

**Post-Decontamination and Dismantlement (D&D)
Characterization Report for CFA-669 Site**

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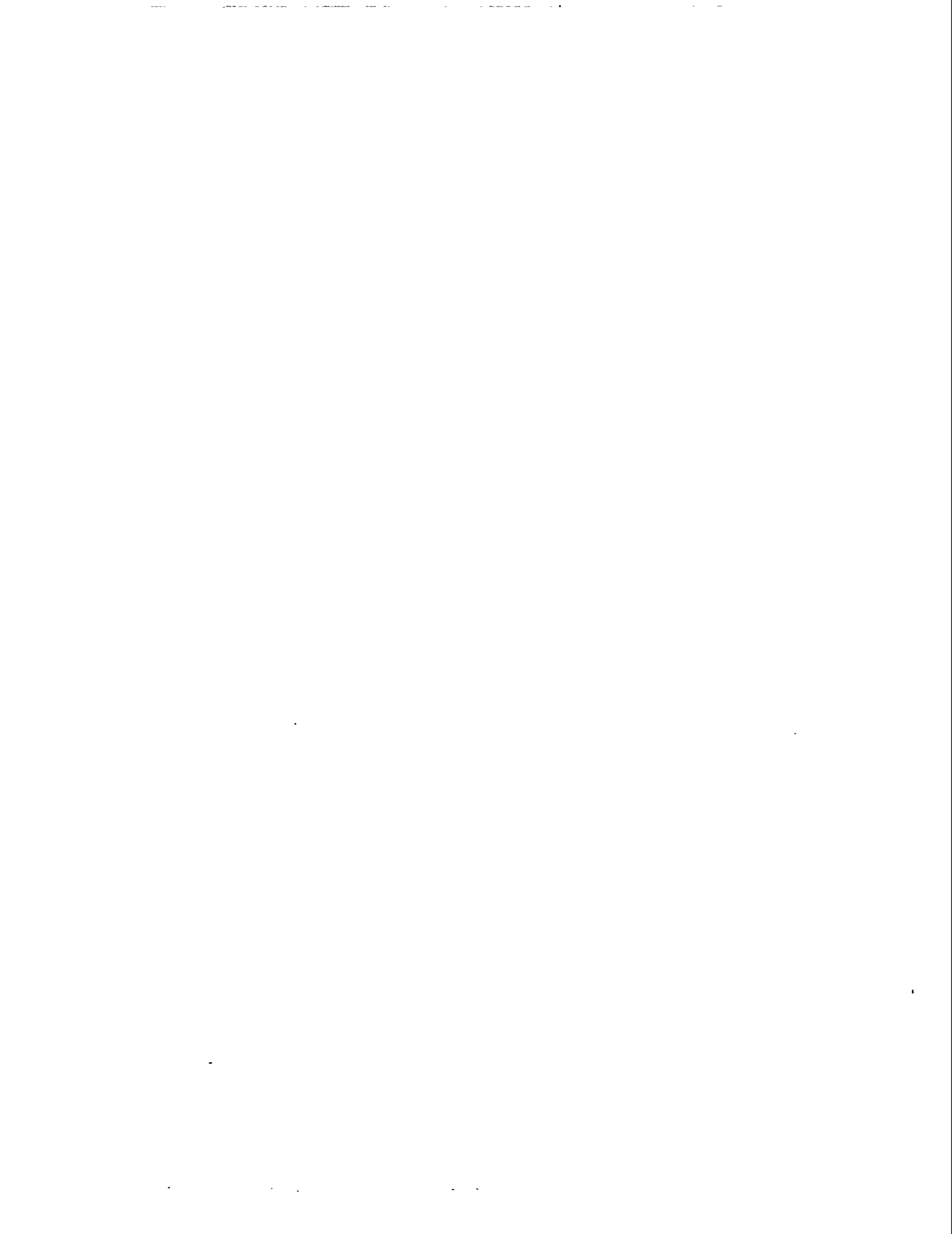
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ABSTRACT

The Post-Decontamination and Dismantlement Characterization Report for CFA-669 presents the results of surveys conducted by EG&G Idaho, Inc., at the Idaho National Engineering Laboratory. These surveys were conducted to determine the levels of radionuclides, metals, volatile organic compounds, and semivolatile organic compounds remaining after the building had been decontaminated and dismantled. This report documents the findings of the surveys.

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SUMMARY

This report presents results of post-decontamination and dismantling (D&D) characterization surveys performed by EG&G Idaho, Inc. (EG&G Idaho), at Central Facilities Area (CFA)-669, which was the Hot Laundry Facility. The site was characterized to determine and document the radiological and chemical conditions of the site following D&D and to determine if the site satisfies the release criteria. Constructed in 1950, CFA-669 served as the "hot" and "cold" laundry for Idaho National Engineering Laboratory site contractors until the boiler exploded in 1981. The building was shut down at that time. Before D&D activities began in 1992, the facility was characterized and the results documented. D&D activities were completed in July 1994.

The post-D&D radiological characterization consisted of radiation measurements and analyses of soil samples to identify man-made radionuclides and determine the specific activity of each sample. The chemical characterization consisted of toxicity characterization leaching procedure (TCLP) analysis for metals and for volatile and semivolatile organic contamination. The post-D&D characterization was performed in two phases by EG&G Idaho's Environmental Monitoring Unit.

Phase I characterization consisted of sampling and analysis of the trench and berm formed during excavation of the 8-in. contaminated sanitary sewer line on the north side and beneath Room 108 of CFA-669. Phase II characterization consisted of sampling and analyses of the entire CFA-669 site following backfilling of the trenches and gridding of the area followed by an area radiological survey.

Analyses of the soil samples for Phases I and II consisted of TCLP metals, volatile organic analysis (VOA) semi-VOA, alpha and gamma spectrum and strontium-90. All the chemical analyses were performed according to analytical procedure SW-846. The results of Phases I and II analyses were validated by the EG&G Idaho Sample Management Office (SMO).

The results of the gamma spectrum analysis and the strontium-90 and alpha spectrum analyses for Phase I indicated that the CFA-669 site meets release criteria specified in DOE Order 5400.5.

The Phase I samples were analyzed for TCLP metals, TCLP volatile organic compounds (VOCs), and TCLP semi-VOCs. The results of these analyses were validated by the EG&G Idaho SMO. Lockheed Idaho Technologies Company (LITCO, formerly EG&G Idaho until October 1, 1994) Environmental Monitoring reviewed the analytical result. The review indicated that all contaminant concentrations were below the regulatory level found in 40 CFR 261.24, Table 1.

The results of the gamma spectrum analysis and strontium-90 and alpha spectrum analyses performed on two select Phase II samples indicated that the CFA-669 site meets release criteria specified in DOE Order 5400.5.

In addition to the radiological analyses of samples collected during Phase II, an area survey was performed using the Global Positioning Radiometric Scanner. The results of this area survey indicated nothing detected above general background, 8 μ R/hour, at the CFA-669 site.

The Phase II samples were analyzed for TCLP metals, TCLP VOCs, and TCLP semi-VOCs. The results of these analyses were validated by the EG&G Idaho SMO. A review of the analytical results was performed by LITCO Environmental Monitoring. The review indicated that all contaminant concentrations were below the regulatory level found in 40 CFR 261.24, Table 1.

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ACRONYMS

ARDC	Environmental Restoration Administrative Record and Document Control
ATI	Analytical Technologies Incorporated
CFA	Central Facilities Area
D&D	Decontamination & Dismantling
EG&G Idaho	EG&G Idaho, Inc. (Lockheed Idaho Technologies Company as of October 1, 1994)
GPRS	Global Positioning Radiometric Scanner
INEL	Idaho National Engineering Laboratory
IVC	Independent Verification Contractor
LITCO	Lockheed Idaho Technologies Company
RML	Radiation Measurements Laboratory
RWMC	Radioactive Waste Management Complex
SMO	Sample Management Office
TCLP	Toxicity Characterization Leaching Procedure
TRA	Test Reactor Area
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound

Post-Decontamination and Dismantlement (D&D) Characterization Report for CFA-669 Site

1. INTRODUCTION

This report presents results of post-decontamination and dismantling (D&D) characterization surveys performed by EG&G Idaho, Inc. (EG&G Idaho), at Central Facilities Area (CFA)-669, which was the Hot Laundry Facility. The site was characterized to determine and document the radiological and chemical conditions of the site following D&D and to determine if the site satisfies the release criteria.

The radiological characterization consisted of radiation measurements and analyses of soil samples to identify man-made radionuclides and determine the specific activity of each sample. The chemical characterization consisted of toxicity characterization leaching procedure (TCLP) analysis for metals and for volatile and semivolatile organic contamination.

2. HISTORY AND BACKGROUND

Building CFA-669 was constructed in 1950 to serve as the "hot" and "cold" laundry for Idaho National Engineering Laboratory site contractors. It served as a laundry until the boiler exploded in 1981, after which the facility remained shut down through 1992. The original location of CFA-669 relative to the Central Facilities Area is shown in Figure 1.

Before D&D activities were started in December 1992, the facility was characterized and the results are reported in Reference 1. D&D activities were completed in July 1994. These D&D activities included removal and disposal of all contaminated and uncontaminated equipment, components, and structures, including underground piping and the building foundation. The area was backfilled and seeded following completion of post-D&D characterization of the site.

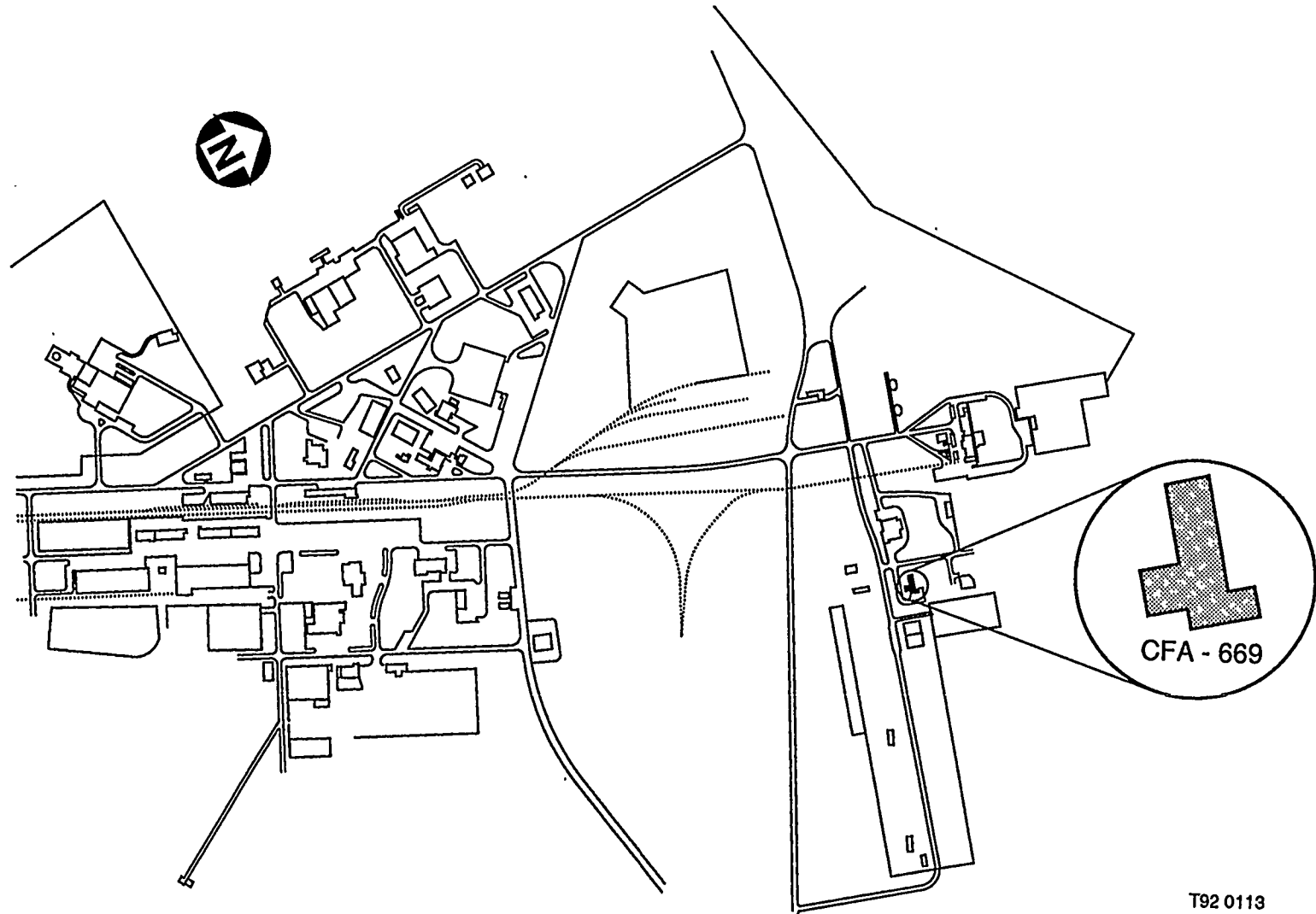


Figure 1. CFA and the original location of CFA-669.

3. SITE PHYSICAL DESCRIPTION

The CFA-669 site boundary and location relative to Quebec Avenue and Ohio Street are shown in Figure 2. The original locations of CFA-669 and the contaminated sewer line are also shown in Figure 2 for reference. The site is an area of approximately 0.6 acre.

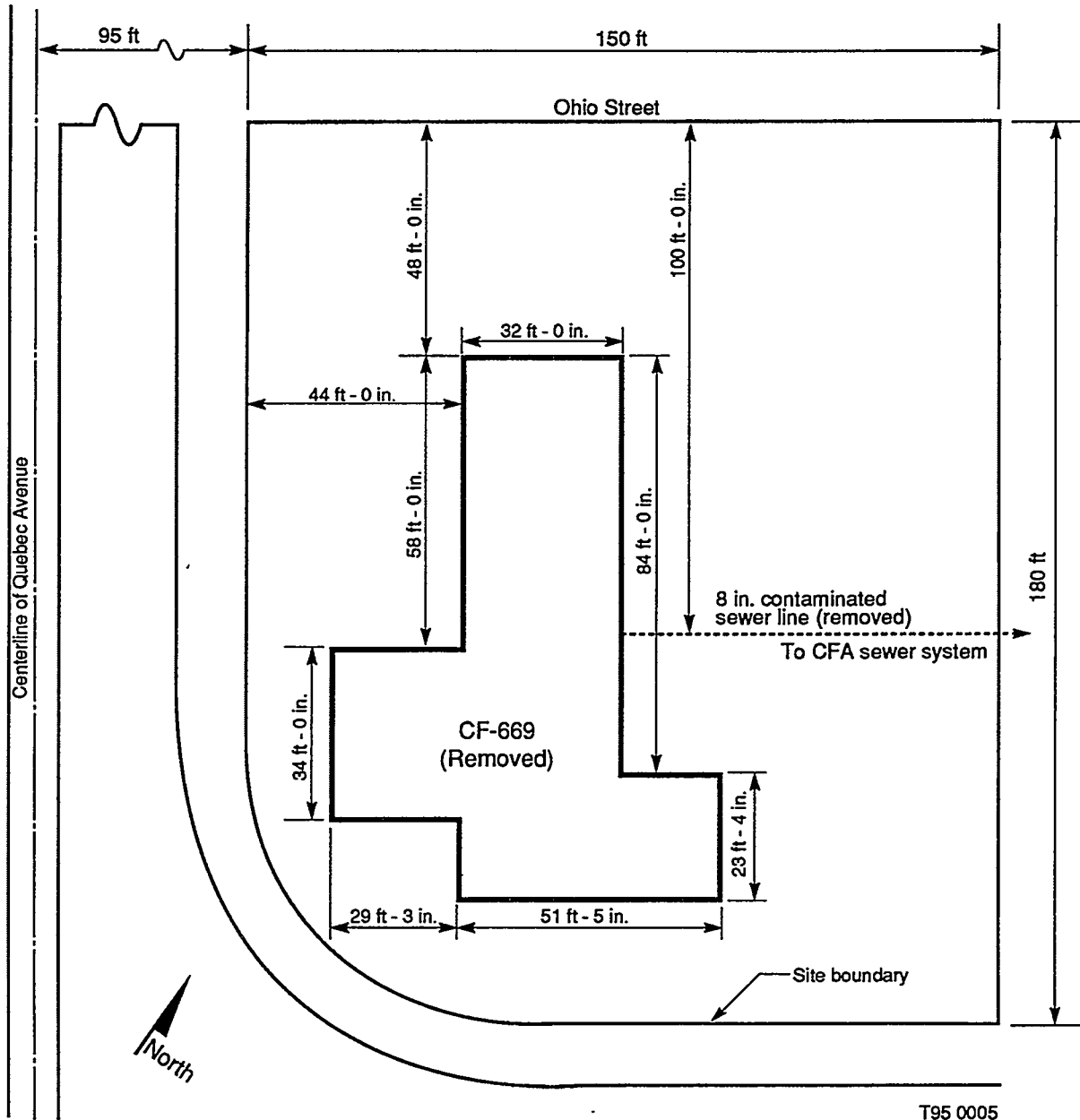


Figure 2. CFA-669 site location and boundary.

4. CHARACTERIZATION PERFORMED

4.1 Introduction

Before starting post-D&D characterization, all radioactively-contaminated soil detectable by field instruments was removed, boxed, and disposed of at the Radioactive Waste Management Complex (RWMC).

The post-D&D characterization was performed in two phases. Both phases were performed by EG&G Idaho's Environmental Monitoring Unit according to Reference 2. Phase I characterization consisted of sampling and analysis of the trench and berm formed during excavation of the 8-in. contaminated sanitary sewer line on the north side and beneath Room 108 of CFA-669 (see Figure 3). Phase II characterization consisted of sampling and analyses of the entire CFA-669 site after the trenches were backfilled and gridded. The sampling was followed by a radiological survey of the area.

Analyses of the soil samples for Phases I and II consisted of TCLP metals, volatile organic analysis (VOA) semi-VOA, alpha and gamma spectrum and strontium-90. All the chemical analyses were performed according to analytical procedure SW-846. The results of Phase I and Phase II analyses were validated by the Sample Management Office (SMO) and are included in Section 5.

4.2 Phase I Characterization

Phase I characterization was performed on the trench and berm formed by excavating the contaminated sewer line and the soil beneath the washer drain trench in the concrete floor of Room 108. The locations where the biased Phase I samples were collected are shown in Figure 3.

4.3 Phase II Characterization

After the completion of Phase I sampling, the entire area was backfilled using the soil previously excavated. After the area was backfilled, it was gridded into 15 × 15-ft squares and numbered as shown in Figure 4. Then, to choose which grids to sample, 21 grid numbers between 1 and 120 were randomly generated: 43, 39, 74, 95, 109, 28, 71, 5, 77, 72, 7, 100, 66, 47, 26, 60, 40, 84, 36, 80, and 14. The grids with those numbers were sampled.

Each chosen grid was sampled by first obtaining five *subsamples* (0–6 in. in depth) from each of the four corners and from the center. These *subsamples* were composited together into a pan. A deep *subsample* (6–24 in.) was then taken from the center hole and composited with the other *subsamples* in the bucket. The VOA sample was collected from an undisturbed portion of the grid (subject to sampler's discretion) at a depth of 0 to 6 in. using a scoop or equivalent. This same procedure was used to sample each chosen grid. One replicate sample set and one split (for the independent verification contractor) sample set were also collected. The replicate and split sample numbers are given in Table 1. After Phase II sampling there were 21 sets of samples, one replicate set, and one split set for a total of 23 sets.

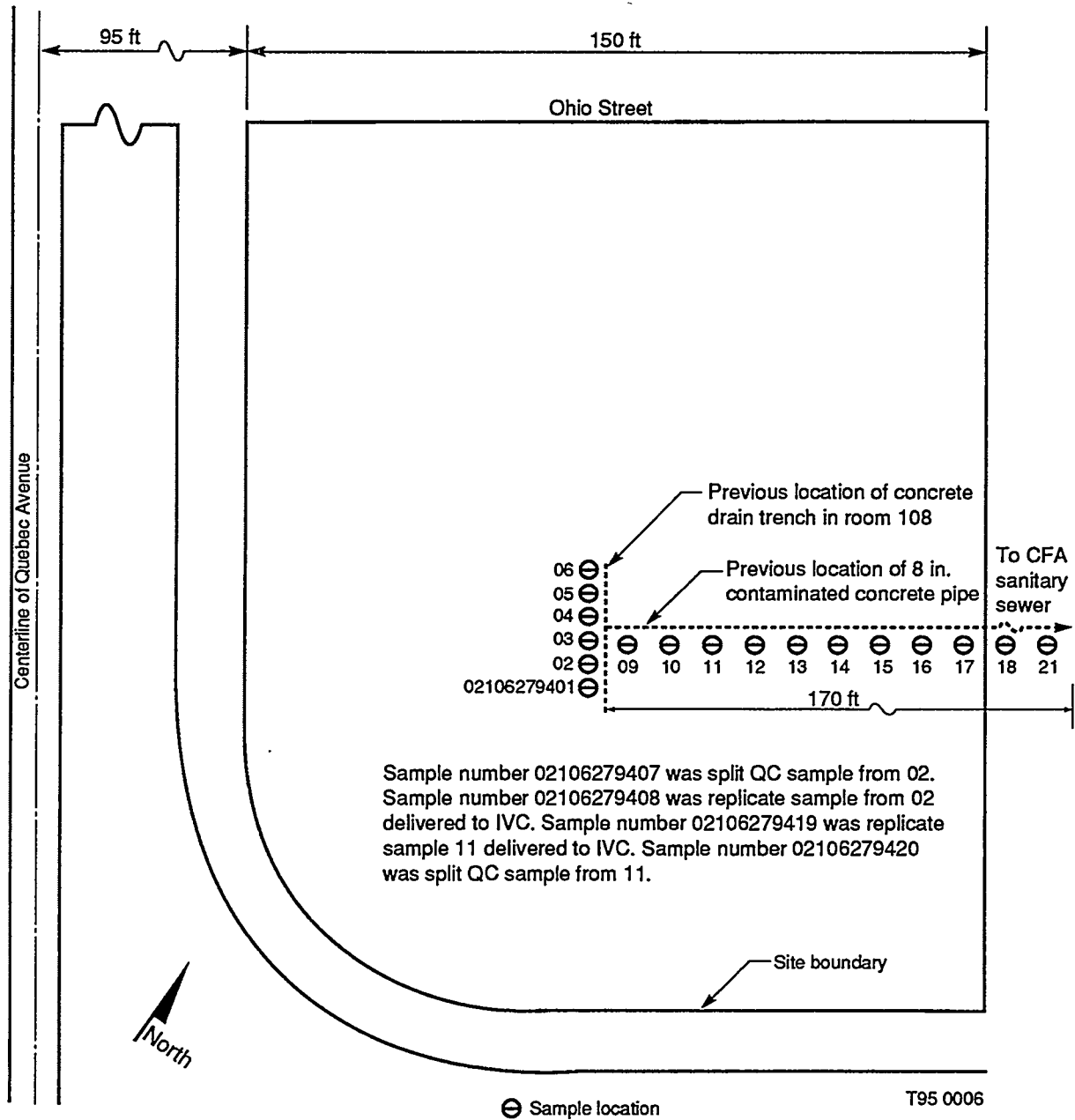


Figure 3. Phase I sample locations.

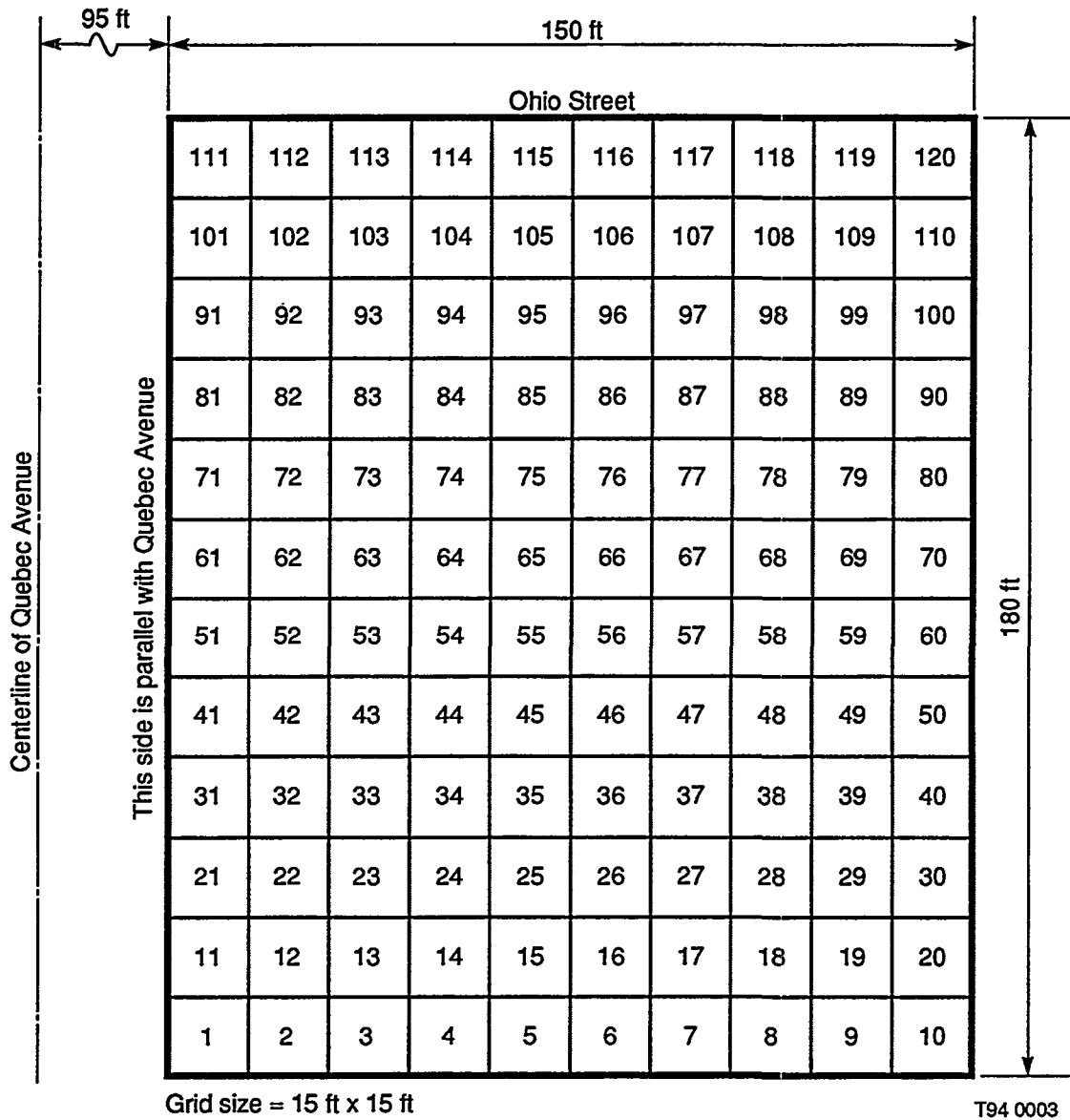


Figure 4. CFA-669 site following gridding of the area.

Table 1 shows the Phase II sample numbers and the grid number where each sample was collected. Samples 02108019412 and 021080191416 were selected for strontium-90 and alpha spectrum analysis because these samples were collected from grid squares near the contaminated drains. Samples collected in support of this project were submitted for analysis to Analytical Technologies Incorporated (ATI) for Toxicity Characteristic Leaching Procedure (TCLP) metals, TCLP VOCs, semi-VOCs, strontium-90, and alpha spectrum. Samples for gamma spectrum analysis were sent to the Radiation Measurements Laboratory (RML) at the Test Reactor Area (TRA) at the INEL. Note that sample 02108019405 was a replicate and sample 02108019412 was split for the independent verification contractor (IVC).

In addition to soil sampling and analysis during Phase II characterization, an area radiological survey was performed using the vehicle-mounted Global Positioning Radiometric Scanner (GPRS), as shown in Figure 5. The GPRS system integrates a five-channel global positioning system with vehicle-mounted plastic scintillation radiation monitor, and a single-board 386 IBM-compatible computer. Information on the GPRS system can be found in EG&G Idaho technical report ERA-NRE-93-067.

Table 1. Phase II samples and the corresponding grid number.

Grid number	Sample number
5	02108019401
7	02
14	03
26	04
28	05 (replicate)
36	06
39	07
40	08
43	09
47	10
60	11
66	12 (split for IVC)
71	13
72	14
74	15
77	16
80	17
84	18
95	19
100	20
109	21



Figure 5. CFA-669 site being radiologically surveyed using the GPRS.

5. CHARACTERIZATION RESULTS

The results of the chemical and radiological analyses and area radiological survey are given in this section.

5.1 Phase I

5.1.1 Radiological Results

The results of the gamma spectrum analysis performed on all Phase I samples are shown in Table 2. The results of the Strontium-90 and alpha spectrum analyses for Phase I are given in Table 3.

The highest concentration of each detected radionuclide for Phase I was used to determine if the CFA-669 site is releasable per guidelines in DOE Order 5400.5. The peak concentrations were input into the Residual Radioactivity (RESRAD) computer program, version 3.121. The calculation including assumptions is documented in EDF-ER-21, "CFA-669 Site Release Analysis." The RESRAD calculation indicated that the maximum total dose would occur at time $t = 10,000$ years and would be 15 mrem/year. The allowable dose per DOE Order 5400.5 is 100 mrem/year.

5.1.2 Chemical Results

The Phase I samples were analyzed for TCLP metals, TCLP VOCs, and TCLP semi-VOCs. The results of these analyses were validated by the EG&G Idaho SMO. Lockheed Idaho Technologies Company (LITCO, formerly EG&G Idaho) Environmental Monitoring reviewed the analytical result. The review indicated that all contaminant concentrations were below the regulatory level found in 40 CFR 261.24, Table 1. The analytical and validation results were transmitted to the Environmental Restoration Administrative Record and Document Control (ARDC) via D. L. Smith letter to ARDC, memo-to-file, Closure Report for Phase I and Phase II sampling of CFA-669, DLS-7-94, December 7, 1994.

5.2 Phase II

5.2.1 Radiological Results

The results of the gamma spectrum analysis performed on all Phase II samples are given in Table 4, and the results of the strontium-90 and alpha spectrum analyses performed on two select Phase II samples are given in Table 5.

The highest concentration of each detected radionuclide for Phase II was used to determine if the CFA-669 site is releasable under guidelines in DOE Order 5400.5. The peak concentrations were input into the Residual Radioactivity (RESRAD) computer program, version 3.121 and documented in EDF-ER-21. The calculation indicated the maximum total dose would occur at time $t = 10,000$ years and would be 18 mrem/year. The allowable dose according to DOE Order 5400.5 is 100 mrem/year.

Table 2. Results of Phase I gamma spectrum analyses.

Sample number	Manmade radionuclides	Specific activity (pCi/g)
02106279401	None detected	N/A
02	⁶⁰ Co	5.8 ± 1.4 E-02
	¹³⁷ Cs	6.1 ± 0.5 E-01
03	¹³⁷ Cs	3.7 ± 0.4 E-01
04	¹³⁷ Cs	7.2 ± 0.7 E-01
05	⁶⁰ Co	5.9 ± 1.4 E-02
	¹³⁷ Cs	3.7 ± 0.4 E-01
06	⁶⁰ Co	9.0 ± 0.7 E-01
	¹³⁷ Cs	5.7 ± 0.6 E-01
07	None detected	N/A
09	¹³⁷ Cs	7.9 ± 0.8 E-01
10	¹³⁷ Cs	2.1 ± 0.4 E-01
11	¹³⁷ Cs	6.0 ± 2.0 E-02
12	¹³⁷ Cs	3.2 ± 0.5 E-01
13	¹³⁷ Cs	1.5 ± 0.2 E-01
14	None detected	N/A
15	¹³⁷ Cs	1.2 ± 0.2 E-01
16	¹³⁷ Cs	2.4 ± 0.3 E-01
17	None detected	N/A
18	⁶⁰ Co	4.7 ± 1.2 E-02
	¹³⁷ Cs	1.96 ± 0.18 E-00
	¹⁵² Eu	2.1 ± 0.3 E-01
20	None detected	N/A
21	None detected	N/A

1. A "None detected" under "Manmade Radionuclides" means that the analyst determined that no manmade true-positive radionuclides were present in the respective sample(s).

2. The uncertainty associated with any reported activity includes the statistical uncertainty and estimated uncertainties in the detector efficiency and the sample geometry (both are typically 5%). Uncertainties are propagated in quadrature and expressed as one standard deviation.

3. When a sample's matrix differs radically from that of the calibration standard used by the RML, the measured activity may not accurately represent the true radionuclide concentration in that sample. In such cases, a non-zero estimated bias is applied in place of the estimated sample geometry; this bias is not propagated into the total uncertainty and is listed separately.

Table 3. Results of Phase I strontium-90 and alpha spectrum analyses (pCi/g).

Sample number	²⁴¹ Am	²⁴³ Am	²⁴² Cm	²⁴⁴ Cm	²³⁸ Pu	^{239/240} Pu	²³⁴ U	²³⁵ U	²³⁸ U	²²⁸ Th	²³⁰ Th	²³² Th	⁹⁰ Sr
02106279401	U	U	U	U	U	U	1.077 ± 0.149	0.043 ± 0.017	1.095 ± 0.151	1.315 ± 0.188	1.227 ± 0.175	1.306 ± 0.186	U
02106279402	U	U	U	U	U	U	1.293 ± 0.179	0.056 ± 0.019	1.351 ± 0.182	1.365 ± 0.199	1.291 ± 0.189	1.311 ± 0.191	7 ± 3 E-01
02106279403	U	U	U	U	0.054 ± 0.019	U	1.167 ± 0.161	0.054 ± 0.017	1.261 ± 0.172	1.372 ± 0.196	1.396 ± 0.198	1.358 ± 0.193	1.3 ± 0.4 E+0
02106279404	U	U	U	U	0.065 ± 0.026	0.009 ± 0.007	1.002 ± 0.148	0.043 ± 0.019	1.086 ± 0.158	1.403 ± 0.200	1.313 ± 0.187	1.336 ± 0.191	8 ± 3 E-01
02106279405	UJ	U	U	U	U	U	1.140 ± 0.158	0.043 ± 0.017	1.205 ± 0.166	1.385 ± 0.197	1.284 ± 0.183	1.300 ± 0.186	9 ± 4 E-01
02106279406	U	U	U	U	U	U	1.061 ± 0.147	0.056 ± 0.017	1.063 ± 0.147	1.358 ± 0.198	1.257 ± 0.185	1.396 ± 0.203	1.3 ± 0.3 E+0
02106279407	U	U	U	U	U	U	1.169 ± 0.159	0.047 ± 0.017	1.115 ± 0.152	1.414 ± 0.202	1.300 ± 0.186	1.437 ± 0.204	1.6 ± 0.4 E+0
02106279409	U	U	U	U	U	U	1.482 ± 0.205	0.072 ± 0.024	1.270 ± 0.178	1.592 ± 0.223	1.426 ± 0.202	1.529 ± 0.215	3.4 ± 0.4 E+0
02106279410	U	U	0.032 ± 0.016	U	U	U	1.216 ± 0.165	0.063 ± 0.019	1.273 ± 0.171	2.347 ± 0.338	2.232 ± 0.322	2.304 ± 0.333	1.3 ± 0.4 E+0
02106279411	U	U	0.050 ± 0.019	U	U	U	1.309 ± 0.174	0.068 ± 0.018	1.234 ± 0.165	1.462 ± 0.211	1.349 ± 0.195	1.511 ± 0.217	2.1 ± 0.4 E+0
02106279412	UJ	0.014 ± 0.007	0.032 ± 0.016	U	U	U	1.164 ± 0.155	0.047 ± 0.015	1.212 ± 0.161	1.464 ± 0.229	1.336 ± 0.209	1.300 ± 0.205	3.3 ± 0.6 E+0
02106279413	UJ	0.016 ± 0.009	U	U	0.020 ± 0.009	U	1.405 ± 0.183	0.070 ± 0.018	1.243 ± 0.164	1.300 ± 0.208	1.225 ± 0.195	1.261 ± 0.200	5.9 ± 0.6 E+0
02106279414	J	0.007 ± 0.005	0.043 ± 0.014	0.041 ± 0.016	0.032 ± 0.018	U	1.450 ± 0.194	0.086 ± 0.023	1.351 ± 0.182	1.559 ± 0.239	1.387 ± 0.214	1.502 ± 0.230	1.2 ± 0.4 E+0

Table 3. (continued).

Sample number	²⁴¹ Am	²⁴³ Am	²⁴² Cm	²⁴⁴ Cm	²³⁸ Pu	^{239/240} Pu	²³⁴ U	²³⁵ U	²³⁸ U	²²⁸ Th	²³⁰ Th	²³² Th	⁹⁰ Sr
02106279415	J	U	U	U	U	U	1.396 ± 0.187	0.056 ± 0.019	1.387 ± 0.186	1.347 ± 0.215	1.302 ± 0.208	1.336 ± 0.212	U
02106279416	J	0.014 ± 0.009	0.036 ± 0.016	U	0.043 ± 0.021	0.011 ± 0.011	1.248 ± 0.168	0.059 ± 0.017	1.189 ± 0.161	1.667 ± 0.259	1.293 ± 0.205	1.514 ± 0.237	3.7 ± 0.8 E+0
02106279417	UJ	U	U	U	U	U	1.140 ± 0.153	0.061 ± 0.017	1.225 ± 0.163	1.802 ± 0.275	1.437 ± 0.224	1.646 ± 0.253	1.6 ± 0.5 E+0
02106279418	UJ	U	0.038 ± 0.016	0.027 ± 0.018	U	U	1.498 ± 0.199	0.074 ± 0.020	1.248 ± 0.168	1.491 ± 0.238	1.475 ± 0.235	1.446 ± 0.231	6.5 ± 0.6 E+0
02106279420	UJ	U	0.038 ± 0.014	0.020 ± 0.016	U	U	1.081 ± 0.144	0.056 ± 0.0	1.189 ± 0.159	1.435 ± 0.210	1.502 ± 0.217	1.387 ± 0.202	1.7 ± 0.4 E+0
02106279421	U	U	0.027 ± 0.014	0.023 ± 0.016	0.016 ± 0.009	U	1.259 ± 0.170	0.072 ± 0.020	1.392 ± 0.187	1.660 ± 0.240	1.309 ± 0.192	1.414 ± 0.206	2.2 ± 0.4 E+0

U = Result is a statistical nondetect at the 95% confidence level.

J = Result is considered to be an estimated quantity because of questionable or out-of-control quality control parameter. Result is statistically positive at the 95% confidence level.

UJ = Result does not meet the criteria for statistically positive value at the 95% confidence level and is considered to be an estimated quantity because of a questionable or out-of-control quality control parameter.

Table 4. Results of Phase II gamma spectrum analysis.

Sample ID	Manmade radionuclides	Activity (pCi/gram)
02108019401	^{137}Cs	$7.0 \pm 2.0\text{E-}02$
02108019402	^{137}Cs	$6.4 \pm 1.9\text{E-}02$
02108019403	None detected ^a	N/A
02108019404	None detected ^a	N/A
02108019405	^{137}Cs	$3.1 \pm 0.3\text{E-}01$
02108019405R	None detected ^a	N/A
02108019406	^{137}Cs	$2.0 \pm 0.4\text{E-}01$
02108019407	^{137}Cs	$3.1 \pm 0.4\text{E-}01$
02108019408	^{137}Cs	$2.4 \pm 0.3\text{E-}01$
02108019409	^{137}Cs	$6.5 \pm 1.6\text{E-}02$
02108019410	^{137}Cs	$9.0 \pm 2.0\text{E-}02$
02108019411	^{60}Co	$9.5 \pm 1.8\text{E-}02$
02108019412	^{60}Co	$9.4 \pm 1.8\text{E-}02$
02108019413	None detected ^a	N/A
02108019414	None detected ^a	N/A
02108019415	None detected ^a	N/A
02108019416	^{137}Cs	$5.5 \pm 1.9\text{E-}02$
02108019417	^{137}Cs	$1.0 \pm 0.3\text{E-}01$
02108019418	None detected ^a	N/A
02108019419	None detected ^a	N/A
02108019420	None detected ^a	N/A
02108019421	^{137}Cs	$10.0 \pm 2.0\text{E-}02$

a. No man-made gamma-emitting radionuclide contaminants were detected above background.

Table 5. Results of Phase II strontium-90 and alpha spectrum analyses (pCi/g).

Sample number	⁹⁰ Sr	²⁴¹ Am	²⁴³ Am	²⁴² Cm	²⁴⁴ Cm	²³⁸ Pu	^{239/240} Pu	²³⁴ U	²³⁵ U	²³⁸ U	²²⁸ Th	²³⁰ Th	²³² Th
02108019412	U	UJ	U	U	U	U	U	1.032 ± 0.143	0.032 ± 0.014	0.164 ± 0.159	1.367 ± 0.246	1.374 ± 0.244	1.286 ± 0.233
02108019416	U	UJ	U	U	0.018 ± 0.011	U	U	1.052 ± 0.142	0.034 ± 0.014	1.079 ± 0.146	0.300 ± 0.220	1.322 ± 0.221	1.297 ± 0.219

U = Result is a statistical nondetect at the 95% confidence level.

UJ = Result does not meet the criteria for statistically positive value at the 95% confidence level and is considered to be an estimated quantity because of a questionable blank condition.

In addition to the radiological analyses of samples collected during Phase II, an area survey was performed using the GPRS. The results of this area survey indicated nothing detected above general background (8 μ R/hour) at the CFA-669 site.

5.2.2 Chemical Results

The Phase II samples were analyzed for TCLP metals, TCLP VOCs, and TCLP semi-VOCs. The results of these analyses were validated by the EG&G Idaho SMO. A review of the analytical results was performed by LITCO Environmental Monitoring. The review indicated that all contaminant concentrations were below the regulatory level found in 40 CFR 261.24, Table 1. The analytical and validation results are on file at the ARDC.

7. REFERENCES

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