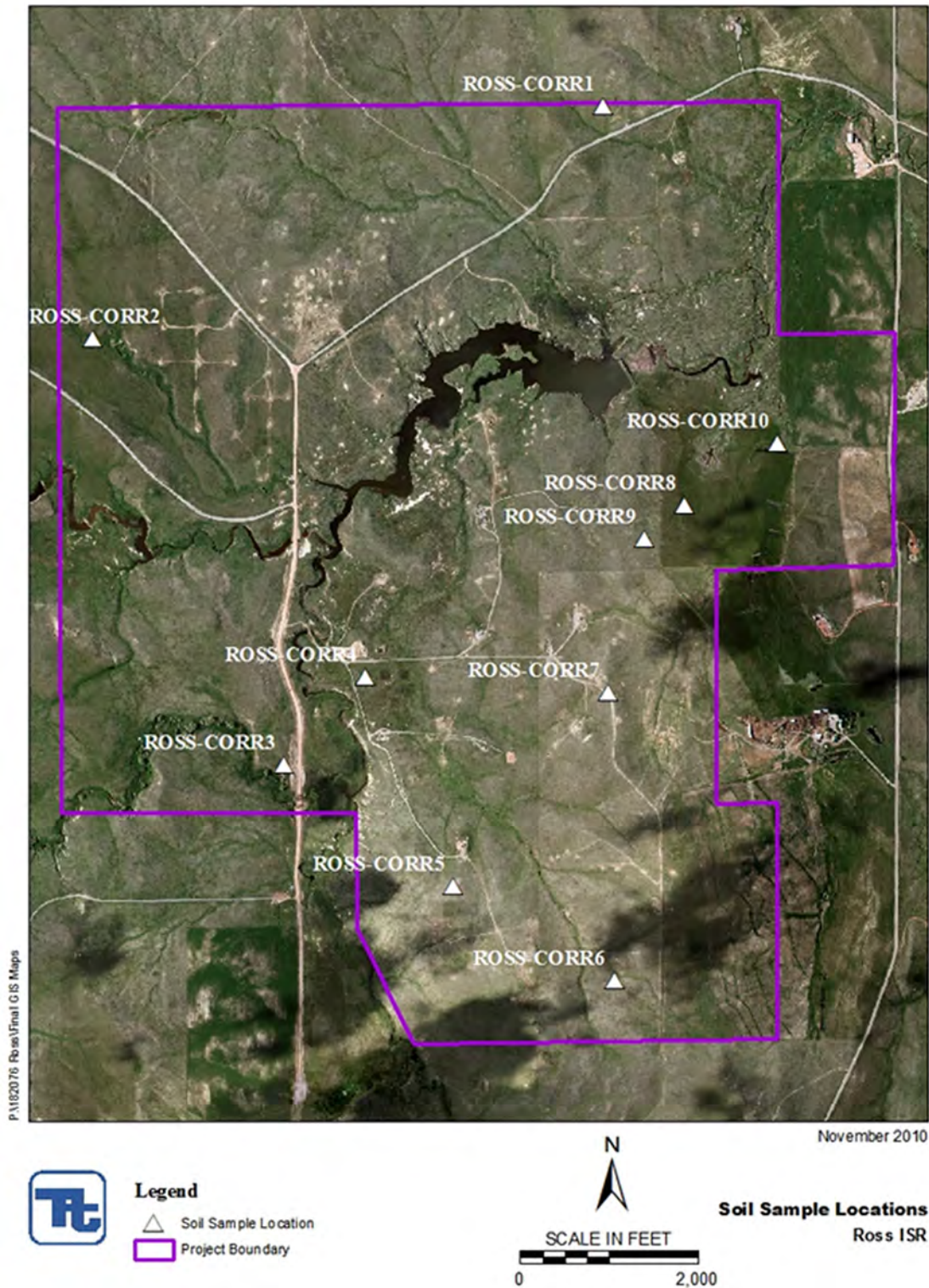


Figure 12. Correlation plot locations

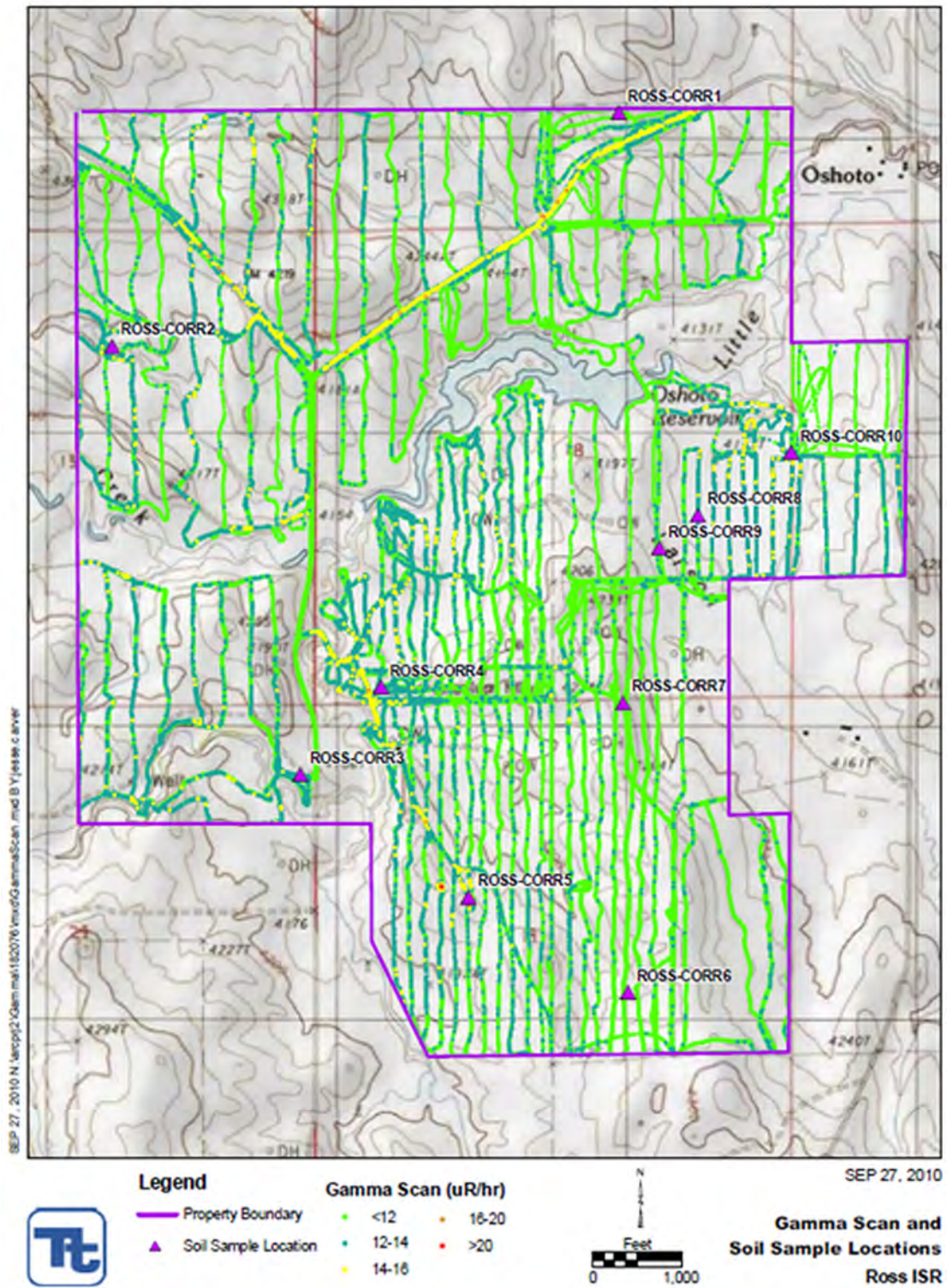
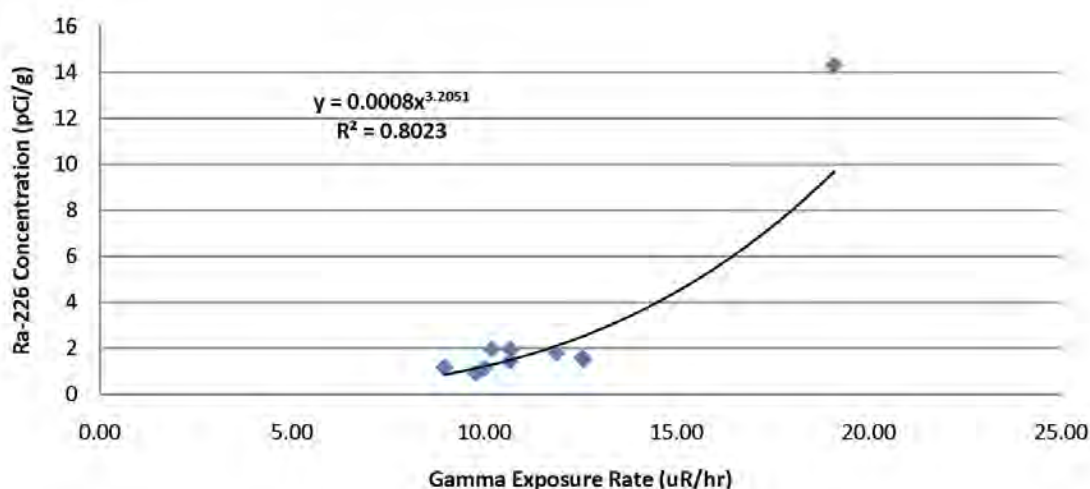


Figure 13. Correlation site locations overlaid on a gamma exposure rate plot

Table 1. Radium-226 soil correlation plot data

Soil Correlation ID	Ra-226 Soil Concentration (pCi/g)	Ra-226 Results Standard Deviation (+/-)	Gamma Radiation Exposure Rate (µR/hr)
ROSS-CORR1	1.15	0.37	10
ROSS-CORR2	1.96	0.48	10.7
ROSS-CORR3	1.97	0.36	10.2
ROSS-CORR4	1.81	0.43	11.9
ROSS-CORR5	14.3	1.9	19.1
ROSS-CORR6	1.18	0.32	9
ROSS-CORR7	0.93	0.25	9.8
ROSS-CORR8	1.60	0.40	12.5
ROSS-CORR9	1.44	0.41	10.7
ROSS-CORR10	1.53	0.42	12.6

A regression analysis performed on the 10 Ross site data pairs results in a power function relationship with an R^2 (coefficient of determination) of 0.80 (Figure 14). Figure 14 indicates that the relationship is significantly influenced by the single, high data point (ROSS-CORR5).

**Figure 14. Radium-226 concentrations vs. gamma radiation exposure rates**

Soil sample analysis results from ALS Laboratory identified no quality control flags or analytical problems.

Except for correlation sample ROSS-CORR5, the Ross site radium-226 soil concentration values are at or near typical natural background levels (~1 pCi/g). At these concentrations, gamma radiation exposure rates are driven by a combination of influences including radium-226 decay products, but are strongly influenced by thorium-232 and potassium-40 soil concentrations as well. In our experience scanning similar sites, a strong correlation of gamma exposure rate with radium-226 soil concentrations is unlikely until soil values approach 3 to 5 pCi/g radium-226,

where radium decay products begin to drive the exposure rate. (Note: neither the Ludlum 44-10 NaI detector nor the Bicron® micro-rem detector is sensitive to cosmic ray particulate radiation, although both will detect photon radiation associated with cosmic ray spallation events.) Although the Ross site correlation data do not provide a strong relationship between exposure rate and soil radium concentrations, the relationship is useable. For the purposes of this report, we have developed a radium-226 soil concentration estimate map (Figure 15), using the Figure 14 correlation equation.

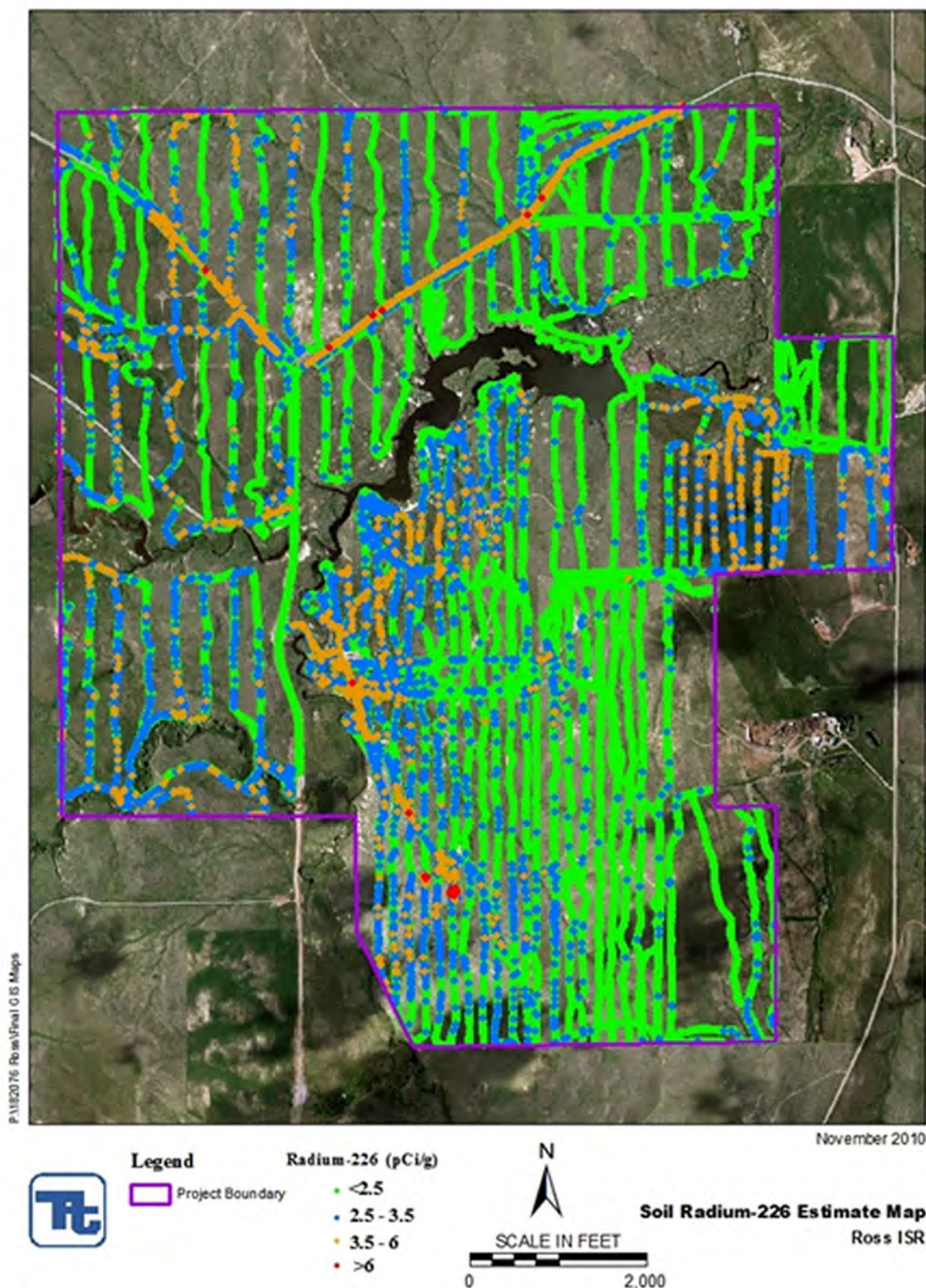


Figure 15. Ross site estimated radium-226 concentrations, based on the Figure 14 correlation equation

3.3 Gamma Radiation Exposure Rate vs. Dose Rate: Correlation Results

As discussed earlier, at the same 10 by 10 m plots from which soil radium-226 vs. NaI gamma radiation exposure rate correlations were developed, a Bicron® micro-rem meter was used to record dose rates averaged over each plot. Results of the gamma radiation exposure and dose rate correlation analysis are presented in Figure 16 and Table 2.

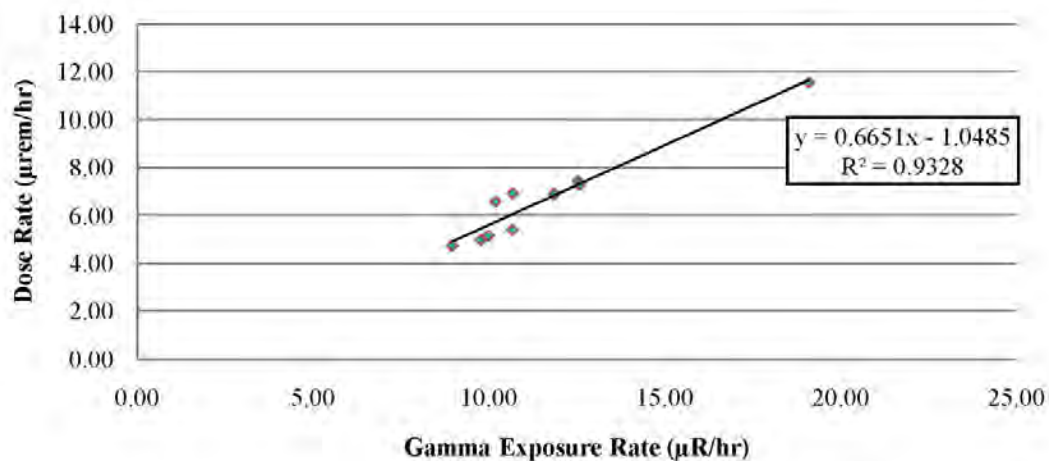


Figure 16. Bicron dose rates vs. Ludlum exposure rates

An R^2 value of 0.93 was calculated for the dose rate to gamma radiation exposure rate correlation. The equation developed in Figure 16 can be used to estimate dose rate values throughout the Site.

Table 2. Dose rate vs. exposure rate at correlation plot locations

Soil Correlation ID	Bicron MicroRem Detector (dose rate)	Nal Detector 44-10/2350 (exp. rate)	Dose Rate ($\mu\text{rem/hr}$)	Exposure Rate ($\mu\text{R/hr}$)	Latitude	Longitude
ROSS-CORR1	SN#B9904	Rhino Left-MFG-2	5.2	10.0	44.58903	-104.95049
ROSS-CORR2	SN#B9904	Rhino Left-MFG-2	6.9	10.7	44.58188	-104.97256
ROSS-CORR3	SN#B9904	Rhino Left-MFG-2	6.6	10.2	44.56873	-104.96436
ROSS-CORR4	SN#B9904	Rhino Right-MFG-3	6.9	11.9	44.57143	-104.96085
ROSS-CORR5	SN#B9904	Rhino Right-MFG-3	12	19.1	44.56497	-104.95704
ROSS-CORR6	SN#B9904	Rhino Left-MFG-2	4.7	8.96	44.56205	-104.95012
ROSS-CORR7	SN#B9904	Rhino Right-MFG-3	5.0	9.78	44.57092	-104.95032
ROSS-CORR8	SN#B9904	Jeep Left - MFG-16	7.4	12.5	44.57669	-104.94704
ROSS-CORR9	SN#B9904	Jeep Left - MFG-16	5.4	10.7	44.57568	-104.94874
ROSS-CORR10	SN#B9904	Jeep Left - MFG-16	7.3	12.6	44.57862	-104.94298

(Note: Nal detector ID numbers and soil plot latitude/longitude locations also apply to Table 1.)

Using the regression equation shown in Figure 16, gamma radiation exposure rate data were converted to produce a plot of site gamma radiation dose rate (Figure 17).

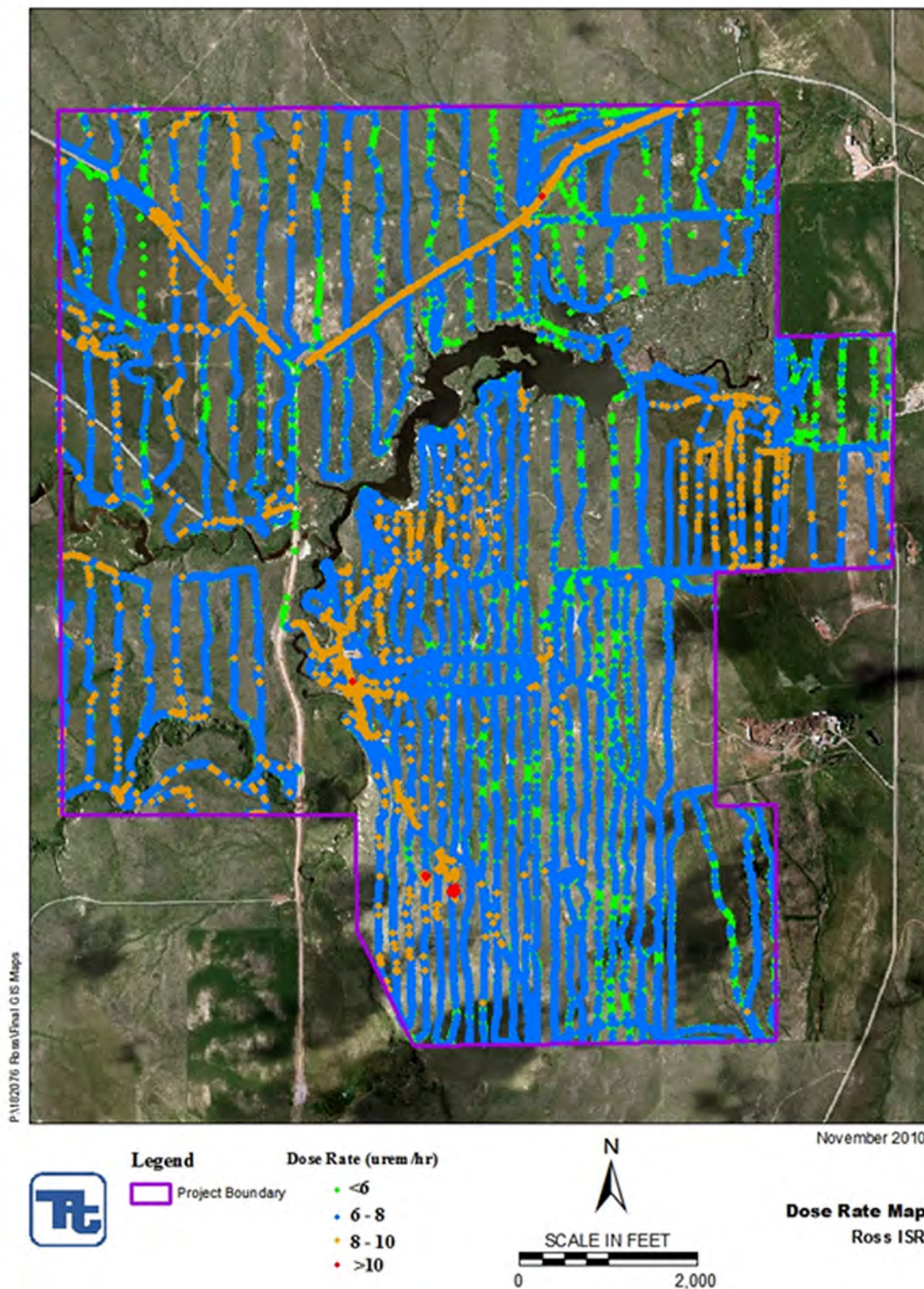


Figure 17. Ross site dose rate estimates (micro-rem/hr)

4.0 SUMMARY

Tetra Tech field engineers performed a survey of baseline gamma radiation exposure rates on the proposed Ross ISR Site. The survey developed GPS-located gamma radiation exposure rate data. Ludlum NaI detector vs. laboratory-analyzed soil radium correlation data allow estimation of soil radium concentrations over much of the Site. Ludlum sodium-iodide detector vs. Bicron® micro-rem detector cross-calibrations were also developed and used to map dose rate over the Site.

Tetra Tech's survey results highlight the following information:

1. Based on the higher exposure rates observed on the CR 193 road segments passing through the northern portion of the site, we conclude that the base material used to develop CR 193 was probably imported from elsewhere. This is not true for the public road segment passing south from CR 193 and exiting the site at the south boundary. Eventual closure and license termination of the Ross ISR site will include evaluations to determine whether site roads were contaminated during uranium transportation activities. This report's record of pre-existing anomalous gamma radiation levels on CR 193 will therefore be important during site closure.
2. This report's measured radiation exposure rates are likely to be overestimates, given the response characteristics of sodium iodide detectors in the mixed-energy radiation field associated with the Ross site's predominantly low soil concentrations of gamma-emitting terrestrial radionuclides. The Bicron micro-rem meter vs. Ludlum NaI detector onsite correlation data provide data to correct for this effect.
3. While oil and gas extraction activities occurring on the Ross site can result in the concentration of naturally-occurring radioactive materials in, for example, pipe scale, no evidence of this effect was noted during evaluation of the field survey results.
4. Based on the data presented here, it is reasonable to conclude that the great majority of the Ross site exhibits relatively low near-surface radium-226 soil concentrations. The data provide a useful record of current site conditions in the context of eventual required evaluations.

These results are provided to meet the intent of specific pre-licensing regulatory guidance related to site radioactive material concentrations. The information should facilitate the eventual assessment of any onsite contamination resulting from ISR activities.

5.0 REFERENCES AND BIBLIOGRAPHY

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APPENDIX A INSTRUMENTATION: FACTORY CALIBRATION SHEETS



Designer and Manufacturer
of
Scientific and Industrial
Instruments

CERTIFICATE OF CALIBRATION

mfg-2

LUDLUM MEASUREMENTS, INC.

POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER TETRA TECH MFG INC

ORDER NO. 20152128/349181

Mfg. Ludlum Measurements, Inc.

Model

2350-1

Serial No.

134748

Cal. Date 22-Apr-10

Cal Due Date

22-Apr-11

Cal. Interval

1 Year

Meterface

N/A

Check mark ☒ applies to applicable instr. and/or detector IAW mfg. spec.

T. 73 °F

RH

52 %

Alt

694.8 mm Hg

☐ New Instrument

☐ Instrument Received

☐ Within Toler. +10%

☐ 10-20%

☐ Out of Tol.

☒ Requiring Repair

☐ Other-See comments

☒ Mechanical check

☒ Input Sens. Linearity

☒ F/S Resp. check

☒ Reset check

☒ Window Operation

☒ Audio check

☒ Alarm Setting check

☒ Battery check (Min. Volt) 4.4 VDC

☒ Ratemeter Linearity check

☒ Integrated Dose check

☒ Recycle Mode check

☒ Data Log check

☒ Overload check

☒ Scaler Readout check

Threshold
Dial Ratio 100 = 10 mV

☐ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89.

☒ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

☒ HV Readout (2 points)

Ref./Inst.

500

/

500

V

Ref./Inst.

2000

/

2001

V

COMMENTS:

Firmware: 37122N20

IO Firmware: 37123N04

Cs137 Resolution: 12.08%

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

Calibrated w. 75397 e cal/p.

Detector #	Probe Model	Serial #	High Voltage	Threshold	Units/ Time Base	Dead Time Correction Factor	Calibration Constant	Linearity ±10%*
Detector #	LMI44-10	PR139487	1000	100	7 / 1	0.000000E+00	1.000000E+00	
Detector #	LMI44-10	PR139487	1000	100	4 / 2	1.800144E-05	5.747030E+10	✓
Detector #	PEAK	CS137	749	642	7 / 1	0.000000E+00	1.000000E+00	
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								

Units: 0 -- rad, 1 -- Gray, 2 -- rem, 3 -- Sv, 4 -- R, 5 -- C/Kg, 6 -- Disintegrations, -- Counts, 8 -- Ci/cm sq., 9 -- Bq/cm sq.

Time Base: 0 -- Seconds, 1 -- Minutes, 2 -- Hours

* See attached detector documentation, if app

Digital Readout	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
	400cpm	h/1A	39869 (p)	400cpm	h/1A	40 (p)
	40cpm	f	3992	40cpm	f	4
	4cpm	f	399			

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978.

State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources: Cs-137 Gamma S/N

☐ 73410

☐ 1131

☐ 781

☐ 059

☐ 280

☐ 60846

☐ 1162

☐ G112

☒ M565

☐ 5105

☐ T1008

☐ T879

☐ E552

☐ E551

☐ 720

☐ 734

☐ 1616

☐ 70897

☐ Neutron Am-241 Be S/N T-304

☐ Alpha S/N

☐ Beta S/N

☒ Other

Am241:0.83uci

☒ m 500 S/N

94940

☒ Multimeter S/N

78401031

Calibrated By:

55 55

Date

22-APR-10

Reviewed By:

Richard Hain

Date

26 Apr 10



Designer and Manufacturer
of
Scientific and Industrial
Instruments

CERTIFICATE OF CALIBRATION

mfg - 3

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER TETRA TECH, INC. ORDER NO. 20140461/342081
Mfg. Ludlum Measurements, Inc. Model 2350-1 Serial No. 98631
Cal. Date 22-Sep-09 Cal Due Date 22-Sep-10 Cal. Interval 1 Year Meterface N/A
Check mark ☒ Applies to applicable instr. and/or detector IAW mfg. spec. T. 75 °F RH 30 % Alt 705.8 mm Hg
☐ New Instrument Instrument Received ☒ Within Toler. $\pm 10\%$ ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments
☒ Mechanical check ☒ Reset check ☒ Window Operation ☒ Input Sens. Linearity
☒ F/S Resp. check ☒ Alarm Setting check ☒ Battery check (Min. Volt) 4.4 VDC
☒ Audio check ☒ Integrated Dose check ☒ Recycle Mode check Threshold
☒ Ratemeter Linearity check ☒ Overload check ☒ Scaler Readout check Dial Ratio 100 = 10 mV
☒ Data Log check ☒ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☒ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.
☒ HV Readout (2 points) Ref./Inst. 500 / 499 V Ref./Inst. 2000 / 1999 V

COMMENTS: Firmware: 37122N26

I/O Firmware: 37123N05

Calibrated using 39" cable.

(44-10) Resolution for Cs137 $\approx 9.06\%$

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

Detector #	Probe Model	Serial #	High Voltage	Threshold	Units/ Time Base	Dead Time Correction Factor	Calibration Constant	Linearity $\pm 10\%$
Detector # 1	LMI44-10	PR011772	900	100	4 / 2	1.204162E-05	5.751392E+10	<input checked="" type="checkbox"/>
Detector # 2	LMI44-10	PR011772	900	100	7 / 1	1.204162E-05	1.000000E+00	
Detector # 3	CS137/PK	662KEV	601	642	7 / 1	0.000000E+00	1.000000E+00	
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								

Units: 0 -- rad, 1 -- Gray, 2 -- rem, 3 -- Sv, 4 -- R, 5 -- C/Kg -- Disintegrations, 6 -- Counts, 7 -- Ci/cm sq, 8 -- Bq/cm sq.

Time Base: 0 -- Seconds, 1 -- Minutes, 2 -- Hours

* See attached detector documentation, if app

Digital Readout	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
	400cpm	40055(0)	40055(0)	400cpm	40(0)	40(0)
	40cpm	4006	4006	40cpm	4	4
	4cpm	400	400			

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques.
The calibration system conforms to the requirements of ANSI/NCCL Z540-1-1994 and ANSI N323-1978.

State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources: Cs-137 Gamma S/N

☐ S-394/1122 ☐ 1131 ☐ 781 ☐ 059 ☐ 280 ☐ 60646

☐ 1162 ☐ G112 ☒ M565 ☐ 5105 ☐ T1008 ☐ T879 ☐ E552 ☐ E551 ☐ 720 ☐ 734 ☐ 1616

☐ Neutron Am-241 Be S/N T-304

☐ Alpha S/N ☐ Beta S/N

☒ Other Am241 ≈ 0.83 μ Ci

☒ m 500 S/N 114520

☒ Multimeter S/N 78401030

Calibrated By: Robert C. Galloway

Date 22-Sep-09

Reviewed By: Dwight Jackson

Date 23-Sep-09



Designer and Manufacturer
of
Scientific and Industrial
Instruments

CERTIFICATE OF CALIBRATION

MFG-16

LUDLUM MEASUREMENTS, INC.

POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER TETRA TECH, INC.

ORDER NO. 20140461/342081

Mfg. Ludlum Measurements, Inc.

Model 2350-1

Serial No. 129405

Cal. Date 22-Sep-09

Cal Due Date 22-Sep-10

Cal. Interval 1 Year Meterface N/A

Check mark ☒ applies to applicable instr. and/or detector IAW mfg. spec.

T. 75 °F RH 30 % Alt 705.8 mm Hg

☐ New Instrument ☐ Instrument Received ☒ Within Toler. +10% ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

☒ Mechanical check

☒ F/S Resp. check

☒ Audio check

☒ Ratemeter Linearity check

☒ Data Log check

☒ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89.

☒ Reset check

☒ Alarm Setting check

☒ Integrated Dose check

☒ Overload check

☒ Window Operation

☒ Battery check (Min. Volt) 4.4 VDC

☒ Recycle Mode check

☒ Scaler Readout check

☒ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

☒ Input Sens. Linearity

Threshold
Dial Ratio 100 = 10 mV

☒ HV Readout (2 points)

Ref./Inst. 500

/ 500

V Ref./Inst. 2000

/ 1997

V

COMMENTS: Firmware: 37122N21

I/O Firmware: 37123N05

Calibrated using 39" cable.

(44-10) Resolution for Cs137 \approx 9.67%

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

Detector #	Probe Model	Serial #	High Voltage	Threshold	Units/ Time Base	Dead Time Correction Factor	Calibration Constant	Linearity $\pm 10\%$ *
Detector # 1	LMI44-10	PR137085	850	100	4 / 2	1.537896E-05	5.740377E+10	<input checked="" type="checkbox"/>
Detector # 2	LMI44-10	PR137085	850	100	7 / 1	1.537895E-05	1.000000E+00	
Detector # 3	CS137/PK	662KEV	578	642	7 / 1	0.000000E+00	1.000000E+00	
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								

Units: 0 -- rad, 1 -- Gray, 2 -- rem, 3 -- Sv, 4 -- R, 5 -- C/Kg, 6 -- Disintegrations, 7 -- Counts, 8 -- Ci/cm sq, 9 -- Bq/cm sq.
Time Base: 0 -- Seconds, 1 -- Minutes, 2 -- Hours

* See attached detector documentation, if app

Digital Readout	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
	400cpm	40087(0)	40087(0)	400cpm	40(0)	40(0)
	40kcpm	4004	4004	40cpm	4	4
	4kcpm	400	400			

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques.
The calibration system conforms to the requirements of ANSI/NCSS Z540-1-1994 and ANSI N323-1978.

State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources: Cs-137 Gamma S/N

☐ S-394/1122 ☐ 1131 ☐ 781 ☐ 059 ☐ 280 ☐ 60646

☐ 1162 ☐ G112 ☒ M565 ☐ 5105 ☐ T1008 ☐ T879 ☐ E552 ☐ E551 ☐ 720 ☐ 734 ☐ 1616

☐ Neutron Am-241 Be S/N T-304

☐ Alpha S/N

☐ Beta S/N

☒ Other Am241 \approx 0.83 μ Ci

☒ m 500 S/N 114520

☒ Multimeter S/N 78401030

Calibrated By: Sebastien Ceballos

Date 22-Sep-09

Reviewed By: Duranopeterson

Date 23-Sep-09



Designer and Manufacturer
of
Scientific and Industrial
Instruments

CERTIFICATE OF CALIBRATION

MF6-17

LUDLUM MEASUREMENTS, INC.

POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER TETRA TECH MFG, INC.

ORDER NO. 20150942/348450

Mfg. Ludlum Measurements, Inc. Model 2350-1

Serial No. 120630

Cal. Date 13-Apr-10 Cal Due Date 13-Apr-11 Cal. Interval 1 Year Meterface

Check mark ☒ applies to applicable instr. and/or detector IAW mfg. spec. T. 75 °F RH 20 % Alt 698.8 mm Hg

☐ New Instrument ☐ Instrument Received ☐ Within Toler. +-10% ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

☒ Mechanical check

☒ Input Sens. Linearity

☒ F/S Resp. check

☒ Reset check

☒ Window Operation

☒ Audio check

☒ Alarm Setting check

☒ Battery check (Min. Volt) 4.4 VDC

☒ Ratemeter Linearity check

☒ Integrated Dose check

☒ Recycle Mode check

☒ Data Log check

☒ Overload check

☒ Scaler Readout check

Threshold
Dial Ratio 100 = 10 mV

☒ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89.

☒ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

☒ HV Readout (2 points) Ref./Inst. 500 / 498 V Ref./Inst. 2000 / 1997 V

COMMENTS: Firmware: 37122N21

I/O Firmware# 37123n04

Resolution for Cs-137 = 12%

Calibrated with a 39" cable.

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

Detector #	Probe Model	Serial #	High Voltage	Threshold	Units/Time Base	Dead Time Correction Factor	Calibration Constant	Linearity ±10%*
Detector # 1	LMI44-10	PR135847	1000	100	4 / 2	1.603268E-05	5.430998E+10	✓
Detector # 2	LMI44-10	PR135847	1000	100	7 / 1	1.603268E-05	1.000000E+00	
Detector # 3	CS137PK	662KEV	676	642	7 / 1	0.000000E+00	1.000000E+00	
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								
Detector #								

Units: 0--rad, 1--Gray, 2--rem, 3--Sv, 4--R, 5--C/Kg, 6--Disintegrations, 7--Counts, 8--Ci/cm sq., 9--Bq/cm sq.

Time Base: 0--Seconds, 1--Minutes, 2--Hours

* See attached detector documentation, if applicable.

Digital Readout	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
	400K cpm	39933 (10)	39933 (10)	400 cpm	40 (10)	40 (10)
	40K	3990	3990	40	4	4
	4K	398	398			

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques.

The calibration system conforms to the requirements of ANSI/NCCL Z540-1-1994 and ANSI N323-1978.

State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources: Cs-137 Gamma S/N

☐ 1162 ☐ G112 ☐ M565 ☐ 5105 ☐ T1008 ☐ T879 ☐ E552 ☐ E551 ☐ 720 ☐ 734 ☐ 1616 ☐ 70897 ☐ Neutron Am-241 Be S/N T-304

☐ Alpha S/N ☐ Beta S/N

☒ Other Am 241 = 0.76uCi

☒ m 500 S/N 50800

☒ Multimeter S/N 83990502

Calibrated By: Charles Dick

Date 13 Apr 10

Reviewed By: Frank Hain

Date 15 Apr 10



Designer and Manufacturer
of
Scientific and Industrial
Instruments

CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.

POST OFFICE BOX 810 PH. 325-235-5494

501 OAK STREET

FAX NO. 325-235-4672

SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER TETRA TECH MFG, INC.

ORDER NO. 20141568/342736

Mfg. BICRON Model MICRO REM Serial No. B990Y

Mfg. _____ Model _____ Serial No. _____

Cal. Date 30-Sep-09 Cal Due Date 30-Sep-10 Cal. Interval 1 Year Meterface 0-200µrem

Check mark ☒ applies to applicable instr. and/or detector IAW mfg. spec. T. 74 °F RH 53 % Alt 697.8 mm Hg

☐ New Instrument ☐ Instrument Received ☐ Within Toler. $\pm 10\%$ ☒ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

☒ Mechanical ck. ☒ Meter Zeroed ☐ Background Subtract ☐ Input Sens. Linearity

☐ F/S Resp. ck. ☐ Reset ck. ☐ Window Operation ☐ Geotropism

☐ Audio ck. ☐ Alarm Setting ck. ☒ Batt. ck. (Min. Volt) _____ VDC

☐ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☒ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set _____ V Input Sens. _____ mV Det. Oper. _____ V at _____ mV Threshold _____ mV
Dial Ratio _____ =

☐ HV Readout (2 points) Ref./Inst. _____ / _____ V Ref./Inst. _____ / _____ V

COMMENTS:

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
x1000	150 mR/hr	150	150
x1000	50 mR/hr	45	45
x100	15 mR/hr	145	150
x100	5 mR/hr	45	50
x10	1500 µR/hr	130	150
x10	500 µR/hr	40	50
x1	150 µR/hr	150	150
x1	100 µR/hr	100	100
x0.1	15 µR/hr	150	150
x0.1			

*Uncertainty within $\pm 10\%$ C.F. within $\pm 20\%$

Range(s) Calibrated Electronically

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout			Log Scale		

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. the calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978 State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources: ☐ S-394/1122 ☒ 1131 ☒ 781 ☐ 059 ☐ 280 ☐ 60646

Cs-137 Gamma S/N ☐ 1162 ☐ G112 ☐ M565 ☐ 5105 ☐ T1008 ☐ T879 ☐ E552 ☐ E551 ☐ 720 ☐ 734 ☐ 1616 ☐ Neutron Am-241 Be S/N T-304

☐ Alpha S/N ☐ Beta S/N ☒ Other 20µCi #356/282A-35

☐ m 500 S/N ☐ Oscilloscope S/N ☐ Multimeter S/N

Calibrated By: Wendell Williams Date 30 Sep 09

Reviewed By: Rhonda Hain Date 30 Sep 09

This certificate shall not be reproduced except in full, without the written approval of Ludlum Measurements, Inc.
FORM C22A 10/15/2008

AC Inst. ☐ Passed Dielectric (Hi-Pot) and Continuity Test
Only ☐ Failed: _____

APPENDIX B LABORATORY ANALYSIS RESULTS



Gamma Spectroscopy Case Narrative

Tetra Tech MM, Inc.

Work Order Number: 1007308

1. The following report consists of analytical results for 10 soil samples received by ALS on 07/27/10.
2. These samples were prepared according to procedure SOP739R9. The samples were sealed in steel cans on 07/31/10 and stored for at least 21 days to allow ^{222}Rn to approach secular equilibrium with its parent, ^{226}Ra . The degree of in-growth achieved prior to analysis on 08/21/10 is at least 97.8%. Conservatively assuming a radon emanation efficiency of approximately 50%, the effective radon progeny in-growth for these samples would be greater than 98.9%.
3. The samples were analyzed for the presence of gamma emitting radionuclides according to procedure SOP713R11. The analyses were completed on 08/21/10.
4. The results for these samples are reported on a "Dry Weight" basis in units of pCi/gram.
5. ALS has observed a reproducible low bias in ^{226}Ra results (about -30% for the geometry in question) when using a mixed gamma source for the calibration of HPGe detectors for solid samples. This bias is eliminated by calibration using a NIST traceable ^{226}Ra source in the same geometry and configuration as the samples.
6. The library used for calibration and analysis employs multiple peaks for the ^{226}Ra progeny, ^{214}Pb (352 and 295 keV) and ^{214}Bi (609 and 1120 keV). Using these peaks avoids the use of the problematic ^{226}Ra photo-peak at 186 keV, which suffers from poorly resolvable interference from ^{235}U at the same energy. Final activity results for ^{226}Ra are calculated, using the uncertainty-weighted mean of the activities for the four photo-peaks, by the Seeker gamma spectroscopy software assuming secular equilibrium.
7. There are cases where the sample density is less than the associated calibration standard density. Cases that exceed the limit of +/- 15% of the density of the calibration standard are flagged with a 'G', denoting a significant density difference between the sample and calibration standard. Consequently, the results may be biased high for the flagged results in this work order. If requested, ALS can perform a transmission spike in order to estimate a magnitude of this bias. The results are reported without further qualification.



8. No further problems were encountered with either the client samples or the associated quality control samples. All remaining quality control criteria were met.

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


Linda Arend
Radiochemistry Primary Data Reviewer

08/27/10
Date


Radiochemistry Final Data Reviewer

08/27/10
Date

ALS Environmental -- FC

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 1007308

Client Name: Tetra Tech MM, Inc.

Client Project Name:

Client Project Number:

Client PO Number:

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
Ross Corr 1	1007308-1		SOIL	22-Jul-10	
Ross Corr 2	1007308-2		SOIL	22-Jul-10	
Ross Corr 3	1007308-3		SOIL	22-Jul-10	
Ross Corr 4	1007308-4		SOIL	22-Jul-10	
Ross Corr 5	1007308-5		SOIL	22-Jul-10	
Ross Corr 6	1007308-6		SOIL	22-Jul-10	
Ross Corr 7	1007308-7		SOIL	22-Jul-10	
Ross Corr 8	1007308-8		SOIL	22-Jul-10	
Ross Corr 9	1007308-9		SOIL	22-Jul-10	
Ross Corr 10	1007308-10		SOIL	22-Jul-10	

**ALS Laboratory Group**

CHAIN OF CUSTODY

By the use of this form the user acknowledges and agrees with the terms and conditions as specified on the back of Chain of Custody

COC number (for client tracking)

Page of

1007308

[illegible]

a) DW (Drinking water), SW (Surface water), GW (Ground water), WW (Waste water), IW (Industrial water), SO (Soil), SL (Sludge), WA (Waste), SE (Sediment), OS (Other solid material), EM (Emission), IM (Invasion, Ambient air)
b) F (Flammable), P (Poisonous), I (Infectious), CR (Corrosive), E (Explosive), CN (Contaminated)



CONDITION OF SAMPLE UPON RECEIPT FORM

Client: TETRAWorkorder No: 1007308Project Manager: ARWInitials: LAS Date: 7/27/10

1. Does this project require any special handling in addition to standard Paragon procedures?	YES	<input checked="" type="radio"/> NO
2. Are custody seals on shipping containers intact?	<input checked="" type="radio"/> NONE	YES NO
3. Are Custody seals on sample containers intact?	<input checked="" type="radio"/> NONE	YES NO
4. Is there a COC (Chain-of-Custody) present or other representative documents?	<input checked="" type="radio"/> YES	YES NO
5. Are the COC and bottle labels complete and legible?	<input checked="" type="radio"/> YES	YES NO
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)	<input checked="" type="radio"/> YES	YES NO
7. Were airbills / shipping documents present and/or removable?	<input checked="" type="radio"/> DROP OFF	YES NO
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	<input checked="" type="radio"/> N/A	YES NO
9. Are all aqueous non-preserved samples pH 4-9?	<input checked="" type="radio"/> N/A	YES NO
10. Is there sufficient sample for the requested analyses?	<input checked="" type="radio"/> YES	YES NO
11. Were all samples placed in the proper containers for the requested analyses?	<input checked="" type="radio"/> YES	YES NO
12. Are all samples within holding times for the requested analyses?	<input checked="" type="radio"/> YES	YES NO
13. Were all sample containers received intact? (not broken or leaking, etc.)	<input checked="" type="radio"/> YES	YES NO
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: <u>< green pea</u> <u>> green pea</u>	<input checked="" type="radio"/> N/A	YES NO
15. Do perchlorate LCMS-MS samples have headspace? (at least 1/3 of container required)	<input checked="" type="radio"/> N/A	YES NO
16. Were samples checked for and free from the presence of residual chlorine? (Applicable when PM has indicated samples are from a chlorinated water source; note if field preservation with sodium thiosulfate was not observed.)	<input checked="" type="radio"/> N/A	YES NO
17. Were the samples shipped on ice?	YES	<input checked="" type="radio"/> NO
18. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #2 #4	<input checked="" type="radio"/> RAD ONLY	YES <input checked="" type="radio"/> NO
Cooler #: <u>1</u>		
Temperature (°C): <u>Amb</u>		
No. of custody seals on cooler: <u>0</u>		
DOT Survey/ Acceptance Information	External µR/hr reading: <u>N/A</u>	
	Background µR/hr reading: <u>11</u>	
Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / <input checked="" type="radio"/> NA (If no, see Form 008.)		

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

If applicable, was the client contacted? YES / NO / ☒ NA Contact: Guszy Date/Time: 7/28/10Project Manager Signature / Date: Guszy 7/28/10

*IR Gun #2: Oakton, SN 29922500201-0066

*IR Gun #4: Oakton, SN 2372220101-0002

Form 201r22.xls (6/1/09)

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Gamma Spectroscopy Results

PAI 713 Rev 11

Method Blank Results

Lab Name: ALS Environmental -- FC

Work Order Number: 1007308

Client Name: Tetra Tech MM, Inc.

ClientProject ID:

Lab ID: GS100801-1MB

Library: RA226.LIB

Sample Matrix: SOIL

Prep SOP: PAI 739 Rev 10

Date Collected: 31-Jul-10

Date Prepared: 31-Jul-10

Date Analyzed: 21-Aug-10

Prep Batch: GS100801-1

QCBatchID: GS100801-1-1

Run ID: GS100801-1A

Count Time: 30 minutes

Final Aliquot: 134 g

Result Units: pCi/g

File Name: 101395d01

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13982-63-3	Ra-226	0.05 +/- 0.25	0.43	1	U

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU

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.

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 half-lives.

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

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

Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

Data Package ID: GSS1007308-1

Date Printed: Friday, August 27, 2010

ALS Environmental -- FC

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Gamma Spectroscopy Results

PAI 713 Rev 11

Laboratory Control Sample(s)

Lab Name: ALS Environmental -- FC

Work Order Number: 1007308

Client Name: Tetra Tech MM, Inc.

ClientProject ID:

Lab ID: GS100801-1LCS

Library: RA226.LIB

Sample Matrix: SOIL

Prep SOP: PAI 739 Rev 10

Date Collected: 31-Jul-10

Date Prepared: 31-Jul-10

Date Analyzed: 21-Aug-10

Prep Batch: GS100801-1

QCBatchID: GS100801-1-1

Run ID: GS100801-1A

Count Time: 30 minutes

Final Aliquot: 215 g

Result Units: pCi/g

File Name: 101465d04

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
13982-63-3	Ra-226	458 +/- 54	3	470	97.5	85 - 115	P,M3

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU

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

MDC - Minimum Detectable Concentration

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 halfives.

Data Package ID: GSS1007308-1

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Gamma Spectroscopy Results

PAI 713 Rev 11

Duplicate Sample Results (DER)

Lab Name: ALS Environmental -- FC

Work Order Number: 1007308

Client Name: Tetra Tech MM, Inc.

ClientProject ID:

Field ID: Ross Corr 10

Lab ID: 1007308-10DUP

Library: RA226.LIB

Sample Matrix: SOIL

Prep SOP: PAI 739 Rev 10

Date Collected: 22-Jul-10

Date Prepared: 31-Jul-10

Date Analyzed: 21-Aug-10

Prep Batch: GS100801-1

QCBatchID: GS100801-1-1

Run ID: GS100801-1A

Count Time: 30 minutes

Report Basis: Dry Weight

Final Aliquot: 138 g

Prep Basis: Dry Weight

Moisture(%): NA

Result Units: pCi/g

File Name: 101212d08

CASNO	Analyte	Sample			Duplicate			DER	DER Lim
		Result +/- 2 s TPU	MDC	Flags	Result +/- 2 s TPU	MDC	Flags		
13982-63-3	Ra-226	1.53 +/- 0.42	0.74	G	1.71 +/- 0.40	0.63	G	0.303	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

DER - Duplicate Error Ratio

BDL - Below Detection Limit

NR - Not Reported

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 half-lives.

G - Sample density differs by more than 15% of LCS density.

Data Package ID: GSS1007308-1

Date Printed: Friday, August 27, 2010

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Gamma Spectroscopy Results

PAI 713 Rev 11

Sample Results

Lab Name: ALS Environmental -- FC

Work Order Number: 1007308

Client Name: Tetra Tech MM, Inc.

ClientProject ID:

Field ID: Ross Corr 1	Sample Matrix: SOIL	Prep Batch: GS100801-1	Final Aliquot: 138 g
Lab ID: 1007308-1	Prep SOP: PAI 739 Rev 10	QCBatchID: GS100801-1-1	Prep Basis: Dry Weight
Library: RA226.LIB	Date Collected: 22-Jul-10	Run ID: GS100801-1A	Moisture(%): NA
	Date Prepared: 31-Jul-10	Count Time: 30 minutes	Result Units: pCi/g
	Date Analyzed: 21-Aug-10	Report Basis: Dry Weight	File Name: 101616d03

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13982-63-3	Ra-226	1.15 +/- 0.37	0.70	1	G

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU

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

MDC - Minimum Detectable Concentration

BDL - Below Detection Limit

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 half-lives.

G - Sample density differs by more than 15% of LCS density.

Data Package ID: GSS1007308-1

Date Printed: Friday, August 27, 2010

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Gamma Spectroscopy Results

PAI 713 Rev 11

Sample Results

Lab Name: ALS Environmental -- FC

Work Order Number: 1007308

Client Name: Tetra Tech MM, Inc.

ClientProject ID:

Field ID:	Ross Corr 2
Lab ID:	1007308-2

Library: RA226.LIB

Sample Matrix: SOIL
Prep SOP: PAI 739 Rev 10
Date Collected: 22-Jul-10
Date Prepared: 31-Jul-10
Date Analyzed: 21-Aug-10

Prep Batch: GS100801-1
QCBatchID: GS100801-1-1
Run ID: GS100801-1A
Count Time: 30 minutes
Report Basis: Dry Weight

Final Aliquot: 109 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: 101210d08

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13982-63-3	Ra-226	1.96 +/- 0.48	0.69	1	G

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU
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.

SQ - Spectral quality prevents accurate quantitation.
SI - Nuclide identification and/or quantitation is tentative.
TI - Nuclide identification is tentative.
R - Nuclide has exceeded 8 half-lives.
G - Sample density differs by more than 15% of LCS density.

Abbreviations:

TPU - Total Propagated Uncertainty
MDC - Minimum Detectable Concentration
BDL - Below Detection Limit

Data Package ID: GSS1007308-1

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Gamma Spectroscopy Results

PAI 713 Rev 11

Sample Results

Lab Name: ALS Environmental -- FC

Work Order Number: 1007308

Client Name: Tetra Tech MM, Inc.

ClientProject ID:

Field ID:	Ross Corr 3
Lab ID:	1007308-3

Library: RA226.LIB

Sample Matrix: SOIL
Prep SOP: PAI 739 Rev 10
Date Collected: 22-Jul-10
Date Prepared: 31-Jul-10
Date Analyzed: 21-Aug-10

Prep Batch: GS100801-1
QCBatchID: GS100801-1-1
Run ID: GS100801-1A
Count Time: 30 minutes
Report Basis: Dry Weight

Final Aliquot: 130 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: 101393d01

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13982-63-3	Ra-226	1.97 +/- 0.36	0.53	1	G

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU
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.

SQ - Spectral quality prevents accurate quantitation.
SI - Nuclide identification and/or quantitation is tentative.
TI - Nuclide identification is tentative.
R - Nuclide has exceeded 8 half-lives.
G - Sample density differs by more than 15% of LCS density.

Abbreviations:

TPU - Total Propagated Uncertainty
MDC - Minimum Detectable Concentration
BDL - Below Detection Limit

Data Package ID: GSS1007308-1

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Gamma Spectroscopy Results

PAI 713 Rev 11

Sample Results

Lab Name: ALS Environmental -- FC

Work Order Number: 1007308

Client Name: Tetra Tech MM, Inc.

ClientProject ID:

Field ID:	Ross Corr 4
Lab ID:	1007308-4

Library: RA226.LIB

Sample Matrix: SOIL
Prep SOP: PAI 739 Rev 10
Date Collected: 22-Jul-10
Date Prepared: 31-Jul-10
Date Analyzed: 21-Aug-10

Prep Batch: GS100801-1
QCBatchID: GS100801-1-1
Run ID: GS100801-1A
Count Time: 30 minutes
Report Basis: Dry Weight

Final Aliquot: 132 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: 101463d04

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13982-63-3	Ra-226	1.81 +/- 0.43	0.67	1	G

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU
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.

SQ - Spectral quality prevents accurate quantitation.
SI - Nuclide identification and/or quantitation is tentative.
TI - Nuclide identification is tentative.
R - Nuclide has exceeded 8 half-lives.
G - Sample density differs by more than 15% of LCS density.

Abbreviations:

TPU - Total Propagated Uncertainty
MDC - Minimum Detectable Concentration
BDL - Below Detection Limit

Data Package ID: GSS1007308-1

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Gamma Spectroscopy Results

PAI 713 Rev 11

Sample Results

Lab Name: ALS Environmental -- FC

Work Order Number: 1007308

Client Name: Tetra Tech MM, Inc.

ClientProject ID:

Field ID: Ross Corr 5	Sample Matrix: SOIL	Prep Batch: GS100801-1	Final Aliquot: 136 g
Lab ID: 1007308-5	Prep SOP: PAI 739 Rev 10	QCBatchID: GS100801-1-1	Prep Basis: Dry Weight
Library: RA226.LIB	Date Collected: 22-Jul-10	Run ID: GS100801-1A	Moisture(%): NA
	Date Prepared: 31-Jul-10	Count Time: 30 minutes	Result Units: pCi/g
	Date Analyzed: 21-Aug-10	Report Basis: Dry Weight	File Name: 101617d03

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13982-63-3	Ra-226	14.3 +/- 1.9	1.0	1	G

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU
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.

SQ - Spectral quality prevents accurate quantitation.
SI - Nuclide identification and/or quantitation is tentative.
TI - Nuclide identification is tentative.
R - Nuclide has exceeded 8 half-lives.
G - Sample density differs by more than 15% of LCS density.

Abbreviations:

TPU - Total Propagated Uncertainty
MDC - Minimum Detectable Concentration
BDL - Below Detection Limit

Data Package ID: GSS1007308-1

Date Printed: Friday, August 27, 2010

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Gamma Spectroscopy Results

PAI 713 Rev 11

Sample Results

Lab Name: ALS Environmental -- FC

Work Order Number: 1007308

Client Name: Tetra Tech MM, Inc.

ClientProject ID:

Field ID:	Ross Corr 6
Lab ID:	1007308-6

Library: RA226.LIB

Sample Matrix: SOIL
Prep SOP: PAI 739 Rev 10
Date Collected: 22-Jul-10
Date Prepared: 31-Jul-10
Date Analyzed: 21-Aug-10

Prep Batch: GS100801-1
QCBatchID: GS100801-1-1
Run ID: GS100801-1A
Count Time: 30 minutes
Report Basis: Dry Weight

Final Aliquot: 142 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: 101211d08

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13982-63-3	Ra-226	1.18 +/- 0.32	0.54	1	G

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU
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.

SQ - Spectral quality prevents accurate quantitation.
SI - Nuclide identification and/or quantitation is tentative.
TI - Nuclide identification is tentative.
R - Nuclide has exceeded 8 half-lives.
G - Sample density differs by more than 15% of LCS density.

Abbreviations:

TPU - Total Propagated Uncertainty
MDC - Minimum Detectable Concentration
BDL - Below Detection Limit

Data Package ID: GSS1007308-1

Date Printed: Friday, August 27, 2010

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Gamma Spectroscopy Results

PAI 713 Rev 11

Sample Results

Lab Name: ALS Environmental -- FC

Work Order Number: 1007308

Client Name: Tetra Tech MM, Inc.

ClientProject ID:

Field ID: Ross Corr 7	Sample Matrix: SOIL	Prep Batch: GS100801-1	Final Aliquot: 140 g
Lab ID: 1007308-7	Prep SOP: PAI 739 Rev 10	QCBatchID: GS100801-1-1	Prep Basis: Dry Weight
Library: RA226.LIB	Date Collected: 22-Jul-10	Run ID: GS100801-1A	Moisture(%): NA
	Date Prepared: 31-Jul-10	Count Time: 30 minutes	Result Units: pCi/g
	Date Analyzed: 21-Aug-10	Report Basis: Dry Weight	File Name: 101394d01

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13982-63-3	Ra-226	0.93 +/- 0.25	0.47	1	LT,G

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU
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.

SQ - Spectral quality prevents accurate quantitation.
SI - Nuclide identification and/or quantitation is tentative.
TI - Nuclide identification is tentative.
R - Nuclide has exceeded 8 half-lives.
G - Sample density differs by more than 15% of LCS density.

Abbreviations:

TPU - Total Propagated Uncertainty
MDC - Minimum Detectable Concentration
BDL - Below Detection Limit

Data Package ID: GSS1007308-1

Date Printed: Friday, August 27, 2010

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Gamma Spectroscopy Results

PAI 713 Rev 11

Sample Results

Lab Name: ALS Environmental -- FC

Work Order Number: 1007308

Client Name: Tetra Tech MM, Inc.

ClientProject ID:

Field ID:	Ross Corr 8
Lab ID:	1007308-8

Library: RA226.LIB

Sample Matrix: SOIL
Prep SOP: PAI 739 Rev 10
Date Collected: 22-Jul-10
Date Prepared: 31-Jul-10
Date Analyzed: 21-Aug-10

Prep Batch: GS100801-1
QCBatchID: GS100801-1-1
Run ID: GS100801-1A
Count Time: 30 minutes
Report Basis: Dry Weight

Final Aliquot: 135 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: 101464d04

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13982-63-3	Ra-226	1.60 +/- 0.40	0.62	1	G

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU
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.

SQ - Spectral quality prevents accurate quantitation.
SI - Nuclide identification and/or quantitation is tentative.
TI - Nuclide identification is tentative.
R - Nuclide has exceeded 8 half-lives.
G - Sample density differs by more than 15% of LCS density.

Abbreviations:

TPU - Total Propagated Uncertainty
MDC - Minimum Detectable Concentration
BDL - Below Detection Limit

Data Package ID: GSS1007308-1

Date Printed: Friday, August 27, 2010

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Gamma Spectroscopy Results

PAI 713 Rev 11

Sample Results

Lab Name: ALS Environmental -- FC

Work Order Number: 1007308

Client Name: Tetra Tech MM, Inc.

ClientProject ID:

Field ID:	Ross Corr 9
Lab ID:	1007308-9

Library: RA226.LIB

Sample Matrix: SOIL
Prep SOP: PAI 739 Rev 10
Date Collected: 22-Jul-10
Date Prepared: 31-Jul-10
Date Analyzed: 21-Aug-10

Prep Batch: GS100801-1
QCBatchID: GS100801-1-1
Run ID: GS100801-1A
Count Time: 30 minutes
Report Basis: Dry Weight

Final Aliquot: 141 g
Prep Basis: Dry Weight
Moisture(%): NA
Result Units: pCi/g
File Name: 101079d10

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13982-63-3	Ra-226	1.44 +/- 0.41	0.72	1	G

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU
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.

SQ - Spectral quality prevents accurate quantitation.
SI - Nuclide identification and/or quantitation is tentative.
TI - Nuclide identification is tentative.
R - Nuclide has exceeded 8 half-lives.
G - Sample density differs by more than 15% of LCS density.

Abbreviations:

TPU - Total Propagated Uncertainty
MDC - Minimum Detectable Concentration
BDL - Below Detection Limit

Data Package ID: GSS1007308-1

Date Printed: Friday, August 27, 2010

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Gamma Spectroscopy Results

PAI 713 Rev 11

Sample Results

Lab Name: ALS Environmental -- FC

Work Order Number: 1007308

Client Name: Tetra Tech MM, Inc.

ClientProject ID:

Field ID: Ross Corr 10	Sample Matrix: SOIL	Prep Batch: GS100801-1	Final Aliquot: 136 g
Lab ID: 1007308-10	Prep SOP: PAI 739 Rev 10	QCBatchID: GS100801-1-1	Prep Basis: Dry Weight
Library: RA226.LIB	Date Collected: 22-Jul-10	Run ID: GS100801-1A	Moisture(%): NA
	Date Prepared: 31-Jul-10	Count Time: 30 minutes	Result Units: pCi/g
	Date Analyzed: 21-Aug-10	Report Basis: Dry Weight	File Name: 101618d03

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13982-63-3	Ra-226	1.53 +/- 0.42	0.74	1	G

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU
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.

SQ - Spectral quality prevents accurate quantitation.
SI - Nuclide identification and/or quantitation is tentative.
TI - Nuclide identification is tentative.
R - Nuclide has exceeded 8 half-lives.
G - Sample density differs by more than 15% of LCS density.

Abbreviations:

TPU - Total Propagated Uncertainty
MDC - Minimum Detectable Concentration
BDL - Below Detection Limit

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Gamma Spectroscopy Results

PAI 713 Rev 11

Sample Duplicate Results

Lab Name: ALS Environmental -- FC

Work Order Number: 1007308

Client Name: Tetra Tech MM, Inc.

ClientProject ID:

Field ID: Ross Corr 10	Sample Matrix: SOIL	Prep Batch: GS100801-1	Final Aliquot: 138 g
Lab ID: 1007308-10DUP	Prep SOP: PAI 739 Rev 10	QCBatchID: GS100801-1-1	Prep Basis: Dry Weight
Library: RA226.LIB	Date Collected: 22-Jul-10	Run ID: GS100801-1A	Moisture(%): NA
	Date Prepared: 31-Jul-10	Count Time: 30 minutes	Result Units: pCi/g
	Date Analyzed: 21-Aug-10	Report Basis: Dry Weight	File Name: 101212d08

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	Lab Qualifier
13982-63-3	Ra-226	1.71 +/- 0.40	0.63	1	G

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU.

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

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 halfives.

G - Sample density differs by more than 15% of LCS density.

Abbreviations:

TPU - Total Propagated Uncertainty

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