File LANL HSWA

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MAR 7 1995

Ms. Barbara Driscoll
NM/Federal Facilities Section
Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Date: MAR 1 1995
Refer to: EM/ER:95-J070

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Dear Ms. Driscoll:

SUBJECT: RESPONSE TO NOTICE OF DEFICIENCY (NOD) CONCERNING OPERABLE UNIT (OU) 1082 RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION (RFI) WORK PLAN ADDENDUM I

Enclosed is the Los Alamos National Laboratory's (the Laboratory) revised work plan pages incorporating all changes required in the Environmental Protection Agency's (EPA's) Notice of Deficiency concerning Addendum I to the OU 1082 RFI Work Plan and a certification form signed by the appropriate officials. The NOD was received at the Los Alamos Area Office on October 24, 1994. We stated that these revised pages would be delivered by March 1, 1995 in the response to the EPA NOD that was transmitted November 23, 1994.

The enclosed revisions show the comments from the NOD indicated in the margins and the text changes highlighted. Also enclosed is a coversheet that indicates where responses to specific NOD comments are located. A documented quality review of the enclosed response has been performed in accordance with procedure LANL-ER-AP-01.3

Please contact Brad Martin at (505) 667-6080 or Everett Trollinger at (505) 667-5801, if you have any questions about this response to the NOD.

Sincerely,

Jorg Jansen, Project Manager
Environmental Restoration

Sincerely,

Theodore J. Taylor, Program Manager
Los Alamos Area Office

Environmental Restoration

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CERTIFICATION

I certify under penalty of law that these documents and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violation.

Document Title:

Response to Notice Of Deficiency (NOD) Concerning Operable Unit (OU) 1082 Resource Conservation And Recovery Act Facility Investigation (RFI) Work Plan Addendum I

Name: _____ Date: 2/22/95

Dennis Erickson, Division Director
Environment, Safety & Health Division
Los Alamos National Laboratory

Name: _____ Date: 3/1/95

Joseph Vozella, Chief
Acting Assistant Area Manager of
Environmental Projects
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DOE-Los Alamos Area Office

or

Theodore J. Taylor
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Enc.: Revised Work Plan Pages for OU 1082 RFI Work Plan

JJ/bp

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TABLE SHOWING LOCATIONS OF RESPONSES TO EPA NOD COMMENTS ON OU 1082 RFI WORK PLAN ADDENDUM 1
– Note that sampling tables were also modified as appropriate

Comment	Pages or Figs.	Notes
1	Not applicable	This information has been provided in the original NOD response as Attachment A.
2	5-0-12	
3	Not applicable	LANL recognizes that EPA does not concur with the statistical approach outlined in Subsection 5.0.2.6. LANL will not delete the statistical sections in each aggregate, but will modify the sampling plans as requested by EPA.
4	Not applicable	LANL will add the above units to the HSWA permit.
5	throughout	SWMU numbers have been added to the background descriptions when it is unclear what SWMU is being referred to in descriptions by structure number.
6	5-322	Typographical error corrected.
7 a-e	Subsections: 5.18.4.2 5.19.4.2 5.20.4.2 5.21.4.2 5.22.4.2 5.23.4.2 5.24.4.2 5.25.4.2 and throughout	Corrections to sampling plan procedures have been noted in sampling subsection of each aggregate.
8	5-341	As stated in NOD response.
9	5-345	As stated in NOD response.
10	addressed globally (see 7d)	As stated in NOD response
11	5-345	As stated in NOD response.
12	5-346	As stated in NOD response.
13	5-341	As stated in NOD response.
14	5-346: Figure 5-65	14 a-c currently addressed in this section.
14b	5-0-11; 5-346	Describes typical World War II era sump.
15	5-313; Fig. 5-60	As stated in NOD response.
16	5-348	As stated in NOD response.
17	5-348	As stated in NOD response.

18	5-349	As stated in NOD response.
19	5-349	As stated in NOD response.
20	5-350	As stated in NOD response.
21	5-350; Fig. 5-64	As stated in NOD response.
22	5-350	As stated in NOD response.
23	5-364 & 5-366	As stated in NOD response.
24	5-377	As stated in NOD response.
25	5-388, Figs 5-73, 77	As stated in NOD response.
26	5-416	As stated in NOD response.
27	5-417	As stated in NOD response.
28	5-417	As stated in NOD response.
29	5-418	As stated in NOD response.
30	5-418	As stated in NOD response.
31	5-418	As stated in NOD response.
32	5-418	As stated in NOD response.
33	5-419; Fig. 5-80	As stated in NOD response.
34	5-435	As stated in NOD response.
35	5-436	As stated in NOD response.
36	5-456	As stated in NOD response.
37	5-457	As stated in NOD response.
38	5-456, Fig 5-86	As stated in NOD response.
39	5-475	As stated in NOD response.
40	5-475	As stated in NOD response.
41	5-475	As stated in NOD response.
42	5-496	As stated in NOD response.
43	5-496	As stated in NOD response.
44	5-497	As stated in NOD response.
45	5-497	As stated in NOD response.
46	5-518	As stated in NOD response.
47	6-31	As stated in NOD response.
48	6-31, 6-34; Table 6-10	As stated in NOD response.
49	6-33	As stated in NOD response.

50	Not applicable.	LANL will request removal of units from the HSWA portion of the permit.
51	6-31, 6-34	Additional information for SWMU 16-017 is provided as part of response #48.
52	Not applicable.	SWMU 16-026(i2) is essentially identical to SWMU 16-006(a)
53	Not applicable.	"South drainage" will be numbered 16-028(a) in Phase Reports.
54	Not applicable.	Excerpts from cited documents were provided with original NOD response as Attachment D.
55	6-40	As stated in NOD response. Documentation provided with original NOD response as Attachment E.
56	Not applicable.	Sampling information was provided with original NOD response as Attachment F.
57	Not applicable.	LANL will not add any of these SWMUs to the HSWA permit.
58	Not applicable	Sampling plans were submitted in December 1994.
59	Not applicable.	Additional information was provided in the original NOD response.

6.4.3.3.2 Recommendation

SWMU 16-031(g) is recommended for NFA because there is no reasonable basis for characterization of the site based on considerations of human health and environmental risk, community concern, Laboratory operations, and value of information (LANL 1993, 1017).

6.4.3.3.3 Rationale for Recommendation

The available information, supplied by a former site worker, indicates that this cooling system used untreated tap water (Martin 1993, 15-16-477). No record of any release of hazardous constituents is known. The area is currently vacant and regrown with vegetation.

6.4.3.4 Decommissioned Septic Systems, SWMU 16-005(f)

6.4.3.4.1 Background

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SWMU 16-005(f) was a 1 500-gal. septic tank, TA-16-272, associated line, doser chamber, distribution box, and outfall. TA-16-272 was built in February 1951, abandoned in December 1952, and later removed; no removal date was given (ENG-R 2436. Following decommissioning of TA-16-272 in December 1952 TA-16-260 was connected to the sitewide sanitary waste water treatment system, which was completed in 1953). According to Engineering drawing ENG-R 135, the tank was located approximately 190 ft from the northeast corner of TA-16-260, an HE machining facility. Operations in TA-16-260 are described in Subsection 5.3 of this work plan (LANL 1993, 1094). The exact location of TA-16-272, in relation to TA-16-260, could not be verified, but fragments of clay pipe were found and the ground was depressed (Weston 1988, 15-16-094). Available drawings indicate that the system was connected to several bathrooms along the west side of building TA-16-260 (Engineering drawing ENG-R 857).

As reported in a memo from a former site worker, septic tank TA-16-272 was monitored and found to be free of radioactive contamination (Buckland 1967, 15-16-131). According to a memo, TA-16-272 was not listed as having an HE hazard (Blackwell 1983, 15-16-076).

6.4.1.1.2 Recommendation

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Defer action on these three SWMUs until D&D. The OU 1082 Team will closely monitor the D & D activities for SWMU 16-017. The location of any leak points beneath the buildings' floors and at the buildings' joints will be documented. Following the completion of the D & D activities, the OU 1082 Team will provide a sampling plan describing verification sampling that will occur in the soil and tuff beneath the decommissioned buildings. The plan will be provided to EPA within 90 days of completion of the D&D activities. The general strategy of this sampling will involve: 1) extensive field screening, biased to observed leak points, of potential discharge points within the buildings' footprints; 2) collection of laboratory samples to a depth of 3 ft in the tuff at a subset of the field screened points; and, 3) submission of the latter samples for full suite analysis.

6.4.1.1.3 Rationale for Recommendation

These three SWMUs consist of structures which are intact or buried, but inactive, and which are slated to go through D&D (LANL 1992, 15-16-550). While the structures themselves are in various states of disrepair and may be contaminated with HE internally, no record of any release to the environment has been found. They present no current human health or environmental risk on or off site and characterization would be needlessly disruptive of the surrounding active operations (see Appendix I of the IWP) (LANL 1993, 1017). An effective sampling program for the buildings that constitute SWMU 16-017 can more easily be developed following completion of the D &D activities. The activities are scheduled to be completed by fiscal year 1996, so RFI activities for this SWMU would be completed during fiscal year 1997, which is the final year of Phase I RFI activities at TA-16.

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6.4.2 SWMUs Recommended for No Further Action Under Step One of the Four-Step Criteria

6.4.2.1 Septic System, SWMU 16-006(i)

6.4.2.1.1 Background

SWMU 16-006(i) is an active septic tank. The septic tank was originally designated as structure TA-16-00 and listed in the 1990 SWMU Report as SWMU 16-006(i) (LANL 1990, 0145). Review of Laboratory job #6416-16 of

TABLE 6-10

STRUCTURES INCLUDED IN SWMU 16-017 (Cont.)

Structure Number	Description (original/later)	Potential Contamination* (likelihood)	Associated SWMUs [Subsection]
TA-16-519	HE processing (assembly/storage)	HE (medium), metals, SVOCs, VOCs, cyanide (low)	None
TA-16-520	HE processing (assembly/storage)	HE (medium), metals, SVOCs, VOCs (low)	None
TA-16-523	Pit	HE, metals, SVOCs, VOCs (low)	None

* All buildings are painted with lead paint and have asbestos-bearing shingles, so these are PCOCs for D & D.

paint, the buildings will be steam cleaned to remove HE, and they will be disassembled prior to combustion of flammable residues at the burning ground.

SWMU 16-029(g2) was pit TA-16-523 (formerly V-9). Drawing ENG-C 1837 indicates that it was an 11 x 16 x 4 ft concrete structure located directly in front of the doors of building TA-16-517. The pit was fitted with three wooden section lids and had a 0.5 ft raised concrete section covering most of the bottom. No drain lines exit the pit (Engineering drawing C 1837). It was completed in 1944 and a year later was abandoned in place, filled with dirt, and covered with a slab of concrete. 49

The pit held the shake table used in vibration tests on the Fat Man device. Because the device had an HE component, the table was controlled remotely from a bunker west of V-Site. No radioactive material was used in the tests. No incidents occurred during operation of the shake table. No known releases occurred in the pit. A memo written in 1983 lists pit TA-16-523 as having been used in association with HE and beryllium (Blackwell 1983, 15-16-076). 49

TABLE 6-10

STRUCTURES INCLUDED IN SWMU 16-017

Structure Number	Description (original/later)	Potential Contamination* (likelihood)	Associated SWMUs [Subsection]
TA-16-10	Storage	HE (low)	16-005(a) [5.22]
TA-16-27	HE processing (casting)/storage	HE (very high), metals, SVOCs (low)	16-026(q), 16-005(d) [5.18]
TA-16-59	Magazine/storage	HE, metals (low)	None
TA-16-61	Magazine/storage	HE, metals, rad (low)	None
TA-16-63	Storage	HE, metals (low)	None
TA-16-73	Magazine/storage	HE, metals (low)	None
TA-16-75	Magazine/storage	HE, metals (low)	None
TA-16-76	Magazine/storage	HE, metals (low)	None
TA-16-77	Magazine/storage	HE, metals (low)	None
TA-16-78	Magazine/storage	HE, metals (low)	None
TA-16-79	Magazine/storage	HE, metals (low)	None
TA-16-80	Magazine/storage	HE, metals (low)	None
TA-16-89	HE processing (machining)/storage	HE (high), metals, SVOCs (low)	16-029(u), 16-026(p) [5.23]
TA-16-90	HE processing (machining)/storage	HE (high), metals, SVOCs (low)	16-029(t), 16-026(o) [5.23]
TA-16-91	HE processing (machining)/storage	HE (high), metals, SVOCs (low)	16-029(s), 16-026(n) [5.23]
TA-16-92	HE processing (inspection)/storage	HE (high), metals, SVOCs, VOCs, rad (low)	16-029(l), 16-026(m) [5.23]
TA-16-93	HE processing (plating)/storage	HE, metals (high), SVOCs, VOCs, cyanide (low)	16-029(k) [5.23]
TA-16-99	HE processing (machining)/storage	HE (high), metals, SVOCs (low)	16-029(q) [5.23]
TA-16-164	Storage shed	HE (low)	None
TA-16-515	HE processing (casting)/storage	HE (high), metals, SVOCs, volatiles, cyanide (low)	16-029(x), 16-031(c), 16-006(g) [5.25]
TA-16-516	HE processing (assembly/plastics)	HE (medium), metals, SVOCs, VOCs (low)	None
TA-16-517	Laboratory/Equipment storage	HE, metals, SVOCs, VOCs (low)	C-16-074 [5.25]

6.4 SWMUs Listed in the February 1993 Request for a Class 3 Permit Modification to the HSWA Module

6.4.1 SWMUs Recommended for Deferred Action Under Step Three of the Four-Step Criteria

The following PRSs are associated with intact structures. It is recommended that further action be deferred until the sites undergo decontamination and decommissioning (D&D). The D&D project leader will coordinate all activities with the 1082 OUPL.

6.4.1.1 Active/Inactive Septic System, SWMU 16-006(h); World War II Era HE Complex, SWMU 16-017; and Inactive HE Sump, SWMU 16-029(g2)

6.4.1.1.1 Background

SWMU 16-006(h) is listed in the SWMU Report under active/inactive septic systems; however, upon field verification it was found to be a steam heating distribution pump pit, TA-16-526 (formerly V-11), located against the berm retaining wall about 12 ft south of building TA-16-517 (LANL 1990, 0145). The 6 x 6 x 6 ft pit was built in 1945 and holds a condensate pump. This pump was probably electrical, an electrical outlet is visible in the pit. No obvious stains are visible within the pit. Drawing ENG-C 1842 shows that steam discharge from the 40-psi boiler in TA-16-517 and from the 100-psi system serving all of S-Site was routed through pressure reduction valves to 15-psi radiator feeder lines. Condensate from the radiators was routed to pump pit TA-16-526 to be returned to the source boiler. The system served buildings TA-16-515, TA-16-516, TA-16-519, and TA-16-520. Drawing ENG-C 6031 indicates that each condensate stream was pumped back to its source boiler. Some pipes in the pit are insulated with asbestos, as are all steam lines at S-Site.

47

SWMU 16-017 is a set of twenty-three intact, abandoned structures in, or closely associated with, the World War II era S-Site. Table 6-10 includes the building number, function and, where applicable, a reference to the subsection in this addendum where the building is discussed further as part of other non-deferred sampling activities. The D & D for the buildings in this SWMU is scheduled to begin in fiscal year 1995 and be completed in fiscal year 1996. The D & D will be done in stages. An asbestos removal team will decontaminate all of the buildings, a lead abatement team will remove lead

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the sump will be submitted to the laboratory based on the biasing hierarchy presented above.

In each sampling sub-domain, additional laboratory samples will be taken at random in the absence of sufficient positive field screening results.

SWMU 16-029(w). There is potential subsurface contamination at the sump for TA-16-100 (HE electroplating facility). Spatial distribution of PCOCs should be similar to the removed portion of the vitreous clay pipe outside of the fence south of the V-Site buildings. Three analytical samples will be selected from 10 random points sampled by field screening (XRF or LIBS) within the former drain line area (see Fig. 5-95). Again, values for nickel, copper, and chromium compared to SALs will be used to select the three samples for laboratory analysis. Phase II is not considered to be likely for this PRS, but the concentrations are expected to be higher than those observed for the building footprint.

Note that the sump drain line connects to the TA-16-515 drainage system at manhole TA-16-795. Thus, data collected at TA-16-795 could provide further information about the presence of electroplating materials in the drain line.

SWMU 16-006(g). The septic tank will have a qualitative design that assumes that the presence of PCOCs is unlikely and, if present, would be fairly homogeneously distributed. For this reason one laboratory analytical sample in the tank is proposed. These measurements will be made at a random location, where sediment or sludge can be collected.

5.25.4.3 Laboratory Analysis

Fixed-base laboratory analyses of samples will be with detection limits and at a QA/QC level acceptable to EPA. We plan to use the following methods or equivalents for radionuclides (LANL or DOE method), metals (SW 846 Method 6010), SVOCs (SW 846 Method 8270), and HE and its byproducts (SW 846 Method 8330). The principal HE of concern are TNT and RDX; the principal HE byproducts of concern are DNT, TNB, and DNB; and, the principal metals of concern are chromium, barium, and silver.

C-16-068. This AOC, which represents potentially contaminated soil in the disturbed footprint of decommissioned TA-16-522, represents a surface contamination problem within the boundary of the foundation that is assumed to be the remains of this building. At least one laboratory sample will be selected based on field screening of four points (Fig. 5-94). Field screening analyses will include metals by XRF or LIBS and beryllium by LIBS, as well as HE spot test analyses and radionuclide screening.

C-16-074. It will be assumed that potential contamination associated with this decommissioned drum storage area will be detected by the sampling for SWMU 16-013. This sampling is described in Subsection 5.17. In addition, four 6-in. cement cores will be taken to select a single laboratory sample within the drum stains in front of TA-16-517. These cores will be to 6 in. rather than 24 in., because this SWMU is undisturbed. If no positive readings occur, select the laboratory sample randomly.

5.25.4.2.2 Subsurface Sampling

SWMUs 16-029(x), 16-031(c). This inactive sump is primarily a subsurface problem, in which buried vitreous clay lines and manholes represent downstream subsurface components of the sump drainage system. A total of at least seven samples from this PRS will be submitted to the analytical laboratory. These samples will be selected from four sub-domains of the PRS: the swale below the outfall, manhole TA-16-795, near the sump for TA–16-515, and near the existing manholes.

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Each of the five manholes (TA-16-793, TA-16-794, TA-16-795, TA-16-796, and TA-16-797) will get one field screening analysis in sediment. Any positive swipes from the manholes will be sent for laboratory analysis. Within the swale, ten field screening samples will be taken from a stratified random sampling pattern. The stratified random sampling pattern will be based on dividing the swale into ten roughly equal areas (Fig. 5-95). A minimum of five laboratory samples will be taken within the swale.

Five field screening samples will be taken from sump TA-16-515, four field screening samples will be collected from the soil on the four sides of the sump, and a single field screening sample will be taken from sediment within the sump (Fig. 5-95). A minimum of two of the screening samples from near

5.25.4.2 Sampling

7a

All samples will be field screened for HE by spot test and for radionuclides by gross-beta gamma. All samples from below a depth of 6 in. will be screened using a photoionization detector. The detection limits of the HE spot test are at a level such that a positive reading for TNT or RDX indicates a sample with contamination at a level above its SAL. Certain samples will be surveyed in the field laboratory for metals by XRF or LIBS. Some subsurface segments of soil cores will be screened for volatile organics by photoionization detector (PID). These field screening results will be used to select samples submitted for laboratory analysis.

7e

All positive field screening results, defined as positive HE or PID readings or as metals or rad two times background or more, will be submitted for laboratory analysis. In the absence of positive screening hits, samples will be biased on a PRS-specific basis as outlined below.

7b

7c

7d

Table 5-134 summarizes the field screening and laboratory analytical data collection planned for this aggregate. Each surface sample will extend to a maxi,mum depth of 24 in., unless otherwise indicated. Each subsurface core will be augered to the soil-tuff interface unless noted otherwise. Sump and septic tank samples will extend to a maximum depth of 3 ft into the tuff. Cores will be divided into 12 in. intervals, and each interval will be screened near its midpoint. If positive field screening hits are obtained on a single augered core, samples from the shallowest positive interval, the deepest positive interval, and the interval below the deepest positive interval will be submitted for laboratory analysis.

5.25.4.2.1 Surface Sampling

SWMU 16-025(x). This SWMU has potential surface contamination from the TA-16-100 HE electroplating facility. Spatial distribution of PCOCs may be fairly uniform due the removal and grading during D&D. Three laboratory samples will be selected from eight random points sampled by field screening (XRF or LIBS) within the former structure area (see Fig. 5-95). Phase II sampling is not considered to be likely for this PRS due to the short period of use.

TABLE 5-134

SUMMARY OF SITE SURVEYS, SAMPLING, AND ANALYSIS FOR V-SITE

PRS	PRS TYPE	SAMPLED MEDIA	LABORATORY SAMPLES						FIELD SCREENING #							FIELD						LABORATORY ANALYSES #										
			STRUCTURE		SURFACE		SUBSURFACE								A					B				C				D	E	F	G	H	
				FIELD DUP		FIELD DUP		FIELD DUP	GROSS ALPHA	GROSS GAMMA/BETA	ORGANIC VAPOR	HE SPOT TEST	GEOPHYSICS SURFACE	LIBS/XRF	GEOLOGICAL CHARACTERIZATION	GROSS ALPHA	GROSS GAMMA/BETA	TRITIUM	VOLATILE ORGANICS	XRF	SOIL MOISTURE	ALPHA SPECTROSCOPY	GAMMA SPECTROSCOPY	BETA SPECTROSCOPY	TOTAL URANIUM	ISOTOPIC PLUTONIUM	ISOTOPIC URANIUM	VOA (SW 8240)	SEMIVOLATILES (SW 8270)	METALS (SW 6010)	ASBESTOS	HIGH EXPLOSIVES (SW 8330)	CYANIDE
16-006(g)	Septic tank	Soil					1			1	1	1													1			1	1	1		1	1
16-025(x)	Burned building	Soil			3	1				8		8		8															3	3		3	3
16-029(w)	Sump	Soil					3			10	10	10		10														3	3	3		3	3
16-029(x)	Sump	Soil					7	1		20	20	20													7			7	7	7		7	7
16-031(c)	Cooling tower **	Soil																															
C-16-068	Decommissioned building	Soil			1					4		4													1				1	1		1	
C-16-074	Drum storage	Soil			1					4		4													1				1	1		1	

Integers indicate minimum numbers of laboratory, field laboratory, and field screening samples for each PRS.
= The actual number of samples will depend on the depth of the cores and number of screening hits.
** = Any potential contamination associated with this unlocated cooling tower will be detected in sampling for 16-029(x)
A, B, C, E = full suite; F = 1082 suite (barium, beryllium, cadmium, chromium, mercury, copper, lead, nickel, thallium, zinc) includes boron in this aggregate; H = full suite.

readings (two times background or more) in any of the screened cores, the additional laboratory samples will be selected randomly from the bottom 12 in. of the core holes.

5.24.4.2.3 South and East Drainages

Three laboratory samples at roughly 50 ft intervals will be taken in the drainage south of the former location of TA-16-490 (Fig. 5-93). Similarly, three laboratory samples will be taken in the east drainage from this PRS aggregate (Fig. 5-93). These samples are designed to identify any contaminants that may be migrating off site. Each sample will be augered to 6 in. or bedrock and will be collected in regions of clay-rich sediment when possible.

5.24.4.3 Laboratory Analysis

Fixed-base laboratory analyses of samples will be with detection limits and at a QA/QC level acceptable to EPA. We plan to use the following methods or equivalents for radionuclides (LANL or DOE method), metals (SW 846 Method 6010), SVOCs (SW 846 Method 8270), and HE and its byproducts (SW 846 Method 8330). The principal radionuclides of concern are uranium, cobalt-60, strontium-90, radium-226, and plutonium; the principal HE of concern are TNT and RDX; the principal HE byproducts of concern are DNT, TNB, and DNB; and the principal metals of concern are beryllium, chromium, barium, and silver.

5.24.4.4 Sample Quality Assurance

Field quality assurance samples will be collected according to the guidance provided in the QAPjP, Appendix T of the IWP (LANL 1991, 0553). Any QA/QC duplicate samples planned to be collected during the course of the field investigations are outlined in Table 5-128.

as described above, to select two surface samples for laboratory analysis. Field screening points will be located in each of the four quadrants of the building, and in the center of the building (Fig. 5-92). In the absence of positive field indicators or if less than two samples yield positive indicators, choose samples in the following order: one laboratory sample from the center of the building and one at random from the other four screened points.

C-16-017. Sampling in this decommissioned steam plant is designed to detect residual metals associated with algaecides on or near the disturbed surface of the SWMU. Five surface samples will be screened in the field laboratory by XRF or LIBS to determine if any metals, particularly chromium, are above local background levels. A minimum of one surface sample will be selected for laboratory analysis based on the highest chromium concentration. The locations of the five screening points are shown on Fig. 5-92. Four points are located in the quadrants of the building, and one point will be located in the center of the building. 44

5.24.4.2.2 Subsurface Sampling

SWMU 16-005(j). The sampling of this decommissioned septic system and associated drain line is designed to detect the presence of subsurface silver associated with the septic system. Ten subsurface cores to bedrock will be screened in the field laboratory for silver using x-ray fluorescence or LIBS. Five core locations are concentrated in the location of the septic tank, as observed on a 1965 aerial photograph. The other five will be located along the inferred location of the drain line. The locations of these cores are shown on Fig. 5-92. A minimum of two corehole samples from the location of the former septic tank and four samples from the drainage area will be sent for laboratory analysis. 45

SWMU 16-005(m). The sampling of this decommissioned chemical pit/sump is designed to detect the presence of subsurface HE. Five subsurface cores to bedrock will be field screened as described above in order to select three laboratory samples. These cores will be located at 3 ft intervals along the length of this chemical pit (Fig. 5-92) beginning at the west end of the PRS. In the absence of field-screening indications of HE or radionuclide contamination, or if less than three samples yield positive HE or radionuclide

5.24.4.2.1 Surface Sampling

SWMUs 16-024(f,g,h) and 16-034(c,d,e). The sampling of these three decommissioned magazines and three decommissioned process buildings is designed to detect residual HE and HE byproducts on the disturbed surfaces of these SWMUs. For each SWMU five surface samples will be field screened, as described above, in order to select a minimum of two samples for laboratory analysis. The five field screening samples will be located in each of the four quadrants of each building and in the center of each structure (Fig. 5-92).

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SWMUs 16-025(m,n,o). The sampling of these three source hutments is designed to detect residual radionuclides on the disturbed surfaces of these SWMUs. For each SWMU, five surface samples will be field screened for HE and radionuclides, as described above, in order to select two surface samples for laboratory analysis. The positions of these field-screening samples are shown on Fig. 5-92 with one in each of the four quadrants and one in the center of each building. However, unlike the other SWMUs in this aggregate, the hierarchy of biasing samples submitted for laboratory analysis for these SWMUs will be: 1) an above-background (two times) radionuclide reading; 2) a sample from the position of the lead-lined pit in the center of each decommissioned building. In the absence of positive field screening results, the samples submitted to the laboratory will include the core hole from the center of the SWMU and another sample selected at random from the four quadrants of the hutments.

SWMU 16-034(b). The sampling of the decommissioned laboratory building is designed to detect residual HE on or near the disturbed surface within this SWMU. Fifteen surface samples will be field screened as described above. Four samples will be located in each of the drainage troughs that were located on the south of the building, and seven will be located within the footprint of the building itself. Field-screening locations are shown on Fig. 5-92. A minimum of two samples from each drainage trough and three from the building footprint will be submitted for laboratory analysis.

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SWMUs 16-034(f). Sampling of this decommissioned building is also designed to detect residual HE on or near the disturbed surface of the SWMU. Five surface samples will be field screened for HE and radionuclides,

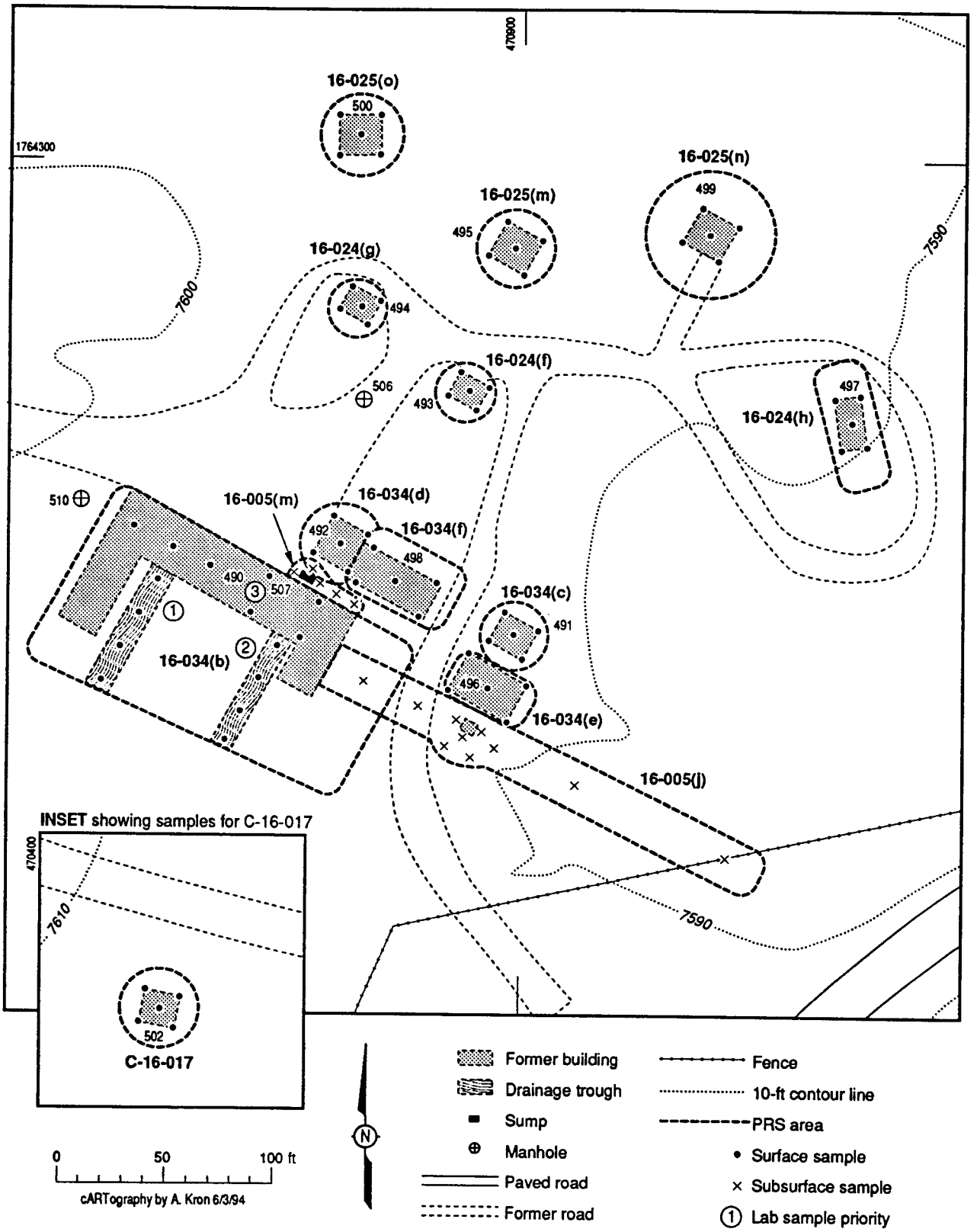

Fig. 5-92. Sampling locations at T-Site.

survey will locate, stake, and document the location of each PRS, each point for field screening and sampling, and the two primary drainages exiting T-Site. Geomorphic sediment mapping will be completed in the drainages. Both field screening and laboratory sampling locations will be registered on a base map, scale 1:7 200. If during the course of sampling any sample points must be relocated, the new position will be surveyed and the revised locations will be indicated on the map. The engineering survey will be performed by a licensed professional under the supervision of the field team leader.

5.24.4.2 Sampling

7a

All samples will be field screened for HE by spot test and radionuclides by gross beta-gamma. All samples from below a depth of 6 in. will be screened using a photoionization detector (PID). SOPs for these procedures are currently in preparation. The detection limits of the HE spot test are at a level such that a positive reading for TNT or RDX indicates a sample with contamination at a level above its SAL.

All positive field screening results, defined as a positive HE or PID reading or a metals or rad reading two times background or more, will be submitted for laboratory analysis. In the absence of positive screening hits, samples will be biased on a PRS-specific basis outlined below. In the absence of positive field screening readings, the sample submitted for laboratory analysis will represent the soil-tuff interface for any core.

7b-7e

All surface samples will be taken to a 24 in. maximum depth in disturbed areas. At least 300 ml of soil will be collected from each surface core. Each subsurface core will be augered to the soil-tuff interface. Sump and septic tank samples will extend to a depth of 3 ft into tuff. Subsurface cores will be divided into 12 in. intervals, and each interval will be screened near its midpoint. In cases where multiple positive field screening hits are obtained on a single augered core, the deepest positive interval, and the interval below the deepest positive interval will be submitted for laboratory analysis.

Sample parameters, including complete lists of PCOCs to be analyzed in the laboratory, are summarized in Table 5-128. Field-screening locations are shown in Fig. 5-92.

TABLE 5-128

SUMMARY OF SITE SURVEYS, SAMPLING, AND ANALYSIS FOR T-SITE

PRS	PRS TYPE	SAMPLED MEDIA	LABORATORY SAMPLES: STRUCTURE	STRUCTURE FIELD DUP	SURFACE	SURFACE FIELD DUP	SUBSURFACE	SUBSURFACE FIELD DUP	FIELD SCREENING #: GROSS ALPHA	GROSS GAMMA/BETA	ORGANIC VAPOR	HE SPOT TEST	GEOPHYSICS SURFACE	CHROMIUM/SILVER - LIBS	A GEOLOGICAL CHARACTERIZATION	FIELD: GROSS ALPHA	GROSS GAMMA/BETA	TRITIUM	VOLATILE ORGANICS	B XRF	SOIL MOISTURE	LABORATORY ANALYSES #: ALPHA SPECTROSCOPY	GAMMA SPECTROSCOPY	C BETA SPECTROSCOPY	TOTAL URANIUM	ISOTOPIC PLUTONIUM	ISOTOPIC URANIUM	D VOA (SW 8240)	E SEMIVOLATILES (SW 8270)	F METALS (SW 6010)	G ASBESTOS	H HIGH EXPLOSIVES (SW 8330)	CYANIDE
16-005(j)	Septic system	Soil					6	1		10	10	10		10									6	6	6	6	6	6	6	6		6	6
16-005(m)	Sump	Soil					3			5	5	5											3	3	3	3	3	3	3	3		3	3
16-024(f)	Burned magazine	Soil			2					5		5																	2	2		2	
16-024(g)	Burned magazine	Soil			2					5		5																	2	2		2	
16-024(h)	Burned magazine	Soil			2	1				5		5											2	2	2		2		2	2		2	
16-025(m)	Burned hutment	Soil			2					5		5											2	2	2		2		2	2		2	
16-025(n)	Burned hutment	Soil			2					5		5											2	2	2		2		2	2		2	
16-025(o)	Burned hutment	Soil			2					5		5											2	2	2		2		2	2		2	
16-034(b)	Burned laboratory	Soil			7	1				15		15											7	7	7		7		7	7		7	7
16-034(c)	Burned building	Soil			2					5		5																	2	2		2	
16-034(d)	Burned building	Soil			2					5		5																	2	2		2	
16-034(e)	Burned building	Soil			2					5		5																	2	2		2	
16-034(f)	Burned building	Soil			2					5		5														2	2		2	2		2	2
C-16-017	Burned steam plant	Soil			1					5		5		5															1	1			
Drainages		Soil			6	1				6		6											6	6	6	6	6		6	6		6	6

Integers indicate minimum numbers of laboratory, field laboratory, and field screening samples for each PRS.
= The actual number of samples will depend on the depth of the cores and the number of screening hits.
A, B = not applicable; C =strontium-90; D,E = full suite; F = 1082 suite (barium, beryllium, cadmium, chromium, mercury, copper, lead, nickel, thallium, zinc);
H = full suite.

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sumps of the 90s-Line. For each set of sumps for an individual SWMU three field screening samples for each sump (six total) will be taken. A minimum of one sample will be submitted from each sump. If no positive readings occur, select the laboratory sample for each sump at random from within the set of screened samples. Sampling locations are shown on Fig. 5-90.

5.23.4.3 Laboratory Analysis

Fixed-base laboratory analyses of samples will be with detection limits and at a QA/QC level acceptable to EPA. We plan to use the following methods or equivalents for radionuclides (LANL or DOE method), metals (SW 846 Method 6010), volatiles (SW 846 Method 8240), SVOCs (SW 846 Method 8270), and HE and its byproducts (SW 846 Method 8330). The principal HE of concern are TNT and RDX; the principal HE byproducts of concern are DNT, TNB, and DNB; and, the principal metals of concern are chromium, nickel, copper, barium, and silver.

5.23.4.4 Sample Quality Assurance

Field quality assurance samples will be collected according to the guidance provided in the QAPjP, Appendix T of the IWP (LANL 1991, 0553). Any QA/QC duplicate samples planned to be collected during the course of the field investigations are outlined in Table 5-122.

the sample submitted for laboratory analysis will represent the soil-tuff interface from any individual core.

Sample parameters, including complete lists of PCOCs to be analyzed in the laboratory, are summarized in Table 5-122. Field-screening locations are shown in Fig. 5-90.

SWMUs 16-026(m), 16-026(n), 16-026(o), 16-026(p), 16-029(q). Sampling of these drain lines and outfalls is designed to detect residual HE in the excavated drain lines and exposed drainages for the sumps of the 90s-Line and TA-16-99. For each drain line ten field screening samples will be collected to the soil-tuff interface, which is expected to be six inches. For the excavated drain lines, screening samples will be collected within the excavations that contained the drain lines. The screening samples will be distributed as shown in Fig. 5-90, but may be biased to areas of visible HE that are exposed during removal of the drain lines. A minimum of two samples from each drain line will be submitted for laboratory analysis. In the absence of positive field screening results, or if less than two samples per drain line yield positive screening results, any additional samples will be selected randomly from within the negative field screened samples.

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SWMU 16-029(k). Sampling of this sump, drain line, and outfall is designed to detect residual chromium in the sump area, excavated drain lines, and exposed drainages from TA-16-93. Seventeen field screening samples will be collected to the soil-tuff interface, which is expected to be six inches. For sumps and drain lines, the screening samples will be collected within the excavations that contained the drain lines. A minimum of four samples from the drain line, two samples from the drainage ditch, and one sample from each sump will be submitted for laboratory analysis. The samples will be screened for HE, radionuclides, and chromium by LIBS or XRF. In the absence of positive HE or radionuclide readings, or if less than the minimum number of samples yield such readings, the highest chromium samples will be selected as the additional samples. The screening samples will be distributed as shown in Fig. 5-90.

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SWMUs 16-029(l), 16-029(s), 16-029(t), 16-029(q), 16-029(u). Sampling of these sump regions is designed to detect residual HE in the excavated

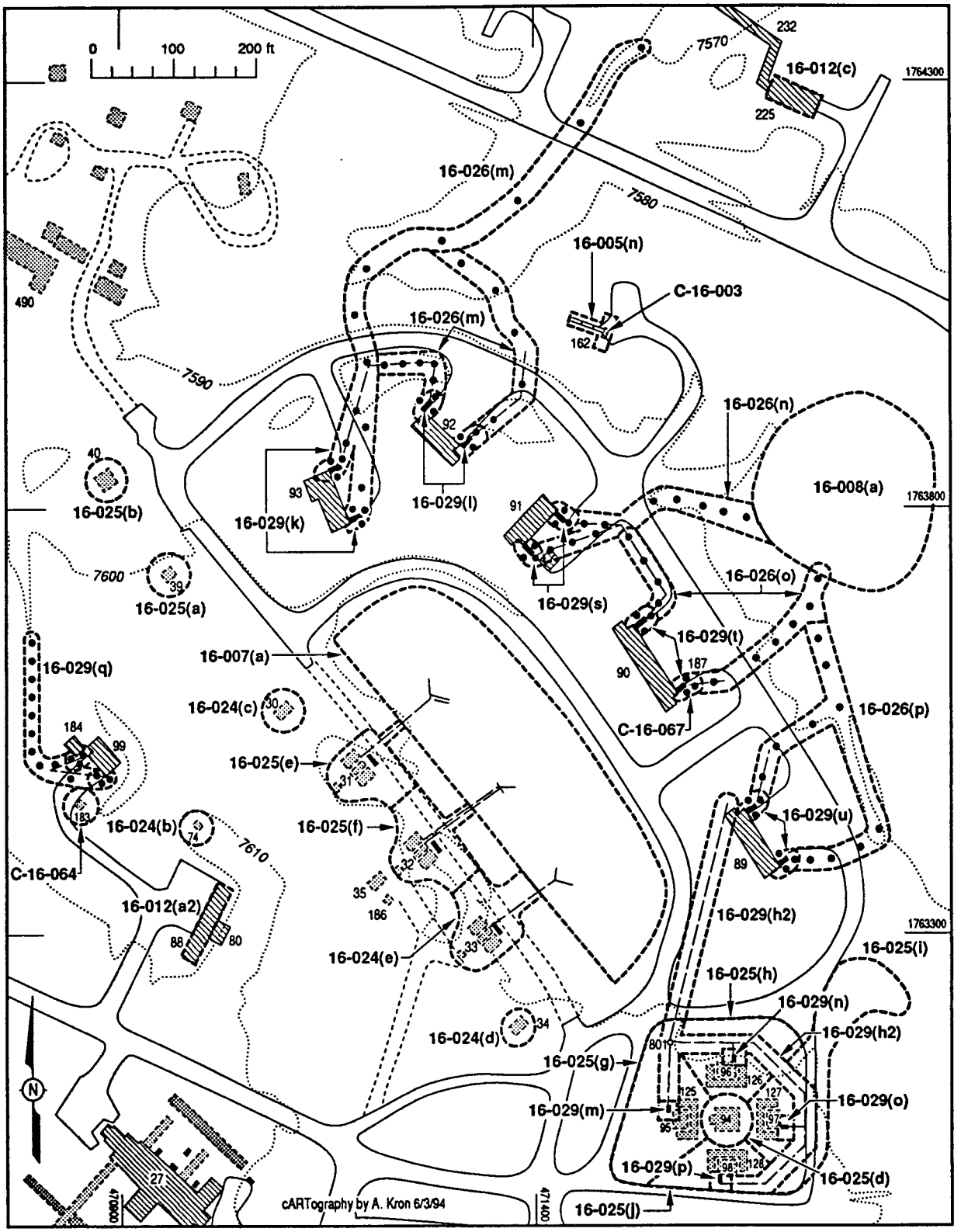

Fig. 5-90. Sampling locations at the 90s-Line.

5.23.4.1 Engineering Surveys

The PRSs composing this aggregate will be field surveyed before sample collection. Site mapping is required to accurately record the location of the PRSs. In the field, the engineering survey will locate, stake, and document the location of each PRS, each point for field screening and sampling, and the main drainages exiting this portion of S-Site. Geomorphic sediment mapping will be completed in the drainages. Both field screening and laboratory sampling locations will be registered on a base map, scale 1:7 200. If during the course of sampling any sample points must be relocated, the new position will be surveyed and the revised locations will be indicated on the map. The engineering survey will be performed by a licensed professional under the supervision of the field team leader.

5.23.4.2 Sampling

All samples will be field-screened for HE by spot test and radionuclides by gross beta-gamma. All samples from below a depth of 6 in. will be screened using a photo ionization detector (PID). SOPs for these procedures are currently in preparation. The detection limits of the HE spot test are at a level such that a positive reading for TNT or RDX indicates a sample with contamination at a level above its SAL. 7a

All positive field screening samples will be sent for laboratory analysis. In the absence of positive screening hits, samples will be biased on a PPS-specific basis as outlined below. 7e

The existing sumps and vitreous clay drain lines will be removed in a VCA. Visible HE will be removed during this VCA.

All surface samples will be sampled to a 24 in. maximum depth in disturbed areas. At least 300 ml of soil will be collected from each surface sample. Sump samples will extend to a depth of three feet into tuff. 7b

Cores will be divided into 12 in. intervals, and each interval will be screened near its midpoint. All field-screening samples that yield positive readings, defined as a positive HE or PID reading or a metals or rad reading 2 times background or more, will be submitted for laboratory analysis. In the absence of positive screening hits, samples will be biased on a PPS-specific basis as outline below. In the absence of positive field screening readings, 7c

TABLE 5-122

SUMMARY OF SITE SURVEYS, SAMPLING, AND ANALYSIS FOR 90s-LINE

			LABORATORY SAMPLES						FIELD SCREENING #							FIELD						LABORATORY ANALYSES #											
			STRUCTURE		SURFACE		SUBSURFACE								A					B				C			D	E	F	G	H	
PRS	PRS TYPE	SAMPLED MEDIA		FIELD DUP		FIELD DUP		FIELD DUP	GROSS ALPHA	GROSS GAMMA/BETA	ORGANIC VAPOR	HE SPOT TEST	GEOPHYSICS SURFACE	CHROMIUM - LIBS	GEOLOGICAL CHARACTERIZATION	GROSS ALPHA	GROSS GAMMA/BETA	TRITIUM	VOLATILE ORGANICS	XRF	SOIL MOISTURE	ALPHA SPECTROSCOPY	GAMMA SPECTROSCOPY	BETA SPECTROSCOPY	TOTAL URANIUM	ISOTOPIC PLUTONIUM	ISOTOPIC URANIUM	VOA (SW 8240)	SEMIVOLATILES (SW 8270)	METALS (SW 6010)	ASBESTOS	HIGH EXPLOSIVES (SW 8330)	CYANIDE
16-026(m)	Drain line TA-16-92	Soil			4					10		10													4			4	4	4		4	
16-026(n)	Drain line TA-16-91	Soil			4	1				10		10																4	4	4		4	
16-026(o)	Drain line TA-16-90	Soil			4					10		10																4	4	4		4	
16-026(p)	Drain line TA-16-89	Soil			4					10		10																4	4	4		4	
16-029(k)	Sump/drain line TA-16-93	Soil			6	1	2			17		17		17											8			8	8	8		8	8
16-029(l)	Sump TA-16-92	Soil			2					6		6													2			2	2	2		2	
16-029(q)	Sump/drain line TA-16-99	Soil			4		2			16		16																6	6	6		6	
16-029(s)	Sump TA-16-91	Soil					2	1		6		6																2	2	2		2	
16-029(t)	Sump TA-16-90	Soil					2			6		6																2	2	2		2	
16-029(u)	Sump TA-16-89	Soil					2			6		6																2	2	2		2	

Integers indicate minimum numbers of laboratory, field laboratory, and field screening samples for each PRS.
= The actual number of samples will depend on the depth of the cores and the number of screening hits.
A, B, C = not applicable; D, E = full suite; F = 1082 suite (barium, beryllium, cadmium, chromium, mercury, copper, lead, nickel, thallium, zinc);
H = full suite.

SWMU 16-005(I). The sampling of this decommissioned grease trap is also designed to detect HE contamination in the subsurface. Five subsurface cores to bedrock will be screened in the field using the HE spot test. These screening locations (shown on Fig. 5-86) are in the former location of the grease trap and its drain line, as inferred from engineering drawings. Because wastewater was discharged to the subsurface and is likely to accumulate at the soil-tuff interface, the subsurface field-screening samples will be taken from the bottom 12 in. of each core hole. Based on the field results, a minimum of two 12-in. laboratory samples will be selected. At least one laboratory sample will be selected from the open drainage ditch and at least one will be selected from the former location of the grease trap.

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5.22.4.3 Laboratory Analysis

Fixed-base laboratory analyses of samples will be with detection limits and at a QA/QC level acceptable to EPA. We plan to use the following methods or equivalents for metals (SW 846 Method 6010), SVOCs (SW 846 Method 8270), volatiles (SW 846 Method 8240), and HE and its byproducts (SW 846 Method 8330). The principal HE of concern are TNT and RDX, the principal HE byproducts of concern are DNT, TNB, and DNB.

5.22.4.4 Sample Quality Assurance

Field quality assurance samples will be collected according to the guidance provided in the QAPjP, Appendix T of the IWP (LANL 1991, 0553). Any QA/QC duplicate samples planned to be collected during the course of the field investigations are outlined in Table 5-114.

along the inferred location of the drain line. The locations of these cores are shown on Fig. 5-85. Because wastewater was discharged to the subsurface, and is likely to accumulate at the soil-tuff interface, the subsurface field screening samples will be taken from the bottom 12 in. of each core hole. At least one 12-in. laboratory sample will be selected from the septic tank location and at least two laboratory samples will be selected from the drain line location.

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SWMU 16-005(h). The sampling of this decommissioned septic tank is designed to detect the presence of HE associated with septic tank operations. For this SWMU, five subsurface cores to bedrock will be screened in the field using the HE spot test in each tank location. These proposed screening locations are in the former location of the septic tank, which can be seen on a 1965 aerial photograph (Koogle and Pouls Engineering, Inc. 1965, 15-16-516) or as gleaned from engineering drawings. The locations of these cores are shown on Fig. 5-87. Because wastewater was discharged to the subsurface and is likely to accumulate at the soil-tuff interface, the subsurface field screening samples will be taken from the bottom 12 in. of each core hole. Based on the field results, one 12-in. laboratory sample will be selected using the biasing scheme described above. If HE are not detected by field screening, each laboratory sample will be taken in the center of the septic tank.

SWMU 16-005(k). The sampling of this decommissioned septic tank is primarily designed to detect any residual petroleum hydrocarbons that may be associated with this tank; however, metals and organic compounds are also of concern (Table 5-114). Five subsurface cores to bedrock will be screened in the field using the BTEX spot test. These screening locations (shown on Fig. 5-86) are in the former location of the septic tank, as inferred from engineering drawings. Because wastewater was discharged to the subsurface, and is likely to accumulate at the soil-tuff interface, the subsurface field screening samples will be taken from the bottom 12 in. of each core hole. Based on the field results, at least two 12-in. laboratory samples will be selected by using the biasing scheme described above. In the absence of positive screening indicators, one laboratory sample will be taken in the center of the septic tank and the second laboratory sample will be selected at random.

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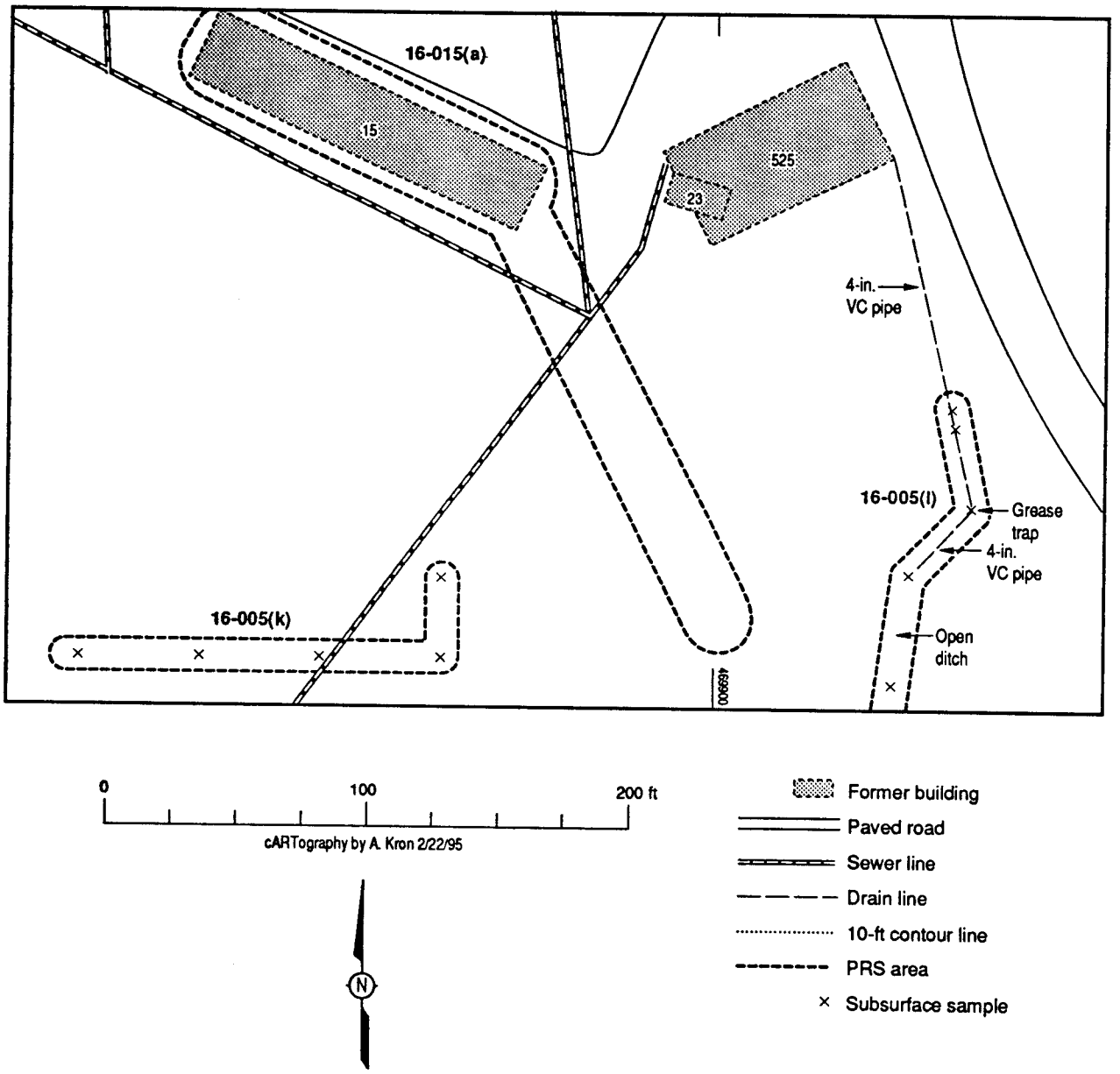

Fig. 5-86. Sampling locations for septic tanks in the administration area.

5.22.4.2 Sampling

All samples will be field-screened for HE by spot test and a few subsurface samples will be screened for gasoline components by the BTEX spot test. All samples from below a depth of 6 in. will be screened using a photo ionization detector (PID). SOPs for these procedures are currently in preparation. The detection limits of the HE spot test are at a level such that a positive reading for TNT or RDX indicates a sample with contamination at a level above its SAL.

7a

7e

All field-screening samples that yield positive readings, defined as a positifve HE or PID reading or a metals or rad reading 2 times background or more, will be submitted for laboratory analysis. In the absence of positive screening hits, samples will be biased on a PPS-specific basis as outlined below. In the absence of positive field screening readings, the sample submitted for laboratory analysis will represent the soil-tuff interface from any individual core.

7c

7d

In the absence of positive screening hits, samples will be biased on a PPS-specific basis as outlined below. In the absence of positive field screening readings, the sample above the soil-tuff interface will be chosen for any individual core.

Septic samples will extend to a depth of three feet into tuff. Drainline samples will extend to the soil-tuff interface. In cases were multiple positive field screening hits are obtained on a single augered core, the shallowest positive interfval, the deepest positive interval and the interval beneath the deepest positive itnerval will be submitted to the laboratory.

Sample parameters, including complete lists of PCOCs to be analyzed in the laboratory, are summarized in Table 5-114. Field screening locations are shown in Figs. 5-85, 5-86, and 5-87.

SWMU 16-005(a). The sampling of this large decommissioned septic tank is designed to detect the presence of HE associated with septic tank operations. Six subsurface cores to bedrock will be screened in the field using the HE spot test. Three screening locations are in the former location of septic tank TA-16-161, as observed on a 1965 aerial photo (Koogle and Pouls Engineering, Inc. 1965, 15-16-516). The other three will be placed

TABLE 5-114

SUMMARY OF SITE SURVEYS, SAMPLING, AND ANALYSIS FOR SEPTIC TANKS

PRS	PRS TYPE	SAMPLED MEDIA	LABORATORY SAMPLES						FIELD SCREENING #							FIELD						LABORATORY ANALYSES #										
			STRUCTURE		SURFACE		SUBSURFACE								A					B				C				D	E	F	G	H	
				FIELD DUP		FIELD DUP		FIELD DUP	GROSS ALPHA	GROSS GAMMA/BETA	ORGANIC VAPOR	HE SPOT TEST	GEOPHYSICS SURFACE	BTEX	GEOLOGICAL CHARACTERIZATION	GROSS ALPHA	GROSS GAMMA/BETA	TRITIUM	VOLATILE ORGANICS	XRF	SOIL MOISTURE	ALPHA SPECTROSCOPY	GAMMA SPECTROSCOPY	BETA SPECTROSCOPY	TOTAL URANIUM	ISOTOPIC PLUTONIUM	ISOTOPIC URANIUM	VOA (SW 8240)	SEMIVOLATILES (SW 8270)	METALS (SW 6010)	ASBESTOS	HIGH EXPLOSIVES (SW 8330)	CYANIDE
16-005(a)	Septic tank	Soil					3	1		6	6	6																3	3	3		3	
16-005(h)	Septic tank	Soil					1			5	5	5																1	1	1		1	
16-005(k)	Septic tank	Soil					2			5	5			5														2	2	2			
16-005(l)	Septic tank	Soil					2			5	5	5																2	2	2		2	

Integers indicate minimum numbers of laboratory, field laboratory, and field screening samples for each PRS.
= The actual number of samples will depend on the depth of the cores and the number of screening hits.
A, B, C = not applicable; D, E = full suite; F = 1082 suite (barium, beryllium, cadmium, chromium, mercury, copper, lead, nickel, thallium, zinc); H = full suite.

C-16-025 and C-16-026. The sampling of these AOCs is designed to detect residual oils or solvents in the soil at the former locations of the decommissioned cabinet shop, TA-16-8, and repair shop, TA-16-6. For each PRS, four subsurface cores to bedrock will be collected and sampled. The locations of these cores are shown on Fig. 5-82. Each core will be screened by BTEX spot test kit and by PID at 0 to 6 in., 12 to 18 in., and the soil-tuff interface. If the bottom interval in any core yields a positive field screening reading, then continue coring into the tuff taking a field-screening sample every two feet until a sample exhibiting no positive field screening indicators is found. In any core, the shallowest positive interval, the deepest positive interval, and the sample two feet beneath the deepest positive interval will be sent for laboratory analysis for the full suite of analytes (Table 5-108). In the absence of positive field screening readings, one sample from each PRS will be sent for laboratory analysis. This sample will be selected randomly from the four cores at the soil-tuff interface.

5.21.4.3 Laboratory Analysis

Fixed-base laboratory analyses of samples will be with detection limits and at a QA/QC level acceptable to EPA. We plan to use the following methods or equivalents for metals (SW 846 Method 6010), SVOCs (SW 846 Method 8270), volatiles (SW 846 Method 8240) and HE and its byproducts (SW 846 Method 8330). The principal HE of concern are TNT and RDX; the principal HE byproducts of concern are DNT, TNB, and DNB; and the principal volatiles of concern are benzene, toluene, and xylene.

5.21.4.4 Sample Quality Assurance

Field quality assurance samples will be collected according to the guidance provided in the QAPjP, Appendix T of the IWP (LANL 1991, 0553). Any QA/QC duplicate samples to be collected during the course of the field investigations are outlined in Table 5-108.

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the field results, at least two laboratory samples will be selected from the building footprint and at least two will be selected from the drainline, for a total of at least four laboratory samples. If HE are not detected by field screening along the drainline, or if less than two positive screening samples are found, the additional laboratory samples will be taken at leak points if observed or 1) near the sump location and 2) at the mapped location of the outfall. If less than two positive field screening samples are found in the building footprint, the additional laboratory samples will be selected at random.

SWMU 16-015(b). The sampling of this decommissioned steam washing facility and associated drain line is designed to detect the presence of HE associated with the building footprint and drain line. Nine subsurface cores to bedrock and four surface samples will be screened in the field using the HE spot test. Four surface screening locations will be located in the footprint of the building, as observed on a 1965 aerial photograph (Koogle and Pouls Engineering, Inc. 1965, 15-16-516). Four subsurface cores will be placed in the former location of the HE sump for TA-16-18. Finally, the last five subsurface samples will be evenly spaced along the inferred location of the drain line and will be augered to bedrock. The locations of these cores are

35

shown on Fig. 5-82. At least two samples from the location of the sump, two samples from the drain line, and one sample from the building footprint will be submitted for laboratory analysis. If less than the minimum number of laboratory samples for each area are positive, the additional laboratory samples will be selected at random.

SWMUs 16-026(s) and C-16-028. The sampling of this inactive outfall is designed to detect residual oil and solvents originating from TA-16-5, an instrument shop. SWMU 16-026(s) will be used as an indicator for C-16-028. For SWMU 16-026(s), a single sample, augered to bedrock, will be taken at the mouth of the outfall (Fig. 5-82).

C-16-030 and C-16-031. The sampling of these AOCs is designed to detect residual gasoline, oil, or diesel that may have spilled in the vicinity of either the diesel unit or the nearby storage tank. For each PRS, four subsurface cores to bedrock will be screened by BTEX kit. Visible oil stained locations (Fig. 5-82) will be preferentially screened. In the absence of a positive reading, no laboratory sample will be taken.

preparation. The detection limits of the HE spot test are at a level such that a positive reading for TNT or RDX indicates a sample with contamination at a level above its SAL.

7e

All positive field screening samples will be submitted for laboratory analysis. In all cases where field screening tests are negative, samples will be biased as described below on a PRS-specific basis. In the absence of positive field screening readings on subsurface cores, the sample above the soil-tuff interface will be chosen for any individual core.

7b

All surface samples will be taken to a maximum depth of 24 in in disturbed areas. A sufficient volume of soil will be removed from the entire length of the core to yield 300 ml. Each subsurface core will be augered to the soil-tuff interface. Sump and septic tank samples will extend to a depth of 3 ft into the tuff. Cores will be divided into 12 in. intervals, and each interval will be screened near its midpoint. In cases where multiple positive field screening hits are obtained on a single augered core, samples from the shallowest positive interval, the deepest positive interval, and the interval below the deepest positive interval will be submitted to the laboratory.

7c

7d

Sample parameters, including complete lists of PCOCs to be analyzed in the laboratory, are summarized in Table 5-108. Field screening locations are shown in Fig. 5-82.

5.21.4.2.1 Subsurface Sampling

Note that the sampling for SWMU 16-015(a) and 16-015(b) includes both surface and subsurface samples.

SWMU 16-015(a). The sampling of this decommissioned laundry facility and associated drain line is designed to detect the presence of HE associated with the building footprint and drain line. Five subsurface cores to bedrock and five surface samples will be screened in the field using the HE spot test. The five surface screening locations are located in the footprint of the building, as observed on a 1965 aerial photograph (Koogle and Pouls Engineering, Inc. 1965, 15-16-516). The five subsurface samples will be collected from the inferred location of the drain line and will be augered to bedrock. If the drain line is encountered, it will be inspected for leaks and removed. The locations of these samples are shown on Fig. 5-82. Based on

TABLE 5-108

SUMMARY OF SITE SURVEYS, SAMPLING, AND ANALYSIS FOR THE ADMINISTRATION AREA

		LABORATORY SAMPLES							FIELD SCREENING #							FIELD						LABORATORY ANALYSES #										
			STRUCTURE		SURFACE		SUBSURFACE								A					B				C				D	E	F	G	H	
PRS	PRS TYPE	SAMPLED MEDIA		FIELD DUP		FIELD DUP		FIELD DUP	ORGANIC VAPOR	GROSS GAMMA/BETA	BTEX	HE SPOT TEST	GEOPHYSICS SURFACE	BARIUM - LIBS	GEOLOGICAL CHARACTERIZATION	GROSS ALPHA	GROSS GAMMA/BETA	TRITIUM	VOLATILE ORGANICS	XRF	SOIL MOISTURE	ALPHA SPECTROSCOPY	GAMMA SPECTROSCOPY	BETA SPECTROSCOPY	TOTAL URANIUM	ISOTOPIC PLUTONIUM	ISOTOPIC URANIUM	VOA (SW 8240)	SEMIVOLATILES (SW 8270)	METALS (SW 6010)	ASBESTOS	HIGH EXPLOSIVES (SW 8330)	CYANIDE
16-015(a)	Laundry	Soil			2		2***		5	10		10																2	4	4		4	
16-015(b)	Steam washing	Soil			1		4***	1	9	13		13																4	5	5		5	
16-026(s)	Outfall	Soil					1		1																			1	1	1			
C-16-025	Cabinet shop	Soil					1		12		12																	1	1	1			
C-16-026	Repair shop	Soil					1		12		12																	1	1	1		1	
C-16-028*	Building	Soil																															
C-16-030**	Tank housing	Soil					1				5																	1	1	1			
C-16-031**	Diesel unit building	Soil					1				5																	1	1	1			

* The sampling of C-16-028 is considered with 16-026(s).
** Laboratory samples will be taken only if positive indicators on the BTEX test are found.
*** These PRSs include screening of both surface and subsurface samples.
# The actual number of samples will depend on the depths of the cores and the screening results.
Integers indicate minimum numbers of laboratory, field laboratory, and field screening samples for each PRS.
A, B, C = not applicable; D = full suite; E = full suite; F = 1082 suite (barium, beryllium, cadmium, chromium, mercury, copper, lead, nickel, thallium, zinc); H = full suite.

TABLE 5-107

STANDARD OPERATING PROCEDURES FOR FIELD ACTIVITIES

LANL-ER-SOP[a]	TITLE	NOTES
01.02, R0	Sample Containers and Preservation	Applied to all laboratory samples
01.03, R1	Handling, Packaging, and Shipping of Sample	Applied to all laboratory samples
01.04, R1	Sample Control and Field Documentation	Applied to all laboratory samples
03.01 R0	Land Surveying Procedures	Applied to all laboratory samples
06.09, R0	Spade and Scoop Method for the Collection of Soil Samples	Used for surface samples
06.10, R0	Hand Auger and Thin-Wall Tube Sampler	Applied to all augered subsurface samples

[a] A later revision of any SOP will be used if the cited version is superceded.

5.21.4.1 Engineering Surveys

The PRSs composing this aggregate will be field surveyed before sample collection. Site mapping is required to accurately record the location of the PRSs. Prior to fieldwork, all building locations will be accurately located (within 2 ft) on a FIMAD base map by orthocorrection of 1947 and 1965 aerial photographs. In the field, the engineering survey will locate, stake, and document the location of each PRS and each point for field screening and sampling. Both field screening and laboratory sampling locations will be registered on a base map, scale 1:7 200. If during the course of sampling any sample points must be relocated, the new position will be surveyed and the revised locations will be indicated on the map. The engineering survey will be performed by a licensed professional under the supervision of the field team leader.

5.21.4.2 Sampling

Most samples will be field-screened for HE by spot test and a few subsurface samples will be screened for volatiles by PID or other organics by BTEX spot test. All samples from below a depth of 6 in. will be screened using a photo ionization detector (PID). SOPs for these procedures are currently in

7a

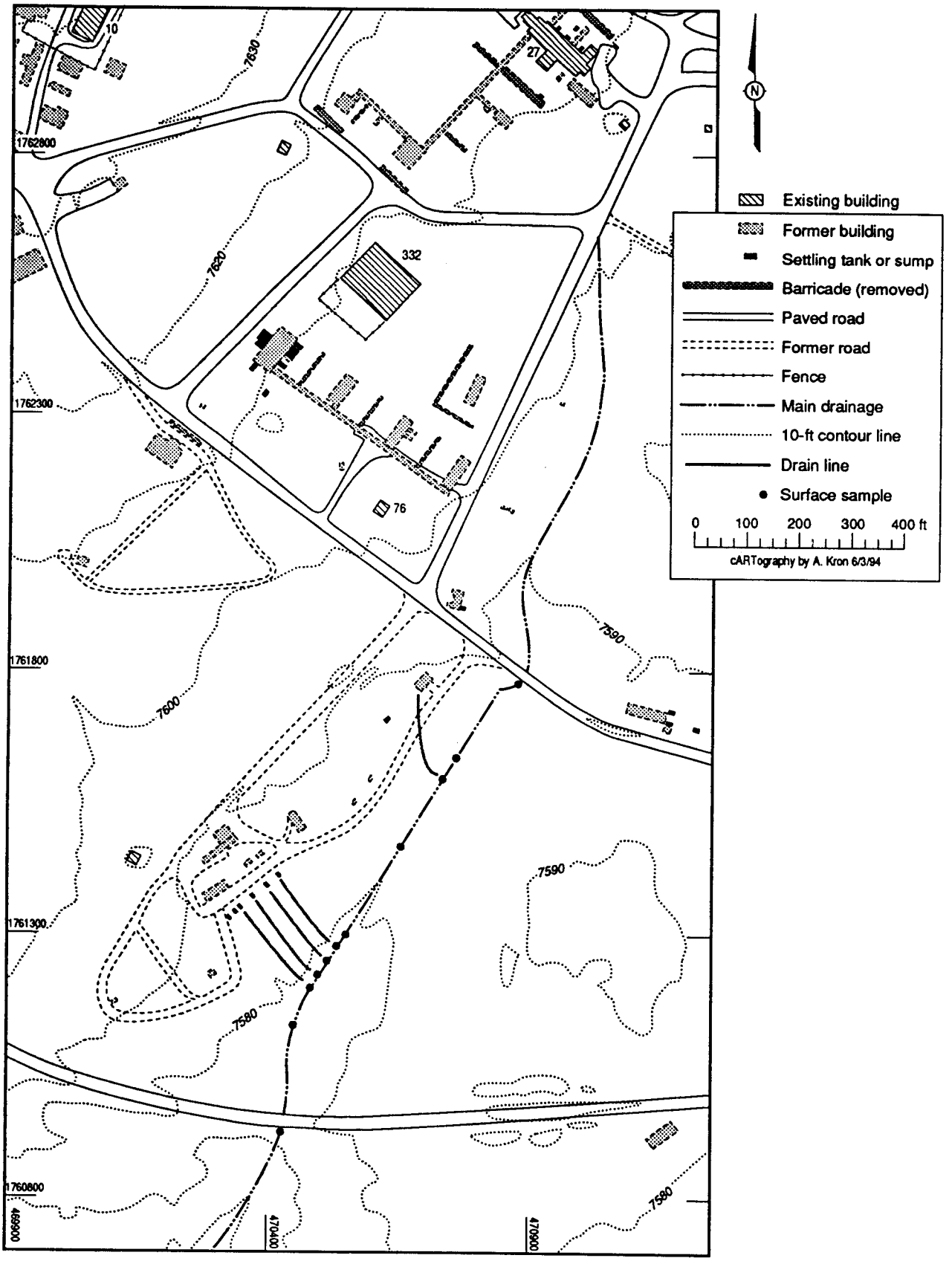

Fig. 5-80. Sampling locations for the main drainage, south.

at one foot intervals below the first six in. In the absence of positive field screening indicators, at least two samples will be selected at random for laboratory analysis. For each core that yields a positive screening reading, laboratory samples will be submitted from the shallowest positive interval, the deepest positive interval, and the interval below the deepest positive interval. 7d

5.20.4.2.3 Drainage Samples

Six laboratory samples will be taken in the drainage to the east of the southern GMX-2 area (Fig. 5-80). These samples will be to a depth of 6 in. or the tuff interface, because the drainages have not been disturbed by decommissioning activities. These will be located due south of the road bisecting the GMX-2 area and at approximately 200 ft intervals to the south, ending just south of the road to K-Site. Samples will be taken in well-defined sediment traps, with emphasis on those traps containing clay-rich sediments.

An additional 6-in. sample will be collected from the 12 in.-18 in. interval at the intersection of each drainage ditch for SWMUs 16-029(b2,d2,and v), and at the intersection of the easternmost drainage for 16-029(e2). 33

5.20.4.3 Laboratory Analysis

Fixed-base laboratory analyses of samples will be with detection limits and at a QA/QC level acceptable to EPA. We plan to use the following methods or equivalents for radionuclides (LANL or DOE method), metals (SW 846 Method 6010), SVOCs (SW 846 Method 8270), and HE and its byproducts (SW 846 Method 8330). The principal radionuclide of concern is carbon-14. The principal HE of concern are TNT and RDX and the principal HE byproducts of concern are DNT, TNB, and DNB. The principal metals of concern are barium and silver.

5.20.4.4 Sample Quality Assurance

Field quality assurance samples will be collected according to the guidance provided in the QAPjP, Appendix T of the IWP (LANL 1991, 0553). Any QA/QC duplicate samples planned to be collected during the course of the field investigations are outlined in Table 5-102.

screening samples will be located directly adjacent to the former location of each building's sumps, and six field screening samples will be located in each drainage (Figs. 5-77 and 5-78). This yields eight screening samples for SWMU 16-029(v), ten for 16-029(b2), eighteen for SWMU 16-029(c2), sixteen for SWMU 16-029(d2), and twenty-four for SWMU 16-029(e2). At least one lab sample will be taken from each sump. At least four lab samples will be taken from each drainage ditch, with one of these samples coming from the area between the building and the sump. For SWMU 16-029(c2), one sample from each sump will be submitted for laboratory analysis, along with four samples from each of the drainage areas on the east and west of the building.

29

SWMU 16-029(a2). The objective of sampling the sumps and drain line associated with operations in the barium nitrate grinding facility is detection of residual barium in the boundaries of the SWMU. Seven field screening samples will be used to select at least four laboratory samples for analysis. Two screening samples will be adjacent to each sump, and three screening samples will be located along the drain line. At least one sample from each sump and at least two additional samples from the drainage ditch will be submitted for laboratory analysis. The disposition of those samples is shown on Fig. 5-78. Barium screening will be by field XRF or LIBS.

30

SWMU 16-005(e). The sampling of this decommissioned septic tank is designed to detect the presence of subsurface HE. Four subsurface cores to bedrock will be field-screened within the surveyed SWMU boundaries as described above in order to select at least one laboratory sample from each core. These cores will be located at evenly spaced intervals along the SWMU (Fig. 5-78). For each core that yields a positive screening reading, laboratory samples will be submitted from the shallowest positive interval, the deepest positive interval, and the interval below the deepest positive interval. If no core intervals yield positive field screening results, select one laboratory sample at random from each core.

7d

31

SWMU 16-025(w). The sampling of the nitrocellulose drying building is designed to detect residual organic compounds in the subsurface soil. One core hole to bedrock will be taken from each of the four quadrants of the former location of the structure. For each core, field screening will be done

32

screened, as described above, in order to select at least one sample for laboratory analysis for each SWMU. The four field screening samples will be located in two of the four quadrants of each building, on the side of the footprint opposite the door, and one foot downgradient from the door of each structure (Figs. 5-77, 5-78, 5-79). If no field screening samples yield a positive reading, take the laboratory sample at random for each SWMU. 27

C-16-069. The sampling of the machine shop trailer is designed to detect residual petroleum hydrocarbons within the boundary of the PRS. One surface sample will be taken from each of the four quadrants of the former location of the structure and will be screened for BTEX (Fig. 5-77). The screening will be done at the bottom of each 24 in. sample. The screening samples will be biased to any oil-stained locations observed during the field survey. In the absence of a positive field screening observation, a sample will be selected at random to be submitted to the laboratory.

5.20.4.2.2 Subsurface Samples

All subsurface samples will be cored to the tuff/fill interface or into the tuff.

SWMU 16-029(y). The objective of sampling the two sumps, one secondary sump, and adjacent drain lines for TA-16-38 is to detect residual subsurface HE within the boundaries of the SWMU. Twelve field screening subsurface samples will be used to select at least six samples for laboratory analysis. Two field screening samples will be taken adjacent to each sump and the secondary sump (Fig. 5-79). Six samples will be taken in the east-west drainage for TA-16-38. At least one sample will be submitted for laboratory analysis from each sump, and three samples will be selected from the drain line. In the absence of positive field screening results, or if one to three positive screening hits occur, take one laboratory sample at random at each sump and three at random within the drain line. 28

SWMUs 16-029(v), 16-029(b2), 16-029(c2), 16-029(d2), 16-029(e2). The objective of sampling the former locations of sumps, drain lines, and outfalls associated with TA-16-49, TA-16-53, TA-16-37, TA-16-50, and TA-16-52 is to detect subsurface and surface residual HE within the boundaries of each SWMU. For each SWMU eight to twenty-four field screening samples will be used to select at least five laboratory samples for analysis. Two field

casting building footprint SWMUs, and one machining building footprint SWMU is designed to detect surface HE contamination of heterogeneous soil at the former sites of these buildings, where the likelihood of contamination is moderate. Therefore, six field screening samples will be taken in each building footprint to choose two laboratory samples for analysis for each SWMU. The field screening samples will be taken as shown on Figs. 5-77, 5-78, and 5-79. In the absence of positive field-screening results, or in a case where fewer than two positive values occur, the additional laboratory samples will be chosen using the following order: 1) near the door of the HE processing area; and 2) near the center of the building.

SWMU 16-025(c2), 16-034(m), 16-034(n), and 16-034(o). The sampling for these four laboratory building footprint SWMUs is designed to detect surface HE contamination of heterogeneous soil with minimal likely severity of potential contamination. Therefore, in each building footprint five field screening samples will be taken to choose at least two laboratory samples for analysis. The field screening samples will be taken in the four quarters and center of each SWMU (Figs. 5-77 and 5-78). In the absence of screening indicators, or if fewer than two samples provide positive screening indicators, each SWMU will be sampled for laboratory analysis in its center and at one other random point.

26

SWMU 16-025(y). The sampling for the barium nitrate grinding facility footprint SWMU is designed to detect surface barium contamination of heterogeneous soil at a site with potential contamination of minimal severity. Therefore, in the building footprint five field screening samples will be taken to choose two laboratory sample for analysis (Fig. 5-78). The samples will be screened for barium by LIBS or XRF as well as the techniques described above. The field screening samples will be taken in the four quarters of the SWMU, and adjacent to the known location of the door of the structure (Fig. 5-78).

26

SWMUs 16-024(k), 16-024(l), 16-024(m), 16-024(n), 16-024(o), 16-024(p), 16-024(q), 16-024(r). The sampling of these eight decommissioned magazines is designed to detect residual HE on the disturbed surfaces of these SWMUs. Within each SWMU, four surface samples will be field

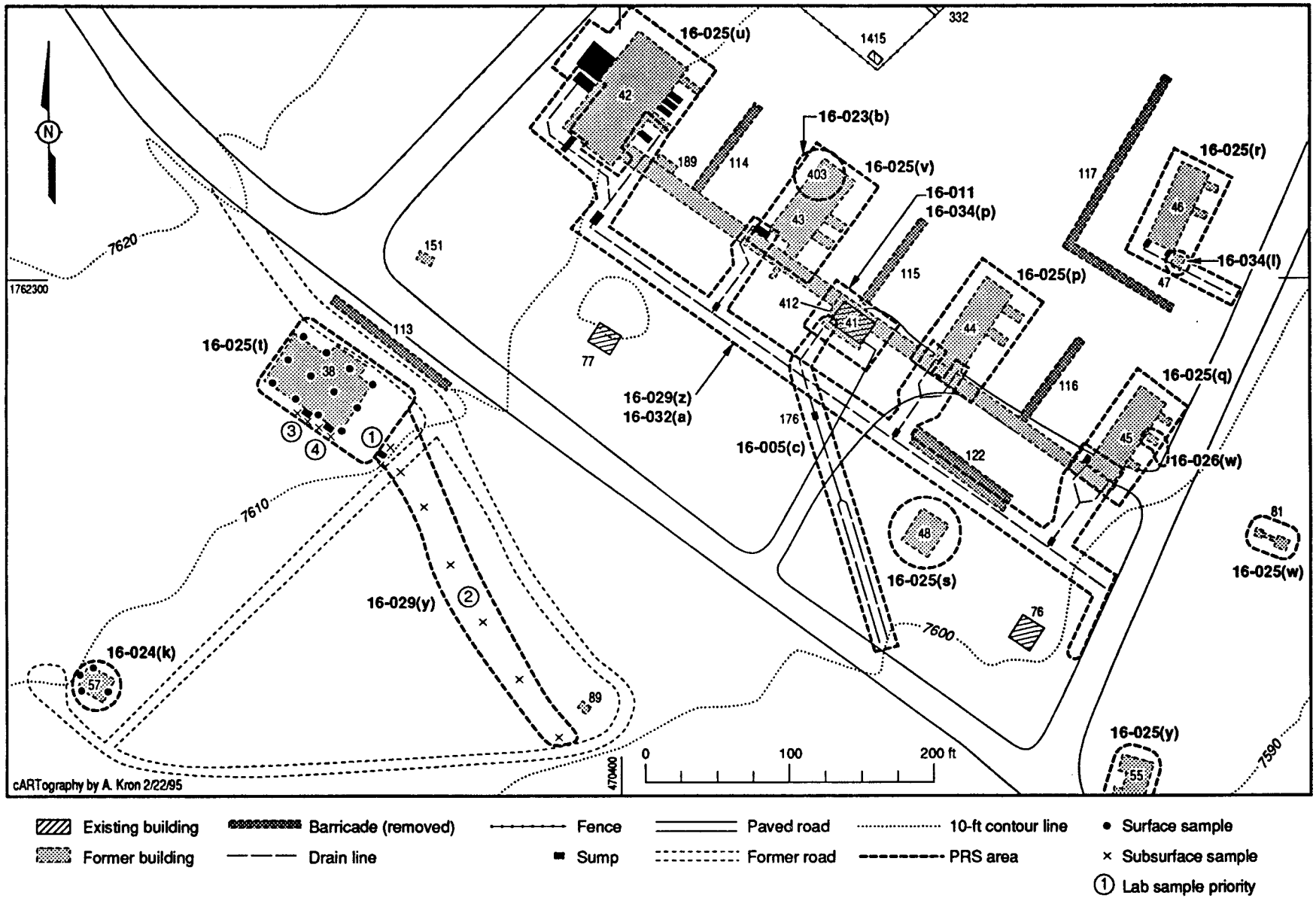

Fig. 5-79. Sampling locations at GMX-2 west.

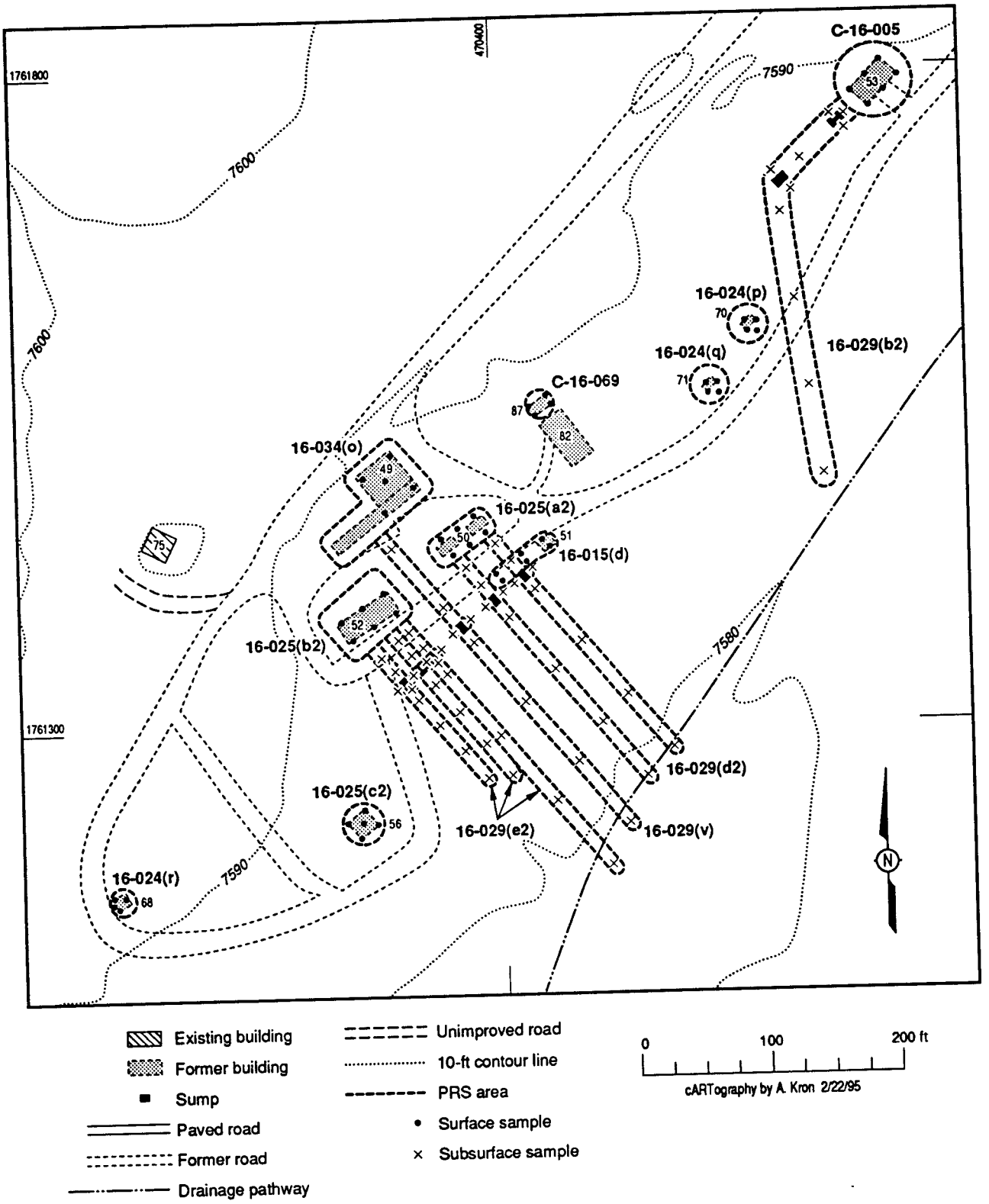

Fig. 5-77. Sampling locations at GMX-2 south.

7e

All field-screening samples that yield positive readings, defined as a positive HE or PID reading or a metals or rad reading two times background or more will be submitted for laboratory analysis. In the absence of positive screening hits, samples will be biased on a PPS-specific basis as outlined below. In the absence of positive field screening readings, the subsurface sample submitted for laboratory analysis will represent the soil-tuff interface for any individual core.

7b

All surface samples will be taken to a 24 in. maximum depth in disturbed areas unless otherwise indicated. At least 300 ml of soil will be collected from each surface sample. Each subsurface core will be augered to the soil-tuff interface.

7c

Sump and septic tank samples will extend to a depth of 3 ft into tuff. Cores will be divided into 12 in. intervals, and each interval will be screened near its midpoint. In cases where multiple positive field screening hits are obtained on a single augered core, the shallowest positive interval,

7d

the deepest positive interval, and the interval below the deepest positive interval will be submitted to the laboratory.

Sample parameters, including complete lists of PCOCs to be analyzed in the laboratory, are summarized in Table 5-102. Field-screening locations are shown in Figs. 5-77, 5-78, and 5-79.

5.20.4.2.1 Surface Sampling

SWMUs 16-025(t), 16-025(z). The sampling of footprints of former casting buildings TA-16-38 and TA-16-37 is designed to detect surface HE contamination in a region of presumed heterogeneous soil contamination of likely moderate to high level. Twelve field screening samples within each building footprint will be taken as shown on Figs. 5-78 and 5-79, in order to choose at least three samples for laboratory analysis. In the absence of field screening indicators, or if fewer than three samples show field indications of contamination, the three samples will be taken in the following order: 1) one near the former primary door of each building; 2) one near the center of the footprint; and, 3) one chosen at random from within the screened samples.

SWMUs 16-015(c), 16-015(d), 16-025(a2), 16-025(b2), C-16-005. The sampling of these two steam cleaning building footprint SWMUs, two

The sampling plan in the main S-Site drainage will be based on qualitative criteria. The design is based on sampling every 200 ft down the drainage starting at the road north of the GMX-2 area and ending 1 200 ft downstream.

5.20.4 Sampling and Analysis Plan

SOPs that control field activities in this sampling plan are listed in Table 5-101. Appropriate health and safety precautions will be undertaken according to the site-specific Health and Safety Plan. Sampling numbers and required analyses are shown in Table 5-102.

5.20.4.1 Engineering Surveys

The PRSs composing this aggregate will be field-surveyed before sample collection. Site mapping is required to accurately record the location of the PRSs. Prior to fieldwork, all building locations will be accurately located (within 2 ft) on a FIMAD base map by ortho-correction of 1947 and 1965 aerial photographs. Subsurface structures will be located using period engineering drawing and field observations when indications of such structures are not visible on aerial photographs. In the field, the engineering survey will locate, stake, and document the location of each PRS, each point for field screening and sampling, and the main drainages exiting S-Site. Geomorphic sediment mapping will be completed in the drainage. Both field screening and laboratory sampling locations will be registered on a base map, scale 1:7 200. If during the course of sampling any sample points must be relocated, the new position will be surveyed and the revised locations will be indicated on the map. The engineering survey will be performed by a licensed professional under the supervision of the field team leader.

5.20.4.2 Sampling

All samples will be field-screened for HE by spot test and radionuclides by gross beta-gamma. All samples from below a depth of 6 in. will be screened using a photo ionization detector (PID). SOPs for these procedures are currently in preparation. The detection limits of the HE spot test are at a level such that a positive reading for TNT or RDX indicates a sample with contamination at a level above its SAL. 7a

TABLE 5-102 (continued)

SUMMARY OF SITE SURVEYS, SAMPLING, AND ANALYSIS FOR GMX-2

		LABORATORY SAMPLES							FIELD SCREENING #							FIELD						LABORATORY ANALYSES #											
			STRUCTURE		SURFACE		SUBSURFACE								A					B				C				D	E	F	G	H	
PRS	PRS TYPE	SAMPLED MEDIA		FIELD DUP		FIELD DUP		FIELD DUP	GROSS ALPHA	GROSS GAMMA/BETA	ORGANIC VAPOR	HE SPOT TEST	BTEX	BARIUM - LIBS	GEOLOGICAL CHARACTERIZATION	GROSS ALPHA	GROSS GAMMA/BETA	TRITIUM	VOLATILE ORGANICS	XRF	SOIL MOISTURE	ALPHA SPECTROSCOPY	GAMMA SPECTROSCOPY	BETA SPECTROSCOPY	TOTAL URANIUM	ISOTOPIC PLUTONIUM	ISOTOPIC URANIUM	VOA (SW 8240)	SEMIVOLATILES (SW 8270)	METALS (SW 6010)	ASBESTOS	HIGH EXPLOSIVES (SW 8330)	CYANIDE
16-029(b2)	Sump	Soil					6			10	10	10																6	6	6		6	
16-029(c2)	Sump	Soil					11			18	18	18												11				11	11	11		11	
16-029(d2)	Sump	Soil					10	1		16	16	16																10	10	10		10	
16-029(e2)	Sump	Soil					15			24	24	24																15	15	15		15	
16-034(m)	Soil contamination	Soil			2	1				5		5																	2	2		2	
16-034(n)	Soil contamination	Soil			2					5		5																	2	2		2	
16-034(o)	Soil contamination	Soil			2					5		5																	2	2		2	
C-16-005	Soil contamination	Soil			2					6		6																	2	2		2	
C-16-069	Trailer site	Soil			1					4		4	4																1	1			
Drainage					11					11		11											11	11	11	11			11	11		11	11

Integers indicate minimum numbers of laboratory, field laboratory, and field screening samples for each PRS.
= The actual number of samples will depend on the depth of the cores and the number of screening hits.
A, B, C = not applicable; D = full suite VOA samples will be analyzed from the bottom half of surface cores; E = full suite; F = 1082 suite (barium, beryllium, cadmium, chromium, mercury, copper, lead, nickel, thallium, zinc); H = full suite.

TABLE 5-102

SUMMARY OF SITE SURVEYS, SAMPLING, AND ANALYSIS FOR GMX-2

PRS	PRS TYPE	SAMPLED MEDIA	LABORATORY SAMPLES: STRUCTURE	STRUCTURE FIELD DUP	SURFACE	SURFACE FIELD DUP	SUBSURFACE	SUBSURFACE FIELD DUP	FIELD SCREENING #: GROSS ALPHA	GROSS GAMMA/BETA	ORGANIC VAPOR	HE SPOT TEST	BTEX	BARIUM - LIBS	A: GEOLOGICAL CHARACTERIZATION	FIELD: GROSS ALPHA	GROSS GAMMA/BETA	TRITIUM	VOLATILE ORGANICS	B: XRF	SOIL MOISTURE	LABORATORY ANALYSES #: ALPHA SPECTROSCOPY	GAMMA SPECTROSCOPY	C: BETA SPECTROSCOPY	TOTAL URANIUM	ISOTOPIC PLUTONIUM	ISOTOPIC URANIUM	D: VOA (SW 8240)	E: SEMIVOLATILES (SW 8270)	F: METALS (SW 6010)	G: ASBESTOS	H: HIGH EXPLOSIVES (SW 8330)	CYANIDE
16-005(e)	Septic system	Soil					4			4	4	4												4				4	4	4		4	4
16-015(c)	Steam cleaning	Soil			2					6		6																	2	2		2	
16-015(d)	Steam cleaning	Soil			2					6		6																	2	2		2	
16-024(k)	Burned magazine	Soil			1					4		4																	1	1		1	
16-024(l)	Burned magazine	Soil			1					4		4																	1	1		1	
16-024(m)	Burned magazine	Soil			1					4		4																	1	1		1	
16-024(n)	Burned magazine	Soil			1					4		4																	1	1		1	
16-024(o)	Burned magazine	Soil			1					4		4																	1	1		1	
16-024(p)	Burned magazine	Soil			1					4		4																	1	1		1	
16-024(q)	Burned magazine	Soil			1					4		4																	1	1		1	
16-024(r)	Burned building	Soil			1					4		4																	1	1		1	
16-025(t)	Burned building	Soil			3	1				12		12													3				3	3		3	
16-025(w)	Burned building	Soil					2			4	4																	2	2				
16-025(y)	Burned building	Soil			2					5		5		5															2	2		2	
16-025(z)	Burned building	Soil			3					12		12												3					3	3		3	3
16-025(a2)	Burned building	Soil			2					6		6																	2	2		2	
16-025(b2)	Burned building	Soil			2					6		6																	2	2		2	
16-025(c2)	Burned building	Soil			2	1				5		5																	2	2		2	
16-029(v)	Sump	Soil					5			8	8	8																5	5	5		5	
16-029(y)	Sump	Soil					6	1		12	12	12													6			6	6	6		6	
16-029(a2)	Sump	Soil					4			7	7	7		7														4	4	4		4	

specific information concerning any of these magazines is available; however, a former site worker (Martin 1993, 15-16-477) suggests that TA-16-57 [SWMU 16-024(k)] was not extensively utilized, and also states that operations in magazines are likely to have spilled HE within the magazines. Prior to their being burned in 1960, it was determined that all of these structures were contaminated with HE (Engineering Department 1959, 15-16-256).

C-16-069 represents potentially contaminated media associated with structure TA-16-87. This building was a standard Signal Corps trailer that was used as a machine shop for metallic parts. It was located in the southern part of the GMX-2 area, northeast of TA-16-49 (Fig. 5-73). The structure was located on flat terrain. TA-16-87 contained no hazardous materials, including HE, when it was surveyed in the late 1950s (Engineering Department 1959, 15-16-256). It was removed and returned to the Atomic Energy Commission in 1957.

SWMUs 16-025(t) and 16-029(y) contain potentially contaminated surface and subsurface soil associate with decommissioned TA-16-38 and its associated sump and drain line system. TA-16-38 was located southwest of TA-16-42 (Fig. 5-75). The area containing the building's footprint is flat with a slight slope to the east. The drain line from the sump system went beneath the road to magazine TA-16-57, under the road to TA-16-49, and emptied into the main drainage ditch for World War II era S-Site south of TA-16-53.

TA-16-38 was a large rectangular building, divided into four sections. These were 30 ft long x 32 ft wide x 12 ft high, 10 x 24 x 9, 10 x 15 x 10, and 10 x 15 x 12. A massive concrete two-bay partition was located in the south corner of the building. The building was of wooden-frame construction with a concrete foundation and a concrete floor. Two outlets fed two sumps located on the southeast side of the building (Fig. 5-75). These sumps fed a secondary sump (over 15 ft deep) located approximately 50 ft southeast of TA-16-38. A drain line from this sump led southeast, apparently daylighting beyond the road to TA-16-57. A former site worker claims that this sump had a French drain system, which has not been removed, downstream from the HE sump (Martin 1993, 15-16-477).

SWMU 16-015(c) contains potentially contaminated surface soil associated with decommissioned steam cleaning building (TA-16-36) located 10 ft southeast of TA-16-37 (Fig. 5-74). It was of wooden-frame construction on a concrete foundation. The surface is level in its former location. Its effluent drained to the primary sump located on the southeast corner of TA-16-37. Steam cleaning HE processing equipment is likely to have produced large amounts of HE contamination. Prior to its removal in 1960, this structure was shown to be contaminated with HE (Engineering Department 1959, 15-16-256).

SWMU 16-015(d) contains potentially contaminated surface soil associated with another decommissioned steam cleaning building (TA-16-51), which was probably located 100 ft east of TA-16-49 (Fig. 5-73). The location of this building is somewhat uncertain. Most engineering drawings, such as R4-ENG 132, show it located roughly 75 ft east of TA-16-50 whereas at least one drawing, R 882, shows it 50 ft south of TA-16-50. The latter engineering drawing shows a drain line from TA-16-51 to the easternmost sump serving TA-16-50. The building was of wooden-frame construction on a concrete foundation. Currently, the site of this SWMU is level. Steam cleaning machinery is likely to have produced large amounts of HE contamination. Prior to its removal in 1960, this structure was shown to be contaminated with HE (Blackwell 1983, 15-16-076; Engineering Department 1959, 15-16-256).

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SWMUs 16-024(k), 16-024(l), 16-024(m), 16-024(n), 16-024(o), 16-024(p), 16-024(q), and 16-024(r) contain potentially contaminated surface soil associated with HE magazines that were located in the GMX-2 area. TA-16-57 [SWMU 16-024(k)] was located south of TA-16-38 (Fig. 5-75); TA-16-72 [SWMU 16-024(l)] was located north of TA-16-81 (Fig. 5-74); TA-16-66 and TA-16-84 [SWMUs 16-024(m) and 16-024(n)] were located northeast of TA-16-37 (Fig. 5-74); TA-16-024(o) was located south of TA-16-37 (Fig. 5-74); TA-16-70, and TA-16-71 [SWMUs 16-024(p)] and 16-024(q)] were located northeast of TA-16-49 (Fig, 5-73); and TA-16-68 [SWMU 16-024(r)] was located southwest of TA-16-56 (Fig. 5-73). The building dimensions are provided in Table 5-94. They were all of wooden-frame construction with earthen barricades on three sides and on top. All were located on flat terrain, none have nearby well-defined drainages. Little

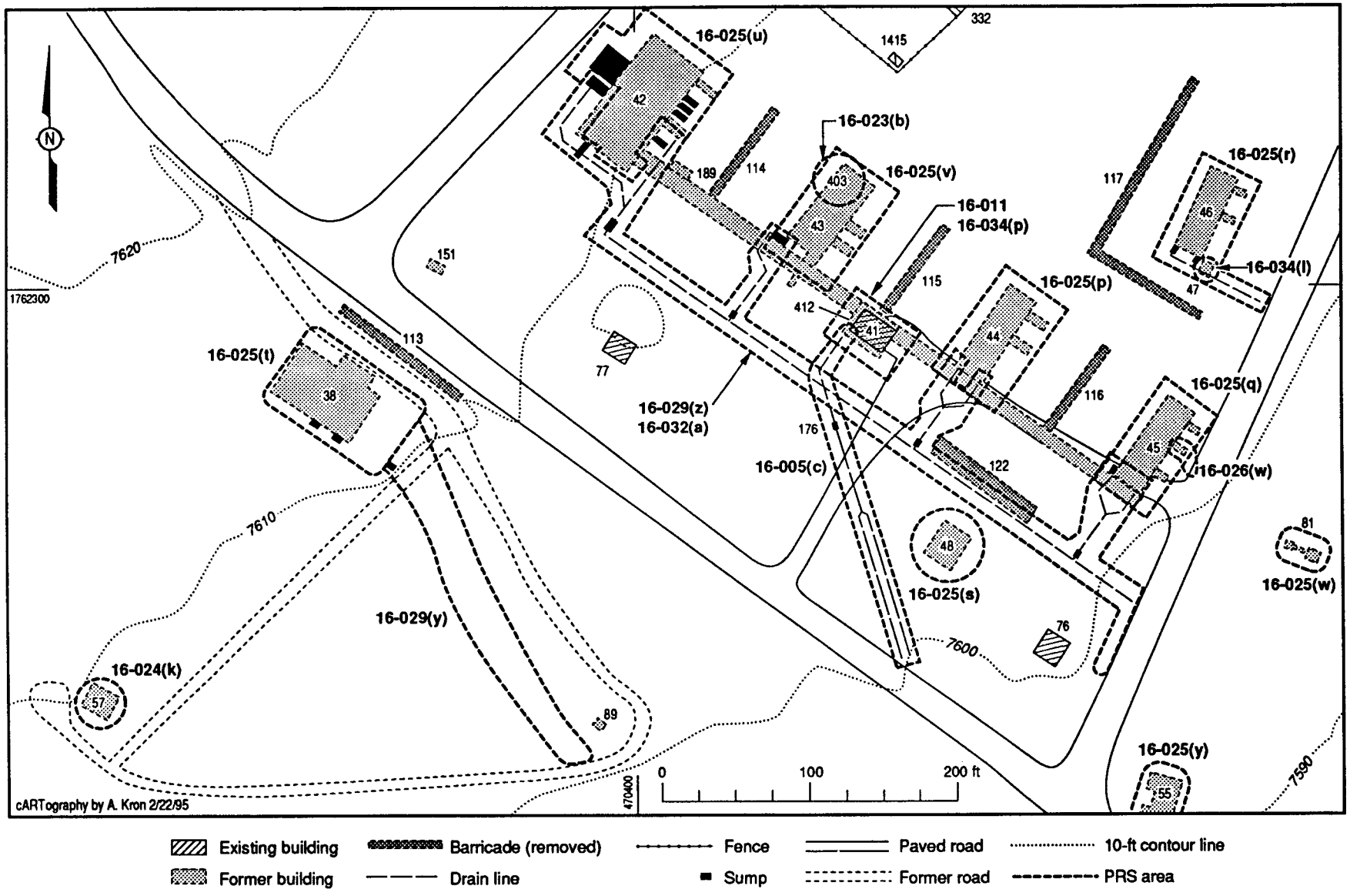

Fig. 5-75. Locations of PRSs at GMX-3 south.

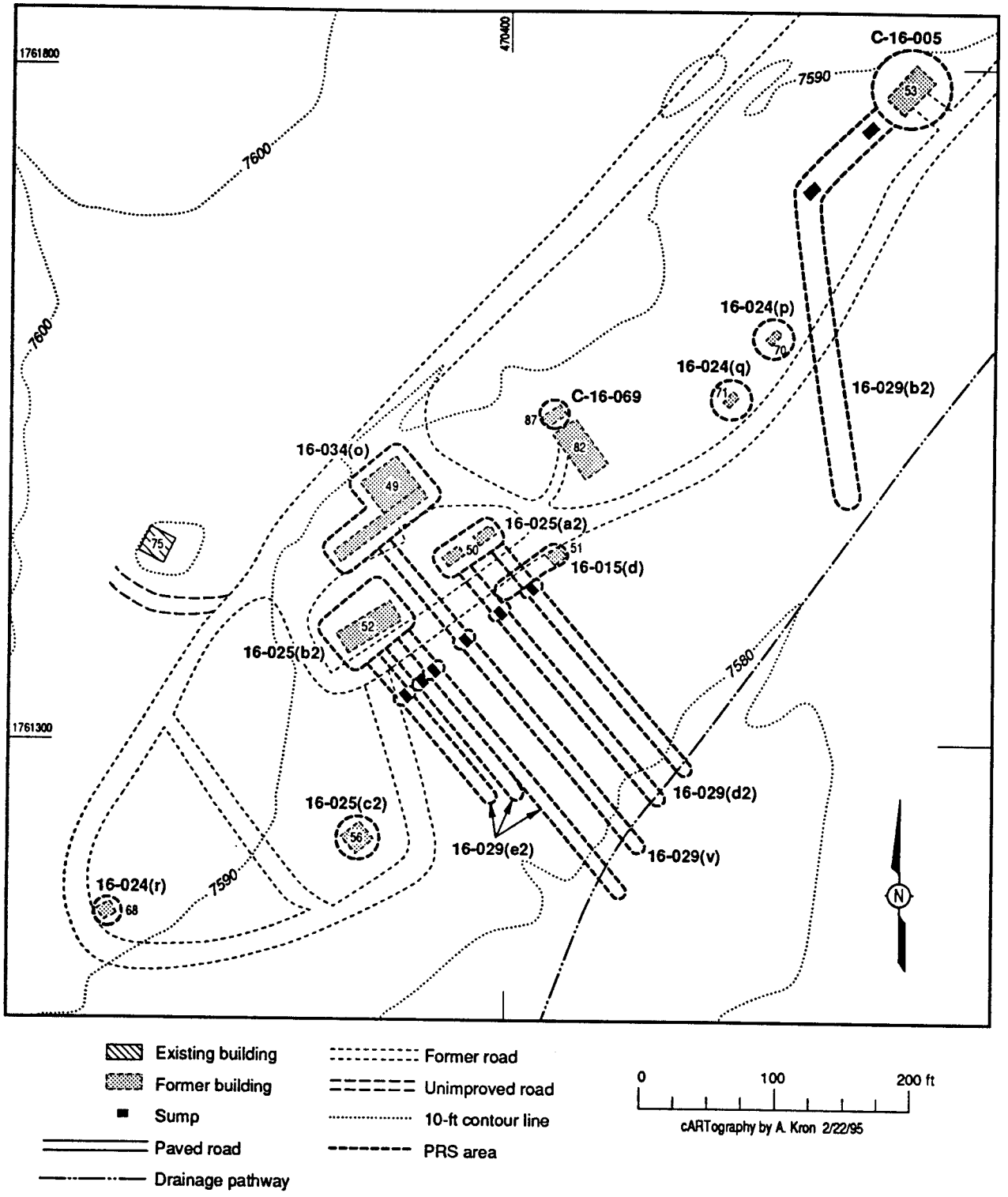

Fig. 5-73. Locations of PRSs at GMX-2 south.

these field-screening samples are shown on Figs. 5-70 and 5-72 with one sample in each of the four quadrants and one in the center of each building. However, unlike most other SWMUs in this aggregate, the hierarchy of biasing samples submitted for laboratory analysis for these SWMUs will be: 1) an above-background (two times) radionuclide reading; 2) positive HE readings; and, 3) a sample from the position of the lead-lined pit in the center of each decommissioned building. In the absence of positive field screening results or if fewer than two samples yield positive screening results, the remaining samples submitted to the laboratory will include: the sample from the center of the SWMU and one other sample selected at random from the remaining samples.

SWMUs 16-024(b), 16-024(c), 16-024(d), 16-025(d), and 16-034(l). The sampling of these three decommissioned magazines, one control building, and one storage building is designed to detect residual HE and HE byproducts on the disturbed surfaces of these SWMUs. For each SWMU, four surface samples will be field screened, as described above, in order to select at least a single 24 in. sample for laboratory analysis. The four field screening samples will be located in each of the four quadrants of each building (Figs. 5-70 and 5-72). SWMU 16-025(d) will be excavated to expose its former footprint prior to sampling. If no positive readings occur, select one laboratory sample at random from each SWMU.

24

SWMU 16-023(b). The sampling of this decommissioned incinerator is designed to detect residual burn products (i.e., benzo(a)pyrene and metals) in surface soil. Five surface samples will be field screened for PAHs, HE, and radionuclides in order to select a minimum of one surface sample for laboratory analysis. Four of the five field screening samples will be located in the four quadrants of the incinerator, and one sample will be taken 5 ft outside of the incinerator boundary in the driveway leading to the incinerator (Fig. 5-72). In the absence of positive field-screening readings, the laboratory sample will be taken in the driveway for the incinerator.

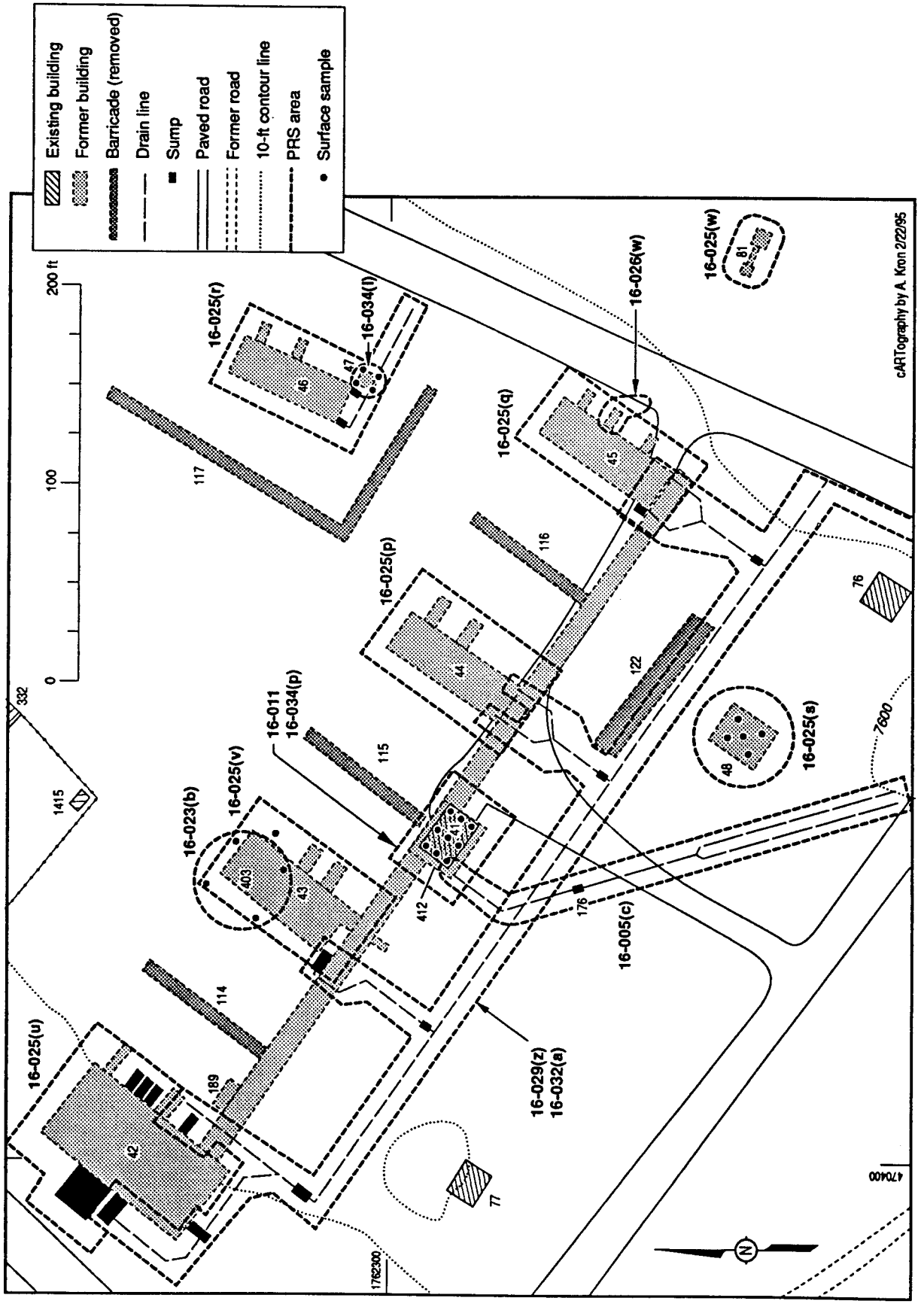

Fig. 5-72. Sampling locations at GMX-3 without sumps, south.

Sample parameters, including complete lists of PCOCs to be analyzed in the laboratory, are summarized in Table 5-93. Field-screening locations are shown in Figs. 5-70, 5-71, and 5-72.

5.19.4.2.1 Surface Sampling

SWMUs 16-011 and 16-034(p). The objective of sampling the decommissioned incinerator and associated decommissioned process building is to determine levels of PAHs or metals present within the debris at the bottom of the incinerator. The incinerator will be field screened for PAHs at nine points and four laboratory samples will be selected based on the field screening. The maximum screening values will be selected. The nine screening locations will be located on the nodes of the grid shown in Fig. 5-72. In the absence of positive field screening indicators or if less than four samples yield positive screening indicators, select the remaining samples randomly.

SWMU 16-025(a). The sampling of this source hutment is designed to detect residual radionuclides on the disturbed surfaces of this SWMU. Four surface samples will be field screened for HE and radionuclides, as described above, in order to select two 24-in. surface samples for laboratory analysis. The positions of these field-screening samples are shown on Fig. 5-70 with one sample in each of the four quadrants. However, unlike most other SWMUs in this aggregate, the hierarchy of biasing samples submitted for laboratory analysis for this SWMU will be: 1) an above-background (two times) radionuclide reading; and, 2) positive HE readings. In the absence of positive field screening results or if fewer than two samples yield positive results, remaining samples submitted to the laboratory will be selected at random.

SWMUs 16-025(b) and 16-025(s). The sampling of these two source hutments is designed to detect residual radionuclides on the disturbed surfaces of these SWMUs. For each SWMU, five surface samples will be field screened for HE and radionuclides, as described above, in order to select at least two surface samples for laboratory analysis. The positions of

5.19.4.1 Engineering Surveys

The PRSs composing this aggregate will be field-surveyed before sample collection. Site mapping is required to accurately record the location of the PRSs. Prior to fieldwork, all structure locations will be accurately delineated (within 2 ft) on a FIMAD base map by ortho-correction of 1947 and 1965 aerial photographs. In the field, the engineering survey will locate, stake, and document the location of each PRS and each point for field screening and sampling. Both field screening and laboratory sampling locations will be registered on a base map, scale 1:7 200. If during the course of sampling any sample points must be relocated, the new position will be surveyed and the revised locations will be indicated on the map. The engineering survey will be performed by a licensed professional under the supervision of the field team leader.

5.19.4.2 Sampling

7a

Most samples will be field-screened for HE by spot test and radionuclides by gross beta-gamma. All samples from below a depth of 6 in. will be field screened using a photo ionization detector (PID). SOPs for these procedures are currently in preparation. The detection limits of the HE spot test are at a level such that a positive reading for TNT or RDX indicates a sample with contamination at a level above its SAL.

7e

All field screening samples that yield positive readings defined as a positive HE or PID reading or as a metals or rad reading 2 times background or more will be submitted for laboratory analysis. In the absence of positive field screening readings or PRS-specific biased sampling points, the sample submitted for laboratory analysis will be selected at random. All surface samples will be taken to a 24 in. maximum depth in disturbed areas. At least 300 ml of soil will be collected from each surface sample. Each subsurface core will be augered to the soil-tuff interface. Sump samples will extend to a depth of 3 ft into the tuff. Cores will be divided into 12 in. intervals, and each interval will be screened near its midpoint. In cases where multiple positive field screening hits are obtained on a single augered core, the shallowest positive interval, the deepest positive interval, and the interval below the deepest positive interval will be submitted to the laboratory.

7b

7d

TABLE 5-93

SUMMARY OF SITE SURVEYS, SAMPLING, AND ANALYSIS FOR GMX-3 BUILDINGS WITHOUT SUMPS

PRS	PRS TYPE	SAMPLED MEDIA	LABORATORY SAMPLES: STRUCTURE	STRUCTURE FIELD DUP	SURFACE	SURFACE FIELD DUP	SUBSURFACE	SUBSURFACE FIELD DUP	FIELD SCREENING #: GROSS ALPHA	GROSS GAMMA/BETA	ORGANIC VAPOR	HE SPOT TEST	POLYCYCLIC AROMATIC HYDROCARBON	BTEX	A: CHROMIUM LIBS	FIELD: GROSS ALPHA	GROSS GAMMA/BETA	TRITIUM	VOLATILE ORGANICS	B: XRF	SOIL MOISTURE	LABORATORY ANALYSES #: ALPHA SPECTROSCOPY	GAMMA SPECTROSCOPY	C: BETA SPECTROSCOPY	TOTAL URANIUM	ISOTOPIC PLUTONIUM	ISOTOPIC URANIUM	D: VOA (SW 8240)	E: SEMIVOLATILES (SW 8270)	F: METALS (SW 6010)	G: ASBESTOS	H: HIGH EXPLOSIVES (SW 8330)	CYANIDE
16-011	Incinerator	Soil			4					9		9	9																4	4		4	
16-023(b)	Incinerator	Soil			1					5		5	5																1	1		1	
16-024(b)	Burned magazine	Soil			1					4		4																	1	1		1	
16-024(c)	Burned magazine	Soil			1					4		4																	1	1		1	
16-024(d)	Burned magazine	Soil			1					4		4																	1	1		1	
16-025(a)	Burned building	Soil			2	1				4		4										2	2		2				2	2		2	
16-025(b)	Burned building	Soil			2					5		5										2	2		2				2	2		2	
16-025(d)	Burned building	Soil			1					4		4																	1	1		1	
16-025(s)	Burned building	Soil			2					5		5										2	2		2				2	2		2	
16-031(d)	Cooling tower	Soil			1					5					5															1			
16-034(l)	Burned building	Soil			1					4		4																	1	1		1	
16-034(p)*	Decom building	Soil																															
C-16-006	Decom building	Soil					1			5	5																	1	1				
C-16-064	Drum storage	Soil			1					5		5																	1	1		1	
C-16-065	Drum storage	Soil					1			5	5			5														1	1				
C-16-067	Drum storage	Soil					1			5	5	5		5														1	1	1		1	

Integers indicate minimum numbers of laboratory, field laboratory, and field screening samples for each PRS.
= The actual number of samples will depend on the depth of the cores and the number of screening hits.
A, B, C = not applicable; D = full suite VOA samples will be taken from the bottom half of each augered core; E = full suite; F = 1082 suite (barium, beryllium, cadmium, chromium, mercury, copper, lead, nickel, thallium, zinc); H = full suite.
* PRS 16-034(p) sampling is covered by PRS 16-011. These PRSs represent the same media.

breakage of a cobalt or radium source, and these were cleaned at the time of the accident with the best available technology. Because radiation measurement technology has improved since the cleanup, it is possible that the cleanup left some residual contamination. In conclusion, the probability of contamination is low to moderate, since all buildings were used for storage of finished products, HE scrap, or chemical supplies.

There are nine PRSs where the problem is not based primarily on the potential HE contamination. PCOCs for the incinerators [SWMU 16-011, SWMU 16-023(b)] include PAHs. PCOCs for the radiography buildings [SWMUs 16-025(a), 16-025(b), 16-025(s)] include cobalt-60 and radium-226. PCOCs for the drum storage areas (C-16-067) include semivolatile organics (e.g., total petroleum hydrocarbons). PCOCs for the solvent storage area [C-16-006] include volatile organic compounds (e.g., carbon tetrachloride).

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5.19.2.2 Decision Process (DQO Step 2)

The decision process for this aggregate is identical to the generic DQO Step 2 presented in Subsection 5.0.2.

5.19.3 Data Needs and Data Quality Objectives

5.19.3.1 Decision Inputs (DQO Step 3)

The decision inputs for this aggregate are those presented in the generic DQO Step 3 in Subsection 5.0.2.

5.19.3.2 Investigation Boundaries (DQO Step 4)

The spatial boundaries of potential contamination for the SWMUs include the PRS boundaries for the decommissioned structures or the inactive incinerators. Although the original location of the PCOCs at the building footprints was the soil surface (less than 6 in.), the decommissioning activities most likely redistributed or covered the PCOCs. Given the shallow soil at S-Site, the depth boundaries for surface soil will be the top 24 in. of soil, or the depth to tuff, whichever is less. The depth boundary for subsurface sampling is the soil-tuff interface.

For each PRS, sampling points will be biased to areas believed to most likely contain the highest concentrations of PCOCs based on field screening,

radiography; and, 8) other metals such as chromium in cooling towers and lead in unusual HE formulations (Table 5-89).

Quantitative analytical data are not available for any of the PRSs located in this aggregate. Quantitative data for the southern GMX-3 area is presented in Subsection 5.18. Screening data from the 1960s are available for a few of the PRSs and are included in the PRS description and history sections.

5.19.1.2.2 Potential Pathways and Exposure Routes

PRSs in this aggregate consist of potential surface contamination due to leaks and spills from former structures and due to combustion and grading of decommissioned buildings. Even though solvents associated with C-16-006 could have volatilized, it is suspected that a portion of the chemicals could have infiltrated soils beneath the former structure.

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The major migration pathway is via surface water runoff that may carry contaminants beyond the original release site to accumulate in sedimentation areas in drainages. The land in this area gently slopes to the south, and surface water eventually drains into the large drainage ditch that runs from north to south. Generation of fugitive dust is not a pathway of concern at this site because the area is covered with grasses and weeds. A detailed discussion of the migration pathways, conversion mechanisms, human receptors, and exposure routes is in Chapter 4.

This site is inactive and removed from current operations. In addition, institutional controls do not permit public access to this area.

5.19.2 Remediation Decisions and Investigation Objectives

5.19.2.1 Problem Statement (DQO Step 1)

In general, the problem statement for this aggregate follows the generic DQOs presented in Subsection 5.0.2. This aggregate consists of inactive incinerators and decommissioned structures without sumps in the GMX-3 area of S-Site. These buildings included a storage building (solvent or oil), magazines for finished HE components, refuse incinerators, and radiography buildings. There is potential for near-surface contamination (upper 24 in. of soil) at most PRSs in this aggregate. Two radiography buildings [SWMU 16-025(b), SWMU 16-025(s)] had known releases of radionuclides from the

Thus, it is likely either that radiography or the storage of sources occurred in TA-16-39.

TA-16-40 [SWMU 16-025(b)] was constructed west of TA-16-39 in 1950 to provide gamma radiography within the GMX-3 area. It was fairly small, about 20 ft^2 and had earthen barricades on two sides. TA-16-40 contained a lead-lined pit in the floor for radioactive sources (Engineering drawing ENG-C 5935). When the building was examined in 1957 by H-1, it was found to be contaminated by cobalt-60 at a spot on the floor (12 mr/h) and on a source plug (0.1 mr/h) (Buckland 1957, 15-16-243). In the same memo, H-1 recommended that Zia Company remove the radiation-contaminated materials. In 1966 the debris of this building and TA-16-39 were checked for radioactivity before cleanup, but no radioactivity was found (Buckland 1966, 15-16-136).

TA-16-48 [SWMU 16-025(s)] was a part of the 40s-Line. It is listed as a smoking room in the Facilities Engineering Structures List but elsewhere (Engineering drawing ENG-R 132) as a radium building. According to a former site worker (Truslow 1973, 15-16-264), "It housed a radium source used in gamma-graphing large or high density objects." A former site worker believed that this was a radium facility and noted that during a small earthquake the radium source was crushed by a lead pig; contamination associated with this spill was cleaned up thoroughly (Martin 1993, 15-16-477).

All three of these source hutments were shown to be contaminated with HE during the late 1950s surveys (Engineering Department 1959, 15-16-256). A former site worker (Blackwell 1983, 15-16-076) suggested that TA-16-39 and TA-16-40 were contaminated with cobalt-60, radium-226, and uranium-238 and that TA-16-48 was contaminated with uranium-238.

5.19.1.1.4 Cooling Tower

SWMU 16-031(d) contains potentially contaminated soil associated with decommissioned cooling tower TA-16-28, located roughly 70 ft east of TA-16-27 (Fig. 5-69). Currently the site of the tower is level. The former location of TA-16-28 drains into the same drainage ditch as the rest of the 20s-Line. The cooling tower was of wooden-frame construction, 28 ft long x 28 ft wide x 46 ft high. This tower was used to store water used in cooling

TA-16-31, TA-16-32, and TA-16-33, and TA-16-34 stored machined product for physical and x-ray examination. TA-16-30 was burned in 1960 but TA-16-34 had caved in and was not burned at that time, nor does it have a known destruction date [Wingfield 1960, 15-16-111]. A rough measurement (from a photograph) of the earthen mounds over these magazines suggests each was covered by roughly 5 000 ft^3 of soil. TA-16-74 [SWMU 16-024(d)] was built in 1946 for storing HE in transit to the machining buildings TA-16-31, TA-16-32, and TA-16-33 but it was later used with the 20s-Line casting operation and held the cast HE after (and perhaps before) sawing of risers. TA-16-74 was removed in 1949 and the earthen barricade for TA-16-88 was built over its former location. This barricade is still present. The magazines were regarded as HE contaminated when they were surveyed in the late 1950s (Engineering Department 1959, 15-16-256) prior to burning in March 1960 [Wingfield 1960, 15-16-117]. There is no information about their removal.

5.19.1.1.3 Radiography Buildings

SWMUs 16-025(a,b,s) contain potentially contaminated surface soil associated with radiography buildings TA-16-39, TA-16-40, and TA-16-48, respectively (Figs. 5-67 and 5-68). All were relatively small (TA-16-39, 16 ft long x 16 ft wide x 9 ft high; TA-16-40, 20 ft long x 20 ft wide x 14 ft high with a 8.5 ft wide x 12 ft long x 11 ft high lean-to; TA-16-48, 20 ft long x 20 ft wide x 14 ft high) wooden-frame buildings with concrete floors. TA-16-40 and TA-16-48 both had source pits in their floors. All lie on level ground with no obvious drainages.

TA-16-39 [SWMU 16-025(a)] was built in early 1945, lay west of the 30s-Line machining buildings, and served as a film loading building for HE radiography at T-Site (Martin 1993, 15-16-477). The Facilities Engineering Structure List suggests that it was a radiographic building and claims it had a lead-lined pit. This claim is contradicted by an engineering drawing (Engineering drawing ENG-C 5675) that shows it to have shelf-lined walls and a concrete slab floor with no pit. Also, it was reported that TA-16-39 had cobalt-60 contamination at 10 mr/h on a source cartridge carrier and 1 mr/h on a spot on the floor prior to destruction by burning (Russo 1957, 15-16-443).

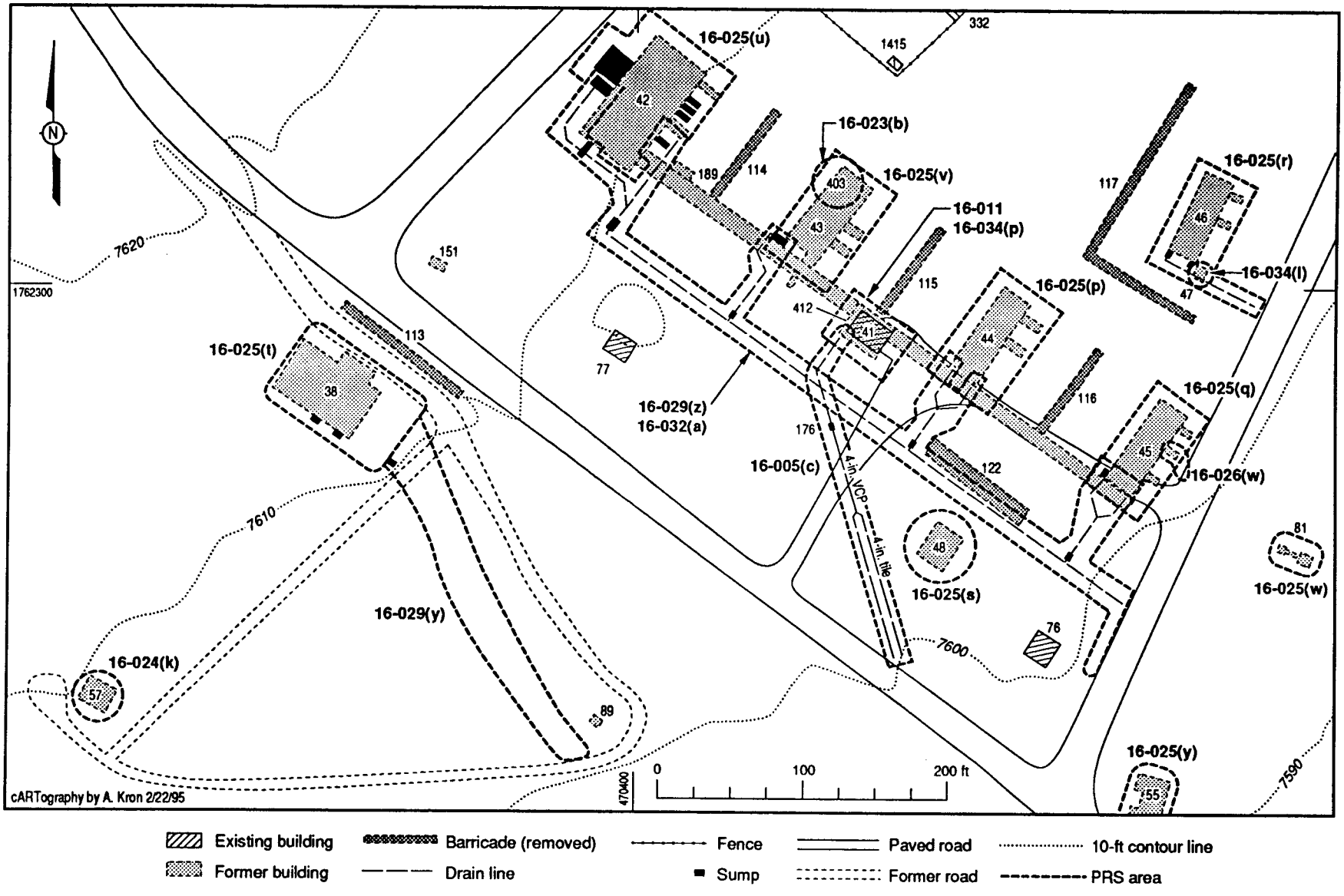

Fig. 5-67. Locations of PRSs at GMX-3, south.

field screening subsurface samples will be used to select at least five samples for laboratory analysis. Three field screening samples will be taken adjacent to each secondary sump associated with the 40s-Line (Fig. 5-65). In the absence of positive field screening results, or if less than four samples yield positive screening results, take one laboratory sample at random at the location of each secondary sump. In addition, one screening sample will be taken at each connection point that can be located, and the fifth laboratory sample will be taken at the end of the drainline near TA-16-45.

20

SWMU 16-026(q). The objective of sampling the ten removed sumps and adjacent drain lines for TA-16-27 is to detect residual subsurface HE within the boundaries of the SWMU. Twenty-seven field screening subsurface samples will be used to select fourteen samples for laboratory analysis. Two field screening samples will be taken adjacent to each sump (Fig. 5-64). At least one sample from each of the former sump locations will be submitted for laboratory analysis. Additional field screening samples will be taken at the joints and connections points that can be located for the drainlines. If connection points cannot be located for the former drainlines, two field screening samples will be taken from the north drainage for TA-16-27 and five field screening samples will be taken from the south drainage. From these field screening samples, at least four additional samples will be selected for laboratory analysis. The additional four laboratory samples will be taken from field screening samples at drainline joints in the following order: 1) from the north drainage for TA-16-27; 2) from the south drainage; 3) near the road; 4) near the culvert. These drainage areas and sumps are labeled one through four on Fig. 5-64. These sumps were selected to provide information on wastes discharged from different portions of TA-16-27.

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5.18.4.2.3 Drainage Sampling

22

The main drainage for the GMX-3 region will be sampled five times. Each of these five samples will be sent for laboratory analysis. Depth of samples will be 6 in. because the drainages are undisturbed. These surface sampling points are distributed at roughly 200 ft intervals south of the discharge point of the 20s-Line SWMUs southeast of the road corner (Fig. 5-66). Sampling

taken along the long drain line north of the manhole (Fig. 5-63). In the absence of positive field screening results, one laboratory sample will be taken at the former site of the manhole and the others will be taken at random from the negative screened samples.

SWMU 16-032(c). The objective of sampling the former locations of the sumps, drain lines, and pond associated with TA-16-26 is to detect subsurface and surface residual HE within the boundaries of the SWMU. Twenty field screening samples will be used to select at least seven laboratory samples for analysis. At least one of the laboratory samples will come from the rock-lined drainage ditch. Two field screening samples will be located directly adjacent to the former location of each of two TA-16-26 sumps, seven field screening samples will be located in the north drainage of TA-16-26, five field screening samples will be taken from the south drainage of TA-16-26, and four screening samples will be located in the inferred location of the pond south of TA-16-26 (see Fig. 5-64). In the absence of positive indications, or if less than seven samples yield any positive indications, select the additional laboratory samples from the following locations: 1st) a sample near the north sump; 2nd) a sample near the south sump; 3rd) a sample within 20 ft of the north sump; 4th) a sample within 20 ft of the south sump; 5th) a sample at the distal end of the north drainage; 6th) a sample from the rock-lined drainage ditch; and, 7th) a sample in the north of the pond. 18

SWMU 16-029(z). The objective of sampling the primary sumps and adjacent drain lines for TA-16-42, TA-16-43, TA-16-44, and TA-16-45 is to detect residual subsurface HE within the boundaries of the SWMU. Sixteen field screening subsurface samples will be used to select at least eight samples for laboratory analysis (Fig. 5-65). Two field screening samples will be taken adjacent to each sump associated with the 40s-Line: three sumps at TA-16-42, one at TA-16-43, two at TA-16-44, and two at TA-16-45. At least one sample from each of the locations of former sumps will be submitted for laboratory analysis. In the absence of positive field screening indicators, select one sample at random from the locations of each of the former sumps. 19

SWMU 16-032(a). The objective of sampling the secondary sumps and adjacent drain lines for TA-16-42, TA-16-43, TA-16-44, and TA-16-45 is to detect residual subsurface HE within the boundaries of the SWMU. Twelve

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SWMUs 16-029(m), 16-029(n), 16-029(o), 16-029(p). The objective of sampling the sumps for the decommissioned machining buildings TA-16-95, TA-16-96, TA-16-97, and TA-16-98 is to locate residual HE in the subsurface for these SWMUs. Because any contamination at these small SWMUs is likely to be moderately heterogeneous because of their small size and moderately serious in likelihood of potential contamination, take three cored screening samples from within each SWMU boundary, as shown on Fig. 5-63 in order to select at least two samples for laboratory analysis. If less than two samples for each SWMU yield positive screening indicators, select any needed laboratory samples at random from within the negative screening samples.

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SWMUs 16-024(e), 16-025(e), and 16-025(f). These SWMUs include both sumps and building footprints, but are considered with subsurface sampling because the sumps are more likely to be contaminated than are the building footprints. The objective of sampling the sumps for machining line buildings TA-16-31, TA-16-32, and TA-16-33 is to locate residual HE in the subsurface portions of these SWMUs. The subsurface portion of each of these SWMUs may be relatively homogeneous, so two field-screened subsurface cores will be taken in each sump and sent for laboratory analysis in each SWMU (Fig. 5-63).

In addition, six field screening samples will be taken to choose at least two laboratory samples in each building footprint (Fig. 5-63). In the absence of positive field screening results, or in a case where less than two positive values occur, the additional laboratory samples will be chosen using the following ranking: 1) near the north door of each machining area; and, 2) near the center of each building.

SWMU 16-029(h2). The objective of sampling the manhole and drain line associated with operations in TA-16-95, TA-16-96, TA-16-97, and TA-16-98 is again detection of subsurface residual HE in the boundaries of the SWMU. Ten field screening samples will be used to select at least three laboratory samples for analysis. The disposition of those samples is shown on Fig. 5-63. In summary, one field screening sample will be taken in front of each machining building (TA-16-95, TA-16-96, TA-16-97, and TA-16-98), two will be taken at the former site of the manhole, and the remaining four will be

these samples are shown on Fig. 5-65; one is in the center of the building footprint, the other is near the known location of its primary entrance.

SWMU 16-005(c). The sampling of this decommissioned septic tank is designed to detect the presence of subsurface HE. Four subsurface cores to bedrock will be field screened within the surveyed SWMU boundaries in order to select at least one laboratory sample. These cores will be located at evenly spaced intervals along the SWMU (Fig. 5-65). In the absence of positive field screening indications of HE or radionuclides, the laboratory sample will be chosen at the location of the tank itself.

SWMU 16-005(d). The sampling of this decommissioned septic tank is also designed to detect the presence of subsurface HE; more samples are being taken than at the previous tank because of the presumed more serious nature of this SWMU. Five subsurface cores to bedrock will be field screened at locations along the septic line to select at least three samples for analysis. The screening locations are shown on Fig. 5-64. In the absence of positive readings the samples will be taken in the proximal and distal ends of the line, and in the tank region (Fig. 5-64).

SWMUs 16-029(r) and 16-029(f2). The sampling of the decommissioned sumps and drain lines for TA-16-24 and TA-16-25 is designed to detect the presence of subsurface HE at the sumps for these two process buildings that were minimally used for activities that disrupted HE. In each case, eight field screening cores to bedrock will be used to select at least three samples for laboratory analysis. Two of these cores for field screening will be located near the sump location or former building site, the other six will be located along the inferred location of the drain lines as shown on Fig. 5-64. In the absence of field screening indicators, or if fewer than three samples show positive field indicators, use the following hierarchy to select the remaining laboratory samples: 1) the two samples near the sump and 2) the nearest sample downstream along the drain line.

SWMU 16-026(w). The objective of sampling the outfall for the decommissioned photography lab is to detect residual silver in the subsurface in the outfall and drainage associated with this SWMU. Because this PRS is considered relatively homogeneous, select at least two laboratory samples within the SWMU boundaries as shown on Fig. 5-65.

absence of field screening indicators, or in a case of a limited number of samples showing field indicators, the following ranking will be used to select the samples: 1) a sample near the door; 2) a sample in the basement area; and, 3) a sample in the southern quadrant.

SWMU 16-025(u). The sampling of the footprint of the former casting building TA-16-42 is designed to detect surface contamination in a region of presumed very serious heterogeneous soil contamination. Twenty-two field screening samples will be taken within the SWMU boundaries on the pattern shown in Fig. 5-65. Six laboratory samples will be taken based on positive field screening results. In the unlikely absence of positive HE screening results, or if less than six samples yield positive results, the laboratory samples will be taken in the following order: 1) near the former north door where HE contamination was found in the blowtorch study (see Fig. 5-61); 2) near the center of the footprint; 3) near the south door; 4) at the point nearest the location of the east sump; 5) at the point nearest the location of the west sump; and, 6) at the point nearest the location of the south sump.

12

5.18.4.2.2 Subsurface Sampling

SWMU 16-025(r). This SWMU includes both sumps and the building footprint of TA-16-46, but is considered with subsurface sampling. The sampling of the sumps is designed to detect the presence of subsurface HE. The exact depth of the sumps is unknown, although typically they were set a few inches to a foot or two into the soil. According to engineering drawing C 5678, the sumps were each 6 ft x 3.5 ft x 5 ft tall constructed of wire-mesh reinforced concrete with a waterproof liner, wooden baffles, and a 4 in. vitreous clay drain pipe. Two subsurface cores to a depth of 3 ft into tuff will be screened at the location of each sump to select at least one sample for laboratory analysis from each sump (Fig. 5-65). For positive field screening hits obtained on a single augered core, samples from the shallowest positive interval, the deepest positive interval, and the interval below the deepest positive interval will be submitted for laboratory analysis. For either sump, in the absence of any positive field screening readings select the sample for laboratory analysis randomly. Two surface samples from the building footprint will be submitted for laboratory analysis. The locations of

14b

7d

14a

14c

door and at another sampling location selected randomly from within the screening samples.

SWMUs 16-025(g), 16-025(h), 16-025(i). The sampling of these three building footprint SWMUs is designed to detect surface HE contamination of nonhomogeneous soil at the former site of building footprints where the likelihood of contamination is low. Therefore, six field screening samples will be taken in each building footprint to choose at least three samples for laboratory analysis. The field screening samples will be taken in the four quarters of each footprint, in the building center, and adjacent to a former location of the buildings' doors (Fig. 5-63). In the absence of positive field screening results, or in a case where less than two positive values occur, the additional laboratory samples will be chosen using the following ranking: 1) near a door of the HE processing area; 2) near the center of the building; and, 3) at a point selected at random from the other screening points.

9

SWMU 16-025(v). The sampling of the footprint of former machining building TA-16-43 is designed to detect surface HE contamination in a region of presumed heterogeneous soil contamination of likely moderate level. Twelve field screening samples will be taken within the building footprint (10) and adjacent to its north door (2), as shown on Fig. 5-65, in order to choose three samples for laboratory analysis. These field screening points are disposed with two each in each of the four quarters of the building footprint, two near a door, and two in the center of the building footprint (Fig. 5-65). In the absence of field screening indicators, or if less than three samples show field indications of contamination, the additional samples will be taken in the following order: 1) one near the door of the building; 2) one in the east quadrant; and, 3) one in the south quadrant.

SWMU 16-025(l). The sampling of the footprint of former casting building TA-16-26 is designed to detect surface contamination in a region of presumed serious heterogeneous soil contamination. Fifteen field screening samples will be taken within the building footprint (13) and adjacent to its southwest door (2) in order to choose at least three samples for laboratory analysis (Fig. 5-64). These field screening samples will be disposed with two in each quadrant of the SWMU, two in the center of the SWMU, two near the southwest door and three in the former location of the basement. In the

11

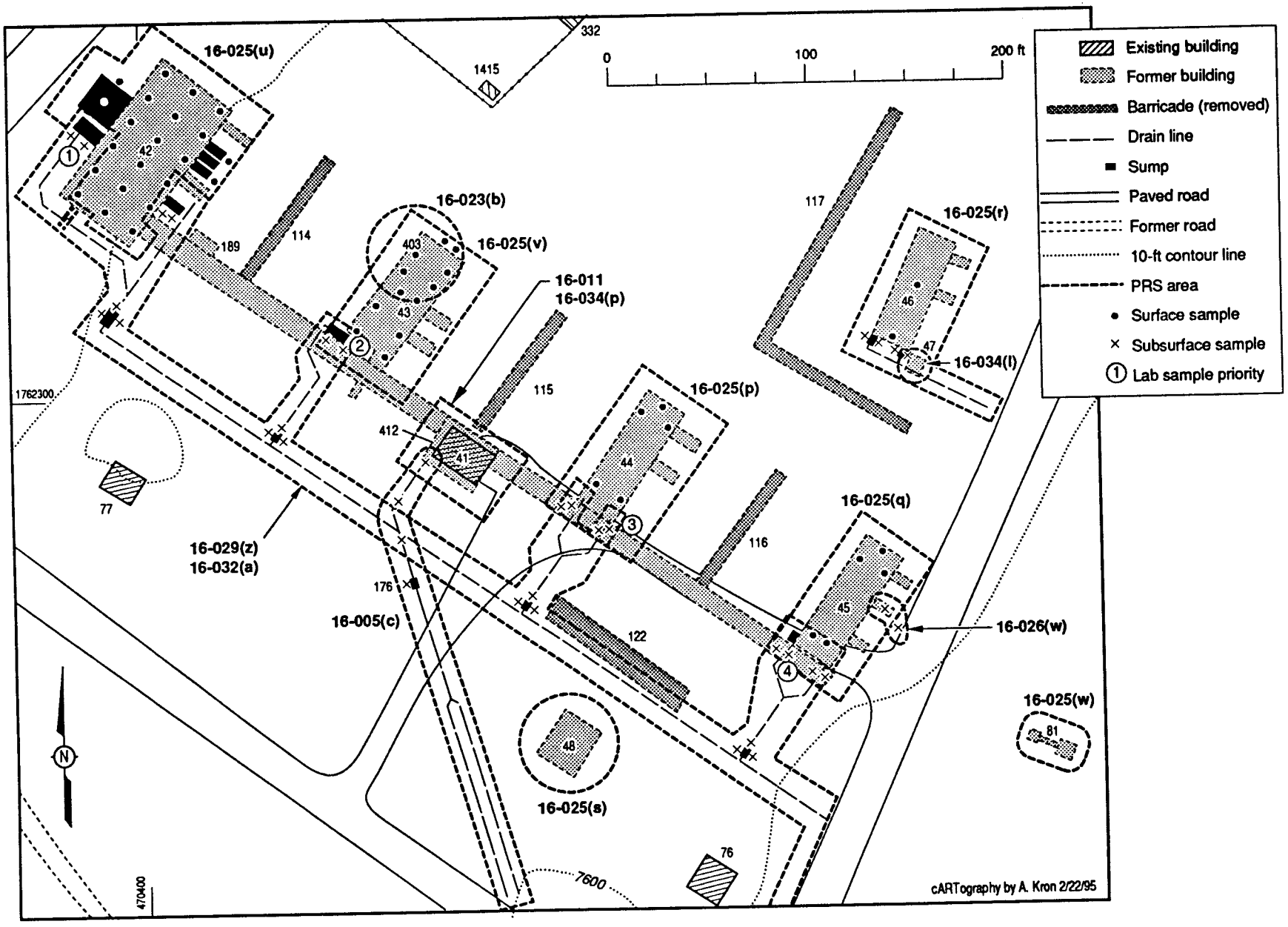

Fig. 5-65. Sampling locations at GMX-3 south.

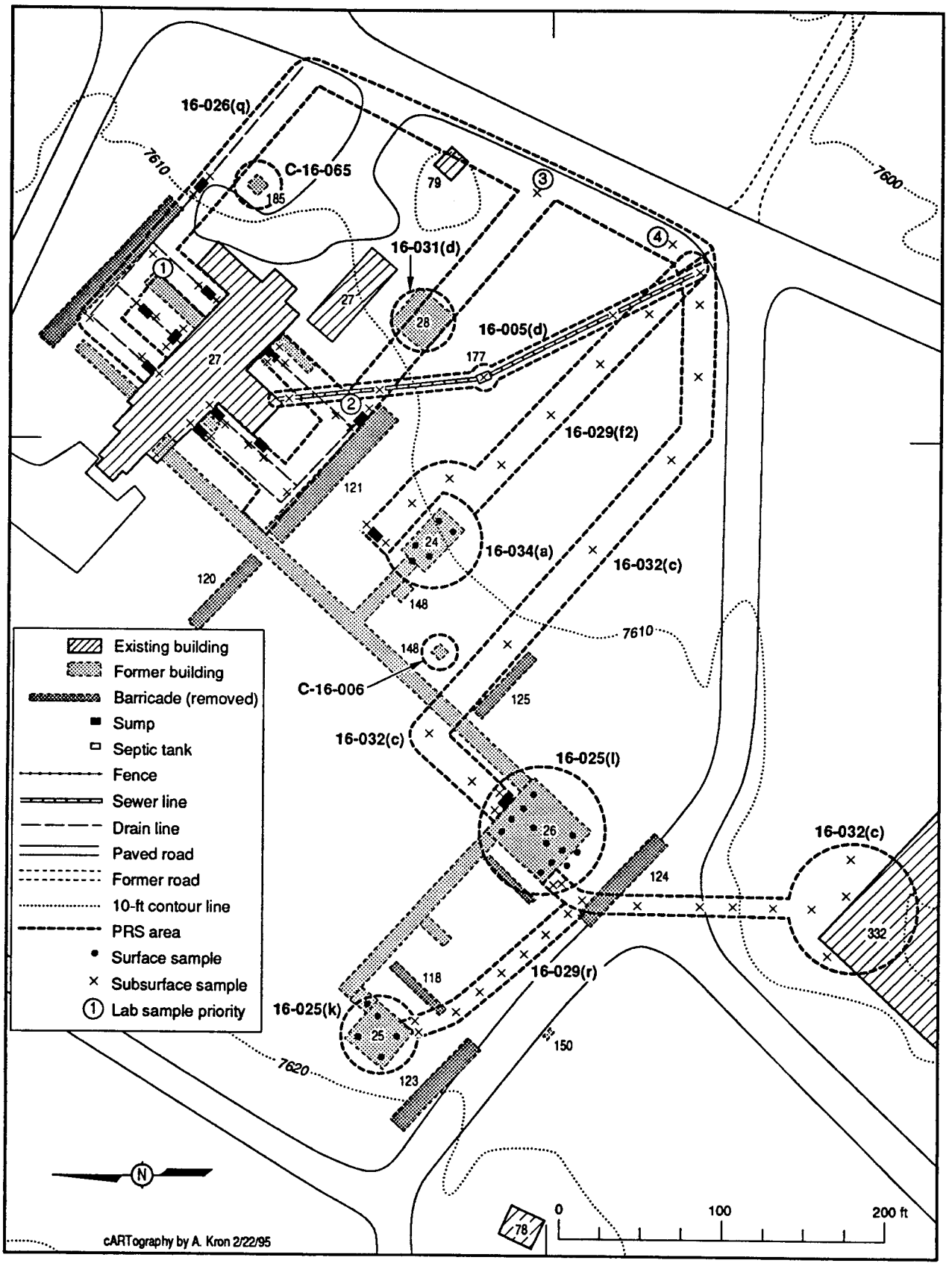

Fig. 5-64. Sampling locations at GMX-3 central.

All field-screening samples that yield positive readings, defined as a positive HE or PID reading or a metals or rad reading 2 times background or more, will be submitted for laboratory analysis. In the absence of positive screening hits, samples will be biased on a PPS-specific basis as outlined below. In the absence of positive field screening readings, the sample submitted for laboratory analysis will represent the soil-tuff interface from any individual core. The rationale for selecting this interval is that most structures were likely excavated into the tuff, and contaminants are likely to be concentrated near the zone of permeability contrast. In addition, this region is least likely to have been disturbed by grading activities during decommissioning. 13 7e

Surface samples will be to a 24 in. maximum depth in disturbed areas unless otherwise indicated, and at least 300 ml of soil will be collected. Each subsurface core will be augered to the soil-tuff interface. Sump and septic tank samples will extend to a depth of 3 ft into tuff. Cores will be divided into 12 in. intervals, and each interval will be screened near its midpoint. In cases where multiple positive field screening hits are obtained on a single augered core, the shallowest positive interval, the deepest positive interval and the interval beneath the deepest positive interval will be submitted to the laboratory. 7b 7c, 10, 11, 14 7d

Sample parameters, including complete lists of PCOCs to be analyzed in the laboratory, are summarized in Table 5-87. Field screening locations are shown in Figs. 5-63, 5-64, and 5-65.

5.18.4.2.1 Surface Sampling

SWMUs 16-025(j), 16-025(k), 16-025(p), 16-025(q), and 16-034(a). The sampling for these five building footprint SWMUs is designed to detect surface HE contamination of nonhomogeneous soil at the site of building footprints with minimal severity of potential contamination. Therefore, five field screening samples will be taken in each building footprint to choose laboratory samples for analysis. SWMUs 16-025(j,k,p) will receive a minimum of three laboratory samples and SWMUs 16-025(q) and 16-034(a) a minimum of two lab samples. The field screening samples will be taken in the four quarters of each building, and adjacent to the known location of a door of each structure (Figs. 5-63, 5-64, and 5-65). In the absence of screening indicators, each SWMU will be sampled once for laboratory analysis near a 8

TABLE 5-87 (continued)

SUMMARY OF SITE SURVEYS, SAMPLING, AND ANALYSIS FOR GMX-3 BUILDINGS WITH SUMPS AND OUTFALLS

			LAB SAMPLES						FIELD SCREENING #							FIELD						LABORATORY ANALYSES #										
			STRUCTURE		SURFACE		SUBSURFACE								A					B				C					D	E	F	G	H	
PRS	PRS TYPE	SAMPLED MEDIA		FIELD DUP		FIELD DUP		FIELD DUP	GROSS ALPHA	GROSS GAMMA/BETA	ORGANIC VAPOR	HE SPOT TEST	GEOPHYSICS SURFACE	BARIUM - LIBS	GEOLOGICAL CHARACTERIZATION	GROSS ALPHA	GROSS GAMMA/BETA	TRITIUM	VOLATILE ORGANICS	XRF	SOIL MOISTURE	ALPHA SPECTROSCOPY	GAMMA SPECTROSCOPY	BETA SPECTROSCOPY	TOTAL URANIUM	ISOTOPIC PLUTONIUM	ISOTOPIC URANIUM	VOA (SW 8240)	SEMIVOLATILES (SW 8270)	METALS (SW 6010)	ASBESTOS	HIGH EXPLOSIVES (SW 8330)	CYANIDE
16-029(o)	Sump	Soil					2			3	2	3																2	2	2		2	
16-029(p)	Sump	Soil					2			3	2	3																2	2	2		2	
16-029(r)	Sump TA-16-25	Soil					3			8	8	8																3	3	3		3	
16-029(z)	Sump TA-16-42	Soil					8			16	16	16																8	8	8		8	8
16-029(f2)	Sump TA-16-24	Soil					3			8	8	8																3	3	3		3	
16-029(h2)	Sump	Soil					3			10	10	10																3	3	3		3	
16-032(a)	Sump	Soil					5			12	12	12											5					5	5	5		5	5
16-032(c)	Sump	Soil					7			20	20	20																7	7	7		7	
16-034(a)	Burned building	Soil			2					5		5																	2	2		2	

Integers indicate minimum numbers of laboratory, field laboratory, and field screening samples for each PRS.
= The actual number of samples will depend on the depth of the cores and the number of screening hits.
A, B, C, E = full suite; F = 1082 suite (barium, beryllium, cadmium, chromium, mercury, copper, lead, nickel, thallium, and zinc); H = full suite.
* These PRSs include both a process building footprint and one or more sumps.

TABLE 5-87

SUMMARY OF SITE SURVEYS, SAMPLING, AND ANALYSIS FOR GMX-3 BUILDINGS WITH SUMPS AND OUTFALLS

			LAB SAMPLES						FIELD SCREENING #							FIELD						LABORATORY ANALYSES #											
			STRUCTURE		SURFACE		SUBSURFACE								A					B				C				D	E	F	G	H	
PRS	PRS TYPE	SAMPLED MEDIA		FIELD DUP		FIELD DUP		FIELD DUP	GROSS ALPHA	GROSS GAMMA/BETA	ORGANIC VAPOR	HE SPOT TEST	GEOPHYSICS SURFACE	BARIUM - LIBS	GEOLOGICAL CHARACTERIZATION	GROSS ALPHA	GROSS GAMMA/BETA	TRITIUM	VOLATILE ORGANICS	XRF	SOIL MOISTURE	ALPHA SPECTROSCOPY	GAMMA SPECTROSCOPY	BETA SPECTROSCOPY	TOTAL URANIUM	ISOTOPIC PLUTONIUM	ISOTOPIC URANIUM	VOA (SW 8240)	SEMIVOLATILES (SW 8270)	METALS (SW 6010)	ASBESTOS	HIGH EXPLOSIVES (SW 8330)	CYANIDE
16-005(c)	Septic tank	Soil					1			4		4																1	1	1		1	
16-005(d)	Septic tank	Soil					3			5		5													3			3	3	3		3	
16-024(e)*	Burned building/sump	Soil			2		2			8	2	8																2	4	4		4	
16-025(e)*	Burned building/sump	Soil			2		2			8	2	8																2	4	4		4	
16-025(f)*	Burned building/sump	Soil			2		2			8	2	8																2	4	4		4	
16-025(g)	Burned building	Soil			3					6		6																	3	3		3	
16-025(h)	Burned building	Soil			3					6		6																	3	3		3	
16-025(i)	Burned building	Soil			3	1				6		6																	3	3		3	
16-025(j)	Burned building	Soil			3					5		5																	3	3		3	
16-025(k)	Burned building	Soil			3					5		5																	3	3		3	
16-025(l)	Burned building	Soil			3					15		15																	3	3		3	
16-025(p)	Burned building	Soil			3					5		5																	3	3		3	
16-025(q)	Burned building	Soil			2					5		5																	2	2		2	2
16-025(r)*	Burned building/sump	Soil			2		2			6	4	6																	4	4		4	
16-025(u)	Burned building	Soil			6					22		22																	6	6		6	
16-025(v)	Burned building	Soil			3	1				12		12																	3	3		3	
16-026(q)	Sump	Soil					14			27	29	27													14			14	14	14		14	
16-026(w)	Outfall	Soil					2			2	2	2																2	2	2		2	2
16-029(m)	Sump	Soil					2			3	3	3																2	2	2		2	
16-029(n)	Sump	Soil					2			3	3	3																2	2	2		2	

aerial photographs. Subsurface structures will be located based on period engineering drawings when their locations cannot be inferred from site mapping and aerial photographs. In the field, the engineering survey will locate, stake, and document the location of each PRS and each point for field screening and sampling. Geomorphic sediment mapping will be completed in the drainage. Both field screening and laboratory sampling locations will be registered on a base map, scale 1:7 200. If during the course of sampling any sample points must be relocated, the new position

TABLE 5-86

STANDARD OPERATING PROCEDURES FOR FIELD ACTIVITIES

LANL-ER-SOP[a]	TITLE	NOTES
01.02, R0	Sample Containers and Preservation	Applied to all laboratory samples
01.03, R1	Handling, Packaging, and Shipping of Sample	Applied to all laboratory samples
01.04, R1	Sample Control and Field Documentation	Applied to all laboratory samples
03.01 R0	Land Surveying Procedures	Applied to all laboratory samples
06.09, R0	Spade and Scoop Method for Collection of Soil Samples	Used for surface samples
06.10, R0	Hand Auger and Thin-Wall Tube Sampler	Applied to all augered subsurface samples

[a] A later revision of any SOP will be used if the cited version is superceded.

will be surveyed and the revised locations will be indicated on the map. The engineering survey will be performed by a licensed professional under the supervision of the field team leader.

5.18.4.2 Sampling

7a

All samples will be field screened for HE by spot test and radionuclides by gross beta-gamma. All samples from below a depth of 6 in. will be screened using a photoionization detector (PID). SOPs for these procedures are currently in preparation. The detection limits of the HE spot test are at a level such that a positive reading for TNT or RDX indicates a sample with contamination at a level above its SAL.

S-Site, usually less than three feet deep. The depth boundary for the sumps, septic tanks, drain fields, and outfalls is from the surface into the tuff. Although the original location of the PCOCs at the building footprints, drainages, ponds, or outfalls was the soil surface (less than 6 in.), the decommissioning activities such as bulldozing most likely redistributed or covered the PCOCs to a shallow depth. Surface HE is also likely to have been redistributed from the surface to a shallow depth by fifty years of water infiltration and resultant transport through the soil column. Given the shallow soil at S-Site, the depth boundaries for surface soil at disturbed sites will be the top 24 in. of soil or the depth to tuff, whichever is less.

7b

The main drainage to the east of the GMX-3 area will be considered from the discharge point of the culvert that drains the 20s-Line to the road due south of TA-16-37. The drainage will be considered in a 1-ft wide swath to a depth of 6 in. This shallow depth was chosen because the drainage was not disturbed by the cleanup activities during the 1960s.

For each PRS, sampling points will be biased to areas believed to most likely contain the highest concentrations of PCOCs based on field screening, archival data, and the results of land surveys.

5.18.3.3 Decision Logic (DQO Step 5)

This aggregate follows generic DQO Step 5, presented in Subsection 5.0.2.

5.18.3.4 Design Criteria (DQO Step 6)

The design for the PRSs in this aggregate follows the general strategy outlined in Subsection 5.0.2.

In order to formalize the design criteria described in Subsection 5.0.2, the PRSs were categorized by the likely severity of any potential contamination and the expected heterogeneity of each PRS (Tables 5-82 and 5-83). Relative ranks were assigned based on the severity of the contamination of all PRSs considered in this phase of the OU 1082 RFI work plan. Each design is based on an indicator PCOC, a PCOC that both can easily be screened and that represents the major likely health risk at a PRS. Based on our knowledge of operations in World War II era S-Site, the low SALs for TNT and RDX, and the shallow soil in the area, it was deemed prudent to

the SWMU Report. Most of the structures associated with these SWMUs were removed in 1967 (see LASL photos 67-5065, 67-5066, 67-5067, and 67-5068). It appears that the drain line segment beneath the barricade for TA-16-89 was never dug up, and it is unclear whether this drain line ever daylighted.

9

These buildings are likely to be less severely contaminated than other machining buildings located in the World War II S-Site complex. They operated from 1948 to the early 1950s, when TA-16-260 was completed, wheras other machining buildings, such as TA-16-31, TA-16-32, and TA-16-33, operated from 1945 until the early 1950s. All of these buildings were designated as HE contaminated in the 1959 HE survey (Engineering Department 1959, 15-16-256).

5.18.1.2 Conceptual Exposure Model

The conceptual exposure model for the HE process buildings is presented in Fig. 4-9. Site-specific information on potential release sources, chemicals of concern, migration pathways, and potential receptors is presented below.

5.18.1.2.1 Nature and Extent of Contamination

The principal PCOCs for PRSs within this aggregate are HE (principally TNT and RDX), HE byproducts (i.e., DNT, DNB, TNB), volatile and semivolatile organics, and metals, particularly barium and silver. Additional minor PCOCs include depleted uranium in PRSs associated with TA-16-27, which contained radioactively contaminated equipment and cyanide in PRSs associated with x-ray and photoprocessing building TA-16-45. Table 5-80 summarizes the PCOCs on a SWMU-specific basis.

For many years there have been concerns with HE contamination at S-Site buildings. In 1945, ten samples were taken beneath casting buildings TA-16-42 and TA-16-27, five under each building (Fig. 5-61). They were subjected to a blowtorch flame to determine if the soils were explosive. The five samples under TA-16-42 were biased to areas with visible HE contamination, those under TA-16-27 were taken at random. The samples from TA-16-42 ignited, but explosions did not propagate. Those from TA-16-27 did not ignite. It was concluded that HE levels under TA-16-42

5.18.1.1.4 Machining Line - North/South/East/West

SWMUs 16-025(g), 16-025(h), 16-025(i), 16-025(j), 16-029(m), 16-029(n), 16-029(o), 16-029(p), and 16-029(h2) contain surface and subsurface soil associated with HE machining buildings TA-16-95, TA-16-96, TA-16-97, and TA-16-98 (often called West, North, East, and South) and their sumps and drain lines (Fig. 5-58). The buildings were located east of the 30s-Line on flat terrain with a slight drop in elevation to the northeast. Some drainage probably flowed into a culvert under the northern end of the easternmost road into a gully. These buildings were all small (20 ft long x 12 ft wide with 20 ft x 6 ft porches), and of wooden-frame construction on concrete floors. They were surrounded by access roads that roughly formed a square border. Each building had a U-shaped and wooden-walled earthen barricade separating it from a central utility building, TA-16-94. Bulldozing of these barricades may have diluted any potential contamination of the building footprint SWMUs.

9

One of these buildings (either TA-16-96 or TA-16-98) was more automated than the rest, with equipment observable with a periscope from TA-16-94. Another, TA-16-98 [SWMU 16-025(j)], was decommissioned as a machining building and converted into a coffee and smoking room.

These buildings all had platforms with garbage cans to collect pieces of HE for disposal at the burning ground. These buildings were destroyed by intentional burning in 1960, explosive residues were removed to TA-54, and noncombustibles were disposed of at the Area P landfill.

SWMUs 16-029(m), 16-029(n), 16-029(o), 16-029(p), and 16-029(h2) contain potential soil contamination associated with the decommissioned sumps and drains of TA-16-95, TA-16-96, TA-16-97, and TA-16-98. There were no secondary sumps.

A drain line flowed from the sump for TA-16-98 [SWMU 16-029(p)] to the sump for TA-16-97 [SWMU 16-029(o)], then to the sump for TA-16-96 [SWMU 16-029(n)], and finally to the manhole TA-16-801 [SWMU 16-029(h2)]. A second drain line exits the sump for TA-16-95 [SWMU 16-029(m)] and flows into this manhole. Another drain line exits TA-16-801 and trends north beneath the 90s-Line. This large drain system will be designated 16-029(h2), which was associated with manhole TA-16-801 in

6

TA-16-46 [SWMU 16-025(r)] was a rest house for HE products awaiting radiography in TA-16-45. Because it was built with sumps, it is in this aggregate, but its likely relatively low level HE contamination justifies treating it much like the buildings in Subsection 5.19. TA-16-46 was offset from the rest of the 40s-Line, and had an outfall that is not a SWMU but that is included within the boundary of SWMU 16-025(r). The exact location of the outfall is not known, but it probably drained into a ditch along the road that was used for the main 40s-Line drainage 200 ft south of TA-16-46 (Martin 1993, 15-16-477). This ditch can be seen in the aerial photograph (Koogle and Pouls Engineering, Inc. 1965, 15-16-516), but is rather obscure in the vicinity of TA-16-46.

SWMUs 16-029(z), 16-032(a), and 16-026(w) represent the soil associated with the principal HE drainage system for the 40s-Line. All parts of the drain system are decommissioned.

SWMU 16-029(z) includes the sumps attached to TA-16-42, TA-16-43, TA-16-44, and TA-16-45 of the 40s-Line and the drain lines extending to the secondary sumps. The drainage ditch that a former site worker claimed was used for discharge of the 40s-Line can be seen on the aerial photograph (Koogle and Pouls Engineering, Inc. 1965, 15-16-516). SWMU 16-032(a) includes secondary sumps for these buildings, located about 60 ft from the building structures, and a common drain line linking them all. The sumps are shown in the Engineering drawing ENG-R 876, but not with enough accuracy to locate them. The TA-16-44 secondary sump is not in any of these photos and may be difficult to locate.

SWMU 16-026(w) consists of the drain line from the darkroom of TA-16-45. The drain line exited the building from its eastern wall. A detailed engineering drawing of TA-16-45 (Engineering drawing ENG-C 5645) shows the pipe only as a line from the building, listing a few specifications such as a filter at the end and instructions to "spill on the ground." Thus, the location of the discharge point for this line is uncertain. The photoprocessing laboratory probably drained directly into the ditch east of TA-16-45. The ditch no longer exists. All of these buildings were designated as HE contaminated in the 1959 survey (Engineering Department 1959, 15-16-256).

(Huselton 1945, 15-16-152). This building had a lead-lined trough across the south of the building in addition to those along the sides. It also had a partial basement for utility service (ENG-C 5732) that could have collected HE. Because the floor was concrete, HE that leaked to the ground could have been protected from burning during decommissioning. Fuel was placed in the basement when the building was burned, but not between the concrete floor and the ground in the pillar-supported region (Martin and Hickmott 1993, 15-16-497). Wings were added to TA-16-42 in 1949 as a control room on the east side and to service a new casting kettle on the west side.

TA-16-43 [SWMU 16-025(v)] was also heavily HE contaminated during its years of operation. It contained a cement partition in its north corner that was used as a blast shield for machine tools in the building. This building was used for cutting risers from HE castings (Martin 1993, 15-16-477). According to a former site worker an extra drain line oriented southward and passing near TA-16-41 was added from the building's single sump.

TA-16-44 [SWMU 16-025(p)] was used for sifting incoming HE powder and removing metallic contaminants; therefore, it may have had significant contamination. It was also used for inspecting completed charges, including density determinations by the water displacement method. The sumps for this building are not visible on the aerial photograph (Koogle and Pouls Engineering, Inc. 1965, 15-16-516); these sumps were removed prior to the 1966 cleanup in order to pave the area adjacent to the incinerators at TA-16-43 and TA-16-41. This paving and drain line pipes were removed in the 1966 cleanup (Martin 1993, 15-16-477). Because the sumps at TA-16-44 are not in the 1965 photograph, it is questionable whether they can be exactly located. The sump locations are depicted on drawing ENG-R 876.

TA-16-45 [SWMU 16-025(q)] was used for x-ray examination of HE lenses. It contained lead shielding and a darkroom. A pair of HE sumps [SWMU 16-029(z)] connected TA-16-45 into the 40s-Line drainage line [SWMU 16-032(a)], but this line did not receive significant amounts of HE (Martin 1993, 15-16-477). More significantly, the darkroom had two sinks and one floor drain which discharged through a separate line from the HE sumps. This floor drain is discussed with SWMU 16-026(w).

Photographs taken during cleanup of these structures suggest the soil removal and dispersal operation did not penetrate significantly below the original level of the land (LASL photographs 67-5070, 67-6022).

These buildings were listed as having HE contamination in 1959 (Engineering Department 1959,15-16-256).

5.18.1.1.3 40s-Line PRSs

SWMUs 16-025(p,q,r,u,v), 16-026(w), 16-029(z), and 16-032(a) contain potentially contaminated surface and subsurface soil associated with TA-16-42, TA-16-43, TA-16-44, TA-16-45, and TA-16-46 and their sump and drain line systems (Fig. 5-60). These buildings compose part of the 40s-Line, which was located on eastward sloping ground in the south-central portion of the World War II era S-Site complex (Fig. 5-60). The 40s-Line contained several HE production facilities in a single line of buildings that were connected by enclosed walkways, with casting in TA-16-42, experimental casting and/or machining in TA-16-43, physical inspection (of raw materials) in TA-16-44, and x-ray examination in TA-16-45. Temporary storage in TA-16-46 was separate from the other four buildings. There were several other buildings associated with the 40s-Line that did not have sumps and these are treated in Subsection 5.19. TA-16-43, TA-16-44, TA-16-45, and TA-16-46 were wooden buildings, 20 ft wide x 60 ft long with wooden floors on pillars. The soil beneath them was leveled from its gentle slope to the east. TA-16-42 had a concrete floor on pillars and slightly larger dimensions of 40 ft wide x 90 ft long. All these buildings had floor troughs along their longer walls that discharged into sumps and, except for TA-16-46, these fed a common outfall. Details of this outfall system are discussed below. There were barricades between the buildings, but they are not within the SWMU boundaries and were encased in wood on both sides, limiting their volume. The level ground between these buildings drained slightly to the north, then east by ditches and culverts along the road that flanked the backs of the buildings (ENG-C 5599). Decommissioning of these structures may have resulted in a thin layer of clean dirt over contaminated regions within the SWMUs.

TA-16-42 [SWMU 16-025(u)] processed high volumes of HE and is the structure within the 40s-Line most likely to have associated contamination

complex on extremely level ground (Fig. 5-58). No drainage exits the location of the SWMUs.

These buildings each consisted of two chambers (13 ft^2) for machining and a separate control room (8 ft^2). Pipes connected the control rooms to the machining chambers. These three wooden structures with concrete slab floors had fill dirt around and between them. Each was almost entirely buried and had a door to the control room exposed on the southwest side and doors to the machining chambers in blowout walls on the northeast side. There was also an air conditioning system mounted on top of each mound surrounding a machining building. Each chamber side faced a road and each earthen mound on that side was flush with the plane of the doors. Originally, each machining chamber had a lead-lined drainage channel to wash out HE. In August 1945 the lead-lined troughs were replaced with concrete troughs with spark-proof mastic covering. In the 1950s these buildings were converted from machining buildings to other purposes. In a 1950s list of structures TA-16-31 [SWMU 16-025(e)] is listed as a hot-cold chamber, TA-16-32 [SWMU 16-025(f)] is listed as an x-ray building, and TA-16-33 [SWMU 16-024(e)] is listed as an additive storage building (Engineering Department 1959, 15-16-256).

A sump that received effluent from the troughs of two machining chambers was located between each building and the road to the northeast of the 30s-Line (Fig. 5-58). Each sump had a drain line that passed beneath the adjacent road, under an earthen barricade that lined the far side of the road, and into the settling ponds to the northeast [SWMU 16-007(a), a row of four ponds]. There were no secondary settling tanks, and each of the three drain lines daylighted at one of the boundaries between two of the four ponds, feeding the two with a Y-shaped end pipe. These sumps and drains were not assigned SWMU numbers, so they will be treated as part of the SWMUs associated with the buildings. Drain line locations are shown on the Utility Location Plan [R-861, 869, 870]. The sumps are clearly visible in an aerial photograph (Koogle and Pouls Engineering, Inc. 1965, 15-16-516).

Because of the small size of these buildings and the large amounts of soil contained in the barricades around them, it is likely that any contamination of the building footprints was diluted during bulldozing of the barricades.

several smaller rooms that were used as laboratories and offices. An associated equipment building to the south of the main building is also considered to be part of TA-16-27. The main casting room was fitted with over twenty casting stations, each of which had temperature-controlled water outlets. Overhead ductwork provided ventilation to the casting room. Some of this ductwork remains and contains recrystallized HE (Martin 1993, 15-16-477; Martin and Hickmott 1993, 15-16-497). There appear to have been five 600-lb casting kettles in the building based on examination of World War II era photographs (LASL photo circa 1946, 3083).

TA-16-27 [SWMU 16-026(q)] was originally constructed with four sumps. Both the north and south sides of the building each had one primary sump adjacent to the building. These sumps were connected to secondary sumps located a few feet from the building (Fig. 5-59). In the early 1950s these four sumps were removed and five new primary sumps were constructed; two on the north side of the building and three on the south side of the building. Both the north set of sumps and the south set of sumps fed secondary sumps located more than 50 ft from TA-16-27 (Fig. 5-59). The drain lines from both secondary sumps flowed eastward in rock-lined ditches to a ditch that flowed south along the roadway, under the road corner, and into the main drainage of the World War II era S-Site (Fig. 5-59).

Construction of TA-16-27 was completed in May 1945. The building was the main production casting facility for S-Site through 1953, when TA-16-300 and TA-16-302 were completed, although casting was stopped temporarily in 1946 due to deterioration of the building. Full-scale lenses for nuclear devices were cast in this building (Ackerman 1945, 15-16-509). During July 1945 casting occurred in three shifts, going on around-the-clock. After casting operations were moved into the 300-Line in the early 1950s, TA-16-27 was used as a warehouse (Thrap 1970, 15-16-001). In 1970 the building was abandoned. It is currently empty, and in a severe state of disrepair.

The sumps and drain lines for this building were removed in 1968. These materials were disposed of in Area L at TA-54. In 1970 the building was surveyed for radioactive contamination (Buckland 1970, 15-16-005; Kennedy 1970, 15-16-006), chemical contamination (Mitchell 1970, 15-16-007), and

collected HE-contaminated wash water. The rest of the main floor was concrete slab slightly elevated from surrounding ground level. This slab contained a lead-lined drainage trough near the permanent floor mounts of the casting kettles. This trough led to a sump that is described below.

TA-16-26 [SWMUs 16-025(l) and 16-032(c)] was first used for casting during the summer of 1944, and continued to be the principal S-Site production casting facility through early 1945. A former site worker's earliest recollections of S-Site were watching HE castings being worked in TA-16-26 with hand tools such as files, rasps, and hand saws (Truslow 1973, 15-16-264). After the construction of TA-16-27, TA-16-26 was used for raw HE inspection (Ackerman 1945, 15-16-509). TA-16-26 was destroyed by intentional burning in March 1968. Industrial drains and sumps were disposed of at TA-54 and noncombustible material was flashed and disposed of at the Area P landfill.

SWMU 16-032(c) is the sumps, drain lines, and outfall drainages for TA-16-26 (Fig. 5-59). A 1944 drawing shows a drain line exiting the southwest side of TA-16-26. This line fed a pond (described in the discussion of TA-16-25) located south of TA-16-26. During the 1945 renovation of TA-16-26, an HE sump was installed on the northeast side of the building. Later drawings and a 1965 aerial photograph show only a single sump on the northeast wall of the building (Koogle and Pouls Engineering, Inc. 1965, 15-16-516). This sump drained to a secondary sump, which fed a drain line that flowed eastward beneath a corner of the road east of TA-16-26. The rock-lined ditch associated with this drainage is still present. This ditch drained into the main drainage of the World War II era S-Site (Fig. 5-0-1). This sump and an attached drain area are shown on Engineering Drawing ENG-R 869 (also see drawing ENG-C 5521 for design of this sump).

SWMU 16-026(q) contains surface and subsurface soil associated with the sumps, drain lines, and inactive outfalls for TA-16-27 (Fig. 5-59). This building has not been decommissioned. The structure itself is treated as part of SWMU 16-017 in Chapter 6. TA-16-27 is a large (roughly 150 ft long x 50 ft wide) wooden-frame building with a concrete foundation, concrete floor, and a large basement that contains vacuum pumps and other equipment. The building consists of a 39 ft x 89 ft central casting room, and

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Engineering drawing C5600 shows septic tank TA-16-176 discharging to a leach field, whereas drawing R876 does not show this leach field. TA-16-41 [SWMU 16-034(p) in Subsection 5.19] contained an office as well as two lavatories, but was physically separate from the HE processing buildings of the 40s-Line that it served. A former site worker regarded TA-16-176 as not contaminated, but could not recall its removal (Martin 1993, 15-16-477). The Facilities Engineering Structure location maps list TA-16-176 as removed but do not specify a removal date. Engineering drawings do not agree concerning its exact location but its drain line was excavated through shallow or exposed tuff so it is likely a trough can be located by hand excavation.

TA-16-27 and its operation are described below. The building is highly contaminated; thus, it is likely that the septic tank, TA-16-177, also was contaminated.

5.18.1.1.1 20s-Line PRSs

SWMUs 16-025(k,l), 16-026(q), 16-029(r,f2), 16-032(c), and 16-034(a) represent building footprints and adjacent soil, and sumps, drain lines, outfalls, and adjacent soil associated with TA-16-24, TA-16-25, TA-16-26, and TA-16-27 (Fig. 5-59). These buildings compose the 20s-Line. All are located in the central portion of the World War II era S-Site complex on level ground (Fig. 5-59). During much of the operational history of the GMX-3 area, HE powder was inspected in TA-16-25, experimental casting occurred in TA-16-26, production casting was done in TA-16-27, and laboratory analysis was completed in TA-16-24. Casting products from the 20s-Line were allowed to cool in TA-16-88, followed by riser removal in TA-16-99, and machining in TA-16-31, TA-16-32, TA-16-33 or TA-16-95, TA-16-96, TA-16-97, and TA-16-98 (Fig. 5-58). These buildings were built at different times, did not have similar histories or designs, and had individual sumps and drain lines.

SWMUs 16-025(k) and 16-029(r) contain potentially contaminated surface and subsurface soil associated with the building footprint and drainage system for TA-16-25 (Fig. 5-59). TA-16-25 was a wooden-frame building (20 ft long x 30 ft wide x 15 ft high) with a concrete foundation and floor. It was constructed in February 1944 and did not have a sump. It has been

the GMX-3 area was administered by Group X-3, Explosives Development and Production, in particular by Section X-3C, Production.

After World War II, HE processing activities decreased markedly. Sections X-3C, X-3D, and X-3E were consolidated into Group X-3, Explosives Production, in 1946. In 1948, this group was renamed GMX-3. Machining buildings TA-16-95, TA-16-96, TA-16-97, TA-16-98, and TA-16-99 were constructed in 1948. HE processing continued until the early 1950s, when casting and machining activities were transferred to TA-16-300 and TA-16-302 (the 300-Line) and TA-16-260 respectively. Most of the structures at the GMX-3 area were destroyed by burning in February 1960. The buildings in the 20s-Line, such as TA-16-24, TA-16-25, and TA-16-26, were not burned until 1968. The residual debris from burning and the subsurface structures such as sumps and drain lines was cleaned up in 1967.

The following PRSs resulted from operations in the GMX-3 buildings that have attached sumps. All of the decommissioned structures in this area were surveyed for radiation, HE, and toxic chemicals prior to being burned. Unless otherwise noted, the results of these surveys were negative. Currently, most of the building footprints are overgrown by scrub grasses. In a few cases, some chunks of concrete, asbestos shingling, or broken vitrified clay pipe mark the locations of the buildings. The locations of the buildings were determined by digitizing a 1947 aerial photograph onto a FIMAD base map. Generally, these locations correlated well with locations of residual pebble driveways and the highest concentrations of debris. Sump locations were accurately determined from a 1965 aerial photograph, on which most of the sumps are clearly visible.

SWMUs 16-005(c,d) are areas that contained septic tanks (TA-16-176 and TA-16-177) and their drain lines. TA-16-176 served TA-16-41 and TA-16-177 served TA-16-27 (Figs. 5-59 and 5-60). Both tanks served lavatories, but the two buildings they served varied drastically in potential HE levels. Both tanks were of reinforced concrete construction and had wooden covers. TA-16-176 discharged to a 4-in. vitreous clay pipe that may have fed a leach field (ENG-C 5600) and TA-16-177 discharged to a 6-in. vitreous clay pipe that discharged to the southeast of the tank in the roadside drainage that received effluent from the 20s-Line buildings (ENG-R 289).

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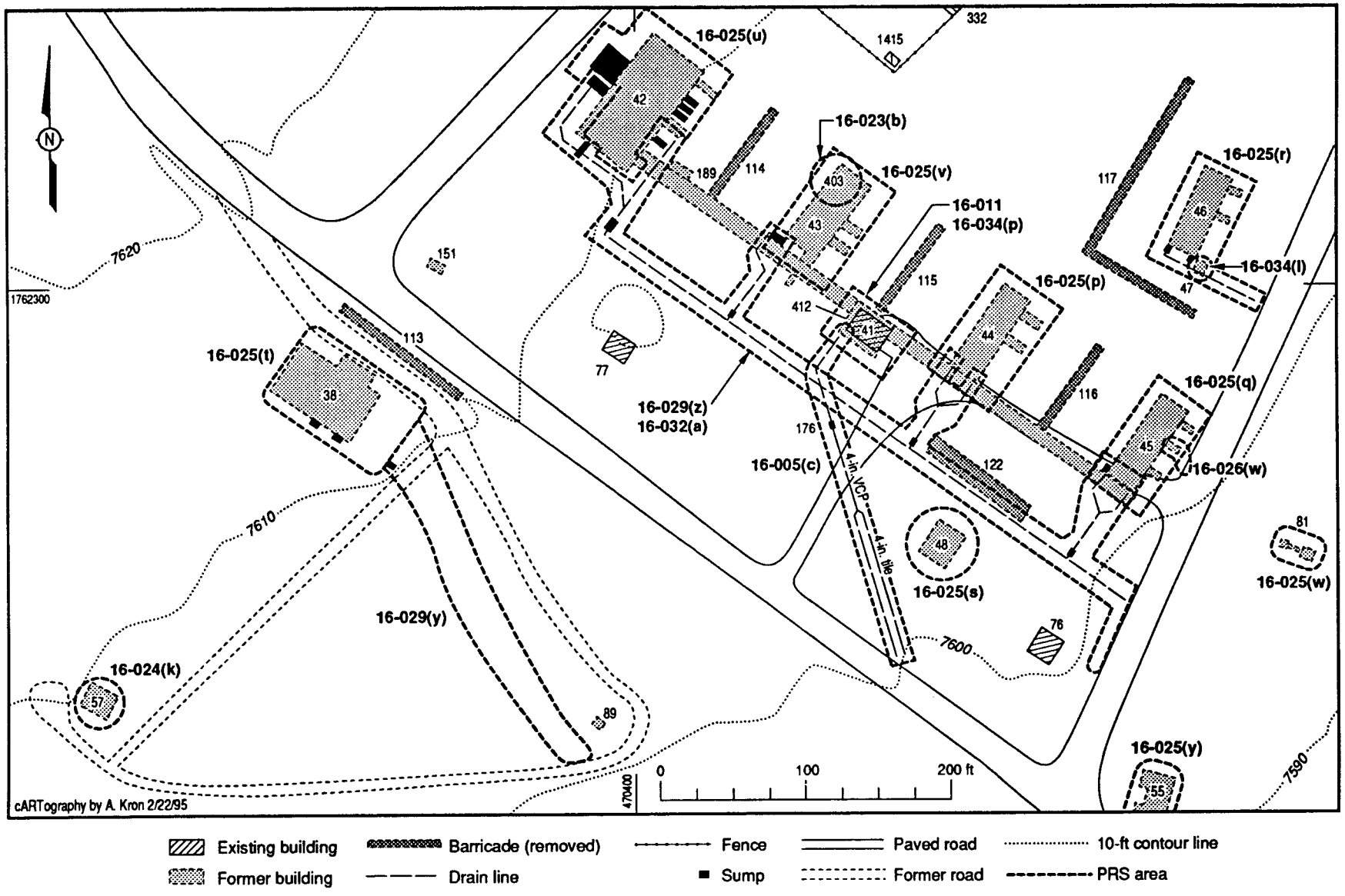

Fig. 5-60. Locations of PRSs at GMX-3 south.

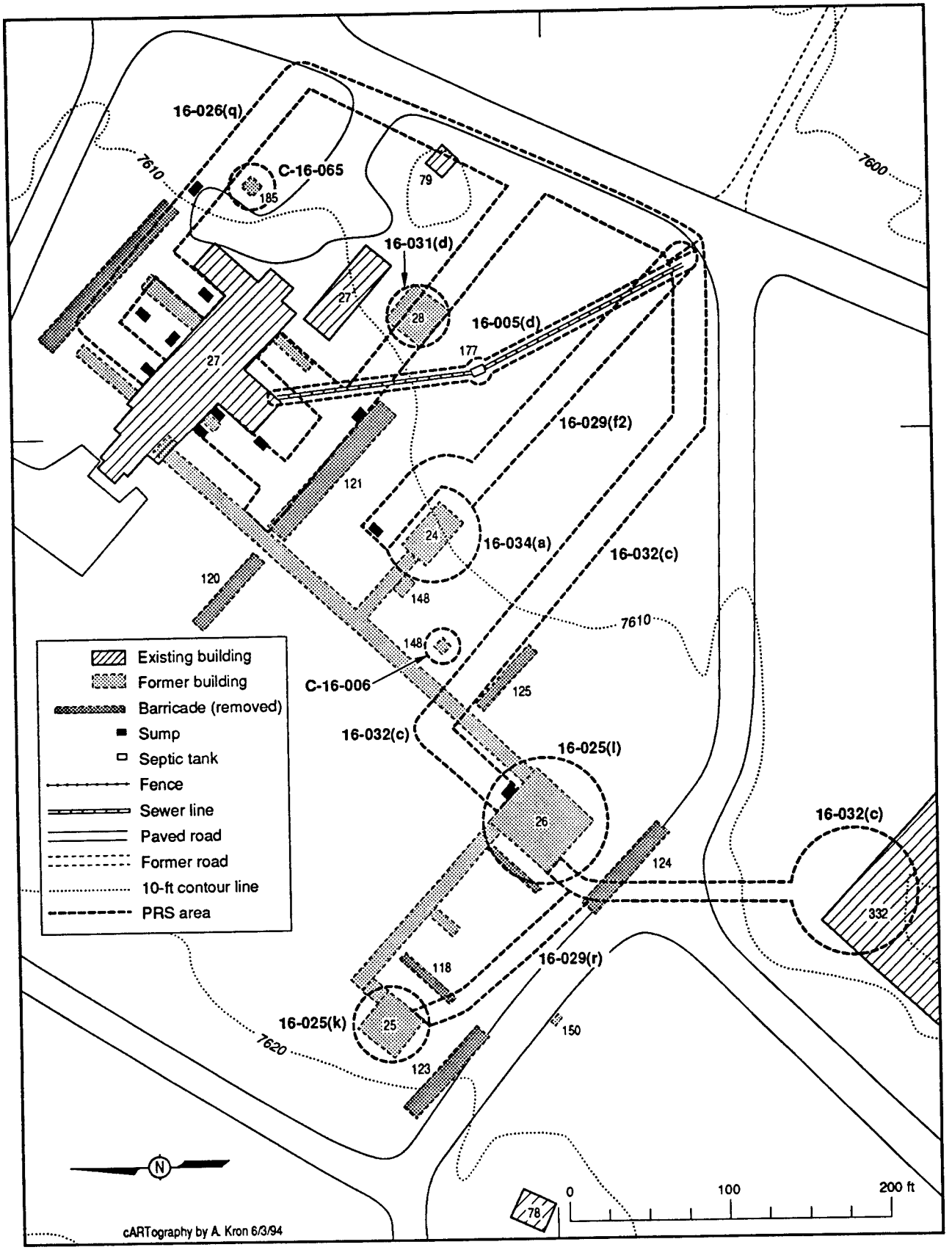

Fig. 5-59. Locations of PRSs at GMX-3 central.

5.0.2.2 Decision Process (DQO Step 2)

The objective of the Phase I investigations for aggregates 5.18 through 5.25 is reconnaissance sampling to determine if PCOC concentrations are above SALs in surface and subsurface soils. For each PRS if PCOC concentrations are below SALs, then a no further action (NFA) decision will be proposed for that PRS. If PCOC concentrations are greater than SALs and background values, then a Phase II study will be initiated to determine the spatial extent and concentrations of contaminants of concern relative to an acceptable risk level.

For each aggregate, potential remediation options for PRSs that pose an unacceptable health and environmental risk include removal of contaminated surface or subsurface soils with treatment and disposal.

5.0.2.3 Decision Inputs (DQO Step 3)

For PRSs in each of aggregates 5.18 through 5.25 the primary data needs are the confirmation of likely PCOCs, identification of additional PCOCs, and determination of the concentrations of all PCOCs in surface and subsurface soils. If SALs are not available for one or more PCOCs detected in a PRS, then these must be determined. Further, in order to locate the potentially contaminated areas of these PRSs for efficient and effective laboratory sampling, site information on facilities from visual indications, engineering drawings, field screening, and particularly ortho-corrected aerial photographs* are needed to determine the location of former structures, subsurface plumbing, and drainages.

5.0.2.4 Investigation Boundary (DQO Step 4)

Boundaries are defined in each aggregate; 5.18 through 5.25. However, the PRS boundaries are typically used as investigation boundaries.

The depth boundary for undisturbed surface samples is 0 to 6 in. For HE process building footprints, where bulldozing of soil has occurred and HE is likely to have infiltrated into the subsurface, the depth boundary is extended to 0 to 24 in. The depth boundary for subsurface samples, such as sumps, drain lines, and septic tanks, is typically 0 in. to below the soil-tuff interface.

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*Orthocorrected aerial photographs are corrected for local topography and the height and position of the airplane from which the photographs were taken.

5.17 are a diverse group of PRS aggregates, with correspondingly diverse DQOs.

In contrast, because all of the aggregates in the 1994 work plan addendum address potential contamination associated with decommissioned World War II era S-Site structures, Subsections 5.18 through 5.25 are all reconnaissance sampling with similar DQOs (Throughout this document the term "World War II era" is used to refer to the period from roughly 1944 to 1950). In particular, portions of DQO Steps 1, Problem Statement; 2, Decision Process; 3, Decision Inputs; 4, Investigation Boundary; 5, Decision Logic; and 6, Design Criteria, are virtually identical for these aggregates. DQO Steps 1, 4, and 6 typically also include aggregate-specific information that is included in Subsections 5.X.2 and 5.X.3 where X extends from 18 to 25. Because of the similarities of the DQOs across aggregates 5.18 through 5.25, generic DQOs appropriate for reconnaissance sampling of the World War II era buildings are presented below. These generic DQOs are then cited in Subsections 5.18 through 5.25 in the interest of minimizing the repetitiveness of the aggregate descriptions.

5.0.2.1 Problem Statement (DQO Step 1)

For aggregates 5.18 through 5.25 the primary Phase I problem is typically to determine if contaminants are at levels of concern in any PRS in each aggregate. Virtually every aggregate contains both surface contamination due to combustion of World War II era buildings and subsurface contamination due to leakage from sumps and drain lines. World War II era sumps were typically 6 ft x 3.5 ft x 5 ft high, constructed of wire-mesh reinforced concrete, containing a waterproof line and wooden baffles, and draining to a 4 in. vitreous clay drain pipe. Examination of historic photographs of decommissioning activities suggests the sumps were set a few inches to a few feet into the soil, probably onto the fill-tuff interface. Typically, the indicator PCOC of concern is HE. The term HE refers to a broad range of compounds (see Appendix D) of varying toxicity. The two principal HE of concern in the World War II S-Site area are TNT (soil SAL = 40 ppm) and RDX (soil SAL = 64 ppm). The probability of contamination in PRSs within each aggregate varies, depending on the specific activities that occurred in the individual PRS in the aggregate.

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