



University of California  
 Environmental Restoration Project, MS M992  
 Los Alamos, New Mexico 87545  
 505-667-0808/FAX 505-665-4747



U. S. Department of Energy  
 Los Alamos Area Office, MS A316  
 Environmental Restoration Program  
 Los Alamos, New Mexico 87544  
 505-667-7203/FAX 505-665-4504

Date: October 17, 1996  
 Refer to: EM/ER:96-546

Mr. Benito Garcia  
 NMED-HRMB  
 P.O. Box 26110  
 Santa Fe, NM 87502

**SUBJECT: VCA COMPLETION REPORT FOR TA-14, PRS 14-001(f) ACTIVITIES**

Dear Mr. Garcia:

Enclosed please find two copies of the Voluntary Corrective Action Completion Report for Technical Area 14, Potential Release Site (PRS) 14-001(f) cleanup activities completed in Fiscal Year 1996. The other appropriate entities within the Department have been included on distribution. The Environmental Restoration Project believes that this completion report justifies no further action (NFA) at this PRS. This PRS is not listed in the Hazardous and Solid Waste Amendments (HSWA) Module of the Los Alamos National Laboratory's Resource Conservation and Recovery Act operating permit; therefore, this report is being submitted for your information only.

The Department of Energy has reviewed and approved this report and agrees with the recommendation for NFA. The approval form is attached to the report. The Certification of Completion has been signed and is included in the enclosed report.

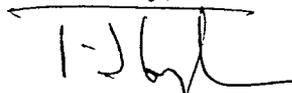
If you have any questions, please call Gene Gould at (505) 667-0402 or Everett Trollinger at (505) 667-5801.

Sincerely,

  
 Jorg Jansen, Program Manager  
 LAN/ER Project

JJ/TT/rfr

Sincerely,

  
 Theodore J. Taylor, Program Manager  
 DOE/LAO



3848

# **Voluntary Corrective Action Completion Report for**

**Potential Release Site  
14-001(f)  
Bullet Test Facility**

**Field Unit 2**

**Environmental  
Restoration  
Project**

**September 1996**

**A Department of Energy  
Environmental Cleanup Program**

**Los Alamos**  
NATIONAL LABORATORY

LA-UR-96-3317

1065

**TABLE OF CONTENTS**

**1.0 INTRODUCTION ..... 1**

**2.0 SITE CHARACTERIZATION PRIOR TO REMOVAL ..... 1**

**3.0 REMEDIAL ACTIVITIES AND RESULTS OF CONFIRMATORY SAMPLING ..... 4**

3.1 Risk Calculations and/or Cleanup Level Derivation ..... 4

3.2 Remedial Implementation ..... 4

3.3 Confirmatory Sampling ..... 5

**4.0 WASTE MANAGEMENT ..... 5**

4.1 Waste Management Activities ..... 5

4.2 Waste Characterization Data ..... 8

**5.0 REFERENCES ..... 9**

**APPENDIX A QA/QC ..... 10**

**APPENDIX B RFI Characterization Data ..... 12**

**APPENDIX C Cost Comparison ..... 13**

**APPENDIX D Confirmatory Sampling Results Table ..... 15**

**APPENDIX E Certification of Completion ..... 16**

**APPENDIX F Transfer of Property ..... 18**

**VOLUNTARY CORRECTIVE ACTION COMPLETION REPORT  
FOR POTENTIAL RELEASE SITE 14-001(f) -  
INACTIVE BULLET TEST FACILITY**

**1.0 Introduction**

Potential Release Site (PRS) 14-001(f) consists of an inactive bullet test facility and its underlying sump at Technical Area (TA)-14 (Figure 1 shows the general area of the PRS). PRS 14-001(f) is not included in Table A of the Hazardous and Solid Waste Amendments (HSWA) Module of the Laboratory's RCRA permit. This report serves as the mechanism to propose no further action (NFA) for PRS 14-001(f).

PRS 14-001(f) (Figure 2), the bullet test facility, is described in the RFI Work Plan for OU 1085 (LANL 1994, 1156) and the Voluntary Corrective Action (VCA) Plan for PRS 14-001(f) (LANL 1996, 1340). The bullet test facility is a steel cylindrical structure 13.3 ft by 13.6 ft by 8 ft tall, and the underlying sump is reinforced concrete approximately 13 ft by 13 ft by 4.5 ft deep. Tests at PRS 14-001(f) used many types of bullets including copper-jacketed lead, plastic, steel, and depleted uranium (DU). The firing, which occurred from the late 1970s until the mid-1990s, was conducted in the 10-ft-diameter steel tube; therefore, the test material was usually contained in the tube, in the sump below the tube, or was vaporized.

A VCA was conducted for health reasons based on the contaminants of concern (COCs) determined during the Phase I analytical results and because pieces of high explosives (HE) were visible within the sand on the site. During Phase I operations, three samples were collected, two from within the bullet test facility and one from the underlying sump. Analytical results from Phase I showed the high explosive RDX (cyclotrimethylenetrinitramine) and uranium above screening action levels (SALs), and manganese above background upper tolerance limit (UTL). Therefore the COCs for PRS 14-001(f) are RDX, uranium, and manganese. The appropriateness of a VCA at this site was confirmed in the VCA checklist (presented in the VCA Plan) (LANL 1996, 1340). Because the remedy was obvious, straightforward, and relatively inexpensive, a VCA for this site was recommended.

**2.0 Site Characterization Prior to Removal**

Sampling data from the 1995 sampling campaign and the data quality evaluation is summarized in the VCA Plan (LANL 1996, 1340).

A total of three surface samples were collected during Phase I operations, two from within the bullet test facility and one from the underlying sump, using the approved spade and scoop technique. The depths of the samples collected in the bullet test facility were 0-1 inch and 0-4 inches. The third sample was a 4-inch depth sample collected from the sump. This sample gave a positive result on the HE spot test and was sent to LANL's DX-2 Group for screening prior to off-site shipment. The three samples were used to characterize the sand within PRS 14-001(f), according to the RFI Work Plan (LANL 1994, 1156), and their locations were shown in the VCA Plan (LANL 1996, 1340).

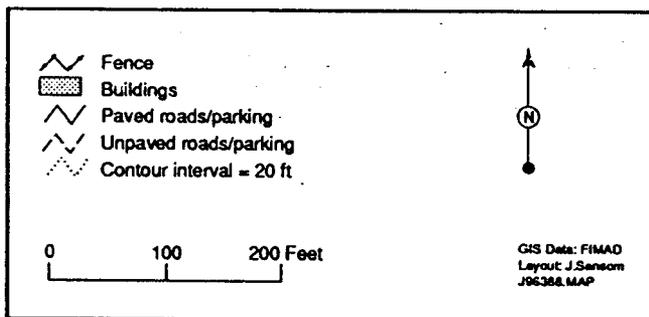
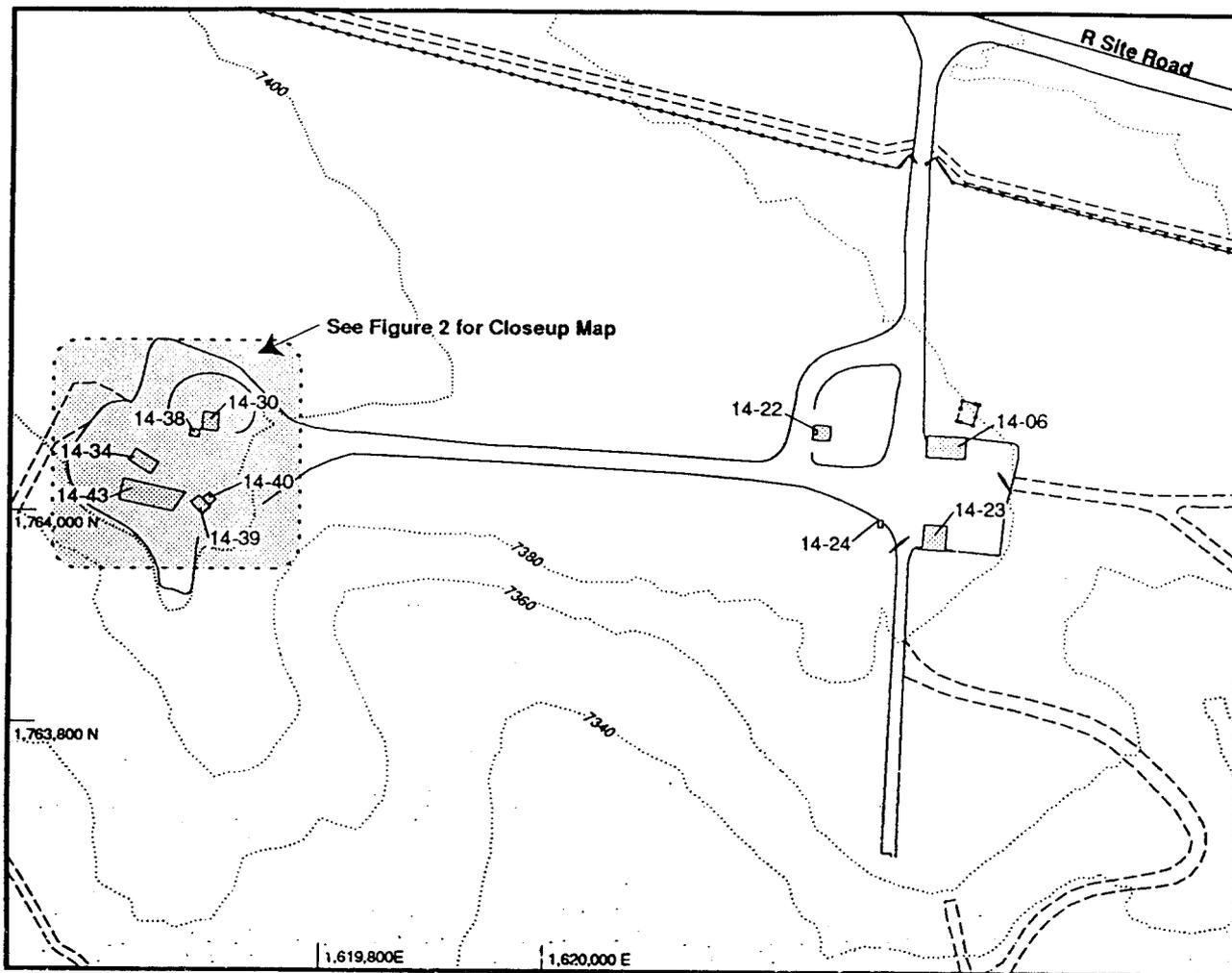


Figure 1. PRS 14-001(f)  
General Location of PRS 14-001(f)

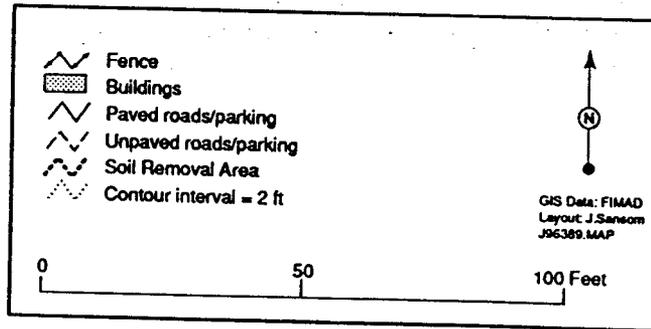
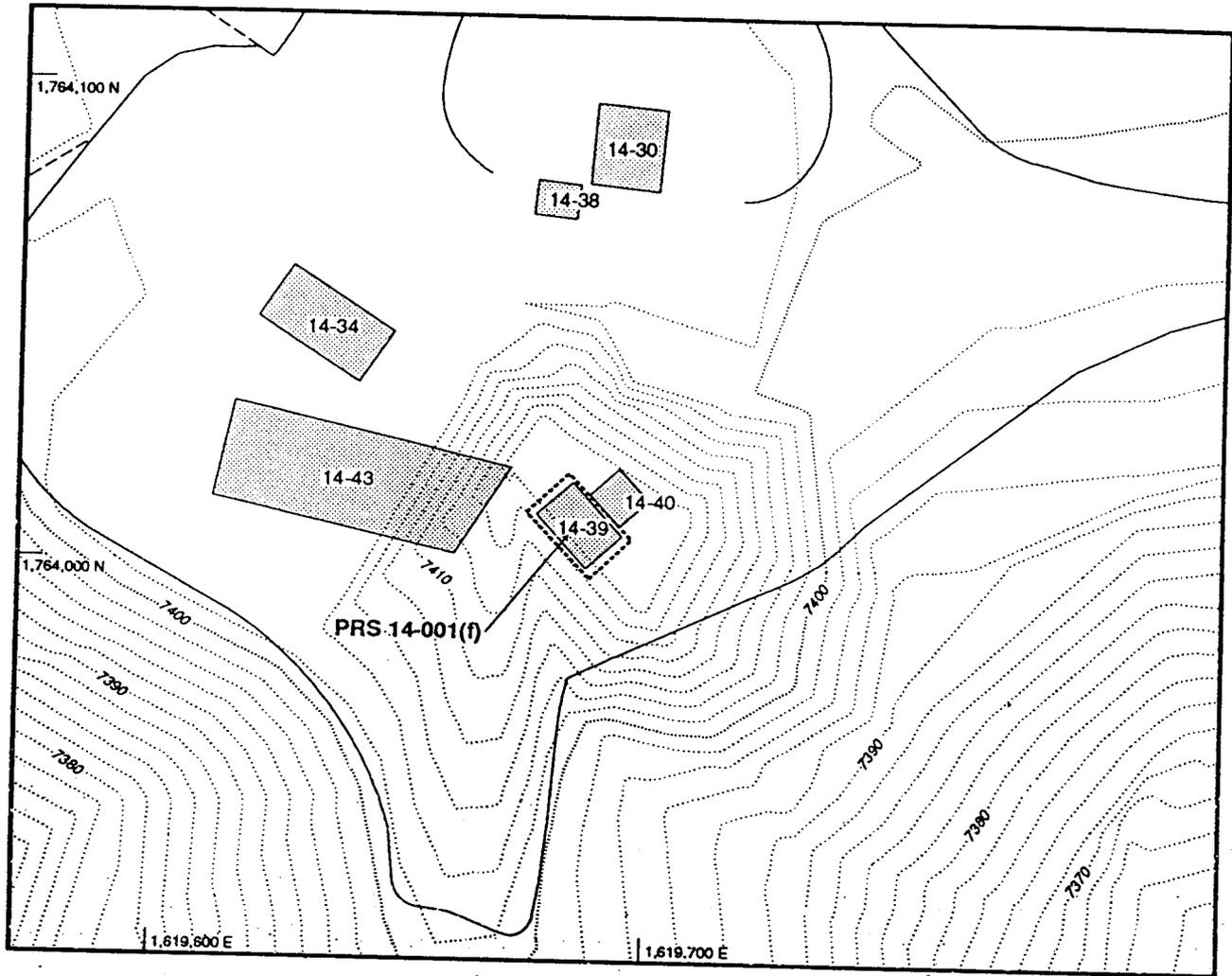


Figure 2. PRS 14-001(f)  
Location of Soil Removal

### 3.0 Remedial Activities and Results of Confirmatory Sampling

#### 3.1 Risk Calculation and/or Cleanup Level Derivation

The Preliminary Remediation Goals (PRGs) presented in Table 3.1-1 were calculated for this site using the modified U.S. Environmental Protection Agency (EPA) equations and LANL site-specific input parameters, which were presented in the Voluntary Corrective Action Plan for PRS 14-001(f) (LANL 1996, 1340). The derivation of human health risk-based cleanup levels for PRS 14-001(f) is based on a nonintrusive industrial exposure scenario using Laboratory-specific default parameters for a generic worker. These default exposure parameters assume an exposure frequency of 250 days per year and a duration of 25 years. Exposure routes considered in the calculations of the PRGs include incidental ingestion and inhalation of contaminated soil.

**Table 3.1-1  
PRGs for Nonintrusive Industrial Exposure Scenario for PRS 14-001(f)**

Chemical	Noncarcinogenic PRG (mg/kg)	Carcinogenic PRG (mg/kg)	PRG (lower of 2) (mg/kg)
Manganese	8.09 E +02	NA	8.09 E +02
RDX	6.13 E +03	5.2 E +01	5.2 E +01
Uranium	150 pCi/g RESRAD; 15 mrem/yr		

NA = Not Applicable

#### 3.2 Remedial Implementation

This VCA was conducted in accordance with the approved VCA Plan (LANL 1996, 1340). The VCA was started on June 11, 1996, and was completed on June 14, 1996. All of the sand was hand shoveled from within the bullet test facility and the underlying sump into four B-25 containers. Pieces of DU, when found, were segregated according to the VCA Plan and placed in a plastic bag, which was placed in the fourth B-25 container based on the waste analytical results. No pieces of HE were found during the clean-up operation, but all four waste characterization samples tested positive for HE using LANL's HE spot test kit. Therefore, an HE sample from each waste sample was sent to DX-2 Division of the Laboratory for HE screening prior to shipping to a fixed analytical laboratory.

The total volume of waste deviated from the volume described in the VCA Plan. The total volume of contaminated soil removed was 20 yds<sup>3</sup> (3-1/3 B-25 containers), versus the 1.4 yds<sup>3</sup> anticipated. When conducting the Phase I operations, a hard layer of compacted sand was found at the 4 inch depth in the steel cylinder. Since the spade could not penetrate this layer of hard sand, it was thought that the base of the steel cylinder was 5 inches deep, when in reality it was a foot and a half deep. This resulted in an increased volume of waste and thus a greater volume of sand. Because the same operations produced all of the sand and small pieces of DU were seen throughout the sand, irregardless of depth, all of the sand was thought to be contaminated.

After the sand was removed, a radiological survey of the interior surfaces of the steel tube and the underlying sump was conducted using an Eberline ESP-1 beta/gamma meter with a HP-260 probe. Above-background readings (approximately 300 cpm) were found on both structures. Uranium was removed from the surfaces of the sump by brushing and washing with Fantastik<sup>®</sup> cleaner, but incompletely removed from the steel tube. Fifteen areas in the steel tube had surface readings above 1000 cpm (figure 3) and were determined to be fixed radioactivity, because repeated brushing and washing could not remove the radioactivity. The 15 areas where

the radioactivity was fixed were painted using two colors, yellow and red (figure 4), following LANL's ESH-1 requirements. A sign was placed in the bullet test facility indicating fixed radioactivity. The operating group has agreed to take control of this site (see Appendix F).

Site restoration was not necessary. Upon the operating group's request, the sump drain was plugged using quick drying cement in August, 1996. Prior to being plugged the sump drainline was the only potential pathway for environmental release. The sump drainline presently leads under the road to a drainage area where the line ends underground at PRS 14-010 (a drainage area), which is scheduled for a VCA in 1997, pending approval of the budget.

### **3.3 Confirmatory Sampling**

No confirmatory sampling was necessary at PRS 14-001(f), since all sand was removed from the steel cylinder and concrete sump. There is no longer any potential for environmental release, since the contaminants have been removed and the drainline plugged.

## **4.0 Waste Management**

### **4.1 Waste Management Activities**

The total volume of waste deviated from the volume written in the VCA Plan. The total volume of soil removed was 20 yds<sup>3</sup> (3-1/3 B-25 containers), versus the 1.4 yds<sup>3</sup> anticipated. It was believed that the depth to the bottom of the bullet test facility was only 5 inches, based on the Phase I sampling effort. Actually, the depth to the bottom was approximately one and a half feet.

The waste was characterized by collection of composite samples as the B-25 containers were filled, followed by fixed laboratory analyses for TCLP metals, HE, isotopic uranium, PCBs, semivolatiles, and volatiles. After reviewing the waste characterization results, the type of waste was classified as low-level radioactive.

The waste was disposed at the Laboratory's low level radioactive storage facility at TA-54. The waste was removed from the <90 day storage area on September 20, 1996. Although the waste was not RCRA hazardous waste, it was placed in a <90 day storage area as a precautionary measure when it was generated.

Waste minimization activities included sorbing the small amount of water (<10 gallons) generated during decontamination procedures onto the sand in the B-25 containers. This is an acceptable practice, as the Waste Acceptance Criteria (WAC) for TA-54 requires that liquids constitute <1% of the volume of the container.

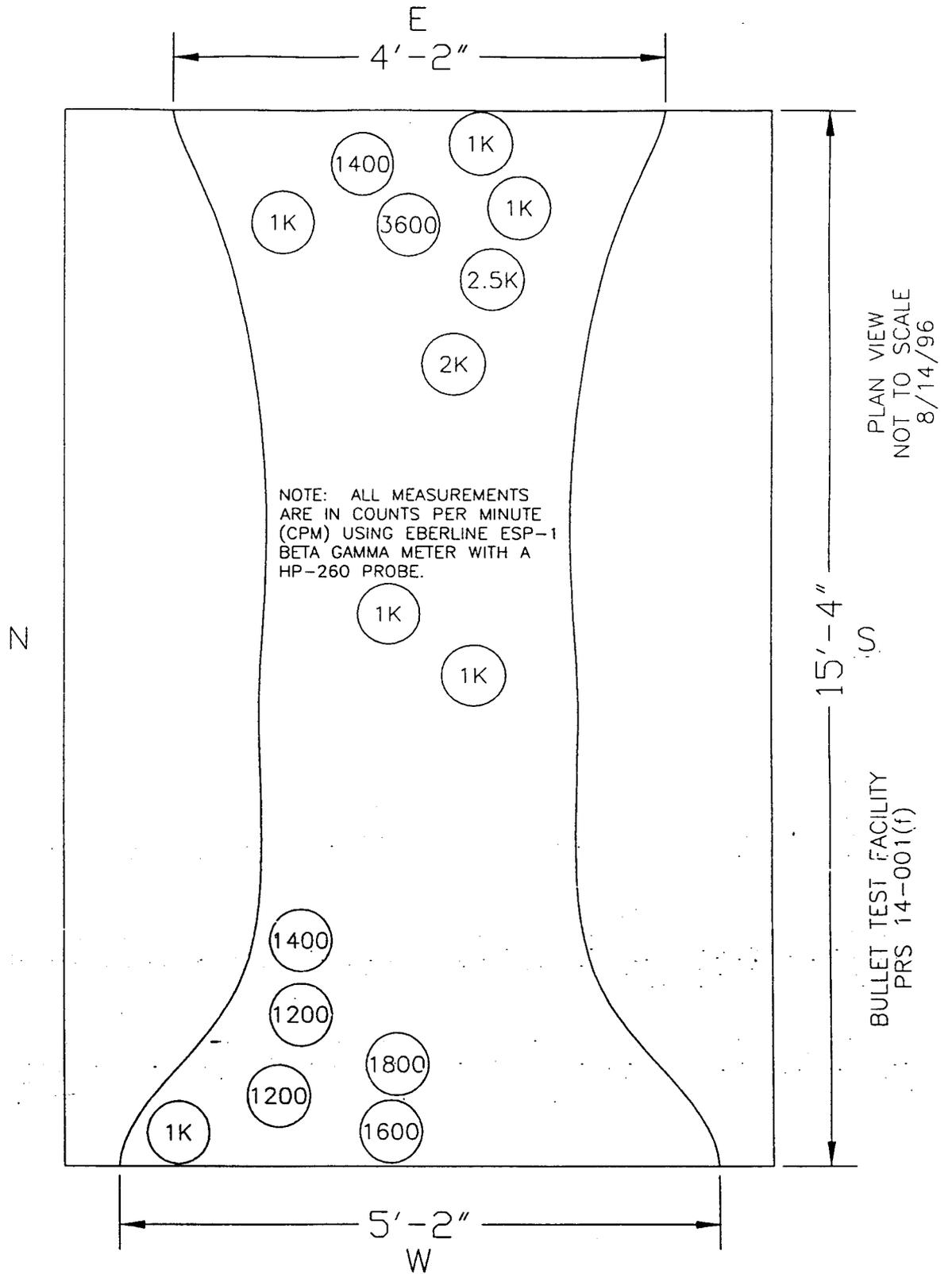


Figure 3. PRS 14-001(f)  
Hot Spots in the Bullet Test Facility



Figure 4. PRS 14-001(f)  
Photo of the Bullet Test Facility

#### 4.2 Waste Characterization Data

Table 4.2-1 shows the results of the waste characterization samples. Data validation showed no qualifiers for the data.

**Table 4.2-1  
Waste Characterization Samples**

Sample ID Number	Compound	Result	Units	Result Qual
0214-96-0100	2,4,6-Trinitrotoluene	5180	UG/KG	
	RDX	34200	UG/KG	
	HMX	60100	UG/KG	
0214-96-0101	2,4,6-Trinitrotoluene	1570	UG/KG	
	RDX	25900	UG/KG	
	HMX	96200	UG/KG	
0214-96-0102	RDX	27400	UG/KG	
	HMX	1150000	UG/KG	
0214-96-0103	2,4,6-Trinitrotoluene	984	UG/KG	
	RDX	44300	UG/KG	
	HMX	399000	UG/KG	
0214-96-0100	Barium	1.7 *	MG/L	
	Lead	1 *	MG/L	
0214-96-0101	Barium	1.8 *	MG/L	
0214-96-0102	Barium	2.2 *	MG/L	
	Lead	3 *	MG/L	
0214-96-0103	Barium	2.1 *	MG/L	
	Lead	2 *	MG/L	
0214-96-0100	U234	2.2	pCi/g	
	U238	11.2	pCi/g	
0214-96-0101	U234	1.8	pCi/g	
	U238	7.4	pCi/g	
0214-96-0102	U234	5.8	pCi/g	
	U235	0.56	pCi/g	
	U238	41.4	pCi/g	
0214-96-0103	U234	3.3	pCi/g	
	U235	0.3	pCi/g	
	U238	22.8	pCi/g	
0214-96-0100	Acetone	23	UG/KG	

\* = TCLP Analyses

## 5.0 References

LANL 1994: Los Alamos National Laboratory, May 1994. "RFI Work Plan for Operable Unit 1085," Final Draft, Los Alamos National Laboratory Report LA-UR-94-1033, Los Alamos, New Mexico. (LANL 1994, 1156)

LANL 1996: Los Alamos National Laboratory, April 1996. "Voluntary Corrective Action Plan for Potential Release Site 14-001(f) Bullet Test Facility, Field Unit 2," Final Draft, Los Alamos National Laboratory Report LA-UR-96-1017, Los Alamos, New Mexico. (LANL 1996, 1340)

**APPENDIX A  
QA/QC**

**Data Quality Evaluation for Soil Samples 0214-96-0100,  
0212-96-0101, 0214-96-0102, and 0214-96-0103  
at PRS 14-001(f)**

The analytical data generated from the soil samples collected from PRS 14-001(f) at TA-14 were analyzed for inorganics (TCLP metals only), radionuclides (isotopic uranium only), volatile and semivolatile organics, PCBs, and high explosives. The data quality and usability were determined by the analysis of a variety of QA/QC samples, including blanks, internal standards, duplicates, surrogates, laboratory control samples, and matrix spikes. The sample data were compared to the QA/QC sample data using numerical acceptance criteria established by either the analytical laboratory or EPA. The data that do not meet these criteria are qualified to indicate to the data user those sample results that may have potential deficiencies associated with sampling handling and analysis. These qualifiers include U (undetected), J (estimated), UJ (undetected estimated), and R (unusable).

The QA/QC data indicated that 100% of the sample data were acceptable and defensible. The QA/QC problems included a surrogate recovery for the volatile organic analysis in one sample that was outside of the QC limits and the exceedance of the calibration range of the instrument for several high explosive analytes. The data are qualified as UJ based on the surrogate recovery problem, as E indicating that the undiluted sample values exceeded the upper calibration range of the instrument, and as D indicating that the sample values were diluted in order to be within instrument calibration. The surrogate recovery for dibromofluoromethane was below the lower QC limit for sample 0214-96-0101. Re-analyses of the surrogate found it to be still slightly below the QC limit. The usability of the data is not affected because the recovery was 2% below the lower limit so that the analytes would be detected and quantified if present and the other surrogate recoveries were acceptable. Dilution(s) of the samples were required due to high concentrations of HMX and RDX in the undiluted samples. The dilutions allowed these analytes to be within the calibration limits. The data for HMX and RDX obtained from the initial dilution of the samples should be used as the reported concentrations. The detected concentrations for 2,4,6-trinitrotoluene obtained from the undiluted samples should be used as the reported values because the dilution of the samples resulted in this analyte being undetected. The remaining volatile organic and high explosives data are usable as reported.

Bis(2-ethylhexyl)phthalate was detected in the method blank. The sample values for this analyte were less than 10X the blank value, indicating that detection could be the result of blank contamination. Therefore, the sample values are considered to be nondetects and the detection limit raised to the reporting limits for each sample. The data are usable as nondetects. All other semivolatile organic data are usable as reported.

In addition, uranium-234 was detected in the initial calibration blank. The concentrations for this radionuclide in three of the four samples were less than 10X the blank value, indicating that detection could be the result of blank contamination. Therefore, the sample values for uranium-234 in these three samples are considered to be nondetects and the detection limits raised to the reporting limits for each sample. The data are qualified as U and are usable as nondetects. The sample value in the remaining sample is not qualified and is usable as reported. Uranium-235 was also qualified as U because of the reported detection of this analyte in a blank. Further review of the QA/QC data indicated that the presence of this analyte in any of the blanks was not evident. The sample values should, therefore, be reported as detected concentrations. Two of the sample values should be qualified as J because the reported concentrations are greater than the instrument detection limits, but less than the reporting limits. These data are estimated because

VCA Completion Report

---

the values are near or in the "noise" range of the instrument and cannot be accurately quantified. The uranium-238 data are usable as reported.

The inorganic and PCB data did not have any QA/QC problems, are qualified as U, and are usable as reported.

**APPENDIX B  
RFI CHARACTERIZATION DATA**

RFI characterization data are available in FIMAD, or will be provided upon request.

**APPENDIX C  
COST COMPARISON**

The estimated costs of this VCA are compared with the actual costs through September 11, 1996 in Table C-1. Differences between estimated and actual costs are discussed in the following sections.

**TABLE C-1  
ESTIMATED VERSUS ACTUAL COST FOR VCA AT PRS 14-001(f)**

<b>Activity</b>	<b>Budget Cost</b>	<b>Actual Cost *</b>
Plan Development	\$ 28,000	\$ 5,000
Mobilization	\$ 7,000	\$ 7,000
Cleanup	\$ 17,000	\$ 49,700
Verification Sampling	\$ 4,500	\$ 0
Waste Disposal	\$ 7,800	\$ 5,000
Field Screening	\$ 1,500	\$ 1,500
Demobilization/Site Restoration	\$ 1,200	\$ 1,200
Reporting	\$ 10,000	\$ 1,000
<b>Total Cost</b>	<b>\$ 78,000</b>	<b>\$ 70,400</b>

\* Actual cost through 9/11/96. Waste disposal costs are estimated.

**C.1 Plan Development**

The actual cost was about one-fifth the budgeted cost due to consolidation of plan writing effort throughout the Field Unit.

**C.2 Mobilization**

Mobilization costs were as planned.

**C.3 Cleanup**

Cleanup costs exceeded budget due to the approximately 10 times more waste removed than planned, and the need to stabilize the fixed radioactivity in the cylinder.

**C.4 Verification Sampling**

No verification sampling was conducted.

**C.5 Waste Disposal**

Waste disposal costs are for low level radioactivity, and are projected at slightly less than the budget.

**C.6 Field Screening**

Field screening costs are as planned.

**C.7 Demobilization/Site Restoration**

Demobilization costs reflect staging the B-25 containers in the storage area, radiological screening of all equipment, and transporting equipment to the appropriate storage areas, the costs were as planned.

**C.8 Reporting**

Reporting costs were below the projected budget due to the consolidation of the writing effort.

**C.9 Total Cost**

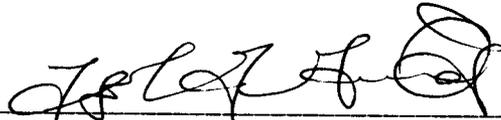
Because the VCA was straightforward, the cost to complete the VCA was approximately 10% less than estimated.

**APPENDIX D  
CONFIRMATORY SAMPLING RESULTS TABLE**

No confirmatory samples were collected.

**APPENDIX E  
CERTIFICATION OF COMPLETION**

I certify that all the work pertaining to the voluntary corrective action PRS 14-001(f) has been completed in accordance with the Department of Energy approved VCA plan entitled VCA Plan for Potential Release Site 14-001(f), Inactive Bullet Test Facility. Based on my personal involvement or inquiry of the person or persons who managed this cleanup, a review of all data gathered and a visit to the site, to the best of my knowledge and belief, all criteria of the plan have been met or exceeded. I believe that the completion of this VCA is protective of both human health and the environment. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.



Field Unit 2, Field Project Leader  
Environmental Restoration Project  
Los Alamos National Laboratory



Date Signed

**VOLUNTARY CORRECTIVE ACTION (VCA) COMPLETION REPORT  
APPROVAL/DISAPPROVAL FORM**

PRS(s) 14-001(f)

The undersigned have reviewed the VCA Completion Report and believe that the intent and goals of the VCA plan have been met.

FPL 

Date 9/20/96

FPC 

Date 9-30-96

.....

I, Theodore J. Taylor, DOE-LAO, **APPROVE** , **DISAPPROVE**  the accompanying Voluntary Correction Action Report for PRS(s) 14-001(f), TA-14.

The following reasons reflect the decision for disapproval:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Signed: 

Date: 9/30/96

**APPENDIX F  
TRANSFER OF PROPERTY**

**Los Alamos**  
NATIONAL LABORATORY  
**memorandum**

*Engineering Sciences & Applications  
Design Engineering Group*

To/MS: Jim Stine, DX-2, MS C920  
From/MS: Doug Pippin, ESA-EPE, MS G787 *DP*  
Phone/FAX: Phone 7-3358/FAX 5-1976  
Symbol: ESA-EPE:96-295  
Date: September 10, 1996

**SUBJECT: FIXED RADIATION WITHIN THE BULLET TEST FACILITY,  
PRS 14-001(f), TA-14, Q- SITE**

In our efforts to clean up the Bullet Test Facility we removed all the sand from within the steel tube and the concrete sump located beneath the tube. After the soil was removed, we surveyed the steel tube and sump again with an Eberline ESP-1 beta/gamma meter with an HP-260 probe. Radioactivity was detected in the tube and the sump. We were successful in removing the radiation from the sump, however, there were 15 spots within the bottom 1/3 of the steel tube that has fixed radiation that we were not able to remove through scrubbing with wire brushes and "fantastic" cleaning solvent. After several unsuccessful attempts, we contacted Al Cucchiara of ESH-1 to discuss this situation. It was recommended that we convene a meeting between Al, Ken Uher and yourself to address how best to handle the fixed radiation in the tube.

Based on our meeting of August 7, it was agreed that the levels of the fixed rad in the tube were low enough to allow it to be left in place and have DX-2 provide administrative control of the steel tube, with this memo in the file to document the status of the tube. As agreed, we mapped the detected 15 spots in the tube, and noted the Counts Per Minute (CPM), which ranged from 1,000 to a high of 3,600 CPM (attachment 1). We responded to the recommendation of ESH-1 and applied a coat of yellow paint over each affected area, followed by application of another coat of red paint over the yellow, leaving a small edge of the yellow showing on the outer edges (attachment 2).

On August 29, we surveyed the inner sidewalls and the top of the tube using the Eberline ESP-1 beta/gamma meter with an HP-260 probe. The results indicated a couple locations with readings of 274 CPM, with most of the tube below this count. Background radioactivity in the area is between 250 - 300 CPM.

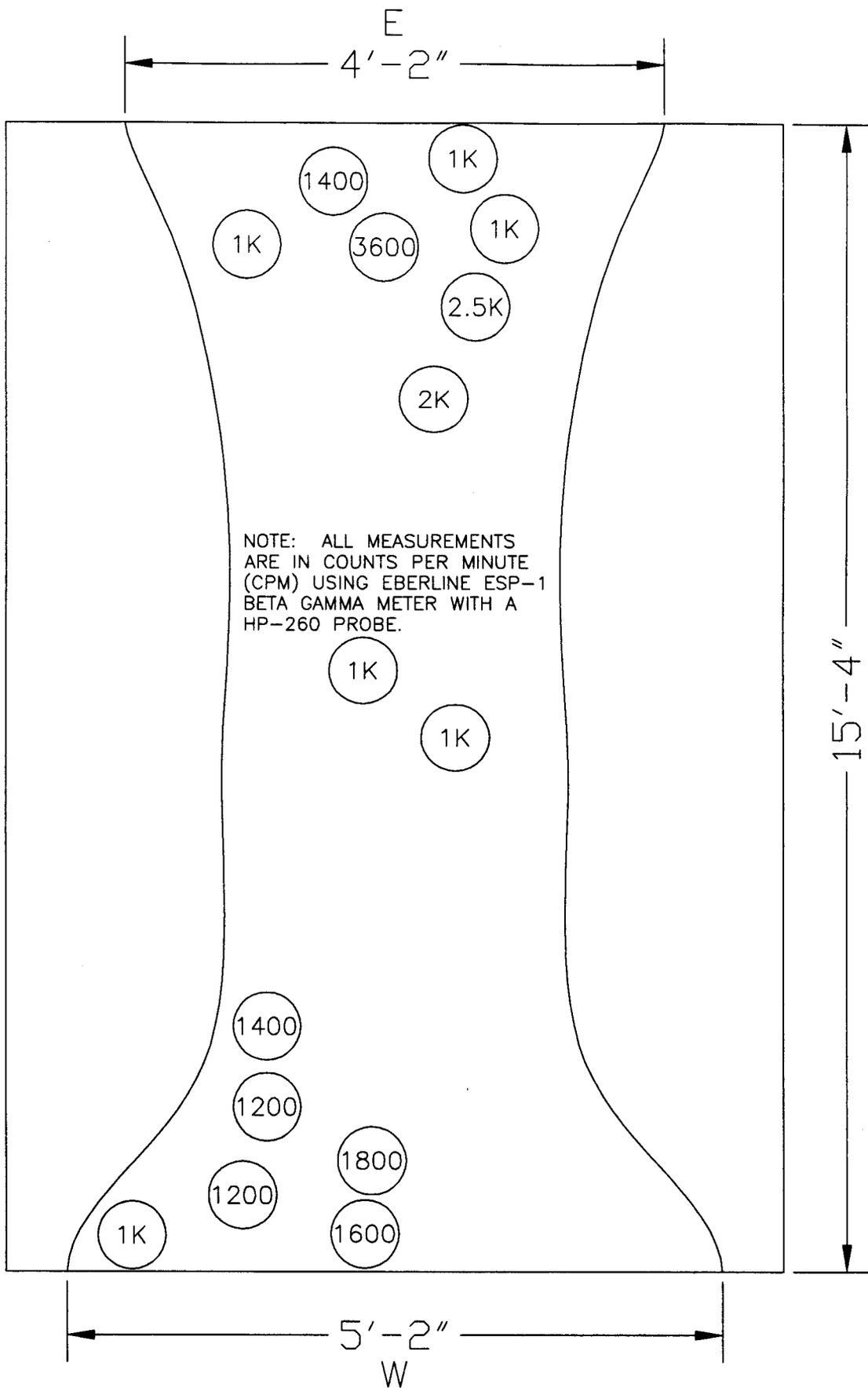
With these actions complete, we now declare the Bullet Test Facility clean of RCRA contaminants with the fixed radioactivity spots located and properly marked, and propose that DX-2 assumes administrative control of the steel tube and provides the necessary signage to mark the area.

By your signature below, you attest to your concurrence with this memo.

  
T. E. Gene Gould, FPL, ESA-EPE

  
Jim Stine, Dpty. Grp. Ldr. DX-2

Cy: J. Snow, DX-2, MS C920  
K. Uher, DX-2, MS C920  
A. Cucchiara, ESH-1, MS P942  
T. Fogg, ICF-KE, MS M892  
T. McFarland, ICF-KE, MS M892  
RPF, MS M707  
project file ou 1085  
ESA-EPE serial file



PLAN VIEW  
NOT TO SCALE  
8/14/96

BULLET TEST FACILITY  
PRS 14-001(f)

Los Alamos National Laboratory Environmental Restoration  
 DETERMINATION OF DA AND MDA

Date: 8-14-96

Technical Area: 14

Operable Unit: 1085

Calibration procedures must be approved by ESH-4. Calibration results must be within acceptable parameters prior to using a specific instrument to document unrestricted release of materials and equipment. Declaration of waste as "non-radioactive" must be documented with appropriate laboratory or enhanced field analyses.

Instrument Type Ld116m

Model Number Ld12/44-9

Serial Number 006962

Calibration Date 2-20-97

ACT J Craig Owens FUZ  
 (Print Name) Group

J Craig Owens 8-14-96  
 (Signature) Date

Background Count Rate	<u>250</u> cpm (B)
Background (or sample) Counting Time	<u>1</u> min. (t)
Detector Efficiency	<u>50%</u> (E)
Detector Active Area	<u>15.5</u> cm <sup>2</sup> (A)

Calculate minimum detectable Activity (MDA):

$$MDA = \frac{2.71 + 4.65\sqrt{Bt}}{t \cdot E \left( \frac{A}{100} \right)} = \underline{983.7} \text{ dpm/100 cm}^2$$

Calculate Decision Amount (DA):

$$DA = \frac{2.33\sqrt{Bt}}{t \cdot E \left( \frac{A}{100} \right)} = \underline{475.4} \text{ dpm/100 cm}^2$$

Calculations Checked by: \_\_\_\_\_  
 (Print Name) Group

\_\_\_\_\_  
 (Signature) Date

**Los Alamos National Laboratory Environmental Restoration  
DETERMINATION OF DA AND MDA**

Date: 8/15/96

Technical Area: 14

Operable Unit: 1085

Calibration procedures must be approved by ESH-4. Calibration results must be within acceptable parameters prior to using a specific instrument to document unrestricted release of materials and equipment. Declaration of waste as "non-radioactive" must be documented with appropriate laboratory or enhanced field analyses.

Instrument Type: Ludlum

Model Number: Lud12/44-9

Serial Number: 006962

Calibration Date: 2-20-97

PCT J. Craig Owens FU2  
 (Print Name) Group  
J. Craig Owens 8/15/96  
 (Signature) Date

Background Count Rate	<u>280</u> cpm (B)
Background (or sample) Counting Time	<u>1</u> min. (t)
Detector Efficiency	<u>50%</u> (E)
Detector Active Area	<u>15.5</u> cm <sup>2</sup> (A)

Calculate minimum detectable Activity (MDA):

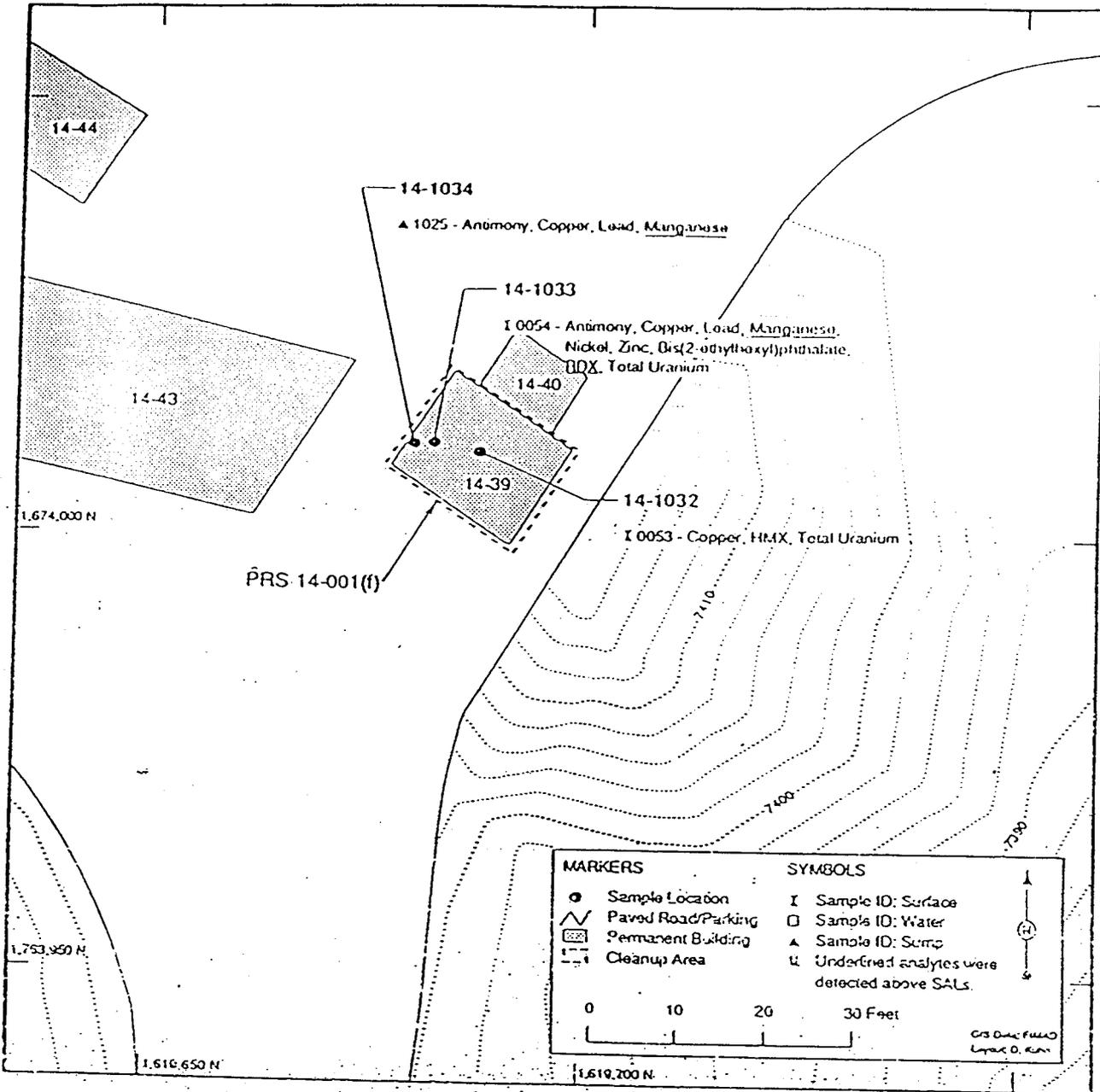
$$MDA = \frac{2.71 + 4.65\sqrt{Bt}}{t \cdot E \left( \frac{A}{100} \right)} = \underline{1039} \text{ dpm/100 cm}^2$$

Calculate Decision Amount (DA):

$$DA = \frac{2.33\sqrt{Bt}}{t \cdot E \left( \frac{A}{100} \right)} = \underline{503.1} \text{ dpm/100 cm}^2$$

Calculations Checked by: \_\_\_\_\_  
 (Print Name) Group  
 \_\_\_\_\_  
 (Signature) Date

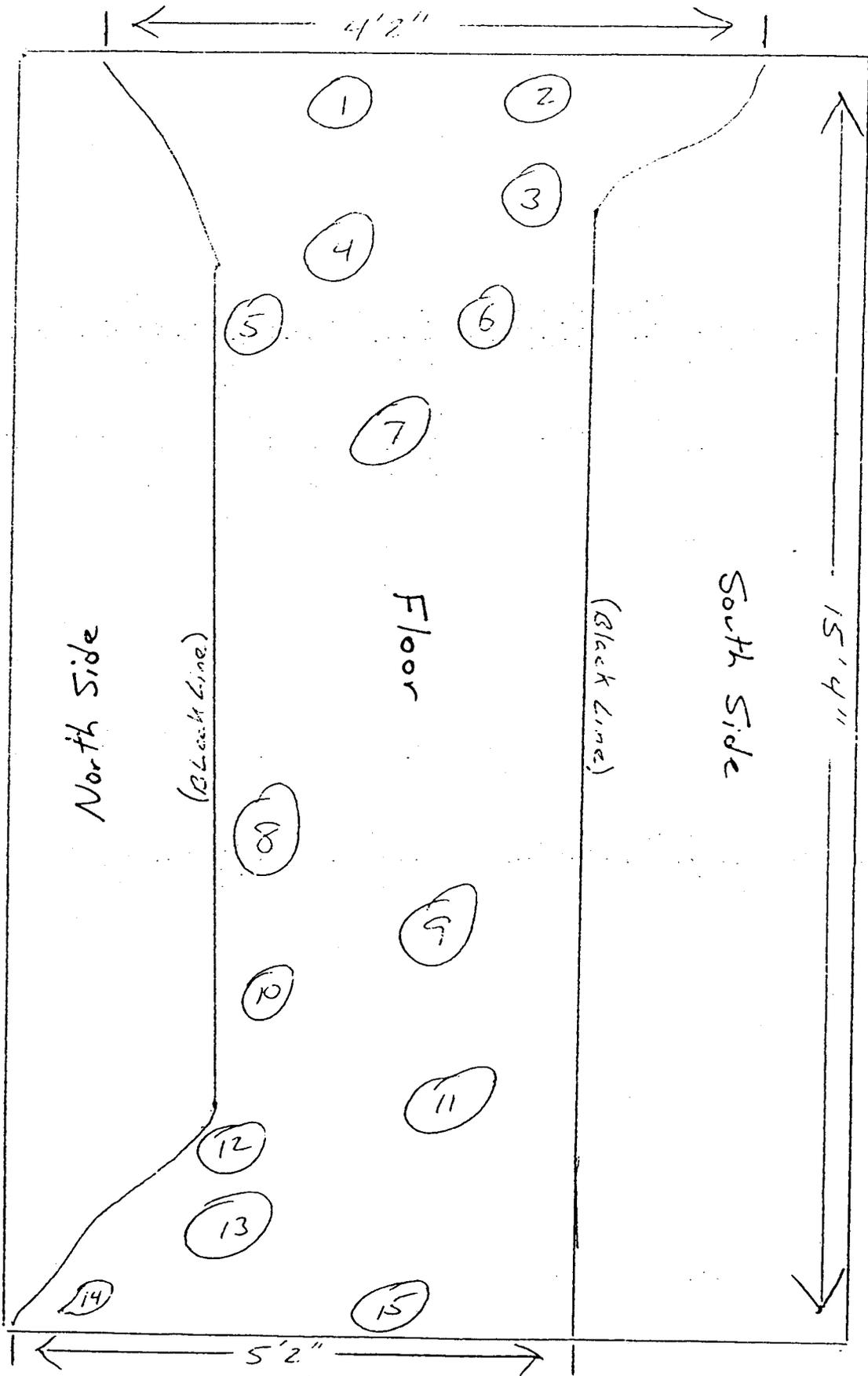
Date 8-14-96



PRS 14-001(f)

Notes: 10/21/11 Facility  
Date: 8-14-96  
RCT: J. Craig Owens

Notes: Circled Numbers indicated  
Elevated Readings. Other  
Readings in CPM - Ranged between  
250-450.



# DIRECT SURVEY RESULTS

## SAMPLE DESCRIPTION

Sample Date 8-14-96 Sample Time: \_\_\_\_\_  
 TA/4 Bldg: \_\_\_\_\_ Room(s)/Area(s): \_\_\_\_\_  
 RCT J Craig Owens Printed Name J Craig Owens  
 Mail Stop: M852 Phone: 661-5200

## ADDITIONAL INFORMATION

Occurrence No.: \_\_\_\_\_  
 Incident No.: \_\_\_\_\_  
 RWP No.: \_\_\_\_\_

## JOB DESCRIPTION

ER Work  
Bullet Test Facility  
Floor Survey

## DISTRIBUTION

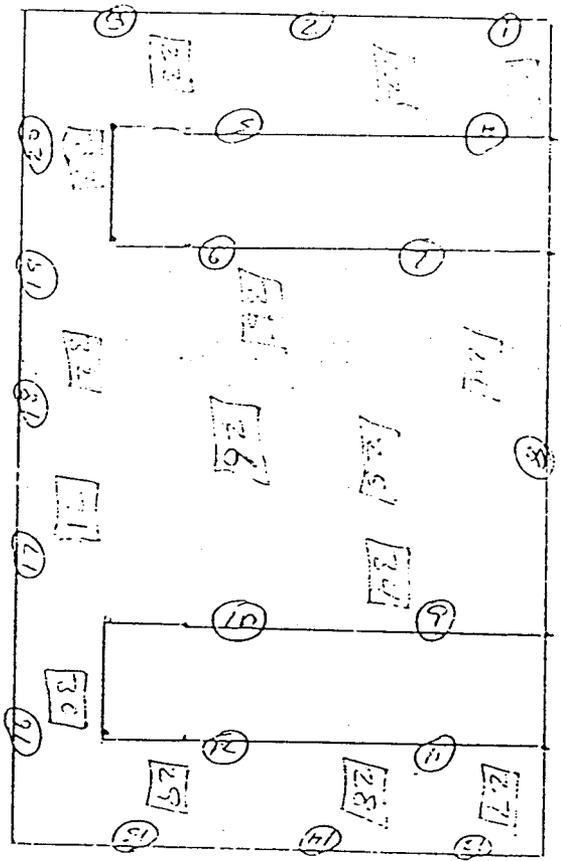
Rich Baker  
Tracy McFarland  
Dave Pippin

## INSTRUMENTATION

	Alpha Channel	Beta Channel
Instrument <u>LU12/44-9</u>	Efficiency <u>NA</u>	50%
HSE Number <u>006962</u>	Background (cpm)	250
Cal Due Date <u>2-20-97</u>	MDA (dpm/100cm <sup>2</sup> )	983.7
	Reference Reading	180,000

Item/Area	Alpha		Beta/Gamma		GROSS	Remarks
	cpm	dpm	cpm	dpm		
① Floor	NA		1400	2800		
②			1000	2000		
③			1000	2000		
④			3600	7200		
⑤			1000	2000		
⑥			2500	5000		
⑦			2000	4000		
⑧			1000	2000		
⑨			1000	2000		
⑩			1400	2800		
⑪			1800	3600		
⑫			1200	2400		
⑬			1200	2400		
⑭	✓		1000	2000		
⑮	✓	NA	1600	3200		
	NA	NA	NA			
	✓					
	✓					

15/11/01 Test Facility of PPRS 14-001(F)  
 Radiological Survey of Pit  
 Date: 8-15-96  
 By: J. Craig Owens



# = Wall  
 --- = Floor

# DIRECT SURVEY RESULTS

## SAMPLE DESCRIPTION

Sample Date: 8-15-96 Sample Time: \_\_\_\_\_  
 TA: 14 Bldg: \_\_\_\_\_ Room(s)/Area(s): PRS 14-001 (F)  
 RCT: J Craig Owen Printed Name: J Craig Owen  
 Mail Stop: M892 Phone: 661-5280

## ADDITIONAL INFORMATION

Occurrence No.: \_\_\_\_\_  
 Incident No.: \_\_\_\_\_  
 RWP No.: \_\_\_\_\_

## JOB DESCRIPTION

FR Work  
Survey of Bullet Test Facility  
Sump

## DISTRUBUTION

Rich Baker  
Tracy McFarland  
Doug Pippin

## INSTRUMENTATION

	Alpha Channel	Beta Channel
Instrument: <u>L2412/44-9</u>	Efficiency: <u>NA</u>	50%
HSE Number: <u>006962</u>	Background (cpm): _____	280
Cali Due Date: <u>2-20-97</u>	MDA (dpm/100cm <sup>2</sup> ): _____	1039
	Reference Reading: <u>↓</u>	180,000

Item/Area	Alpha		Beta/Gamma		Gross	Remarks
	cpm	dpm	cpm	dpm		
① West Wall	NA	NA	240	480		
② ↓ ↓			300	600		
③ ↓ ↓			300	600		
④ Inner Wall			240	480		
⑤ ↓ ↓			260	520		
⑥ ↓ ↓			240	480		
⑦ ↓ ↓			280	560		
⑧ North Wall			180	360		
⑨ Inner Wall			240	480		
⑩ ↓ ↓			260	520		
⑪ ↓ ↓			240	480		
⑫ ↓ ↓			260	520		
⑬ East Wall			300	600		
⑭ ↓ ↓			200	400		
⑮ ↓ ↓			300	600		
⑯ South Wall			200	400		
⑰ ↓ ↓			180	360		
⑱ ↓ ↓			240	480		
⑲ ↓ ↓			220	440		
⑳ ↓ ↓			200	400		

# DIRECT SURVEY RESULTS

## SAMPLE DESCRIPTION

Sample Date: 8/15/76 Sample Time: \_\_\_\_\_  
 TA: 14 Bldg: \_\_\_\_\_ Room(s)/Area(s): PRS 14-001(F)  
 ACT: King Over Printed Name: J. Craig Over  
 Mail Stop: M892 Phone: 661-5200

## ADDITIONAL INFORMATION

Occurrence No.: \_\_\_\_\_  
 Incident No.: \_\_\_\_\_  
 RWP No.: \_\_\_\_\_

## JOB DESCRIPTION

ER Work  
Survey of Bullet Test  
Facility - Sump

## DISTRIBUTION

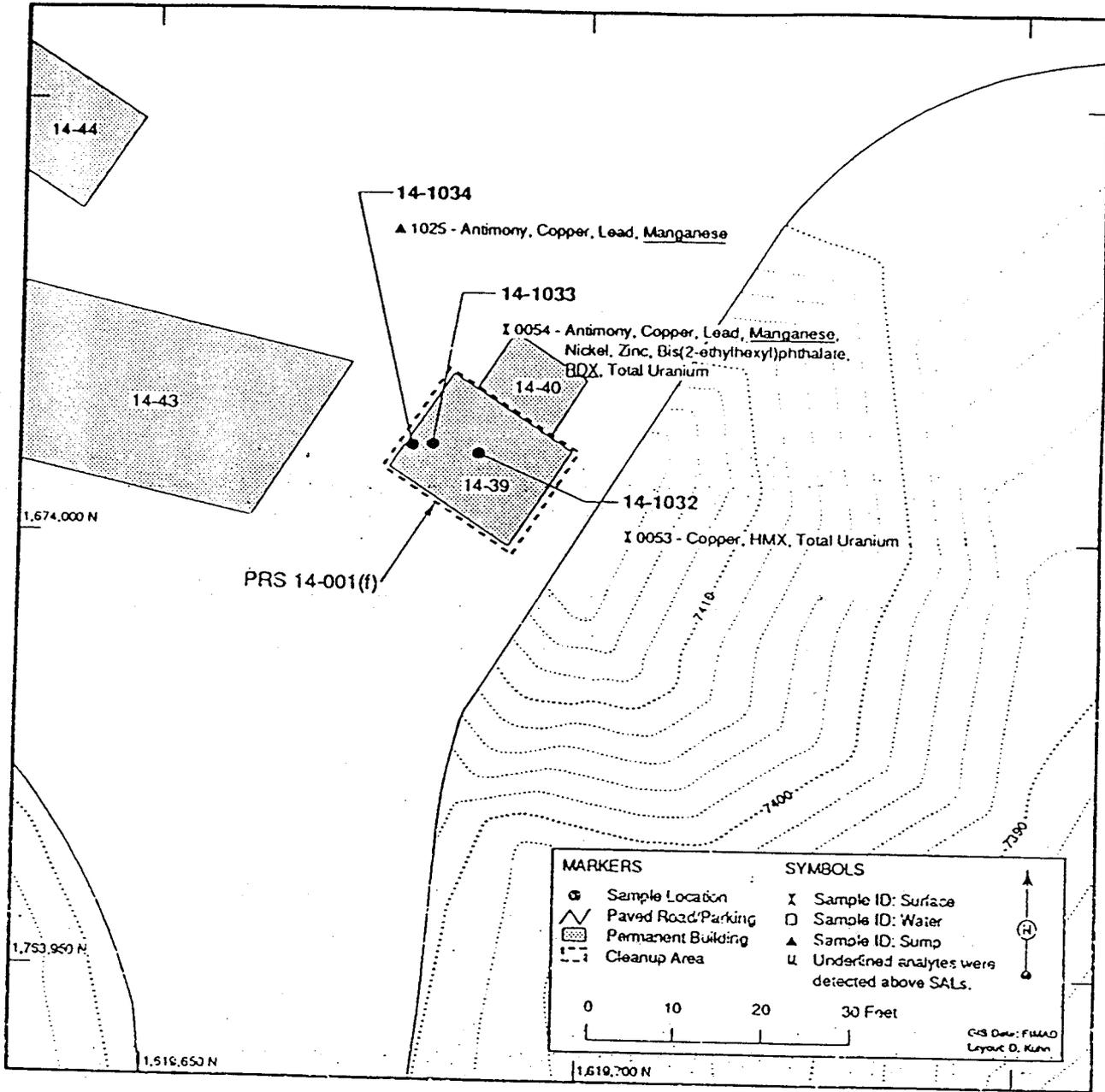
Rich Baker  
Tracy Mateland  
Doug Pippin

## INSTRUMENTATION

	Alpha Channel	Beta Channel
Instrument: <u>Zudiz/44-9</u>	Efficiency: <u>NA</u>	50%
HSE Number: <u>006962</u>	Background (cpm):	<u>280</u>
Cal Due Date: <u>2-20-97</u>	MDA (dpm/100cm <sup>2</sup> ):	<u>1039</u>
	Reference Reading: <u>↓</u>	<u>180,000</u>

Item/Area	Alpha		Beta/Gamma Gross		Remarks
	cpm	dpm	cpm	dpm	
<u>21</u> Floor	<u>NA</u>	<u>NA</u>	<u>240</u>	<u>480</u>	
<u>22</u>	<u>↓</u>	<u>↓</u>	<u>260</u>	<u>520</u>	
<u>23</u>	<u>↓</u>	<u>↓</u>	<u>220</u>	<u>440</u>	
<u>24</u>	<u>↓</u>	<u>↓</u>	<u>280</u>	<u>560</u>	
<u>25</u>	<u>↓</u>	<u>↓</u>	<u>300</u>	<u>600</u>	
<u>26</u>	<u>↓</u>	<u>↓</u>	<u>320</u>	<u>640</u>	
<u>27</u>	<u>↓</u>	<u>↓</u>	<u>280</u>	<u>560</u>	
<u>28</u>	<u>↓</u>	<u>↓</u>	<u>320</u>	<u>640</u>	
<u>29</u>	<u>↓</u>	<u>↓</u>	<u>260</u>	<u>540</u>	
<u>30</u>	<u>↓</u>	<u>↓</u>	<u>300</u>	<u>600</u>	
<u>31</u>	<u>↓</u>	<u>↓</u>	<u>280</u>	<u>560</u>	
<u>32</u>	<u>↓</u>	<u>↓</u>	<u>300</u>	<u>600</u>	
<u>33</u>	<u>↓</u>	<u>↓</u>	<u>240</u>	<u>480</u>	
<u>34</u>	<u>↓</u>	<u>↓</u>	<u>260</u>	<u>540</u>	
<u>35</u>	<u>↓</u>	<u>↓</u>	<u>300</u>	<u>600</u>	
	<u>NA</u>	<u>NA</u>	<u>NA</u>		
	<u>↓</u>	<u>↓</u>	<u>↓</u>		
	<u>↓</u>	<u>↓</u>	<u>↓</u>		

Date 6-24-96



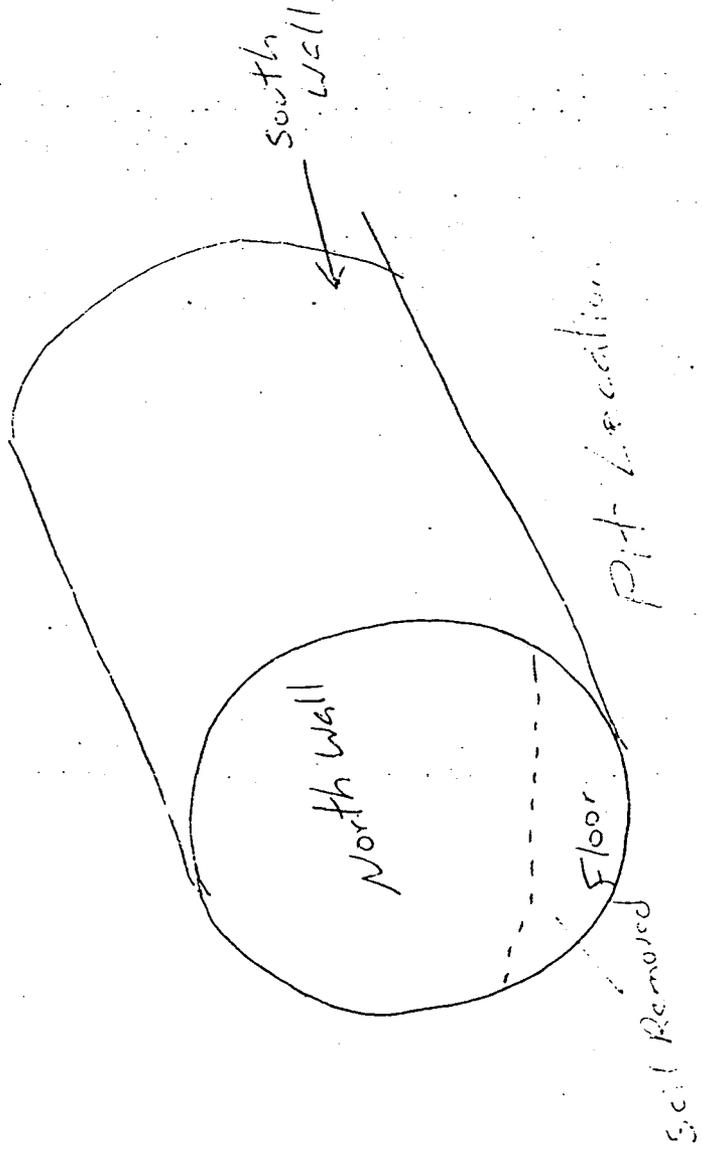
Figure

PRS 14-001(f)

12411e1 test facility 1KS 14-001(F)  
Radiological Survey in Cylinder Tube

Date: 6-24-96  
By: J Craig Owens

N  
↑



# DIRECT SURVEY RESULTS

## SAMPLE DESCRIPTION

Sample Date 6/24/96 Sample Time: \_\_\_\_\_  
 TA: 14 Bldg: \_\_\_\_\_ Room(s)/Area(s): PRS 14-001(P)  
 ACT: J. Craig Owens Printed Name: J. Craig Owens  
 Mail Stop: M852 Phone: 661-5200

## ADDITIONAL INFORMATION

Occurrence No.: \_\_\_\_\_  
 Incident No.: \_\_\_\_\_  
 RWP No.: DX-20

## JOB DESCRIPTION

ER Work  
Radiological Survey of  
Bullet Test Facility

## DISTRUBUTION

Rich Bekker  
Doug Pippin  
Tom Robinson  
Tracy McFarland  
Doug Pippin

## INSTRUMENTATION

		Alpha Channel	Beta Channel
Instrument <u>Lud 12/44-9</u>	Efficiency	<u>NA</u>	<u>50%</u>
HSE Number <u>006962</u>	Background (cpm)		<u>200</u>
Cal Due Date <u>2-20-97</u>	MDA (dpm/100cm <sup>2</sup> )		<u>883.5</u>
	Reference Reading		<u>180,000</u>

Item/Area	Alpha		Beta/Gamma		Remarks
	cpm	dpm	cpm	dpm	
1 <u>South Side</u>	<u>NA</u>	<u>NA</u>	<u>240</u>	<u>480</u>	<u>GROSS</u>
2			<u>200</u>	<u>400</u>	
3			<u>250</u>	<u>500</u>	
4			<u>200</u>	<u>400</u>	
5			<u>180</u>	<u>360</u>	
6 <u>↓</u>			<u>250</u>	<u>500</u>	
7 <u>Floor</u>			<u>1400</u>	<u>2800</u>	
8			<u>2000</u>	<u>4000</u>	
9			<u>800</u>	<u>1600</u>	
10			<u>1000</u>	<u>2000</u>	
11 <u>↓</u>			<u>1400</u>	<u>2800</u>	
12			<u>1000</u>	<u>2000</u>	
13 <u>North Side</u>			<u>200</u>	<u>400</u>	
14			<u>240</u>	<u>480</u>	
15			<u>200</u>	<u>400</u>	
16			<u>200</u>	<u>400</u>	
17 <u>↓</u>			<u>220</u>	<u>440</u>	
18			<u>240</u>	<u>480</u>	
<u>NA</u>	<u>↓</u>	<u>↓</u>	<u>NA</u>		
<u>NA</u>	<u>↓</u>	<u>↓</u>	<u>NA</u>		

# REMOVABLE SURVEY RESULTS

## SAMPLE DESCRIPTION

## ADDITIONAL INFORMATION

Sample Date: 6/26/96 Sample Time: \_\_\_\_\_  
 TA/4 Bldg: \_\_\_\_\_ Room(s)/Area(s): PRS 14-001 (F)  
 RCT: J. Craig Owen Printed Name: J. Craig Owen  
 Mail Stop: M852 Phone: 661-5200

Occurrence No.: \_\_\_\_\_  
 Incident No.: \_\_\_\_\_  
 RWP No.: DX-20

## JOB DESCRIPTION

## DISTRUBUTION

ERB Work  
Radiological Survey of  
Bullet Test Facility

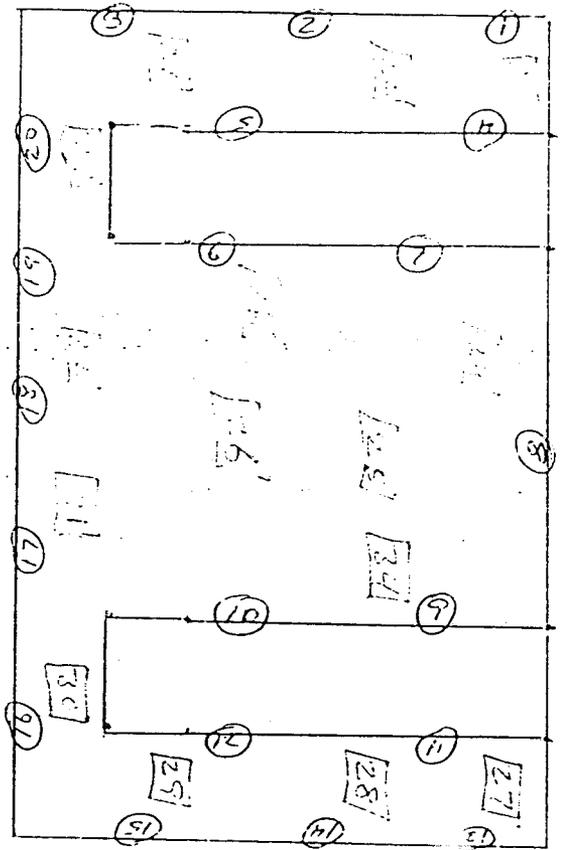
Tom Robinson  
Rich Baker  
Tracy McFarland  
Doug Pippin

## INSTRUMENTATION

Instrument	Efficiency	Alpha Channel	Beta Channel
<u>42525/43-10-1</u>			
HSE Number <u>5910</u>	Background (cpm)	<u>37.2%</u>	<u>41.0%</u>
Cal Due Date <u>10/13/96</u>	MDA (dpm/100cm <sup>2</sup> )	<u>.7</u>	<u>94.5</u>
	Reference Reading	<u>40.4</u>	<u>355.3</u>
		<u>3517</u>	<u>154582</u>

Item/Area	Alpha		Beta/Gamma		Remarks
	cpm	dpm	cpm	dpm	
<u>South Side</u>	<u>0</u>	<u>NDA</u>	<u>84</u>	<u>NDA</u>	
	<u>0</u>	<u>NDA</u>	<u>95</u>	<u>1.22</u>	
	<u>0</u>	<u>NDA</u>	<u>99</u>	<u>11.0</u>	
	<u>1</u>	<u>.81</u>	<u>117</u>	<u>54.9</u>	
	<u>0</u>	<u>NDA</u>	<u>114</u>	<u>47.6</u>	
	<u>1</u>	<u>.81</u>	<u>115</u>	<u>50.0</u>	
<u>Floor</u>	<u>3</u>	<u>6.18</u>	<u>109</u>	<u>35.4</u>	
	<u>2</u>	<u>3.49</u>	<u>122</u>	<u>67.1</u>	
	<u>0</u>	<u>NDA</u>	<u>96</u>	<u>3.66</u>	
	<u>0</u>	<u>NDA</u>	<u>111</u>	<u>40.2</u>	
	<u>3</u>	<u>6.18</u>	<u>112</u>	<u>42.7</u>	
	<u>1</u>	<u>.81</u>	<u>95</u>	<u>1.22</u>	
<u>North Side</u>	<u>0</u>	<u>NDA</u>	<u>122</u>	<u>67.1</u>	
	<u>1</u>	<u>.81</u>	<u>101</u>	<u>15.9</u>	
	<u>1</u>	<u>.81</u>	<u>95</u>	<u>1.22</u>	
	<u>0</u>	<u>NDA</u>	<u>101</u>	<u>15.9</u>	
	<u>0</u>	<u>NDA</u>	<u>103</u>	<u>20.7</u>	
	<u>0</u>	<u>NDA</u>	<u>98</u>	<u>8.54</u>	
	<u>JCO 6/26/96</u>				

Bullet Test Facility of PRS 14-001(F)  
 Radiological Survey of P.I.T  
 Date: 6-24-96  
 By: J. Craig Owens



# = Wall  
 --- = door

# DIRECT SURVEY RESULTS

## SAMPLE DESCRIPTION

Sample Date 6/25/96 Sample Time: \_\_\_\_\_  
 TA/4 Bldg: \_\_\_\_\_ Room(s)/Area(s): FRS 14-001(F)  
 RCT Long Over Printed Name: J. Cross  
 Mail Stop: M852 Phone: 661-5200

## ADDITIONAL INFORMATION

Occurrence No.: \_\_\_\_\_  
 Incident No.: \_\_\_\_\_  
 RWP No.: \_\_\_\_\_

## JOB DESCRIPTION

FR Work  
Survey of Bullet Test  
Facility - Sump

## DISTRIBUTION

Tom Robinson  
Rich Baker  
Tracy McFarland  
Colg Pippin

## INSTRUMENTATION

	Alpha Channel	Beta Channel
Instrument <u>Zud 12/44-9</u>	Efficiency <u>NA</u>	<u>50%</u>
HSE Number <u>006962</u>	Background (cpm)	<u>240</u>
Cal Due Date <u>2-20-97</u>	MDA (dpm/100cm <sup>2</sup> )	<u>964.5</u>
	Reference Reading	<u>180,000</u>

Item/Area	Alpha		Beta/Gamma <u>CROSS</u>		Remarks
	cpm	dpm	cpm	dpm	
① West Wall	<u>NA</u>	<u>NA</u>	<u>240</u>	<u>480</u>	
② ↓ ↓			<u>800</u>	<u>1600</u>	
③ ↓ ↓			<u>300</u>	<u>600</u>	
④ Inner Wall			<u>240</u>	<u>480</u>	
⑤ ↓ ↓			<u>260</u>	<u>520</u>	
⑥ ↓ ↓			<u>200</u>	<u>400</u>	
⑦ ↓ ↓			<u>280</u>	<u>560</u>	
⑧ North Wall			<u>180</u>	<u>360</u>	
⑨ Inner Wall			<u>220</u>	<u>440</u>	
⑩ ↓ ↓			<u>200</u>	<u>400</u>	
⑪ ↓ ↓			<u>240</u>	<u>480</u>	
⑫ ↓ ↓			<u>200</u>	<u>400</u>	
⑬ East Wall			<u>240</u>	<u>480</u>	
⑭ ↓ ↓			<u>260</u>	<u>520</u>	
⑮ ↓ ↓			<u>800</u>	<u>1600</u>	
⑯ South Wall			<u>200</u>	<u>400</u>	
⑰ ↓ ↓			<u>180</u>	<u>360</u>	
⑱ ↓ ↓			<u>220</u>	<u>440</u>	
⑲ ↓ ↓			<u>180</u>	<u>360</u>	
⑳ ↓ ↓			<u>180</u>	<u>360</u>	

# REMOVABLE SURVEY RESULTS

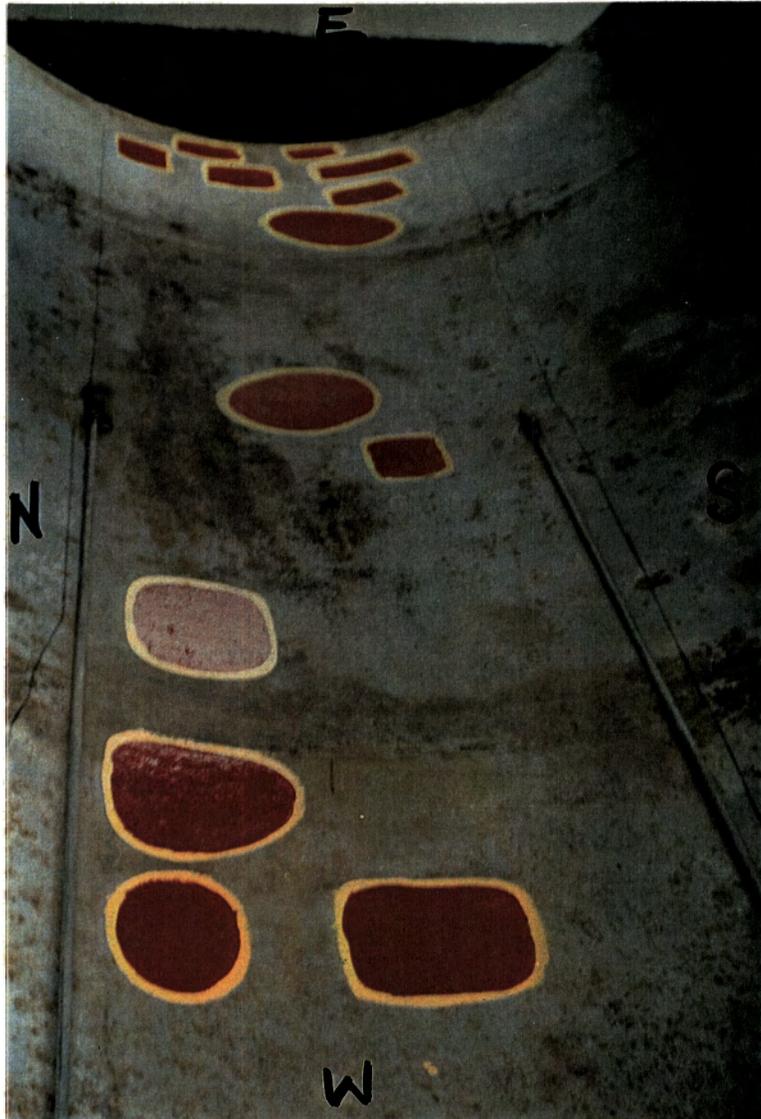
SAMPLE DESCRIPTION	ADDITIONAL INFORMATION
Sample Date: <u>6/26/96</u> Sample Time: _____ TA: <u>14</u> Bldg: _____ Room(s)/Area(s): <u>PRS 14-001(F)</u> RCT: <u>Shag Owens</u> Printed Name: <u>J. Craig Owens</u> Mail Stop: <u>M892</u> Phone: <u>661-5200</u>	Occurrence No.: _____ Incident No.: _____ RWP No.: <u>DX-20</u>
JOB DESCRIPTION	DISTRIBUTION
<u>ER Work</u> <u>Radiological Survey of</u> <u>Bullet Test Facility - Pit</u>	<u>Tom Robinson</u> <u>Rich Lockett</u> <u>Troy McFarland</u>

INSTRUMENTATION		Alpha Channel	Beta Channel
Instrument	<u>Lud 2929/43-10-1</u>	Efficiency	<u>37.2%</u>
HSE Number	<u>5910</u>	Background (cpm)	<u>.7</u>
Cal Due Date	<u>10/13/96</u>	MDA (dpm/100cm <sup>2</sup> )	<u>40.4</u>
		Reference Reading	<u>3517</u>
			<u>154582</u>

Item/Area	Alpha		Beta/Gamma		Remarks
	cpm	dpm	cpm	dpm	
1 West Wall	0	NDA	106	28.0	
2 ↓ ↓	0	NDA	112	42.7	
3 ↓ ↓	0	NDA	115	50.0	
4 Inner Wall	1	.81	116	52.4	
5 ↓ ↓	0	NDA	100	13.4	
6 ↓ ↓	1	.81	95	1.22	
7 ↓ ↓	1	.81	109	35.4	
8 North Wall	2	3.49	92	NDA	
9 Inner Wall	0	NDA	94	NDA	
10 ↓ ↓	0	NDA	110	37.8	
11 ↓ ↓	1	.81	95	1.22	
12 ↓ ↓	2	3.49	116	52.4	
13 East Wall	0	NDA	119	59.8	
14 ↓ ↓	2	3.49	93	NDA	
15 ↓ ↓	0	NDA	93	NDA	
16 South Wall	0	NDA	94	NDA	
17 ↓ ↓	0	NDA	89	NDA	
18 ↓ ↓	0	NDA	112	42.7	
19 ↓ ↓	1	.81	92	NDA	
20 ↓ ↓	2	3.49	106	28.0	



BULLET TEST FACILITY TA-14 (Q-SITE)  
PRS 14-001(f)



Attachment 2. Steel tube showing locations of fixed radiation.

# REMOVABLE SURVEY RESULTS

## SAMPLE DESCRIPTION

Sample Date 6/26/96 Sample Time: \_\_\_\_\_  
 TA: 14 Bldg: \_\_\_\_\_ Room(s)/Area(s): PRS 14-001(F)  
 RCT: J. Craig Owens Printed Name: J. Craig Owens  
 Mail Stop: \_\_\_\_\_ Phone: 661-5600

## ADDITIONAL INFORMATION

Occurrence No.: \_\_\_\_\_  
 Incident No.: \_\_\_\_\_  
 RWP No.: OX-20

## JOB DESCRIPTION

ER Work  
Radiological Survey of Pit in  
Bullet Test Facility

## DISTRIBUTION

Tom Robinson  
Tracy McFarland  
Rich Baker

## INSTRUMENTATION

		Alpha Channel	Beta Channel
Instrument	<u>22929/43-101</u>	Efficiency	<u>37.2%</u>
HSE Number	<u>5910</u>	Background (cpm)	<u>7</u>
Cal Due Date	<u>10/13/96</u>	MDA (dpm/100cm <sup>2</sup> )	<u>355.3</u>
		Reference Reading	<u>3517</u>

Item/Area	Alpha		Beta/Gamma		Remarks
	cpm	dpm	cpm	dpm	
<u>21</u> Floor	<u>0</u>	<u>NDA</u>	<u>104</u>	<u>23.2</u>	
<u>22</u>	<u>1</u>	<u>0.81</u>	<u>115</u>	<u>50.0</u>	
<u>23</u>	<u>2</u>	<u>3.49</u>	<u>90</u>	<u>NDA</u>	
<u>24</u>	<u>1</u>	<u>0.81</u>	<u>92</u>	<u>NDA</u>	
<u>25</u>	<u>1</u>	<u>0.81</u>	<u>113</u>	<u>45.1</u>	
<u>26</u>	<u>1</u>	<u>0.81</u>	<u>117</u>	<u>54.9</u>	
<u>27</u>	<u>2</u>	<u>3.49</u>	<u>121</u>	<u>64.6</u>	
<u>28</u>	<u>2</u>	<u>3.49</u>	<u>108</u>	<u>32.9</u>	
<u>29</u>	<u>0</u>	<u>NDA</u>	<u>104</u>	<u>23.2</u>	
<u>30</u>	<u>0</u>	<u>NDA</u>	<u>100</u>	<u>13.4</u>	
<u>31</u>	<u>0</u>	<u>NDA</u>	<u>113</u>	<u>45.1</u>	
<u>32</u>	<u>2</u>	<u>3.49</u>	<u>118</u>	<u>57.3</u>	
<u>33</u>	<u>0</u>	<u>NDA</u>	<u>107</u>	<u>30.5</u>	
<u>34</u>	<u>2</u>	<u>3.49</u>	<u>103</u>	<u>20.7</u>	
<u>35</u>	<u>1</u>	<u>0.81</u>	<u>109</u>	<u>35.4</u>	
<del><u>820</u> <u>6/26/96</u></del>					