Analytical Data Package Prepared For

Rust International Corp

Radiochemical Analysis By

Quanterra Analytical Services
Richland Laboratory

Report Nbr: 10029

SDG Nbr	ORDER Nbr	CLIENT ID NUMBER	LOT Nbr	WORK ORDER	RPT DB ID	BATCH
14130		RW-41-GW-01	J0B230186-3	D978A101	9D978A10	0066266

Comments:

Quanterra
2800 George Washington Way
Richland, Washington 99352-1613

509 375-3131 Telephone
509 375-5590 Fax

CERTIFICATE OF ANALYSIS

Earth Tech, Inc.
10 Patewood Drive
Building VI, Suite 500
Greenville, SC 29615

March 16, 2000

Attention: Jim Refermat

SDG Number	:	14130
Date Samples Received	:	February 24, 2000
Number of Samples	:	One (1)
Sample Type	:	Water
PO Number	:	36008 WBS 17.01.07

I. Introduction

On February 24, 2000, one water sample was received at the Quanterra Richland Laboratory (QRL) for radiochemical analysis. Upon receipt, the sample was assigned the following laboratory ID number to correspond with the Earth Tech, Inc. (ETI) specific ID:

QRL ID#	ETI ID#	MATRIX	DATE OF RECEIPT
9D978A10	RW-41-GW-01	WATER	2/24/00

II. Analytical Results/Methodology

The analytical results for this report are presented by laboratory sample ID. Each set of data includes sample identification information, analytical results and the appropriate associated statistical errors.

The requested analysis was: **Gamma Spectroscopy**
Gamma Spec by method RICH-RC-5017

III. Quality Control

The analytical results for each analysis performed under SDG 14130 includes a minimum of one laboratory control sample (LCS), one method (reagent) blank, and one duplicate sample analysis. Any exceptions have been noted in the "Comments" section.

QC and sample results are reported in the same units.

IV. Comments

Gamma Spectroscopy

Gamma Spectroscopy by method RICH-RC-5017:

The samples were analyzed for U-235 and U-238 by gamma spectroscopy. The LCS, batch blank, samples and sample duplicate results are within contractual requirements.

I certify that this Certificate of Analysis is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the Laboratory Manager, or a designee as verified by the following signature.

Reviewed and approved:

Jackie Waddell

Jackie Waddell
Project Manager

Date: 3/16/00

Sample Results Summary

Quanterra, Richland

REPORT No. : 10029

SDG NBR: 14130

CLIENT ID	WORK ORDER NUMBER	PARAMETER	RESULT	UNITS	YIELD	MDA
BLANK QC	D9A0C101	U-235HP	-4.34E+00 +- 1.90E+01 (2s)	pCi/L		3.36E+01
BLANK QC		U-238DHP	-2.69E+01 +- 2.94E+02 (2s)	pCi/L		4.91E+02
LCS	D9A0C102	CS-137	1.26E+02 +- 2.05E+01 (2s)	pCi/L		8.27E+00
P-403-VW-01 DUP	D8WD7102	U-235HP	-3.22E+00 +- 1.47E+01 (2s)	pCi/L		2.59E+01
P-403-VW-01 DUP		U-238DHP	4.21E+01 +- 5.23E+01 (2s)	pCi/L		9.66E+01
RW-41-GW-01	D978A101	U-235HP	-9.55E-03 +- 2.02E+01 (2s)	pCi/L		3.54E+01
RW-41-GW-01		U-238DHP	-2.44E+01 +- 5.92E+01 (2s)	pCi/L		1.05E+02

Number of Results: 7

Comments:

FORM I

Date: 3/16/200

SAMPLE RESULTS

LAB NAME: QUANTERRA, Richland
LOT,RPT DB ID: J0B230186-3 9D978A10
CLIENT ID: RW-41-GW-01

SDG: 14130
REPORT NBR: 10029
ORDER NBR:

COLLECTION DATE: 2/23/2000 10:00:00 AM
RECEIVED DATE: 2/23/2000 10:30:00 AM
MATRIX: WATER

ISOTOPE	RESULT	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDC	REPORT UNIT	YIELD	RST/MDC	RST/CNTERR	ANALYSIS DATE	ALIQUOT SIZE	ALQ UNIT	DETECTOR ID	METHOD NUMBER
Batch: 0066266	Work Order:	D978A101											
U-235HP	-9.55E-03	2.0E+01	2.0E+01	3.54E+01	pCi/L		0.	0.	3/8/00 07:46 a	1.0767	L	GER5$1	RICHRC5017
U-238DHP	-2.44E+01	5.9E+01	5.9E+01	1.05E+02	pCi/L		-0.23	-0.82	3/8/00 07:46 a	1.0767	L	GER5$1	RICHRC5017

Number of Results: 2

Comments:

Date: 3/16/00

FORM II
DUPLICATE RESULTS

LAB NAME:	QUANTERRA, Richland	**SDG:**	14130	**COLLECTION DATE:**	2/21/2000 9:00:00 AM
RPT DB ID/ORIG ID	D8WD712R / 9D8WD710	**REPORT NBR:**	10029	**RECEIVED DATE:**	2/23/2000 10:30:00 AM
CLIENT ID:	P-403-VW-01 DUP	**ORDER NBR:**		**MATRIX:**	WATER

Batch: 0066266 **Work Order:** D8WD7102

ISOTOPE	RESULT	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDC	REPORT UNIT	YIELD	ORIG RESULT	RPD	ANALYSIS DATE	ALIQUOT SIZE	ALQ UNIT	DETECTOR ID	METHOD NUMBER
U-235HP	-3.22E+00	1.5E+01	1.5E+01	2.59E+01	pCi/L		4.81E+00	1009.61%	3/8/00 10:35 a	1.0414	L	GER8$1	RICHRC5017
U-238DHP	4.21E+01	5.2E+01	5.2E+01	9.66E+01	pCi/L		1.59E+02	116.46%	3/8/00 10:35 a	1.0414	L	GER8$1	RICHRC5017

Number of Results: 2

Comments:

Date: 3/16/00

FORM II
BLANK RESULTS

LAB NAME: QUANTERRA, Richland   SDG: 14130   ORDER NBR:

LOT,RPT DB ID: J0C060000-266 D9A0C11B   REPORT NBR: 10029   MATRIX: Water

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDC	REPORT UNIT	YIELD	RST/MDC	RST/CNTERR	ANALYSIS DATE	ALIQUOT SIZE	ALQ UNIT	DETECTOR ID	METHOD NUMBER
Batch: 0066266	Work Order:	D9A0C101											
U-235HP	-4.34E+00	1.9E+01	1.9E+01	3.36E+01	pCi/L		-0.13	-0.46	3/8/00 07:40 a	1.0	L	GER3$1	RICHRC5017
U-238DHP	-2.69E+01	2.9E+02	2.9E+02	4.91E+02	pCi/L		-0.05	-0.18	3/8/00 07:40 a	1.0	L	GER3$1	RICHRC5017

Number of Results: 2

Comments:

Date: 3/16/00

FORM II

LABORATORY CONTROL SAMPLE

LAB NAME: QUANTERRA, Richland **SDG:** 14130 **ORDER NBR:**

LOT,RPT DB ID: J0C060000-266 D9A0C12S **REPORT NBR:** 10029 **MATRIX:** Water

ISOTOPE	RESULT	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDC	REPORT UNIT	YIELD	Expected	Expected Uncert	Recovery	ANALYSIS DATE	ALIQUOT SIZE	ALQ UNIT	DETECTOR ID	METHOD NUMBER
Batch: 0066266	Work Order:	D9A0C102												
CS-137	1.26E+02	2.1E+01	2.1E+01	8.27E+00	pCi/L		1.26E+02	2.2E+00	100.06%	3/8/00 07:45 a	1.0	LITE	GER4$1	RICHRC5017

Number of Results: 1

Comments:

Page 1 of 1
Project Number 36008
WBS Number 17010
Chain of Custody Number 15022

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

Chain of Custody and Analytical Request

Lab Bill To TERC III MSA Project No 36008 WBS #

LIMS Number

Facility / Air Force Base ID: Eglin Air Force Base/EGLIN

Project Name / ~~[illegible]~~ Site No. RW-41 Test Area C-74L

Client Name: USACE - Omaha District

Collected by N. Kantor, C. Forbes

Field Sample ID (30 Characters Max)	ERPIMS LOCID (15 Characters Max)	Date Collected (dd-mmm-yyyy)	Time Collected (Military) (hhmm)	Sample Depth (beginning - ending)	SA Code (2)	Sample Number (3)	Sample Matrix	No Of Containers	Sample Analysis Requested (4): U Iso Gamma Spec									Quality Assurance Samples (4): Ambient Blank Lot Control Number	Equipment Blank Lot Control Number	Trip Blank Lot Control Number	Cool ID
RW-41-~~AG~~ GW-01	RW41-WG01	~~24~~ 23 02 00	1000	0 - 0	N	01	WG	1	X				/	/	/			02230000	02230000	02230000	A
D978A				-														~~02230000~~	~~02230000~~	~~02230000~~	A
				-																	
				-																	
				-																	
				-																	
				-																	
				-																	
				-																	
				-																	
				-																	
				-																	
Temp Blank				-																	

Comments Please Fax Preliminary Results to (850) 862-3012 Attn: Carl Forbes Custody Seal #'s A 061, 062

*All VOC's Will Be shipped in cooler A

Custody Transfers Prior to Receipt by Laboratory

	Relinquished By (Signed)	Date	Time	Received By (Signed)	Date	Time
1	N. Kantor	2/23/00	15:00	[signature]	2-24-00	[illegible]
2						
3						

Sample Delivery Details / Laboratory Receipt

Delivered Directly to Lab ____ Shipped ✓ (check one)

Method of Shipment FedEx   Airbill # 7925 5252 1069

Analytical Lab Quanterra   Location Richland, WA

Lab Recipient   Date   Time

1) Chain of Custody Number = date collected + custody number (e.g. 09-02-1999-01)

2) Sample Type (SA) Codes: N = Normal Sample, TB = Trip Blank (-c) Sample, FD = Field Duplicate (-a) Samples, FR = Field Replicate (-b) Samples, EB = Equipment Blank (-d) Samples, MS = Matrix Spike, SD = Matrix Spike Duplicate, AB = Ambient Blank (-e)

3) Sample Number: Unique sample number collected from a particular location per day (e.g. Groundwater sample collected from MW-1 on 10/10/99 = 01, if sampled again on 10/10/99 = 02, etc.)

4) Matrix Codes: GS = Soil Gas, WG = Groundwater, WS = Surface Water, SO = Soil, SE = Sediment, SL = Sludge, SS = Surface Soil Samples, WQ = Aqueous Blank Samples (trip, equipment, ambient, etc), SQ = Soil Blanks

RADIOACTIVE

Limited Quantity Radioactive Material

From: Alec Macbeth
Rust E&I
11 Racetrack Rd NE Bldg A
Ft. Walton Beach, Fla.

To: Toni Lauricella
Quanterra Labs
Richland, WA

This package conforms to the conditions and limitations specified in 49 CFR 173.421 for radioactive material, excepted package-limited quantity of material, UN2910.

Radiation surveys:

<0.05 mR/hr on contact with shipping container

Loose surface contamination:

<500 dpm/300 cm^2 on surface of shipping container

Description of Contents: Water Sample, should not contain any rad. No elevated readings were detected.

Prepared by: [signature] Date: 23 Feb 00

Radiation Safety Officer

Approved by: ______________ Date: ______________

Project Manager

RADIOACTIVE

Client Sample Screening Results

03-Mar-00

ⓇR 3/3/00

CLIENT CODE	ID	MATRIX	RECEIVED	DETECTOR	ACQ DATE	SAMPLE	MINUTES	CNTS A	NET CPM A	CNTS B	NET CPM B
ETC	P40VW01D8WD7		2/23/2000 3:20:00 PM	QUAD21B	3/3/2000 2:43:26 PM	P40VW01D8WD7	30	7	0.116666667	40	0.37
	D8WD7	LIQUID		Bkg:	3/3/2000 3:14:32 AM	BKG	600	70	0.116666667	578	0.96333333

Anl Date: 3/3/00 **Tot Sa, Alq:** 1.00E+00 , 1.00E+01 **Alp:** **(Dpm/** 3.53E-01 **(uCi/** 1.59E-05 **(pCi/** 1.59E+01 + 2.2E+01 CAT 1.6E+00 **Lab**
Ppt mg: 0.2 ✓ **Units:** l ✓ , ml **Bet;** **Alq):** 6.43E-01 **Sa):** 2.90E-05 **L|g):** 2.90E+01 + 1.9E+01 I ✓ 1.7E+00 **Alq** **L|g**

CLIENT CODE	ID	MATRIX	RECEIVED	DETECTOR	ACQ DATE	SAMPLE	MINUTES	CNTS A	NET CPM A	CNTS B	NET CPM B
ETC	P40VW02D9788		2/23/2000 3:20:00 PM	QUAD21C	3/3/2000 2:43:26 PM	P40VW02D9788	30	4	-0.01	39	0.39333333
	D9788	LIQUID		Bkg:	3/3/2000 3:14:32 AM	BKG	600	86	0.143333333	544	0.90666667

Anl Date: 3/3/00 **Tot Sa, Alq:** 1.00E+00 , 1.00E+01 **Alp;** **(Dpm/** -4.03E-02 **(uCi/** -1.82E-06 **(pCi/** -1.82E+00 + 1.9E+01 CAT 1.0E+00 **Lab**
Ppt mg: 0.1 ✓ **Units:** L ✓ , ml **Bet:** **Alq):** 7.78E-01 **Sa):** 3.50E-05 **L|g):** 3.50E+01 + 2.0E+01 I ✓ 1.4E+00 **Alq** **L|g**

CLIENT CODE	ID	MATRIX	RECEIVED	DETECTOR	ACQ DATE	SAMPLE	MINUTES	CNTS A	NET CPM A	CNTS B	NET CPM B
ETC	RW41GW01D978A		3/3/2000 10:04:00 AM	QUAD21D	3/3/2000 2:43:26 PM	RW41GW01D978A	30	5	0.076666667	37	0.33
	D978A	LIQUID		Bkg:	3/3/2000 3:14:32 AM	BKG	600	54	0.09	542	0.90333333

Anl Date: 3/3/00 **Tot Sa, Alq:** 1.00E+00 , 1.00E+01 **Alp:** **(Dpm/** 2.29E-01 **(uCi/** 1.03E-05 **(pCi/** 1.03E+01 + 2.1E+01 CAT 2.4E+00 **Lab**
Ppt mg: 1 ✓ **Units:** L ✓ , ml **Bet;** **Alq):** 6.04E-01 **Sa):** 2.72E-05 **L|g):** 2.72E+01 + 1.9E+01 I ✓ 1.8E+00 **Alq** **L|g**

DATA QUALITY OBJECTIVES & QUALITY ASSURANCE PROJECT PLAN – ITEM 12A

1. DATA QUALITY OBJECTIVES

State the Problem

Problem Description

The problem is the potential presence of residual radioactive material associated with past DU munitions testing operations in excess of the Site Industrial Use Criteria (DCGLs). Depleted Uranium is the only radionuclide of concern and was used in the ground to ground testing of 20 and 30 mm DU munitions at the site. Previous investigations performed after site closure for DU testing have identified DU fragments in soil in excess of the site DCGLs. Initial characterization and remediation of the fire control building gun bays for DU contamination will also take place.

Planning Team Members

For the removal of low level radioactive material (LLRW) from its land ranges Eglin AFB established a LLRW Partnering Team that closely resembled and operated in the same manner as its hazardous waste partnering team. The team was formed and the membership was established. The voting team members include regulators from the Air Force, State of Florida, and the U. S. Environmental Protection Agency (EPA). Base members included the Base Radiation Safety Officer, 46 TW Range Operator, USACE Health Physicist, and the contractor Project Manager. Non-voting members include the Assistant Base Radiation Safety Officer, Contractor Health Physicist, USACE Contract Manager and special guest. Topics of concern are brought before the partnering team and discussed. The team votes on each of the topics. The team comes to a consensus on each topic. The team either approves, denies, continues the discussion, but the decision is based on a consensus from the team. No decending votes are allowed, all voting members must agree or not vote for action to be taken on the topic.

Available Resources and Relevant Deadlines

Sufficient resources are available through the combined staff of US Army Corp of Engineers (USACE), Eglin AFB, AFIERA, and contractors to perform and complete work required to achieve the objectives of this site remediation.

Identify the Decision

Principal Study Question

Is the level of residual DU contamination in the soil and site buildings below the release criteria for Industrial Use? The Null Hypothesis (Ho) is that residual DU contamination exceeds the release criteria for Industrial Use.

Alternative Actions

No alternative remediation alternatives have been identified. The remediation activities described earlier in this item and other areas of this permit application represent the Eglin LLRM Partnering Team approved remediation activities.

Decision Statement

Determine whether surface and subsurface soil FIDLER measurements exceed the investigation level of one half the $DCGL_{EMC}$ which is 22 kcpm. FIDLER scaler measurements will be taken whenever a scanning measurement indicates the possibility of a DU fragment exceeding 2 times background. DU fragments exhibiting measurements exceeding 22 kcpm will be removed and the position marked. A post scaler reading will be taken to ensure that the entire DU fragment has been removed. The post removal scaler reading must be below 22 kcpm or additional soil will be removed until the remainder of the fragment has been removed and its removal verified by additional scaler measurements.

Identify Inputs to the Decision

DU contamination in soils and potentially on building materials in the fire control building and after remediation of the RCA require a Final Status Survey (FSS) of the entire site be performed. This will require soil sample collection in the RCA and a FIDLER survey of the remaining land areas. The characterization survey performed of the fire control building will also be used as the final status survey of the building. Areas of elevated activity found during the FSS will be removed during performance of the FSS. The following field surveys will be performed to gather data:

FIDLER 100 Percent Walk-over Survey

A FIDLER walk-over survey will be performed over the entire land area of the site within the original characterization survey boundaries, which was performed in 1999. The FIDLER survey performed in the RCA will be conducted after the top six inches of soil has been removed from the DU contaminated area of the RCA. All other land areas within the 1999 characterization survey boundaries will be 100 percent FIDLER surveyed. Hot spots "elevated areas of DU contamination" will be removed as the areas are located. Pre and Post DU removal FIDLER measurements will be taken at these locations to ensure the entire DU fragment has been removed and the post removal scaler measurement is below the $DCGL_{EMC}$. Futher remediation will take place if the POST FIDLER survey indicates a DU fragment above one half the $DCGL_{EMC}$ still exists. At the descresition of the Site Health Physicist areas of elevated activity above two times the background level (5 kcpm background) can be removed.

Soil Sample Collection

Two types of soil samples will be collected during the remediation operations within the RCA. Soil samples will not be taken in land areas outside the boundaries of the RCA. Profile soil samples will be taken as directed by the approved transportation broker to meet disposal site criteria. Surface soil samples will also be taken within the RCA as part of the FSS. The location of the surface soil samples, taken as part of the FSS, will be based on the findings of the FIDLER 100 percent walk-over survey. These samples will be biased samples and will be collected using a hand auger. The depth of the soil samples will be zero to six inches below the current land surface, which is actually six to 12 inches below the initial land surface. The location of these soil samples will be documented by a land survey conducted by a land surveyor certified by the State of Florida.

The soil samples taken during the FSS of the RCA are not entended to verify that the survey unit is below the release criteria. The FIDLER scanning and scaler measurements are designed to fine all areas of elevated activity. The soil samples are designed to verify that no DU contamination exist after removal of the DU fragment since all soil samples will be taken in areas of previously found elevated activity.

Field Gamma Spectroscopy Sample Screening

Profile samples taken at the site will be screened using a portable gamma spec operated by the Site Certified Health Physicist (Site Radiation Safety Officer) to ensure the samples meet the radiological and chemical requirements of the disposal site.

Contract Laboratory Sample Analyses

Based on previous investigations, the only radionuclide of potential concern is DU. All soil samples submitted to the off-site laboratory will be analyzed for isotopic uranium. Isotopic uranium includes U-238, U-235, and U-234. The contract laboratory will be the the Air Force Radionuclide Laboratory located at Brooks AFB, Texas.

Define the Study Boundaries

Population of Interest Defining Characteristics

The population of interest is the range worker. The maximum number of range workers on the site at any one time would be eleven. The range workers are at the site only during performance of non-DU munitions test projects. Depending upon the work load range workers are normally on the site only several days a month. The majority of the time workers will be inside the control building. Minimal time is spent outdoors and very little time within the old RCA.

Develop a Decision Rule

The intent of this remediation is to identify areas of elevated activity in each survey unit which exceeds one half the $DCGL_{EMC}$. Since background levels of Uranium in the environment is much less than the $DCGL_W$, background reference areas are not required. The decision rule for DU, which is not present in background is any confirmed positive detection.

Specify Limits on Decision Errors

The quality applicable to contract laboratory data generated during this effort is categorized as definitive data. Definitive data are generated using rigorous analytical methods such as approved USEPA reference methods. Data are analyte-specific and both identification and quantification are confirmed. These methods have standardized quality control and documentation requirements. Definitive data are not restricted in their use unless quality problems require data qualification. Specific quality control procedures to define the acceptable range of precision, accuracy, and representativeness are presented in the Quality Assurance Project Plan. Data will be validated and will be flagged or rejected if the requirements are not adequately fulfilled. Field gamma spectroscopy sample screening data will undergo similar levels of quality control, but will only provide screening data to help guide the field effort and support sample shipment documentation.

Gross gamma data, as is provided by the FIDLER, is not radionuclide-specific and is generally recorded in units of counts (or interactions) per unit time. The response of a gross gamma detector to a given source can be significantly affected by changing the instrument's upper or lower level pulse discriminator and/or operating voltage. These settings are established during instrument calibration. Thus, if more than one gross gamma instrument is used during this effort, each detectors response will be matched during calibration, to the extent practical.

Optimize the Design of the Survey

To the extent practical, the design for collecting data presented has been optimized to achieve the stated DQOs. The data collection process has been designed to provide near real time data during implementation of field activities. This data will be used to modify and expand the scope of field activities, as needed, to ensure the DQOs are met.

2. QUALITY ASSURANCE PROJECT PLAN

This Quality Assurance Project Plan describes the site-specific procedures to be followed for the remedial action at IRP Site No. RW-41 Test Area C-74L Gunnery Ballistic Facility located on Eglin Air Force Base, Florida (Eglin). The document establishes the analytical protocols and documentation requirements to ensure the data are collected, reviewed, and analyzed in a consistent manner.

Organization

The Site Quality Assurance Officer (QAO) is responsible for the QA/QC activities associated with IRP Site No. RW-41. This includes responsibility for ensuring data is legible, correct and complete on all sampling and health and safety forms provided by Earth Tech and its subcontractors on site.

The Site QAO will be an Earth Tech employee with direct responsibility to the Site Radiation Safety Officer (RSO) and Site Program Manager (PM) and will have full authority to require contractor completion or correction of forms. The QA/QC forms will be maintained by the Site QAO on site until the completion of the remediation. The forms will then be transferred to the Earth Tech Fort Walton Beach Office for long term retention.

Site controls shall be in accordance with applicable Eglin procedures and Section 6.0 of the Site *Radiation Protection Plan* (RPP) located in Appendix B of the Site Work Plan.

The RSO may designate a site or a portion of a site as a Restricted Area, Radiation Area, Contamination Area, Airborne Radioactivity Area or Radioactive Materials Storage Area, as appropriate. These designations are defined in the site Radiation Protection Plan, located in Appendix B of the site RA-C Work Plan. The last four specified areas are generically known as Radiation Controlled Areas (RCAs), and require special training, medical surveillance and other qualifications for entry by IRP Contractor personnel. Restricted Areas and RCAs shall be secured from unauthorized access by the appropriate means (enclosed buildings, fences, locked gates, etc.). Access to restricted areas is limited to properly trained IRP Contractor, subcontractor, and government personnel and shall be made via an Entry Control Point.

The Control Point shall be manned by Health Physics personnel, and contain the supplies and equipment necessary to provide the level of protection required for the specific RCA (Personal Protective Equipment [PPE]). Supplies and equipment for radiological surveys, minor decontamination of personnel and equipment, and minor First Aid shall be available at the Control Point when it is active.

Entry into RCAs shall also be controlled by issuance of a Radiation Work Permit (RWP) by the RSO. All personnel entering an RCA are required to read, sign and comply with the instructions in the RWP. Upon leaving the RCA, personnel will perform the appropriate contamination checks (frisking - as required by the RWP) and sign out on the RWP before leaving the Control Point. All equipment removed from the RCA shall be surveyed in accordance with the RWP requirements before leaving the Control Point.

Data Characteristics

Screening data for radiological sample parameters are generated by rapid methods of analysis in the field. Screening data are collected with less rigorous sample preparation, calibration and/or QC requirements than that necessary to produce definitive analytical data.

Definitive data for radiological sample analysis are generated using rigorous analytical methods, such as approved U.S. Environmental Protection Agency (EPA) or U.S. Department of Energy (DOE) reference methods. These analytical methods are discussed in more detail in Section 6.0. In general, these data can be generated only under controlled laboratory conditions. These methods have standardized QC and documentation requirements. Definitive data are not restricted in their use unless quality problems require data qualification. Definitive sample analytical data will be generated from the analysis of the samples shipped off site to an approved analytical laboratory. All off-site laboratory radiological data will be generated by laboratories, which are validated by USACE. Definitive data can also be developed on site by conducting radiological monitoring surveys and on-site radioanalytical laboratory, provided that such monitoring surveys and laboratory analyses are performed under stringent procedural control using recognized monitoring methods, calibrated equipment, and qualified personnel.

Field And Laboratory Quality Control Checks For Samples

The following sections discuss the calibration of portable survey instruments, the calibration of laboratory instruments, and field quality control samples.

Calibration Of Portable Survey Instruments

Portable (field) radiation survey instruments selected for use at Eglin shall comply with American National Standards Institute (ANSI) N42.17A-1989, *Performance Specifications for Health Physics Instrumentation—Portable Instrumentation for Use in Normal Environments* or ANSI N42.17B, *Performance Specifications for Health Physics Instrumentation—Occupational Airborne Radioactivity Monitoring Instrumentation.* Portable radiation survey instruments shall be calibrated in accordance with ANSI N323A-1997, *Radiation Protection Instrumentation, Test and Calibration.* Instruments shall be calibrated using written procedures, with instruments and radiation sources that are directly traceable to the National Institute of Standards and Technology (NIST). These calibration procedures shall include the following:

- Electronic testing and calibration of the instrument's electronics, such as meter response to calibrated test pulse trains over the readout range of the instrument, high-voltage output test and calibration.
- Calibration of the electronic readout of the instrument with the assigned probe(s) or detector(s) for the radiation(s) of interest alpha (α), beta (β) or gamma (γ).

- Setting the high-voltage plateau, threshold and window settings of the instrument, as appropriate.

Each field instrument will be assigned an appropriate radioactive check source. The instrument shall be checked with that source, in a reproducible geometry, at the time of, or immediately following calibration of the instrument. This same source shall be used for the daily checks of the instrument. If the daily check source reading of the instrument changes by greater than 10 percent from the initial calibration value, the test will be repeated. If the average of three checks, or two out of three checks shows a deviation of greater than 10 percent from the initial calibration value, the instrument shall not be used until the reason for the change is corrected or the instrument is recalibrated.

A daily background check shall also be performed on each portable radiation survey instrument. The Site RSO shall establish acceptable limits for these background counts based on the local radiation background, desired Minimum Detectable Count Rate (MDCR) for each instrument and other operational requirements as deemed necessary. Increasing daily background readings should be investigated promptly, as it is often an indication of detector contamination. If the background readings exceed those specified by the RSO, the instrument shall not be used until the reason for the change is corrected, or the instrument is recalibrated.

Off-Site Laboratory Services

Off-site laboratory services will be conducted by Brooks Air Force Base, Texas. Quality Assurance sample analysis has been contracted to Severn Trent Laboratories (STL) in Richland, Washington. STL Richland has been validated by USACE for performing radiological analysis of soil and water samples collected during the remedial action at this site.

Field Quality Control Samples

Field QC sample duplicates will be collected as described by the Final Status Survey. The Final Status Survey design will be determined by Earth Tech's site Certified Health Physicist prior to completion of soil excavation and will be approved by the Eglin LLRM Partnering Team.

Analytical Methods And Detection Limits Laboratory Analyses

The detection limits for laboratory radiological analysis shall be as outlined in the following table:

RADIOLOGICAL METHOD DETECTION LIMITS		
Parameter	**Method**	**MDL**
Isotopic Uranium in Air Filters	HASL-300	0.5 pCi/filter
Isotopic Uranium in Water	HASL-300	0.5 pCi/L
Isotopic Uranium in Soil	HASL-300	0.05 pCi/g
Isotopic Uranium in Vegetation	HASL-300	0.001 pCi/g

Notes:pCi = picoCurie
L = Liter
g = gram

The off-site laboratory shall perform analyses in accordance with the listed method or a similarly approved method. The laboratory shall have a written Standard Operating Procedure (SOP) in use, which describes how the laboratory meets the requirements of a particular method or Test Code.

The soil samples collected at the remediation site will be submitted to the laboratory for isotopic uranium (ratio of ^{235}U and ^{238}U) analysis. These soil samples will be analyzed using gamma spectroscopy methods (a common method is a modified EPA 900.0, which is substantially equivalent to HASL-300 Method Ga-01R). These methods commonly detect less than 1 picoCurie per gram (pCi/g) for ^{238}U, and slightly lower for ^{235}U. Approximately 10 percent of the samples will also be submitted for alpha spectroscopy (using, for example, a modified American Standard Testing Method [ASTM] D3972-90m method, which is substantially equivalent to HASL-300 method U-04) to determine the isotopic uranium concentration.

Field Equipment

Because of inherent problems with reproducible geometry, lack of sensitivity, and lack of counting time, it is often difficult to quantify radiation levels or radioactivity with field survey instruments. For this reason, many conservatisms are usually built into any decision making process relying on field instrumentation. Questionable or borderline results obtained with field instrumentation are usually subjected to more rigorous analysis in the laboratory, verification by other measurements or instruments, or assuming the worst-case for the readings obtained (e.g., if performing a field survey to determine if an object is contaminated, a borderline reading would result in the decision to treat the object as contaminated).

For these same reasons, rigorous analysis of the Lower Limits of Detection (LLDs), Minimum Detectable Count Rates (MDCRs) and Minimum Detectable Activities (MDAs) are difficult for field instrumentation, especially rate meter-type instruments. Numerous published studies, as well as practical knowledge of field survey instruments, has lead to the generalization that a count rate twice the ambient background reading may be considered the MDCR for most rate-type instruments (e.g., count-rate, dose-rate, etc.). The exceptions to this rule of thumb are when the background count rate is very low (e.g., approximately 1 count per minute [cpm] for α scintillation detectors) or when the count rate is relatively high (e.g., approximately 1000 cpm for γ scintillators) in both these extreme cases, the change in count rate can be more easily detected by the surveyor than when intermediate background count rates (e.g., approximately 20 to 100 cpm) are encountered. For the table below, however, it was assumed that the minimum change in rate that could be detected by a surveyor would be twice the background rate. The detection limits for scaler instruments (instruments which count for a specified pre-selected time) are more applicable to rigorous statistical analysis.

Ratemeter-Type Instruments

The MDCRs and approximate MDAs for several typical rate meter-type instruments are listed below.

Instrument	Radiation Measured	Typical Background[2]	Approximate Instrument Efficiency	MDA_{net}
Pancake-type G-M detector/ rate meter (15 cm^2)	α,β,γ	50 cpm	α = 10% β = 10% γ = 3200 cpm/mR/hr or 1%	α = 500 dpm β = 500 dpm γ = 16 μR/hr or 5000 γpm
ZnS-type α detector/rate meter	α	1-3 cpm (depends on surface area of detector, etc.)	α = 10%	α = 10-30 dpm
NaI-type μR Meter	γ	3 μR/hr	125,000 cpm/mR/hr	3 μR/hr
Pressurized Ion-Chamber Dose-Rate Meter	γ	30 μR/hr	N/A – instrument is calibrated directly in dose rate	30 μR/hr
Air Ion-Chamber Dose-Rate Meter	γ, β	0.1 mR/hr γ 1 mrad/hr β	N/A – instrument is calibrated directly in dose rate	0.1 mR/hr γ 1 mrad/hr β[3]

The Field Instrument for the Detection of Low-Energy Radiation (FIDLER) is not included in the above table, because its response is highly dependent upon detector and source geometry,

[2] The Minimum Detectable Count Rate is assumed to be equal to twice the background count rate. Therefore, after subtracting the background reading the net MDCR = background count rate.

the method of calibration used (e.g., high-voltage, threshold and window settings), and local factors such as radon levels. Some of these factors may change on a day-to-day basis. Therefore, only relative readings of the FIDLER will be used during the remediation project. At the count rates expected for the FIDLER (several thousand cpm), an increase of 50 percent or less over the background count rate should be easily detected by an average surveyor.

Scaler-Type Instruments

Field-type scaler instruments follow the same statistical laws as laboratory instruments. Therefore, LLDs or MDAs may be calculated for these instruments using the same formulas as laboratory instruments. Limitations of field scalers over laboratory instruments are the following: lack of environmental controls (temperature & humidity) in the field; lack of detector shielding in the field (e.g., higher background readings); shorter counting times in the field (to expedite the number of analyses that can be performed in a given time); and, for AC powered instruments, lack of a stable power source in the field. These factors tend to express themselves in higher and somewhat more erratic backgrounds than instruments in a controlled laboratory environment.

Scalers may be used for two purposes in the field: counting in-situ and quasi-laboratory-type analyses of samples (especially smears and air samples). In the first case, with the exception of in-situ germanium lithium (GeLi) spectrometers, usually only relative counts or the change in count rate are important (see paragraph on the FIDLER, above) to indicate the presence of a hot spot. In the second case, accuracy is important. However, the limits used for radiation protection are usually high enough to allow reasonable count times (on the order of 10 minutes or less per sample). In the latter case, selection of count times, and the addition of some temporary shielding if necessary, can result in MDAs that are no more than 10 to 25 percent of the applicable contamination limits. This is normally acceptable for field applications, such as demonstrating compliance with decontamination standards for personnel and equipment.

Calculation of MDA: Adjustments for Long Background Counting Time

Normally, the formula used to calculate the MDA (or LLD) of an instrument assumes that the background counting time and the sample counting time are equal. Then, the formula for calculating the MDA is as follows[4]:

---

[3] Usually high β dose rates are accompanied by high γ dose rates. Therefore, in reality, the above β MDA is rarely achievable.

[4] USDoE, EML Procedures Manual, HASL-300, 27th Edition.

$$MDA = \frac{2.71 + 4.65\sqrt{C_b T_b}}{\varepsilon T_b}$$

Where:	MDA	=	Minimum Detectable Activity
	C_b	=	Background count rate (cpm)
	T_b	=	Background count time (min)
	ε	=	Counter efficiency (dpm/cpm)

However, when the background is very low (e.g., 1 cpm or less), the MDA can be improved by counting a long background (e.g., 5 times or greater than the sample count time). The MDA formula then changes to the following[5]:

$$MDA = \frac{3 + 3.29\sqrt{C_b T_g (1 + T_g / T_b)}}{\varepsilon T_g}$$

Where:	MDA	=	Minimum Detectable Activity
	C_b	=	Background count rate (cpm)
	T_b	=	Background count time (min)
	T_g	=	Gross sample count time (min)
	ε	=	Counter efficiency (dpm/cpm)

Therefore, when a low-background alpha counting system (scaler) is being used, the MDA can be improved by counting long background counts using the second MDA formula, above.

Field Sampling

The purpose of this section is to provide a sample control program addressing the importance of collecting a representative portion of material small enough in volume to be transported conveniently, yet to accurately represent the material sampled. This section will also address the proper identification of the sample container and use of chain of custody, decontamination, and corrective action.

The objectives and specific scope of work for sampling activities are presented in the main body of the site Remedial Action Work Plan. The following considerations are addressed in this QAPjP:

- Location and selection of the media to be sampled.
- Methods of sampling to be employed.
- Media to be sampled.

[5] Strom, D.J.; Stansbury, P.S. Minimum detectable activity when background is counted longer than sample. Health Phys. 63(3): 360-361; 1992.

- Number and volume of samples to be collected.
- Type and kind of field screening and laboratory analyses to be performed.
- Procedures and precautions to be followed during sampling.
- Methods of preservation and shipment.

Proposed Sampling

Soil samples at IRP Site No. RW-41 will be collected from the Radioactive Material Controlled Area (RCA) characterized during 1999. The lateral and vertical extent of DU-impacted soil at concentrations exceeding the derived concentration guideline level (DCGL) were determined during the soil sampling and FIDLER surveys conducted during that period. Additional soil sampling will be conducted after the remediation is completed. This will be the site's Final Status Survey, and the design of this survey will be determined after the remediation of the RCA has been completed. The proposed sampling locations for this site will be based on the FIDLER survey results conducted of the remediated area. The survey design will approximate total number of samples to be collected, the associated number of QA/QC samples, and the analyses to be run on each sample. The analytical method for isotopic uranium that will be used for this sampling effort will be gamma spectroscopy (method equivalent to pertinent HASL-300 method). In addition, 10 percent of the samples will also be analyzed using alpha spectroscopy. Minimum detectable activities of 1.0 pCi/g will be attained. The sample quantitation limits for radiological constituents will be equal to or less than the method detection limits.

Prevention Of Cross-Contamination And Decontamination

Sampling equipment will be decontaminated before use and between each sample. Alternatively, disposable equipment may be used. Each decontamination event will be logged in the field logbook. The field log book will denote the specific materials used for decontamination, the date and time of the decontamination, and the type of sampling equipment decontaminated. Upon completion of decontamination procedures, sampling equipment will be surveyed for radiological contamination by direct reading instrumentation capable of measuring the nuclides of interest. Typically a pancake-type G-M detector with a rate meter is used for direct β/γ contamination measurements and a ZnS α detector and rate meter are used for direct α contamination measurements. Equipment should also be smeared or wiped and the smears/wipes counted for removable $\alpha/\beta/\gamma$ contamination with a field rate meter or scaler equipped with the appropriate detector(s). The analytical laboratory shall provide pre-cleaned containers for collection of field samples. Where possible, site personnel should consider utilizing disposable sampling equipment.

Sample Identification

Samples shall be unique and the sample container will be selected and handled in accordance with the requirements of the analytical method. All soil samples will be surface samples (zero to 6 inches bls) and will be denoted as in this example: "RW-41-SB-01". To denote a discrete soil sample collected from a boring, additional digits are added to the end of the boring name to define the bottom depth of the sample in feet bls. For instance, the sample collected at a depth of zero to 0.5 feet bls from boring RW-41-SB-01 is designated as RW-41-SB-01-0.5. After collection and identification, samples will be maintained under the chain-of-custody procedure.

Sample Containers, Preservatives, And Holding Times

Sample containers for this project will consist of wide-mouth polyethylene bottles with screw caps. These containers will be furnished by the laboratory or be supplied by a commercial laboratory supply vendor. According to the *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM;* NRC and others, NUREG 1575, 1997), soil and sediment samples for radiochemical analysis require no field preparation and do not require preservation. Containers, preservation, holding times, and storage requirements for constituents of interest are presented in Table 3.

Sample Packaging And Shipment

All samples being transported for chemical or radiochemical analysis will be properly packaged and labeled before transport off site or within the site. All sample containers will be wiped with a damp cloth to remove any exterior contamination and the outer surfaces of the containers will be surveyed with the hand held Micro-R Meter to check for the presence gamma-emitting radiation. Each sample bottle will be placed in heavy, sealable plastic bags to contain samples prior to shipment. Smear/wipe samples will be collected from the outside of the sample packaging container (cooler) to demonstrate that the removable surface contamination level on the external surface is less than 22 disintegrations per minute (dpm)/cm^2 beta, gamma, and alpha.

Sample packing and shipping procedures are included in the *Waste Management, Transportation and Disposal Plan* in Appendix E. In addition, U.S. Nuclear Regulatory Commission (NRC) regulations for packaging, preparation, and shipment of licensed material are contained in 10 CFR Part 71, "Packaging and Transportation of Radioactive Materials", and should be referenced. However, samples containing low levels of radioactivity are exempted from these requirements according to NRC regulations if the specific activity of the samples is not greater than 74,000 becquerel per kilogram (Bq/Kg; 2,000 pCi/g).

Radiological Surveys

Surveys for radiation and contamination will be performed in accordance with the site RPP, located in Appendix B of the site RW-41 RA-C Work Plan. Instrumentation utilized for the performance of radiological surveys will be properly calibrated in accordance with the Site RPP. The instruments shall be of a type designed to measure the nuclide(s) of interest for the area or items being monitored. Surveys for radiation and contamination will be documented on the "Contamination/Radiation Survey Report" located in Appendix A of this document.

Sample Handling And Custody

Custody and integrity of the samples begin at the time of sampling and continue through transport, sample receipt, preparation, analysis and storage, data generation and reporting, and sample disposal.

Sample containers of samples collected on site will be smeared/wiped and the smears/wipes counted for $\alpha/\beta/\gamma$ contamination. Once cleared by the smears/wipes, the samples must be counted to determine which DOT category they may be shipped under. This is normally accomplished using a mobile γ spectroscopy laboratory equipped with either NaI or GeLi γ spectrometers. There are no DOT limits for shipping DU as Limited Quantity Radioactive Material. However, it must be determined that there are no other nuclides present in the sample that would require more stringent DOT labeling and/or placarding, for shipment (e.g., the sum of all other nuclides must be less than 2 nanoCuries per gram [nCi/g]). If the sum of all other nuclides is less than 2 nCi/g, then the samples may be shipped in accordance with 49 CFR 173.410, 173.421 and 173.425.

Instrumentation used for performance of radiological surveys and sample screening will be calibrated in accordance with the requirements of the manufacturer and ANSI (1996). This is discussed in more detail in Section 5.0.

Data Review, Validation, And Reporting

Parametric errors or uncertainties are those of a purely statistical or random nature, non-parametric errors are those caused by bias in either sampling or the analysis of the samples.

<u>Parametric Errors</u>

These errors or uncertainties are called parametric, stochastic, or random errors. They result from the fact that radioactive decay is, by definition, a random event bound by the laws of statistics and also by the fact that sampling is a random process. Parametric errors may be handled by the laws of statistics. Two important points need to be made, however. First, when dealing with a small number of random events, a Poisson distribution and its associated statistics must be used. This is necessary since we are dealing with discrete events, which the Poisson distribution and statistics are designed to handle. As the number of events increases, the distribution may be approximated by a normal distribution curve, and the laws governing Gaussian statistics may be applied. Gaussian statistics are preferable to Poisson statistics, mainly because of the differential and integral equations that may be used to analyze the Gaussian distribution.

Aside from the theoretical mathematics involved with these parametric statistics, there are three features of parametric statistics that are useful on a day-to-day basis. They are accuracy, precision, and goodness of fit (discussion of this last item will lead into the discussion of non-parametric errors).

Accuracy—Accuracy is the degree to which the mean of a number of samples represents the true mean of the population being sampled. In other words, does the result of our sampling give us the correct picture of the actual state of things? Since radioactive decay is a random process, the "actual" value may not be a single value at all but a distribution of values governed by the laws of decay. In that case, rather than comparing the mean of our samples to one value, we are actually comparing a distribution of sample results to a distribution of actual values. Parametric statistics such as a T-test are useful for comparing two distributions in this fashion.

Precision—In addition to accuracy, the way in which our sample results are spread around the mean are also important. The degree to which the samples are grouped or spread around the mean is described by measurements of precision, most commonly the Standard Deviation of the distribution. For data to be meaningful, it must be both accurate and precise. One of the factors that will influence the sample data in the case of the LLRM sites, is the fact that the material is not expected to uniformly distributed in the environment. This creates some problems in the interpretation of data, since the precision may appear to be poor, but is actually caused by the non-random distribution of the material in the environment. A solution to this problem is to identify and clean up the hot spots so that normal statistics may be used.

Goodness of Fit—To use Gaussian statistics, it must be shown that the data are approximately randomly or normally distributed. Several rules of thumb and more rigorous statistical tests exist to show that the data may be described by a normal distribution curve. First, a sufficient number of samples must be taken, so that a normal distribution is approximated. Second the distribution must be approximately symmetrical. For example if the mean, median and mode of a distribution are approximately equal, the distribution is symmetrical. If the mean is much less the median, which itself is much less that the mode, the distribution is skewed left. Finally, if the mode is much less than the median, which is much less than the mean, the distribution is skewed right. This right skew is common for environmental radiation data, which is often log-normally distributed in nature. Thus, if the log of the sample results were plotted and used to calculate the mean, median and mode, the data would take on the symmetrical appearance of the normal curve. More rigorous tests of the skewness and spread of a distribution can be described by the moments around the mean. Calculation of the moments are beyond the scope of the present discussion, however, the fact that they exist should be noted. Finally, one test of goodness of fit that is routinely used with radiation data is the Chi-Square Test. The Chi-Square Test is used to see if a number of sample results show the proper random "spread" caused by the fact that radioactive decay is a random event. Data can be either too spread out or too tightly grouped to be purely random, in which case a systematic or non-parametric error may be present. The existence of this non-parametric error leads into the next subject.

Non-Parametric Errors

Technically, non-parametric errors are any errors that cannot be described by "normal" or Gaussian statistics. This could be caused by something as simple as too small a sample size (which would mean that Poisson statistics would have to be used), to something as complicated as bias in the sampling or analysis of the data. The solution to the first cause is simply to take more samples.

Sampling or analytical biases may not be so easily uncovered. First, bias may be introduced by the non-random distribution of the radioactive material in question at the LLRM sites. This is because of the presence of discrete fragments of radioactive material in the form of the DU armor piercing penetrators, which may or may not have remained largely intact after being fired. This, in turn, leads to the finding of hot-spots during a scanning survey. Later sampling should be biased by the hot spots, which would skew the sample data towards the higher readings. Since the aim of radiation protection is too be conservative (ALARA) this is not necessarily a negative position. However, it could complicate analysis if we are comparing log-normally distributed environmental levels of a radionuclide, skewed to the right, with sample data biased by hot-spots, or data skewed to the left. If the hot spots are located and removed, this problem is eliminated.

Second, bias may be introduced by other sampling biases which are harder to analyze. Because of this, care must be taken to generate a random sampling program, again, unless the conscious decision is made to be conservative (ALARA) in the sampling regime. If this is the case, then the bias can be identified and allowed to remain. Other sampling biases may be caused by difficulties in reaching some of the randomly chosen sample locations, inability to sample in accordance with the sampling plan, or topographic or geologic features that interfere with the sampling plan.

Finally, bias can be introduced in the analysis of the samples. This may be caused either by problems in the sample preparation, or biases in the analytical instruments. Instrument bias may be caused by improper calibration, defective electronics, or improper set-up of the analytical instruments.

Careful vigilance and attention to details should be implemented to provide protection or the means to locate bias in sampling or sample analysis.

Personnel Monitoring And Dosimetry

The Site RSO is responsible for ensuring that all personnel (employees, vendors, subcontractors, and visitors) are appropriately monitored for exposure to ionizing radiation, if required based on expected radiation levels. Each individual working at the site shall wear the dosimetry devices specified in the Radiation Work Permit (RWP). Visitors to the site, who are not expected to receive radiation exposure above the limits specified for exposure to the general public in Title 10 Code of Federal Regulations Part 20 (10 CFR 20), will not be required to wear dosimetry devices. Personnel shall be issued appropriate personnel monitoring devices consisting of one or more of the following types, as deemed appropriate: thermoluminescent dosimeter (TLD), self-reading dosimeter (SRD), and extremity TLD devices.

Proper Wearing Of Dosimetry Devices

Unless otherwise directed by the Site RSO, personnel monitoring dosimetry shall be worn on the front of the body between the neck and the waist. When circumstances are such that other parts of the body may receive significantly greater doses, the Site RSO may instruct the individual to wear the dosimetry in a more representative place, or may specify additional dosimetry devices.

Official Exposure Determination

Dosimetry shall be provided and processed by a vender that is accredited by the National Institute of Standards and Technology (NIST) National Voluntary Laboratory Accreditation Program (NVLAP) in accordance with ISO-9002 ISO/IEC Guide 25. The Site RSO will have the responsibility for distributing and collecting the devices. The official and permanent record of accumulated external dose received by individuals will be obtained from the interpretation of the personnel monitoring devices (TLDs). Upon written request, personnel will be informed of their exposure.

Lost Or Damaged Dosimetry Devices

Individuals shall immediately notify the Site RSO (or designee) if they lose or damage their dosimeter. A thorough search shall be made for any dosimeter reported lost. Personnel whose exposures are being investigated shall be excluded from work in radiologically controlled areas until the investigation is completed and documented and dosimetry devices reissued. In the event of lost or damaged TLD devices, the Site RSO shall investigate the exposure conditions and assign an external dose for the individual.

Training

Training shall be provided to all project personnel to ensure compliance with the site *RPP* and technical competence in performing the work effort. Details on training are provided in Appendix A of the site *RA-C Work Plan.*

APPENDIX A

CONTAMINATION/RADIATION SURVEY REPORT

CONTAMINATION/RADIATION SURVEY REPORT

PROJECT NUMBER:

DATE: | TIME START: | TIME COMPLETE: | PAGE ____ OF ____

LOCATION:

SURVEYOR:

SURVEY NUMBER:

MAP ID:

PERMISSIBLE LEVELS

Loose ________ dpm/100cm^2 Alpha ________ dpm/100cm^2 Beta-Gamma

Total ________ dpm/100cm^2 Alpha ________ dpm/100cm^2 Beta-Gamma

Γ OTHER (SEE COMMENTS)

Γ NO ACTION REQUIRED

Source Check Data	Contamination Surveys				Radiation Surveys
	α (LOOSE)	α (TOTAL)	β-γ (LOOSE)	β-γ (TOTAL)	Beta-Gamma
Instrument					
Source Type and I.D.					
Source Strength in dpm					µCi
Efficiency					
MDA in dpm/100 cm^2					
Background in cpm					mrem/hr or µrem/hr

REASON FOR SURVEY

Γ PROCEDURE-NO. ______________________

Γ SPECIAL ______________________

Γ ROUTINE ______________________

Contamination Γ By Shift Γ Daily Γ Weekly Γ Monthly Γ

Radiation Γ By Shift Γ Daily Γ Weekly Γ Monthly Γ

COMMENTS:

Contamination Survey INSTRUMENT SERIAL #	ALPHA (LOOSE)	BETA-GAMMA (LOOSE)
	ALPHA (TOTAL) /	BETA-GAMMA (TOTAL) /
Radiation Survey INSTRUMENT SERIAL #	NEUTRON /	BETA-GAMMA /

THE KNOWING & WILLFUL RECORDING OF FALSE, FICTITIOUS, OR FRAUDULENT STATEMENTS OR ENTRIES ON THIS DOCUMENT MAY BE PUNISHABLE AS A FELONY UNDER FEDERAL STATUTES.

Item #	Alpha Loose dpm/100cm^2	Alpha Total dpm/100cm^2	Beta-Gamma Loose dpm/100cm^2	Beta-Gamma Total dpm/100cm^2	Beta-Gamma mrem/hr. Γ micro rem/hr Γ Neutron Γ	Item or Location
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						

RADCON REVIEW ______________________ DATE ____________

CONTAMINATION / RADIATION SURVEY REPORT (CONTINUATION SHEET)		PROJECT NUMBER:	DATE:	PAGE ____ OF ____
LOCATION:	SURVEYOR:	COMMENTS:		
	SURVEY NUMBER:			
	MAP ID:			
RADCON REVIEW ____________ DATE ________				

[redacted]	Alpha		Beta-Gamma		Beta-Gamma mrem/hr ☐ microrem/hr ☐ Neutron ☐	Item or Location
	LOOSE	TOTAL	LOOSE	TOTAL		
Item #	dpm/ 100cm²	dpm/ 100cm²	dpm/ 100cm²	dpm/ 100cm²		

[redacted]	Alpha		Beta-Gamma		Beta-Gamma mrem/hr ☐ micro rem/hr ☐ Neutron ☐	Item or Location
	LOOSE	TOTAL	LOOSE	TOTAL		
Item #	dpm/ 100cm²	dpm/ 100cm²	dpm/ 100cm²	dpm/ 100cm²		

THE KNOWING & WILLFUL RECORDING OF FALSE, FICTITIOUS, OR FRAUDULENT STATEMENTS OR ENTRIES ON THIS DOCUMENT MAY BE PUNISHABLE AS A FELONY UNDER FEDERAL STATUTES.

TABLES

TABLE 1
SUMMARY OF DATA QUALITY OBJECTIVES
IRP SITE NO. RW-41
TEST AREA C-74L
DELIVERY ORDER NO.20
EGLIN AFB RA-C WORK PLAN
EGLIN AFB, FLORIDA

Activity	**Soils**
Parameters of Interest	Isotopic Uranium
Level of Concern	Levels of commercial/industrial soils that generate a 3×10^{-4} health risk for Depleted Uranium
Required Quantitation/ Detection Limit	1.0 pCi/g for Isotopic Uranium
Staff Requirements	Health Physicist/Health Physics Technician
Sample Type	Grab/Discrete
Total Number of Samples Submitted to Laboratory (excluding QC)	TBD
QA/QC Samples	Refer to QAPP and Table 2
Background Samples	NA (Eglin, March 1999)
Sampling Procedures	Stainless Steel Hand Auger
Analytical Methods	Gamma Spectroscopy and Alpha Spectroscopy using HASL-300 equivalent methods
Field Screening Data	FIDLER, Micro-R Meter (Ludlum Model 19)
Definitive Data	Off-Site Laboratory and QA Laboratory

Notes: QA/QC = Quality Assurance/Quality Control
NA = Not Applicable
TBD = To Be Determined

TABLE 2
DETAILED SAMPLING SCHEME AND QUALITY CONTROL PROGRAM
IRP SITE NO. RW-41
TEST AREA C-74L
DELIVERY ORDER NO. 15
EGLIN AFB RA-C WORK PLAN
EGLIN AFB, FLORIDA

Sample Matrix: Soil

Sample Locations	Isotopic Uranium
Surface Soil Sample[1]	TBD
RW-41-SB-01-0.5[1]	1
RW-41-SB-02-0.5	1
RW-41-SB-03-0.5	1
RW-41-SB-04-0.5	1
RW-41-SB-05-0.5	1
RW-41-SB-06-0.5	1
RW-41-SB-07-0.5	1
RW-41-SB-08-0.5	1
RW-41-SB-09-0.5	1
RW-41-SB-10-0.5	1
RW-41-SB-11-0.5	1
RW-41-SB-12-0.5	1
RW-41-SB-13-0.5	1
RW-41-SB-14-0.5	1
RW-41-SB-TBD-0.5	1
QUALITY CONTROL SAMPLES	TBD
FIELD DUPLICATES	TBD
FIELD BLANK	TBD
TOTALS	

TBD = To Be Determined

NOTES: 1. A discrete soil sample will be collected from 0 – 0.5 ft. bls from each hand auger soil boring.

TABLE 3
SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES
IRP SITE NO. RW-NO. 41
TEST AREA C-74L
DELIVERY ORDER NO. 15
RA-C WORK PLAN
EGLIN AIR FORCE BASE, FLORIDA

Matrix	**Parameters**	**Container**	**Preservation**	**Maximum Holding Times***	
				Extraction	Analysis
Solid	Isotopic Uranium	1 500 mL to 1,000 mL glass or Polyethylene bottle	None	6 mo	6 mo

* Holding time begins at time of collection

mo = month
mL = milliliter

QUALITY ASSURANCE PROJECT PLAN – ITEM 12B

A Quality Assurance Project Plan (QAPP) will be developed and provided to the USAF for comment and acceptance. The QAPP will include pertinent sections of USACE EM-200-1-4 and NUREG-1575 (MARSSIM). At a minimum the plan will cover the following:

1.0 ORGANIZATION

2.0 DATA CHARACTERISTICS

3.0 FIELD AND LABORATORY QUALITY CONTROL CHECKS FOR SAMPLES
- CALIBRATION OF PORTABLE SURVEY INSTRUMENTS
- OFF-SITE LABORATORY SERVICES
- FIELD QUALITY CONTROL SAMPLES

4.0 ANALYTICAL METHODS AND DETECTION LIMITS LABORATORY ANALYSES and FIELD EQUIPMENT
Instrument Calculation of MDC: Adjustments for Long Background Counting Time

5.0 FIELD SAMPLING
The purpose of this section is to provide a sample control program addressing the importance of collecting a representative portion of material small enough in volume to be transported conveniently, yet to accurately represent the material sampled.
- PROPOSED SAMPLING
- PREVENTION OF CROSS-CONTAMINATION AND DECONTAMINATION
- SAMPLE IDENTIFICATION
- SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES
- SAMPLE PACKAGING AND SHIPMENT

6.0 RADIOLOGICAL SURVEYS

7.0 SAMPLE HANDLING AND CUSTODY

8.0 DATA REVIEW, VALIDATION, AND REPORTING
Parametric errors or uncertainties are those of a purely statistical or random nature, non-parametric errors are those caused by bias in either sampling or the analysis of the samples.
PARAMETRIC and NON-PARAMETRIC ERRORS

DECOMMISSIONING FUNDING PLAN – ITEM 13

The funding requirements of IRP Site RW-41 Test Area C-74L are based on the following:

- Earth Tech will be the remediation contracotor,
- Earth Tech will supply all personnel except the approved broker,
- The maximum amount of soil to be excavated is 500 cubic yards,
- No chemical contamination is found in the rad contamination soil,
- Earth Tech will not be responsible for waste disposal cost.

Funding Requirements

DESCRIPTION	NO.	UNIT	UNIT COST	TOTAL
Mobilization/Demobilization	11	LS	$1,000.00	$11,000.00
Land Survey Cost	1		$6,000.00	$6,000.00
Contaminated Soil Containerization	15	B-25	$950.00	$14,250.00
Radiation Safety Personnel	6	Personnel		$248,820.00
Non-Health Physics Personnel	1	Personnel		$11,700.00
EOD Support Personnel	2	Personnel		$75,900.00
Profile Sampling	45	Samples		$19,688.00
Final Status Survey Samples	30	Samples		$13,125.00
Final Status Survey Report	1	Report		$18,000.00
Equipment Rental, Tool, Materials				$26,500.00
PerDiem	11	77 Days	$100/day	$84,700.00
Miscellaneous				$15,000.00
TOTAL				$544,683.00

Funds have been approved and are available for the decommissioning activities.

STRUCTURE SURVEY COSTS – ITEM 13B

Total cost to survey the building and target area is $37,000. Summary table is included below.

Task or Item	Costs $	
	Labor	Other
Site visit and scoping	1,800	3,210
Plan development	5,400	540
Surveys	13,200	8,360
Final Report development	4,000	400
Total	37,000	

Scanned 30 May 01

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON DC

20 March 2001

MEMORANDUM FOR 46 TW/TS

FROM: AFMOA/SGZR
110 Luke Ave Room 405
Bolling AFB DC 20332-7050

SUBJECT: USAF Radioactive Material Permit No. FL-00643-00/00AFP, Docket No. 040-00643

This is to acknowledge receipt of your E-mail correspondence dated 16 March 2001 requesting a new USAF Radioactive Material Permit. In order for this office to process your request we need the following information.

The attached tabs specify the format for submission of applications for USAF Radioactive Material Permits. All permit actions must be submitted on letter size paper (8.5 x 11 inch), with three holes punched on the left margin. Large documents such as maps or blueprints may deviate from the standard if they are submitted in duplicate, folded neatly, and placed in a document protector pocket so they do not get damaged or lost. Where possible, materials submitted should be in 12 point New Century Schoolbook or Times Roman fonts (the Air Force standard for correspondence).

Please complete the attached NRC Form 313. Complete the information requested in Items 5 – 11 at their corresponding tabs. If a tab does not apply to your particular use then include a negative declaration in that tab. Set up a binder for your permit that has tabs that correspond with the attached tabs. You are to keep the References Tab and its contents in your permit binder (do not return with application).

Attachment 2 is a Decommissioning Cost Estimate Applicability Questionnaire, which must be answered to respond to question 5.X of attachment 1. In order to determine the applicability of this requirement to your permit, we request that you review 10 CFR Parts 30.35, 40.36, and 70.25 in light of your uses of radioactive material and complete the questionnaire. If your response to the questionnaire indicates that your uses of material require a decommissioning cost estimate, the USAF RIC will forward more information to you to aid you in developing your decommissioning cost estimate. The development of a decommissioning cost estimate may involve the following steps:

a. The development of a decommissioning plan in accordance with USNRC Regulatory Guide 3.65 (Attachment 3).

b. Solicitation of cost estimates from contractors to carry out the decommissioning actions.

Some Permittees may be unaware of 10 CFR Parts 30.36 that requires a permittee to submit a decommissioning plan to the NRC (through the RIC) if they decide not to conduct any further activities at a location or have not conducted activities at a location for 24 months. We would encourage all Permittees to review the requirements of that section to ensure that they are in compliance.

You are reminded that a Transportation Quality Assurance (QA) Program is required for any radioactive material shipments exceeding Type A quantities. Enclosed for your use in applying for a Transportation QA Program is a copy of the Air Force Generic Transportation QA Program (attachment 4). This document may be used to develop a tailored Transportation QA Program application for your sources using the guidance provided in Title 10, Part 71.105, Code of Federal Regulations, (attachment 5) and NRC Regulatory Guide 7.10 (attachment 6).

Please return to us your permit application in the "maroon" binder by 23 June 2001. Reference Permit No. FL-00643-00/00AFP and Docket No. 040-00643. If you have any questions please contact me at DSN 297-4307 or E-Mail at david.pugh@usafsg.bolling.af.mil. Our Telefax is DSN 754-8089. Our Beeper for receiving after-duty-hours Incident/Accident Reports is 1-888-425-3861. AFMOA/SGZR's web page is http://sg-www.satx.disa.mil/moasgor/.

DAVID L. PUGH, Capt, USAF, BSC
Health Physicist
Radiation Protection Division and
USAF Radioisotope Committee Secretariat
Air Force Medical Operations Agency
Office of the Surgeon General

Attachments: (See Next Page)

Attachments:
1. Permit Application Format
2. Decommissioning Cost Estimate Applicability Questionnaire
3. USNRC Regulatory Guide 3.65
4. Air Force Transportation QA Program
5. 10 CFR Part 71.105
6. NRC Regulatory Guide 7.10

cc:
96 AMDS/SGPB w/o Atch

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON DC

24 May 2002

MEMORANDUM FOR U.S. NRC, REGION IV
(Mr. Tony Gaines)

FROM: AFMOA/SGZR
110 Luke Avenue, Room 405
Bolling AFB DC 20332-7050

SUBJECT: Review of Decommissioning Plan, Eglin AFB, FL.

Enclosed is the decommissioning plan for Test Area C-74L, Eglin AFB, Florida. Test Area C-74L is a range on the Eglin reservation in Walton County, Florida, approximately 14 miles northwest of the City of Niceville. Depleted Uranium munitions testing occurred at C-74L from 1974-1978. The range was licensed under the NRC and the Atomic Energy Commission.

Upon NRC approval, an AF Radioactive Material Permit will be issued for this decommissioning project. Please note that Eglin AFB has requested that this project be given special attention due to funding constraints (atch 1). If you have any questions, please contact me at 202-767-4307 or e-mail, david.pugh@pentagon.af.mil.

DAVID L. PUGH, Capt, USAF, BSC
Health Physicist, Radiation Protection Division
USAF Radioisotope Committee Secretariat
Air Force Medical Operation Agency
Office of the Surgeon General

Attachment

Memorandum For AFMOA/SGZR, Subject: Request for Expeditious Review of Installation Restoration Program Site, RW-41, Range C-74L, Eglin AFB, FL.

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR ARMAMENT CENTER (AFMC)
EGLIN AIR FORCE BASE, FLORIDA

RECEIVED
15 MAY 2002

9 May 2002

MEMORANDUM FOR AFMOA/SGZR

FROM: AAC/EMR
207 N. Second Street Bldg 216
Eglin AFB, FL 32542-5133

Subject: Request for Expeditious Review of Installation Restoration Program Site RW-41, Range C-74L, Eglin AFB, FL.

The Environmental Management Restoration (EMR) Division at Eglin AFB requests that the Decommissioning plan for the subject site be reviewed as soon as practically possible. We understand every office has constraints upon their resources. We are requesting this process be expedited due to several factors. The funding for restoration projects have their two-year time limits for execution enforced at this time. Range C-74L is adjacent to other active ranges and within the safety footprint of other ranges. Range activity and use is high due to the September 11th attacks. Access to the range for restoration work is limited. Optimal windows of opportunity are November through early January when mission activity is generally lower.

Please contact Howard Mathews at (850) 882-7791, extension 212, or by email at howard.mathews@eglin.af.mil any time should you have any questions or comments.

THOMAS CHURAN
Restoration Program Manager

1st Endorsement

96 AMDS/SGPBR
W. Choctawhatchee Ave Building 37
Eglin AFB, FL 32542-5714

JOSEPH E. GREEN, Lt, USAF, BSC
Base Radiation Safety Officer
96th Aerospace Medicine Squadron

469166

JUL - 1 2002
DATE

This is to acknowledge the receipt of your letter/application dated 5/24/02, and to inform you that the initial processing, which includes an administrative review, has been performed.

☒ There were no administrative omissions. Your application will be assigned to a technical reviewer. Please note that the technical review may identify additional omissions or require additional information.

☐ Please provide to this office within 30 days of your receipt of this card:

The action you requested is normally processed in ____ days.

A copy of your action has been forwarded to our License Fee & Accounts Receivable Branch, who will contact you separately if there is a fee issue involved.

Your action has been assigned **Mail Control Number** 469166.
When calling to inquire about this action, please refer to this mail control number.
You may call me at 817-860-8103.

Sincerely,

Colleen Murnahan
Licensing Assistant

NRC FORM 532 (RIV)
(11-1999)

BETWEEN:

License Fee Management Branch, ARM
and
Regional Licensing Sections

(FOR LFMS USE)
INFORMATION FROM LTS

Program Code: 03613
Status Code: 0
Fee Category: EX 7B 3L 1D 2B 2C
Exp. Date: 20501111
Fee Comments: ____________________
Decom Fin Assur Reqd: Y

LICENSE FEE TRANSMITTAL

A. REGION

1. APPLICATION ATTACHED
   Applicant/Licensee: AIR FORCE, DEPARTMENT OF THE
   Received Date: 20020530
   Docket No: 3028641
   Control No.: 469166
   License No.: 42-23539-01AF
   Action Type: Notifications

2. FEE ATTACHED
   Amount: /
   Check No.: /

3. COMMENTS

Signed Colleen Kurnahan
Date 7/1/02

B. LICENSE FEE MANAGEMENT BRANCH (Check when milestone 03 is entered /__/)

1. Fee Category and Amount: ____________________

2. Correct Fee Paid. Application may be processed for:
   Amendment ________
   Renewal ________
   License ________

3. OTHER ____________________

Signed ____________________
Date ____________________