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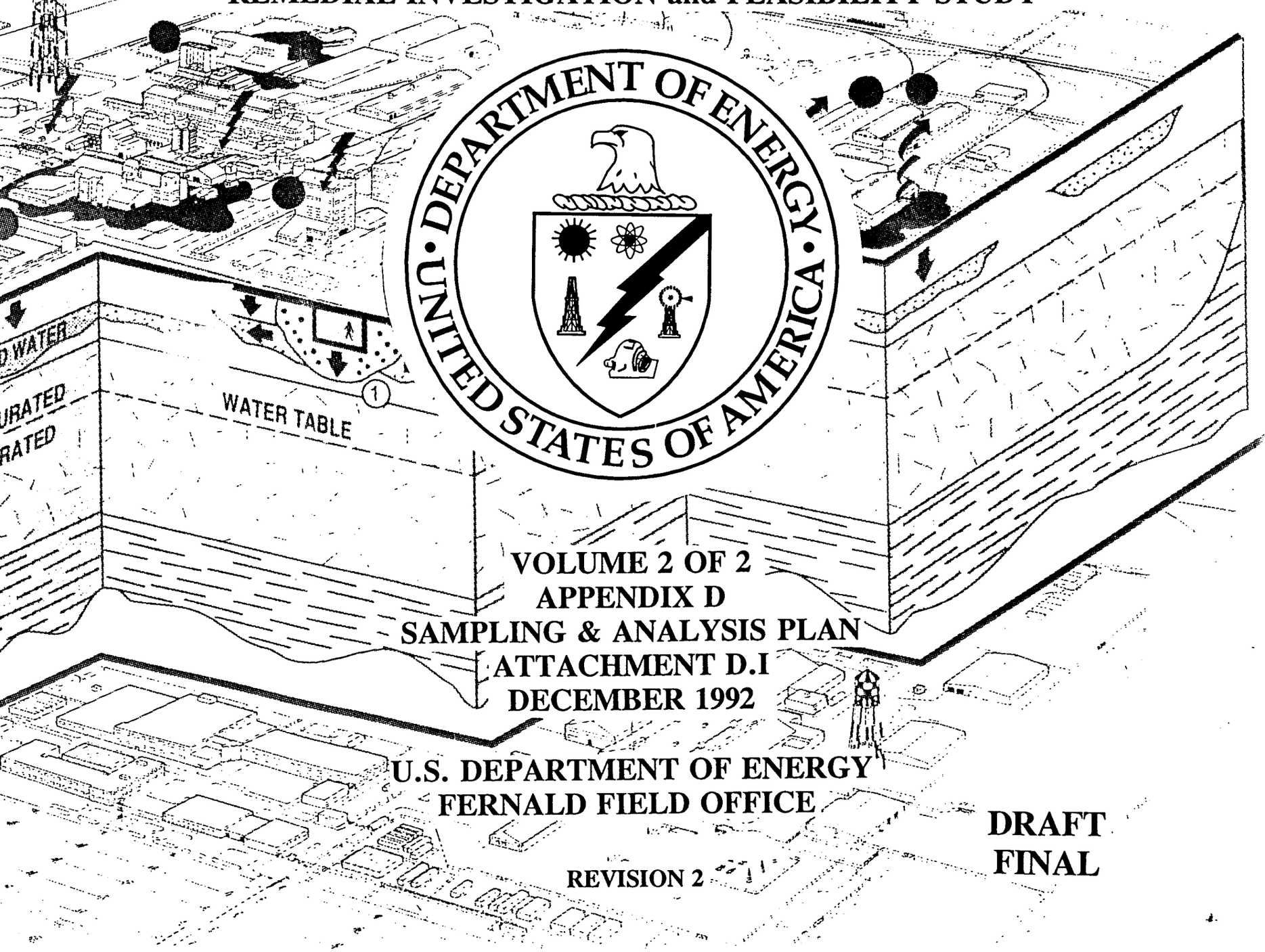
OPERABLE UNIT 3
WORK PLAN ADDENDUM

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

REMEDIAL INVESTIGATION and FEASIBILITY STUDY



VOLUME 2 OF 2
APPENDIX D
SAMPLING & ANALYSIS PLAN
ATTACHMENT D.I
DECEMBER 1992

U.S. DEPARTMENT OF ENERGY
FERNALD FIELD OFFICE

DRAFT
FINAL

REVISION 2

OPERABLE UNIT 3
WORK PLAN ADDENDUM

4009

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
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VOLUME 2 OF 2
APPENDIX D

DECEMBER 1992

U.S. DEPARTMENT OF ENERGY
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Revision 2

DRAFT
FINAL

2

APPENDIX D

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APPENDIX D

SAMPLING AND ANALYSIS PLAN

D.1 INTRODUCTION

D.1.1 Purpose and Scope

This Sampling and Analysis Plan (SAP) contains the guidance and requirements for the remedial investigation (RI) characterization of the facilities and components within Operable Unit 3 (OU3) of the Fernald Environmental Management Project (FEMP). This SAP defines the organization and responsibilities necessary to complete the characterization task. A sampling approach is defined that is designed to meet the RI field program objectives related to satisfying information needs to support RI/FS activities. Specific protocols are established to implement field activities, including performing instrument measurements and collecting intrusive samples for laboratory analysis. Specific procedures are also identified to make field instrument measurements, to collect intrusive samples, and to carry out the required analyses of those samples. The means for implementing quality assurance measures are discussed. Operational plans and schedules are provided, and the personnel resources required to meet them are discussed. Finally, a component-by-component discussion identifying preliminary sampling locations by process areas and involved media is presented.

The SAP differs somewhat in organization from that suggested in guidance, wherein a SAP comprises two main parts: (1) a quality assurance project plan (QAPjP), and (2) a field sampling plan (FSP). At the FEMP, all quality assurance related elements have been compiled in a single document, the Site-Wide CERCLA QAPjP (SCQ). The SCQ addresses all sampling activities at the FEMP (which includes OU3). All required sampling and analysis procedures are, or will be, incorporated into, and approved through, that document. The SCQ is included in the SAP by reference. The OU3 SAP is considered a project-specific plan (PSP), and must meet the requirements of PSPs under the SCQ. Applicable SCQ sampling and analysis procedures are identified in Section D.6. Abstracts of the procedures being developed for the OU3 RI are provided in Attachment D.I for informational purposes.

Before RI characterization activities are initiated for a specific component, a field work package (FWP) will be prepared for that component. The protocols and procedures described in this SAP will be specified in the FWPs for the actual implementation of the specific sampling activities required for each component.

D.1.2 Description of Operable Unit 3

OU3, as defined in the Amended Consent Agreement of 1991, consists of the FEMP Production Area and all production-associated facilities and equipment (including all above- and belowgrade improvements). Components within OU3 include all structures, equipment, utilities, drums, tanks, solid waste, waste product, thorium, effluent lines, K-65 transfer line,

piles. The Production Area covers approximately 136 acres and operated essentially as a uranium refinery and foundry with an extensive array of support and related facilities. The soil and water under OU3 are a part of OU5, Environmental Media. Under the terms of the Amended Consent Agreement, soil and debris waste piles around the site that resulted from previous waste management practices are also included in OU3. However, any soils beneath these waste piles are considered within OU5.

Detailed descriptions of all components within OU3 are provided in the elements of this OU3 Work Plan Addendum noted below:

Section 2 Site Background and Environmental Setting

Appendix A Summary Tables

Table A.1 Operable Unit 3 Component Identification List

Table A.2.1 Description of Structures and Processes

Table A.3 Potential Contaminants

D.1.3 Changing Conditions

The characteristics of some components within OU3 will change during the RI because of planned and ongoing interim actions that include removal from the site or treatment and/or translocation of major quantities of product, feed inventory, contaminants, and wastes. Section 2.5 of the Work Plan Addendum summarizes those actions. To minimize premature field data collection, characterization of those components will be scheduled following completion of the interim actions, if possible, or toward the end of the characterization period when the duration of interim actions is uncertain. Some affected components will be characterized before completion of interim actions in order to meet the Consent Agreement schedule for the OU3 RI report.

D.1.4 Field Sampling Approach

The objective of the field sampling program is to fill the data needs for the RI as defined in Section 3 of the OU3 Work Plan Addendum. The uses to which data will be put support two main RI/FS functions, conducting a baseline risk assessment, and evaluating remedial action alternatives (RAAs). The sampling approach developed addresses specific data needs related to these two functions.

Data needs are met by making specific types of measurements at appropriate locations in appropriate media in contaminated OU3 components. The determination of the

types, locations, and frequencies of measurement samples to be collected is an outcome of careful analysis of the sampling problem through implementation of the data quality objective (DQO) logic process as presented in Section D.4.2. That process produces an approach that has as a basic unit of organization and representativeness an entity called the process area. A process area is an area within a component in which a particular function was carried out involving a consistent set of process materials and/or equipment. All areas of a component are assigned to a process area for completeness.

Major sampling media, defined as concrete, masonry, and structural steel, within process areas are the primary focus of sampling. To support other identified data needs, primarily related to risk assessment, supplemental samples will also be collected from a variety of contexts for various purposes, including assessing potential for contaminant migration, estimating gamma exposure rates, and evaluating airborne contamination.

Major media and supplemental sampling will be conducted through an increasingly focussed approach that employs the following six steps, the first three of which have already been conducted it the preparation of the SAP:

1. Examine existing site radiological monitoring and environmental data to identify components that are likely to be significantly contaminated and those that are not. All contaminated components will be designated for detailed sampling, while a representative set of the identified uncontaminated components will be designated for confirmational sampling to support their status.

2. Inspect all identified contaminated components to map process areas and identify media.

3. As a result of the inspection, and with the use of the existing radiological survey database, assign preliminary sample locations and numbers for all sampled components.

4. Perform nonintrusive sampling to support specific data needs and to help finalize locations for intrusive samples. Protocol 1 in Section D.5.1 provides guidance on conducting nonintrusive sampling.

5. Finalize intrusive sample locations for both major media and supplemental sampling after examining results from nonintrusive sampling and conducting further inspections as necessary. Protocol 2 in Section D.5.2 provides guidance on finalizing intrusive sample locations.

6. Conduct intrusive sampling of major media and of supplemental sample locations. Protocol 3 in Section D.5.3 provides guidance on selecting the appropriate type of intrusive sample (e.g., a core versus chips or scrapings) and identifies the appropriate sampling procedures and preferred sampling tools to be employed.

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D.2 ORGANIZATION AND RESPONSIBILITIES

D.2.1 Organization

This section describes the organizational and management structure to be used in implementing the approved OU3 RI/FS Work Plan Addendum at the FEMP. Figure D.2-1 illustrates the relationships between the various organizations involved. An Environmental Restoration Management Contract (ERMC) approach has been implemented at the FEMP site to manage the restoration activities, with Fernald Environmental Restoration Management Corporation (FERMCO), a wholly owned subsidiary of Fluor Daniel Inc., currently serving as the ERMC. The ERMC, reporting directly to the Department of Energy Fernald Field Office (DOE-FN), will act as the main contractor for FEMP activities and coordinator of technical support and remediation subcontractors. Under the current FERMCO organizational structure, OU3 activities will be the responsibility of CERCLA/RCRA Unit 3 (CRU3), with such activities being conducted by individuals of various disciplines matrixed to CRU3 from other FERMCO departments. Implementation of the OU3 Work Plan Addendum will be the specific responsibility of the Environmental Section within CRU3, as illustrated in Figure D.2-2.

D.2.2 Responsibilities

The major tasks that constitute the OU3 RI/FS program implementation and the organizational responsibilities to carry out those tasks are identified here. Primary responsibilities for implementing the OU3 Work Plan Addendum will rest with the Environmental Section matrixed to CRU3 of the FERMCO organization, with additional necessary support provided through matrixing from other FERMCO departments and through subcontracts as appropriate to ensure quality and timeliness. Task specific responsibilities will be implemented as follows:

1. Complete overall planning, integration, execution, and support of the OU3 RI/FS program. Implementation of these activities, is the responsibility of the Environmental Section matrixed to CRU3.

2. Prepare and obtain approval of OU3 sampling and analytical procedures. Development of any new procedures will be the responsibility of the Planning Group within the Environmental Section of CRU3. New procedures will be submitted to EPA for approval, as addenda to the SCQ.

3. Prepare component-specific field work packages (FWPs) according to the approach outlined in Section D.4 of this Work Plan Addendum by use of the component-specific sampling approach presented in Section D.9. FWPs must be prepared, reviewed, and approved for

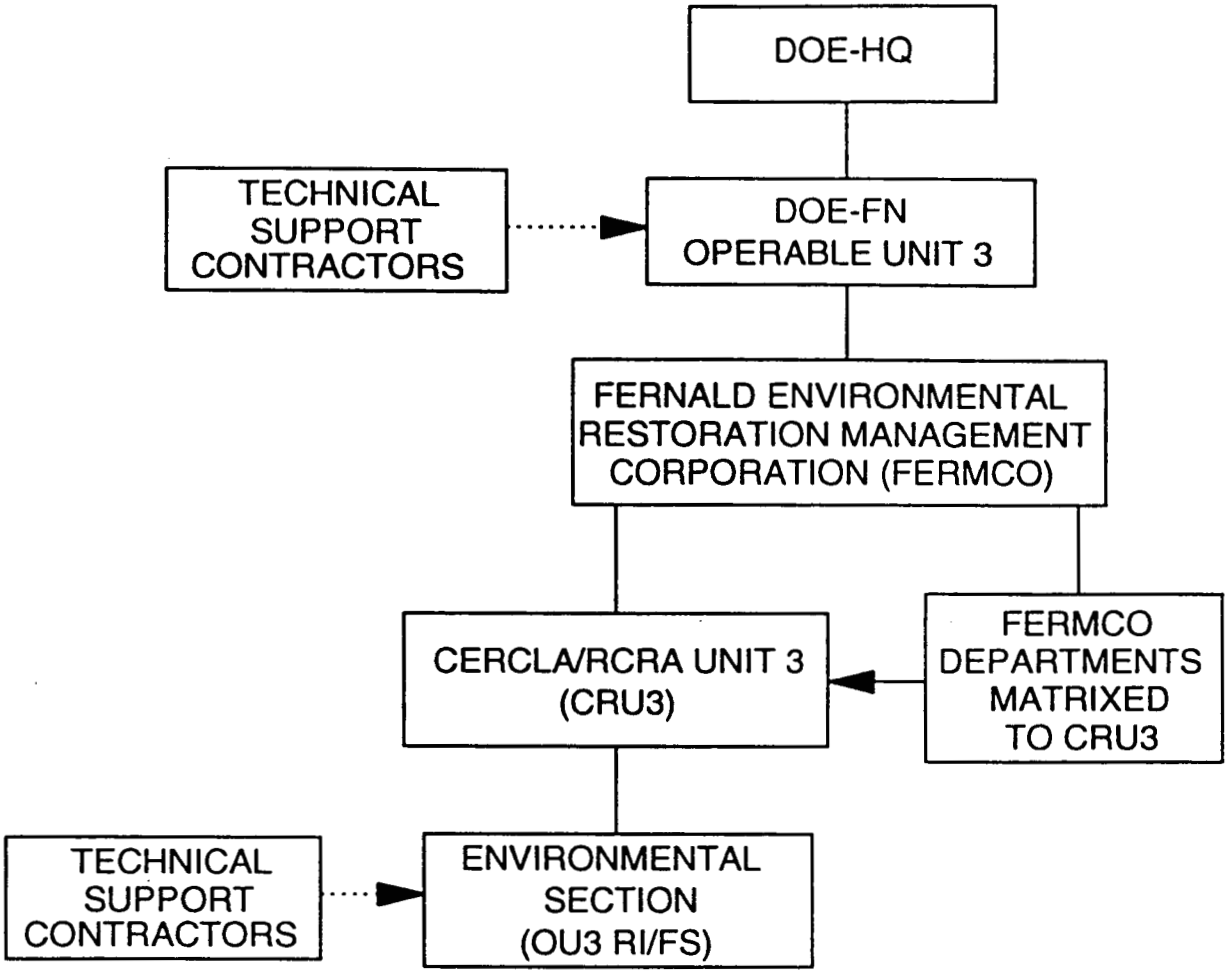

FIGURE D.2-1 FEMP OU3 RI/FS Organization

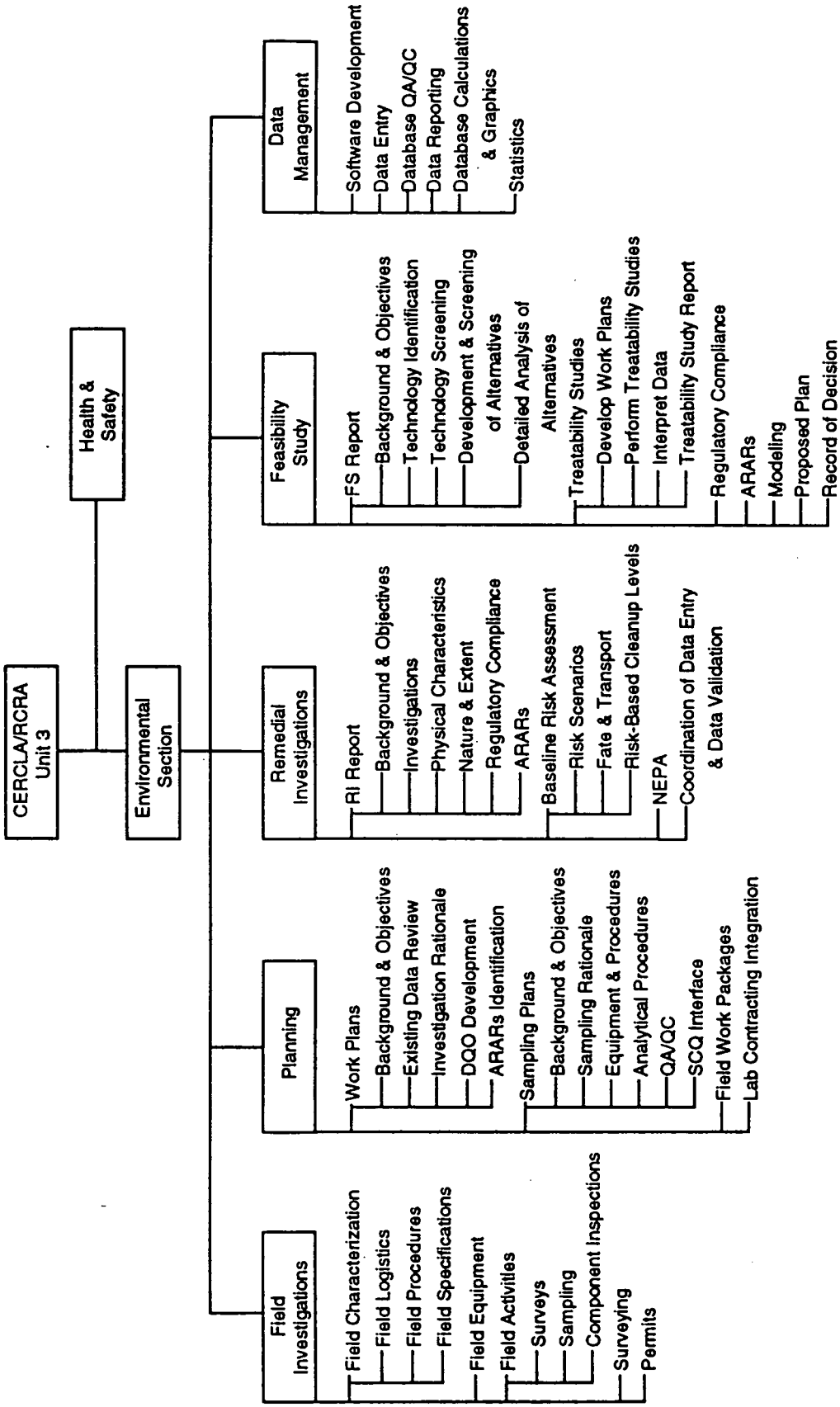

FIGURE D.2-2 OU3 RI/FS Functional Organizational Chart

each component before sampling of that component can begin. These activities will be the primary responsibility of the Planning Group within the Environmental Section of CRU3. Each FWP will be provided to the U.S. EPA and the Ohio EPA for their information before sampling activities are initiated on the component.

4. Conduct the field program in accordance with the SCQ, established procedures, and the FWPs, including all aspects of monitoring, sampling, and shipment of samples. The Field Investigations Group of the Environmental Section will provide the necessary matrixed support to CRU3 to ensure completion of these tasks.

5. Review and validate data collected during field sampling/field characterization program. This task will be conducted by the Data Management Group of the Environmental Section matrixed to CRU3, on an ongoing basis throughout the data collection and reporting processes. These tasks will be performed in accordance with the approved SCQ data validation procedures. Validated data will be entered into the FEMP RI/FS database.

6. Assess and evaluate the field characterization data to verify attainment of the data quality objectives of the Work Plan Addendum and define additional data needs (those not fulfilled by data collected in the field program). If necessary, additional information needs and/or sampling efforts will be identified, and a supplemental FWP will be prepared. Various facets of this task will be the responsibility of various groups within the Environmental Section of CRU3, including the Planning Group, the Remedial Investigations Group, and the Data Management Group.

7. As a part of data analysis, evaluate past data to provide guidance to future data gathering. In particular, as outlined in Section D.3, evaluate trends in sampling results from some select, initially sampled components, and detail these trending results in an interim submittal to U.S. EPA and Ohio EPA. Responsibility for this task will fall on various groups within the Environmental Section of CRU3.

D.3 OBJECTIVES AND APPROACH

D.3.1 RI Field Program Objectives

The objectives of the RI field program are to collect data needed to support fundamental decision making with regard to the management and future disposition of OU3 in both the short and long term. An approach to addressing these objectives is described in Section 4.2 of the OU3 Work Plan Addendum, which presents a discussion of the logic process for developing data quality objectives (DQOs) for the RI/FS. The eight-step DQO logic process is summarized as follows (with references to the corresponding sections of the Work Plan Addendum):

- Define the problem (site evaluation, Section 3),
- Identify the decision (remedial approach, Section 3.2),
- Identify inputs to the decision (data needs, Section 3),
- Define the domain of the decision (contaminated media, Section 3.2),
- Develop a logic statement (data uses, Section 3),
- Specify constraints on uncertainty (DQOs, Section 4.2.2.6; and D.3.3.1),
- Develop a cost-effective sampling plan (SAP), and
- Specify appropriate analytical support levels (ASLs) and identify required sampling and analysis procedures (SAP, D.3.3.2).

The elements of this process that involve sampling and analysis, and therefore must be addressed in the sampling and analysis plan, include (1) meeting data needs, (2) meeting uncertainty requirements (data objectives), and (3) specifying ASLs and corresponding sampling and analysis procedures.

Data uses, which address the main decision, effectively drive the sampling approach. The primary decision addressing the problem posed by OU3 is: What RAA should be implemented? The sampling approach developed will therefore be focused on providing the data necessary to address this decision. A secondary use of data will be to perform a baseline risk assessment that is required under the NCP for remedial investigations and that will be useful for gauging the benefits of remediation of OU3, both by itself and in the larger context of the FEMP as a whole.

D.3.2 Data Needs, Data Objectives, and Data Collection Approach

D.3.2.1 Data Collection Approach for RAA Evaluation

Specific data needs, data objectives, and data collection approaches have been identified for each type of data use required for evaluating RAAs (Section 4.2). Data uses generally address (1) determining volumes of various materials contaminated to various degrees, (2) assessing the feasibility of various treatment and disposal options, (3) assessing the health risks associated with various treatment and disposal options, and (4) predicting the nature and volume of final treated or untreated waste forms. Data needs, uses, objectives, and collection approaches are summarized in Table 4.2 of the Work Plan Addendum and are discussed below.

Material Volumes

The first-order data need for RAA evaluation is volumes of OU3 materials, by type. This information will be used to determine the upper limits on the volumes of materials potentially requiring treatment and/or disposal. With these volumes as a starting point, the overall goal of field sampling will be to establish the volumes of various materials that are contaminated and that can feasibly be treated to reduce and/or stabilize contamination to reduce risks associated with, and thus facilitate, material disposition. The results of sampling will be used to estimate volumes of various categories or classes of wastes requiring disposition.

Estimates of total material volumes are available from site knowledge. Refined estimates of building contents will be obtained from component inspections conducted throughout the field program. The data objective is estimates of material volumes accurate to within plus 50% to minus 30% of the true values.

Contaminant Composition, Level, and Depth

A corollary to the first-order data need is information on the identities, or types, of contaminants and surface contamination levels and depth (assuming little bulk contamination), by material type for OU3 materials. This information will be used in estimating volumes of materials contaminated to various depths with various types of contaminants. Such estimates are needed to screen treatment technologies and to understand the nature of waste streams that may be generated by these technologies.

The objectives for measurements supporting these data needs are (1) a conservative estimate of the surface levels of gross alpha and beta-gamma radioactivity in those contaminated materials primarily used in construction; (2) a representative composition of the radionuclides underlying the gross activity, as well as any chemical contaminants of concern; and (3) a conservative estimate of the depth of contamination by material type.

The approach to fill the data need for gross radiological surface contamination is to use the existing body of radiological survey data available, supplemented with survey data collected during the RI to confirm and expand on existing surveys. These data are, or will be, of sufficient quality to meet the intended data uses, which in this case relate primarily to determining volumes of various categories of contaminated materials.

To meet data needs related to composition of contaminants, by material/media, intrusive sampling will be conducted. One intrusive sample for all parameters of interest will be collected for each major construction medium in each defined process area in each contaminated component. The sample for radiological parameters will be taken from an area representing the highest levels of contamination for each medium in each process area. The location sampled for chemical parameters may differ from the radiological sampling location within a given medium, depending on available chemical information. The type of sample collected will depend on the expected depth of penetration of contaminants into the medium.

It is expected that such an approach will yield data that are sufficiently representative of the contaminated media to meet intended data uses, which relate primarily to evaluating treatment technologies and predicting the nature and disposal options of expected waste forms and waste streams.

Media Characteristics

A data need of importance in evaluating treatment technologies is a set of parameters defining the physical and chemical characteristics of the contaminants and the affected contaminated materials themselves. Examples of several such parameters are given in Table 4.2. The data objective is to determine those parameters important for preliminary evaluation of alternatives, related primarily to an evaluation of effectiveness and cost. It is expected that standard handbook values for these parameters will suffice for preliminary evaluations. Parameters required for detailed analysis of alternatives will be obtained in subsequent treatability studies. No sampling needs are identified for these parameters at this time.

Exposure Rates and Removable Contamination

Data needs related to risk assessment for the evaluation of RAAs primarily involve determining radiation exposure rates (beta and gamma) and levels of removable (by swiping) contamination on major surfaces. Exposure rates will be used to estimate on-site risks to workers during remedial actions for direct exposure to radiation, while levels of removable contamination will be used to estimate risks to these workers from direct contact with surfaces. The latter data may influence decisions on in-situ decontamination of components before dismantlement. The objectives for exposure rate data are (1) a conservative value and (2) maximum value, for each component. Exposure rate measurements will be taken in areas

of highest surveyed gamma levels. Removable contamination levels will be confirmed in areas previously determined to have maximal levels of removable activity.

Waste Form Characterization

A final data need for alternatives evaluation is characterization of expected waste forms and an estimate of waste volumes from the various treatment options, as well as a characterization of any air emissions produced from them. The data will be used to evaluate the expected effectiveness of various alternatives, as well as the applicability of various disposal options. The associated data objectives are representative estimates of parameters related to physical and chemical characteristics of waste forms and emissions and estimates of volumes of waste forms accurate to plus 50% to minus 30% of actual values. These data needs will be met with a combination of the already specified RI/FS sampling, and inferences therefrom; standard handbook values; and results from treatability studies. No specific sampling needs are identified at this time.

D.3.2.2 Data Collection Approach for Baseline Risk Assessment

Data uses related to baseline risk assessment primarily involve determining (1) on-site risks from direct exposure to or contact with radioactivity or other contaminants and (2) off-site risks from the release and transport of site contaminants. A substantial portion of the data needs to support baseline risk assessment will be satisfied in the collection of data for alternatives evaluation. In the interest of differentiating the data needs for the former, all baseline risk assessment data needs, uses, and data objectives, as well as an approach for data collection, are summarized in Table 4.2 and are discussed below.

Surface Contamination Levels

The composition, concentrations, and areal extent of total and removable surface radiological and chemical surface contamination are needed to evaluate source terms for potential release of contamination by various processes, such as wind and water erosion. The objective of the data collection effort is to obtain a conservative value, that is, a representative maximum value, for each major medium (mainly concrete and steel) in each defined process area in each contaminated component.

A conservative value is desired for estimating an upper bound on risk under a worst-case scenario. A representative value would also be desirable for risk assessment but is not sought for two reasons — (1) after some analysis, it has been deemed impractical and cost-ineffective to obtain such data for such a complex and heterogeneous site as OU3, and (2) evaluation and comparison of risks associated with various alternatives can be conducted with a conservative approach.

The data collection approach described above for RAA evaluation to determine surface contaminant composition, levels, and depth will meet the general requirements for

characterizing total surface contamination for baseline risk assessment purposes. As for RAA evaluation, removable contamination will be characterized through collection of swipe samples. Locations for these samples will be areas of elevated total surface contamination determined from existing monitoring data or from further measurements taken during characterization, assuming that all major sources of contamination have been identified.

Contaminant Leaching Potential

To evaluate contaminant leaching from OU3 media as a release mechanism, an estimate is needed of leaching potential from various major media. Again, a conservative estimate is sought to set an upper bound on off-site risks. To meet this data need, a small number of samples of affected media representing various conditions from throughout OU3 will be collected and analyzed for contaminant leaching potential (see Section D.3.4.3.4).

Exposure Rates

Radiation exposure rates for both beta and gamma radiation will be needed to estimate on-site risk under an intruder scenario. A conservative value is sought on a component-wide basis to represent a worst-case scenario. Measurements will be taken in areas of highest total surface activity as determined from existing survey data, or from any further surveys conducted during the RI.

Airborne Radioactivity

Similarly, levels of airborne radioactivity are sought for estimating on-site risks (airborne chemical contaminants are not thought to pose a significant risk). A determination of representative levels in each component is sought. To meet this data need, an air monitoring sample will be collected from each component with a high-volume air sampler operated for at least 24 hours. Grab samples for radon monitoring will be collected when there is a significant presence of radium-226 or thorium-232 in a component.

Container Leakage

The volume of contaminated liquids in various process containers, the concentration of the contaminants in the liquids, and any release rates of these liquids are needed to assess risks associated with the migration of such contaminants. Values for liquid volumes and composition are sought, along with a conservative estimate of release rate. To meet these

objectives, container dimensions will be measured and potential leak rates postulated, and composition of unknown liquids of significant volume will be determined from grab samples as needed.

Ponds and Basins

The concentrations of contaminants in the water and sediment phases of contaminated ponds and basins are needed to assess the risks from infiltration and overflow of water, as well as from direct contact with these media. Representative samples of water and sediment are sought. Composite grab samples of water and sediment will be collected to meet this data need.

D.3.3 Representativeness, Analytical Support Levels, and Sensitivity Requirements

D.3.3.1 Representativeness and Sampling Approach

Sample locations, frequencies, and types must be selected in such a manner that the information gained from the samples represents specific aspects of the true underlying distribution of contaminants that are of interest for the intended uses of the data. The particular properties of the distribution that are of interest dictate the design of the sampling program. For instance, if the properties of interest are mean contaminant levels in a certain medium, a statistically based, unbiased selection of sample locations and numbers would be appropriate. In the present case, the properties of contaminant distribution of interest are those necessary for evaluating RAAs — principally the type, extent, and depth of surface contamination in large-volume materials in OU3. The sampling approach developed for the RI field program is therefore designed to determine these properties. The constraint on the approach is the determination of these properties within the uncertainty requirements specified in the DQOs for the RI as they relate to volumes of various categories of expected waste materials from OU3.

Because of the great complexity and heterogeneity of OU3, it is neither feasible nor cost-effective to design a sampling program that quantitatively addresses uncertainty, hence the qualitative nature of the uncertainty requirements in the DQOs. Instead, an approach was devised that is essentially mechanistic, assuring that data needs are met through purposeful sampling. The devised approach is based on some important underlying assumptions regarding representativeness, as follows:

1. The composition of contaminants is uniform within a given medium within a given process area.

2. The location of maximum surface level and/or depth of contamination in a given medium will dictate the treatment option for the entire extent of the medium in a given process area (i.e., it represents the medium for treatment purposes).

3. The types of contaminants present place further constraints on treatment options.

The fundamental conceptual and organizational unit under this approach is the process area. Process areas are defined on the basis of function. Therefore, a component that houses a single operation may be broken down into several processes, each involving a distinct set of materials and equipment. On the basis of this definition, and following assumption 1, above, the process area becomes the basic unit of representativeness for contaminant composition.

The quantitative aspect of representativeness is addressed in assumption 2. The quantity of interest in the investigation is that quantity of each major material from a given process area that will fall into various waste categories. As stated in the assumption, the maximum surface level and/or depth of contamination represents the entire extent of the medium within the process area for treatment purposes. This assumption assures a conservative estimate of waste volumes, guarding against the possibility of a false negative outcome, or underestimate, which is consistent with the stated goals of the uncertainty constraints.

Lastly, regarding the representativeness of contaminant identifications, which affects the applicability of various treatment options, a wide variety of potential contaminants must be considered. Potential contaminants come from the process materials themselves, reagents added to the process, and ancillary materials used in general industrial processes. Such potential contaminant sources represent a fairly large number of both radiological and chemical contaminants. The possibility of mixed radiological and hazardous waste is clearly present and will certainly affect treatment and disposal options for affected materials.

Taking these three assumptions regarding representativeness together, the following sampling approach was devised:

A single intrusive sample taken from each major medium in each defined process area at the location of greatest known surface level and/or depth of radiological contamination will be analyzed for all radiological contaminants of potential concern.

A single intrusive sample for each class of chemical contaminants of potential concern taken from each major medium at the location of highest expected surface levels will be analyzed for a standard list of chemical parameters for each class, including all contaminants of interest.

This approach addresses the primary data needs for supporting RAA evaluation, and will also coincidentally meet much of the data needs for the baseline risk assessment. Further data needs for both RAA evaluation and the baseline risk assessment will be met through nonintrusive sampling and supplemental intrusive sampling, as described in Section D.3.4.3.2 and D.3.4.4, respectively.

D.3.3.2 Analytical Support Levels

Analytical support levels (ASLs) refer to groups of analytical or measurement options of increasing analytical power and information content, as well as increasingly stringent levels of QA/QC. Five ASLs, labelled A-E, have been defined for the FEMP in the SCQ and are analogous to the five analytical levels defined by EPA for remedial investigations with the addition of radiological analyses. ASLs are further discussed in Section 4.2, while the definition of each ASL is given in Table 4.1 of that section.

The ASLs support various levels of data use and in this way provide a link between project DQOs and appropriate analytical options for meeting them. Table 4.2 in Section 4.2.3 assigns the appropriate ASL to each of the identified data uses for the OU3 RI. Various analytical options for each ASL are, in turn, identified in Table D.3-1. This table constrains the selection of analytical options for each measurement type in such a way that the quality of the measurements achieved will support the intended data uses.

D.3.3.3 Sensitivity Requirements

Sensitivity goals for sample analysis are necessary to ensure that contaminants are detected at sufficiently low levels to be meaningful for the intended uses of the data. Sensitivity requirements are set for each type of measurement, including field and laboratory measurements. Table D.3-2 presents a listing of all the major laboratory and field parameters to be determined in the OU3 RI and gives the corresponding analytical technique, source protocol or method, method detection limits, and the basis for the selection of the method in terms of sensitivity requirements.

The laboratory radiological analytical procedures are specified in the statement of work (SOW) developed by FERMCO as part of request for proposals for laboratory analyses in support of site-wide needs. The procedures to be employed by the responding laboratories are, or will be, included in a revision of the SCQ. Laboratory analytical procedures for chemical parameters are also found in the SCQ and are based on either the EPA's SOW for the contract laboratory program (CLP) or the EPA methods for analyzing solid wastes (SW-846, PCBs only). The field method procedures are all found in the SCQ and were developed specifically for environmental monitoring at the FEMP.

The detection limits listed for both the radiological and chemical laboratory analyses are the required detection limits in the respective SOWs. In the case of volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) the limits in the table are actually contract required (reliable) quantitation limits (CRQLs). Detection limits for these analytes would actually be somewhat lower.

The basis for requiring the sensitivity of the selected methods is given in the last column of Table D.3-2. In the case of analysis of specific radionuclides or chemicals (listed as VOCs, SVOCs, PCBs and metals), a separate basis is provided for either solid or liquid

TABLE D.3-1 Analytical Options under Various ASLs

ASL	Parameters	Analytical Options	Media to be Sampled
A	Alpha surface contamination surveys	• Thin ZnS (Ag) scintillator • Gas flow proportional counter • Thin-face Geiger-Mueller detector	• Surface of major media • Bulk media and beach areas • Sediments, uncharacterized solids/loose media
	Beta and gamma surface contamination surveys	• Geiger-Mueller detector • Gas flow proportional counter • Beta scintillator • Plastic scintillator	• Surface of major media • Bulk media and beach areas • Sediments, uncharacterized solids/loose media
	Removable alpha surface contamination	• Low background counting (Tennelec)	• Surfaces of major media or supplemental sampling locations
	Removable beta-gamma surface contamination	• Low background counting (Tennelec)	• Surfaces of major media or supplemental sampling locations
	Total organic vapors	• Photoionization detector • Flame ionization detector	• Bulk media and beach areas • Sediments, uncharacterized solids/loose media
B	Low-level gamma surveys	• FIDLER scintillator • NaI (Tl) scintillator	• Surfaces of major media or supplemental sampling locations
	Higher-level beta and gamma surveys	• Gamma-compensated Geiger-Mueller probe • Ionization chamber	• Surfaces of major media or supplemental sampling locations
	Gamma exposure rates	• Pressurized ionization chamber • NaI (Tl) scintillator • Plastic scintillator	• At locations of elevated gamma activity where individuals may be exposed

TABLE D.3-1 (Cont.)

ASL	Parameters	Analytical Options	Media to be Sampled
B (Cont.)	Metals	• Portable X-ray fluorescence spectrometer	• Surfaces of major media or supplemental sampling locations • Bulk media and beach areas • Sediments, uncharacterized solids/loose media, liquids
	Polychlorinated biphenyls (PCBs)	• Field test kit • Laboratory gas chromatography (GC) procedure	• Sediments, uncharacterized solids/loose media, liquids (field test kits) • Surfaces of major media or supplemental sampling locations (laboratory GC procedure)
	Organic vapors	• Portable GC	• General component air sampling
C/D	Radiological Suite		
	U, Th, Pu isotopes	• Alpha spectrometry by SCQ protocols	• Intrusive samples from major media and supplemental sampling locations
	C-137	• Gamma spectrometry by SCQ protocol	• Bulk media and beach areas
	Ra-226	• Radon emanation by SCQ protocol	• Sediments, uncharacterized solids/loose media, liquids
	Sr-90, Tc-99, Pb-210 Po-210, Ra-228, Rn-222, Np-237, Pu-241	• Radiochemistry by SCQ protocol	(All apply to entire radiological suite)
	Total uranium	• Phosphorimetry by SCQ protocol	

TABLE D.3-1 (Cont.)

ASL	Parameters	Analytical Options	Media to be Sampled
C/D (Cont.)	Chemical Suite		
	Volatile organic compounds (VOCs)	• Gas chromatography/mass spectrometry (GC/MS) by SCQ protocol	• Intrusive samples of sediments, uncharacterized solids/loose media, liquids
	Semivolatile organic compounds (SVOCs)	• GC/MS by SCQ protocol	• Intrusive samples of sediments, uncharacterized solids/loose media, liquids
	PCBs	• GC by SCQ protocol	• Intrusive samples from major media and supplemental sampling locations
			• Intrusive samples of sediments, uncharacterized solids/loose media, liquids
	Trace metals	• Furnace atomic absorption spectrometry (FAA) and inductively coupled plasma atomic emission spectrometry (ICP) by SCQ protocol	• Intrusive samples from major media and supplemental sampling locations
			• Intrusive samples of sediments, uncharacterized solids/loose media, liquids
	Toxic Characteristics Leaching Procedure (TCLP)	• SCQ protocol based on standard RCRA procedure	• Suspected hazardous waste materials not previously identified and managed at the site
			• Suspected mixed waste containing both radiological and chemical contaminants
			• Used for determining leaching potential of materials subject to weathering

TABLE D.3-2 Analytical Sensitivity Requirements

Parameter	Technique	Protocol/Method	Method Detection Limits		Basis for Method Selection	
			Solids (pCi/g)	Liquids (pCi/L)	Solids	Liquids
Isotopic U	Alpha-spectrometry	WEMCO-SOW/SCQ	0.2	0.5	Soil PRGS	ARARs/TBCs
Isotopic Th	Alpha-spectrometry	WEMCO-SOW/SCQ	0.2	0.5	Soil PRGS	ARARs/TBCs
Isotopic Pu	Alpha-spectrometry	WEMCO-SOW/SCQ	0.2	0.5	Soil PRGS	ARARs/TBCs
Cs-137	Gamma-spectrometry	WEMCO-SOW/SCQ	1.0	1.0	Soil PRGS	ARARs/TBCs
Sr-90	Radiochemistry	WEMCO-SOW/SCQ	0.2	1.0	Soil PRGS	ARARs/TBCs
TC-99	Radiochemistry	WEMCO-SOW/SCQ	10	30	Soil PRGS	ARARs/TBCs
Pb-210	Radiochemistry	WEMCO-SOW/SCQ	1.0	30	Soil PRGS	ARARs/TBCs
Po-210	Radiochemistry	WEMCO-SOW/SCQ	0.5	1.0	Soil PRGS	ARARs/TBCs
Ra-226	Radon emanation	WEMCO-SOW/SCQ	0.2	1.0	Soil PRGS	ARARs/TBCs
Ra-228	Radiochemistry	WEMCO-SOW/SCQ	0.5	3.0	Soil PRGS	ARARs/TBCs
Rn-222	Radiochemistry	WEMCO-SOW/SCQ	--	100	-	ARARs/TBCs
Np-237	Radiochemistry	WEMCO-SOW/SCQ	0.2	0.5	Soil PRGS	ARARs/TBCs
Pu-241	Radiochemistry	WEMCO-SOW/SCQ	0.5	1.0	Soil PRGS	ARARs/TBCs
Total U	Phosphorimetry	WEMCO-SOW/SCQ	0.1 µg/g	1.0 µg/L	Confirmatory	
Gross alpha	Proportional counter	WEMCO-SOW/SCQ	4 pCi/filter		ARARs/TBCs	
Gross beta	Proportional counter	WEMCO-SOW/SCQ	10 pCi/filter		ARARs/TBCs	

TABLE D.3-2 (Cont.)

Parameter	Technique	Protocol/Method	Method Detection Limits		Basis for Method Selection	
			Solids (pCi/g)	Liquids (pCi/L)	Solids	Liquids
			(µg/kg)	(µg/L)		
VOCs	GC/MS	CLP-SOW/SCQ	10	10	Soil PRGS	ARARs
SVOCs	GC/MS	CLP-SOW/SCQ	330	10	Soil PRGS	ARARs
PCBs	GC	SW-846/SCQ	33	1	Soil PRGS	TSCA
Metals	FAA/ICP	CLP-SOW/SCQ	(TAL CRDLs)		Soil PRGS	ARARs
Removable alpha	Low-background counting	SCQ	<20 dpm		NRC limits	
Removable beta-gamma	Low-background counting	SCQ	<1,000 dpm		NRC limits	
Total alpha	Geiger-Mueller	SCQ	<300 dpm		NRC limits	
Total beta-gamma	Geiger-Mueller	SCQ	<15,000 dpm		NRC limits	
Low-level gamma	NaI (Tl)	SCQ	background		Background	
Gamma exposure rate	Pressurized ionization chamber	SCQ	background +20 µR/h		DOE Order 5400.5	
Organic vapors	PID or portable GC	SCQ	1 ppmv		Background	
PCB screen	GC and test kits	SCQ	50 ppm (bulk, test kit) <10 µg/100 cm^2 (surface, GC)		TSCA	
Metals screen	XRF	SCQ	1-200 ppm		Instrument performance	

media. For solid media, the basis for the required detection limits, and thus the listed methods, has been determined to be the proposed preliminary remediation goals (PRGs) for soil remediation in OU5 at the FEMP. The reason for this basis is that any materials left at the site from OU3 will likely be reduced to rubble and behave much like the soils remaining at the site. Moreover, such detection limits meet all the expected data uses anticipated for the OU3 RI, some of which may in fact be based on soil PRGs. The quantity of liquids in OU3, on the other hand, is quite small, and liquids are not likely to be left on the site without treatment or disposal. Required detection limits for liquids, as a practical matter, are based on the requirement of assessing compliance with ARARs and TBCs. Such detection limits readily meet the data uses related to liquids, which primarily support the baseline risk assessment and waste characterization.

Required detection limits for field radiological procedures are set to the specific requirements of OU3 and are based on the corresponding U.S. Nuclear Regulatory Commission (NRC) surface contamination limits for release without radiological restrictions (NRC 1974). For field screening for polychlorinated biphenyls (PCBs), the required detection limits are based on the requirements of the Toxic Substances Control Act (TSCA) for bulk and surface contamination spill cleanup levels. The detection limit set for organic vapor detection by photoionization detector (PID) or portable gas chromatography (GC) is based on general background levels found in industrial buildings and is readily achieved with commercial instruments.

Detection limits set for screening of trace metal contamination by X-ray fluorescence (XRF) analysis are based on the general performance characteristics of commercial instrumentation. These limits generally are not as low as laboratory methods, nor do they generally meet the sensitivity requirements for metals based on soil PRGs. Metals screening results therefore cannot be used to meet such data needs. Such needs will have to be met using the available laboratory methods. XRF screening will, however, be very useful for helping select locations for intrusive laboratory samples and for exploring the areal extent of contamination where levels are high enough to be detected.

D.3.4 Approach to OU3 Component Sampling

D.3.4.1 Categorizing Components for Sampling

OU3 consists of approximately 220 components representing the entire spectrum of structures and functions present in the Production Area of the FEMP. Because of the varying types of operations that went on in the various components, contamination levels range from negligible to high. Component sizes, and therefore material volumes, also vary widely. It is reasonable, therefore, to remove or reduce the sampling requirements for components representing relatively small volumes of essentially uncontaminated materials without

significantly affecting the interpretation of results of the RI. Three component categories have been specified for designating component sampling, as follows:

Sampled: Components suspected of being contaminated;

Confirmatory: Components having at most isolated pockets of relatively low levels of contamination; and

Nonsampled: Components having at most isolated pockets of low levels of contamination; inferences regarding actual contamination levels will be based on the results of confirmatory sampling.

Every component in OU3 has been placed in one of these three categories on the basis of a detailed inspection and a review of existing data, including recent radiological surveys. Components were placed in the (to be) sampled category, hereafter referred to as components designated for sampling, if average removable contamination was above 1,000 dpm/100 cm^2 or if average total in-place activity exceeded 5,000 dpm/100 cm^2 (see Section 2.4). For components with contamination below these levels, additional information and factors were examined that might cause the components to be classified as components to be sampled. Screening information included process knowledge, RCRA sampling activities, drum contents and locations, past sampling programs, removal action data, and air monitoring results. Somewhat more than half of OU3 components, approximately 140 of 220, representing the great preponderance of material volumes have been designated for sampling.

If no screening criteria were exceeded, a component was placed in the nonsampled category. A subset of 16 of these components was then selected for confirmatory sampling to be conducted to substantiate the absence of other than isolated contamination in these components, that is, that levels are similar to background. Confirmatory sampling will consist of radiological surveys with nonintrusive measurements of gross radiological activity as described in Section D.9.0.3. Measurement locations will be laid out systematically, with the objective of identifying isolated contamination. Systematic walkovers will also be conducted to verify the absence of widespread contamination. Limited intrusive sampling and analysis will be conducted in areas of identified contamination. Sampled components are covered in Section D.9. Nonsampled and confirmatory sampled components are listed in Tables D.9.0-1 and D.9.0-2. For the following discussion, components in the nonsampled and confirmatory (sampling) groups are referred to as nonsampled components.

D.3.4.2 Major Considerations Influencing Component Sampling Approach

The following considerations shape the rationale for OU3 component data collection:

- All buildings and other components in OU3 will be removed and have no use beyond the period of remediation. This assumption limits the range of remedial alternatives requiring evaluation.

- The baseline risk assessment will not attempt to demonstrate that no remediation is necessary. The requirement for remediation is already assumed.

- Estimates of quantities of materials by major material type[1] are generally available for all components (Table A.7).

- All components have been placed in one of three sampling categories (Section D.3.4.1).

- All materials in all components designated for sampling are either known or assumed to be contaminated. The quantity of contaminated material and the level of contamination in nonsampled components are assumed to be negligible for purposes of conducting needed calculations, although isolated areas of contamination may be present.

- The quantities of contaminated materials in OU3 are dominated by contributions from a limited number of components. Therefore, uncertainties over the extent of contamination in small components have little effect on the overall estimate of quantities of contaminated materials.

- All materials in OU3 will be thoroughly surveyed during remediation. Therefore, actual disposition of materials will not be affected by the assumptions concerning contamination in nonsampled components.

- The types of contaminants present in a given type of media (concrete, steel, etc.) are assumed to be the same throughout a given process area[2] within a particular component (Section D.3.3.1). Adjustments will be made in the event that this assumption is questioned in a given process area.

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[1] The material types are concrete, cement block, steel, transite, other metals (e.g., copper), soil and rubble, asphalt, and miscellaneous. These material types also correspond to media types discussed throughout this document.

[2] For areas in which processing occurred, a process area is the area taken up by a particular chemical process. For other areas, the term is used to indicate contiguous areas with common activities. Process areas are identified for all components in Section D.9.

- The record of decision (ROD) for OU3 will be performance based and there will be selection only of general technologies (e.g., decontamination of metal surfaces) in the ROD.

- Treatment technologies found applicable to contamination in sampled components will also be applicable to nonsampled components to achieve performance-based ROD requirements.

- Anomalies or unusual conditions may result in the requirement for additional field sampling beyond that anticipated. Such requirements will be identified before or during the sampling of individual components.

D.3.4.3 Component Sampling Activities

The general approaches to be used to meet particular data objectives are provided in Sections D.3.2.1 and D.3.2.2. The approaches all involve four major areas of RI activity: (1) a preliminary inspection and evaluation of OU3 components designated for sampling, (2) the systematic nonintrusive sampling of media in OU3, (3) the systematic collection and analysis of intrusive samples from contaminated media in OU3, and (4) supplemental intrusive sampling. These four areas are discussed in Sections D.3.4.3.1 - D.3.4.3.4. Activity in the first area was completed in order to support the preparation of the revised Work Plan Addendum. A discussion of how it may be possible to limit sampling in later sampled components on the basis of trends observed during field characterization is provided in Section D.3.4.3.5.

The site characterization program itself will be carried out with the three field sampling protocols discussed in Section D.5. The protocols provide instruction on the specific types, locations, and numbers of samples to be collected to meet the objectives of the field sampling program. Before the actual sampling of a component, a field work package (FWP) will be prepared, specifying sample locations and types, as discussed in Section D.4.6.

D.3.4.3.1 Preliminary Evaluation of Site Conditions

Before nonintrusive and intrusive sampling, a variety of activities have been carried out related to evaluation of conditions in OU3. Some of these evaluations are related to satisfying data needs, others will support subsequent sampling. These activities involved the following: (1) verifying processes that occurred in components; (2) correlating available radiological data with types of processes; (3) identifying major media types within process areas; (4) identifying locations of spills or other chemical contamination; and (5) refining drawings for components. In terms of meeting data needs, the preliminary activities provide input to the development of engineering estimates, the results of which will be provided in the draft RI report.

Development of Engineering Estimates. Data are needed in several areas that require development of improved engineering estimates or the use of engineering judgment: refinement of the volume and nature of building contents, development of improved estimates of the quantity of containerized materials, assessment of container integrity, review of available data on stack emissions, review of information on wastewater and storm-water releases, estimation of infiltration and overflow rates for ponds and basins, estimation of the fraction of contaminated areas exposed to natural weathering, and assembly of handbook values on the physical and chemical characteristics of media. These activities involve no sampling and will be based on the use of existing information and inspections.

Initial engineering inspections have been carried out for all components. These inspections considered each process area in each component. Boundaries of the process areas were refined and the presence of major media was evaluated. The inspections also identified potential areas of chemical contamination and potential sampling locations. Locations for supplemental sampling were also addressed. The results of the inspection were used to designate preliminary component sampling locations and types, as presented in Section D.9. Further inspections will focus on refining descriptions and volume estimates of building contents.

Determining Radiological and Chemical Analytes. Establishing a list of contaminants to be analyzed in OU3 media involved a two-pronged approach: (1) defining a comprehensive pool of radiological parameters on the basis of process knowledge and (2) specifying chemical parameters on the basis of the established EPA Target Compound List (TCL) for organics and Target Analyte List (TAL) for inorganics.

To determine radiological and chemical contaminants of potential concern in OU3, the nature of the various functional processes carried out in each component was reviewed. The results are summarized in Table A.2.1. Next, an inventory of the known process materials involved and any reagents used directly or indirectly in each process area of each component was compiled. A list of potential contaminants, radiological and chemical, associated with the various process materials was then compiled (Table A.3). A discussion of process-related radiological and chemical contaminants of interest, along with detailed lists of analytes is given in Sections D.4.2 and D.4.3, respectively.

The TCL and TAL for chemical contaminants were developed to support investigations of uncharacterized abandoned hazardous waste sites under CERCLA. The lists include a wide range of potentially hazardous substances typically used in significant quantities in industrial processes and include all the hazardous chemical substances of potential concern in OU3 (with a few exceptions, which can be eliminated, see Section D.4.3.3), plus many substances not suspected of being present. The TCL/TAL (less pesticides) form the basis of the OU3 chemical analyte list. It is supplemented with selected anions and water quality parameters, as discussed in Section D.4.3.3.

To ensure data sufficiency, an approach of analyzing every sampled major medium, regardless of location, for all applicable analytes will be implemented. The analyte list for

a given medium will be limited only by the absence of an analytical procedure for that medium. Analytical procedures exist, or will be written, for all parameters that are reasonably applicable for a given medium. An example of a set of analytes not reasonably applicable to a specific medium is TCL volatile or semivolative organic compounds in steel or concrete. Because of the low permeability of these materials, it is not expected that volatile or semivolatile organic contaminants will be present at levels of concern in these media, nor is such analysis practical. Similarly, analysis of trace metals and PCBs will be applied selectively to these media in areas where such contamination is reasonably expected. Sampling and analysis procedures for OU3 are listed in Tables D.6-1 through D.6-5 in Section D.6.

Preliminary Specification of Intrusive Samples. As discussed below, two types of intrusive sampling will be conducted in components during the field program of the RI: (1) sampling of major (by volume) media within each process area of components (Section D.3.4.3.3) and (2) supplemental sampling of loose media, transite, process residuals, etc. (Section D.3.4.3.4). As mentioned above, preliminary specification of numbers and locations of these intrusive samples are given in Section D.9, determined from an initial inspection of components.

Major media have been identified in all components (Table A.7). Locations with elevated levels of radiological contamination have been, or will be, identified in components on the basis of data from past, ongoing, or future radiological surveys. The preliminary location for sampling a given major medium for radiological parameters has been designated as the location with the highest survey reading for total beta-gamma activity (Section D.9). If survey data are unavailable for a given medium, a sample has been designated for the medium without specifying the location. The medium will be surveyed (nonintrusive sampling) to determine the intrusive sample location. Locations for sampling chemical parameters will be determined after nonintrusive sampling and further inspection. They may or may not coincide with radiological locations.

Potential locations for taking supplemental samples have been determined in components designated for sampling from an inspection of likely contaminant collection points, as well as from identification of promising locations for specific supplemental sampling needs, such as leachability tests. Expected contaminant collection points include heating, ventilating, and air conditioning equipment; sumps and pits; gutters and runoff points; or simply dust deposited on surfaces. Preliminary locations and numbers of intrusive samples are indicated in component sampling tables presented in Section D.9.

D.3.4.3.2 Nonintrusive Sampling

Nonintrusive sampling will fulfill various specific data needs discussed in Section D.3.2, as well as support the intrusive sampling discussed below. In particular, nonintrusive sampling will involve determining radiation exposure rates, measuring levels of airborne contaminants in buildings, collecting swipe samples, and carrying out a variety

of chemical monitoring. Nonintrusive sampling will also provide a basis for finalizing the selection of locations to be used for intrusive sampling. Details related to nonintrusive sampling are addressed in Protocol 1, discussed in Section D.5.1.

Swipe samples will be the primary means of characterizing removable contamination on major media, a major data need identified in Tables D.3-1 and D.3-2. A specified area of each media will be swiped with a suitable material, which will be surveyed in the field for gross radioactivity with appropriate instruments. All swipes from within a component whose concentrations exceed by an order of magnitude the surface contamination guidelines in DOE Order 5400.5 will be composited as a single sample for laboratory analysis of individual radionuclides.

D.3.4.3.3 Intrusive Sampling — Major Media

Intrusive sampling will be used to determine the types and concentrations of contaminants present in major construction media in OU3 as described in Section 4.2.2.7. Samples will be taken for laboratory analysis in locations of elevated contamination (selected on the basis of surveys and inspections, historical knowledge, and the availability of media for sampling) for identified major media in each process area of each component designated for sampling. Corings will also be taken in process areas where corrosive conditions existed to determine the depth of contaminant penetration. Such sampling, combined with the collection of supplemental grab samples from unknown or uncharacterized liquids, solids, and sediments and other supplemental sampling discussed below, will fulfill the data needs related to intrusive sampling identified in Section D.3.2 for evaluating alternatives and assessing baseline risks, and is consistent with the sampling approach presented therein.

Systematic intrusive sampling will be conducted for concrete, structural steel, and masonry to meet primary data needs. Such sampling will not be conducted for a number of construction materials found in OU3, including transite, metals other than structural steel, asphalt, and selected other materials. The intrusive sampling needs for these materials will be satisfied through supplemental sampling, discussed below. The reasons for limiting sampling of these materials as follows:

- For the sake of waste volume estimates, all transite is assumed to be radiologically contaminated and is not considered to be practically treatable to reduce contamination because of its small relative volume, large surface area, porous nature, and negligible recovery value. For this reason, intrusive sampling will be carried out only on a limited scale for OU3 as a whole as supplemental sampling to meet waste characterization requirements. (See additional discussion in Section D.3.4.3.4).

- Metals other than structural steel have only limited options for treatment or recycle and reuse, while volumes are relatively small. Moreover, treatment options may be difficult to carry out. For these

reasons, no intrusive sampling of other metals is planned during site characterization.

- Other construction materials, such as wall board, have very limited treatment options, and therefore intrusive sampling will not be carried out during the RI.

- Limited treatment options are available for asphalt and wood, which are concentrated in a few components. Limited sampling of asphalt and wood will be conducted under supplemental sampling.

D.3.4.3.4 Intrusive Sampling — Supplemental

Additional intrusive samples may be taken in OU3 components and media to supplement those identified in Section 3.3. The additional samples would be used to (1) interpret and/or validate the data taken systematically, (2) confirm assumptions, and (3) address specific data needs. The types of supplemental sampling envisioned for OU3 include sampling on a site-wide basis and sampling on a component-specific basis.

Site-wide supplemental sampling would consist of the following:

- *Transite* — Transite is a common construction material used as sheeting for walls and roofs for many OU3 buildings. It consists of a mixture of asbestos and concrete. For the purpose of waste volume estimates, it is assumed that all transite is radiologically contaminated. To evaluate the possibility that transite is contaminated with both radiological and chemical species (other than asbestos) at levels that would classify it as a "mixed waste," and therefore limit disposal options, a small number of samples will be taken from transite at site locations with the greatest potential for chemical contamination. Samples will undergo the toxicity characteristic leaching procedure (TCLP) test, as well as radiological analyses to determine its status. If leachable chemical contamination is below toxicity characteristic levels, transite will be assumed to be contaminated with only radiological constituents. Components designated for transite sampling are listed in Section D.9.0.8.

- *Media for Leaching Tests* — To support estimates of quantities of contaminants released by wind and water erosion for use in the baseline risk assessment, several samples will be collected from various media throughout the site for leaching tests. TCLP methods will be used to model leaching Chemical and radiological analyses will be performed on the leachate. Sampling will be in areas with expected elevated levels of chemical or radiological contamination. Components designated for media leaching tests are listed in D.9.0.8.

Component-specific supplemental sampling would consist of the following:

- *Heating, Ventilating, and Air Conditioning (HVAC) Equipment* — Air filtration units will be sampled on a component basis within the major office buildings only. Analysis of air filters will allow identification of airborne particulate contaminants within the component since the filter was installed. The information obtained from analysis of filter media may support a general evaluation of contamination throughout a component and provide a check on the types and identity of contaminants observed in the component.

- *Contaminant Collection Points (sumps, pits, drains, and runoff locations)* — Collection points to be sampled for each of the components designated for sampling will be determined during preliminary inspections. These collection points will then be sampled when sufficient quantities of liquids, sediments, or sludges are found to support chemical and/or radiological analyses. The objective of this sampling is to evaluate the transfer of contaminants to environmental media.

- *Loose Solids* — Loose materials that are likely to reflect general conditions in components will be sampled. For example, such materials could include particulate material deposited on horizontal surfaces. When significant quantities of uncharacterized loose materials are found, a sample may be collected for chemical and radiological analyses. Objectives of this sampling are to determine potential health and safety risks during decontamination and dismantling of components, the presence of residual loose contamination throughout the process area, and potential contaminants available for wind and water erosion and transport.

- *Bulk Material, Asphalt, Wood, and Beach Areas* — Screening with field instruments will be conducted to locate areas of elevated radiological contamination in bulk material, such as soil piles and scrap piles, and in dry free board or beach areas around impoundments. A single grab or composite sample will be taken, as appropriate, for laboratory analysis.

- *Liquids and Other Containerized Materials* — In cases in which unknown liquids or other containerized materials are identified in a component, a grab sample will be collected and analyzed for contaminants.

- *Ponds and Basins* — One composite of grab samples will be collected from the water and sediment of each pond and basin. The samples will be analyzed to determine the identity and concentration of contaminants

that could be released to the environment or directly contacted by a receptor.

- *Identifying Hazardous Waste* — Where appropriate, samples of media (outside the stored waste inventory) that are identified as potential hazardous waste under RCRA will be collected and subjected to analysis by TCLP.

D.3.4.3.5 Limiting Sampling on the Basis of Observed Trends

Data will be analyzed as they are being collected during the implementation of the SAP. If the analysis shows strong trends in the results for certain types of media in certain types of process areas, it is reasonable that as part of this analysis, trends should help focus the scope of the subsequent sampling and analysis program. For example, the depth of penetration of contaminants into materials may be about the same for the same types of materials in similar process areas. If this is observed to be the case, then the number and type of samples to be taken will be re-evaluated. An interim report of results and analysis of trends will be submitted to the U.S. EPA and Ohio EPA midway through the sampling program. Depending on the analysis of trends, and if appropriate, the sampling and analysis plan will be modified.

The field program will start with selected components in the process building component category, specifically with three wet (employing acid or caustic) process buildings (Plant 2/3, the Pilot Plant, and Plant 8) and a dry process building (Plant 4). These components will be sampled first and results from the sampling will be evaluated for trends, which will be detailed in the interim submittal. Analysis of trends is discussed in greater detail in Section 4.3.4.

D.4 SITE EVALUATION AND FIELD PLANNING

D.4.1 Introduction

The previous section outlined the RI objectives and presented an approach to gather data to meet them. The purpose of the present section is twofold — (1) to provide a general review of the nature and extent of contamination at the site and (2) to provide some details on practical matters involved in implementing field sampling and analysis, including a discussion of the sample numbering system, field work packages, and aspects of the data management system related to sampling and analysis activities.

With respect to the nature of contamination, the types and sources of known and expected radiological contamination are discussed in Section D.4.2. A similar discussion is provided for chemical contaminants in Section D.4.3. In each section, a discussion of specific contaminants is presented. The identified contaminants are evaluated as to their potential concern, resulting in the generation of a list of target analytes (contaminants for which an analysis is performed). The elimination of potential contaminants from the final analyte list is discussed on a case-by-case basis. For chemical analyses, standard analyte lists associated with the various analytical methods are used. The lists include identified analytes of interest plus additional analytes not specifically identified for OU3 but of general concern in industrial settings.

In Section D.4.4, a directory of component-specific information is presented. Various parts of the Work Plan Addendum are cited that contain information on the types and levels of contamination in individual components.

The final three sections discuss details related to the implementation of field sampling activities. Section D.4.5 describes the sample numbering system to be used and how it is implemented in the field. Section D.4.6 discusses field work packages, which are the actual field assignment documents for each sampled component used by field sampling teams. Finally, Section D.4.7 discusses, in very general terms, the data management system in place for the FEMP and aspects related to sample numbering and sample entry to the system.

D.4.2 Radiological Contaminants

D.4.2.1 Radionuclides of Interest

A list of radionuclides of interest for OU3 has been drawn from a number of sources that are summarized in the OU3 RI/FS Work Plan Addendum, including Table A.3. The following radionuclides have been identified through analyses of samples from surface and

subsurface soils adjacent to OU3 components and from other sampling activities related to interim actions:

Cesium (Cs)-137	Strontium (Sr)-90	Thorium (Th)-232
Radium (Ra)-228	Thorium (Th)-230	Uranium (U)-238
Thorium (Th)-228	Uranium (U)-235, 236	Lead (Pb)-210
Uranium (U)-234	Radium (Ra)-226	Polonium (Po)-210
Plutonium (Pu)-238	Technetium (Tc)-99	

Other radionuclides known to be (or to have been) present in OU3 components include:

Plutonium (Pu)-239, 240	Plutonium (Pu)-241	Plutonium (Pu)-242
Neptunium (Np)-237	Uranium (U)-233	

In addition, any other radionuclides in the uranium-238, thorium-232, or uranium-235 decay series (Figures D.4-1, D.4-2, and D.4-3) are of potential interest in OU3.

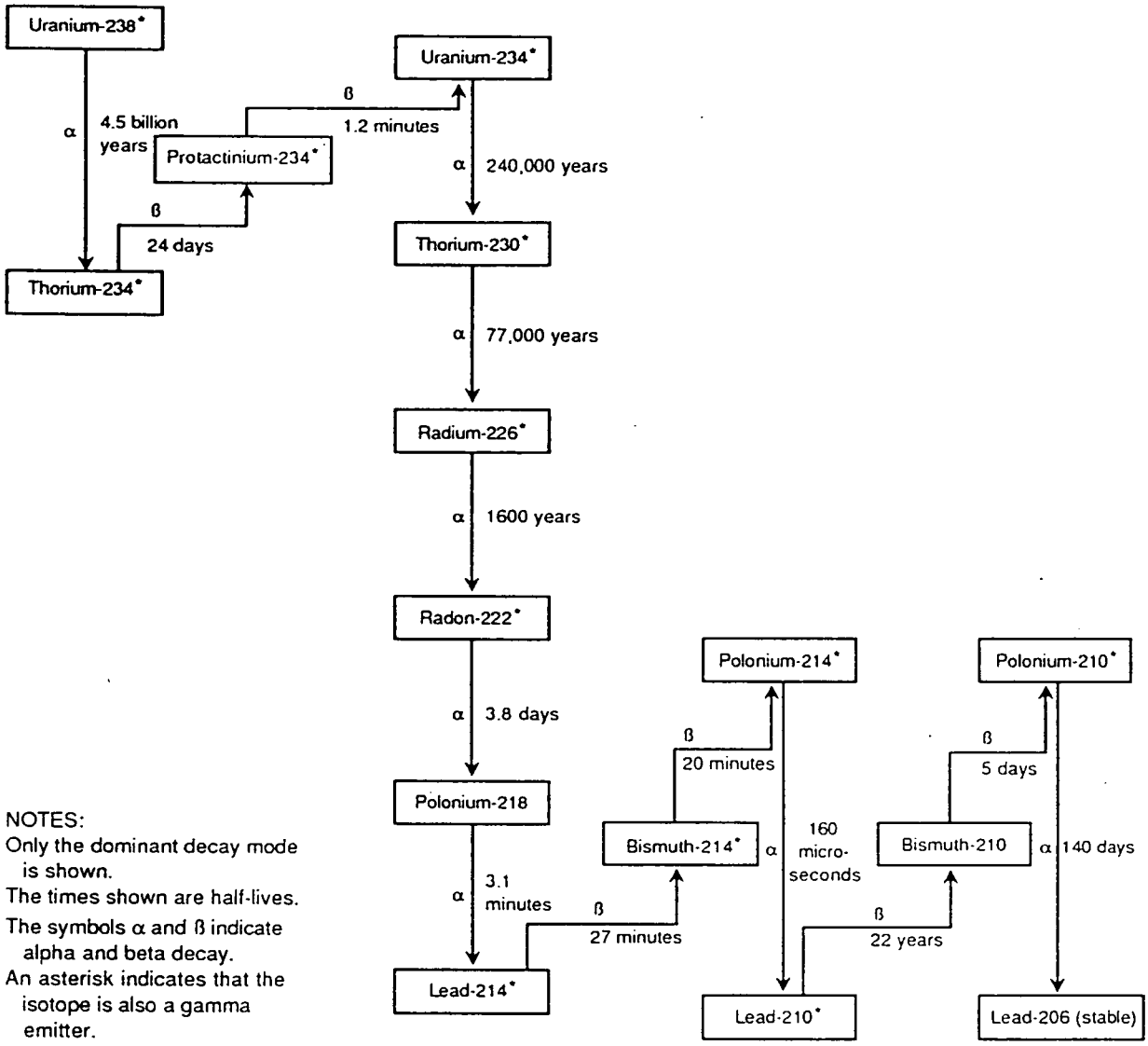
The radiological characteristics of the isotopes present in OU3 determine the instruments that can be used and the analytical procedures needed for identification. Table D.4-1 summarizes those characteristics. Information presented includes the isotopes, their half-lives, the type of radiation emitted (alpha, beta, or gamma), and the energies and abundances of those emissions. In addition, the same characteristics are provided for decay products (daughters) of the parent isotopes. The table shows only those emissions that have an abundance of at least 10%.

Significant daughters are selected on the basis of a half-life of 24 days or less. Any contaminant that has existed for six months or longer since any physical or chemical separation will have those daughters present in equal activity concentrations relative to the parent isotope.

Younger half-lived daughters, with a half-life of 138 days or more, are listed as a primary isotope. Physical and/or chemical separations can cause movement away from the parent isotope because of properties that are different from those of the parent. For example, it is possible for the lead-210 daughter of radium-226 to be present in reduced or increased activity concentrations relative to the parent. These kinds of disequilibrium are known to exist within OU3.

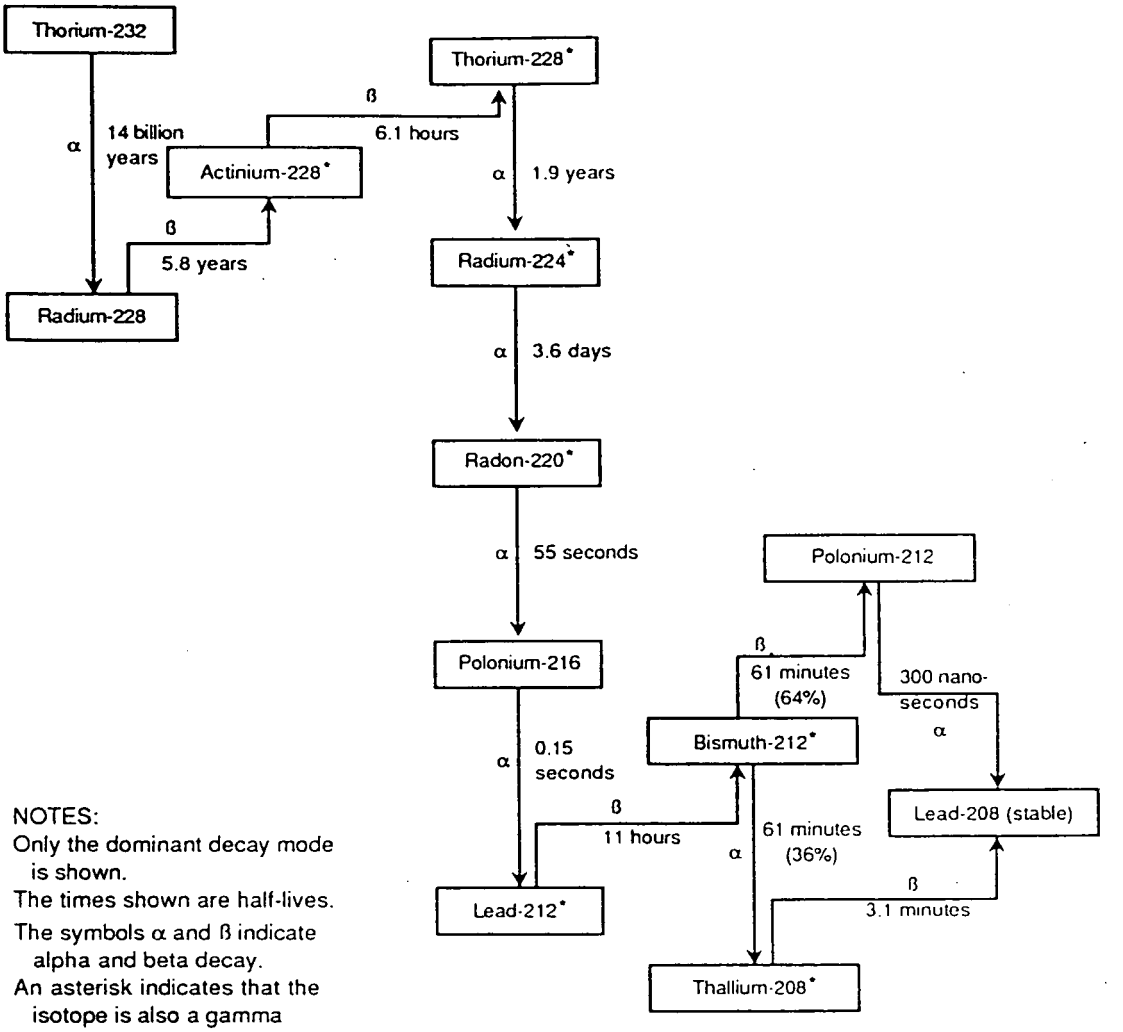
Through knowledge of process operations at the FEMP, the nature of contaminants can be related to the isotope mixtures that can be expected for the various facilities. The types of materials related to the expected isotopic mixtures are listed in Table D.4-2.

Table D.4-1 presents radiological properties for each of the isotopes listed in Table D.4-2. Process and operations knowledge, along with existing data, have been used to develop a universal set of parameters. All intrinsic samples will be analyzed for this universal set of parameters, including all potential FEMP radionuclides, to assure completeness.



NOTES:
Only the dominant decay mode is shown.
The times shown are half-lives.
The symbols α and ß indicate alpha and beta decay.
An asterisk indicates that the isotope is also a gamma emitter.

FIGURE D.4-1 Uranium-238 Radioactive Decay Series



NOTES:
Only the dominant decay mode is shown.
The times shown are half-lives.
The symbols α and ß indicate alpha and beta decay.
An asterisk indicates that the isotope is also a gamma emitter.

FIGURE D.4-2 Thorium-232 Radioactive Decay Series

Three radionuclides of potential significance have not been included specifically in RI/FS analyses thus far — uranium-233, protactinium-231, and actinium-227. These may require consideration for the situations described below. Uranium-233 is present in a thorium-232 matrix in Building 68, with a minor amount in Building 67. Analysis by alpha spectrometry does not permit resolution of uranium-233 and uranium-234 because the alpha particle energies are nearly equivalent. Analytical distinction is not critical because the committed effective dose equivalent through inhalation and ingestion is only slightly higher with uranium-233 (approximately 2%).

Where uranium-235 concentrations are significant, concentrations of the daughters protactinium-231 and actinium-227 should be known because of their contribution to the

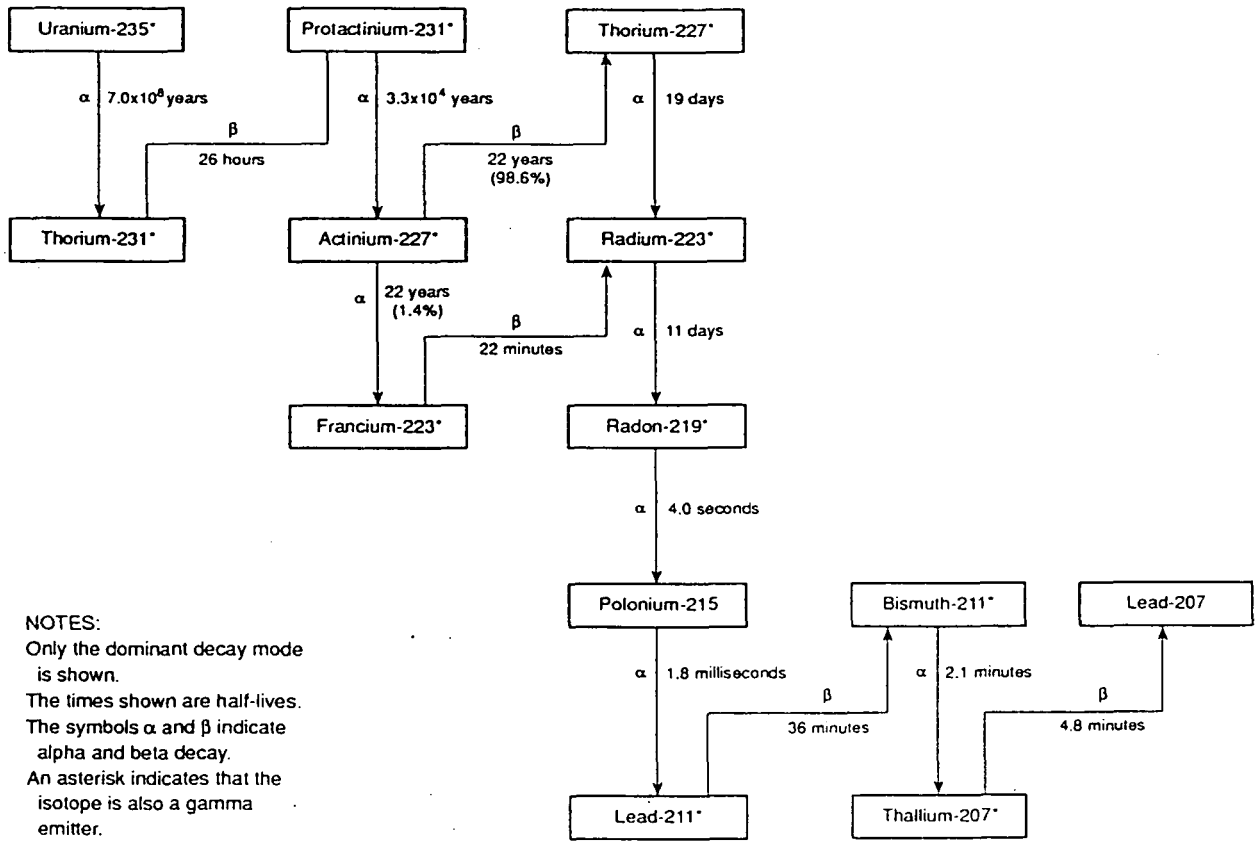


FIGURE D.4-3 Actinium (Uranium-235) Radioactive Decay Series

committed effective dose equivalent; this can be important for risk assessment. Protactinium-231 is present in natural uranium. Following chemical separation to produce normal, depleted, or enriched uranium, protactinium-231 and actinium-227 go to the waste stream. Subsequent in-growth of the two uranium-235 daughters is insignificant because of the 33,000-year half-life of protactinium-231. No routine analytical procedure is specific for either of the daughters. Instead, isotopic thorium alpha spectrometry provides results using the 6.04-MeV alpha particle energy from thorium-227. Protactinium-231 and actinium-227 are conservatively assumed to be in secular equilibrium.

D.4.2.2 Radionuclide Analysis

Radioanalytical procedures frequently yield results for more than one radionuclide. Some procedures are element specific and can provide results for more than one isotope of that element. Analyses for OU3 may include the following:

- Isotopic uranium — U-233 (as U-234), U-234, U-235, U-236, and U-238;

TABLE D.4-1 Significant Radioactive Emissions and Abundances for Radioactive Contaminants of Interest

Primary Isotope (half-life)[a]	Alpha Particles[b] (keV[%])	Beta Particles[c] (keV)	Gamma Rays[b] (keV[%])	Significant Daughters[d] (half-life)[a]	Alpha Particles[b] (keV[%])	Beta Particles[c] (keV)	Gamma Rays[b] (keV[%])
Transuranic Isotopes							
Pu-241 (14.4 y)		5.23		Am-241			
Am-241 (232 y)	5,443 [12.8]		59.5 [35.9]	Np-237			
Pu-239 (2.4 E+04 y)	5,155 [73.3] 5,143 [15.1] 5,105 [11.5]			U-235			
Np-237 (2.1 E+06 y)	4,788 [47.0] 4,771 [25.0]		29.4 [14.0] 86.5 [12.6]	Pa-233 (27.4 d)		58	312 [38.6] 98.4 [17.6] 94.7 [10.8]
				U-233[e]			
U-233 (1.6 E+05 y)	4,824 [84.4] 4,784 [13.2]						
Uranium-238 Series							
U-238 (4.5 E+09 y)	4,196 [77.0] 4,147 [23.0]			Th-234 (24.1 d)		43.5	
				Pa-234 m (1.17 m)		819	
				U-234			

TABLE D.4-1 (Cont.)

Primary Isotope (half-life)[a]	Alpha Particles[b] (keV[%])	Beta Particles[c] (keV)	Gamma Rays[b] (keV[%])	Significant Daughters[d] (half-life)[a]	Alpha Particles[b] (keV[%])	Beta Particles[c] (keV)	Gamma Rays[b] (keV[%])
U-234 (2.5 E+05 y)	4,776 [72.4] 4,724 [27.4]			Th-230			
Th-230 (7.7 E+04 y)	4,688 [76.3] 4,621 [28.4]			Ra-226			
Ra-226 (1,600 y)	4,785 [94.5]			Rn-222 (3.82 d)	5,490 [100]		
				Po-218 (3.05 m)	6,003 [100]		
				Pb-214 (26.8 m)		219	352 [37.2] 295 [19.2]
				Bi-214 (19.9 m)		632	609 [46.3] 1,764 [15.8] 1,120 [15.1]
				Po-214 (1.6 E-04 s)	7,687 [100]		
				Pb-210			
Pb-210 (22.3 y)		6.5		Bi-210 (5.01 d)		389	
				Po-210			
Po-210 (138 d)	5,305 [100]						

TABLE D.4-1 (Cont.)

Primary Isotope (half-life)[a]	Alpha Particles[b] (keV[%])	Beta Particles[c] (keV)	Gamma Rays[b] (keV[%])	Significant Daughters[d] (half-life)[a]	Alpha Particles[b] (keV[%])	Beta Particles[c] (keV)	Gamma Rays[b] (keV[%])
Thorium-232 Series							
Th-232 (1.4 E+10 y)	4,010 [77.0] 3,953 [23.0]			Ra-228			
Ra-228 (5.75 y)		9.9		Ac-228 (6.13 h)		375	911 [27.7] 969 [16.6] 338 [11.4]
				Th-228			
Th-228 (1.91 y)	5,423 [72.7] 5,341 [26.7]			Ra-224 (3.62 d)	5,686 [95.1]		
				Rn-220 (55.6 s)	6,288 [100]		
				Po-216 (0.15 s)	6,779 [100]		
				Pb-212 (10.6 h)		99.4	239 [44.6]
				Bi-212 (60.6 m)	64% Branch 6,051 [25.2] 6,090 [10.0]	36% Branch 717	727 [11.8]

TABLE D.4-1 (Cont.)

Primary Isotope (half-life)[a]	Alpha Particles[b] (keV[%])	Beta Particles[c] (keV)	Gamma Rays[b] (keV[%])	Significant Daughters[d] (half-life)[a]	Alpha Particles[b] (keV[%])	Beta Particles[c] (keV)	Gamma Rays[b] (keV[%])
				Po-212 (3.0 E-07 s)	64% Branch 8785 [100]		
				Tl-208	36% Branch -----	559	2,615 [100] 583 [84.2] 511 [21.6] 860 [12.5]
Uranium-235 Series							
U-235 (7.0 E+08 y)	4,396 [55.0] 4,364 [11.0]		184 [54.0] 144 [10.5]	Th-231 (25.5 h)		76.4	25.6 [14.7]
				Pa-231			
Pa-231 (3.3 E+04 y)	5,011 [25.4] 4,950 [22.8] 5,028 [20.0]			Ac-227			
Ac-227 (21.8 y)		9.6		Th-227 (18.7 d)	6,038 [24.5] 5,978 [23.4] 5,757 [20.3]		236 [11.5]
				Ra-223 (11.4 d)	5,715 [52.5] 5,606 [24.2]		269 [13.6]
				Rn-219 (3.96 s)	6,819 [79.6] 6,553 [12.9]		271 [10.6]

TABLE D.4-1 (Cont.)

Primary Isotope (half-life)[a]	Alpha Particles[b] (keV[%])	Beta Particles[c] (keV)	Gamma Rays[b] (keV[%])	Significant Daughters[d] (half-life)[a]	Alpha Particles[b] (keV[%])	Beta Particles[c] (keV)	Gamma Rays[b] (keV[%])
				Po-215 (1.8 ms)	7,386 [100]		
				Pb-211 (36.1 m)		453	
				Bi-211 (2.15 m)	6,623 [83.5] 6,279 [16.2]		351 [12.9]
				Ti-207 (4.77 m)		493	
Fission Products							
Cs-137 (30.2 y)		171		Ba-137 m (2.55 m)			662 [90.0]
Ru-106 (368 d)		10		Rh-106 (29.9 s)	-	1411	512 [20.6]
Tc-99 (2.1 E+05 y)		85					
Sr-90 (28.6 y)		196		Y-90 (64.1 h)		935	

TABLE D.4-1 (Cont.)

[a] Half-lives are given in years (y), days (d), hours (h), minutes (m), or seconds (s).

[b] Information provided for alpha particles and gamma rays is energy (keV) (outside of brackets) and percent abundance (inside brackets).

[c] Information for beta particles is average energy (keV) for the beta particle spectrum.

[d] Half-lives listed for daughters are for less than 24 days. Longer half-lived daughters are listed under the "Primary Isotope" column.

[e] Underlined daughters are those with longer half-lives and are presented in the table as primary isotopes because processes may cause them to exist independent of parent radionuclides.

TABLE D.4-2 Isotopes Expected to be Associated with Selected Material at OU3

Material	Expected Isotopes
Natural uranium (ores)	U-238 series (U-238 through Po-210) U-235 series (U-235 through Tl-207) [0.7% weight] May contain significant Th-232 series (Th-232 through Tl-208)
Normal uranium	U-238+Th-234+Pa-234m U-235+Th-231 U-234
Depleted uranium	U-238+Th-234+Pa-234m
Enriched uranium	U-238+Th-234+Pa-234m U-235+Th-231 (higher than normal) U-234 (higher than normal) Tc-99
Uranium tailings (unprocessed)	Th-230+Ra-226+daughters
K-65 residues (silos 1&2)	Th-230/Ra-226/Pb-210 = 0.25/1.00/1.10
Metal oxides (silo 3)	Th-230/Ra-226/Pb-210 = 1.00/0.05/0.05
Natural thorium (ores)	Th-232 series (Th-232 through Tl-208)
Normal thorium	Th-232 (slow in-growth of Ra-228+Ac-228; equilibrium in about 40 years)
Breeder thorium	U-233+Th-232 (Buildings 67 & 68 only)
Fission products	Cs-137, Ru-106, Sr-90
Transuranics	Pu-242, Pu-241, Am-241, Pu-239, Pu-238, Np-237

- Isotopic thorium Th-227, Th-228, Th-230, and Th-232; and
- Isotopic plutonium Pu-238, Pu-239, Pu-240, and Pu-242.

In addition to these three isotopic analyses, a fourth analytical procedure will be gamma spectrometry for Ru-106, Cs-137, Pb-214, Bi-214, Ac-228, Pb-212, Tl-208, Th-227, Ra-223, Bi-211, Th-231, and Am-241.

Gamma-ray spectrometry does not normally require chemical separation before analysis. Many gamma-emitting radionuclides can be quantified; the scope and sensitivity depend on the configuration of the analytical system and the energy and abundance of gamma rays from specific isotopes.

Because of their chemical and radiological properties, certain radionuclides are usually analyzed through specific radiochemical procedures. The following require such analytical procedures: Pu-241, Np-237, Ra-226, Ra-228, Tc-99, Sr-90, Pb-210, and Po-210.

D.4.3 Chemical Contaminants

D.4.3.1 Chemical Contaminants of Interest

Determining chemical contaminants of interest is not as straightforward as determining radiological contaminants of concern, which can be directly related to process materials. Chemicals were generally used as reagents or in a fashion ancillary to the main plant processes and therefore are not readily related to the process materials themselves. This section is intended to provide an explanation of the process used to determine chemical contaminants of interest on an OU3-wide basis.

Table D.4-3 lists potential chemical (as well as radiological) contaminants of interest that have been identified in OU3 through the RI/FS sampling and analyses of environmental media or identified by process knowledge (Table A.3 in Appendix A). The general sources, concerns, and rationale for selecting chemical contaminants are given in Table D.4-4.

Three types of information about OU3 components were considered in determining contaminants of interest: (1) process considerations, (2) media considerations, and (3) general considerations. The list presented in Table D.4-5 illustrates the types of potential chemical contaminants of interest by analysis group under each of these types of considerations.

TABLE D.4-3 Potential Contaminants of Concern 1

Radionuclides		Inorganics	2
Americium-241		Aluminum	3
Cesium-137		Arsenic	4
Lead-210		Barium	5
Neptunium-237		Beryllium	6
Plutonium-238, 239, 240, 241, and 242		Cadmium	7
Polonium-210		Calcium	8
Radium-226, and 228		Chromium	9
Strontium-90		Cobalt	10
Thorium-228, 230, 232, and 234		Copper	11
Technetium-99		Europium	12
Uranium-233, 234, 235, 236, and 238		Germanium	13
		Lanthanum	
Volatile Organics		Lead	14
1,1-Dichloroethene		Lithium	15
1,1,1-Trichloroethane		Magnesium	16
1,2-Dichloroethane		Mercury	17
Acetone		Molybdenum	18
Benzene		Nickel	19
Carbon Tetrachloride		Niobium	20
Chlorobenzene		Platinum	21
Chloroform		Potassium	22
Ethylbenzene		Selenium	23
Methanol		Silver	24
Methylene Chloride		Sodium	25
Methyl Ethyl Ketone (2-butanone)		Tin	26
Tetrachloroethane		Titanium	27
Tetrachloroethene		Vanadium	28
Toluene		Yttrium	29
Trichloroethene		Zinc	30
Vinyl Chloride		Zirconium	31
Xylenes			32
		Anions	
Semivolatile Organics		Chloride	33
Chlordane		Fluorides	34
Diamyl Amyl Phosphonate		Nitrates	35
Ethylene Glycol		Phosphates	36
PCBs		Sulfates	37
Pentachlorophenol			38
Tributyl Phosphate		Other	39
		Ammonia	
Petroleum, Oil, and Lubricants (POL)		Asbestos	40
Diesel Fuel		Cyanide	41
Fuel Oil		Phenols (total)	42
Gasoline		Sulfide	43
Hydraulic Oil			44
Kerosene			45
Lubricating Oil			46
Motor Oil			47
Naphtha Spirits			48

TABLE D.4-4 Chemical Contaminants of Interest by Analysis Class

Analysis Class[a]	Likely Sources	Concerns/Rationale
VOCs (33)	Solvents, fuels, POL	Toxicity, volume, mobility
SVOCs (64)	General industrial, POL	Toxicity
PCBs (7)	Transformers High temperature uses	Toxicity, persistence
Metals (23)	Ores, waste streams	Toxicity, volume
Anions	Acids, salts (nitrate, sulfate, phosphate, fluoride, chloride)	Water quality (runoff)
Asbestos	Insulation, transite	Toxicity, mobility
Other	General industrial (inorganic nitrogen, cyanide, sulfide, phenols)	Toxicity, safety, water quality

[a] Number in parentheses are the approximate number of analytes determined in the corresponding group by EPA methods.

D.4.3.2 Expected Locations for Chemical Contaminants

Selection of locations for collecting samples for chemical analysis will rely heavily on existing plant knowledge, as well as on visual observations and on collection of samples from natural collection points, such as in sumps and drains, ditches, and lagoon sediments. Field survey instruments will be used where there is evidence or suspicion of contamination of a type to which those instruments respond, but such instruments will not be used for general surveying of large surface areas.

Widespread chemical contamination over large surfaces at levels of concern is not expected in most OU3 components. Hazardous chemicals were used in relatively small amounts compared with process materials or were minor constituents of process materials, such as nonradioactive metals. Chemicals used in bulk were generally nonhazardous (such as lime), highly mobile (such as anions from mineral acids), or volatile (such as solvents). Mobile or volatile contaminants are not likely to adhere to or remain on surfaces.

Therefore, it will not be an objective of this plan to conduct surveys for chemical contaminants over large surface areas. Moreover, such surveys would be very cost inefficient. Rapid, sensitive, and inexpensive field survey techniques, such as those that exist for radioactivity, are not available for many potential chemical contaminants of interest, thus requiring that expensive laboratory analysis be conducted of any such survey samples. Instead, samples for chemical contaminants will generally be selected from the following sampling contexts: (1) areas that are collection points for runoff or that would otherwise

TABLE D.4-5 Illustration of Factors Affecting Indentification of Potential Chemical Contaminants of Interest

Factors	Contaminants of Interest[a]
Process Type	
Ore storage	Metals
Ore crushing	Metals
Digestion	Metals, anions
Extraction	Metals, anions, TBP, kerosene
NAR	Nitrate, metals
Raffinate	Metals, anions, VOCs
Cooling Water	Metals, anions
Electrical Supply	PCBs
Maintenance	VOCs, SVOCs, POL, metals
Hydrofluorination	Anions, inorganics, nitrogen
Metals production	Metals, anions, VOCs, POL
Metals fabrication	Metals, anions, VOCs, POL
Scrap recovery	Metals, anions, VOCs, POL
Media/Material Type	
Sump sediments/sludges	Metals, VOCs, SVOCs, PCBs, POL, wet methods
Sump and surface waters	Metals, VOCs, SVOCs, PCBs, POL, anions
Concrete floors	Metals, PCBs, POL
Steel and transite surfaces	Metals, POL
Bulk organic liquids	Metals, PCBs, POL
General Considerations	
Buildings	Asbestos, PCBs
Surfaces	Metals
Waters, liquids	VOCs, metals, anions
Sediments	VOCs, SVOCs, PCBs, metals, wet methods

[a] Acronyms: TBP = tributylphosphate; VOCs = volatile organic compounds; PCBs = polychlorinated biphenyls; SVOCs = semivolatile organic compounds; POL = petroleum, oils, and lubricants.

integrate contaminants that are diffusely dispersed at low concentrations over large areas, such as sumps or other runoff collection points; (2) areas that are pathways to environmental or human receptors outside the component, such as unlined sumps, ditches, or lagoons; or (3) areas suspected from process knowledge of being contaminated, such as ore storage pads, or other materials handling areas. Unidentified liquids and loose solids will be sampled as needed.

Field survey instruments or field test kits for chemical contaminants will be used to their best advantage in areas of suspected contamination. Photoionization detectors will be used to identify areas contaminated with volatile hydrocarbons, such as fuels and solvents, and therefore will help guide sample collection for VOCs. Field test kits for PCBs may be

used in areas around electrical transformers or equipment to help guide collection of laboratory samples. A portable X-ray fluorescence analyzer may be used in the field or in an on-site laboratory to locate areas with trace metals contamination.

D.4.3.3 Chemical Analysis

The basic list of chemical (and radiological) analytes is given in Table D.4-6. The chemical analytes listed comprise the EPA TAL for inorganics and the TCL for organic substances, with the exception of pesticides. The lists contain most of the potential contaminants of concern (Table D.4-3), with the following exceptions and justifications:

Potential Contaminant	Justification for not Analyzing
Metals	
Europium Germanium Lanthanum Niobium Platinum	These substances are or were present only in small and controlled amounts in the laboratory facilities on-site.
Lithium Tin Titanium Yttrium	These substances are not expected to represent a toxicity hazard.
Molybdenum Zirconium	These substances are present in only small quantities is isolated areas of OU3 and are not expected to represent a toxicity hazard.
Semivolatile organic compounds	
Chlordane	Chlordane was identified in only the Plant 1 Detrex still bottoms and is not expected to exist in significant quantities elsewhere.
Diamylamylphosphonate	Toxicity values not available, presumed to be relatively nonhazardous at levels present in OU3 materials; areas of use were limited.

Tributyl phosphate	Toxicity value low (oral LD50 in rat = 3.0 g/kg, Merck Index, 10th editon); not expected to represent a hazard.
Volatile organic compounds	
Ethylene glycol Methanol	Relatively low toxicity (lethal dose in humans about 100 mL for each, Merck Index, 10th edition), miscible with water; not expected to be present at hazardous levels in OU3 materials.

In addition to the basic analyte list given in Table D.4-6, several other parameters, mostly related to water quality, will be analyzed on an as-needed basis. Included among these parameters are anions, such as chloride, fluoride, nitrate, phosphate, and sulfate, which are primarily residuals from the use of strong acids in plant processes. In addition, ammonia nitrogen, cyanide, and sulfide will be analyzed for precautionary purposes in appropriate situations. Potential contaminants of concern that may be constituents of the petroleum products identified in Table D.4-3, such as benzene or polynuclear aromatic hydrocarbons, are covered in the analysis of VOCs and SVOCs.

The extensive list of potential chemical contaminants is analyzed through a relatively short list of analytical methods. Table D.4-7 summarizes the class of chemical contaminants and the analytical method.

Gas chromatography/mass spectrometry (GC/MS) will be used to analyze volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs). GC/MS is a reliable technique to analyze specific organic contaminants in environmental matrices. GC/MS is generally regarded as the most authoritative analysis available for identifying organic contaminants. It is also capable of reliable quantitative analysis when appropriate protocols are followed. The technique uses a gas chromatograph to separate contaminants in a mixture, the condition in which organics are typically present in environmental samples. Individual contaminants are then analyzed in the mass spectrometer portion of the instrument through the generation of their mass spectra.

Gas chromatography with conventional detectors will be used to analyze PCBs. PCBs are identified by their characteristic chromatographic patterns and retention times by comparison with those of authenticated standards.

Trace metals will be analyzed by one of two instrumental techniques — furnace atomic absorption spectroscopy (FAA), or inductively coupled plasma-atomic emission spectroscopy (ICP). FAA is more sensitive than ICP for certain metals, such as lead,

TABLE D.4-6 OU3 RI/FS Analyte List

Radionuclides

Isotopic uranium
Isotopic thorium
Isotopic plutonium and 241
Radium-226 and 228
Neptunium-237
Americium-241
Cesium-137
Strontium-90
Lead-210
Polonium-210
Technetium-99

TAL Inorganics

Aluminum
Antimony
Arsenic
Barium
Beryllium
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Magnesium
Manganese
Mercury
Nickel
Potassium
Selenium
Silver
Sodium
Thallium
Vanadium
Zinc
Cyanide

TCL Semi-Volatile Organics

1,2-Dichlorobenzene
1,2,4-Trichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
2-Chloronaphthalene
2-Chlorophenol
2-Methylnaphthalene
2-Methylphenol
2-Nitroanilene
2-Nitrophenol
2,2-Oxybis-(1-chlororpropane)
2,4-Dichlorophenol
2,4-Dimethylphenol
2,4-Dinitrophenol
2,4-Dinitrotoluene
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol
2,6-Dinitrotoluene
3-Nitroaniline
3,3-Dichlorobenzidine
4-Bromophenyl-phenyl ether
4-Chloro-3-methylphenol
4-Chloroaniline
4-Chlorophenyl-phenyl ether
4-Methylphenol
4-Nitroaniline
4-Nitrophenol
4,6-Dinitro-2-methylphenol
Acenaphthene
Acenaphthylene
Anthracene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(g,h,i)perylene
Benzo(k)fluoranthene
bis(2-Chloroethyl) ether
bis(2-Chloroethoxy) methane
bis(2-Ethylhexyl)phthalate
Butylbenzylphthalate
Carbazole
Chryzene
Dibenzofuran
Dibenzo(a,h)anthracene
Diethylphthalate
Dimethylphthalate
Di-n-butylphthalate
Di-n-octylphthalate
Fluoranthene
Fluorene
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Ideno(1,2,3-cd)pyrene
Isophorone
Napthalene
Nitrobenzene
N-Nitroso-di-n-dipropylamine
N-Nitrosodiphenylamine
Pentachlorophenol
Phenanthrene
Phenol
Pyrene

TCL PCBs

Arochlor-1016
Arochlor-1221
Arochlor-1232
Arochlor-1242
Arochlor-1248
Arochlor-1254
Arochlor-1260

TCL Volatile Organics

1,1-Dichloroethane
1,1-Dichloroethene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
1,1,2,2-Tetrachloroethane
1,2-Dichloroethane
1,2-Dichloroethene (total)
1,2-Dichloropropane
2-Butanone
2-Hexanone
4-Methyl-2-pentanone
Acetone
Benzene
Bromodichloromethane
Bromoform
Bromomethane
Carbon disulfide
Carbon tetrachloride
Chlorobenzene
Chloroethane
Chloroform
Chloromethane
cis-1,3-Dichloropropene
Dibromochloromethane
Ethylbenzene
Methylene chloride
Styrene
Tetrachloroethene
Toluene
Total Xylenes
trans-1,3-Dichloropropene
Trichloroethene
Vinyl Chloride

TABLE D.4-7 Summary of Chemical Contaminant Classes and Corresponding Analytical Method

Contaminant	Analytical Method
VOC	Gas chromatography/mass spectrometry
SVOC	Gas chromatography/mass spectrometry
PCBs	Gas chromatography
Metals	Atomic absorption spectroscopy, inductively coupled plasma-atomic emission spectroscopy
Anions	Ion chromatography, wet methods
Asbestos	Light microscopy
Phenols	Wet methods
Sulfides	Wet methods
Cyanides	Wet methods
Inorganic N	Wet methods
Oil and grease	Gravimetry

mercury, thallium, arsenic, and selenium. ICP is generally cheaper and faster for analysis of many metals in individual samples. The sensitivity requirements determined by the DQOs of the investigation will dictate which technique will be used for particular trace metals. Typically, both techniques are employed in investigations of this type. The techniques rely on the absorption (FAA) or emission (ICP) of light of characteristic wavelengths for the identification and quantification of metals.

Anions, such as sulfate, nitrate, phosphate, chloride, and fluoride, usually originating from mineral acids used in uranium processing will be analyzed by ion chromatography (IC) or by wet methods. The IC process has the ability to separate and analyze multiple anions in a single analysis. It usually employs an anion exchange column to separate anions and a conductivity cell to detect them. Specific anions are identified by their characteristic retention times.

So-called "wet" methods, generally those that involve characteristic chemical reactions, as opposed to instrumental methods, will be used as needed for a variety of analytes, including total phenols, sulfides, cyanides, and inorganic (ammonia) nitrogen. For some analytes, field analysis of air samples can be performed with Draeger tubes that involve similar chemistries. Total oil and grease will be determined by gravimetry (weighing) after a simple extraction and drying process.

D.4.3.4 Physical and Chemical Waste Properties

Characterization of the physical properties of the contaminants, or contaminated matrices, is particularly important to establish and assess potential remedial actions. Such

physical properties include particle-size distributions, porosity and void fractions, viscosity, and density.

Chemical properties of the contaminant and/or contaminated matrix are important for both risk assessment and potential remedial action alternatives. Much information will become available through analysis for chemicals and hazardous materials; however, limited additional analyses can be expected. For example, the chemical form of the contaminated matrix will bear upon decontamination and other treatment for waste minimization. For stabilization, storage, and disposal options, the solubility and potential for migration are also important properties.

Most of the information necessary to adequately characterize wastes will be available through analysis for contaminants of concern and through the determination of physical and chemical properties. Known existing wastes and waste forms are sanitary waste, low-level radioactive waste, RCRA hazardous waste, mixed wastes, and other forms of waste that may require controls and proper disposition. The ultimate disposition of wastes presumes the existence of waste acceptance criteria that may require additional characterization and documentation.

D.4.4 Directory to Component Information

A great deal of information on individual components is presented in various parts of the Work Plan Addendum, and it is neither practical nor necessary to summarize all that information here. Instead, this section provides a directory to the locations of relevant component information.

The concept of organizing OU3 into components is discussed in Section 2.2. The designation of 11 component categories is presented in Section 2.2.2, while Table 2.3 lists all OU3 components and grid map locations by component category.

The nature and extent of known contamination in OU3 components is discussed in Section 2.4, along with a description of past radiological and nonradiological monitoring programs. A basis for classifying components as either significantly contaminated or not significantly contaminated is also described in that section, and components for which sufficient data exists to make such a determination are classified accordingly.

Detailed component-specific information is provided in the Appendix A tables. Table A.1 provides a complete OU3 component list; Tables A.2.0 and A.2.1 describe component structures and processes; Table A.3 list potential contaminants for all components; Tables A.4.0 through A.4.5 summarize historical monitoring data for radiological and various nonradiological types of contamination; Tables A.5.0 through A.6 summarize drummed waste and drummed product inventories; and Table A.7 provides estimates of volumes of potentially contaminated materials by component.

D.4.5 Sample Numbering System and Tracking

Sample numbers for field sampling have been developed on the basis of a robust descriptive system, which can be readily decoded by field personnel. The system was developed primarily to facilitate database management and field sampling activities, as opposed to sample management. For the purpose of sample management and tracking, a subcode of the full sample number is used. This subcode system allows the project-specific numbering system to be integrated with the requirements of the SCQ and existing forms.

The sample numbering system incorporates component category, component number, process number, process type, sample media, sample type, and a unique sequence number for the component. For example, one sample designation identified for Building 39A is: 3-39A-4-Dry-Stel-Scrp-009. This sample number refers to a category 3 component numbered 39A, in identified process area number 4, which is a dry process. The sample will be a scraping from the structural steel in the process area, and the sample is number 9 for Building 39A. The subcode for this sample, which will be the primary representation of the sample number by field crews, is simply 39A-009, which can be cross-referenced back to the original number. Additional sample number delineation will be necessary for samples requiring multiple analyte group analysis (e.g., radiological and inorganics) to maintain unique sample container designations.

The sample numbers will be predetermined at the time of FWP development to the extent possible; however, field crews will be equipped to add to the list of samples. The sample designation will be used in a project-specific database (see Section D.4.7) to support tracking of the samples and to allow trending of field results. The database will be preloaded with sample numbers to the extent practical to allow for automated sample label and forms preprinting. The extent to which this can be achieved is contingent upon FWP progress and the results of QA/QC audits on its effectiveness.

The robust sample numbers and subcode will not be applied to field screening surveys (radiological swipes, radiological surveys, XRF surveys, etc.). A survey tracking system currently in use for radiological surveys will be employed, using area maps to number and mark the locations of sequential surveys and cross-referenced to describe each.

Sample labels will include all necessary cross references to completely relate them to the Daily Logs, Requests for Analysis, and Chain-of-Custody records described in the SCQ. Additional requirements dealing with various media and specific types of samples that may affect the information included on the sample labels are also contained in the SCQ.

Sample location is to be identified according to the 1983 state planar coordinate system. Sample locations will be field marked at the time of the sampling and surveyed in after sampling, working from benchmarks established throughout the site. Elevation will be reported relative to mean sea level as defined in the state planar coordinate system.

D.4.6 Field Work Packages

D.4.6.1 Description

Section D.9 is devoted to component-specific application of the sampling approach and protocols for each of the identified components of the OU3. In addition to this information, a component-specific field work package (FWP) will be completed for each of the components before the field sampling of the individual components is performed.

The primary function of the component-specific FWPs is to document specific sampling activity plans in each component and to obtain site approval for the activity. The FWP also reiterates the component description and process divisions for the benefit of field sampling personnel and further provides a systematic method of identifying procedures (see abstracts in Attachment D.I) to be employed and equipment requirements. A schedule is also prepared to serve as a flag for logistics coordinators.

The FWP specifies sample numbers to be utilized for sample locations identified in the component inspection activities per the OU3 RI/FS sample numbering system described above. Total sample volume needs are discussed relative to laboratory requirements to perform the relevant analyses for each location and media. The FWP also includes the project-specific Health and Safety Plan (HASP) and the authorized forms to perform the sampling, including Radiation Work Permits, FEMP Safety Work Permits, Chain-of-Custody forms, and others as applicable.

The outline for the FWP is as follows:

Signature/Authorization Block: This section includes authorizations from site management to implement the proposed activitity in the field. The preparer, the project supervisor, and the manager of the OU3 RI/FS will authorize the document.

Section 1.0 Introduction: This section provides a short summary of the component and a map. The description of the component is similar to that presented in the Section D.9 component-specific sampling summary; however, this section will highlight any logistics issues or special requirements for field crews.

Section 2.0 QA/QC Requirements: This section includes a signature block for the QA/QC lead for the project to verify that the identified plan for QA/QC samples in the component meet the intent and requirements of the SCQ.

Section 3.0 Sample Locations: This section describes the sampling locations and notes if changes have been made since the Section D.9 component-specific sampling summary was developed.

Section 4.0 Sampling Activities and Sample Handling: This section includes sample number designations, required volumes, and required containers. A table is provided to aid in sample number correlation to location, procedure, and ASL.

Section 5.0 Equipment Needed: A standard table of sampling equipment is marked to correspond to the specific sampling needs of the component. Additional special requirements are also addressed.

Section 6.0 Sampling Procedures: This section identifies which sampling procedures are to be employed for component sampling.

Section 7.0 Component Sampling Schedule: This section provides a timeline schedule of sampling for the component. Any special activities to be performed in the component and any timing logistics requirements are also addressed.

Section 8.0 Health and Safety Compliance: This section includes the component-specific HASP and any other safety-related documents are attached.

D.4.6.2 Procedure for Preparing Field Work Packages

For each OU3 component to be sampled, an engineering inspection has been performed and documented in the Section D.9 component-specific sampling chapters. On the basis of the findings in these inspections, an FWP will be developed for each component to be sampled. The following step-by-step procedure will be used to develop the FWPs:

1. Review corresponding Section D.9 subsection for the component and the backup file for the component.

2. Review identified site-wide supplemental samples from Section D.9 for applicability.

3. Review survey and sampling results for the component more recent than those documented in Section D.9 and the component backup file.

4. Review anticipated contaminants as listed in Table A.3.

5. Evaluate interim component changes for impact to sampling plans.

6. Perform component inspection to verify records.

7. Develop text sections of the FWP from gathered information and requirements of the OU3 RI/FS Work Plan Addendum and SCQ.

8. Develop a component-specific Health and Safety Plan to cover all sampling related activities in the component.

9. Obtain completed permits (Radiation Work Permit, FEMP Safety Work Permit, etc.) for planned sampling activities.

10. Provide initial FWP draft for program internal review.

11. Revise FWP per review comments.

12. Route FWP for formal review/signature.

13. Provide finalized document for training and logistics purposes.

The FWP is to be used by field personnel. Any deviations or additions to the FWP will be maintained in field logs by field personnel. Finalized information related to sample numbers, sample quantities, and sample locations will also be detailed in the logs, to be used in the sample tracking database.

D.4.7 Data Management Plan

The overall FEMP data management plan is described in Appendix F of the SCQ, and is summarized in Section 4.5 of this Work Plan Addendum. The purpose of the following discussion is to summarize the data management plan with respect to important interfaces with the field sampling program. The major elements of the data management system will be discussed in this regard, along with the aspects of the system important to planning field sampling efforts.

As described in the Section F.1.2 of the SCQ, there are seven steps, or activities, in the life cycle of environmental data after the approval of a project specific plan, as follows:

- Collection of samples (or field measurements),
- Transfer and handling of samples,
- Laboratory analysis and reporting,
- Data verification and validation,
- Data repository,
- Data analysis, and
- Data archiving and storage.

There are four main system elements of the data management system developed to support these activities: Automated Sampling and Analysis Program (ASAP), Fernald Analytical Computerized Tracking System (FACTS), Environmental Resource Management and Analysis (ERMA), and the Data Management System Results Database (DMSRD). The

centerpiece of the system is the Oracle-based DMSRD, which includes the site-wide environmental database and which is the central repository for all FEMP environmental data. The other three systems interface with the DMSRD to support data input/output, sample tracking and scheduling, and graphical representations and mapping, among other activities.

Two of the system elements, ASAP and FACTs, are the main ports of sample entry, as well as the main sample tracking systems, and therefore are of importance to field sampling teams. The DMSRD and ERMA systems are primarily involved in data storage and access and data analysis, respectively.

The main interface with field sampling is the ASAP system, which works in conjunction with the FACTS system to assign system sample numbers and generate sample analysis request and custody records and bottle labels for nonroutine samples (including RI samples). ASAP contains a subsystem that interfaces with FACTS, which is the primary laboratory data management system employed. FACTS contains a subsystem for sample tracking that issues sample identification numbers unique to each analytical sample generated. This identification number is used in all other FEMP environmental data base systems to cross-reference sample analysis results data.

In the present case, the sample number generating capability of the FACTS system will provide sample numbers for RI samples to the extent practical, as described above in Section 4.5. A manual system will be used to generate any additional field sample numbers. This provision is necessary to provide flexibility to field teams in the collection and numbering of discretionary samples. Therefore, a master cross reference table will be necessary that matches manual field sample numbers for RI samples to internal sample numbers used in the data management system.

D.5 FIELD SAMPLING PROTOCOLS

The purpose of the following three protocols is to provide guidance on the appropriate collection of samples to support the RI/FS, consistent with the identified data needs, objectives, and sampling approach discussed in Section D.3. Guidance is given on determining the location of the samples, as well as the type of sample to be collected and means of extraction. Locations are determined on the basis of process knowledge and existing radiological monitoring data, supplemented with visual inspections and nonintrusive sampling. The types of intrusive samples to be collected and the means of extraction are determined on the basis of potential contaminant penetration, as related to the type of process, "wet" or "dry," that took place within a given component. Protocol 1 provides guidance on nonintrusive sampling, Protocol 2 on determining final sampling locations, and Protocol 3 on selecting the appropriate sampling procedure and sampling tools.

D.5.1 Protocol 1: Nonintrusive Sampling

Nonintrusive sampling and measurements are made to:

- Estimate the magnitude and areal extent of contamination,
- Guide intrusive sampling, and
- Ensure worker safety.

The following protocol describes (1) the various types of nonintrusive measurements and associated instrumentation for both radiological and chemical contamination that will be required in the OU3 RI field program and (2) the methods for selecting measurement locations and frequencies in the course of conducting surveys using the various types of measurements. The protocol is divided into three discussions, (1) the nature of the measurements and the instruments, (2) how radiological surveys are conducted, and (3) how chemical surveys are conducted.

D.5.1.1 Survey Measurements and Instrumentation

Radiological monitoring of surface contamination includes both total and removable gross alpha and beta-gamma measurements. Total activity is measured directly, while removable activity is measured on material used to swipe a contaminated surface.

Low-level gamma measurements will identify potential accumulations of gamma-emitting radionuclides and low-level gamma exposure rates on the order of ambient background. High-range instrumentation is used primarily to monitor occupational exposure to gamma rays and beta particles to control penetrating and shallow radiation dose, respectively. Information gathered from these measurements will also contribute to the understanding of radiological contamination, and be useful for directing intrusive sampling.

Two types of radiological air sampling will be performed. Continuous air samples will be assayed for longer half-lived airborne radioactivity concentrations. Shorter-term grab samples will be assayed for concentrations of radon, thoron, and their respective short half-lived daughters. If significant levels are observed, continuous monitoring will be employed.

Field surveys of chemical contaminants will be made to explore regions of suspected contamination by the following means:

- Organic vapors using a photoionization detector and/or a portable gas chromatograph.
- PCBs using field test kits, and/or an on-site laboratory procedure, and
- Selected trace metals using a portable and/or on-site laboratory X-ray fluorescence spectrometer.

Health and safety protection will be supported by the above measurements, as well as by additional measurements of various types made specifically for this purpose. The types of additional measurements are listed in the corresponding section below, and calibration procedures are described in Appendix I of the SCQ.

D.5.1.1.1 Surface Radioactivity Measurements

Total surface contamination measurements will be taken with ZnS(Ag) alpha scintillation detectors and "pancake" thin-window (2 mg/cm^2) Geiger-Müller (G-M) beta-gamma detectors.

The alpha scintillation detectors respond very selectively to alpha-emitting contaminants. Instrument response to a given alpha particle energy is relatively constant, so response to different alpha emitters is comparable. Instrument backgrounds are typically low, and sensitivity, in the scaler mode, is adequate to meet the most restrictive limits.

The thin-window G-M beta-gamma detector response to beta particles is energy dependent. Potential contaminants represent a range of average beta particle energies (e.g., 85 keV from Tc-99 to 935 keV from the Y-90 daughter of Sr-90). The isotopic composition of the contaminants must be known to interpret instrument response. This response may be indeterminate with a variable mix of beta-emitting contaminants. Response to gamma rays is also a function of energy, and similarly it may be impossible to interpret response with a mix of gamma emitters. A mixture of beta emitters further complicates interpretation. In addition, the thin window allows some limited response to alpha emitters that may be present. One approach for qualifying G-M measurements would be calibration to a single contaminant species that may be present. Even though response may be nonspecific, the G-M detector is the most reasonably sensitive tool for beta-gamma emitter monitoring. Relative count rates can be used for screening and for selecting intrusive sampling locations.

Because these measurements are not radionuclide specific, proper assessment requires applying process knowledge or laboratory analyses of surface samples to identify the sources of the radioactivity. Field instrument response can only be interpreted in absolute terms when the underlying radionuclide mix is known.

Removable surface contamination is determined by swiping potentially contaminated surfaces. All swipes are assessed with low-background alpha-beta counting instruments. The efficiency of the counter for alpha and beta particles depends upon the energy of the radiation. Alpha particle counting efficiency varies less with energy compared with the beta particle energies that might be present in contaminants. The counting data are interpreted in relation to the isotopic mix assumed, expected, or known, and the calibration of the low-background counter.

D.5.1.1.2 Low-Level Gamma Radiation Measurements

Two types of NaI (Tl) gamma scintillation detectors will be used to measure gamma-ray fields at low levels (on the order of ambient background). Where higher-energy gamma-emitting contaminants (>100 keV) are to be measured, a cylindrical 2- × 2-in. detector is used. Effective monitoring of low-energy gamma-emitting contaminants, through reduced response to higher energies, is afforded by use of the FIDLER thin-crystal scintillation detector. With both detectors, response depends on the energy of the gamma rays present, and, therefore, knowledge of the identity of gamma emitters is needed for interpretation of measurements.

These measurements may be used to estimate bulk concentrations of contaminants in media such as soil or process residues. These measurements are sensitive, but sensitivity varies with the gamma energies of the source contaminants. The area distribution of gamma emitters determined from intrusive sample results in various process areas will be useful in interpreting gamma ray measurements.

Depending upon the gamma-ray energies and concentrations of the contaminants, low-level gamma measurements reveal contaminants at a relatively limited depth from the surface. For a practical estimate, FIDLER measurements are representative for depths up to 1 in., and 2 × 2 measurements are representative for depths up to 6 in. This range is acceptable for most of the media to be encountered in OU3. Low-level gamma ray measurements will have reasonable sensitivity and statistics with the instruments in the scaler mode and with count times of 30 seconds. Sensitivity will be reduced at locations where the ambient gamma level is elevated.

D.5.1.1.3 Gamma and Beta Radiation Exposure Measurements

Gamma-ray exposure rates will be measured with a pressurized ion chamber (PIC). The PIC responds uniformly to a broad range of gamma ray energies; therefore, the gamma-emitting isotopes need not be completely identified.

The PIC response accuracy is reduced at gamma ray energies below 40 keV. Where higher ambient gamma exposure rates are encountered, in excess of the range of the PIC, alternative instruments will be used. An energy-compensated (external plastic probe sheath) G-M detector is effective within the range of 0.1 to 100 mR/h. An ion chamber survey instrument (e.g., Cutie Pie) is effective for exposure rates in excess of 10 mR/h.

Beta emitter dose rates may be of concern for occupational exposure. Both G-M detectors and ion chamber instruments have moveable shields to allow beta plus gamma, as well as gamma only, to permit distinction of beta dose rate.

D.5.1.1.4 Air Sampling

Airborne particulate contaminants are primarily of significance for worker exposure. Measurements of airborne contaminant concentrations can also demonstrate the degree of entrainment and resuspension that occurs from contaminant sources. Air sampling locations are selected to be most representative of worker breathing zones within the facilities. High-volume air samples (tens of cubic feet per minute) will be used where sampling periods may be limited (noncontinuous). Where possible, continuous air sampling will be used for representativeness.

The presence of radium-226 and thorium-232 in a particular component may lead to concern for the presence of airborne radon, thoron and their short half-lived daughters. Short-term grab air particulate samples will be collected and counted in the field as needed. If significant daughter concentrations are encountered, specific monitoring will be performed to better characterize these airborne contaminants.

D.5.1.1.5 Organic Vapor Detection

A variety of types of organic vapors can be detected with a hand-held photoionization detector (PID) at levels as low as 0.1 ppm by volume (ppmv). The PID uses an ultraviolet (UV) light source to ionize and thereby detect organic vapors. The PID responds to a wide variety of chemical classes, particularly to aromatics, including benzene, toluene and xylene, and olefins, such as chlorinated ethenes (e.g., trichloroethene, TCE). Fuels can be detected primarily because of their aromatic content (aliphatic hydrocarbons give poor response). The identity of the detected organic vapor must be determined by a selective method, usually gas chromatograph/mass spectrometry (GC/MS). PIDs are very useful for determining the areal extent of contamination and for locating hot spots.

An alternative method for characterizing organic vapors is the use of a portable gas chromatograph (GC). Advantages of this method are the ability to identify and quantify specific vapors in air, with proper calibration. A further advantage is that with the use of various detectors, including a PID, a portable GC will respond to a greater variety of vapors than will a hand-held PID detector. Disadvantages include greater difficulty in calibration and use, larger size, and cost, as compared with the PID.

D.5.1.1.6 Detection of PCBs by Field Test Kits or On-Site GC

Field test kits are available for detecting PCB contamination in the field. PCBs can be detected at the low-to-mid ppm range in a variety of media, including soils, waters, and loose solids. The test kits use a chemical reagent to strip chlorine atoms, as chloride ions, from PCB molecules. The chloride ion concentration generated, determined with a chloride-specific electrode, is proportional to the concentration of PCB in the original sample. The test is nonspecific for a particular PCB mixture (Aroclor) and is subject to false positive results from the presence of other chlorinated organic compounds. Its speed and low cost, however, make it a useful screening tool for selecting laboratory samples. This test will be used at locations determined by process knowledge or visual inspection to be suspected of PCB contamination.

An alternative to using the test kits for conducting PCB surveys is to submit surface swipes or media samples to the on-site laboratory for a rapid screen by GC (gas chromatography). The analysis involves a simple and rapid solvent extraction step and analysis using an ASL B level of calibration and QA/QC.

D.5.1.1.7 Field Screening of Metals by X-Ray Fluorescence

Many trace metal contaminants of interest can be detected in a variety of media with a portable, or laboratory, X-ray fluorescence (XRF) spectrometer. Metal atoms are detected directly in their host media, eliminating the need for sample preparation. Most instruments use a detection cell that holds the sample. Some instruments also use a probe for directly detecting trace metal contamination on surfaces. In either case, various metals are detected with varying sensitivities, corresponding to their ability to fluoresce under the influence of the particular X-ray source. Therefore, the response characteristics of the instrumentation must be considered in light of the sensitivity requirements of the investigation to establish the usability of this technique. It is expected that this technique will be quite useful for locating or confirming the absence of many of the metals of interest to the RI. This emerging technology may prove to be a very useful tool for guiding field sampling for trace metal contamination.

D.5.1.1.8 Health and Safety and Physical Measurement Instruments

The following instruments will be used for industrial hygiene monitoring and for physical property measurements when conditions warrant:

- Oxygen percent meters,
- Combustible gas indicators,
- Photoionization detectors (PID),
- Organic Vapor Analyzers (OVA),

- Indicator tubes (e.g., Draeger — NH_3 vapors),
- Temperature measurement devices,
- Conductivity meters, and
- pH meters.

Descriptions of these devices and instructions for their use are provided in the SCQ. The previously described radiological measurements will also be used for health physics monitoring and controls. Other monitoring is provided at the FEMP, including external radiation dosimetry and both direct and indirect radiobioassay.

D.5.1.2 Conducting Radiological Surveys and Air Sampling

The following provides guidance on (1) selecting what areas within components should be surveyed, (2) what types of surveys are appropriate in a given situation, and (3) how surveys and air sampling are to be carried out. The primary objective of conducting surveys is to guide or confirm the selection of intrusive sampling locations. However, all survey locations and readings will be recorded for possible later use in characterizing contamination levels over the surveyed regions of components.

D.5.1.2.1 Surface Contamination Surveys

Total beta-gamma and removable alpha and beta-gamma surface activity measurements, as appropriate for known and/or suspected contaminants, will be made over areas of a component suspected of being contaminated, as determined through a judgmental approach. Existing data and process knowledge will be used to select the areas to be surveyed, generally defined process areas where existing survey is sparse or nonexistent. The objective of the survey within a given process area is to identify the locations of highest radiological levels within each of the media types sampled, for the purpose of selecting appropriate intrusive sampling locations.

Generally, final sampling locations will be selected on the basis of highest total beta-gamma activity (Protocol 2). Removable alpha, as well as removable beta-gamma measurements, will supplement the total beta-gamma measurements to help select final locations. Measurements of removable contamination are also required to fill specific data needs related to risk assessment and worker protection.

Surveys of the removable fraction of gross alpha and/or beta-gamma radioactivity will be determined through surface swipe sampling. Generally, a surface swipe sample will be collected at locations of elevated activity identified in the measurements of total activity. The sampling goals are to obtain at least one swipe sample per major medium in each process area and to collect multiple swipes in extensively contaminated areas in order to characterize the general levels and composition of removable activity in those areas.

Consistent with the overall approach to characterizing components described in Section D.3, surveys will be conducted to guide intrusive sampling of major media, as well as to pre-screen prospective supplemental sampling locations and media. The following guidance addresses the activities related to both of these objectives.

Radiological Surveys of Major Media

Surveys will be conducted of major media (concrete, masonry, and structural steel, as defined in Section 4.3.3) within each process area of a component, as defined in the corresponding subsection of Section D.9. Component drawings in Section D.9 outlining the various process areas should be consulted during the survey, which will be conducted as follows:

1. Within a process area, confirm the locations of "hot spots" (local maxima) for removable alpha and total beta-gamma activity as indicated on the component drawing by resurveying the locations. Survey removable alpha and total beta-gamma as necessary to pinpoint previously identified maxima.

2. For each major medium in a process area, characterize the region around the maximum by systematically surveying at an increasing radius. The distance between measurements and the total number of measurements will be determined in the field based on the size of the area being surveyed and the degree to which readings change with distance. Continue to survey until readings stop decreasing, or begin to increase. Record all readings.

3. If readings do begin to increase outward from an identified maximum, locate this adjacent maximum and confirm that it does not exceed the original maximum. If it does, designate this as the current maximum and revise the component drawing accordingly by hand.

4. Using a judgmental approach, identify through surveys locations on major media within the process area, other than identified maxima, that could plausibly be significantly contaminated due to location, orientation, presence of stains or cracks, or based on specific process knowledge.

5. If no survey data exist for a given major medium, the medium should be systematically surveyed for total beta-gamma, using survey practices in accordance with FEMP monitoring procedures and relying on the judgment of the survey technician. Record all readings and identify the location of the maximum reading for total beta-gamma, regardless of the actual magnitude of the reading. Also survey removable alpha and

beta-gamma levels in the vicinity of the hot spot. Annotate component drawings by hand accordingly.

Surveys of Prospective Supplemental Sampling Locations

Prospective supplemental sampling locations within a component identified in the corresponding subsection of Section D.9, or during the present inspection and survey phase, are to be screened for alpha and/or beta-gamma activity to guide intrusive sampling. The survey should be conducted as follows:

1. Locate the prospective areas and media for supplemental sampling for a given component as identified in Section D.9, and specified accordingly in the component FWP.

2. Note any other prospective locations for supplemental sampling identified during major media surveying or further inspections, and annotate drawings.

3. Survey surfaces and any identifiable loose media present in the vicinity that are reasonable candidates for intrusive sampling using conventional surveying practices. Locate a maximum at each location. Record all readings along with a brief description of the location and medium surveyed.

4. If an air or liquid handling system within a component, such as HVAC, has been designated for supplemental sampling without predesignation of sampling locations, a survey should be conducted at key points in the system, particularly the filters themselves, loose solids, and locations in ductwork or piping where deposition is likely, such as at elbows or drainage points, as accessible.

5. If the component being surveyed has been designated for characterization of media addressed under supplemental sampling, such as transite, prospective locations for intrusive sampling of the involved media, as identified in Section D.9, should be surveyed for total beta-gamma activity.

The location of each identified hot spot with respect to a standard survey point in each component identified by state planar coordinates will be measured with a tape, recorded on survey forms (along with a description of the media sampled), and marked and numbered with paint or adhesive tape.

All swipe samples in the component exceeding one order of magnitude of the limits for release without radiological restrictions as stated in DOE Order 5400.5 will be composited for a single laboratory analysis to identify the radionuclide mix that is present. For each

component, if no swipe samples exceed this level, no laboratory analysis of swipe samples will be conducted.

D.5.1.2.2 Low-Level Gamma Radiation Measurements

Qualitative low-level gamma ray measurements will be taken during the initial approach to each process area known, or suspected to be, contaminated. In areas where gamma levels are equal to, or greater than, twice background, exposure rate measurements will be taken. Process equipment such as tanks, pumps, traps, and similar features will be surveyed to identify those containing significant quantities of gamma emitters. A reading of greater than 100,000 counts per minute (cpm) is a reasonable guideline for supplemental sampling of unknown material contents.

D.5.1.2.3 Beta and Gamma Exposure Rates

Gamma ray exposure rates will be measured at locations known, or suspected to have levels in excess of typical background (approximately 10,000 cpm low-level gamma). The limit for environmental exposure under DOE Order 5400.5 is 20 µR/h above background.

Prospective locations for beta and gamma ray exposure rate measurements within components are locations exhibiting the highest beta-gamma activity as identified in the corresponding subsections of Section D.9, and specified in the component FWP. To meet the needs of risk assessment (Section 3.1 of the WPA), measurements are required at the location of highest exposure for an individual in a given component. Measurements should be taken at several high exposure locations within a component so that risk assessors can choose one corresponding to the most likely exposure scenario. Exposure rate measurements for occupational exposure are handled separately, according to the requirements of the health and safety plans for individual component FWPs.

D.5.1.2.4 Air Sampling

At least one particulate air sampler will be in operation per component undergoing investigation. Sampling locations for air samplers are to be selected to be most representative of worker breathing zones within facilities. This sampling activity will be completed in advance of component sample collection to establish ambient conditions and to indicate any potential need for personal protective equipment. Previous health physics air sample data will also be assessed.

In buildings where the presence of radium-226 could lead to airborne radon-220 and radon-222 and/or where the presence of thorium-232 could lead to airborne radon-220, grab samples will be collected daily for one week (five work days) before RI work begins. If the grab samples show concentrations in excess of 0.02 working level (WL), then a continuous sampling program will be initiated. Radon and/or thoron daughters will be monitored by a

continuous air monitor. If the chosen monitor does not have a direct readout, stored instrument data will be accessed every 24 hours.

D.5.1.3 Chemical Surveys

Widespread chemical contamination over large surfaces at levels of concern is not expected in most OU3 components. Hazardous chemicals were used in relatively small amounts compared with process materials, or were trace constituents of process materials, such as nonradioactive metals. Chemicals used in bulk were generally nonhazardous (such as lime), highly mobile (such as anions from mineral acids), or volatile (such as solvents). Mobile or volatile contaminants are not likely to adhere to, or remain on, surfaces.

Selection of locations for taking field measurements of chemical contaminants will rely heavily on existing plant knowledge, as well as on visual observations, emphasizing natural collection points. In general, field survey instrument measurements will be taken wherever there is evidence or suspicion of contamination of a type to which the various instruments respond. On the other hand, such instrument measurements will not be used for general surveying of large surface areas on the chance of locating isolated contamination.

Surveys for chemical contaminants will be conducted in the following sampling contexts: (1) areas that are collection points for runoff, or that would otherwise integrate contaminants that are diffusely dispersed at low concentrations over large areas, such as sumps or other runoff collection points; (2) areas that are pathways to environmental or human receptors outside the component, such as unlined sumps, drains, ditches, or lagoons; or (3) areas suspected from process knowledge of being contaminated (such as ore storage pads or other materials handling areas) or near electrical transformers (for PCB contamination). Bulk liquids and solids of uncertain identity will also be surveyed.

D.5.1.3.1 Organic Vapor Surveys

Hand-held photoionization detectors and/or a portable GC will be used to identify areas contaminated with volatile hydrocarbons, such as fuels and solvents, and will thereby help guide sample collection for VOC analysis.

Locations for surveying will be determined judgmentally as the surveyor systematically walks through and inspects the component. Features of the component that should be given special attention are those in which VOCs may have collected, such as sumps and drains. Unknown materials in various containers or process equipment may also be surveyed for the presence of organic vapors. Such materials must be surveyed for radioactivity prior to organic vapor sampling.

To identify areas of elevated vapor concentrations, the general background vapor level within a component must first be determined. Readings should be taken in an open area of a component, away from suspected sources, to establish background. Sources

contaminated with VOCs will generally yield readings that are 2 ppm or more above background in the air immediately above the source.

D.5.1.3.2 PCB Surveys

Field surveys for PCBs will be conducted using field test kits or rapid turnaround GC analysis in the on-site laboratory, both of which are ASL B procedures. Surveys will be conducted in components that contain or formerly contained electrical transformers or other types of equipment in which PCBs may have been used and spilled.

Potentially contaminated surfaces and loose media or liquids associated with such equipment should be subjected to screening. Surfaces of major media will be sampled by swiping a 100-cm^2 area with a glass fiber filter wetted with hexane. Surface swipes will be subjected to laboratory GC analysis to achieve required detection limits. Either the ASL B or C/D procedure may be used; however, when surficial PCB contamination in excess of 100 µg/100 cm^2 is located on a major medium, at least one swipe sample from the area must be submitted for laboratory analysis at ASL C/D. The approximate areal extent of contamination exceeding this level should be determined through further swipe sampling of the contaminated area and employing analysis at ASL B.

Solid and liquid media will require a simple extraction procedure before analysis by either field test kits or GC. Sample preparation for field kits will be done according to instructions and using materials supplied in the kits, while extractions for GC analysis will done in the laboratory using a simple solvent extraction procedure. Positive results in excess of 50 ppm by either test must be confirmed by analysis with the ASL C/D procedure.

D.5.1.3.3 Trace Metals Screening

A portable or on-site laboratory X-ray fluorescence analyzer will be used to identify areas and/or media with trace metals contamination under ASL B. It is not practical to analyze the entire 23 element target analyte list using the XRF technique. Therefore, the instrument employed will be configured with the appropriate source or sources required to detect an optimal suite of elements of interest. The suite of analytes will be determined by examining instrument performance characteristic for various elements in conjunction with identifying elements of particular interest determined through specific process knowledge or previous analytical results.

One possible instrument configuration would be using a Cd-109 source in a field instrument to analyze for copper, zinc, lead, arsenic and zirconium in the range of 10-100 mg/kg in solid media. Configuring the instrument with multiple sources is also possible. In either case, calibration must be performed for all elements of interest in the media of interest to obtain quantitative results.

Surface contamination on major media can be determined in swipes or scrapings of nonporous media, or in chips of porous media. Loose media and liquids can be analyzed

directly, after filtering, screening, or homogenizing as necessary. XRF by itself is not sensitive enough to meet the primary data requirements of the RI, but will be useful for guiding intrusive sampling.

Locations for measurement and/or sampling will be selected judgmentally based on process knowledge and visual inspections. Surveying will be conducted to support the objectives of locating areas of maximum contamination in major media to be sampled intrusively for laboratory analysis of the TAL, and also for determining the presence or absence and approximate areal extent of trace metals contamination in the media. Screening of prospective supplemental samples will also be possible for determining the presence or absence of trace metal contamination and for selecting intrusive samples.

D.5.2 Protocol 2: Determining Final Intrusive Sample Locations

Preliminary locations for intrusive and supplemental samples are identified for all components in the respective subsections of Section D.9. These locations were selected after each component was inspected to gather component-specific information in preparation of that section of the SAP. The purpose of this protocol is to provide guidance for selecting final locations for collecting intrusive samples following evaluation of nonintrusive sampling results (Protocol 1) and further inspection of the components.

D.5.2.1 Major Media Sampling

For radiological samples, a single, specific location will be designated for intrusive sampling by such means as coring, chipping, or cutting. For surface swipe or scraping samples, a general area will be designated to be covered by multiple subsamples that will be composited into a single sample. For applicable chemical parameters, a single intrusive sample will also be taken in each major medium in each process area. This location may or may not coincide with the radiological sample location. Guidance for conducting chemical surveys of various types is given in Protocol 1, which aids the selection of intrusive sample locations. If chemical survey data or process knowledge is inconclusive, samples for chemical parameters should be taken at the same location as the radiological sample. The following factors will be considered in designating the optimum radiological sample locations:

1. Areas that represent a maximum for total beta-gamma readings will be given greatest consideration.

    a. If a single area of elevated survey readings exists, that area should be selected as the sampling location, in the absence of prohibiting factors.

    b. If several areas exhibit activity near the maximum, a representative location in terms of orientation and surface exposure should be selected for sampling.

c. If no elevated levels are found in a given medium in a given process area, other factors listed below will determine the final sampling location.

2. Areas of potential or likely deposition of contaminants on major media will be considered. Factors to be considered include the following:

   a. Proximity of medium to process equipment or materials.

   b. Orientation of this medium with respect to likely contamination pathways, which may include:

      - air deposition,
      - liquid runoff, and
      - contact with process media.

3. Consider the levels of removable alpha activity. If several areas have similarly high levels of total beta-gamma activity, focus on areas with the highest levels of removable alpha activity.

4. Evaluate the accessibility of the prospective sampling location. Locations that are not accessible to sampling crews and equipment will not be selected.

5. Observe the presence of cracks or fractures, where contaminants may have migrated, and which may be of interest for intrusive sampling. Coring or breaking up of the media may be necessary to sample the full depth of penetration.

6. Observe areas of discoloration, erosion or deposits, or similar visual clues. Such areas will be considered in conjunction with other criteria for determining intrusive sample locations.

D.5.2.2 Supplemental Sampling

Preliminary identification of media for supplemental sampling will result from a visual inspection of a component. Locations will be considered on a component-wide, or even site-wide basis, versus by process area (as is the case for major media sampling) and will require coordination prior to finalization. This mode of sampling addresses data needs not provided for by major media sampling. It is expected that various collection points will provide relatively abundant sample material, such as loose solids, to reveal general

contamination conditions within a component. Given these objectives and uses, the following guidelines apply:

1. Availability of sampling material: Locations that provide sufficient sample volume to meet standard analytical requirements for parameters of interest will be given priority. Such locations include:

   a. HVAC filters and ducts in specified components,

   b. Sumps, pits, gutters, and other runoff points,

   c. Air samples (see Protocol 1), and

   d. Major media sampled in only specified components, such as transite, in locations of potential contaminant exposure.

2. Sampling material location: Locations that have a clear relationship to a component process area are preferred to those of a more general nature for their usefulness in data interpretation. Such areas, for example, include a sump that drains a specific process area, as opposed to a combined sump for an entire component.

3. Accessibility of the prospective location: Locations that are readily and safely accessible to sampling crews are preferred to those that are not, other factors being equal.

4. Environmental release point or pathway: Locations that provide information that will be useful in interpreting potential contaminant release and transport are desirable to the extent they can support risk assessment, worker safety and decontamination data needs.

D.5.3 Protocol 3: Intrusive Sampling

Intrusive sampling will be specified by media, location, and sample type for both major media and supplemental sampling. In Section D.9, the general locations and types (e.g., cores, chips, or surface scrapings) of intrusive samples to be collected are specified by media types for each component. Protocols 1 and 2 determine final sampling locations. The purpose of Protocol 3 is to (1) identify the appropriate sampling procedure to be used, and (2) describe how to select options within the procedures, such as what sampling tool should be used under various circumstances, for collection of the specified samples.

D.5.3.1 Scope of Intrusive Sampling

A number of types and subtypes of media have been identified as possible sampling targets for the OU3 RI, as indicated by the variety of available sampling procedures

(Table D.5-1). The focus of this protocol is applying available procedures for sampling major media, concrete, masonry, and structural steel (see Section 4.3.3). Such sampling constitutes a major portion of all intrusive sampling and has the greatest number of options for the method of sample extraction.

The type of sample and means of collection of concrete and steel samples depends on the nature of the environmental conditions to which the respective materials have been exposed during their use. Basically two types of conditions existed within OU3, so called wet and dry conditions. Chemical processing took place on the "wet" side of the plant. Materials in many areas of this side of the plant were subjected to corrosive atmospheres from the use of strong acids and caustics in chemical processing and are designated as acid, caustic, or simply "wet" subtypes. Concrete, steel, and other materials in these areas are likely to be corroded or otherwise chemically altered, providing a means for greater penetration of contaminants than would otherwise occur.

On the "dry" side of the plant casting and machining activities took place, which did not involve the use of acids or caustics. Materials in these areas were not exposed to corrosive atmospheres and therefore are less likely to exhibit significant penetration of contaminants. Different types of intrusive samples are therefore appropriate in the dry, versus wet, processes. The collection of the appropriate sample type is addressed in the following section.

The application of the available sampling procedures (Table D.5-1) for collecting supplemental samples of nonmajor media is straightforward, and therefore is not addressed in detail here. The type of sample to be collected is generally obvious and not affected by the prevailing environmental conditions. The selection of an appropriate sampling tool should be based on practicality of use and generally will not affect the nature of the sample ultimately collected.

D.5.3.2 Applying Sampling Procedures

Abstracts of OU3-specific sampling procedures created to support the RI, but not yet in the SCQ, are given in Attachment D.I.2, while general sampling procedures are given in Appendix K of the SCQ. A listing of the sampling procedures, the means of extraction, and the applicable media are given in Table D.5-1. The analytical procedures to be employed are contained in Attachment I of the SCQ. Summary table listings of all applicable sampling and analysis procedures are given in Section D.6. The following discussion addresses application of selected sampling procedures and the associated sampling tools for the collection of the specified samples.

TABLE D.5-1 Liquid and Solid Sampling Methods

Procedure No./ Applicable Media	Sampling Devices or Methods	Items Sampled
Liquid Sampling Methods		
EMON-001 Shallow or standing liquids	Ladle, scoop, dipper, or container	Standing liquids on or in roofs, floors, tanks, drums, sumps, ducts, process equipment, wet scrubbers, surface skins from impoundments
EMON-009 Deeper liquids	Grab Sampler, Coliwasa, Teflon bailer, or weighted bottle	Retention basins, larger drums, tanks, and vessels
EMON-010 Contained liquids	Valves, disconnects, or penetrations	Tanks, process lines and pipes, other containerized liquids
Solid Sampling Methods		
EMON-016 Loose solids	Dipper, thief, trier, scoop, trowel, or shovel	Process residues, wastes, solids in tanks, vessels, dry sumps, scrubbers, lines, and conduits
EMON-017 Firmer solids	Trier, auger, or probe	Stiffer materials from above
EMON-018 Surface soil	Top soil cutter, scoop, chisel	Dirt storage piles and impoundment beaches
EMON-018 Sub-surface soil	Auger, probe, coring tool, or split-spoon sampler	Above for profile
EMON-011 Sub-liquid sediments	Dredge	Impoundments, process and waste sumps, tanks and vessels
EMON-019 Soft surfaces	Rasp, plane, scraper, or rotary hammer drill	Wood, drywall, coatings, laminates, paint, tiles
EMON-020 Hard surfaces	Jackhammer, chisel, or rotary hammer drill	Concrete, asphalt, masonry
EMON-020 Hard cores	Diamond coring tool (powered)	Above for contaminant penetration
EMON-021 Metallic surfaces	Drill with grinding knurled rasp or coring bit, or cutting wire for tubes	Structural steel, tanks, equipment, scrap

TABLE D.5-1 (Cont.)

Procedure No./ Applicable Media	Sampling Devices or Methods	Items Sampled
Solid Sampling Methods (Cont.)		
EMON-022 Fabric and sheet metal	Shears	Heating, ventilating, or air conditioning filters, curtains, drapes, fabric, ducts, siding
EMON-023 Solids in lines	Bottle and steel brushes	Pipes, conduits, lines

D.5.3.2.1 Sampling Concrete

Wet Process Areas

Concrete in wet (acidic or caustic) process areas will be sampled with procedure EMON-20, Sampling Hard Surface Media, which offers several options for extracting a sample. The first option that should be considered is using the powered diamond coring tool to extract a core of the concrete. If a good quality core, one that can be sectioned, cannot be obtained, other sample extraction options in the procedure may be pursued. If another sampling tool is used, the objective of determining the depth of contamination should still be addressed to the extent practical.

Cores are to be sectioned in the field or in the laboratory with an appropriate saw. Sections are to be cut at depths of 1/2 in. and 1 in., with the remainder of the core constituting the third section (which may be further sectioned later). Core sections are to be surveyed at the top and bottom surfaces with appropriate survey instruments for the types of contamination known or suspected to be present in the area of the core. All readings are to be recorded, along with the core and section surface identification.

Dry Process Areas

Concrete in dry process areas will also be sampled with procedure EMON-20. In this instance, obtaining a core sample is not required. Any of the sample extraction options that will produce a sample consisting of surface concrete chips may be used, including use of a jackhammer, chisel, or hammer drill.

D.5.3.2.2 Sampling Structural Steel

Wet Process Areas

Structural steel in wet process areas is likely to be corroded and will require vigorous sampling to remove surface contamination. Samples, generally in the form of "scrapings," will be obtained using sampling procedure EMON-21, Sampling Metallic Surfaces. Of the sampling tools suggested for removing a surface sample, one should be used that provides a strong abrasive action to penetrate the full depth of contamination, such as a knurled rasp or coring bit, and the device should be used forcefully to ensure effective sampling. The option of using a diamond coring bit should be considered where it is feasible to cut completely through a steel member. This option should be used only if structural integrity is not compromised.

Dry Process Areas

Structural steel in dry process areas will not require as vigorous sampling as that in wet areas. Any of the sample extraction options in sampling procedure EMON-21 may be used.

D.5.3.2.3 HVAC Ducts

Selecting locations for sampling HVAC systems is described in Protocol 1. If ductwork is to be sampled, procedure EMON-22, Sampling Fabric and Sheet Metal, should be used. Shears are used to cut the sheet metal. Care must be taken in removing cut portions of ductwork to avoid falling deposits of loose media. Survey readings and swipe samples should be taken from the inside surface of the ductwork sample. Loose media within the ductwork should be surveyed for possible collection as a supplemental sample.

D.6 PROCEDURES

This section identifies the procedures that support the OU3 field characterization program. These procedures address health and safety, instrument measurement, field sampling, and laboratory analysis. Existing approved procedures are found in the SCQ. Attachment D.I includes abstracts of all new procedures developed to support the OU3 RI. The associated requirement is to have all the identified new procedures approved in the SCQ before actual measurements, sampling, and analyses begin.

Currently, the following source documents have been identified and were examined for information on sources of procedures:

1. FEMP SCQ (September 22, 1992 version)
2. DOE *Analytical Methods Compendium* (through Los Alamos National Laboratory)
3. EPA (Region IV) *Standard Operating Procedures and Quality Assurance Manual*, February 1, 1991
4. Installation Restoration Program (IRP), Volume 2, *Quality Assurance Project Plan, Field Standard Operating Procedures*, February 22, 1991
5. Westinghouse Hanford Company, *Environmental Investigations and Site Characterization Manual*, July 24, 1989
6. *Environmental Restoration Program, Standard Operating Procedures*, DOE, Albuquerque Operations Office, December 1988
7. Remedial Action Program Information Center (RAPIC)

D.6.1 Health and Safety Procedures

The following procedures have been identified as applicable to OU3 field activities and will be included in a component-specific (project-specific) Health and Safety Plan (HASP) and/or the SCQ, as necessary:

1. Evaluation of work areas,
2. Health and safety planning,
3. Access control,
4. Confined space entry,
5. Heat stress,

6. Cold stress,

7. Equipment decontamination,

8. Sampling media, chemicals storage, and

9. Personnel monitoring.

D.6.2 Field Instrument Measurement Procedures

The following field instrument procedures have been identified as applicable for OU3 activities:

- Radiological

  - Use of a NaI detector (cylindrical and FIDLER),
  - Use of a MicroR meter,
  - Use of a pressurized ion chamber (PIC),
  - Use of an alpha scintillation detector,
  - Use of a pancake GM detector,
  - Use of a gas flow proportional detector, and
  - Use of a radon/thoron monitor;

- Chemical

  - Use of a combustible gas indicator,
  - Use of a MicroTIP (PID) monitor,
  - Use of a flame-ionization detector,
  - Use of a portable gas chromatograph,
  - Use of indicator tubes (e.g., Draegers — NH_3 vapors),
  - Use of a HNu-SEFA-P-XRF analyzer, and
  - Use of a pH meter; and

- Physical

  - Use of hygrometers/temperature measurements,
  - Use of noise monitors,
  - Use of an electromagnetic radiation monitor, and
  - Use of water quality measurement instruments.

D.6.3 Field Sampling Procedures

The required sampling procedures are identified in Table D.6-1 and are organized by component categories. Potential media in each category are identified and the status of existing procedures is given.

TABLE D.6-1 Potential Sample Media and Required Sampling Procedures for Component Categories

Component Category Sampling Procedure	Potential Media	Procedure Identification[a] SCQ Sec. No.	EMON/OU3 No.
Categories 1-4 (Buildings)			
Samples from surface water	Water	K.4(M)	001
	Aqueous liquid	K.4.M)	001
	Organic liquid	K.4(M)	001
Cores from slabs	Concrete	K.8.3	020
	Wood	K.8.3	019
	Asphalt	K.8(M)	020
	Transite	K.8(M)	019
	Drywall	K.8(M)	019
	Sheet metal	K.8(M)	021
	Structural steel	K.8(M)	020
	Masonry	K.8(M)	0.20
Air samples-particulate	Filter media	K.6.3, K.6.1, K.6.4.5	022
Air samples-gases	Adsorbents	K.6.3, K.6.4.1, K.6.4.5	022
	Air	K.6.2, K.6.6	028
Categories 5 & 6 (Containerized Materials)			
Liquid samples from tanks	Water	K.4(M)	001, 009
	Aqueous liquid	K.4(M)	001, 009
	Organic liquid	K.4(M)	001, 009
	Inorganic liquid	K.4(M)	001, 009
Liquid samples from drums	Water	K.5.5(M)	001, 009
	Aqueous liquid	K.5.5(M)	001, 009
	Organic liquid	K.5.5.6	001, 009
	Inorganic liquid	K.5.5(M)	001, 009
Solid samples from tanks	Salts/powders	K.5.M	001, 009
	Sludge	K.5.M	001, 009
	Organic residues	K.5.M	001, 009
	Inorganic residues	K.5.M	001, 009
Solid samples from drums	Salts/powders	K.5.5, K.5.5(M)	001, 009
	Sludge	K.5.5, K.5.5(M)	001, 009
	Organic residues	K.5.5, K.5.5(M)	001, 009
	Inorganic residues	K.5.5, K.5.5(M)	001, 009
	Soils/sand/gravel	K.5.5, K.5.5(M)	001, 009
	Sediments	K.5.5, K.5.5(M)	001, 009
	Heterogeneous waste	K.5.5, K.5.5(M)	001, 009

TABLE D.6-1 (Cont.)

Component Category Sampling Procedure	Potential Media	Procedure Identification[a] SCQ Sec. No.	EMON/OU3 No.
Category 7 (Bulk Materials)			
Surface samples	Soil/sand/gravel	K.5.1, K.5.2, K.5.4	018
Samples at depth	Soil/sand/gravel	K.5.3, K.5.3.1, K.5.4	018
Samples from waste piles	Concrete	K.8.3	020
	Wood	K.8.2	019
	Asphalt	K.8(M)	020
	Transite	K.8(M)	019
	Drywall	K.8(M)	019
	Structural steel	K.8(M)	021
	Other metals	K.8(M)	022
	Masonry	K.8(M)	020
	Soils/sand/gravel	K.5.1(M), K.5.2	018
	Paint	K.8.1	019
Category 8 (Parking Lots, Storage Pads, Roads, Railroads)			
Core samples from pads	Concrete	K.8.3	020
	Wood	K.8.2	019
	Asphalt	K.8(M)	020
	Structural steel	K.8(M)	021
Samples from surface water	Water	K.4.3, K.4.4 (M)	001
	Aqueous liquid	K.4.8, K.4.4	001
	Organic liquid	K.4(M)	001
Categories 9 & 10 (Piping, Utilities, Equipment)			
Liquid samples from process equipment	Water	K.4(M)	010
	Aqueous liquids	K.4(M)	010
	Organic liquids	K.4(M)	010
Liquid samples from pipes-unpressurized	Water	K.4(M)	010
	Aqueous liquids	K.4(M)	010
	Organic liquids	K.4(M)	010
Liquid samples from ducts	Water	K.4(M)	010
	Aqueous liquids	K.4(M)	010
	Organic liquids	K.4(M)	010
Solid samples from pipes-unpressurized	Salts/powders	K.5(M)	023
	Sludge	K.5(M)	023
	Dust	K.5(M)	023
	Organic residues	K.5(M)	023
	Inorganic residues	K.5(M)	023

TABLE D.6-1 (Cont.)

Component Category Sampling Procedure	Potential Media	Procedure Identification[a] SCQ Sec. No.	EMON/OU3 No.
Solid samples from dusts	Salts/powders	K.5(M)	016/017
	Sludge	K.5(M)	016/017
	Dust	K.5(M)	016/017
	Organic residues	K.5(M)	016/017
	Inorganic residues	K.5(M)	016/017
Solid samples from surface liquids	Salts/powders	K.5(M)	016/017
	Sludge	K.5(M)	016/017
	Dust	K.5(M)	016/017
	Organic residues	K.5.M	016/017
	Inorganic residues	K.5.M	016/017
Category 11 (Ponds & Basins)			
Samples from surface liquids	Water	K.4.3	001
	Aqueous liquids	K.4.4	001
	Organic liquids	K.4(M)	001
Soil samples underlying surface liquids	Sludge	K.5.1, K.5.2, K.5.4	016/017
	Sediment	K.5.1, K.5.2, K.5.4	016/017
	Salts/powders	K.5(M)	016/017
	Soil/sand	K.5.1, K.5.2, K.5.4	016/017
Sample collection forms	All	K.9	003, 024, 025
Field storage and shipment of samples	All	K.10	026
Decontamination of sampling equipment	All	K.11	024

[a] M = existing procedure modification.

D.6.4 Analytical Procedures

This section identifies the required analytical procedures for the expected sample matrices and analytes. Table D.6-2 shows the potential sample matrices grouped by sample type. Table D.6-3 shows the status of required radiochemical analytical procedures (e.g., either currently in the SCQ; or requires modification of an existing SCQ procedure, etc.). Table D.6-4 summarizes the status of required organic/inorganic and physical characteristic analytical procedures. All of the procedures identified in this section will be included in the SCQ. Table D.6-5 is a summary of all necessary analytical procedures that do not currently exist in the SCQ.

TABLE D.6-2 Sample Matrices by Sample Type

Sample Type	Potential Sample Matrix
Aqueous samples	Water Aqueous liquids
Organic samples	Organic liquids Asphalt Organic residues
Solids	Concrete Transite Wood Drywall Soil/sediment/sand Gravel Sludge Salts/powders Masonry Steel/metals Glass Inorganic residues Dust
Heterogeneous waste	Miscellaneous substances, trash, etc.
Air samples	Filter media Air

TABLE D.6-3 Radiochemical Analytical Procedures[a]

Sample Matrix	U Isot(1)	Pu Isot(2)	Th Isot(3)	Gamma Spect.(4)	PU-241	AM-241	NP-237	RA-226
Aqueous Samples								
Water	RAD0100	RAD0010	RAD0080M	RAD0140	EM	EM	EM	RAD0050
Aqueous liquids	RAD0100	RAD0010	RAD0080M	RAD0140	EM	EM	EM	RAD0050
Organic Samples								
Organic liquid	RAD0100	RAD0010	RAD0080	RAD0140	EM	EM	EM	RAD0050
Asphalt	RAD0100M	RAD0010M	RAD0080M	RAD0140M	EM	EM	EM	RAD0060M
Org. residues	RAD0100M	RAD0010M	RAD0080M	RAD0140M	EM	EM	EM	RAD0060M
Solid Samples								
Concrete	RAD0100M	RAD0010M RAD0010M	RAD0080M	RAD0140M	EM	EM	EM	RAD0060M
Transite	RAD0100M	RAD0010M	RAD0080M	RAD0140M	EM	EM	EM	RAD0060M
Wood	RAD0100M	RAD0010M	RAD0080M	RAD0140M	EM	EM	EM	RAD0060M
Drywall	RAD0100M	RAD0010M	RAD0080M	RAD0140M	EM	EM	EM	RAD0060M
Soil/sediment/sand	RAD0100	RAD0010M	RAD0080	RAD0140	EM	EM	EM	RAD0060
Gravel	RAD0100M	RAD0010M	RAD0080M	RAD0140M	EM	EM	EM	RAD0060M
Sludge	RAD0100M	RAD0010M	RAD0080M	RAD0140M	EM	EM	EM	RAD0060M
Salts/powders	RAD0100M	RAD0010M	RAD0080M	RAD0140M	EM	EM	EM	RAD0060M
Masonry	RAD0100M	RAD0010M	RAD0080M	RAD0140M	EM	EM	EM	RAD0060M
Steel/metals	RAD0100M	RAD0010M	RAD0080M	RAD0140M	EM	EM	EM	RAD0060M
Glass	RAD0100M	RAD0010M	RAD0080M	RAD0140M	EM	EM	EM	RAD0060M
Inorg. residues	RAD0100M	RAD0010M	RAD0080M	RAD0140M	EM	EM	EM	RAD0060M
Dust	RAD0100M	RAD0010M	RAD0080M	RAD0140M	EM	EM	EM	RAD0060M
Hetero. waste	RAD0100M	RAD0010M	RAD0080M	RAD0140M	EM	EM	EM	RAD0060M
Part. air filters	RAD0100	RAD0010M	RAD0080	RAD0140	EM	EM	EM	RAD0060
Gas Samples								
Adsorbents	NA	NA	NA	NA	NA	NA	NA	NA
Air	NA	NA	NA	NA	NA	NA	NA	NA

TABLE D.6-3 (Cont.)

Sample Matrix	RA-228	TC-99	SR-90	RN-222/ PROGENY	PB-210	PO-210	Gross Alpha and Beta
Aqueous Samples							
Water	RAD0040	EM	EM	EM	RAD0070	EM	RAD130
Aqueous liquids	RAD0040	EM	EM	EM	RAD0070	EM	RAD130
Organic Samples							
Organic liquid	RAD0040	EM	EM	NA	RAD0070	EM	NA
Asphalt	RAD0040M	EM	EM	NA	RAD0070M	EM	NA
Org. residues	RAD0040M	EM	EM	NA	RAD0070M	EM	NA
Solid Samples							
Concrete	RAD0040M	EM	EM	NA	RAD0070M	EM	NA
Transite	RAD0040M	EM	EM	NA	RAD0070M	EM	NA
Wood	RAD0040M	EM	EM	NA	RAD0070M	EM	NA
Drywall	RAD0040M	EM	EM	NA	RAD0070M	EM	NA
Soil/sediment/sand	RAD0040M	EM	EM	NA	RAD0070M	EM	NA
Gravel	RAD0040M	EM	EM	NA	RAD0070M	EM	NA
Sludge	RAD0040M	EM	EM	NA	RAD0070M	EM	NA
Salts/powders	RAD0040M	EM	EM	NA	RAD0070M	EM	NA
Masonry	RAD0040M	EM	EM	NA	RAD0070M	EM	NA
Steel/metals	RAD0040M	EM	EM	NA	RAD0070M	EM	NA
Glass	RAD0040M	EM	EM	NA	RAD0070M	EM	NA
Inorg. residues	RAD0040M	EM	EM	NA	RAD0070M	EM	NA
Dust	RAD0040M	EM	EM	NA	RAD0070M	EM	NA
Hetero. waste	RAD0040M	EM	EM	NA	RAD0070M	EM	NA
A filters	RAD0040	D	D	EM	RAD0070	EM	RAD130M
Gas Samples							
Adsorbents	NA	NA	NA	NA	NA	NA	NA
Air	NA	NA	NA	N	NA	NA	NA

[a] Abbreviations: M = modification of existing SCQ procedure; N = requires new procedure; NA = analysis not determined in the matrix indicated; EM = modification of existing procedure; D = procedure in draft; (1) = 233/234U, 235U, and 238U; (2) = 238Pu, 239/240Pu, and 242Pu; (3) = 227Th, 228Th, 230Th, 232Th; (4) = 60Co, 106Ru, 137Cs, Pb-214, 214Bi, 228Ac, 212Pb, 208Tl, 227Th, 223Ra, 211Bi, 231Th.

TABLE D.6-4 Organic/Inorganic Chemical and Physical Property Analytical Procedures[a]

Sample Matrix	VOC		Di, Tri, Tetra-Chloroethylene	SVOC GC/MS	TBP	PCB/PEST	TPH	GFAA Metals	Flame AA Metals
	GC/MS	GC(P&T)							
Aqueous Samples									
Water	ORG0010	ORG0050	ORG0050M	ORG0060	ORG0060M	ORG0030	CON0200	INO0010	INO0020
Aqueous liquids	ORG0010	ORG0050	ORG0050M	ORG0060	ORG0060M	ORG0030	CON0200	INO0010	INO0020
Organic Samples									
Organic liquid	ORG0010M	ORG0050M	ORG0050M	ORG0060M	ORG0060M	ORG0030M	EM	INO0010M	INO0020M
Asphalt	ORG0010M	ORG0050M	ORG0050M	ORG0060M	ORG0060M	ORG0030M	EM	INO0010M	INO0020M
Org. residues	ORG0010M	ORG0050M	ORG0050M	ORG0060M	ORG0060M	ORG0030M	EM	INO0010M	INO0020M
Solid Samples									
Concrete	NA	NA	NA	NA	NA	ORG0030M	NA	INO0010M	INO0020M
Transite	NA	NA	NA	NA	NA	ORG0030M	NA	INO0010M	INO0020M
Wood	NA	NA	NA	NA	NA	ORG0030M	NA	INO0010M	INO0020M
Drywall	NA	NA	NA	NA	NA	NA	NA	INO0010M	INO0020M
Soil/sediment/sand	ORG0010	ORG0050	ORG0050M	ORG0060	ORG0060M	ORG0030	CON0200M	INO0010	INO0020
Gravel	NA	NA	NA	NA	NA	NA	NA	INO0010M	INO0020M
Sludge	ORG0010M	NA	NA	ORG0060M	ORG0060M	ORG0030M	CON0200M	INO0010M	INO0020M
Salts/powders	NA	NA	NA	NA	NA	NA	NA	INO0010M	INO0020M
Masonry	NA	NA	NA	NA	NA	NA	NA	INO0010M	INO0020M
Steel/metals	NA	NA	NA	NA	NA	NA	NA	INO0010M	INO0020M
Glass	NA	NA	NA	NA	NA	NA	NA	INO0010M	INO0020M
Inorg. residues	NA	NA	NA	NA	NA	NA	NA	INO0010M	INO0020M
Dust	NA	NA	NA	NA	NA	NA	NA	INO0010M	INO0020M
Hetero. waste	NA	NA	NA	NA	NA	NA	NA	INO0010M	INO0020M
Part. air samples	NA	NA	NA	NA	NA	NA	NA	INO0010M	INO0020M

TABLE D.6-4 (Cont.)

Sample Matrix	ICP Metals	Mercury	Zirconium	Nitrogen Nitrates Nitrites	Fluoride	Chloride	Sulfate	Sulfide	Cyanide
Aqueous Samples									
Water	INO0030	INO0040	INO0030M	CON0040	CON0300	CON0120	CON0280	CON0130	CON0010
Aqueous liquids	INO0030	INO0040	INO0030M	CON0040	CON0300	CON0120	CON0280	CON0130	CON0010
Organic Samples									
Organic liquid	INO0030M	INO0040M	INO0030M	NA	NA	NA	NA	NA	NA
Asphalt	INO0030M	INO0040M	INO0030M	NA	NA	NA	NA	NA	NA
Org. residues	INO0030M	INO0040M	INO0030M	NA	NA	NA	NA	NA	NA
Solid Samples									
Concrete	INO0030M	INO0040M	INO0030M	NA	NA	NA	NA	NA	NA
Transite	INO0030M	INO0040M	INO0030M	NA	NA	NA	NA	NA	NA
Wood	INO0030M	INO0040M	INO0030M	NA	NA	NA	NA	NA	NA
Drywall	INO0030M	INO0040M	INO0030M	NA	NA	NA	NA	NA	NA
Soil/sediment/sand	INO0030	INO0040	INO0030M	NA	NA	NA	NA	EM	CON0010M
Gravel	INO0030M	INO0040M	INO0030M	NA	NA	NA	NA	NA	NA
Sludge	INO0030M	INO0040M	INO0030M	N	NA	NA	NA	N	CON0010M
Salts/powders	INO0030M	INO0040M	INO0030M	NA	NA	NA	NA	NA	NA
Masonry	INO0030M	INO0040M	INO0030M	NA	NA	NA	NA	NA	NA
Steel/metals	INO0030M	NA	INO0030M	NA	NA	NA	NA	NA	NA
Glass	INO0030M	NA	INO0030M	NA	NA	NA	NA	NA	NA
Inorg. residues	INO0030M	INO0040M	INO0030M	NA	NA	NA	NA	NA	NA
Dust	INO0030M	INO0040M	INO0030M	NA	NA	NA	NA	NA	NA
Hetero. waste	INO0030M	INO0040M	INO0030M	NA	EM	EM	EM	EM	EM
Part. air samples	INO0030M	NA	NA	NA	NA	NA	NA	NA	NA

TABLE D.6-4 (Cont.)

Sample Matrix	Oil/ Grease	TOC	Asbestos	TCLP	Corrosivity	Ignitability	Reactivity	Physical Characteristics
Aqueous Samples								
Water	CON0180	CON0080	NA	MISC0010	MISC0020	NA	NA	N
Aqueous liquids	CON0180	CON0080	NA	MISC0010	MISC0020	MISC0030	MISC0040	N
Organic Samples								
Organic liquid	CON0180M	NA	NA	MISC0010	MISC0020	MISC0030	MISC0040M	N
Asphalt	CON0180M	NA	NA	MISC0010	NA	MISC0030	MISC0040M	N
Org. residues	CON0180M	NA	NA	MISC0010	NA	MISC0030	MISC0040M	N
Solid Samples								
Concrete	NA	NA	NA	MISC0010	NA	NA	NA	N
Transite	NA	NA		MISC0010	NA	NA	NA	N
Wood	NA	NA		MISC0010	NA	NA	NA	N
Drywall	NA	NA		MISC0010	NA	NA	NA	N
Soil/sediment/sand	NA	EM	NA	MISC0010	NA	NA	NA	GTT11,12,14, 21-25,31-33, 41-44, 51, 61-63, 72
Gravel	NA	NA	NA	MISC0010	NA	NA	NA	Same as above
Sludge	CON0180M	EM	NA	MISC0010	NA	MISC0030M	MISC0040	N
Salts/powders	NA	NA	NA	MISC0010	NA	NA	MISC0040	N
Masonry	NA	NA		MISC0010	NA	NA	NA	N
Steel/metals	NA	NA	NA	MISC0010	NA	NA	N	N
Glass	NA	NA	NA	MISC0010	NA	NA	NA	N
Inorg. residues	NA	NA	NA	MISC0010	NA	MISC0030M	NA	N
Dust	NA	NA	NA	MISC0010	NA	NA	NA	N
Hetero. waste	EM	NA	EM	MISC0010	MISC0020	MISC0030M	MISC0040	N
Part. air samples	NA	NA	EM	NA	NA	NA	NA	N

[a] Abbreviations: M = modification of existing SCQ procedures; N = requires new procedure; NA = analyte not determined in the matrix indicated; EM = modification of existing procedures.

TABLE D.6-5 Summary of Required Analytical Procedures[a]

Parameter	SCQ Proc. No.	Aqueous		Organic		Solid	
		M	EM	M	EM	M	EM
Isotopic uranium[c]	RAD0100			X		X	
Isotopic plutonium[c]	RAD0010			X		X	
Isotopic thorium[c]	RAD0080	X		X		X	
Gamma spectroscopy[c]	RAD0140			X		X	
Plutonium 241[c]	RAD0020		X		X		X
Americium 241[c]	RAD0030		X		X		X
Neptunium 237[c]	RAD0090		X		X		X
Radium 226[c]	RAD0050						
Radium 228[c]	RAD0040			X		X	
Technetium 99[c]	RAD0150		X		X		X
Strontium 90[c]	RAD0160		X		X		X
Lead 210[c]	RAD0070			X		X	
Polonium 210	RAD0170		X		X		X
Alpha radioisotopes	RAD0112		X				
Gross alpha and beta[c]	RAD0130						
VOC(GC/MS)[c]	ORG0010			X		X	
VOC(P&T)[c]	ORG0050	X		X		X	
SVOC(GC/MS)[c]	ORG0060	X		X		X	
PCB/PEST[c]	ORG0030			X		X	
TPH[c]	CON0200				X	X	
GFAA metals[c]	INO0010			X		X	
FLAME AA metals[c]	INO0020			X		X	
ICP metals	INO0030	X		X		X	
Mercury(CVAA)	INO0040			X		X	
NO_3, NO_2, tot. nitrate[c]	CON0040					X	
Fluoride	CON0300						
Chloride	CON0120						
Sulfate	CON0280						
Sulfide[c]	CON0130						X
	CON0132						
Cyanide	CON0010					X	
Oil/grease[c]	CON0180			X		X	
TOC[c]	CON0080						X
Asbestos[c]	CON0040-42						
TCLP	MISC0010						
Corrosivity	MISC0020						
Ignitability	MISC0030					X	
Reactivity	MISC0040			X			X
Physical characteristics	GTT'S		X		X		X
Totals		4	8	16	8	19	10

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TABLE D.6-5 (Cont.)

Parameter	SCQ Proc. No.	Hetero. Waste M	Hetero. Waste EM	Air Filters M	Air Filters EM	Totals[b] M	Totals[b] EM
Isotopic uranium[c]	RAD0100	X				X	
Isotopic plutonium[c]	RAD0010	X		X		X	X
Isotopic thorium[c]	RAD0080	X		X		X	
Gamma spectroscopy[c]	RAD0140	X				X	
Plutonium 241[c]	RAD0020		X		X		X
Americium 241[c]	RAD0030		X		X		X
Neptunium 237[c]	RAD0090		X		X		X
Radium 226[c]	RAD0050					X	
Radium 226[c]	RAD0060	X				X	
Radium 228[c]	RAD0040	X				X	
Technetium 99[c]	RAD0150		X		X		X
Strontium 90[c]	RAD0160		X		X		X
Lead 210[c]	RAD0070		X		X		X
Polonium 210	RAD0170		X		X		X
Alpha radioisotopes	RAD0112						
Gross alpha and beta[c]	RAD0130		X	X		X	X
VOC(GC/MS)[c]	ORG0010					X	
VOC(P&T)[c]	ORG0050					X	
SVOC(GC/MS)[c]	ORG0060					X	
PCB/PEST[c]	ORG0030					X	
TPH[c]	CON0200					X	X
GFAA metals[c]	INO0010	X		X		X	
FLAME AA metals[c]	INO0020	X		X		X	
ICP metals	INO0030	X		X		X	
Mercury(CVAA)	INO0040	X		X		X	
NO_3, NO_2, tot. nitrate[c]	CON0040					X	
Fluoride	CON0300		X				X
Chloride	CON0120		X				X
Sulfate	CON0280		X				X
Sulfide[c]	CON0130		X				X
	CON0132						
Cyanide	CON0010		X			X	X
Oil/grease[c]	CON0180		X			X	X
TOC[c]	CON0080						
Asbestos[c]	CON0040		X		X		
	CON0041						
	CON0042						
TCLP	MISC0010						
Corrosivity	MISC0020						
Ignitability	MISC0030	X				X	
Reactivity	MISC0040					X	
Physical characteristics	GTT'S		X				
Totals		11	16	7	10	22	16

TABLE D.6-5 (Cont.)

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[a] X = needed procedure; may require modifications to existing procedures.

[b] Assumes multiple matrix categories can be covered by one procedure.

[c] Modified SCQ procedure in draft form. To be submitted to U.S. EPA for review/approval.

D.7 QUALITY ASSURANCE AND QUALITY CONTROL

The OU3 RI/FS will be conducted according to the overall quality assurance program at the FEMP as described in the FEMP Site-Wide CERCLA Quality Assurance Project Plan (SCQ), conditionally approved by the U.S. EPA by letter of August 28, 1992. Basic requirements for the development of DQOs, sampling, sample handling and storage, chain-of-custody records, and laboratory and field analyses are specified in the sections and appendices of the SCQ. The following is a summary of sections of the SCQ applicable to the OU3 SAP, much of which is included by reference, with emphasis on any enhancements/deviations specifically related to OU3 RI/FS activities.

D.7.1 General Quality Assurance/Quality Control (QA/QC) Requirements

A successful QA/QC program must establish positive controls over planning, implementation, and assessment of all sampling and analysis activities. Because of the breadth and complexity of the facilities and components found in OU3, it is essential that all these controls be applied in RI/FS activities from their initiation.

The SCQ establishes a framework for control of the various sampling and analysis activities, with general variances to this framework addressed below. Specific quality assurance requirements will also be incorporated into written and approved procedures and will be emphasized during personnel training.

D.7.2 Elements of QA/QC

D.7.2.1 Project Description

The FEMP project description is as defined in Section 2 of the SCQ. Project objectives specific to the OU3 RI/FS are discussed in Section D.3 of the SAP. The project schedule is presented in Section 6 of the Work Plan Addendum and is discussed in Section D.8 of the SAP.

D.7.2.2 Project Organization and Responsibility

The general FEMP project organization and responsibilities are described in Section 3 of the SCQ. The OU3 RI/FS organization and responsibilities are specifically discussed in Section D.2 of the SAP.

Section 3.3 of the SCQ discusses the necessity for preparing project-specific DQOs and a project-specific plan (PSP). The development of DQOs for the OU3 RI/FS is discussed in Section 4.2 of the Work Plan Addendum. The required contents of a PSP are met for the OU3 RI/FS through various PSPs (e.g., the Work Plan Addendum, the Sampling and Analysis Plan, and the component-specific FWPs). The Work Plan Addendum provides such

items as the project background, project organization, data needs identification, sampling approach identification. The SAP provides the mechanism for application of the sampling approach, including the sample design, sample number location and description, media to be sampled, sampling protocols, and proposed analytical methods. Finally, as discussed in Section D.4.6, FWPs will be developed for each component to be sampled, which will provide even more specifics on the sample design, such as QA/QC samples, sample volumes, sampling schedule, sampling equipment needs, and sampling procedures.

Another aspect of the PSPs discussed in Section 3.3 of the SCQ is the proposed utilization of technologies, procedures, or methods not described in the SCQ. A number of sampling and analytical procedures, not currently described in the SCQ, have been developed for use in the OU3 RI/FS. The need for these additional procedures was discussed in the SCQ, and the SCQ will be amended to include these new procedures.

D.7.2.3 Quality Assurance Objectives

Section 4 of the SCQ presents FEMP-specific objectives for the level of quality control effort; accuracy, precision, and sensitivity of analytical data; and data completeness, representativeness, and comparability. A brief discussion of the key elements necessary for attaining these QA objectives was discussed in Section 4, and is further discussed below.

The first key element is that the data must be legally traceable and defensible. Associated with this, as discussed in Section 4.1.1 of the SCQ, is that appropriate field quality assurance samples must be taken or prepared (including, as required, trip blanks, field blanks, equipment rinsate samples, preservative blanks, container blanks, duplicate samples, split samples, spiked samples, and material blanks). The FWP for each component will specify the appropriate number and type of blanks. For duplicate samples for the OU3 RI/FS, the requirements of the SCQ and the project have been evaluated, with the result that one duplicate sample will be taken by each sampling team for each significant matrix to represent the first sample from each group of 20 samples of that matrix, thereby ensuring 1 in 20 or greater than 1 in 20 duplicate sample representation.

Other key elements are that analytical accuracy, precision, and sensitivity be determined and be within the specified acceptance values in the SCQ, and that completeness, representativeness, and comparability of data sets be determined and meet requirements. These elements are discussed in Section 4.2 of the Work Plan Addendum and in Section D.3.3 of the SAP.

The remaining key elements are as follows: (1) the need to provide and document required site- and job-specific training; (2) the need to provide for proper records administration, preparation, control, and retention; and (3) the need to follow required documentation and drawing change control procedures. These elements will be completed in accordance with the appropriate portions of Section 4.4 of the SCQ.

D.7.2.4 Field Activities and Sampling Requirements

Field activities/sampling for the OU3 RI/FS will consist of nonintrusive (i.e., screening) and intrusive (e.g., cores) sampling. The general policies/procedures for conducting the activities/sampling will be in accordance with Sections 5 and 6 of the SCQ. All field activities will be documented in a daily log as stated in Section 5.1 and Appendix J of the SCQ. Field radiological contamination surveys will be conducted in accordance with Section 5.4 of the SCQ. Unique aspects of the field radiological contamination surveys for the OU3 RI/FS are discussed in Sections D.5 and D.6 of the SAP and will be reflected in future revisions to the SCQ. Other sampling activities, including the collection of aqueous, solid matrix, gaseous, and miscellaneous samples, will be conducted in accordance with Sections 6.2, 6.3, 6.4, and 6.6 of the SCQ, as well as Appendix K of the SCQ. Procedures for additional sampling activities not currently addressed in the SCQ are being developed as is discussed in Section D.6 of the SAP and will be submitted as an addendum to the SCQ. Procedures for the field storage and shipment of samples, as well as decontamination of equipment, will be in accordance with Sections 6.7 and 6.8, respectively, of the SCQ.

D.7.2.5 Sample Custody

Sample custody will be in accordance with Section 7 of the SCQ.

D.7.2.6 Calibration Procedures and Frequency

Calibration procedures, frequency of calibration, and the associated documentation requirements are covered by Section 8 and Appendix I of the SCQ. Before any instrument is used for making measurements at the FEMP, it must be documented that the particular instrument has been calibrated against standards traceable to the National Institute for Standards and Technology (NIST), EPA-certified standards, or if neither are available, the best quality standard that is obtainable. Additional details on instrument calibration will be provided in approved site procedures.

D.7.2.7 Analytical Procedures

Analytical procedures and methods for sample analysis will be in accordance with the requirements of Section 9 of the SCQ, as well as other procedures/methods developed specifically for the needs of the OU3 RI/FS, as discussed in Section D.6 of SAP. The new analytical requirements identified in Section D.6 of the SAP, and further discussed in Attachment D.I of the SAP, will be submitted for approval as an addendum to the SCQ.

D.7.2.8 Internal Quality Control Checks and Frequency

Internal quality control checks and frequency will be in accordance with Section 10 of the SCQ and will be defined in the component FWPs and in approved sampling procedures.

Required frequencies for the quality control checks are found in SCQ Table 2-2 (Appendix A). These frequencies will satisfy requirements for the OU3 RI/FS ASLs listed in Table D.3-1 of the SAP.

D.7.2.9 Data Reduction, Validation and Reporting

Data reduction, validation and reporting will be in accordance with requirements specified in Section 11 of the SCQ and the Data Validation Plan located in Appendix D of the SCQ.

D.7.2.10 Performance and System Audits

Self assessments and independent assessments of the OU3 RI/FS activities will be in accordance with requirements specified in Section 12 of the SCQ.

D.7.2.11 Preventive Maintenance

Preventive maintenance will be performed on instruments and equipment used for the OU3 RI/FS, in accordance with Section 13 of the SCQ. Additional details on preventive maintenance will be provided in approved site procedures.

D.7.2.12 Corrective Actions

Corrective actions will follow the guidance contained in Section 15 of the SCQ.

D.8 OPERATIONAL PLAN, SCHEDULE, AND PERSONNEL RESOURCES

As a basis for the development of a comprehensive sampling program schedule for the OU3 RI/FS field program, a series of assumptions were made on the time required for elements of the effort. The assumptions provide a systematic basis for evaluation of sampling time needs on the basis of all information currently available about each of the OU3 components. Component groupings, trending analysis, baseline risk assessment requirements, removal action plans, remedial action alternatives, other site activities, and sampling approaches have been evaluated with respect to their impact on the scheduling of RI/FS sampling for each component (Section 4.3). Sample requirements for each component are a direct result of information needs for each component, as reflected in the sampling protocols of Section D.5. The following sections present the key assumptions made in the schedule development (Section D.8.1); a summary discussion of the sample quantity estimates (Section D.8.2); the field operations schedule (Section D.8.3); and the personnel resources to be utilized for field implementation (Section D.8.4). All of the following information is based on preliminary approximations of time and materials and will be refined as more information becomes available.

D.8.1 Component Sampling Assumptions

An initial baseline assumption for the field collection of ASL C/D samples identified that eight sampling crews of four technicians each would be required. Additional support for the sampling crew would consist primarily of supervisors, and health and safety technicians. The estimated crew hours for each ASL D sample to be collected in each media is detailed in Table D.8-1. The crew hours represent the number of hours required by one sampling crew (four technicians) to collect one sample in each media. These estimates include assumptions concerning sample location access, daily decontamination setup and teardown, site radiological controls, and health and safety restrictions.

The crew hour estimates are for actual sample collection time and do not account for the required time to perform preliminary health and safety reviews, nonintrusive sample measurements, or selection of final sample location. These activities are assumed to be performed by other staff before the sample crew reaches the component or sampling location. DOE/FERMCO approval of the Field Work Package is assumed before initiation of any activities.

Additional assumptions related to the field characterization program are detailed below. These assumptions are made for the purpose of cost and schedule estimates and were used as a baseline to develop actual component sample quantities (Section D.9).

- Concrete chip samples will be collected only in dry process areas.
- Concrete core samples will be collected only in wet process areas.

TABLE D.8-1 Estimated Sampling Crew Hours per Media per Sample

Media	Crew Hours
Concrete	
Chips	10
Cores	20
Masonry	10
Steel Surface Scrapings	20
Soil/Loose Media	10
Liquid	5
Transite	30
HVAC Filters	10

- One supplemental liquid sample may be collected in each wet process area.
- One transite sample will be collected in components anticipated to have chemical contamination.
- Field duplicate samples will be collected by media type per team, 1 for every 20 samples.
- Trip blanks will be developed for each sample collected requiring volatile or semivolatile organic analysis.
- RCRA and non-RCRA drums and product inventory were assumed to be characterized through continuation of existing and ongoing site programs.

D.8.2 Sample Quantity Estimates

The sampling approach outlined by the protocols was individually applied to all of the components. For each component, assumptions were made to estimate the sample quantities. More than 1,000 samples will be required and include solid and liquid samples removed from floors, walls, soils, vessels, and other features.* Access to residues and contaminated areas will require additional precautions in preparation for sampling and sample collection.

*Of the 1,000 samples, approximately 800 are component specific, with the remaining 200 consisting of QA/QC samples representing field duplicates and trip blanks.

The overall sampling program will require significant levels of analytical (laboratory) support. For the approximate 1,000 samples submitted to the labs, multiple analytes will be requested. Samples may be submitted for radiological analyses, with 20 separate analytes, and not all of these can be determined by a single analytical method. Samples may also be submitted for chemical analyses with as many as 150 analytes being requested. QA/QC samples comprise 1/5 of the total samples estimated (200 out of 1,000). The result is a need for several specialized labs or one comprehensive lab facility. In either case, a very complicated data management, tracking, and validation program will result. Since laboratories provide the results of analyses and the necessary documentation to support the ASL requirements of the sample, laboratory capacity can be a constraint to the overall RI/FS field program schedule. For OU3, laboratory capacity may present a constraint to the overall schedule, but this is unknown at this time. Efforts have been initiated to identify and contract with multiple laboratories for the support of this project.

D.8.3 Field Schedule

On the basis of the assumptions detailed in Section D.8.1, sample quantities and person-hours were estimated for each component. These estimates were combined with the sequential approach to scheduling each component, as detailed in Figure D.8-1, to develop the schedule for the field program. The specific component sampling order has been established. This order may be adjusted throughout the sampling program based on influences from on-site programs and activities. The sampling program is expected to commence on April 1, 1992, and to be complete on December 5, 1994.

The activities that comprise a component sampling program are presampling, sampling, and post sampling. Presampling activities consist of all actions required before the sampling crew initiates sampling tasks. Table D.8-2 details these activities and references the number of days (duration) required to complete the activity. Included in this table is the day number, which sequentially adds the days from the inception of presampling activities throughout the completion of the component sampling schedule. X denotes the number of days required to collect the samples. This table illustrates that 11 days are required to complete all presampling activities.

Sampling activities consist of intrusive sample collection within each component. Nonintrusive measurements are performed as a presampling activity. Table D.8-3 details the sample quantities by media type, as developed in Section D.9, and the estimated sampling duration for each of the OU3 components. This table does not include quantities of QA/QC samples. The duration of sampling in the field will be based on the total number of field technicians that are (and can be reasonably) assigned to this task. The durations do not include the time required to receive results from the laboratories.

Post-sampling activities consist of equipment decontamination and teardown, laboratory analysis, data validation, and data entry. Equipment decontamination and teardown is a one-day activity for dismantling/relocating equipment used for component-wide

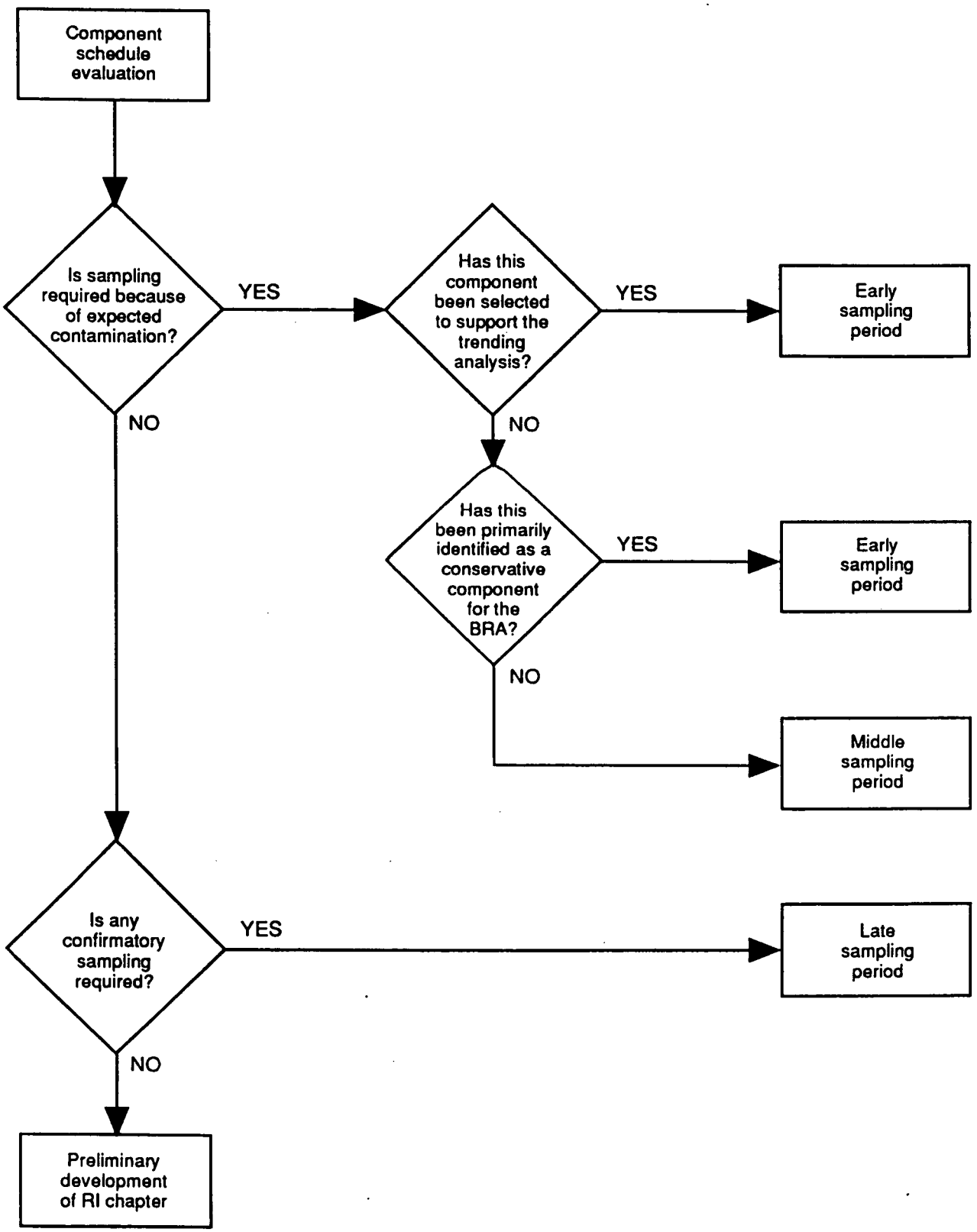

FIGURE D.8-1 Development of Component Sampling Periods

TABLE D.8-2 Estimated Duration for Sampling Preparation Activities by Component

Activity Description	Duration (Days)	Activity Completion Day
Particulate Air Sampling Initiated	1	1
Logistic Inspection	1	1
Nonintrusive Survey Performed	1-4	1-5
Particulate Air Sampling Completed	5	5
Radiological Survey Assessment	2	7
Field Work Package Updates	1	8
Equipment Setup	2	10
Decontamination Setup	1	11
Perform Sampling	X	12 (start)
Complete Sampling	0	X + 11
Teardown Equipment	1	X + 12

sampling activities. This activity occurs after component sampling is complete. Laboratory analyses are assumed to take 120 days or less. Data validation and data entry will continue until all OU3 data is validated and entered into the database. These activities are anticipated to extend past the field program completion date by seven months (July 31, 1995). All component data packages will be reviewed in-house to verify the component sampling completion prior to the end of the field characterization program.

Assumptions that were included in the development of the field program schedule are:

- Additional characterization may be required as a result of unexpected conditions or contaminants that have not been included in schedule planning.
- Time required to mobilize the work force necessary to complete the effort has been assumed to occur before the field activities, and assumes hiring by the field start date (April 1, 1993).
- National laboratory capacity to support the FEMP OU3 RI/FS as scheduled is assumed to exist.
- Laboratory turn-around time is assumed to be 120 days or less (per the Amended Consent Agreement schedules).
- Sampling teams are supported by others to the extent that sample technicians can sample in an uninterrupted mode throughout the duration of the RI/FS field program.

TABLE D.8–3 Estimated Sample Quantities by Component

Component	Component Designation	Concrete Chips	Concrete Cores	Masonry	Steel Surface	Loose Media	Liquid	Transite	Composite Swipe	Air Particulate	Total Samples	Duration Days
Preparation Plant	1 A	3	4	0	7	2	1	1	1	1	20	30
Plant 1 Storage Shelter	1 B	0	0	0	0	0	0	0	0	0	0	0
Plant 1 Ore Silos	1 C	1	0	0	0	0	1	0	0	1	3	12
Ore Refinery Plant	2 A	0	4	3	4	1	3	1	1	1	18	27
General/Refinery Sump Control Building	2 B	1	0	0	1	0	1	0	1	1	5	14
Bulk Lime Handling Building	2 C	0	1	0	1	0	1	0	1	1	5	14
Metal Dissolver Building	2 D	0	3	3	3	1	1	0	1	1	13	21
NFS Storage & Pump House	2 E	0	1	1	1	0	1	0	1	1	6	15
Cold Side Ore Conveyor	2 F	1	0	0	1	0	0	0	1	1	4	13
Hot Side Ore Conveyor	2 G	1	0	0	1	0	0	0	1	1	4	13
Conveyor Tunnel (From Plant 1)	2 H	1	0	0	1	0	0	0	1	1	4	13
Maintenance Building	3 A	0	1	1	1	0	0	0	1	1	5	15
Ozone Building	3 B	0	1	0	1	0	0	0	1	1	4	14
NAR Control House	3 C	1	0	0	1	0	0	0	1	1	4	13
NAR Towers	3 D	0	1	0	1	0	1	0	1	1	5	14
Hot Raffinate Building	3 E	0	1	1	1	0	2	1	1	1	8	17
Harshaw Digestion Fume Recovery	3 F	0	1	1	1	0	1	0	1	1	6	15
Refrigeration Building	3 G	0	1	0	1	0	0	0	1	1	4	14
Refinery Sump	3 H	0	1	1	1	1	0	0	1	1	6	15
Combined Raffinate Tanks	3 J	0	1	1	1	0	1	0	1	1	6	15
Old Cooling Water Tower	3 K	0	1	0	0	0	1	0	0	1	3	13
Electrical Power Center Building	3 L	1	0	1	1	0	0	0	1	1	5	14
Green Salt Plant	4 A	1	2	0	3	2	2	1	1	1	13	22
Plant 4 Warehouse	4 B	0	0	0	0	0	0	0	0	0	0	0
Plant 4 Maintenance Building	4 C	1	0	0	1	0	0	0	1	1	4	13
Metals Production Plant	5 A	9	3	1	12	3	3	1	1	1	34	40
Plant 5 Ingot Pickling	5 B	0	0	0	0	0	0	0	0	0	0	0
Plant 5 Electrical Substation	5 C	1	0	0	1	0	0	0	1	1	4	13
West Derby Breakout/ Slag Milling	5 D	0	0	0	0	0	0	0	0	0	0	0
Plant 5 Filter Building	5 E	0	0	0	0	0	0	0	0	0	0	0
Plant 5 Covered Storage Pad	5 F	1	0	0	1	0	0	0	1	1	4	13
Plant 5 Ingot Storage Shelter	5 G	1	0	0	1	0	0	0	1	1	4	13
Metals Fabrication Plant	6 A	5	2	0	7	0	3	1	1	1	20	29
Plant 6 Covered Storage Area	6 B	1	0	0	1	0	0	0	1	1	4	13
Plant 6 Electrostatic Precipitator (South)	6 C	1	0	0	1	0	0	0	1	1	4	13
Plant 6 Electrostatic Precipitator (Central)	6 D	1	0	0	0	0	0	0	0	1	2	12
Plant 6 Electrostatic Precipitator (North)	6 E	1	0	0	1	0	0	0	1	1	4	13
Plant 6 Salt Oil Heat Treat Building	6 F	0	1	1	1	0	1	0	1	1	6	15
Plant 6 Sump Building	6 G	0	0	0	0	0	0	0	0	0	0	0
Plant 7	7 A	3	1	0	4	0	0	1	1	1	11	21
Plant 7 Overhead Crane	7 B	0	0	0	0	0	0	0	0	0	0	0
Recovery Plant	8 A	12	3	2	15	6	3	1	1	1	44	48
Plant 8 Maintenance Building	8 B	1	0	2	0	1	1	0	1	1	7	14

TABLE D.8–3 Estimated Sample Quantities by Component

Component	Component Designation	Concrete Chips	Concrete Cores	Masonry	Steel Surface	Loose Media	Liquid	Transite	Composite Swipe	Air Particulate	Total Samples	Duration Days
Rotary Kiln/Drum Reconditioning	8 C	0	0	0	0	0	0	0	0	0	0	0
Plant 8 Railroad Filter Building	8 D	0	0	0	0	0	0	0	0	0	0	0
Drum Conveyor Shelter	8 E	0	0	0	0	0	0	0	0	0	0	0
Plant 8 Old Drum Washer	8 F	0	0	0	1	0	0	0	0	0	1	13
Special Products Plant	9 A	2	5	1	7	0	2	1	1	1	20	31
Plant 9 Sump Treatment Facility	9 B	0	1	1	1	0	0	0	1	1	5	15
Plant 9 Dust Collector	9 C	1	0	0	1	0	0	0	1	1	4	13
Plant 9 Substation	9 D	1	0	0	1	0	0	0	1	1	4	13
Plant 9 Cylinder Shed	9 E	0	0	0	0	0	0	0	0	0	0	0
Electrostatic Precipitator	9 F	1	0	0	1	0	0	0	1	1	4	13
Boiler Plant	10 A	0	0	0	0	0	0	0	0	0	0	0
Boiler Plant Maintenance Bldg.	10 B	0	1	0	1	0	1	0	1	1	5	14
Wet Salt Storage Bin	10 C	0	0	0	0	0	0	0	0	0	0	0
Cont. Oil/Graphite Burn Pad	10 D	0	1	0	0	1	1	0	0	1	4	14
Service Building	11	3	1	4	0	0	1	0	1	1	11	17
Main Maintenance Building	12 A	0	6	7	6	0	1	0	1	1	22	30
Cylinder Storage Building	12 B	0	0	0	0	0	0	0	0	0	0	0
Lumber Storage Building	12 C	0	0	0	0	0	0	0	0	0	0	0
Pilot Plant Wet Side	13 A	0	8	6	3	3	1	0	1	2	24	30
Pilot Plant Maintenance Bldg.	13 B	0	1	1	0	0	0	0	1	1	4	13
Sump Pump House	13 C	0	1	1	0	0	0	0	1	1	4	13
Pilot Plant Thorium Tank Farm	13 D	0	1	0	0	0	1	0	0	1	3	13
Administration Building	14 A	1	0	1	0	0	0	0	1	1	4	13
Building 14 EOC Generator Set	14 B	0	0	0	0	0	0	0	0	0	0	0
Laboratory	15	1	2	2	0	1	1	0	1	1	9	17
Main Electrical Station	16 A	1	0	0	1	0	1	0	1	1	5	14
Electrical Substation	16 B	1	0	1	0	0	0	0	1	1	4	13
Electrical Panels & Transformer	16 C	1	0	0	0	0	0	0	0	0	1	12
Main Electrical Switch House	16 D	1	0	1	0	1	0	0	1	1	5	13
Main Electrical Transformers	16 E	1	0	0	0	0	0	0	0	0	1	12
Trailer Substation #1	16 F	1	0	0	0	0	0	0	0	0	1	12
Trailer Substation #2	16 G	1	0	0	0	0	0	0	0	0	1	12
BDN Surge Lagoon	18 A	0	0	0	0	1	1	0	0	1	3	12
General Sump	18 B	0	1	0	1	1	0	0	1	1	5	15
Coal Pile Runoff Basin	18 C	0	0	0	0	1	1	0	0	1	3	12
Biodenitrification Towers	18 D	0	0	0	0	0	0	0	0	0	0	0
Storm Water Retention Basin	18 E	0	0	0	0	2	2	0	0	1	5	13
Clearwell Pump House	18 G	0	0	0	0	0	0	0	0	0	0	0
BDN Effluent Treatment Facility	18 H	0	0	0	0	0	0	0	0	0	0	0
Methanol Tank	18 J	1	0	0	1	0	1	0	1	1	5	14
Low Nitrate Tank	18 K	0	0	0	0	1	1	0	1	1	4	12
High Nitrate Tank	18 L	0	0	0	0	1	1	0	1	1	4	12
High Nitrate Storage Tank	18 M	1	0	0	1	0	0	0	1	1	4	13

TABLE D.8–8 Estimated Sample Quantities by Component

Component	Component Designation	Concrete Chips	Concrete Cores	Masonry	Steel Surface	Loose Media	Liquid	Transite	Composite Swipe	Air Particulate	Total Samples	Duration Days
Main Tank Farm	19 A	0	0	0	0	0	0	0	0	0	0	0
Pilot Plant Ammonia Tank Farm	19 B	0	0	0	0	0	0	0	0	0	0	0
Tank Farm Control House	19 C	0	0	0	0	0	0	0	0	0	0	0
Old North Tank Farm	19 D	0	2	0	1	1	1	0	1	1	7	16
Pump Station & Power Center	20 A	0	0	0	0	0	0	0	0	0	0	0
Water Plant	20 B	0	0	0	0	0	0	0	0	0	0	0
Cooling Towers	20 C	0	1	0	0	0	0	0	0	1	2	13
Elevated Potable Storage Tank	20 D	0	0	0	0	0	0	0	0	0	0	0
Well House #1	20 E	0	0	0	0	0	0	0	0	0	0	0
Well House #2	20 F	0	0	0	0	0	0	0	0	0	0	0
Well House #3	20 G	0	0	0	0	0	0	0	0	0	0	0
Process Water Storage Tank	20 H	0	0	0	0	0	0	0	0	0	0	0
Gas Meter Building	22 A	0	0	0	0	0	0	0	0	0	0	0
Storm Sewer Lift Station	22 B	0	0	0	0	0	0	0	0	0	0	0
Truck Scale	22 C	0	0	0	0	0	0	0	0	0	0	0
Scale House & Weigh Scale	22 D	0	0	0	0	0	0	0	0	0	0	0
Utility Trench to Pit Area	22 E	0	1	0	0	1	0	0	1	0	3	13
Meteorological Tower	23	0	0	0	0	0	0	0	0	0	0	0
Railroad Scale House	24 A	0	0	0	0	0	0	0	0	0	0	0
Railroad Engine House	24 B	1	0	1	1	0	0	0	1	1	5	14
Chlorination Building	25 A	0	0	0	0	0	0	0	0	0	0	0
M.H.#175/Eff. Line/Sampling Bldg.	25 B	0	0	0	0	0	0	0	0	0	0	0
Sewage Lift Station Building	25 C	0	0	0	0	0	0	0	0	0	0	0
U.V. Disinfection Building	25 D	0	0	0	0	0	0	0	0	0	0	0
Digester & Control Building	25 E	0	1	1	1	0	0	0	1	1	5	15
Sludge Drying Beds	25 F	0	1	0	0	1	1	0	0	1	4	14
Primary Settling Basins	25 G	1	0	0	0	1	1	0	0	1	4	13
Trickling Filters	25 H	0	1	0	0	1	1	0	0	1	4	14
Pump House–HP Fire Protection	26 A	0	0	0	0	0	0	0	0	0	0	0
Elevated Water Storage Tank	26 B	0	0	0	0	0	0	0	0	0	0	0
Main Electrical Strainer House	26 C	0	1	1	0	0	1	0	1	1	5	14
Security Building	28 A	1	0	1	0	0	0	0	1	1	4	13
Human Resources Building	28 B	0	0	0	0	0	0	0	0	0	0	0
Guard Post on South End of 'D' St.	28 C	0	0	0	0	0	0	0	0	0	0	0
Guard Post on West End of 2nd St.	28 D	0	0	0	0	0	0	0	0	0	0	0
Chemical Warehouse	30 A	3	0	0	2	0	0	0	1	1	7	16
Drum Storage Warehouse	30 B	0	0	0	0	0	0	0	0	0	0	0
Old Ten Ton Scale	30 C	0	0	0	0	0	0	0	0	0	0	0
Engine House/Garage	31 A	0	1	1	0	1	2	0	1	1	7	15
Old Truck Scale	31 B	0	0	0	0	0	0	0	0	0	0	0
Magnesium Storage Building	32 A	0	0	0	0	0	0	0	0	0	0	0
Building 32 Covered Loading Dock	32 B	1	0	0	1	0	0	0	1	1	4	13
Pilot Plant Annex	37	9	0	6	0	1	3	0	1	1	21	22

TABLE D.8–3 Estimated Sample Quantities by Component

Component	Component Designation	Concrete Chips	Concrete Cores	Masonry	Steel Surface	Loose Media	Liquid	Transite	Composite Swipe	Air Particulate	Total Samples	Duration Days
Propane Storage	38 A	0	0	0	0	0	0	0	0	0	0	0
Cylinder Filling Station	38 B	0	0	0	0	0	0	0	0	0	0	0
Incinerator Building	39 A	2	2	1	4	1	1	1	1	1	14	23
Waste Oil Decant Shelter	39 B	0	1	0	1	1	0	0	1	1	5	15
Incinerator Sprinkler Riser House	39 C	0	0	0	0	0	0	0	0	0	0	0
Sewage Treatment Plant Incinerator	39 D	1	0	0	1	0	0	0	1	1	4	13
Rust Engineering Building	45 A	1	0	0	1	0	0	0	1	1	4	13
Utility Shed East of Rust Trailers	45 B	0	0	0	0	0	0	0	0	0	0	0
Heavy Equipment Building	46	0	1	0	1	0	0	0	1	1	4	14
Six to Four Reduction Facility #2	51	0	0	0	0	0	0	0	0	0	0	0
Health & Safety Building	53 A	3	0	3	0	0	0	0	1	1	8	15
In–Vivo Building	53 B	0	0	0	0	0	0	0	0	0	0	0
Six to Four Reduction Facility #1	54 A	6	2	8	8	0	0	0	1	1	26	32
Pilot Plant Shelter	54 B	1	0	1	0	0	0	0	1	1	4	13
Pilot Plant Dissociator Shelter	54 C	1	0	0	1	0	0	0	1	1	4	13
Slag Recycling Building	55 A	1	0	0	0	0	0	0	1	1	3	12
Slag Recycling Pit/Elevator	55 B	1	0	0	0	0	0	0	1	1	3	12
CP Storage Warehouse	56 A	1	0	0	1	0	0	0	1	1	4	13
Storage Shed (West)	56 B	0	0	0	0	0	0	0	0	0	0	0
Storage Shed (East)	56 C	0	0	0	0	0	0	0	0	0	0	0
Quonset Hut #1	60	1	0	0	1	0	0	0	1	1	4	13
Quonset Hut #2	61	1	0	0	1	0	0	0	1	1	4	13
Quonset Hut #3	62	1	0	0	1	0	0	0	1	1	4	13
KC–2 Warehouse	63	1	0	1	0	0	0	0	1	1	4	13
Thorium Warehouse	64	2	0	0	2	0	0	0	1	1	6	15
(Old) Plant 5 Warehouse	65	1	0	0	1	0	0	0	1	1	4	13
Drum Reconditioning Building	66	3	1	0	4	0	2	0	1	1	12	20
Plant 1 Thorium Warehouse	67	1	0	0	1	0	0	0	1	1	4	13
Pilot Plant Warehouse	68	1	0	0	1	0	0	0	1	1	4	13
Decontamination Building	69	0	1	2	1	0	1	0	1	1	7	15
General In–Process Warehouse	71	2	0	2	0	0	0	0	1	1	6	14
Drum Storage Building	72	1	0	0	1	0	0	0	1	1	4	13
Fire Brigade Training Center Bldg.	73 A	0	0	0	0	0	0	0	0	0	0	0
Fire Training Pond	73 B	0	0	0	0	1	1	0	0	1	3	12
Fire Training Tank	73 C	0	0	0	0	0	0	0	0	0	0	0
Fire Training Burn Trough	73 D	0	0	0	0	1	1	0	0	1	3	12
Confined Space Burn Tank	73 E	0	0	0	0	0	0	0	0	0	0	0
Plant 2 East Pad	74 A	1	0	0	0	1	0	0	0	1	3	13
Plant 2 West Pad	74 B	1	0	0	0	0	0	0	0	1	2	12
Plant 8 East Pad	74 C	1	0	0	0	1	1	0	0	1	4	13
Plant 8 West Pad	74 D	1	0	0	0	0	1	0	0	1	3	12
Plant 4 Pad	74 E	1	0	0	0	1	0	0	1	1	4	13
Plant 7 Pad	74 F	1	0	0	0	0	0	0	0	1	2	12

TABLE D.8-3 Estimated Sample Quantities by Component

Component	Component Designation	Concrete Chips	Concrete Cores	Masonry	Steel Surface	Loose Media	Liquid	Transite	Composite Swipe	Air Particulate	Total Samples	Duration Days
Plant 5 East Pad	74 G	1	0	0	0	0	0	0	0	1	2	12
Plant 5 South Pad	74 H	1	0	0	0	0	0	0	0	1	2	12
Plant 6 Pads	74 J	1	0	0	0	0	0	0	0	1	2	12
Plant 9 Pad	74 K	1	0	0	0	1	0	0	0	1	3	13
Building 65 West Pad	74 L	1	0	0	0	0	0	0	0	1	2	12
Building 64 East Pad & R.R. Dock	74 M	1	0	0	0	0	0	0	0	1	2	12
Building 12 North Pad	74 N	1	0	0	0	1	0	0	1	1	4	13
Decontamination Pad	74 P	1	1	0	0	0	0	0	1	1	4	13
Plant 8 Old Metal Dissolver Pad	74 Q	0	1	1	0	1	1	0	1	1	6	14
Plant 8 North Pad	74 R	0	1	0	0	1	1	0	0	1	4	14
Building 63 West Pad	74 S	1	0	0	0	0	0	0	0	1	2	12
Plant 1 Storage Pad	74 T	7	0	0	0	0	1	0	1	1	10	16
Pilot Plant Pad	74 U	1	0	0	0	0	0	0	0	1	2	12
Laboratory Pad	74 V	1	0	0	0	0	0	0	0	1	2	12
Building 39A Pad	74 W	0	0	0	0	0	0	0	0	0	0	0
Finished Products Warehouse(4A)	77	1	0	0	1	0	0	0	1	1	4	13
D & D Building(Under Constr.)	78	0	0	0	0	0	0	0	0	0	0	0
Plant 6 Warehouse	79	1	0	0	1	0	0	0	1	1	4	13
Plant 8 Warehouse	80	1	0	0	1	0	0	0	1	1	4	13
Plant 9 Warehouse	81	1	0	0	1	0	0	0	1	1	4	13
Receiving/Incoming Mat'ls. Insp.	82	0	0	0	0	0	0	0	0	0	0	0
Clearwell Line	88	0	0	0	0	1	1	0	0	0	2	12
Parking Lot	89	0	0	0	0	0	0	0	0	0	0	0
Skeet Range Building	90	0	0	0	0	0	0	0	0	0	0	0
Railroad Tracks	G-001	0	0	0	0	0	0	0	0	0	0	0
Roads	G-002	0	0	0	0	0	0	0	0	0	0	0
Storm Sewer System	G-003	0	0	0	0	1	1	0	0	0	2	12
Utility Lines	G-004	0	0	0	0	0	0	0	0	0	0	0
Underground Storage Tanks	G-005	0	0	0	0	7	0	0	0	0	7	16
Process Trailers	G-006	0	0	0	0	0	0	0	0	0	0	0
Non-process Trailers	G-007	0	0	0	0	0	0	0	0	0	0	0
Pipe Bridges	G-008	0	0	0	0	0	0	0	0	0	0	0
Drums (Non-RCRA)	G-009	0	0	0	0	0	0	0	0	0	0	0
RCRA Drums	G-010	0	0	0	0	0	0	0	0	0	0	0
Inventory	G-011	0	0	0	0	0	0	0	0	0	0	0
Mobile Containers (Sea-Land)	G-012	0	0	0	0	0	0	0	0	0	0	0
Soil Piles	G-013	0	0	0	0	15	0	0	0	0	15	20
Rock salt pile	P-001	0	0	0	0	0	0	0	0	0	0	0
Sand piles	P-002	0	0	0	0	0	0	0	0	0	0	0
Gravel pile	P-003	0	0	0	0	0	0	0	0	0	0	0
Copper metal scrap pile	P-004	0	0	0	0	2	0	0	0	1	3	13
Coal pile	P-005	0	0	0	0	1	0	0	0	0	1	12
Scrap metal pile	P-006	0	0	0	0	2	0	0	0	0	2	13

TABLE D.8–3 Estimated Sample Quantities by Component

Component	Component Designation	Concrete Chips	Concrete Cores	Masonry	Steel Surface	Loose Media	Liquid	Transite	Composite Swipe	Air Particulate	Total Samples	Duration Days
Outside Equipment Storage Area	P–007	0	0	0	0	0	0	0	0	0	0	0
Tension Support Structure #1	TS–001	0	0	0	0	0	0	0	0	0	0	0
Tension Support Structure #2	TS–002	0	0	0	0	0	0	0	0	0	0	0
Tension Support Structure #3	TS–003	0	0	0	0	0	0	0	0	0	0	0
	TOTALS:	145	83	75	147	77	68	10	97	127	829	2075

- Data validation and entry is anticipated to last the duration of the field characterization program and extend past the completion date by seven months (until July 31, 1995).
- Technician training personnel are available and training will be complete before sample collection begins.
- Site-wide RI/FS database is ready for data entry upon initiation of sample collection.
- Budgets are sufficient to support activities as scheduled.

D.8.4 Personnel Resources

This section discusses the number and type of personnel identified for the implementation of the OU3 RI/FS field program. On the basis of the assumptions detailed in Sections D.8.1, D.8.2, and D.8.3, the field program will require 32 sampling technicians. Significant additional resources will also be required to support the field crews in preparation of access documents, preparation of equipment for sampling, verification of sampling locations, verification of sample quality, sample tracking, and other tasks. Support staff resources will include:

- Sample point location crews,
- Daily operations unit,
- Field program administration,
- Field work package development,
- Data validation,
- Data entry,
- Training development, and
- Training support.

The field activities assume the use of a field force of 32 sampling technicians divided into four teams with two crews per team; approximately 30 field support positions are planned to support the sampling technicians, for a total of approximately 60 persons in the RI/FS field force. Support positions include survey, health and safety, sample coordinator, and equipment maintenance. The office staff will require approximately 50 personnel.* The

* These positions will include, but not be limited to, data validation, data entry, field management, and FWP development.

program will be planned and implemented with the organizational structures identified in Section D.2.

Implementation activities necessary before the field program can begin have been grouped for discussion in the following categories: field program implementation, procedure development, laboratory contracting, database, equipment procurement, and field activities.

D.8.4.1 Field Program Implementation Planning

Initial planning for the implementation of the OU3 field characterization has been completed to support schedule development and summarization in this document. Additional detailed planning is underway to identify specific job classifications and organizational structures to be employed. This activity will utilize approximately four full-time equivalents (FTEs), which will continue as project oversight throughout the implementation.

D.8.4.2 Procedure Development

Approximately 70 procedures (analytical laboratory, field sampling, and health and safety procedures) have been identified as additional (in addition to existing procedures identified in the Sitewide CERCLA Quality Assurance Project Plan [SCQ]) requirements to support the OU3 RI/FS. The procedure abstracts are detailed in Attachment D.I to Appendix D. A team of engineers and technical writers is currently drafting the procedures. The procedures will receive internal review and approval before submittal for U. S. EPA and Ohio EPA review for incorporation into the SCQ. This task will require approximately four FTEs, completing prior to field mobilization.

D.8.4.3 Laboratory Contracting

New contracts are being developed with analytical laboratories nationwide to procure the laboratory capacity to support the radiological analyses required for OU3. The new laboratory contract request for proposal (RFP) references the procedures currently in the SCQ and the new procedures being developed for OU3 for inclusion in a revision to the SCQ. The laboratory contracts are expected to be in place by the commencement of field activities. Laboratory contracts for chemical analyses are presently in place, with no new activities required. National analytical laboratory capacity to support OU3 is assumed to exist.

D.8.4.4 Database Interface

OU3 will utilize the new site-wide RI/FS database presently being implemented on-site. This requires coordination between the field implementation staff and the database staff. This activity will utilize approximately four FTEs.

D.8.4.5 Equipment Procurement

Procurement and delivery of equipment to support the OU3 field program has begun with equipment expected to be available before completion of development of training modules. The equipment will also be available for hands-on training of the field personnel. This activity will utilize approximately two FTEs, completing prior to field mobilization.

D.8.4.6 Field Activities

As indicated in the Section D.8.1, a field force of 32 sampling technicians has been assumed for the project. The technicians will work as four teams of eight technicians, with two crews per team; however, this may change as the sampling program is initiated and discovery of beneficial solutions or problems reduce or increase the crew sizes.

The sampling crews will consist of technicians, fully trained and tested in the implementation of the field sampling procedures identified in Section D.6 and abstracted in Attachment D.I. Crew members will also have received a full complement of site and job-specific safety training and orientation and will have completed all applicable regulatory-based training requirements before initiating field work.

Approximately 100 individuals are to be used as staff for the field characterization program. This group includes managers, supervisors, schedulers, data entry clerks, secretarial support, quality assurance/quality control technicians, data validators, trainers, drafters, health and safety engineers, equipment custodians, instrument troubleshooters, engineers, and technologists.

Before sampling of a component begins, the detailed plans for the sampling will be finalized in the field work package (FWP). The group developing the FWPs will function during most of the field program and will consist of approximately six FTEs.

D.9 COMPONENT-SPECIFIC SAMPLING PLANS

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D.9.11.7 Component 25G — Primary Settling Basins D.9-664
D.9.11.8 Component 73B — Fire Training Pond D.9-667

D.9 COMPONENT-SPECIFIC SAMPLING PLANS

D.9.0 Introduction

D.9.0.1 General Information

The following sections describe in detail the sampling plans for each Operable Unit 3 (OU3) component. The sampling approach described by the sampling protocols in Section D.5 has been implemented in Sections D.9.1 through D.9.11 for each of the 11 component categories. Components are described in additional detail. Process areas are identified according to activities performed, contaminants expected, and contamination modes (process types). Major media for each process area are identified. Available radiological data are summarized for each process area, with a hot spot (area of elevated radiation level) for each identified and an overall assessment of the data set provided. Nonintrusive and intrusive sampling requirements for the component are described, and a summary of sampling for the component is provided. A map of the component is also supplied, with process areas, major equipment, and radiological hot spots identified.

Information about components that will not be sampled is also included in Sections D.9.1 through D.9.11, including descriptions of the component, the process areas and processes, the major media employed in the construction, and available radiological data, as well as supporting justification for not sampling. Table D.9.0-1 identifies each component not sampled and provides reasons for not sampling the component. Additionally, 16 components in the not sampled category are identified for confirmatory sampling. Confirmatory sampling for those components is further detailed in Section D.9.0.3. To minimize repetition of certain basic approach details in each component-specific section, information applicable to all sampled components is discussed in the following introductory sections.

D.9.0.2 FEMP Radiological Survey Program

Radiological survey information from 1989 through 1992 has been assembled to provide background data for each component to be sampled. The data focus for the OU3 Remedial Investigation/Feasibility Study (RI/FS) characterization has been on total beta-gamma and removable alpha radiation on surfaces of major media. The data available for this use have been generated at Fernald Environmental Management Project (FEMP) by the ongoing health physics/radiological safety program. The program is governed by existing U.S. Department of Energy (DOE) orders as implemented at FEMP.

The data collection focus under this program has shifted in the last several years, from fixed to removable contamination and from production areas to personnel areas. This shift is primarily a result of the shutdown of production activities in 1989 but also is reflected

TABLE D.9.0-1 Nonsampled Components and Reason Codes[a]

	Component	Reason Codes		Component	Reason Codes
1B	Plant 1 Storage Shelter	C*,F	26A	Pump House-HP Fire Protection	C,E,F
4B	Plant 4 Warehouse	C*	26B	Elevated Water Storage Tank	C*,E,F
5B	Plant 5 Ingot Pickling	A,F	28B	Human Resources Building	B,C,E,F
5D	West Derby Breakout/ Slag Milling	A,C*,F	28C	Guard Post on South End of D St.	B,D,E,F
5E	Plant 5 Filter Building	A,F	28D	Guard Post on West End of 2nd Street	D
5F	Plant 5 Covered Storage Pad	C*,E,F	30B	Drum Storage Warehouse	C*
6G	Plant 6 Sump Building	A,F	30C	Old Ten-Ton Scale	D
7B	Plant 7 Overhead Crane	C*	31B	Old Truck Scale	F
8C	Rotary Kiln/Drum Reconditioning	A,C*,F	32A	Magnesium Storage Building	E,F
8D	Plant 8 Railroad Filter Building	D	38A	Propane Storage	C,E,F
8E	Drum Conveyor Shelter	A,D,F	38B	Cylinder Filling Station	D,E,F
9E	Plant 9 Cylinder Shed	D,E,F	39C	Incinerator Sprinkler Riser House	C*,D,E,F
10A	Boiler Plant	C	45B	Utility Shed East of Rust Trailers	D,E,F
10C	Wet Salt Storage Bin	D,E	51	Six to Four Reduction Facility 2	A,B,C,F
12B	Cylinder Storage Building	C,E,F	53B	In-Vivo Building	B,C,E,F
12C	Lumber Storage Building	C,E,F	56B	Storage Shed (West)	E,F
14B	Building 14 EOC Generator Set	B,D,E,F	56C	Storage Shed (East)	E,F
18D	Biodenitrification Towers	C,F	73A	Fire Brigade Training Center	B,E
18G	Clearwell Pump House	D	73C	Fire Training Tank	B,D,E,F
18H	BDN Effluent Treatment Facility	C*,E	73E	Confined Space Burn Tank	B,D,E,F
19A	Main Tank Farm	A,C*,F	78	D and D Building (under construction)	A,F
19B	Pilot Plant Ammonia Tank Farm	E,F			
19C	Tank Farm Control House	A,C*,F	82	Receiving/Incoming Materials Inspection	B,C,E,F
20A	Pump Station and Power Center	C	89	Parking Lot	B,C,E,F
20B	Water Plant	C	90	Skeet Range Building	B,D
20D	Elevated Potable Storage Tank	C,E,F	G-001	Railroad Tracks	C
20E	Well House 1	C,D,E,F	G-002	Roads	B(part),C,E
20F	Well House 2	C,D,E,F	G-004	Utility Lines	E,F
20G	Well House 3	C,D,E,F	G-006	Process Trailers	C,E,F
20H	Process Water Storage Tank	C*,E,F	G-007	Nonprocess Trailers	B,C,E,F
22A	Gas Meter Building	C,D,E,F	G-008	Pipe Bridges	E,F
22B	Storm Sewer Lift Station	C*,D	G-012	Mobile Containers (Sea-Land)	E,F
22C	Truck Scale	B,E,F	P-001	Rock Salt Pile	D,E,F
22D	Scale House and Weigh Scale	C	P-002	Sand Piles	D,E,F
23	Meteorological Tower	B,D,E,F	P-003	Gravel Pile	D,E,F
24A	Railroad Scale House	C,D	P-007	Outside Equipment Storage Area	C*
25A	Chlorination Building	D,F	TS-001	Tension Support Structure 1	E,F
25B	Manhole 175/Sampling Building	C	TS-002	Tension Support Structure 2	E,F
25C	Sewage Lift Station Building	C,D	TS-003	Tension Support Structure 3	E,F
25D	U.V. Disinfection Building	C,D			

[a] Definitions for codes:

A = Component has not been used because construction was recently completed.
B = Component is located outside of radiologically controlled areas.
C = Results from component radiological surveys do not exceed criteria for sampling detailed in Section D.3.4.1.
C* = Component has not been radiologically surveyed recently or recent surveys did not provide results for both removable and total surface contamination; however, it is anticipated that contamination levels do not exceed criteria for sampling.
D = Component is of insignificant size.
E = Component has suspected contaminants that are of low toxicity or are present only in trace quantities (18H).
F = Component exhibits little or no evidence of contamination.

in the DOE orders governing the program. The sample locations are generally chosen by radiological technicians to reflect areas of probable contamination; therefore, data from the program generally represent higher levels of contamination.

Because of the high quality of the data taken under this program, including traceability of the data to calibration standards and controlled archiving of the data, the radiological survey data in the program have been deemed acceptable for RI/FS decision-making uses, in screening to determine locations for intrusive sampling, and for use in gauging component contamination levels.

Data from 1989 through 1991 are summarized in Appendix A Table A.4.0, and data from early 1992 are summarized in Table A.4.1. Table A.4.0 information was compiled before the finalization of the operable unit component designation scheme; therefore, data for many of the smaller components are summarized with nearby larger components. In the component-specific sampling summaries provided in Sections D.9.1 through D.9.11, radiological data have been summarized for each process area of each component. Where discrepancies exist, the information presented in these sections supercedes information presented in the Appendix A tables, because data usability has been factored into data reported in the following sections (e.g., radiological data reported without maps to substantiate location have not been used as hot spots in the following sections) and because data not representing major media have been filtered from the data set (e.g., contaminated equipment sitting on a shelf in a maintenance shop has not been included in hot spot determination).

In some locations, no recent radiological screening data were available. In others, only removable radiological contamination data were available. Total beta-gamma radiological contamination was used as the basis for hot spot (a local maximum, not necessarily exceeding any criterion) determination, when available. Removable alpha radiological contamination (reported as disintegrations per minute [dpm] in the text, but referring to dpm/100 cm^2) was used as the basis for hot spot determination when no total beta-gamma data were available. Total beta-gamma radiation was chosen as a marker because this information is a generally available measurement for each component and because this information is generally a good representation of the extent of contamination and provides a meaningful measure for understanding the magnitude of the requirements of any treatment options. Removable alpha radiation is also listed, both as a means to represent a portion of the potential airborne radioactivity for risk assessment modeling (Section 3.1) and for worker health protection (because the primary radiological contaminants in the operable unit are all considered major alpha radiation emitters). Removable beta-gamma radiation was not used as a marker because total beta-gamma radiation measurements are generally available, even for components with little or no detectable removable contamination (representing fixed contamination in the media from past activities). Removable beta-gamma radiation results will be available from airborne particulate samples and from swipe sample counting results from each component at the time of sampling. Fixed alpha radiation field measurements were likewise not chosen because the information will be generated from intrusive sampling results.

In locations with no recent radiological survey data, no hot spot was identified. Further surveys before the time of intrusive sampling will be performed to support hot spot identification. In all components, additional radiological surveys will be taken in the field before field sampling activities (to identify or to field verify a hot spot and to provide data for health physics personnel protection).

D.9.0.3 Confirmatory Sampling

In determining the components of OU3 to be sampled, a screening based on surface contamination levels was employed (Section 2.4). Because a significant number of the components in the operable unit were not identified as having significant contamination levels through this process, a confirmatory sampling activity has been proposed as a conservative measure for those components. In each component category, nonsampled components have been reevaluated for potential risk and treatability challenge. Those components judged more significant are identified in Table D.9.0-2 as selected candidates for confirmatory sampling.

The confirmatory sampling of these components will follow an approach similar to the approach to be employed for the sampled components, with the following exceptions:

- Each component will be handled as a single process area, to the extent practical.
- Nonintrusive screening (e.g., radiological surveys and swipes, x-ray fluorescence [XRF] surveys, and photoionization detector [PID]) of major media will be employed systematically rather than judgmentally.
- Intrusive sampling will be performed only if resultant survey levels exceed the criteria for sampling provided below.

Systematic confirmatory surveys of these components will be conducted for the various survey methods using the following approach:

- Radiological surveys and swipes will be conducted at the intersects of a 10 × 10 ft grid pattern.
- XRF surveys will be conducted for floor media at the intersects of a 20 × 20 ft grid pattern.
- Field surveys for polychlorinated biphenyls (PCBs) will be conducted using a Field Test Kit only at locations identified from visual inspection that indicate probable PCB contamination.

TABLE D.9.0-2 Components with Confirmatory Sampling

Component Description	Number
Category 1: Administration Buildings	
Human Resources Building	28B
Fire Brigade Training Center	73A
Category 2: Warehouse/Storage Buildings	
Plant 1 Storage Shelter	1B
Plant 4 Warehouse	4B
Drum Storage Warehouse	30B
Category 3: Process Buildings	
Biodenitrification Towers	18D
Category 4: Process Support Buildings	
Plant 8 Railroad Filter Building	8D
Boiler Plant	10A
Water Plant	20B
Manhole 175/Sampling Building	25B
Guard Post on West End of 2nd Street	28D
Category 5/6: Containers	
Pilot Plant Ammonia Tank Farm	19B
Fire Training Tank	73C
Category 7: Bulk Material	
Outside Equipment Storage Area	P-007
Category 8: Parking Lots, Roads, etc.	
Roads	G-002
Category 9/10: Equipment	
Plant 7 Overhead Crane	7B

- PID surveys will begin by establishing ambient conditions for component air concentrations of anticipated and key volatile organic compound/ semivolatile organic compound (VOC/SVOC) contaminants. If ambient air concentrations exceed reasonable natural backgrounds for the analytes in question, additional surveys in the component will be conducted in attempts to locate a source.

- Airborne particulates will be sampled in each component in the same manner as proposed for sampled components.

The criteria for confirmatory intrusive sampling of these components, if necessary, follow:

- Intrusive sampling for radiological constituents will be necessary when the survey values averaged over the component exceed average surface contamination guidelines identified in DOE Order 5400.5.

- Intrusive sampling for inorganic analytes will be necessary when Resource Conservation and Recovery Act (RCRA) metals are detected in excess of values that could potentially result in the material exceeding toxic characteristic leaching procedure (TCLP) limits.

- Intrusive sampling for PCBs will be necessary when results of a PCB Field Test Kit indicate the presence of PCBs in concentrations exceeding Toxic Substances Control Act (TSCA) limits.

- Intrusive sampling for organic compounds (both VOCs and SVOCs) will be necessary when PID analysis reveals an excessive source for airborne organics.

In all cases, intrusive samples, when required from components in the confirmatory classification, will be implemented in a manner parallel to the approach used for sampled components.

D.9.0.4 Inaccessible Samples

In some instances, sample locations identified by the engineering inspections may not be available or accessible for sampling. In such an event, presampling logistics inspections will identify the interference and determine an acceptable alternate location for the process area media sample. Sampling locations may be considered inaccessible if:

- high radiation is present to the extent that as-low-as-reasonably-achievable (ALARA) principles dictate risk is undue,

- sampling equipment cannot be safely operated because of space or atmosphere, or

- uninterruptable utilities or live power sources can be potentially breached by the sampling activity.

In each case, a suitable alternative sampling location or alternative sampling schedule will be identified, if possible, to maintain the intent of the sampling program.

D.9.0.5 Radiological Swipe Samples

Swipe samples for each major medium in each process area of a component will be collected. Each sample will be counted in the field as well as in the lab for total radiation. In addition, swipes from a component that exceed by an order of magnitude the surface contamination guidelines in DOE Order 5400.5 are composited from the entire component, regardless of medium, and submitted as a single analytical sample for digestion and radiochemical analysis in the laboratory. Swipe sampling is additionally described in Protocol 1 of Section D.5.1.2.

D.9.0.6 Multiple Sample Locations

Several factors additionally affect the location of samples in the field. In the event that nonintrusive sampling determines organic, inorganic, and/or PCB hot spots in major media of process areas not coinciding with the identified radiological hot spot, then sampling from those additional locations for the appropriate analyte grouping will be considered as fulfilling the sampling requirements for those analytes for that medium within the process area. In an extreme example, samples from four separate locations within a process area medium could be submitted as representing the medium for the process area (radiological, inorganic, organic, and PCB). Field activities will implement screening operations in the field per Protocol 1 of Section D.5.1 to determine whether and where hot spots for these analyte groupings exist. The radiological hot spot area will serve as the source of all samples from the process area media in the absence of identified, individual hot spots for the other contaminant categories.

D.9.0.7 Approach to Core Sampling

In process areas identified as wet, any concrete medium is assumed to have contaminants migrated to indeterminant depth in the media. On this assumption, coring is identified as the sampling method. The following is intended to further define core sampling of concrete.

A full cylindrical section of the concrete is made with an appropriate tool. The extracted core is examined visually and then further sectioned at predetermined locations (Section D.5.3.2.1). Each section is examined on the top surface with field instruments appropriate for the contaminants initially identified for the sample location. Records of the surface readings for the sections will be taken and documented for later potential use in verifying trending analysis.

D.9.0.8 Supplemental Sampling

To satisfy data needs not addressed by the central aspects of the sampling approach, several media sampling activities are identified across component boundaries. The following describes the sampling approach employed for these media throughout the operable unit.

Transite, which is asbestos-fiber-reinforced concrete sheeting, is used in constructing many components of the operable unit. Transite sampling is to be performed at locations across the operable unit determined to represent worst-case examples (Section D.3.4.3.4). Following completion of engineering inspections, these components have been identified: Building 1A, Preparation Plant; Building 2A, Ore Refinery Plant; Building 3E, Hot Raffinate Building; Building 4A, Green Salt Plant; Building 5A, Metals Production Plant; Building 6A, Metals Fabrication Plant; Building 7A, Plant 7; Building 8A, Recovery Plant; Building 9A, Special Products Plant; and Building 39A, Incinerator Building. In each of these facilities, the transite sample will be collected at a location most likely to exhibit contamination by RCRA constituents. In each case, the samples will be submitted for TCLP analysis. Radiological contamination is assumed to be ubiquitous for this highly porous media as a result of continuous exposure to airborne radionuclides; therefore, radiological analysis will not be performed for this sample group. TCLP results will be used to determine whether transite will require treatment as a mixed hazardous/radiological waste.

Samples to be taken from heating, ventilation, and air conditioning (HVAC) filters will be used in components as supplemental to air particulate samples being taken before the intrusive sampling activities. HVAC filters in administrative buildings are expected to provide a larger source of sample material than the air particulate sampler alone. The use of this sample technique will be limited to office areas and subject to availability of filters with sufficient activity as determined by field sampling teams.

Samples of various media throughout the operable unit will be taken to develop data for leachable contaminants. Samples for leachability will be collected specifically for risk assessment needs. The TCLP will be employed to produce an extract for analysis, as appropriate for the media category.

During engineering inspections of the OU3 components, the following criteria were employed in selecting candidate locations for leachability sampling and testing:

- A major medium in the operable unit,
- Process type represents a general class of contamination types,
- Readily accessible to field crews for sampling, and
- Likely to exhibit contamination of concern.

As a result, the following areas have been selected: Plant 1 Pad (Component 74T) (concrete), to represent storage of miscellaneous products, wastes, and hazardous materials; Refinery (Component 2A) digestion area floor (concrete and acid brick), to represent acidic

uranium processes with ore contaminants present; Plant 5 (Component 5A) mold cleaning area (concrete), to represent a dry uranium process with daughter products in abundance; Pilot Plant Wet Side (Component 13A) thorium extraction area floor (concrete and acid brick), to represent a wet thorium process; Pilot Plant Wet Side (Component 13A) central processing area floor (concrete and acid brick), to represent miscellaneous wet processes involving various thorium and uranium compounds and hazardous materials. These sampling requirements will be included in the FWP for these components, and specific locations meeting the criteria will be identified and sampled by field sampling crews.

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D.9.1 ADMINISTRATIVE AND SUPPORT BUILDINGS

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D.9.1.1 Building 3C — NAR Control House

Component Description

Building 3C (Nitric Acid Recovery [NAR] Control House) is a single-story building located just north of 101st Street and west of the Maintenance Building (Component 3A), as shown on the Grid 19 map in Appendix C. The building is rectangular, with approximate dimensions of 26 × 110 ft and 14 ft high. Building 3C is constructed with a structural steel frame and transite panels on a poured concrete base (Type A building[1]). The interior of the building is divided into several rooms for administrative operations. The administrative areas have linoleum tile covering the concrete floor. The floor plan for the building is provided in Figure 3C-1. Building 3C houses the electrical control panels for the NAR Towers (Component 3D). This building also contains an office, conference room, and breakroom.

Process Area Description

Building 3C has one dry process area — NAR control. The NAR control process occupies only a fraction of the space in the building. Most of the space is used for administrative purposes. Anticipated contaminants from the NAR control process are summarized in Table A.3. The NAR control process involves the operation of the electrical control panels that control the NAR system. The NAR system uses a closed-loop design that consists of a series of tanks, pumps, and transfer lines to recover nitric acid from digestion processes in and around the Ore Refinery Plant (Component 2A).

Major Media Types per Process Area

The major media for Building 3C include structural steel and concrete. Because transite is addressed as a separate supplemental sampling activity, it is not considered a major medium in Building 3C.

Summary of Available Radiological Data

Building 3C is routinely sampled for removable alpha contamination and total beta-gamma contamination. Results from these surveys, performed from 1989 through 1992, are summarized in Tables A.4.0 and A.4.1 and are the basis for identifying "hot spots" (areas with elevated radiation levels). In total, 25 removable alpha and 90 total beta-gamma survey measurements were collected from the floor in Building 3C. The floor survey measurements were collected from both the linoleum tile and the concrete areas. Because of limited decontamination technology for linoleum tile, the radiological data for the tile were assessed

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[1] See Table A.2.0 in Appendix A for a description of building types.

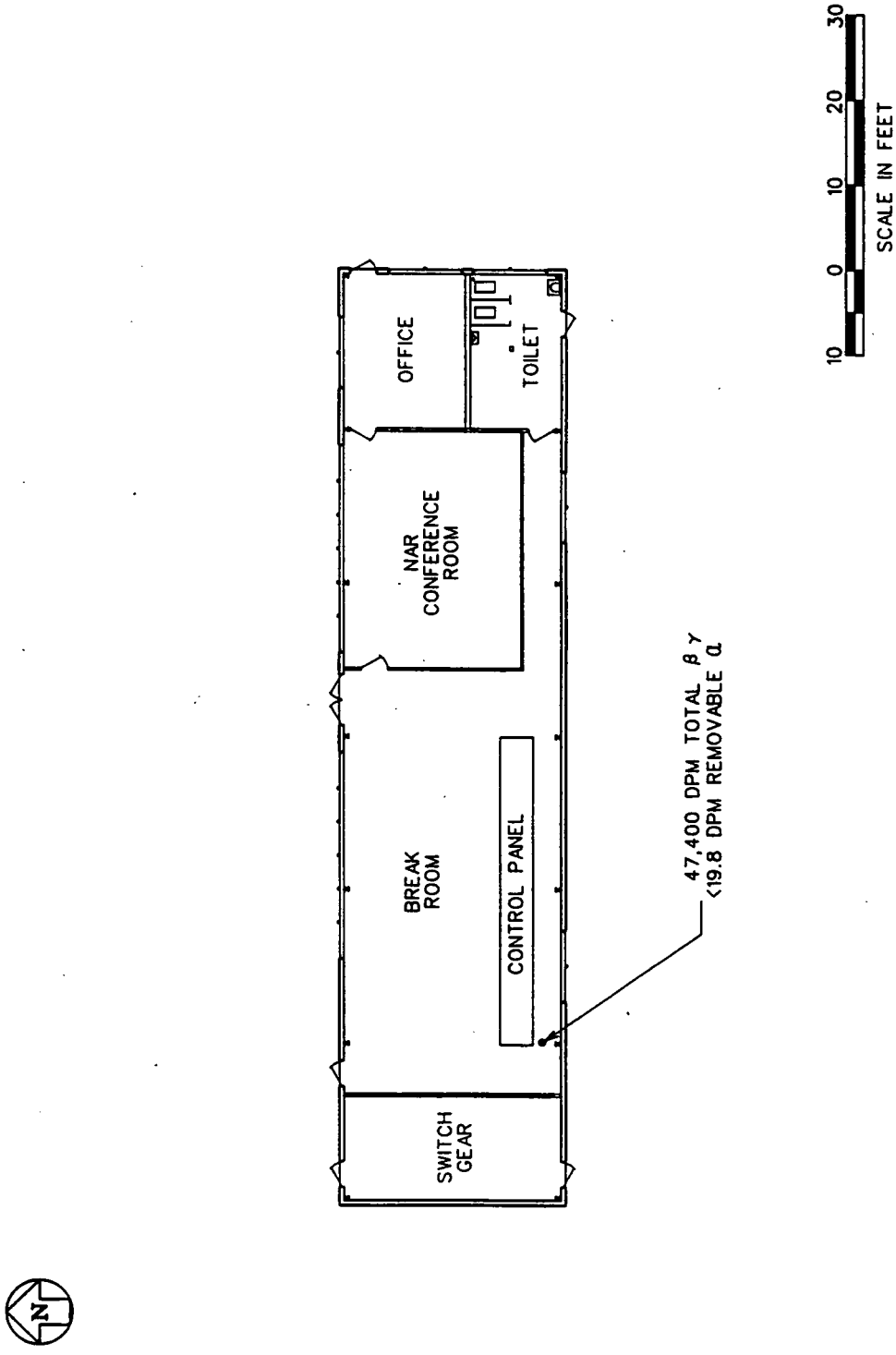

FIGURE 3C-1 Layout of Building 3C

as part of the concrete floor. The data from the surveys performed in 1989 through 1992 have been assembled, and the hot spots are identified for the concrete medium in Figure 3C-1. Before sampling begins, all data, including that gathered in ongoing radiological surveys, will be reassessed.

The highest total beta-gamma reading was 47,400 disintegrations per minute (dpm) for the concrete floor medium. The corresponding removable alpha reading was below the minimum detectable activity (MDA) of 19.8 dpm. Most of the high total beta-gamma readings were near the control panels. However, only 21 of the 90 total beta-gamma readings for the concrete floor medium were greater than 1,000 dpm. The removable alpha data indicated only two readings above the MDA for the entire building.

Summary of Sampling for Building 3C

One air sample will be collected in the building and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, X-ray fluorescence (XRF) surveys, radiological surveys, and swipes, will be performed and assessed in the field to further detail final intrusive sampling locations. An intrusive sample will be performed in the location identified as the radiological hot spot for the concrete medium shown in Figure 3C-1 and as discussed. One concrete chip will be obtained from the NAR control process area. If the sample is located in a tiled area, the sample will be extracted from the concrete beneath the tile. Protocols 1 and 3 will be used to collect structural steel scrapings and swipe samples. Sample types and quantities are summarized in Table 3C-1. No supplemental sample needs were identified during the building inspection.

TABLE 3C-1 Sample Types and Quantities for Building 3C

Sample Type	NAR Control	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.1.2 Building 11 — Service Building

Component Description

Building 11 (Service Building) is a two-story structure shown on the Grid 14 map in Appendix C. It is rectangular and measures approximately 230 × 322 ft and 30 ft high. Building 11 consists of cinder block construction on reinforced poured concrete footers, with reinforced poured concrete floors, glass windows, and a flat reinforced poured concrete roof (Type B building). Numerous floor drains are throughout the building. Building floor plans are provided in Figures 11-1 and 11-2.

Process Area Description

Building 11 houses four process areas: the FEMP cafeteria and kitchen; locker rooms; maintenance department offices; and laundry facilities. Only the laundry facility is considered a wet process. These areas are shown in Figures 11-1 and 11-2 and are described as follows. Anticipated contaminants for Building 11 are summarized in Table A.3.

Laundry. Since being refurbished and enlarged in 1987, this process area provides cleaning services for on-site process clothing using washers, dryers, and dry cleaning equipment. Historically, the laundry also serviced articles from off-site operations. Before entry into the process area, clothes are monitored to ensure that all articles are radiologically clean. Tetrachloroethylene has not been used in the operation in several years.

Maintenance. The maintenance shop, located near the southwestern corner of the first floor, handles malfunctions associated with laundry facilities and provides storage for small items used for any maintenance or repair work on the administrative side of the FEMP. Service fluids are stored in one area of the maintenance office. Although this storage area has a concrete floor, it does not have a dike or any other form of containment. Very little work on equipment is done within the room itself; any work that is done must be radiologically clean upon entry.

Locker Room (Changing Room). Changing rooms are located on most of the first floor. Separate rooms are available, according to sex, employment status (visitor or permanent employee), and radiological contamination. This area provides lockers and shower facilities. Numerous drainage pipes carry wastewater to the laundry sump. Like the laundry area, these facilities were refurbished and enlarged in 1987.

Cafeteria/Kitchen. The kitchen and cafeteria provide lunchroom service for FEMP employees and subcontractors.

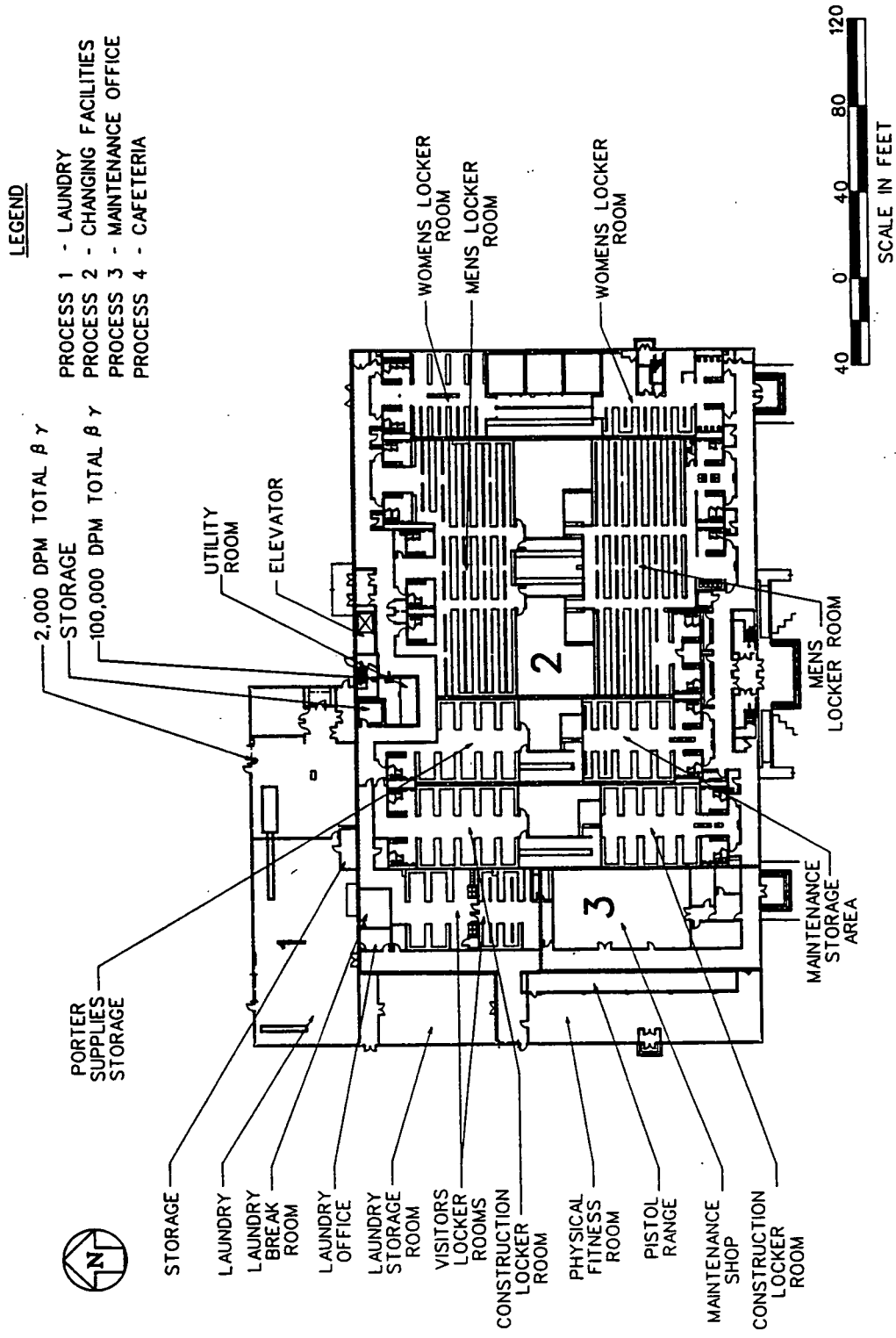

FIGURE 11-1 Layout of Building 11 — First Floor

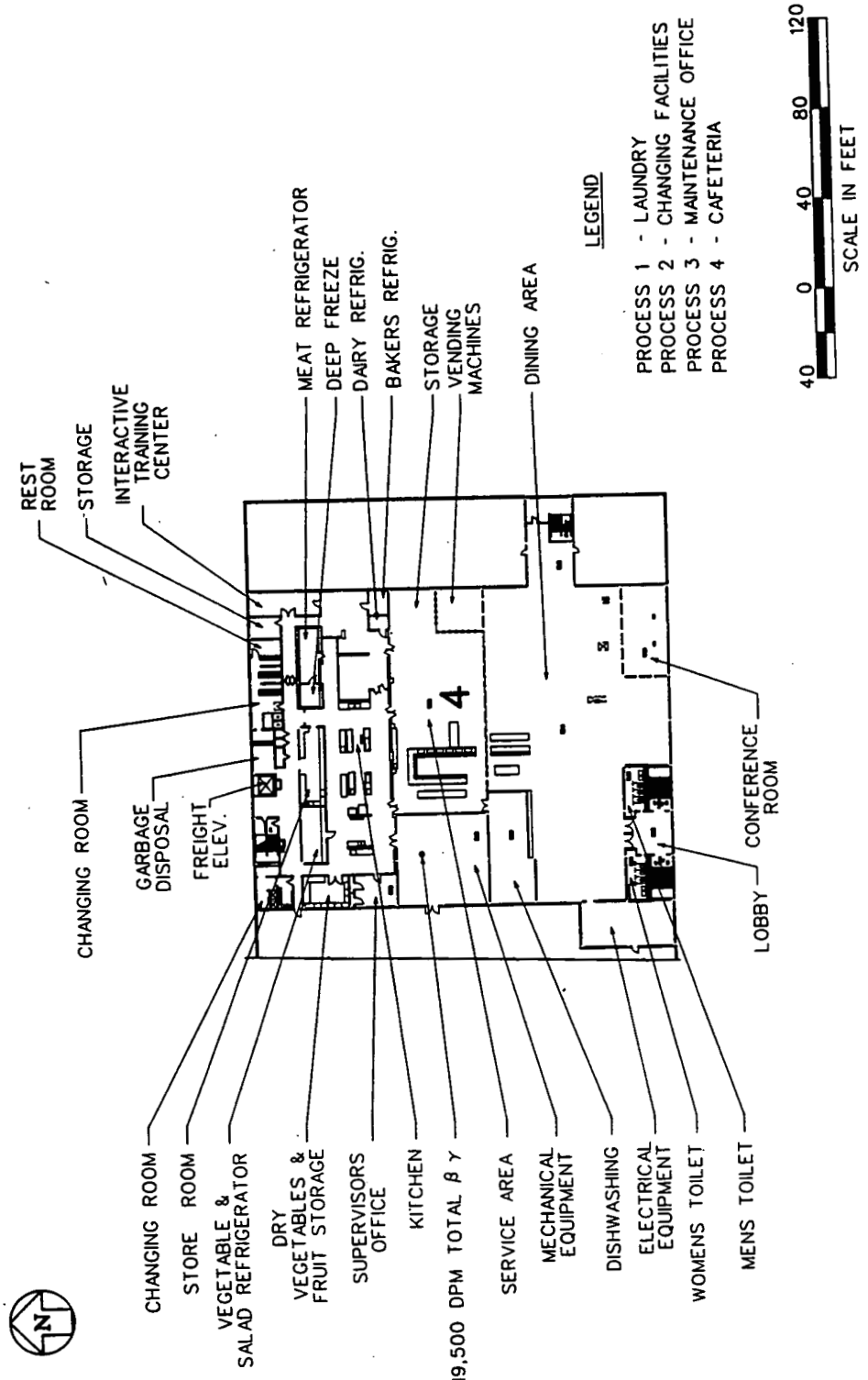

FIGURE 11-2 Layout of Building 11 — Second Floor

Major Media Types

The major media in Building 11 consist of the concrete and cinder block (masonry) throughout the building processes.

Summary of Available Radiological Data

Building 11 is routinely sampled for removable alpha and total beta-gamma contamination. Results from these surveys are summarized in Tables A.4.0 and A.4.1 and are the basis for identifying radiological hot spots. From 1989 through 1992, 590 removable alpha and 1,216 total beta-gamma survey measurements were performed in Building 11. The data have been assembled and the hot spots for the concrete are identified in Figures 11-1 and 11-2. Radiological data do not exist for the office/training rooms adjacent to the cafeteria. These rooms are isolated from the process areas; therefore, they are considered to have little impact on the hot spot determinations. All data will be reassessed before sampling to include data from ongoing radiological surveys.

The highest total beta-gamma readings obtained from surveying the concrete in four process areas were 2,000 dpm for the laundry area, 100,000 dpm for changing room facilities, and 19,500 dpm for the second floor kitchen and cafeteria. The removable alpha readings corresponding to these locations were all less than the MDA. The Maintenance Area total beta-gamma measurement was 4,000 dpm for 22 of 24 readings (the remaining two were lower), and the levels for 18 of 24 removable alpha readings were nondetectable.

Summary of Sampling for Building 11

One airborne particulate sample will be taken in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed in the radiological hot spots for the concrete. Because only the laundry process is considered wet, concrete chips samples will be taken for all processes except the laundry, where a concrete core will be taken. Swipe samples will be collected on the basis of Protocols 1 and 3. On the basis of the building inspection, a supplemental liquid sample will be taken from the laundry sump. Table 11-1 summarizes the planned sampling program for Building 11.

TABLE 11-1 Sample Types and Quantities for Building 11

Sample Type	Laundry	Main-tenance	Locker Rooms	Cafeteria Kitchen	Component Totals
Nonintrusive[a]					
Radiological surveys	b	b	b	b	NA[c]
Chemical surveys	b	b	b	b	NA
Air particulates	NA	NA	NA	NA	1
Swipes	2	2	2	2	8
Lab composite swipes	NA	NA	NA	NA	1
Intrusive[a]					
Concrete chips	NA	1	1	1	3
Concrete cores	1	NA	NA	NA	1
Masonry	1	1	1	1	4
Steel surface scraping	NA	NA	NA	NA	NA
Supplemental					
Liquid sample	1	NA	NA	NA	1
Loose media	NA	NA	NA	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.1.3 Building 14A — Administration Building

Component Description

Building 14A (Administration Building) is an irregularly shaped two-level structure measuring 143 x 240 ft and 24 ft high. It is located south of the Service Building (Component 11) and the 10-Plex Trailer Complex, as shown on the Grid 14 map in Appendix C. Building 14A is constructed of cinder block walls supported on reinforced concrete footers with poured concrete floors (Type B building). The building comprises a central hallway with east and west wings, and a partial basement is located under the west wing. The floor layouts of Building 14A are detailed in Figures 14A-1 and 14A-2.

Process Area Description

Building 14A houses the main offices for site management, the main mailroom, central reproduction and drafting, central computing, file storage, and the Emergency Operations Center (EOC). The building is also equipped with several restrooms/locker rooms. Anticipated contaminants for Building 14A are summarized in Table A.3.

Major Media Types per Process Area

The major media for Building 14A are the concrete floors and cinder block walls (masonry).

Summary of Available Radiological Data

Building 14A was surveyed extensively during 1991. Available radiological data include 725 total beta-gamma measurements and 333 removable alpha smear samples, as assembled in Tables A.4.0 and A.4.1. Slightly more than half of the beta-gamma measurements (402) and one-third of the removable alpha samples (103) were taken from floor surfaces. As expected for this building, most of these radiological measurements indicated levels below the MDA, with a few hot spots in the range of 1,000 to 3,000 dpm at the building's exterior entry points. As additional data are acquired during the course of ongoing radiological survey activities, they will be combined with the existing data, and the existing hot spots will be reevaluated.

The highest total beta-gamma measurement (25,000 dpm) was obtained on a storage locker located on the building's second floor. Because this reading was obtained on an item of removable equipment, it is not considered to be the building hot spot for the purpose of media sampling. Instead, the 7,000-dpm total beta-gamma hot spot located on the floor of the building's southwestern entry stairwell is the designated hot spot for sampling purposes.

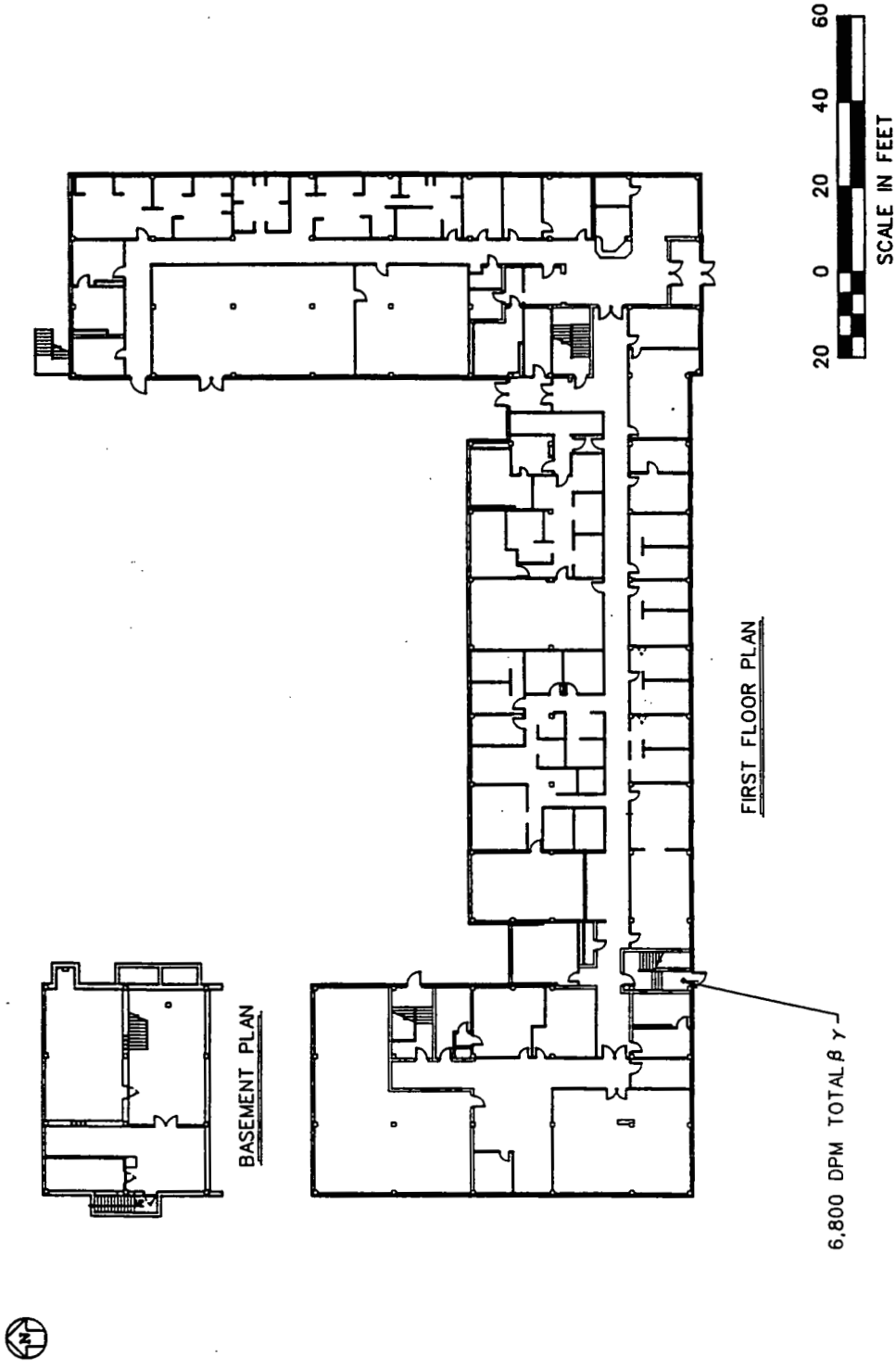

FIGURE 14A-1 Layout of Building 14A — First Floor

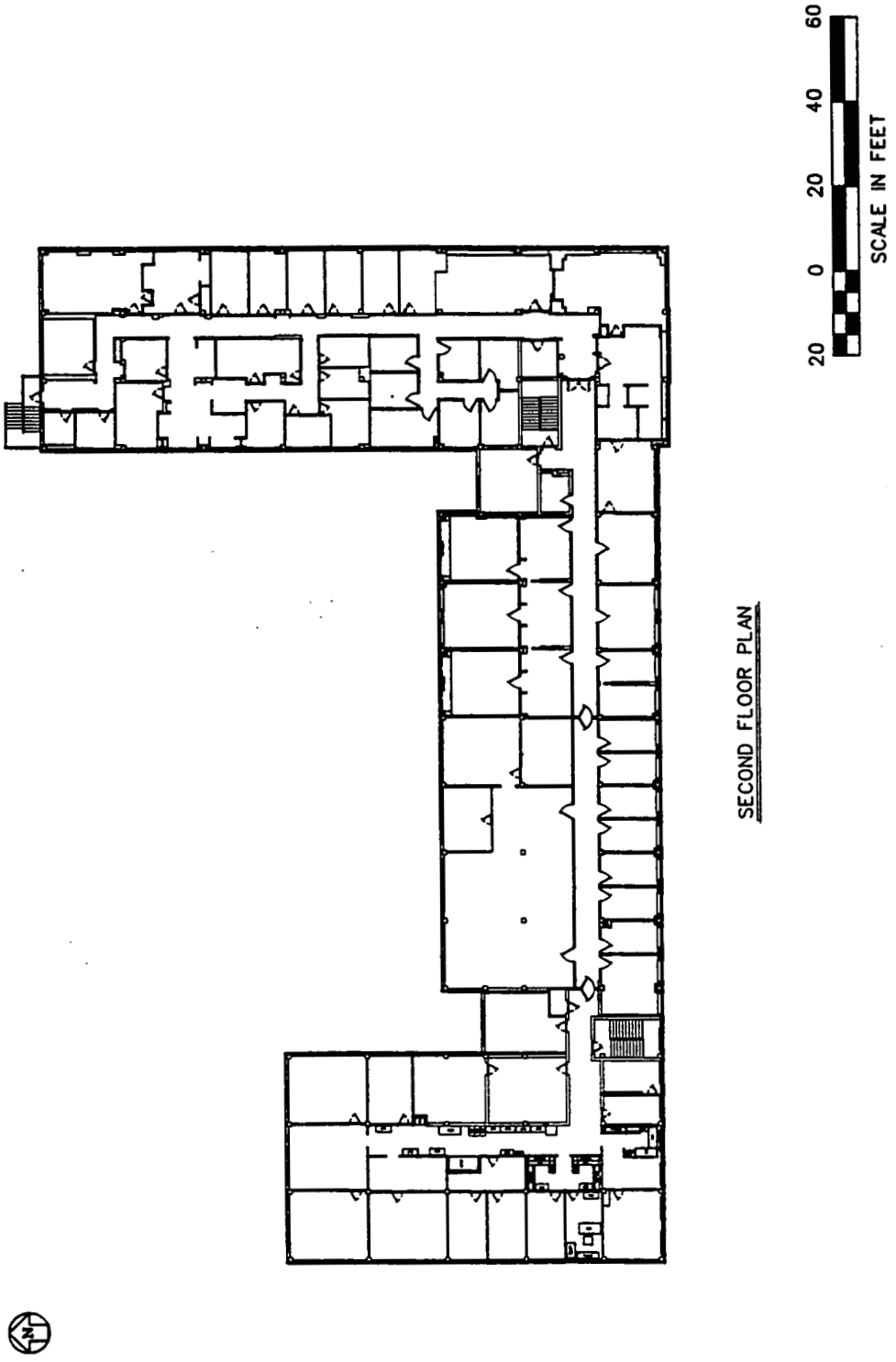

FIGURE 14A-2 Layout of Building 14A-2 — Second Floor

The removable alpha result for this location was less than detectable. The locations of the high beta-gamma readings (7,000 dpm) and the associated removable alpha readings are depicted in Figure 14A-1.

Summary of Sampling for Building 14A

One airborne particulate sample will be taken in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Non-intrusive measurements, including exposure rate measurements, XRF surveys, radiological surveys, and swipe samples, will be performed and assessed in the field to further define final intrusive sampling locations. Intrusive sampling will consist of one concrete chip sample and one masonry sample. If analysis of radiological swipe samples detects elevated levels of removable contamination as outlined in Protocol 1, then the swipe samples will be combined over the component for laboratory analysis. Although no supplemental samples were identified during component inspection for Building 14A, supplemental samples may be identified by field crews during sampling activities. Table 14A-1 summarizes the planned sampling program for Building 14A.

TABLE 14A-1 Sample Types and Quantities for Building 14A

Sample Type	Offices	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	1	1
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.1.4 Building 28A — Security Building

Component Description

Building 28A (Security Building) is an irregularly shaped, single-level structure measuring 109 × 82 ft and 10 ft high. It is located south of the Health and Safety Building (Component 53A), as shown on the Grid 14 map in Appendix C. Building 28A is constructed of cinder block walls supported on reinforced concrete footers with poured concrete floors (Type B building). Building 28A includes a turnstile area that separates Building 28A from the Human Resources Building (Component 28B). The layout of Building 28A is detailed on Figure 28A-1.

Process Area Description

Building 28A is the headquarters for on-site security. The building is equipped with several security offices, a communications center, and a classified document vault. Security turnstiles located between Building 28A and the Human Resources Building are the main access to the site and are staffed by security personnel. A site truck entrance is located immediately east of Building 28A, and this site access is also controlled by security personnel.

Major Media Types per Process Area

The major media for Building 28A are the concrete floors and cinder block walls (masonry).

Summary of Available Radiological Data

The turnstiles associated with Building 28A were surveyed during 1991. Recent radiological data include 71 total beta-gamma measurements and 47 removable alpha smear samples. Most of both measurement types were associated with floor surfaces (57 and 42, respectively). As additional data are acquired during the course of ongoing radiological survey activities, they will be combined with the existing data, and the existing hot spots will be reevaluated.

The hot spot for the floor medium is located just outside the guard station (northeastern corner) in the west side of the turnstile area, with a reading of 7,500 dpm total beta-gamma and 39.5 dpm removable alpha. All total beta-gamma results were greater than the instrument MDA, with 17 of the 71 measurement points reading 1,000 dpm or higher. The location of the high beta-gamma reading (7,500 dpm) and the associated removable alpha reading is depicted in Figure 28A-1.

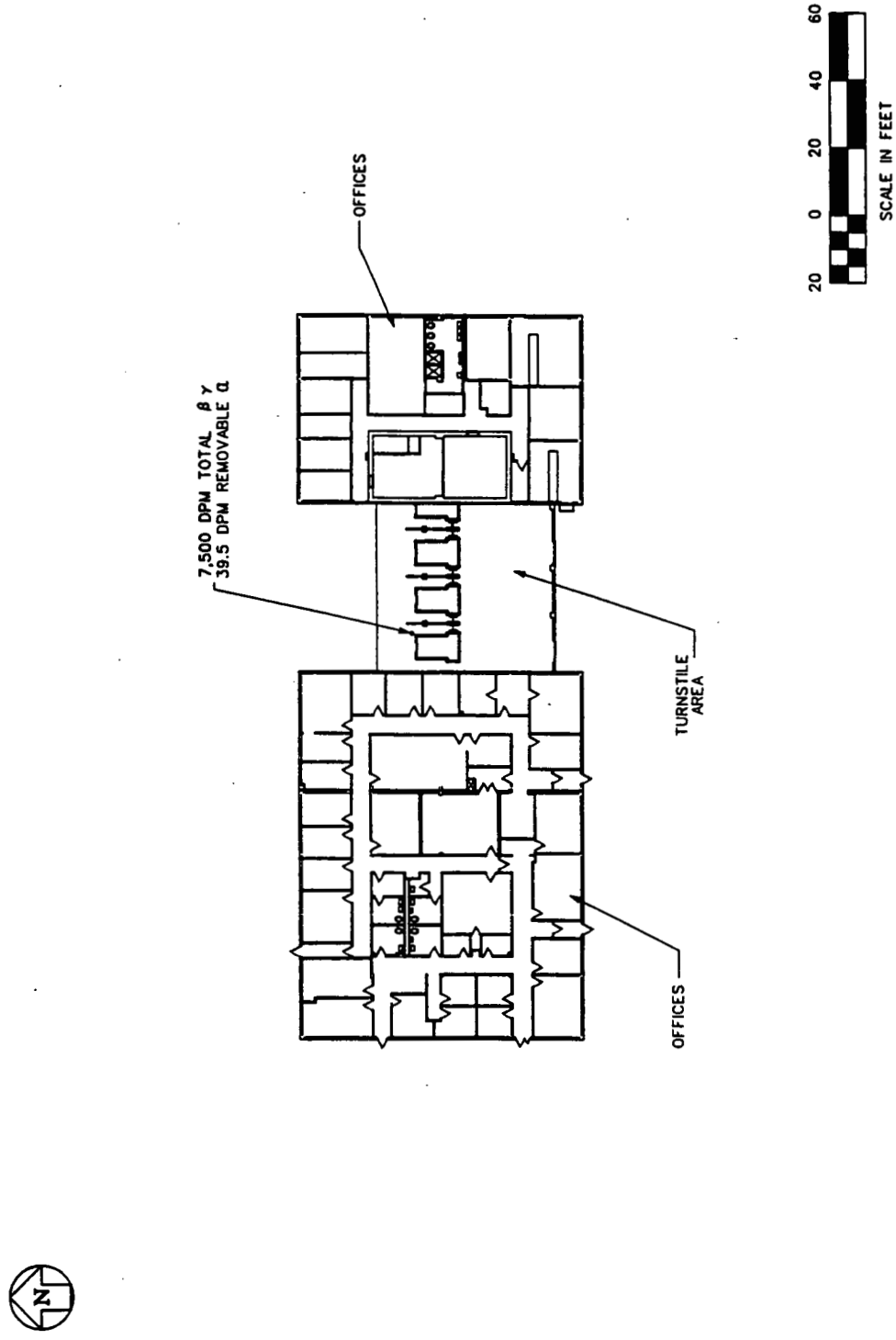

FIGURE 28A-1 Layout of Building 28A

Summary of Sampling for Building 28A

One airborne particulate sample will be taken in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, radiological surveys, and swipe samples, will be performed and assessed in the field to further define final intrusive sampling locations. Intrusive sampling will consist of one concrete chip sample and one masonry sample. If analysis of radiological swipe samples detects elevated levels of removable contamination as outlined in Protocol 1, then the swipe samples will be combined over the component for laboratory analysis. Although no supplemental samples are anticipated for Building 28A, supplemental samples may be identified by field crews during sampling activities. Table 28A-1 summarizes the planned sampling program for Building 28A.

TABLE 28A-1 Sample Types and Quantities for Building 28A

Sample Type	Security Area	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	1	1
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.1.5 Building 28B — Human Resources

Component Description

Building 28B (Human Resources) is a single-story building located adjacent and to the west of the Security Building (Component 28A), as shown on the Grid 14 map of Appendix C. The building is irregularly shaped, with approximate dimensions of 80 × 100 ft and 10 ft high. The building is constructed from a combination of concrete and cinder blocks (Type B building). The floor plan for Building 28B is provided in Figure 28B-1.

Process Area Description

Building 28B provides office space for human resources employees and for the DOE Inspector General. Several services for the facility's employees were conducted in this building. The anticipated contaminants from the offices process, a dry process area, are summarized in Table A.3.

Major Media Types per Process Area

The major media for Building 28B are concrete and masonry.

Summary of Available Radiological Data

Radiological data for Building 28B are available for the concrete floor medium from the 1989 to 1992 surveys. Floor survey measurements include both samples collected directly from the concrete floor and those taken from the floor tile. A total of 246 beta-gamma survey measurements were collected from the concrete floor medium. The radiological values range from not detectable to 800 dpm. Of the 246 survey measurements, 39 were recorded at detectable concentrations. No removable alpha measurements were collected for the concrete medium. Data from the ongoing radiological surveys will also be assessed before systematic surveys of Building 28B are conducted.

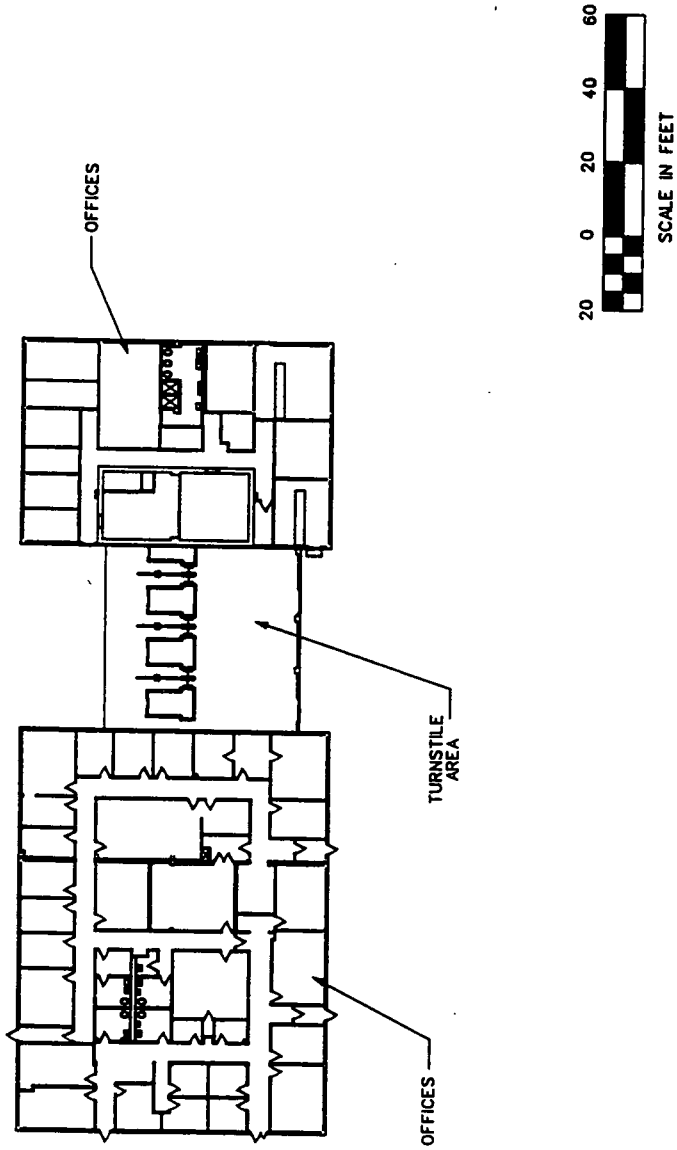

FIGURE 28B-1 Layout of Building 28B

D.9.1.6 Component 28C — Guard Post on South End of D Street

Component Description

Component 28C (Guard Post on South End of D Street) is a single-level, pre-engineered facility consisting of a structural steel frame on a reinforced poured concrete base that is approximately 10 × 10 ft and 10 ft high. The building is located in the administrative area, as shown on the Grid 14 map in Appendix C.

Process Area Description

The guard post is located next to the vehicle access point for the production area. This component was previously used for security personnel to control production area vehicle access.

Summary of Sampling for Component 28C

No sampling is required for this component. The component is located outside of radiologically controlled areas and is of insignificant size; moreover, the contaminants expected for the component are of low toxicity. The component also exhibits little or no evidence of contamination.

D.9.1.7 Building 45A — Rust Engineering Building

Component Description

Building 45A (Rust Engineering Building) is a single-story building shown on the Grid 25 map in Appendix C. It is rectangular, measuring approximately 121 × 150 ft and 14 ft high. The building consists of a structural steel frame with corrugated metal siding and a poured concrete base and floor (Type C building). The floor plans for Building 45A are shown in Figure 45A-1.

Process Area Description

The primary purpose of Building 45A was to develop techniques, machines, and machining tools for the machining of uranium and thorium. The facility also housed an experimental rolling mill in the south bay and induction heat treating equipment in the center bay. Building 45A was thoroughly decontaminated in 1988, before conversion for office space. Building 45A contains one process area. Currently, the building contains offices and stores small tools and equipment. Anticipated contaminants for Building 45A are summarized in Table A.3.

Major Media Types per Process Area

Major media for Building 45A consist of structural steel and concrete.

Summary of Available Radiological Data

Building 45A is routinely surveyed for removable alpha and total beta-gamma contamination. Results from the most recent surveys are summarized in Tables A.4.0 and A.4.1 and provide the basis for identifying radiological hot spots. As indicated, 96 removable alpha and 74 total beta-gamma survey measurements were performed in Building 45A from 1989 through 1992. On the basis of the assembled data, the concrete hot spot is identified on Figure 45A-1. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys. The highest measured concentrations of contamination for the concrete medium were 250,000 dpm for total beta-gamma and 244 dpm for removable alpha contamination.

Summary of Sampling for Building 45A

One airborne particulate sample will be taken and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will

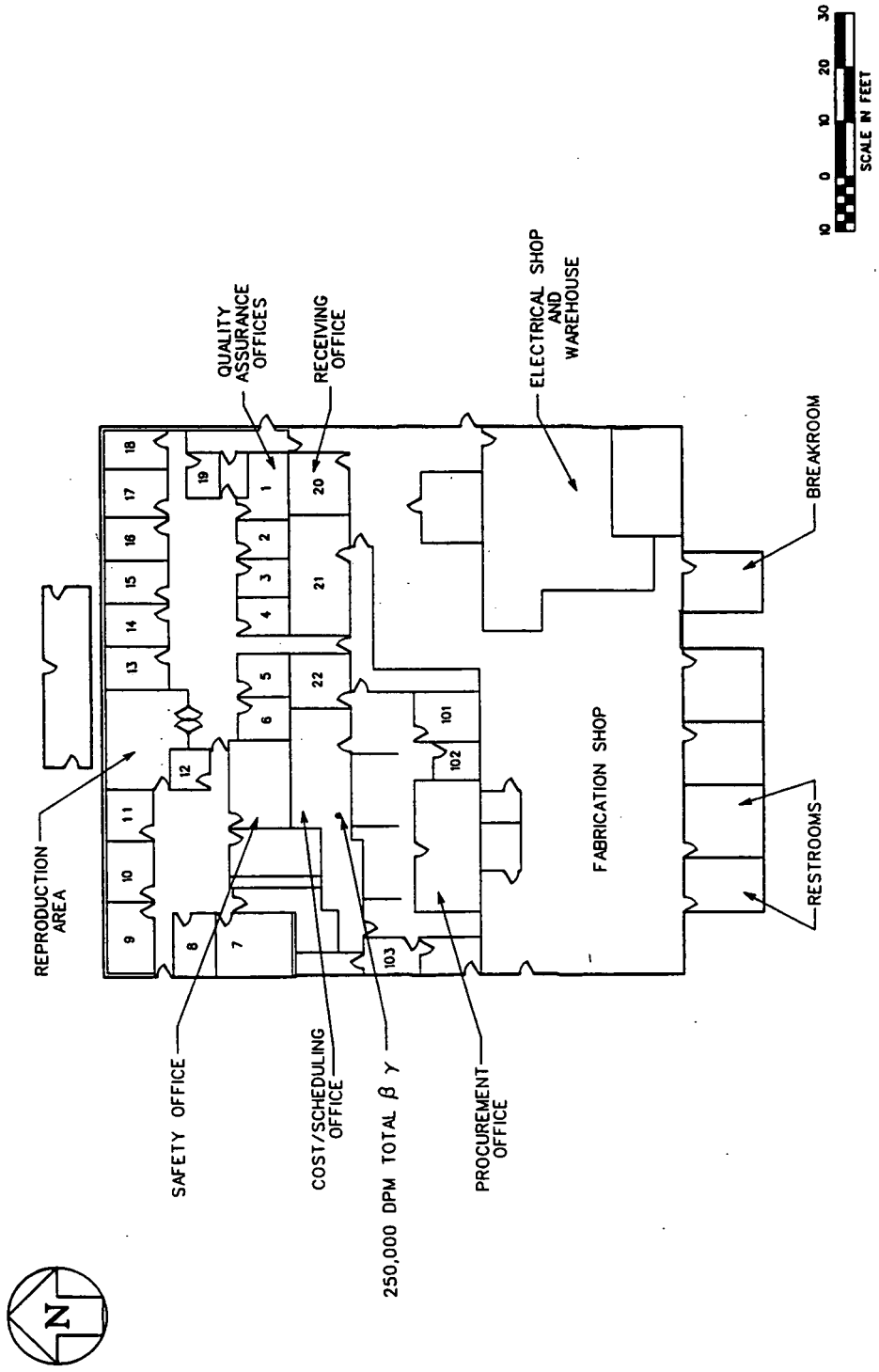

FIGURE 45A-1 Layout of Building 45A

be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive sampling for the concrete medium will be performed at the radiological hot spot shown in Figure 45A-1. Because the process area in Building 45A is considered dry, the concrete sample will be a chip sample. Structural steel scrapings and swipe samples will be collected on the basis of Protocols 1 and 3. On the basis of visual inspection, no supplemental samples are needed. Table 45A-1 summarizes the planned sampling program for Building 45A.

TABLE 45A-1 Sample Types and Quantities for Building 45A

Sample Type	Offices	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.1.8 Building 53A — Health and Safety Building

Component Description

Building 53A (Health and Safety Building) is a multilevel building shown on the Grid 14 map in Appendix C. It is rectangular, measuring approximately 89 × 221 ft and 22 ft high, with two floors and a partial basement under the west section (Figures 53A-1 through 53A-3). The building consists of cement block construction on reinforced poured concrete footers and floors, flat reinforced poured concrete roofs, and glass windows (Type B building).

Process Area Description

Building 53A currently contains three process areas: offices, medical services, and security communications headquarters. Figures 53A-1 through 53A-3 identify the locations of these process areas within the building. Anticipated contaminants are summarized in Table A.3. Offices and conference areas exist on both main floors. The medical services area of the building houses equipment for emergency medical attention, routine examination and testing, X-ray testing, medical laboratory, and offices. Site security uses much of the basement floor as a communications headquarters.

Major Media Types per Process Area

The major media for Building 53A are cement blocks and concrete for each process area.

Summary of Available Radiological Data

Building 53A is routinely surveyed for removable alpha and total beta-gamma contamination. Results from the most recent surveys are summarized in Tables A.4.0 and A.4.1 and provide the basis for identifying radiological hot spots. As indicated, 11 removable alpha and 398 total beta-gamma survey measurements were performed on the floors from 1989 through 1992. On the basis of assembled data, each process area hot spot is identified in Figures 53A-1 through 53A-3. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys.

The highest concentration of total beta-gamma contamination for the linoleum tile covering the concrete medium in the office process area is 2,000 dpm. The hot spot for the medical services process area also measures 2,000 dpm for total beta-gamma contamination. The basement, which holds the security process area, has a total beta-gamma measurement of 1,000 dpm.

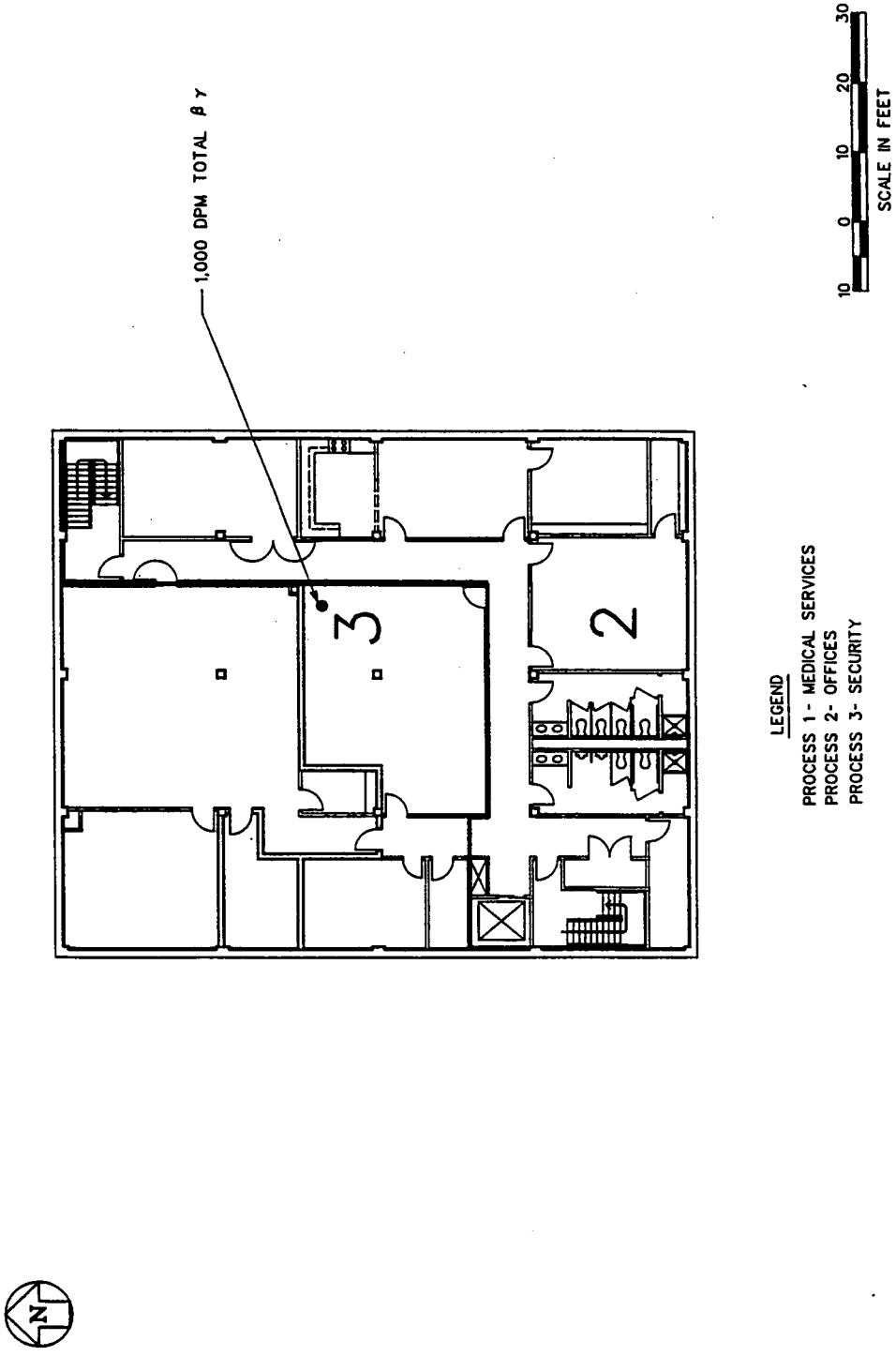

FIGURE 53A-1 Layout of Building 53A — Basement

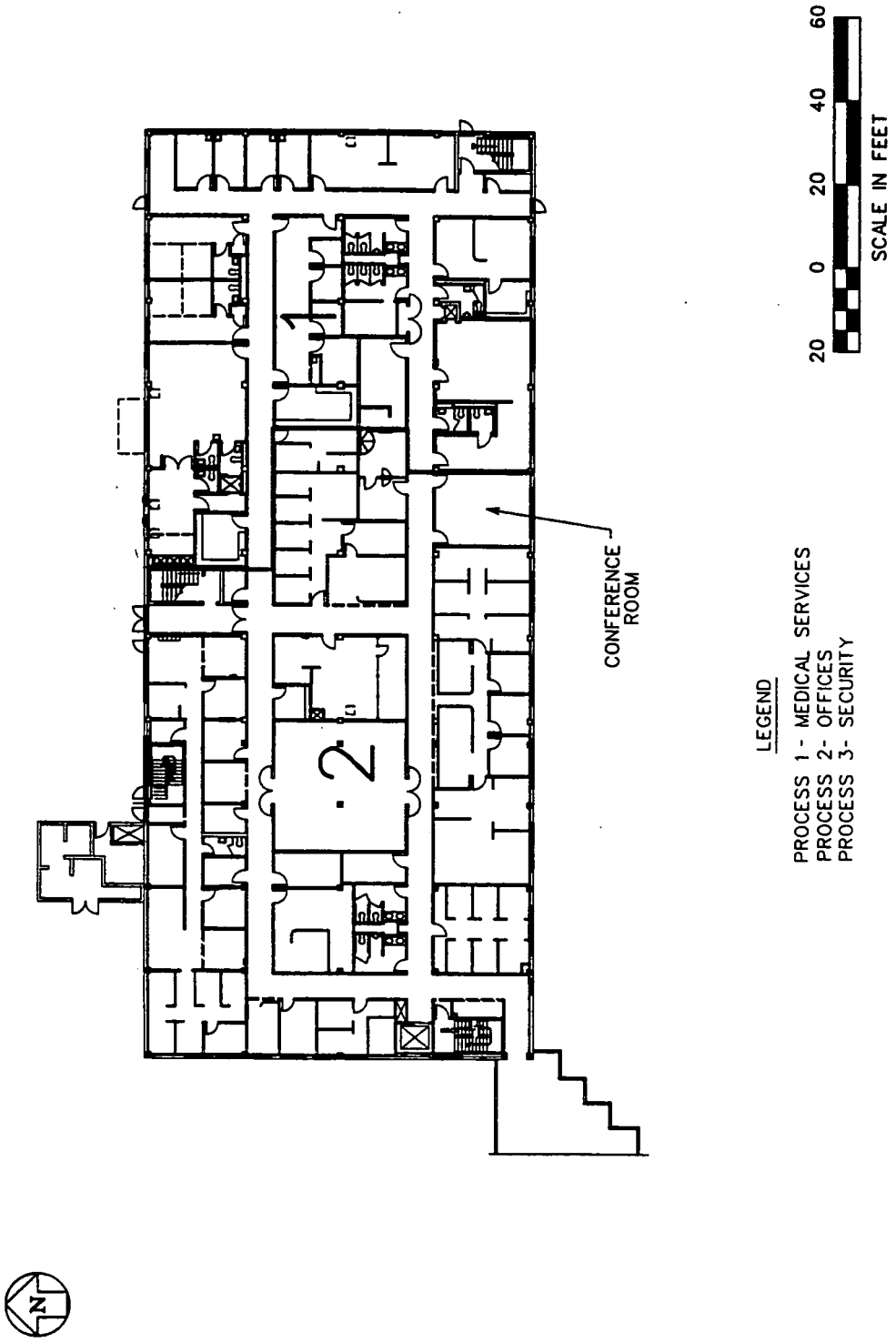

FIGURE 53A-2 Layout of Building 53A — First Floor

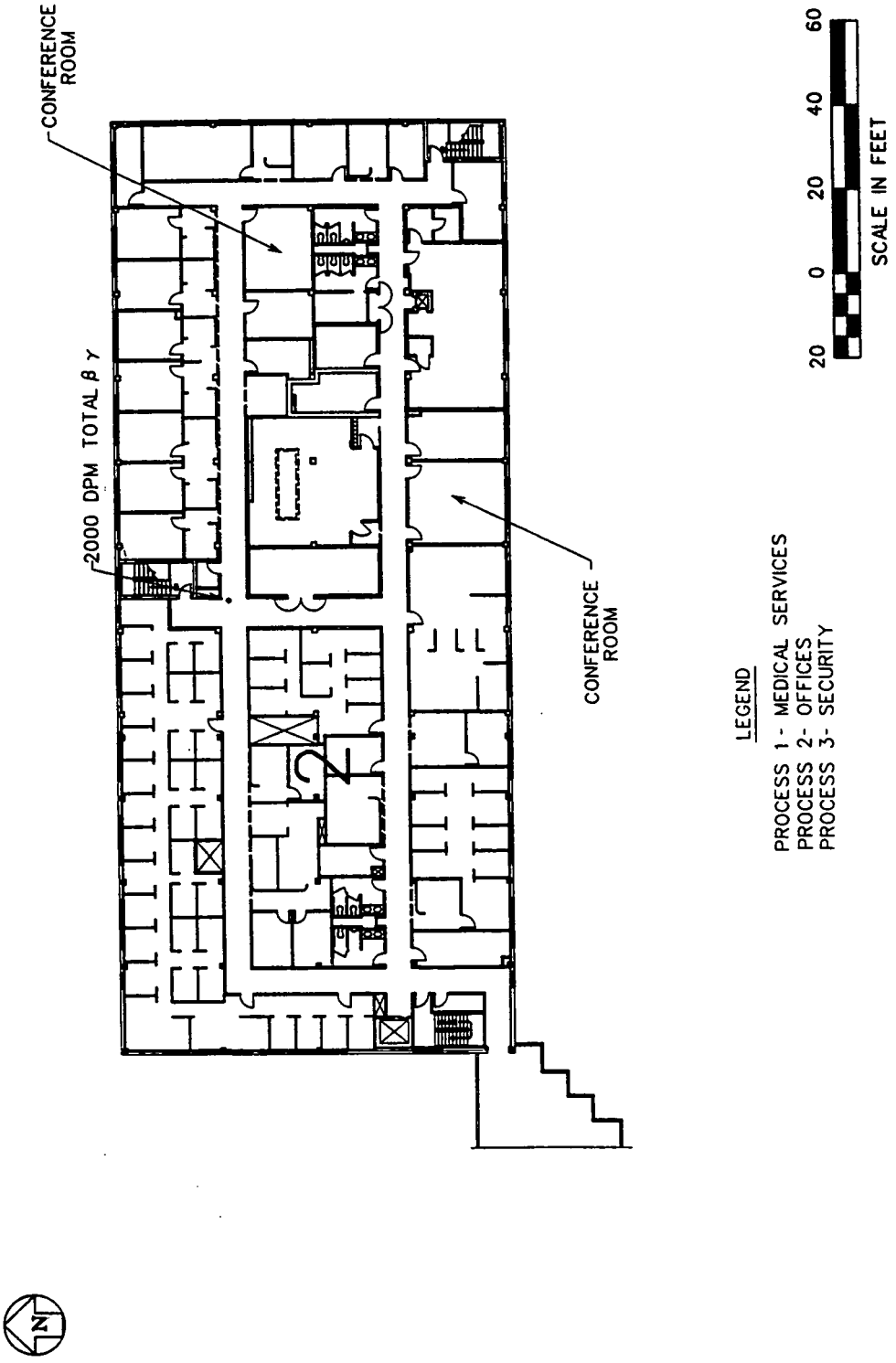

FIGURE 53A-3 Layout of Building 53A — Second Floor

Summary of Sampling for Building 53A

One airborne particulate sample will be taken and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive sampling for the concrete medium will be performed at the radiological hot spots shown in Figure 53A-1. All process areas are considered dry; therefore, concrete samples will be chips. Table 53A-1 summarizes the planned sampling program for Building 53A.

TABLE 53A-1 Sample Types and Quantities for Building 53A

Sample Type	Offices	Security	Medical Services	Component Totals
Nonintrusive[a]				
Radiological surveys	b	b	b	NA[c]
Chemical surveys	b	b	b	NA
Air particulates	NA	NA	NA	1
Swipes	2	2	2	6
Lab composite swipes	NA	NA	NA	1
Intrusive[a]				
Concrete chips	1	1	1	3
Concrete cores	NA	NA	NA	NA
Masonry	1	1	1	3
Steel surface scraping	NA	NA	NA	NA
Supplemental				
Liquid sample	NA	NA	NA	NA
Loose media	NA	NA	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.1.9 Building 53B — In-Vivo Building

Component Description

Building 53B (In-Vivo Building) is a single-level cement block structure approximately 36 × 72 ft and 15 ft high attached as an annex due south of Building 53A (Health and Safety Building). This facility contains health and safety radiation monitoring equipment. The building is located in the administrative area, as shown on the Grid 14 map in Appendix C.

Process Area Description

The In-Vivo Building has been constructed since the primary production activities for the site were halted. The facility houses highly sensitive radiation detection equipment in a shielded area for the determination of personnel internal radiation contamination. This facility is maintained in a state of minimal contamination to ensure accurate in-vivo monitoring.

Summary of Sampling for Component 58B

This facility does not require sampling. The component is located outside of radiologically controlled areas. The component exhibits little or no evidence of contamination, results of the radiological surveys for the component do not exceed the criteria established for sampling, and anticipated contaminants are of low toxicity.

D.9.1.10 Building 73A — Fire Training Center Building

Component Description

Building 73A (Fire Training Center Building) is a multilevel structure measuring approximately 20 × 30 ft and 14 ft high. Building 73A is shown on Figure 73A-1 and is located near the northern boundary of the FEMP site, along B Street, as shown on the Grid 33 map in Appendix C. The building consists of cement blocks, a poured concrete base and floor, and a reinforced, poured concrete roof (Type B building).

Process Area Description

Building 73A is considered one process area and was used for training fire brigade members. Materials such as straw, wood, and tires were burned to create "hot" and "smoky" situations for use during training. Currently, the building is empty and condemned. A trailer-type office and a tanker truck were abandoned nearby. Anticipated contaminants for Building 73A are summarized in Table A.3.

Major Media Types per Process Area

Building 73A major media consist of concrete (floors and roofing) and cement blocks (walls).

Summary of Available Radiological Data

Building 73A has not been routinely surveyed for removable alpha or total beta-gamma contamination. Because no recent data exist, the data from ongoing radiological surveys will be assessed before systematic surveys of the component are conducted.

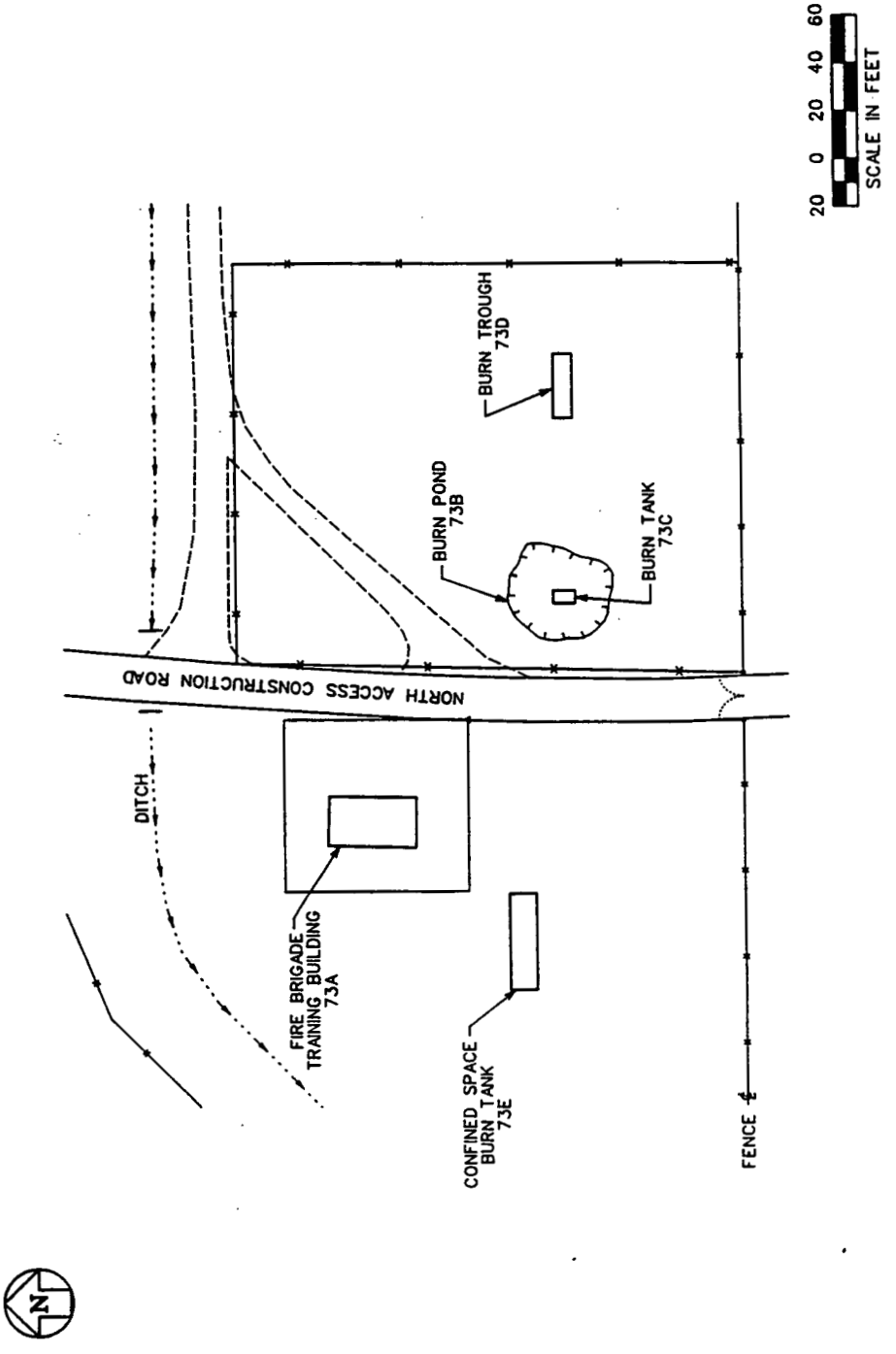

FIGURE 73A-1 Location of Building 73A

D.9.1.11 Building 90 — Skeet Range Building

Component Description

Building 90 (Skeet Range Building) is a single-level, pre-engineered structure consisting of a structural steel frame on a reinforced poured concrete base that is approximately 15 x 15 ft and 15 ft high. The building is located outside the administrative area, as shown on the Grid 32 map in Appendix C.

Process Area Description

This building supported the skeet range activities by storing clay pigeons and launching equipment.

Summary of Sampling for Building 90

This component requires no sampling. The component is insignificant in size and located outside of radiologically controlled areas.

D.9.1.12 Component G-006 — Process Trailers

Component Description

Component G-006 (Process Trailers) comprises various mobile office trailers located throughout the process areas of the site.

Process Area Description

The trailers located throughout the site are currently used for temporary office space. These trailers are not considered a permanent facility on-site and will be released off-site under DOE guidelines after their service is no longer required to support site activities. It is anticipated that these trailers will be removed from the site before completion of the RI/FS process unless unrestricted release criteria can not be met at the time.

Summary of Sampling for Component G-006

This component does not require sampling and exhibits little or no evidence of contamination. Results of the radiological surveys for the component do not exceed the criteria established for sampling, and anticipated contaminants are of low toxicity.

D.9.1.13 Component G-007 — Nonprocess Trailers

Component Description

Component G-007 (Nonprocess Trailers) comprises various mobile office trailers located throughout the administrative area that are often linked into multiplexed units.

Process Area Description

The trailers located throughout the site administrative areas are currently used for temporary office space. These trailers are not considered a permanent facility on-site and will be released off-site under DOE guidelines after their service is no longer required to support site activities. It is anticipated that these trailers will be removed from the site before completion of the RI/FS process unless unrestricted release criteria can not be met at the time.

Summary of Sampling for Component G-007

This component does not require sampling. The component is located outside of radiologically controlled areas and exhibits little or no evidence of contamination. Results of the radiological surveys for the component do not exceed the criteria established for sampling, and anticipated contaminants are of low toxicity.

D.9.2 WAREHOUSE AND STORAGE BUILDINGS

D.9.2.1 Building 1B — Plant 1 Storage Shelter

Component Description

Building 1B (Plant 1 Storage Shelter) is the steel roof that covers a portion of the Plant 1 Pad (Component 74T). Building 1B is located just north of the Preparation Plant (Component 1A) in the Grid 27 map of Appendix C. The steel roof has a height of 18 ft and covers 12,780 ft^2 of storage area on the Plant 1 Pad. A schematic of Building 1B is provided in Figure 1B-1. Building 1B provides covered storage for a portion of the Plant 1 Pad.

Process Area Description

A single process area is defined for Building 1B. Covered storage is considered a dry process area. Anticipated contaminants from this process are summarized in Table A.3.

Major Media Types per Process Area

The structural steel of Building 1B is the only major medium for the building. The concrete in the area is associated with the Plant 1 Pad (Component 74T).

Summary of Available Radiological Data

Radiological data from 1989 to 1992 do not exist for Building 1B.

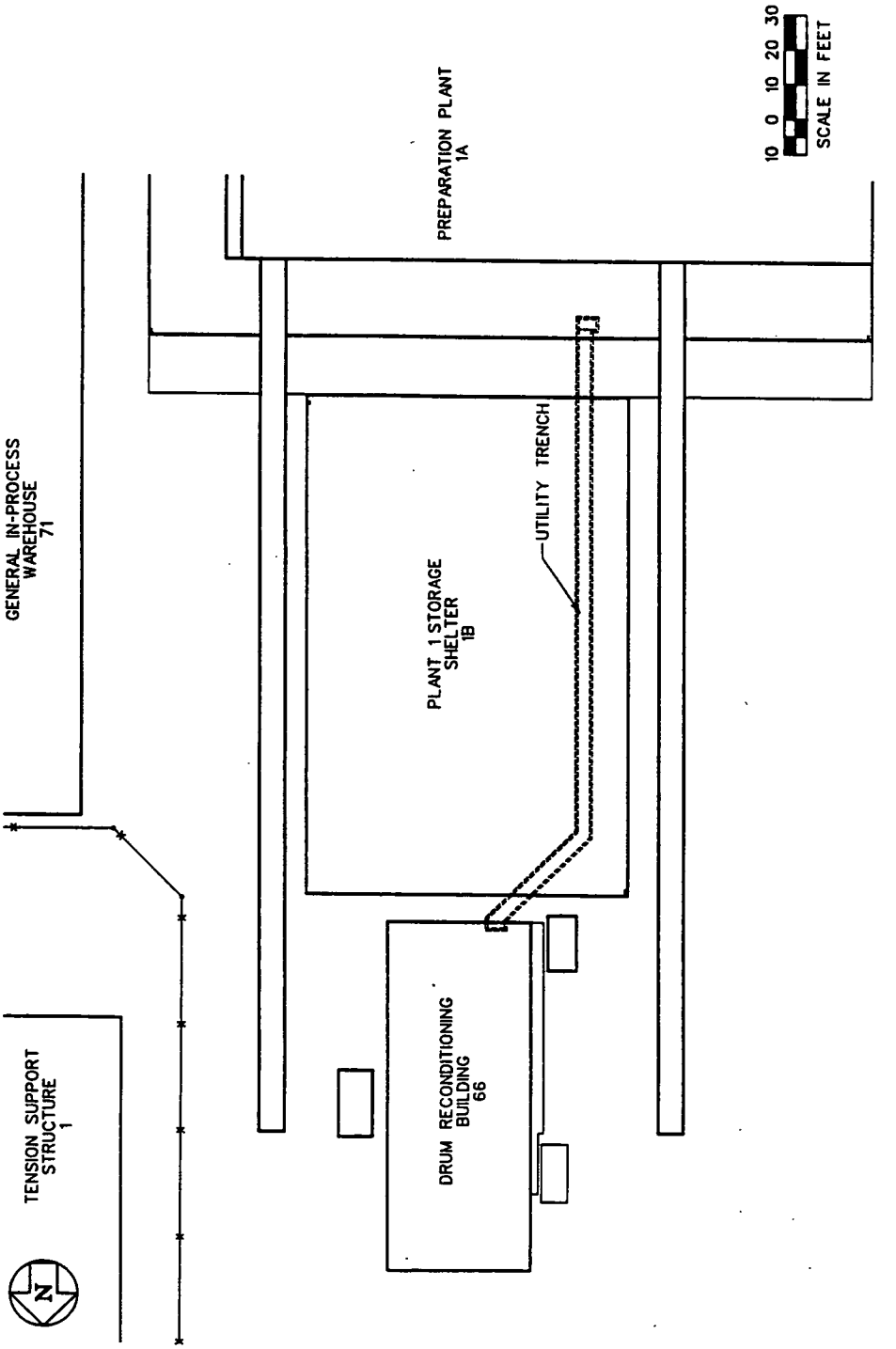

FIGURE 1B-1 Schematic of Building 1B

D.9.2.2 Building 4B — Plant 4 Warehouse

Component Description

Building 4B (Plant 4 Warehouse) is a single-level warehouse measuring approximately 60 × 202 ft and 13 ft high. Building 4B is shown on Figure 4B-1 and is located east of the Plant 4 Maintenance Building (Component 4C) along C Street, as shown on the Grid 13 map in Appendix C. Building 4B is a pre-engineered structure consisting of a structural steel frame with steel siding panels and sloped steel roof panels. The building is supported on a reinforced poured concrete base (Type C building).

Process Area Description

Building 4B is considered one process area and is used for the covered storage of UF_4 resulting from Plant 4 and Pilot Plant UF_6 to UF_4 operations. Anticipated contaminants for Building 4B are summarized in Table A.3.

Major Media Types per Process Area

The major media for Building 4B are concrete and structural steel.

Summary of Available Radiological Data

Building 4B has been surveyed for removable alpha contamination. During 1991 and 1992, 12 removable alpha readings were taken on the concrete floor of the warehouse. The hot spot for the concrete floor in Building 4B was located in the corridor near the east side of the warehouse and had a removable alpha reading of 98 dpm (Figure 4B-1).

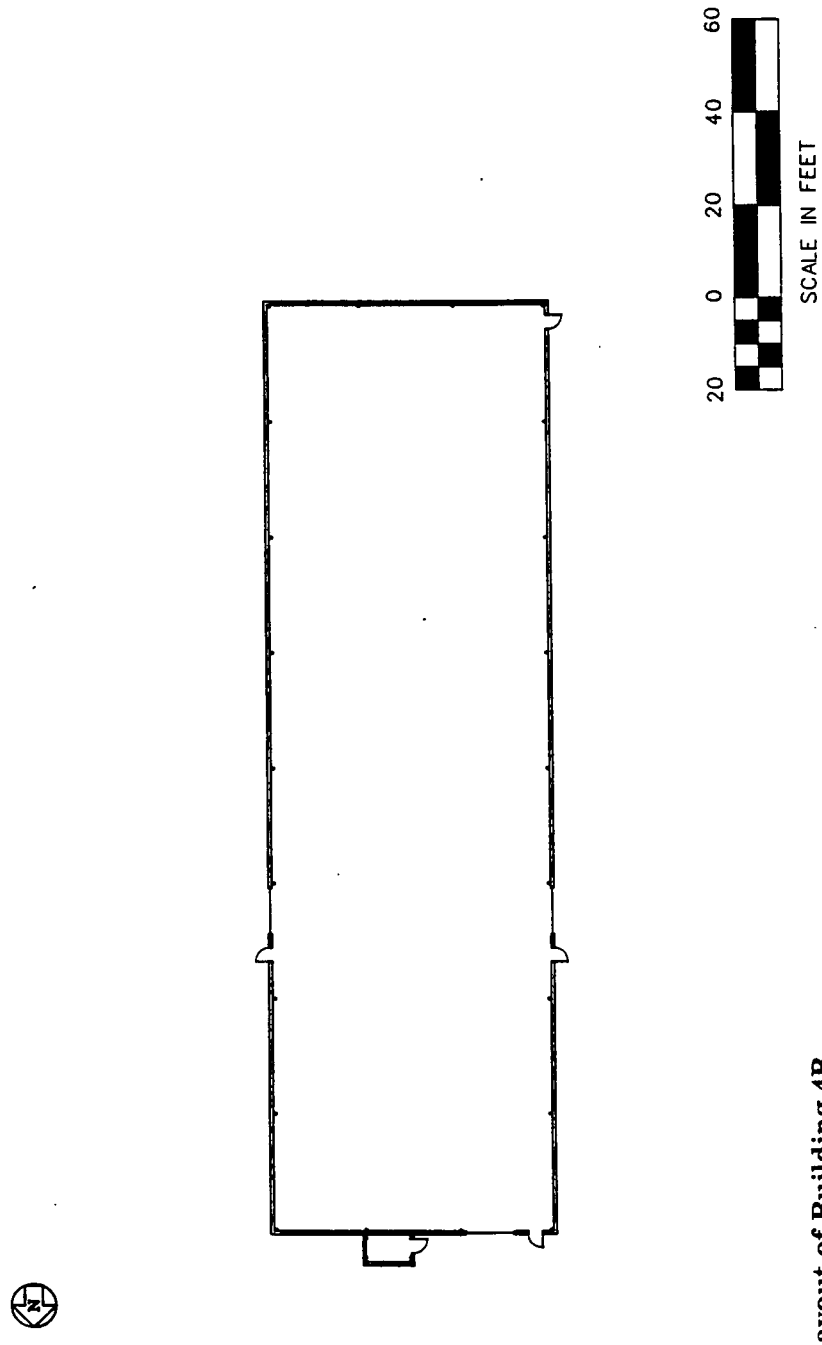

FIGURE 4B-1 Layout of Building 4B

D.9.2.3 Building 5E — Plant 5 Filter Building

Component Description

Building 5E (Plant 5 Filter Building) is a single-level, pre-engineered structure consisting of a structural steel frame on a reinforced poured concrete base that is approximately 54 × 70 ft and 24 ft high. This building is a new addition to the west side of the Metals Production Plant (Component 5A), as shown on the Grid 12 map in Appendix C.

Process Area Description

The Filter Building was recently constructed but never placed into service because the production activities at the FEMP were discontinued. This building is designed to be physically separate from Plant 5 and has not been used for process activities.

Summary of Sampling for Building 5E

This component does not require sampling. The component has not been placed into service following the recent completion of construction and exhibits little or no evidence of contamination.

D.9.2.4 Building 5F — Plant 5 Covered Storage Pad

Component Description

Component 5F (Plant 5 Covered Storage Pad) is a covered storage area with a structural steel roof with no sides and a reinforced poured concrete base. The pad is approximately 85 x 142 ft. The steel roof is attached to Plant 5 but is designed to be physically separate, as shown on the Grid 12 map in Appendix C.

Process Area Description

The original northwest pad area of Plant 5 was refurbished with a new pad and covering structure to improve storage options for Plant 5 (Component 5A). Results of the radiological surveys completed since modifications to this component do not exceed the criteria for sampling. Production residues, empty drums, and excess equipment are currently stored on this pad.

Summary of Sampling for Component 5F

This component does not require sampling. The component exhibits little or no evidence of contamination, results of the radiological surveys for the component do not exceed the criteria established for sampling, and anticipated contaminants are of low toxicity.

D.9.2.5 Building 5G — Plant 5 Ingot Storage Shelter

Component Description

Building 5G (Plant 5 ingot storage shelter) is a single-story building located east of Plant 5 (Grid 12 map in Appendix C). The building is rectangular, measuring approximately 30 × 62 ft and 12 ft high. It covers a storage pad east of Plant 5 (Figure 5G-1) and consists of a structural steel frame with no sides and a metal roof on a reinforced concrete base.

Process Area Description

Building 5G performs a single function — temporary storage of Plant 5 metal products (ingots and derbies), feed stock (scrap and briquettes), and excess materials. Currently stored are derbies, briquettes, and other uranium metal in 55-gal drums and on stacked metal trays. Anticipated contaminants are summarized in Table A.3.

Major Media Types per Process Area

Major media identified for Building 5G are a structural steel frame and a reinforced concrete base.

Summary of Available Radiological Data

Building 5G has not been routinely surveyed for removable alpha and total beta-gamma contamination. No recent data are available, but the radiological hot spot will be determined from field measurements before sampling occurs. Also, as data are acquired from ongoing radiological surveys taken for health physics needs, any identified hot spots will be assessed.

Summary of Sampling for Building 5G

One airborne particulate sample will be collected in the component and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. The two media within the building are the structural steel frame and the concrete floor. Because Building 5G is a storage area, it is considered to be a dry process area; therefore, a concrete chip will be taken from the floor. Also, a surface scraping will be taken from the structural steel supports. Visual inspection of the component identified no supplemental sample locations. Table 5G-1 summarizes the planned sampling program for Building 5G.

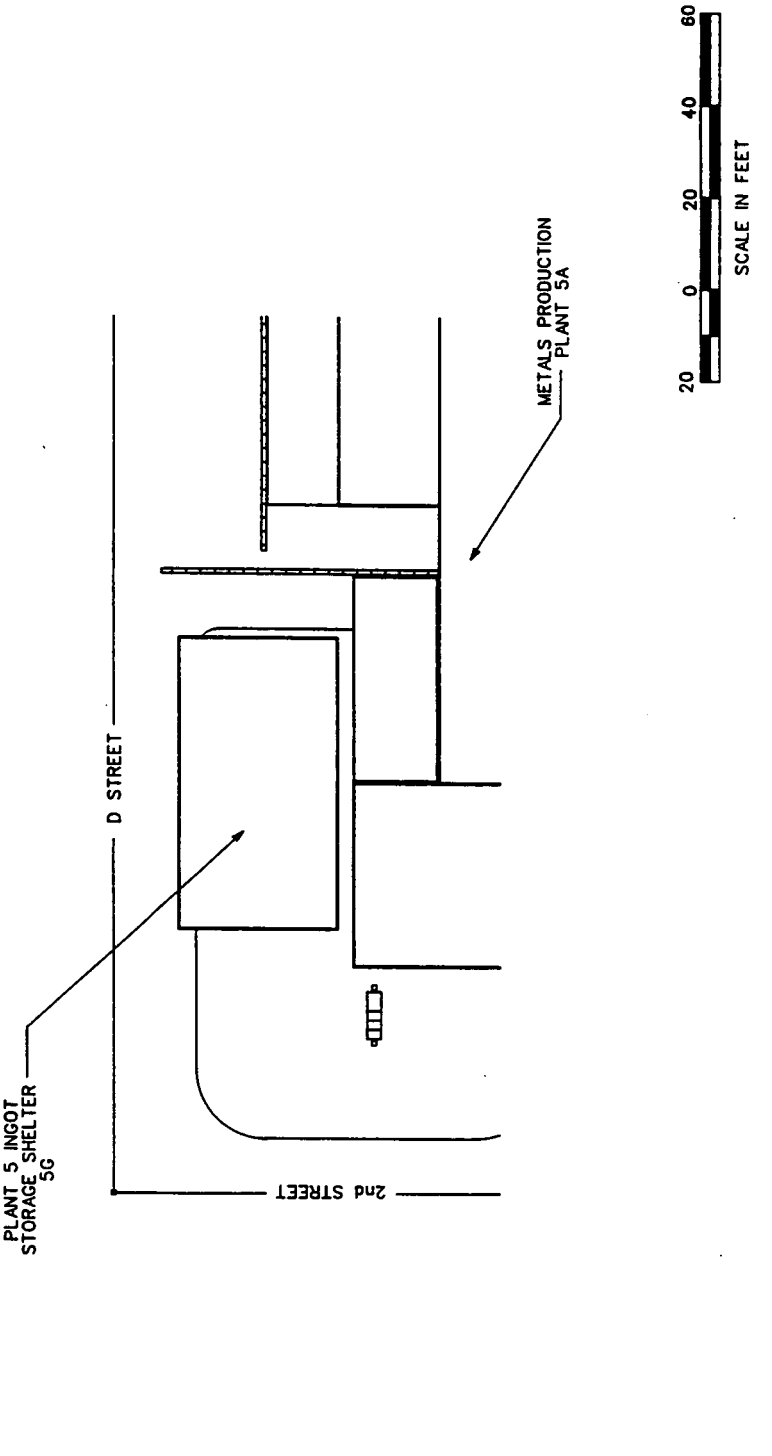

FIGURE 5G-1 Location of Building 5G

TABLE 5G-1 Sample Types and Quantities for Building 5G

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.2.6 Building 6B — Plant 6 Covered Storage Area

Component Description

Building 6B (Plant 6 covered storage area) is a single-story building located east of Plant 6 (Grid 6 map in Appendix C). It is rectangular, measuring approximately 42 × 60 ft and 12 ft high. Building 6B covers a storage pad east of the Metals Fabrication Plant (Component 6A) and consists of a structural steel frame with no sides and a metal roof on a reinforced concrete base. Figure 6B-1 shows the layout of the covered storage area.

Process Area Description

Building 6B is considered one process area and was used to store drummed uranium chips, turnings, briquettes, and residues for processing in the Metals Fabrication Plant or shipment to the Recovery Plant (Component 8A). Currently, construction wastes are being stored in Building 6B in metal shipping containers. Anticipated contaminants are summarized in Table A.3.

Major Media Types per Process Area

Two major media have been identified for Building 6B, a structural steel frame and a reinforced concrete base.

Summary of Available Radiological Data

Building 6B was surveyed for removable alpha contamination in 1989. No recent total beta-gamma surveys have been performed. Eleven removable alpha survey measurements were taken, with an average result of 81 dpm. Results from this survey are the basis for identifying the hot spot identified on Figure 6B-1. The hot spot had a removable alpha reading of 230 dpm. Before sampling begins, all data (including those from ongoing radiological surveys) will be reassessed.

Summary of Sampling for Building 6B

One airborne particulate sample will be collected and analyzed on the basis of Protocol 1 for airborne radiological and inorganic contaminants, as well as asbestos, in the component. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. The two media within the building are the structural steel frame and the concrete floor. Because Building 6B is a storage area, it is considered a dry

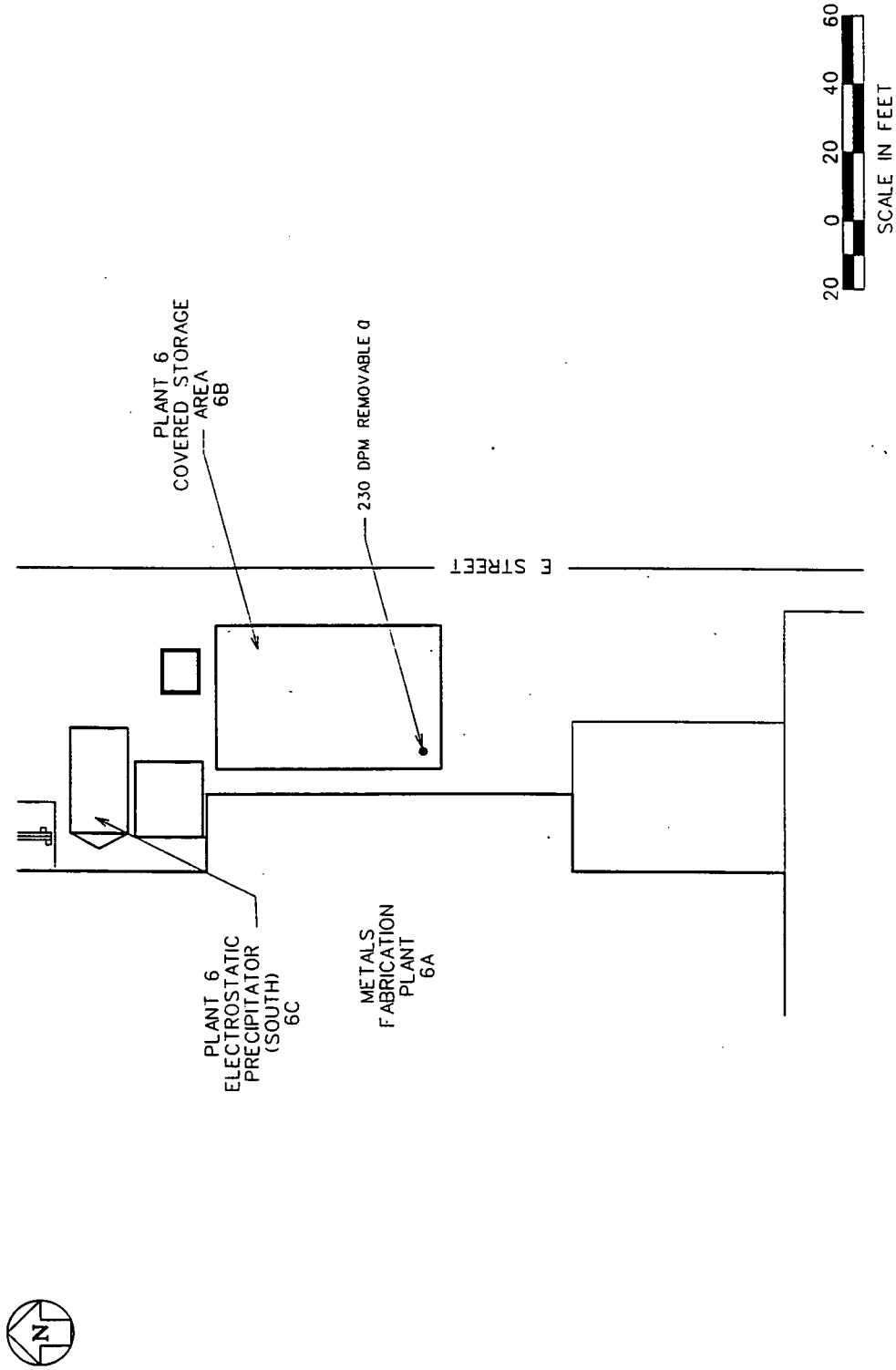

FIGURE 6B-1 Layout of Building 6B

process area; therefore, a concrete chip will be taken from the floor. Also, a surface scraping will be taken from the structural steel supports. Visual inspection of the component identified no supplemental sample needs. Table 6B-1 summarizes the planned sampling program for Building 6B.

TABLE 6B-1 Sample Types and Quantities for Building 6B

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.2.7 Building 7A — Plant 7 Uranium Hexafluoride Reduction Facility

Component Description

Building 7A (Plant 7) is a multilevel building shown on the Grid 13 map in Appendix C. It is irregularly shaped, measuring approximately 80 × 110 ft and 102 ft high. The building consists of a poured concrete base and a structural steel frame covered with transite siding and roofing panels (Type A building). Building 7A consists of seven floors (concrete and diamond plate steel grating) with a two-story annex extending on the southwestern side and a small penthouse above the top floor; floor plans for Building 7A are provided in Figures 7A-1 through 7A-7.

Process Area Description

The Building 7A facilities were designed to convert uranium hexafluoride (UF_6) into uranium tetrafluoride (UF_4) using a gas-gas reaction with hydrogen. The plant was shut down in 1956, and the process equipment was removed in the early 1970s. Building 7A is currently used primarily as a storage warehouse for drums of UF_4 and residues from the Green Salt Plant (Component 4A). Anticipated contaminants for Building 7A are summarized in Table A.3. The following processes operated in Building 7A.

UF_6 to UF_4 Reduction. From autoclaves on the west side of Building 7A, UF_6 cylinders were heated to sublime UF_6 for processing in the building processes. The gas was contacted with hydrogen gas in the six to four reactor tubes to produce UF_4 and hydrogen fluoride (HF) gas. The HF was fed to the HF recovery system, and the UF_4 was processed through the UF_4 packaging systems. The process ceased operation in 1956, and most of the equipment has since been removed. Process areas have primarily become storage areas since that time. UF_4 packaging operations in Building 7A reportedly continued through the late 1950s. This was the only portion of the six to four process that operated past 1956. The HF recovery system received HF vapors from the process and condensed and scrubbed the vapors to recover anhydrous HF (AHF) and dilute HF (DHF), respectively. This process also ceased operation in 1956.

Storage. Since the shutdown of the plant in 1956, the facility has been used for various storage activities. In mid-1968, most of the remaining Building 7A process and support equipment was sold as salvage to a vendor and removed from the plant site. Building 7A has stored slightly enriched uranium trioxide (UO_3) on the upper floors and is currently storing drums of UF_4 on the lower two floors. Other equipment, supplies, and empty cans are also currently stored in and adjacent to the plant. Numerous T-hoppers containing depleted UF_4 and enriched UO_3 are adjacent to the west end of the plant.

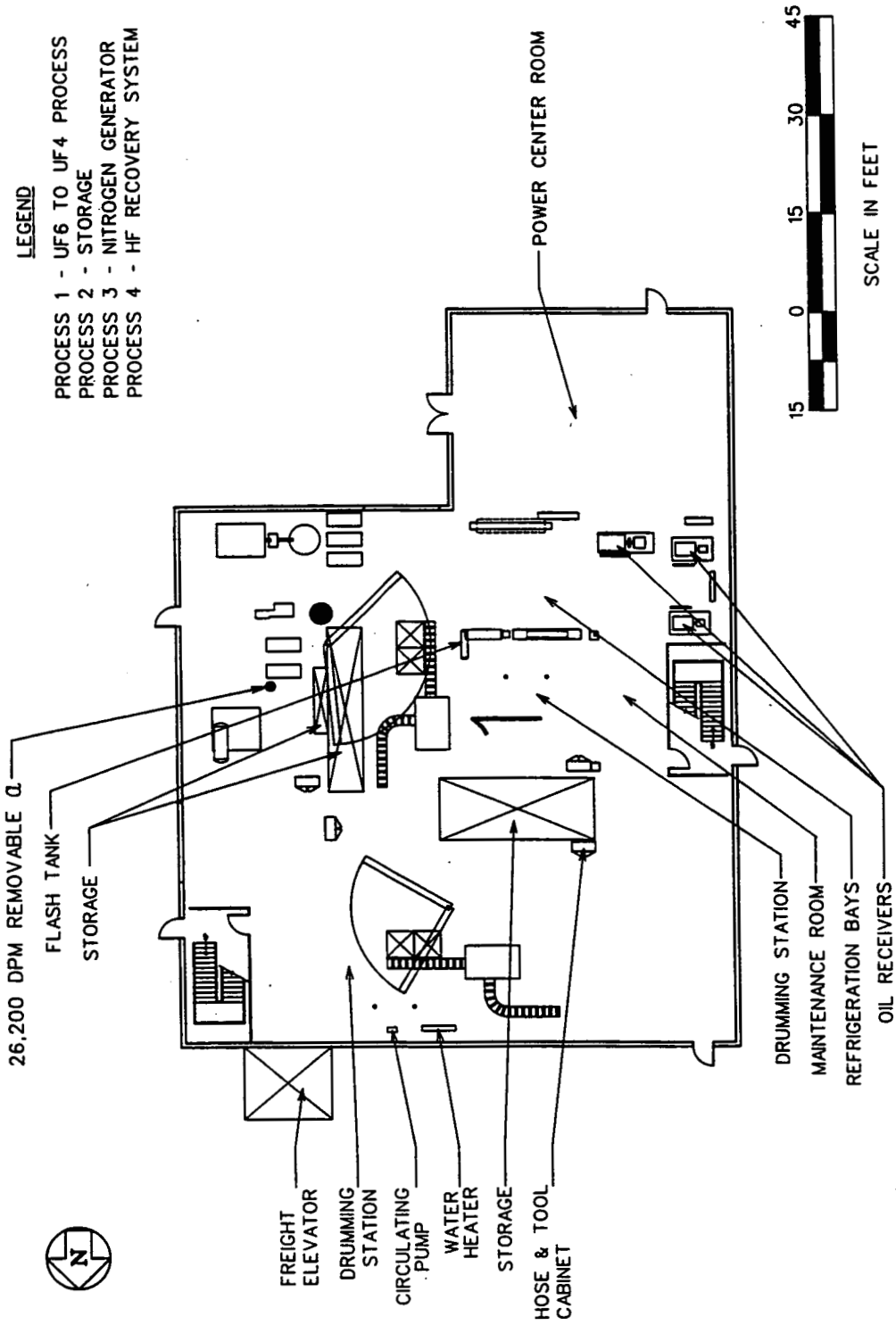

FIGURE 7A-1 Layout of Building 7A — First Floor

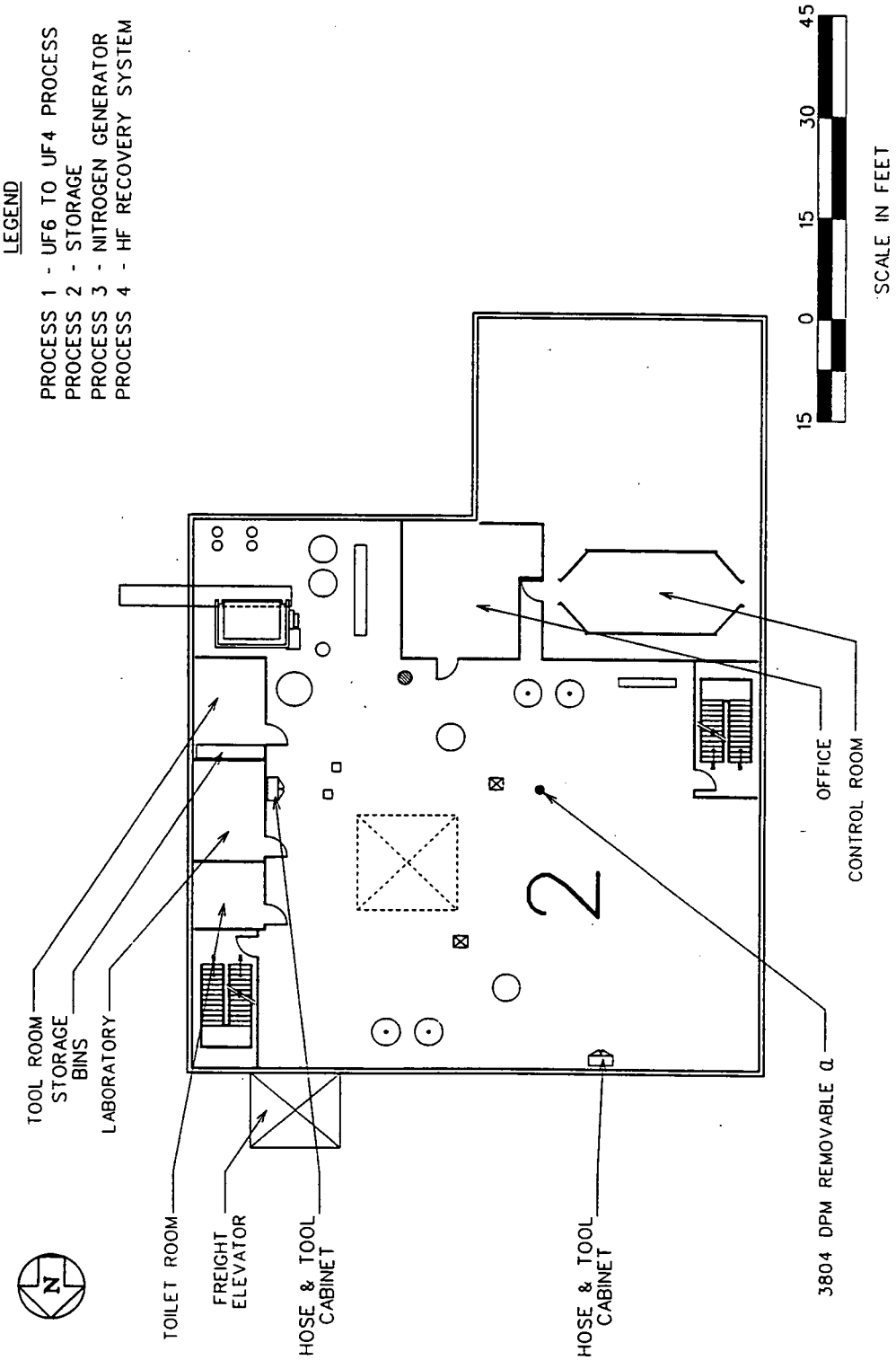

FIGURE 7A-2 Layout of Building 7A — Second Floor

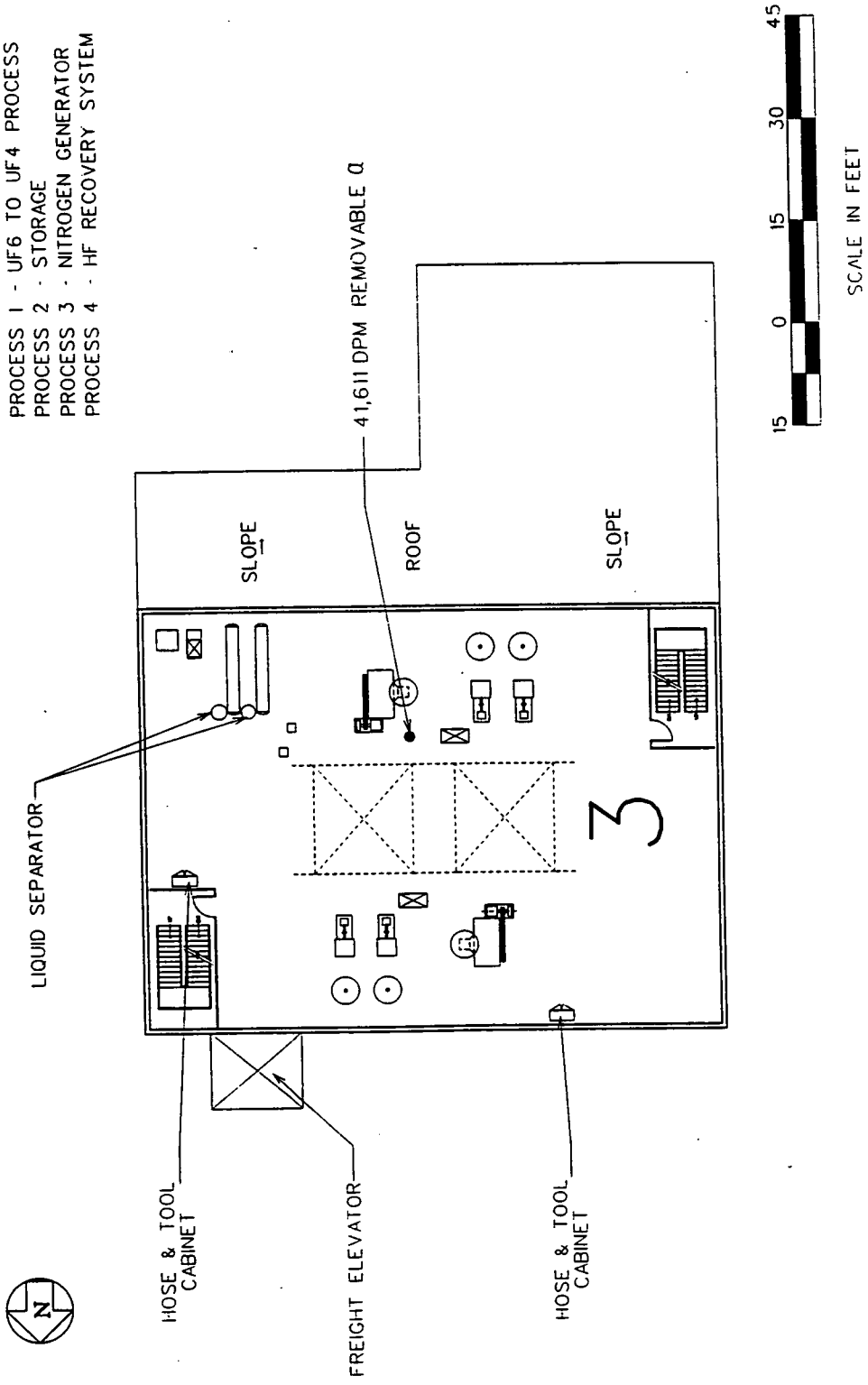

FIGURE 7A-3 Layout of Building 7A — Third Floor

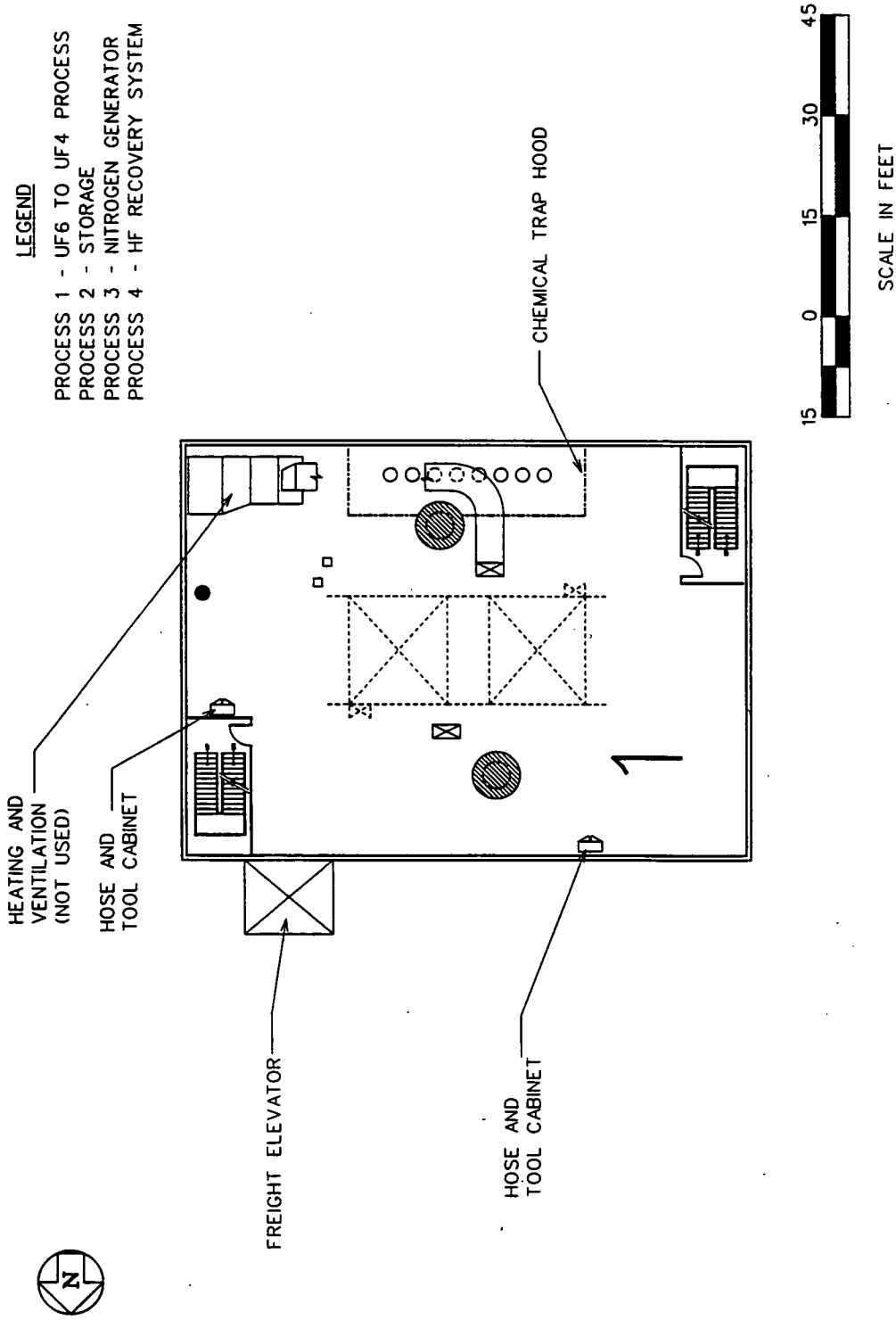

FIGURE 7A-4 Layout of Building 7A — Fourth Floor

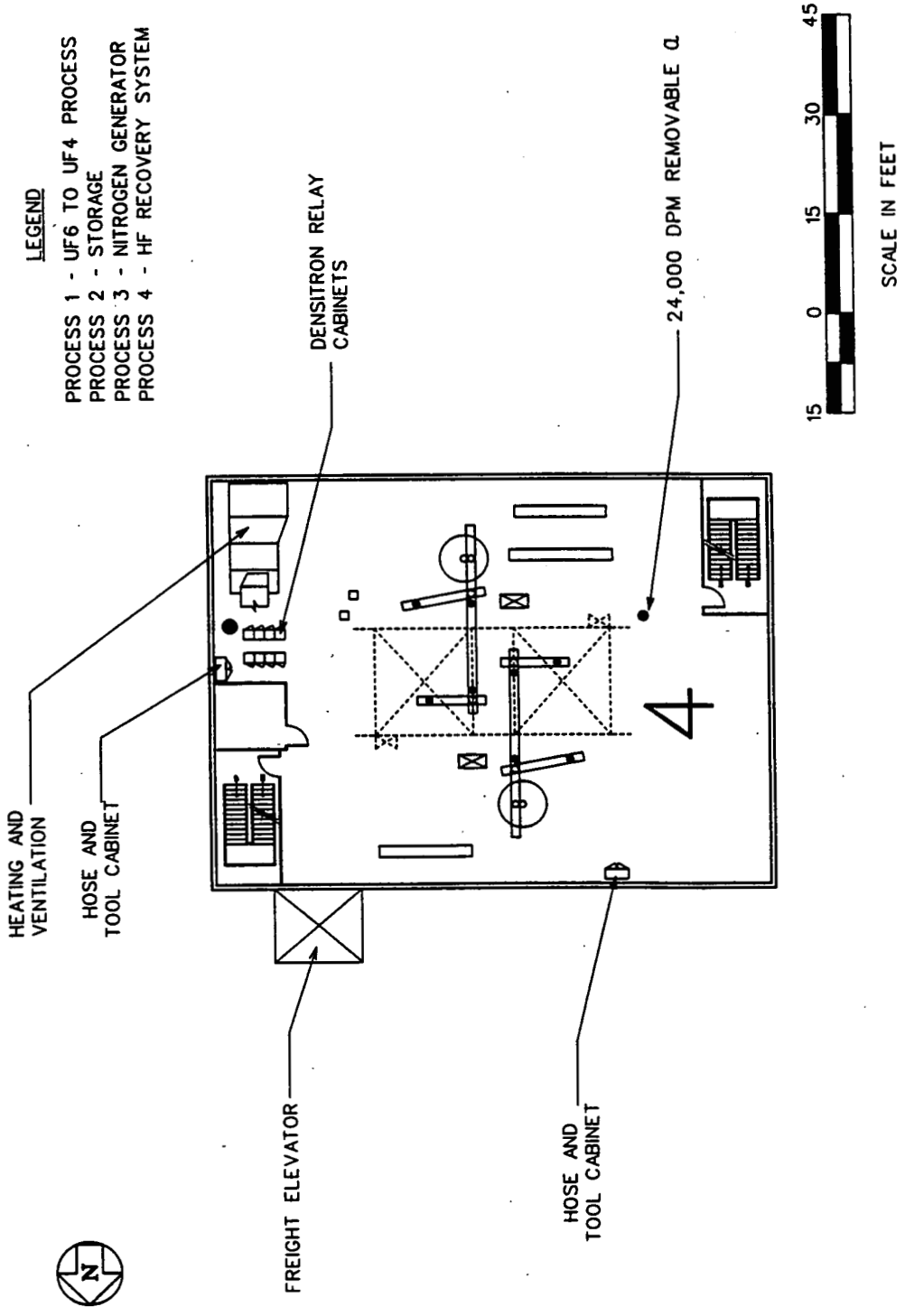

FIGURE 7A-5 Layout of Building 7A — Fifth Floor

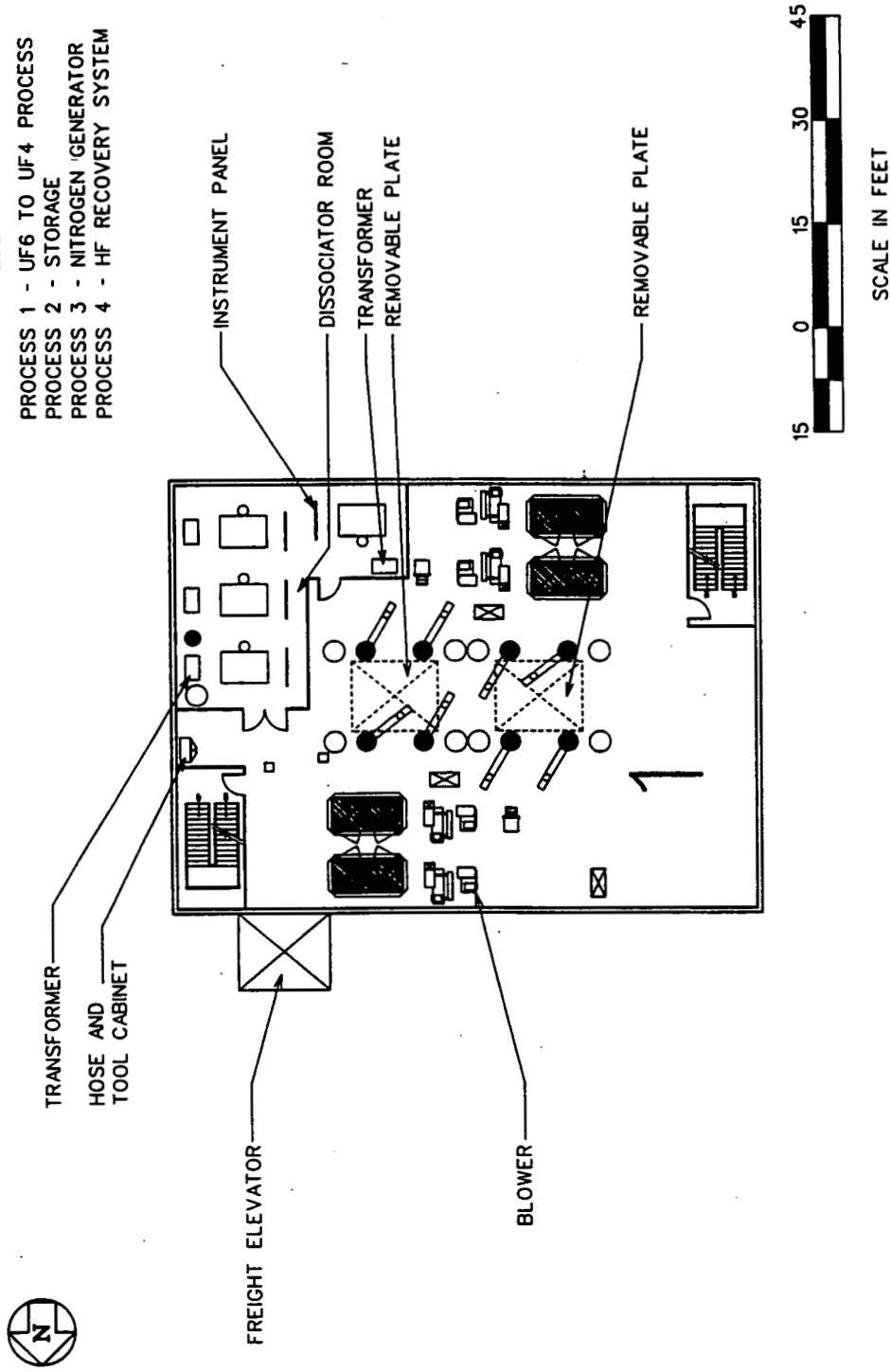

FIGURE 7A-6 Layout of Building 7A — Sixth Floor

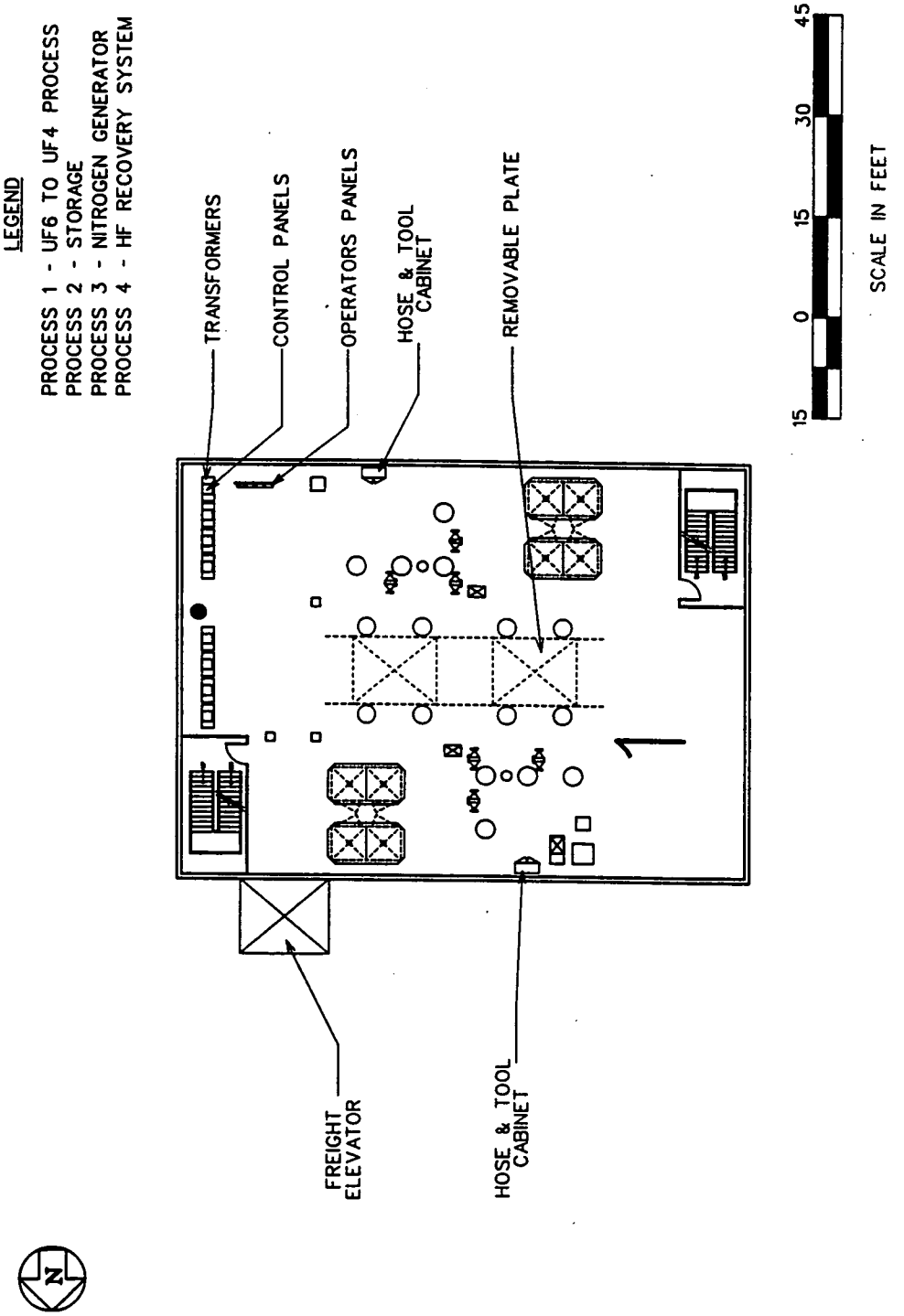

FIGURE 7A-7 Layout of Building 7A — Seventh Floor

Nitrogen Generator. The Building 7A nitrogen (N_2) generator was operated until 1967 to supplement N_2 gas production for operations in the Green Salt Plant. This process was discontinued following a hydrogen explosion and pipeline release at Building 7A in early 1967.

Major Media Types per Process Area

Building 7A major media consist of structural steel and concrete. The steel and concrete are uniform across the component; all processes are considered to contain these major media. Because transite is addressed as a separate supplemental sampling activity, it is not considered as a major medium in Building 7A.

Summary of Available Radiological Data

Building 7A is routinely sampled for removable alpha and removable beta-gamma contamination, but no recent results for total beta-gamma contamination are available. Results from the most recent surveys are summarized in Tables A.4.0 and A.4.1 and form the basis for identifying radiological hot spots. From 1989 through 1992, 210 removable alpha and 210 removable beta-gamma survey measurements were performed. On the basis of this data, the hot spot for each process area is identified in Figures 7A-1 through 7A-7 and discussed below. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys.

The UF_6 to UF_4 Process is located on the first, seventh, fourth, and sixth floors of Building 7A. Of the samples taken, three were higher than the magnitude of 10,000 dpm removable alpha; the hot spot was 26,200 dpm removable alpha. The HF recovery system is located on the fifth floor of Building 7A. Four samples were higher than the magnitude of 10,000 dpm removable alpha; the hot spot was 24,000 dpm removable alpha. Storage is located on the second floor of Building 7A. One sample was greater than the magnitude of 1,000 dpm removable alpha; the hot spot was 3,804 dpm removable alpha. The nitrogen generator process is located on the third floor of Building 7A. One sample was greater than the magnitude of 10,000 dpm removable alpha; the hot spot was 41,611 dpm removable alpha.

Summary of Sampling for Building 7A

One airborne particulates sample will be taken in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, radiological surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive sampling for the concrete medium will be performed at the radiological hot spots shown in Figures 7A-1 through 7A-7. The ammonia dissociator process and the lime neutralization system are considered wet processes

and thus require concrete core samples. Additionally, structural steel scrapings and swipe samples will be collected on the basis of Protocols 1 and 3. No supplemental samples were found during a visual inspection of Building 7A. However, supplemental samples may be identified by field crews at the time of sampling activities for residues not identified in the visual inspection of the component. Table 7A-1 summarizes the planned sampling program for Building 7A.

TABLE 7A-1 Sample Types and Quantities for Building 7A

Sample Type	UF_6 to UF_4	HF Recovery System	Nitrogen Generator	Storage	Component Totals
Nonintrusive[a]					
Radiological surveys	b	b	b	b	NA[c]
Chemical surveys	b	b	b	b	NA
Air particulates	NA	NA	NA	NA	1
Swipes	2	2	2	2	8
Lab composite swipes	NA	NA	NA	NA	1
Intrusive[a]					
Concrete chips	1	NA	1	1	3
Concrete cores	NA	1	NA	NA	1
Masonry	NA	NA	NA	NA	NA
Steel surface scraping	1	1	1	1	4
Supplemental					
Liquid sample	NA	NA	NA	NA	NA
Loose media	NA	NA	NA	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.2.8 Building 12B — Cylinder Storage Building

Component Description

Building 12B (Cylinder Storage Building) is a single-level structure consisting of sections of concrete construction and sections of steel frame and siding construction approximately 31 × 47 ft and 10 ft high. The building is located north of the Main Maintenance Building (Component 12A), as shown on the Grid 11 map in Appendix C.

Process Area Description

This building stores argon, chlorine, and other gas cylinders used on-site as part of the maintenance stores operation.

Summary of Sampling for Building 12B

This component does not require sampling. The component exhibits little or no evidence of contamination, results of the radiological surveys for the component do not exceed the criteria established for sampling, and anticipated contaminants are of low toxicity.

D.9.2.9 Building 12C — Lumber Storage Building

Component Description

Building 12C (Lumber Storage Building) is a single-level steel shelter approximately 40 × 50 ft and 14 ft high. The building is located north of the Main Maintenance Building (Component 12A), as shown on the Grid 11 map in Appendix C.

Process Area Description

This component stores lumber and plywood for construction projects on-site. The component also has served as an equipment receiving and storage location before construction of the Receiving/Incoming Materials Inspection Building (Component 82).

Summary of Sampling for Building 12C

This component does not require sampling. The component exhibits little or no evidence of contamination, results of the radiological surveys for the component do not exceed the criteria established for sampling, and anticipated contaminants are of low toxicity.

D.9.2.10 Building 30A — Chemical Warehouse

Component Description

Building 30A (chemical warehouse), a single-level structure measuring 82 × 321 ft and 16 ft high, is north of the Ore Refinery Plant (Component 2A) at the northwestern corner of the intersection of 2nd Street and B Street (Grid 18 map in Appendix C). The chemical warehouse is constructed of a structural steel frame supported on a reinforced poured concrete base with a reinforced concrete floor and transite siding panels and roof (Type A building). It is equipped with two loading docks, and several Sealand boxes are located immediately south of Building 30A near 2nd Street (Figure 30A-1).

Process Area Description

Building 30A was originally constructed as a warehouse and is currently operated by Site Services. The building stores operating supplies used at the FEMP site, and the warehouse has been divided into a northern restricted access area and a southern unrestricted access area. No floor sumps were visible during the inspection, although in some areas the concrete near floor joints was cracked and stained. Areas of the west loading dock were discolored with "rusty" stains. The anticipated contaminants for Building 30A are summarized in Table A.3.

Northern Restricted Access Area. The northern portion of Building 30A is a restricted access area used to access the Plant 1 Pad (Component 74T) and to store operating supplies (i.e., herculite, supplies for white metal boxes, paper towels, polyvinyl chloride [PVC] piping and fittings, storage cabinets, and absorbent materials) used routinely in and around the Plant 1 Pad. An access control point and steel cage/gate separate the restricted northern portion from the unrestricted southern portion of Building 30A. A small office area constructed mainly of cinder block and an X-ray room are located in the northeastern corner of the building within the restricted access area. The X-ray machine located in the northeastern corner of Building 30A will eventually be used for examining bundled process area trash prepared for off-site shipment.

During the winter of 1990, the northeastern corner of Building 30A was used for visual inspection of drums for Resource Conservation and Recovery Act (RCRA) determination, for drum reconditioning (e.g., scraping rust, painting, and labeling), and for over-packing low-level waste. During a 1992 inspection, the Site Services staff indicated that (1) drums did not remain in the building for more than 24 to 48 hours; (2) once reconditioning was complete, drums were returned to the appropriate storage facility; (3) no drum sampling was conducted; and (4) no spills occurred during the drum activities. After completion of the drum reconditioning activities, the northeastern corner of the building was cleaned (e.g., removal of trash and paint supplies) to make room for the X-ray machine and ancillary equipment.

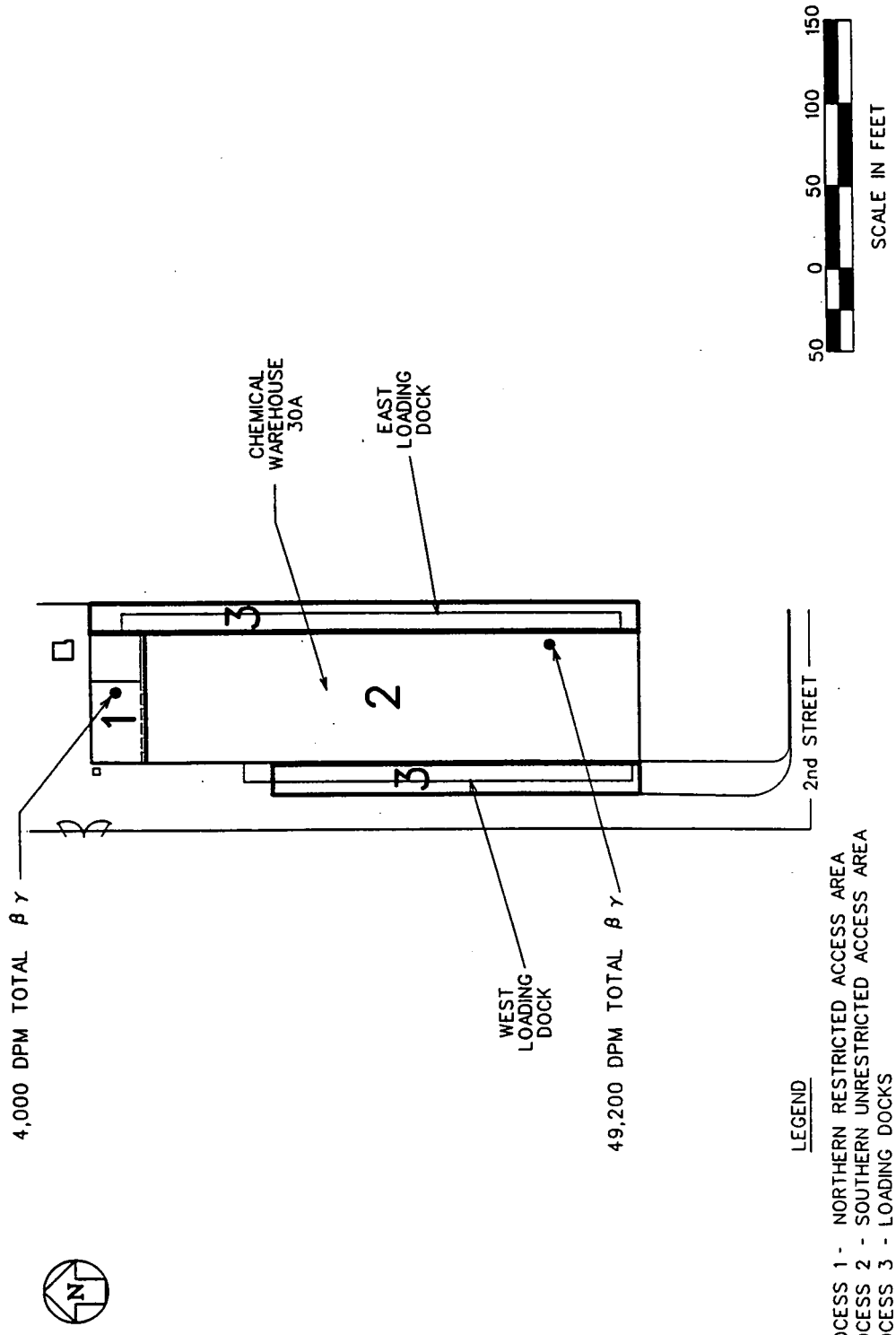

FIGURE 30A-1 Layout of Building 30A

Southern Nonrestricted Access Area. A large storage area and restrooms are located in the unrestricted southern portion of the building. The storage area stores operating supplies that are currently used on the FEMP site and materials that have been excessed (i.e., materials that have been sold or are on the market for sale). A wide variety of operating supplies and excessed materials are stored in the southern portion of Building 30A, including lime, Poly-Floc, aluminum sulfate, Dicalite, caustic soda, rock salt, disodium phosphate, sweeping compound, silica sand, graphite, barium carbonate, lithium carbonate, heat treatment salts, and zirconium.

Loading Docks and Sealand Containers. Building 30A is equipped with two loading docks. The first is located along the outside southwest wall of Building 30A and stored T-Hoppers as recently as August 1992. During the October 1992 inspection, it was noted that the T-Hoppers had been removed from the loading dock. The second loading dock is located along the outside east wall of the building and is storing white metal boxes filled with construction-related waste and unused furnace pots that were intended for use in derby production.

Several blue Sealand boxes are located on gravel south of Building 30A. These Sealand boxes were empty according to the August 1992 inspection but currently store Dicalite and lime.

Major Media Types per Process Area

The structural steel frame and concrete floor are considered the major media in the northern and southern portions of Building 30A, and concrete is the major medium for the loading docks. Because transite is addressed as a separate supplemental sampling activity, the transite used in the roof and walls of the northern and southern portions of Building 30A is not considered a major medium. Also, because the masonry forming the walls of the small office area in the northeastern corner of the building constitutes a small fraction of the total media, the masonry is not considered a major medium.

Summary of Available Radiological Data

Building 30A is routinely sampled for removable alpha and total beta-gamma contamination. Recent data (1991 and 1992) from these surveys have been assembled and indicate that the radiological hot spots for each process are as described below and as indicated on Figure 30A-1. No recent data for the outside loading dock areas are available, but the radiological hot spots for these areas will be determined from field measurements to be taken before sampling occurs. Also, as data are acquired from ongoing radiological surveys taken for health physics needs, the identified hot spots will be reassessed before sampling occurs.

The highest reading of 55 total beta-gamma floor readings taken in the northern portion of Building 30A was 4,000 dpm, and 6 of the readings exceeded 1,000 dpm. The highest reading of the 224 total beta-gamma floor readings taken in the southern portion of Building 30A was 49,200 dpm, and 23 of the readings exceeded 5,000 dpm. The removable alpha activities at the hot spots were less than the MDAs. The locations of the highest beta-gamma readings in the northern and southern portions of Building 30A and the associated removable alpha readings are depicted in Figure 30A-1.

Summary of Sampling for Building 30A

One airborne particulate sample will be taken in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, radiological surveys, and swipe samples, will be performed in the field and assessed (1) to further define final intrusive sampling locations within the northern and southern portions of Building 30A and (2) to define intrusive sampling locations on the east and west loading docks. Intrusive sampling, to be performed in each area, will consist of concrete chip samples in and surface scrapings from structural steel in the northern and southern portions of the building and a concrete chip sample from the loading docks. If analysis of radiological swipe samples detects elevated levels of removable contamination as outlined in Protocol 1, then the swipe samples will be combined over the component for laboratory analysis.

Visual inspection of the component identified no supplemental samples, although supplemental samples may be identified by field crews during sampling activities. Table 30A-1 summarizes the planned sampling program for Building 30A.

TABLE 30A-1 Sample Types and Quantities for Building 30A

Sample Type	Northern Restriced Access Portion	Southern Unrestricted Access Portion	Loading Docks	Component Totals
Nonintrusive[a]				
Radiological surveys	b	b	b	NA[c]
Chemical surveys	b	b	b	NA
Air particulates	NA	NA	NA	1
Swipes	2	2	1	5
Lab composite swipes	NA	NA	NA	1
Intrusive[a]				
Concrete chips	1	1	1	3
Concrete cores	NA	NA	NA	NA
Masonry	NA	NA	NA	NA
Steel surface scraping	1	1	NA	2
Supplemental				
Liquid sample	NA	NA	NA	NA
Loose media	NA	NA	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.2.11 Building 30B — Drum Storage Warehouse

Component Description

Building 30B (Drum Storage Warehouse) is a single-level building located south of the General In-Process Warehouse (Component 71), as shown on the Grid 27 map in Appendix C. It is rectangular, measuring approximately 20 × 33 ft and 12 ft high. Building 30B consists of a structural steel frame on a poured concrete base and floor with transite siding and roofing (Type A building). Figure 30B-1 shows the floor plan of Building 30B.

Process Area Description

Building 30B was formerly used for a truck dock office and scale house. Additionally, it was used for RCRA sampling of drums. Currently, Building 30B is a radiological clothing change area. Anticipated contaminants for the component are summarized in Table A.3.

Major Media Types per Process Area

Major media for Building 30B consist of a poured concrete base and floor and a structural steel frame. Because transite siding and roofing are addressed as a separate supplemental sampling activity, they will not be considered among the Building 30B major media.

Summary of Available Radiological Data

Building 30B is routinely surveyed for removable alpha contamination. No recent total beta-gamma radiation measurements are available. As indicated in Table A.4.0, 33 removable alpha survey measurements were performed in Building 30B from 1989 through 1992. Of the 33 removable alpha measurements, 28 fell below the MDA of 55 dpm.

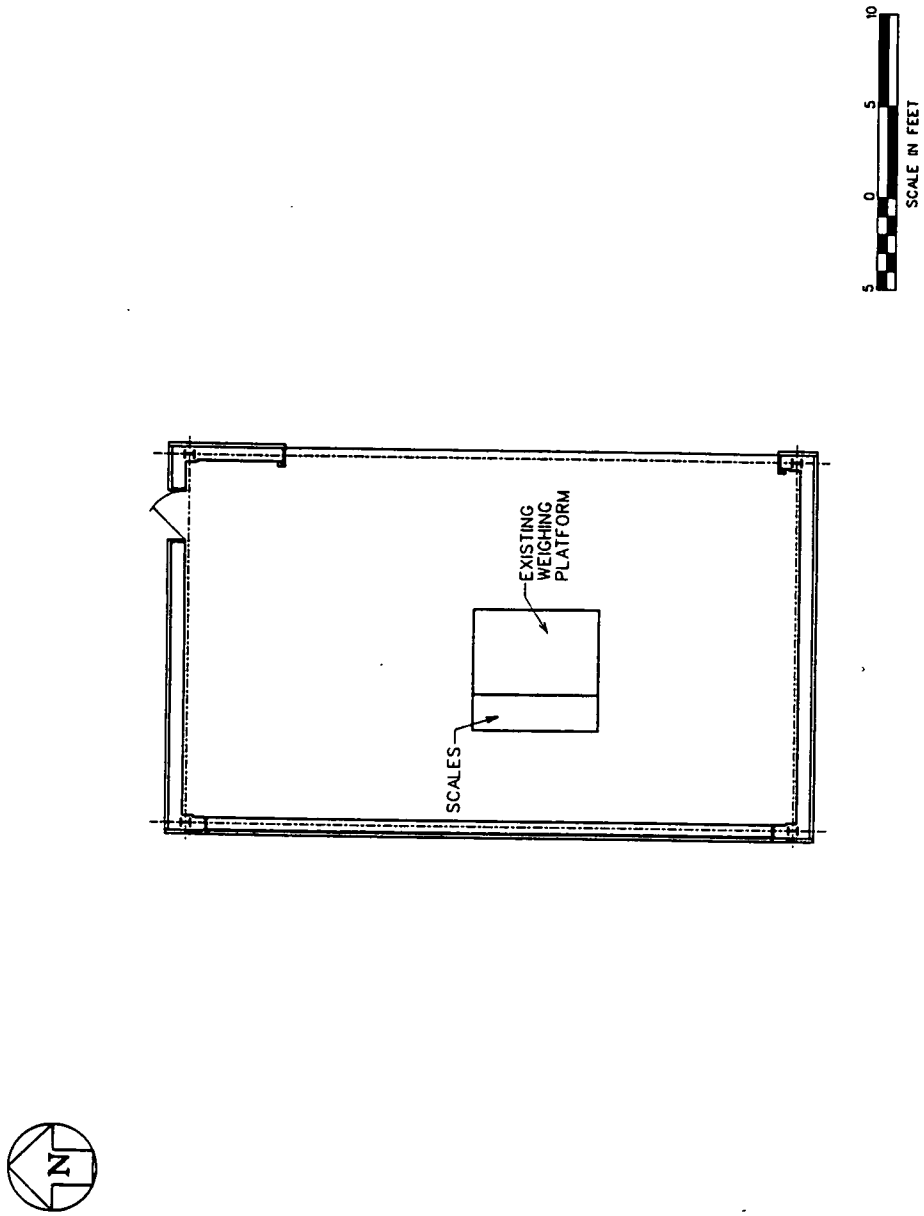

FIGURE 30B-1 Layout of Building 30B

D.9.2.12 Building 32A — Magnesium Storage Building

Component Description

Building 32A (Magnesium Storage Building) is a single-level cement block structure approximately 52 × 122 ft and 25 ft high. This building is located west of the D&D Building (Component 78) currently under construction, as shown on the Grid 2 map in Appendix C.

Process Area Description

This building stored drummed and bagged magnesium metal turnings for use in the Plant 5 reduction process. The building is currently not in use. This building may be used to store excess equipment from Building 56A.

Summary of Sampling for Building 32A

This component does not require sampling. The contaminants expected for the component are of low toxicity, and the component exhibits little or no evidence of contamination.

D.9.2.13 Component 32B — Magnesium Storage Covered Loading Dock

Component Description

The magnesium storage covered loading dock (Component 32B) is a single-story shelter shown on the Grid 2 map in Appendix C. It is rectangular, measuring approximately 20 x 60 ft and 15 ft high (Figure 32B-1), and consists of a structural steel frame on a reinforced poured concrete floor with metal roofing (Type C building).

Process Area Description

Component 32B is considered one process area. It is a covered railroad loading dock with a ramp for vehicle access. The dock was used for loading and unloading materials, primarily drummed or bagged magnesium metal turnings for use in the Metals Production Plant (Component 5A), which were stored in the Magnesium Storage Building (Component 32A). The anticipated contaminants for Component 32B are summarized in Table A.3.

Major Media Types per Process Area

Component 32B has two major media: a steel frame covered with metal roofing and a reinforced concrete floor.

Summary of Available Radiological Data

Component 32B was surveyed for removable alpha and total beta-gamma contamination twice in January 1992, which is the basis for identifying the hot spot. A total of 18 removable alpha and 33 total beta-gamma survey measurements were performed on the concrete floor medium. All 18 of the removable alpha measurements were above the MDA, with an average measurement of 248 dpm. All 33 of the total beta-gamma measurements were above the MDA, with an average measurement of 1,936 dpm. The corresponding hot spot is identified in Figure 32B-1. As data are acquired from ongoing radiological surveys, the identified hot spot will be reassessed before sampling. The removable alpha and total beta-gamma readings for the concrete media hot spot location were 248 and 16,000 dpm, respectively.

Summary of Sampling for Component 32B

One airborne particulate sample will be taken in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Non-intrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling

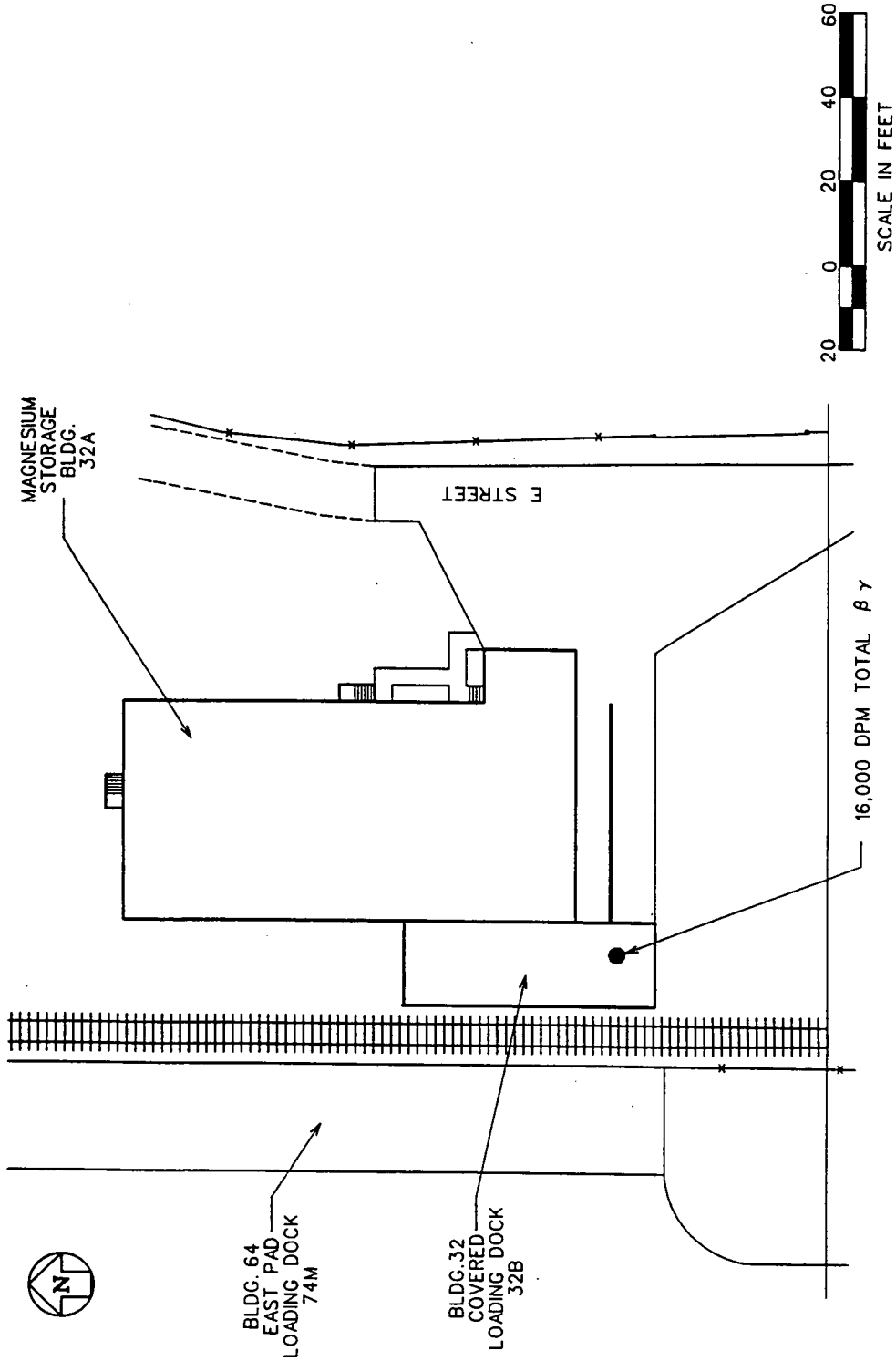

FIGURE 32B-1 Layout of Component 32B

locations. Because Component 32B is a dry process area, a concrete chip will be taken from the floor. Also, a surface scraping will be taken from the structural steel supports. Visual inspection of the component identified no supplemental samples. Table 32B-1 summarizes the planned sampling program for Component 32B.

TABLE 32B-1 Sample Types and Quantities for Component 32B

Sample Type	Loading Dock	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.2.14 Building 54B — Pilot Plant Shelter

Component Description

Building 54B (Pilot Plant Shelter) is a single-level building south of 1st Street South in the northeastern corner of the Pilot Plant complex, as shown on the Grid 26 map in Appendix C (Figure 54B-1). The shelter is rectangular and has a steel frame structure 50 × 74 ft and 10 ft high, with a reinforced concrete foundation and floor and a metal roof. The shelter has an open south side, combination metal and transite east and west sides (that is, the lower panels are steel while the upper panels in the roof gables are transite), and a steel north wall. Building 54B stored Pilot Plant materials and processed hydrocarbon materials containing green salt (UF_4).

Process Area Description

Building 54B originally provided temporary storage of green salt, which was produced by the reduction process housed in the Six to Four Reduction Facility (Component 54A) and stored other Pilot Plant materials. The shelter also previously housed a heating and centrifuging process designed to remove UF_4 from paraffin. All the paraffin processing equipment has been removed. Building 54B is currently used exclusively to store palleted drums that are stacked two-high and contain green salt and freon. The shelter has no sumps or trenches for spill control.

Major Media per Process Area

The major media associated with Building 54B include the structural steel frame and concrete floor. Because transite is addressed as a separate supplemental sampling activity, it is omitted as a major medium for Building 54B in this document. The metal wall and roof panels are only a fraction of an inch thick and will thus not be a target medium for decontamination, so the wall and roof metal is not included as a major medium for sampling purposes.

Summary of Available Radiological Data

A single radiological survey, conducted in 1992, is available for the shelter and includes 10 concrete floor readings for removable alpha and removable beta-gamma contamination. No total beta-gamma readings were taken. All removable alpha measurements, which were spaced evenly around the shelter floor, were less than the instrument background. Thus, no hot spot has been identified for Building 54B. A follow-up radiological survey, which includes total beta-gamma measurements and readings for structural support steel, will be conducted before sampling to allow identification of hot spots. Any data developed from ongoing radiological surveys will also be assessed at that time.

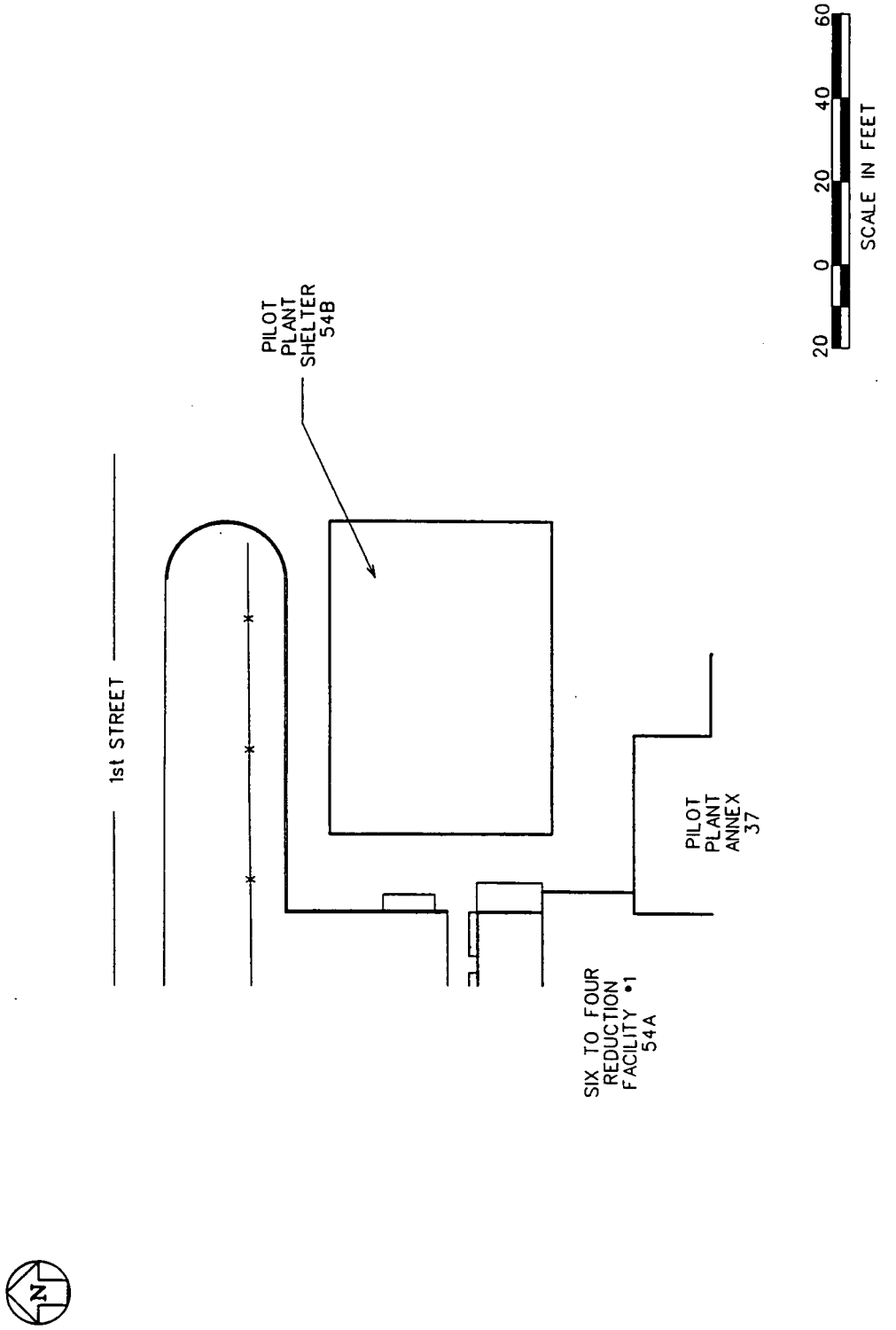

FIGURE 54B-1 Layout of Building 54B

Summary of Sampling for Building 54B

One particulate air sample will be collected in the shelter and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including radiological and chemical surveys, exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field in an attempt to identify intrusive sampling locations for the concrete floor and structural steel media. Because the Pilot Plant Shelter is both a dry materials storage area and former paraffin processing area, it is considered a dry process area; therefore, a concrete chip will be the intrusive sample taken. A structural steel surface scraping will also be collected. No supplemental sample locations were identified during component inspection. Table 54B-1 summarizes the planned sampling program for Building 54B.

TABLE 54B-1 Sample Types and Quantities for Building 54B

Sample Type	Drum Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	1	1
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.2.15 Building 56A — CP Warehouse (Butler Building)

Component Description

Building 56A (CP Warehouse) is a single-story building; its location is shown on the Grid 17 map in Appendix C. The rectangular building measures approximately 50 × 180 ft and 14 ft high (Figure 56A-1) and consists of a structural steel frame with noninsulated, corrugated metal siding and roofing on a reinforced poured concrete base and floor (Type C building).

Process Area Description

Building 56A is considered as one process area and was formerly used for electrical transformer storage. More recently, it provided excess furniture and supply storage for the site. Currently, it is being used for low-level waste RCRA drum storage and is to be permitted as an approved RCRA storage unit. Anticipated contaminants are summarized in Table A.3.

Major Media Types per Process Area

Building 56A has two major media, a steel frame and a reinforced concrete base and floor.

Summary of Available Radiological Data

Building 56A is routinely surveyed for removable alpha contamination but not beta-gamma radiological contamination. Results from the most recent surveys are summarized in Work Plan Addendum Appendix tables that indicate no detectable hot spots. From 1989 through 1991, 14 removable alpha survey measurements were performed in Building 56A; all survey measurements were below the minimum detection level. All removable alpha radiological data collected in 1992 were below the MDA of 40.2 dpm. Before sampling, data will be reassessed to include data gathered from ongoing radiological surveys.

Summary of Sampling for Building 56A

One airborne particulate sample will be taken in the component and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, polychlorinated biphenyl (PCB) field test kit measurements, XRF surveys, and swipe samples, will be performed in the field and assessed to further detail final intrusive sampling locations. Building 56A is a dry materials storage area; therefore, it is considered a dry

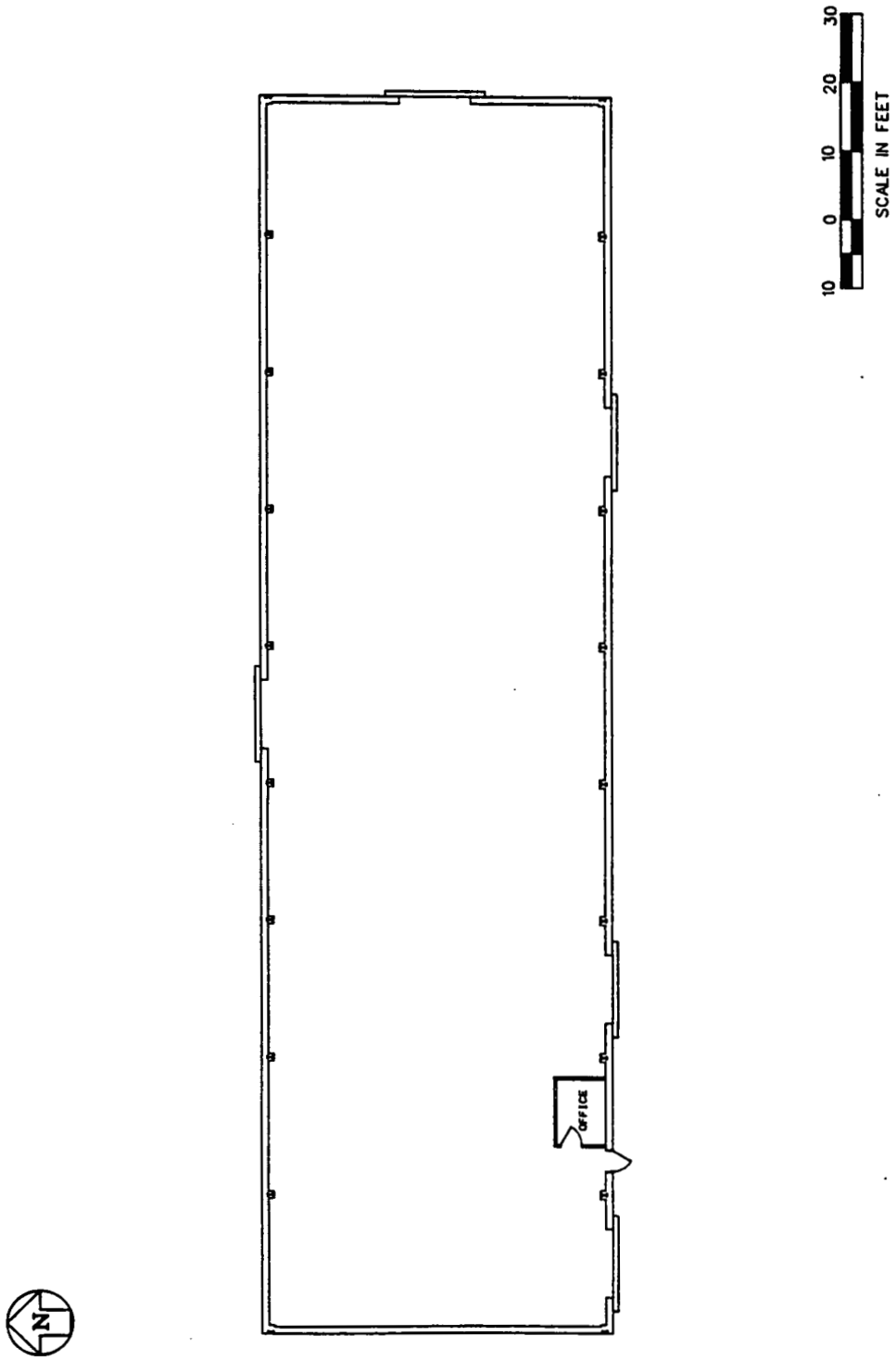

FIGURE 56A-1 Layout of Building 56A

process area and a concrete chip will be taken from the floor. Also, a surface scraping will be taken from the structural steel supports. Visual inspection of the component identified no supplemental sampling locations. Table 56A-1 summarizes the planned sampling program for Building 56A.

TABLE 56A-1 Sample Types and Quantities for Building 56A

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.2.16 Building 56B — Storage Shed (West)

Component Description

Building 56B (Storage Shed West) is a single-level, pre-engineered structure consisting of a structural steel frame on a reinforced poured concrete base that is approximately 24 × 36 ft and 14 ft high. The building is located north of the Plant 1 Pad (Component 74T), as shown on the Grid 17 map in Appendix C.

Process Area Description

This component provides tool storage for the site's primary construction management subcontractor.

Summary of Sampling for Building 56B

This component does not require sampling. The contaminants expected for the component are of low toxicity, and the component exhibits little or no evidence of contamination.

D.9.2.17 Building 56C — Storage Shed (East)

Component Description

Building 56C (Storage Shed East) is a single-level, pre-engineered structure consisting of a structural steel frame on a reinforced poured concrete base that is approximately 30 × 50 ft and 14 ft high. The building is located north of the Plant 1 Pad (Component 74T), as shown on the Grid 17 map in Appendix C.

Process Area Description

This component provides tool storage for the site's primary construction management subcontractor.

Summary of Sampling for Building 56C

This component does not require sampling. The contaminants expected for the component are of low toxicity, and the component exhibits little or no evidence of contamination.

D.9.2.18 Building 60 — Quonset Hut 1

Component Description

Building 60 (Quonset Hut 1), measuring 41 × 60 ft and 20 ft high, is shown on the Grid 16 map in Appendix C. This single-story shelter is a pre-engineered facility consisting of a structural steel frame on a reinforced poured concrete base, with reinforced poured concrete floor, sloped steel roof panels, steel siding panels, and glass windows (Type C building). The component floor plans are provided in Figure 60-1.

Process Area Description

Originally, Building 60 stored stores equipment, materials, and miscellaneous items. Currently, it stores drums containing thorium compounds from the Recovery Plant (Component 8A). No drains or floor sumps exist at this location. A single process area is identified. Anticipated contaminants for Building 60 are summarized in Table A.3.

Major Media Types per Process Area

Building 60 has a steel frame and a poured concrete base and floor.

Summary of Available Radiological Data

Building 60 has not been routinely surveyed for removable alpha and total beta-gamma contamination. Results from a survey performed in July 1992 indicate that no radiological hot spot exists on the floor of the building. Fifteen removable alpha measurements were taken; all readings were below the MDA of 49 dpm. No information was available for total beta-gamma readings. Data will be taken and assessed before sampling to determine the location of the radiological hot spots or to verify nondetectable levels. To prevent technician exposure to unnecessary large doses of radiation, data will be reassessed and sampling activities will occur only if the thorium material has been removed from this location.

Summary of Sampling for Building 60

One airborne particulate sample will be taken in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Non-intrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. The two media within the building are structural steel and concrete. Because Building 60 is a storage area, it is considered a dry process area; therefore, a concrete chip

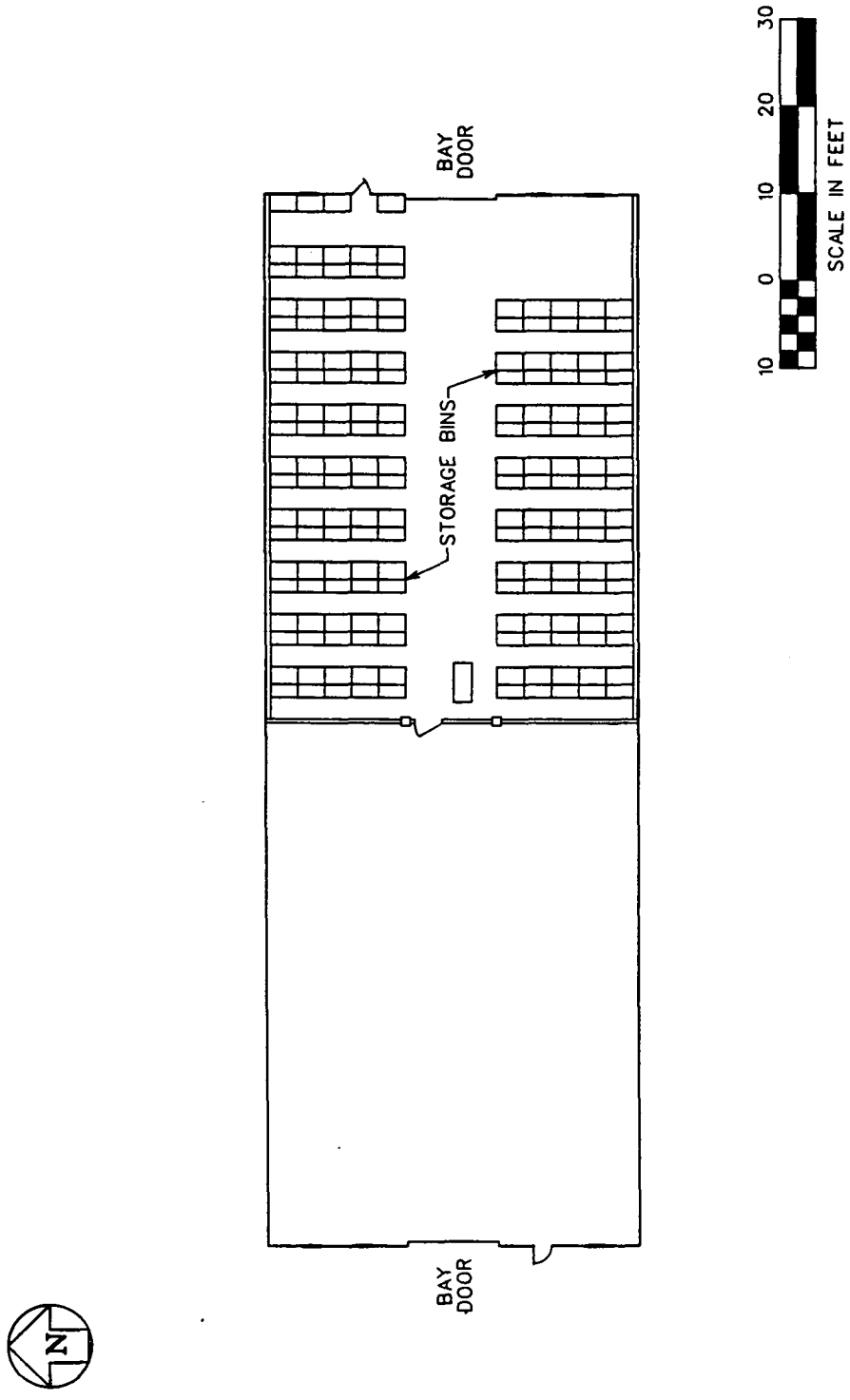

FIGURE 60-1 Layout of Building 60

will be taken from the floor. Also, a surface scraping will be taken from the structural steel supports. No visual inspection of the component could be performed because of high radioactivity levels. Supplemental sampling will be assessed at the time of sampling. Sampling will need to be well planned so that it can be done as quickly as possible to minimize the radiation exposure to the technicians. Table 60-1 summarizes the planned sampling program for Building 60.

TABLE 60-1 Sample Types and Quantities for Building 60

Sample Type	Drum Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.2.19 Building 61 — Quonset Hut 2

Component Description

Building 61 (Quonset Hut 2), a pre-engineered single-level structure measuring 41 × 60 ft and 20 ft high (Figure 61-1), is shown on the Grid 16 map in Appendix C. It is located on the north end of the FEMP process area past 3rd Street, adjacent to Quonset Hut 3 (Component 62). Building 61 is constructed of a structural steel frame supported on a reinforced poured concrete base (Type C building). The structural steel frame is covered by corrugated steel panels that form the walls of the building, although the base of each wall is constructed of concrete approximately 2 ft in height. Two large sliding doors are located at the east and west ends of the building.

Process Area Description

Building 61 has functioned as a storage area for thorium-contaminated equipment from the Bettis operation.

Major Media Types per Process Area

The structural steel frame and concrete of the floor and walls are considered the major media of Building 61. The corrugated steel siding is not considered a major medium because it constitutes a small fraction of the total building media.

Summary of Available Radiological Data

Building 61 has recently been surveyed for removable alpha contamination. Data from the 1992 removable alpha surveys have been assembled and indicate that the radiological hot spots for the storage area are as follows. Recent data are not available for total beta-gamma measurements. As data are acquired from ongoing radiological surveys taken for health physics needs, the identified hot spots will be reassessed before sampling activities begin.

Of the 22 removable alpha readings taken on the concrete floor in Building 61, the highest reading was 68 dpm; the remaining 21 readings were all below the MDA of 58 dpm. The location of the highest removable alpha reading (68 dpm) is depicted in Figure 61-1.

Summary of Sampling for Building 61

One airborne particulate sample will be taken in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1.

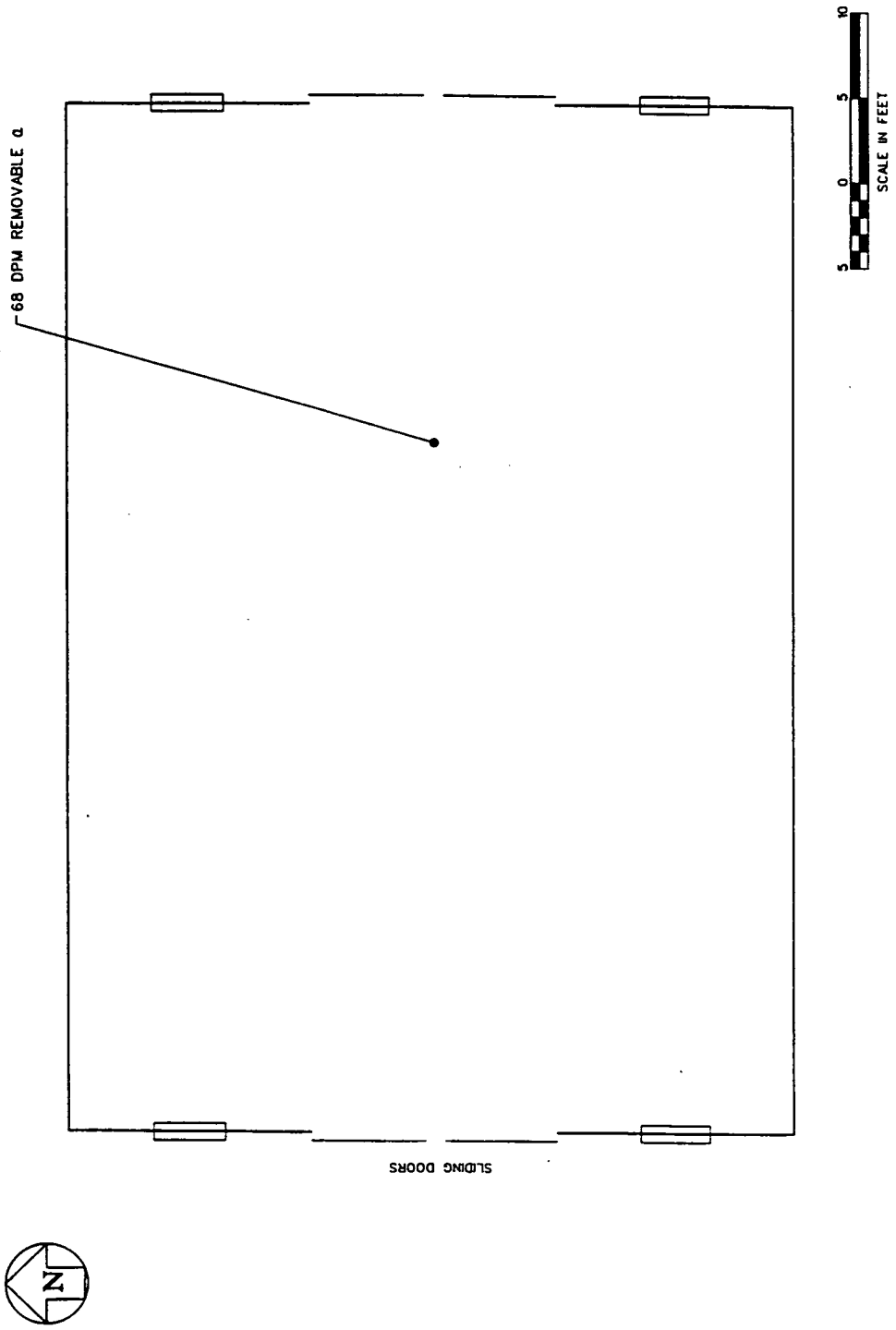

FIGURE 61-1 Layout of Building 61

Because recent radiological total beta-gamma data are not available, nonintrusive measurements, including exposure rate measurements, XRF surveys, radiological surveys, and swipe samples, will be performed and assessed in the field to define final intrusive sampling locations. Intrusive sampling will consist of one concrete chip sample and one steel surface scraping. If analysis of radiological swipe samples detects elevated levels of removable contamination as outlined in Protocol 1, then the swipe samples will be combined over the component for laboratory analysis. Although Building 61 was not inspected because of the health risks associated with thorium-contaminated equipment stored in the building, supplemental samples may be identified by the field team during sampling activities. Table 61-1 summarizes the planned sampling program for Building 61.

TABLE 61-1 Sample Types and Quantities for Building 61

Sample Type	Storage Area	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.2.20 Building 62 — Quonset Hut 3

Component Description

Building 62 (Quonset Hut 3) is a pre-engineered, single-level structure measuring 41 × 60 ft and 20 ft high (Figure 62-1). It is located at the north end of the FEMP process area past 3rd Street adjacent to Quonset Hut 2 (Component 61). Quonset Hut 3 is constructed of a structural steel frame supported on a reinforced poured concrete base. The frame is covered by corrugated steel panels (Type C building) that form the walls of the building. The base of each wall is concrete approximately 2 ft high. Two large sliding doors are located at the east and west ends of the building.

Process Area Description

Building 62 has functioned primarily as a maintenance storage area for spare parts and miscellaneous items of bulk size; in 1991, the building stored archived drummed samples from K-65 and Silos 1 and 2. Currently, the building stores a variety of miscellaneous items, including process equipment, empty 5-gal containers, palletized transformers, and bales of wire. Some areas of the concrete floor were slightly stained with "oily-looking" materials. Anticipated contaminants for the building are summarized in Table A.3.

Major Media Types per Process Area

The structural steel frame and concrete floor are considered to be the major media of Building 62. The corrugated steel siding is not of a gauge heavy enough to be considered recoverable and, therefore, is not considered a major medium.

Summary of Available Radiological Data

Building 62 is routinely surveyed for removable alpha contamination. Data from the 1991 removable alpha surveys have been assembled and indicate that the radiological hot spots for the storage area are as follows. Recent data are not available for total beta-gamma measurements. As data are acquired from ongoing radiological surveys taken for health physics needs, the identified hot spots will be reassessed before sampling activities begin. All 12 removable alpha readings taken in Building 62 were below the MDA of 39.1 dpm; therefore, no hot spots have been identified on Figure 62-1.

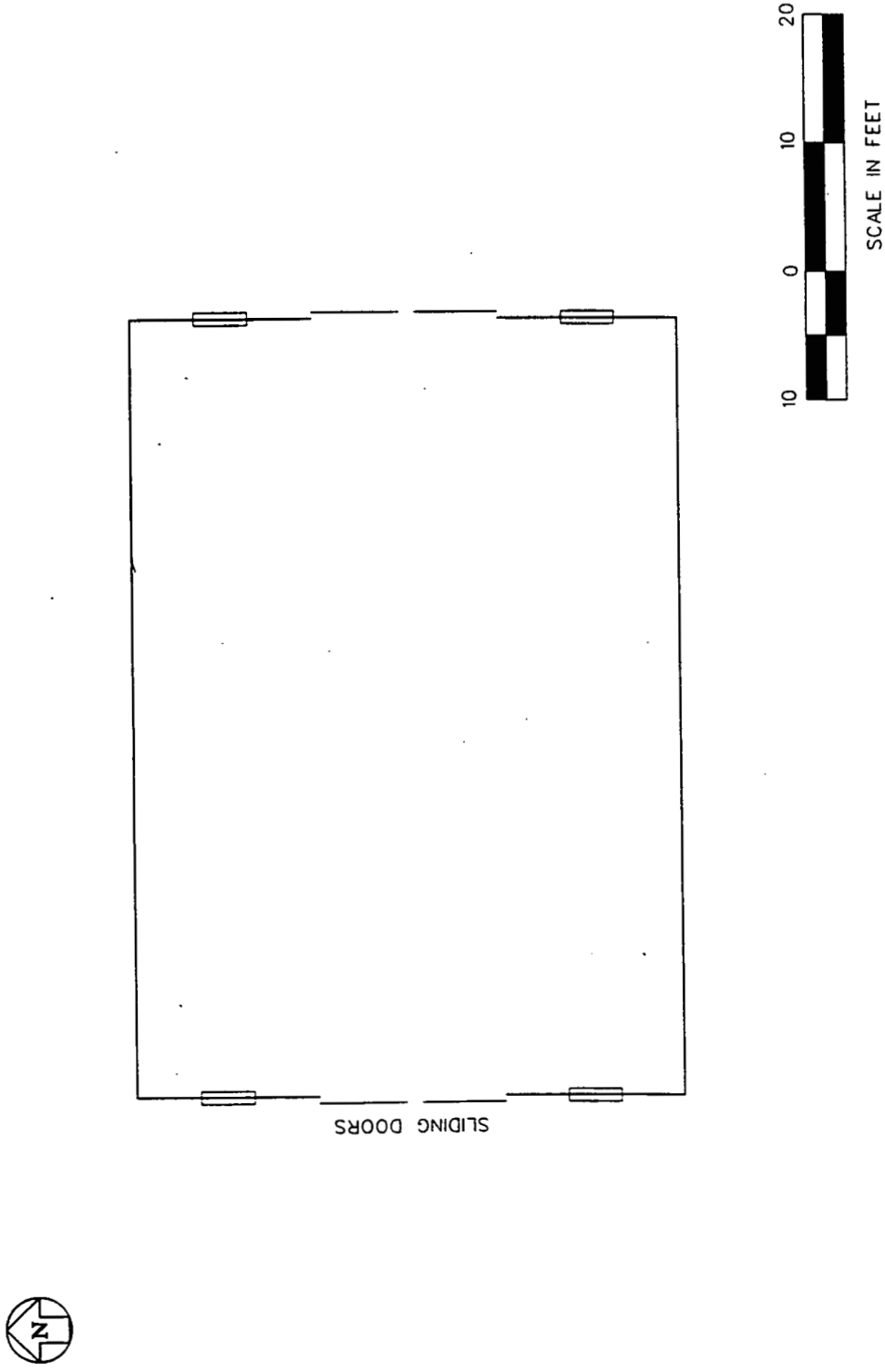

FIGURE 62-1 Layout of Building 62

Summary of Sampling for Building 62

One airborne particulate sample will be taken in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and radiological surveys and swipes, will be performed and assessed in the field to define final intrusive sampling locations. Intrusive sampling will include a concrete chip sample and one steel surface scraping. If analysis of radiological swipe samples detects elevated levels of removable contamination as outlined in Protocol 1, then the swipe samples will be combined over the component for laboratory analysis. Visual inspection of the component revealed no supplemental samples, although supplemental samples may be identified by the field team during sampling activities. Table 62-1 summarizes the planned sampling program for Building 62.

TABLE 62-1 Sample Types and Quantities for Building 62

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	3	3
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.2.21 Building 63 — KC-2 Warehouse

Component Description

Building 63 (KC-2 Warehouse) is a single-level structure measuring 79 × 346 ft and 16 ft high (Figure 63-1). It is located at the north end of the FEMP process area north of the Boiler Plant (Component 10A), as shown on the Grid 9 map in Appendix C. Building 63 is constructed of cement blocks supported on reinforced poured concrete footers, with a reinforced poured concrete floor and roof (Type B building). Building 63 comprises eight storage bays (Bays 1 through 8) of various sizes. The walls separating the bays are cement block, as are the north and south walls of Bays 1 through 4. The north and south walls of Bays 5, 6, and 7 are chain-link with corrugated steel-siding overlay. Bays 1 through 4 are equipped with roll-up doors located along the southern wall of each bay; Bays 5, 6, and 7 are equipped with chain-link swing-gates (also with corrugated steel-siding overlay) along the northern and southern chain-link wall of each bay. Bay 8, which is also equipped with chain-link swing-type gates, is approximately half the size of the other bays.

Process Area Description

Although Building 63 has mainly functioned as a storage area, the uses of the eight bays have changed with time. During 1991, Bay 1 provided maintenance storage of materials for work order requests; Bays 2, 3, and 4 were used for stores and the inventory control storage of bulk items; Bays 5 and 6 stored RCRA waste; Bay 7 stored RCRA waste and PCB-contaminated equipment and waste oils; and Bay 8 provided maintenance storage of landscaping and snow removal equipment. Currently, most of the bays are undergoing renovation (cleaning, sealing of concrete floors, and construction of containment berms) for eventual use as RCRA storage areas. Bay 1, which has been renovated but is not equipped with containment berms, is a sample disposition area; RCRA drums are being stored in Bays 5, 6, and 7. PCB-contaminated equipment and oils are no longer stored at the KC-2 Warehouse. Additional roofing material has recently been added to prevent the spread of radiological contamination from the radiologically contaminated roof.

Major Media Types per Process Area

The concrete of the floor and the masonry of the walls are considered the major media of Building 63. Because yellow-colored brick in the north wall of Bay 8 constitutes a small fraction of the total building media, this material is not considered a major medium for Building 63.

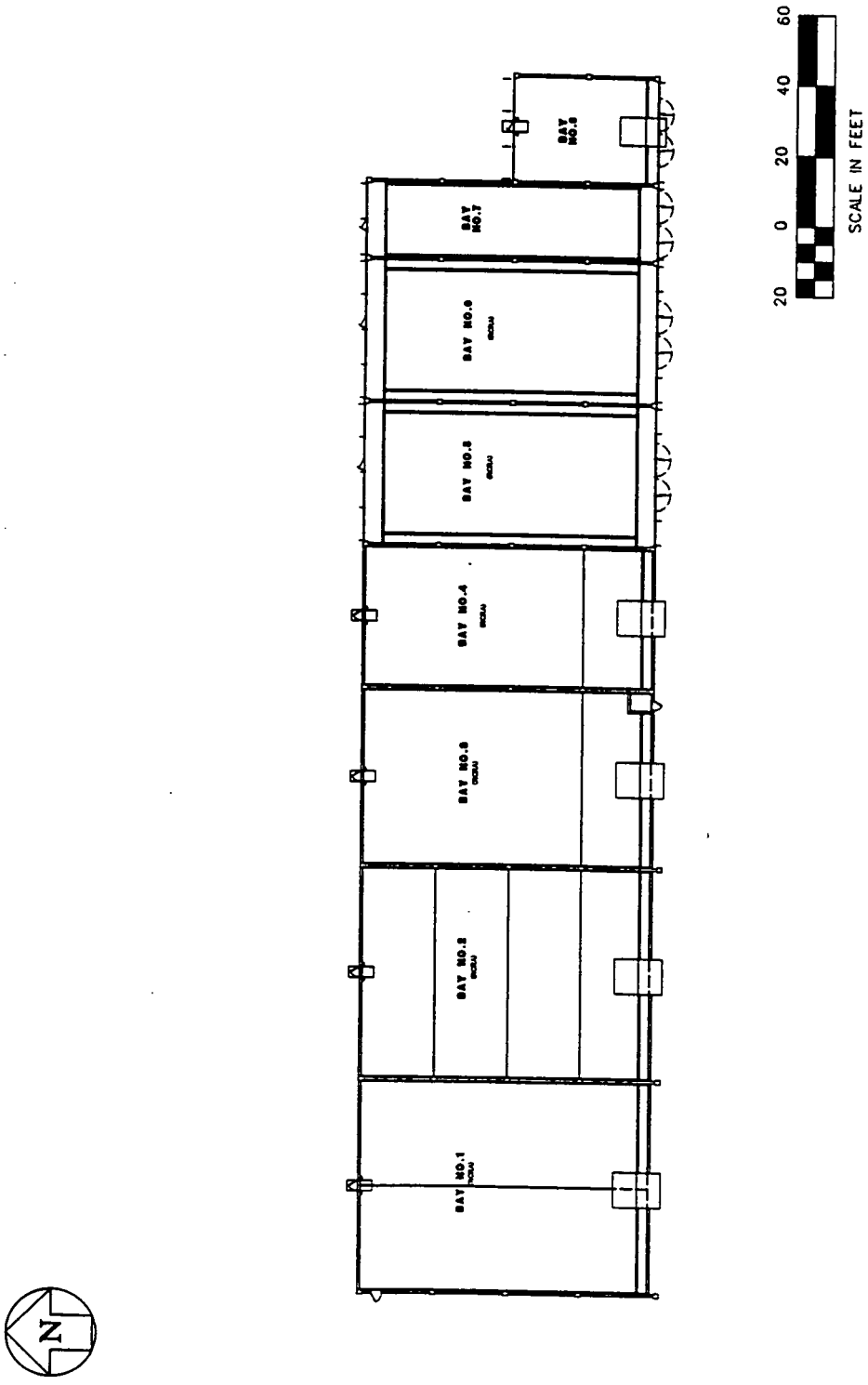

FIGURE 63-1 Layout of Building 63

Summary of Available Radiological Data

Bay 1 of Building 63 has recently been surveyed for removable alpha contamination. Data from the 1992 removable alpha surveys have been assembled and indicate that no radiological hot spot for the storage area is available. All seven total beta-gamma readings taken in Bay 1 of Building 63 were below the MDA of 37.0 dpm. The seven associated total alpha readings also were below the MDA of 40.6 dpm. Therefore, no hot spot was identified. As data are acquired from ongoing radiological surveys taken for health physics needs, the identified hot spot will be assessed before sampling activities begin.

Summary of Sampling for Building 63

One airborne particulate sample will be taken in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, PCB field test kit measurements, radiological surveys, and swipe samples, will be performed and assessed in the field to further define final intrusive sampling locations. Because of information received during the inspection, the concrete roof and the building walls and floor will be surveyed. Intrusive sampling will consist of one concrete chip sample from the floor and one masonry (cement block) chip sample. If analysis of radiological swipe samples detects elevated levels of removable contamination as outlined in Protocol 1, then the swipe samples will be combined over the component for laboratory analysis. Visual inspection of the component identified no supplemental samples, although supplemental samples may be identified by the field crew during sampling activities. Table 63-1 summarizes the planned sampling program for Building 63.

TABLE 63-1 Sample Types and Quantities for Building 63

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	1	1
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.2.22 Building 64 — Thorium Warehouse

Component Description

Building 64 (Thorium Warehouse) is a single-story building shown on the Grid 2 map in Appendix C. This component is placed on cement slabs; it is constructed of corrugated metal walls and roofing, and the roof is supported by steel beams and columns (Type C building). The warehouse is rectangular, measuring approximately 50 × 320 ft and 22 ft high (Figure 64-1). The building is divided into three sections: the north, center, and south bays. The north and center bays are each 20 ft long by 50 ft wide. The south bay is 280 ft long and 50 ft wide. These bays have no drains and no air purifying systems such as HEPA filters or Hoffman vacuums. The roof has rotating peak vents.

Building 64 was originally referred to as the Plant 9 Warehouse. It stored pallets and drums full of 2.1%-enriched uranium in the form of ingots, billets, top crops, and Zirnlo scrap from Hanford. The current Plant 9 Warehouse (Component 81) replaced Building 64 in function. Building 64 was then converted for thorium repackaging operations. For example, a 16-ft barrier made of concrete has been added in the center of Building 64 for shielding purposes.

Process Area Description

The building has been divided into two process functions. The first, overpacking, was done in two areas. Higher enriched thorium material was overpacked in the north bay, while low-level thorium and mixed waste overpacking occurred in part of the south bay. The second process, which involved the temporary storage of mixed waste, occurred in the center bay and part of the south bay. The anticipated contaminants for Building 64 are summarized in Table A.3.

Thorium Overpacking. The north bay was used for overpacking higher radioactive thorium compounds. Equipment was set up to allow the overpacking of thorium drums to occur automatically from a remote control point behind a concrete block wall from which cameras were used to observe the thorium overpack activities.

The south bay was used for repackaging low-level thorium compounds and some RCRA mixed wastes. This area was also used to recondition drums and to overpack drums of trash and uranium materials; both waste streams are nonhazardous. Reconditioning included painting and labeling the containers.

Drum Storage. The center and south bays have stored overpacked thorium wastes and product and temporarily stored uncharacterized mixed wastes. Thorium materials originally came from repackaging operations and/or storage in Building 64, the Plant 1 Thorium Warehouse (Component 67), and the Pilot Plant Warehouse (Component 68).

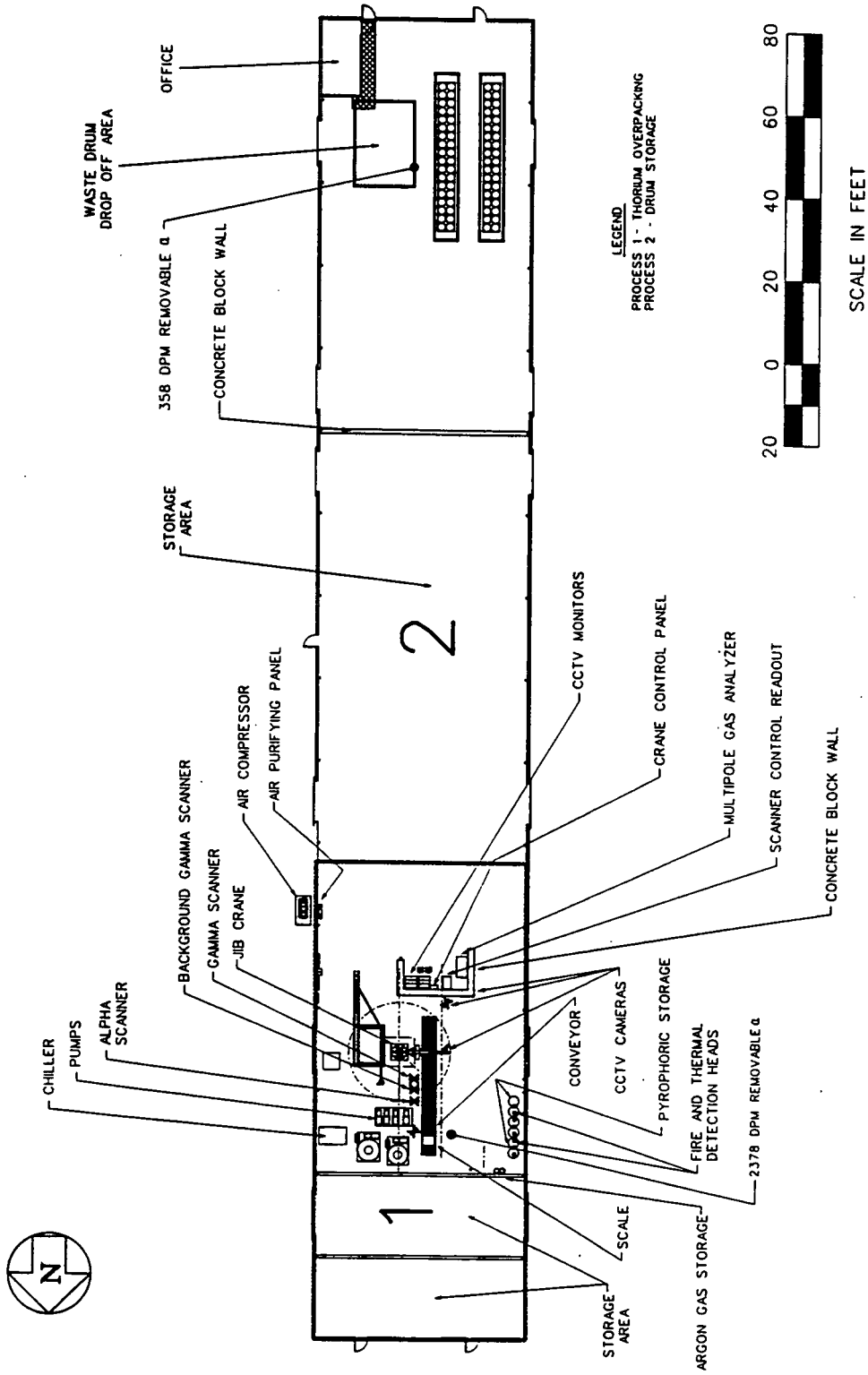

FIGURE 64-1 Layout of Building 64

Major Media Types per Process Area

Building 64 has a structural steel frame and a concrete base and floor. Also, the shielding between the south and center bays is considered part of the concrete medium for the building.

Summary of Available Radiological Data

Building 64 is surveyed only periodically for removable alpha and total beta-gamma contamination because of quantities of high-radioactivity thorium compounds. Results from measurements taken in 1991 and 1992 form the basis for identifying radiological hot spots. During this time, 83 removable alpha measurements were performed in Building 64. The data have been assembled, and the hot spot for the concrete is identified in Figure 64-1. The highest removable alpha measurement for the concrete medium in the thorium overpacking process area was determined to be 2,378 dpm by the weigh scale in the north bay. The highest removable alpha measurement for the concrete medium in the storage area was determined to be 358 dpm in the south bay between two rows of stacked drums. No information was available for total beta-gamma readings. To prevent technician exposure to unnecessary doses of radiation, sampling will occur only if thorium material is removed from this location.

Summary of Sampling for Building 64

One airborne particulate sample will be taken in the component and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. The two media within the building are the structural steel frame with corrugated metal siding and roofing and the concrete floor. Because Building 64 is a storage and overpacking area, it is considered to have dry process areas; therefore, concrete chips will be taken from the floor. Also, surface scrapings will be taken from the structural steel supports. No visual inspection of the building could be done because of the high radioactivity levels. Supplemental sampling possibilities will be assessed at the time of sampling. Sampling will need to be well planned so that it can be done as quickly as possible to minimize the radiation exposure to the technicians. Table 64-1 summarizes the planned sampling program for Building 64.

TABLE 64-1 Sample Types and Quantities for Building 64

Sample Type	Thorium Overpacking	Drum Storage	Component Totals
Nonintrusive[a]			
Radiological surveys	b	b	NA[c]
Chemical surveys	b	b	NA
Air particulates	NA	NA	1
Swipes	2	2	4
Lab composite swipes	NA	NA	1
Intrusive[a]			
Concrete chips	1	1	2
Concrete cores	NA	NA	NA
Masonry	NA	NA	NA
Steel surface scraping	1	1	2
Supplemental			
Liquid sample	NA	NA	NA
Loose media	NA	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.2.23 Building 65 — Plant 5 Warehouse

Component Description

Building 65 (Plant 5 Warehouse) is a single-story building; its location is shown on the Grid 2 map in Appendix C. The rectangular building measures approximately 50 × 210 ft and 22 ft high (Figure 65-1). It consists of a structural steel frame with noninsulated, corrugated metal siding and roofing on a reinforced poured concrete base and floor (Type C building).

Process Area Description

Building 65 is considered to contain one process area, which currently stores drummed thorium compounds. The building is shielded with concrete blocks 2 ft thick by 6 ft tall around the south and west sides of the building. Anticipated contaminants are summarized in Table A.3.

Major Media Types per Process Area

Building 65 has two major media, a steel frame and a reinforced concrete base and floor.

Summary of Available Radiological Data

Building 65 has not been routinely surveyed for removable alpha and total beta-gamma contamination because it contains a large quantity of higher radioactivity thorium compounds. Routine surveys would expose the radiation technicians to unnecessary, large doses of radiation. No recent data are available, but the radiological hot spot will be determined from field measurements before sampling occurs, provided the thorium has been removed. Also, if data are acquired from other radiological surveys taken for health physics needs, the identified hot spots will be incorporated into the sampling plans.

Summary of Sampling for Building 65

One airborne particulate sample will be taken in the component and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. The two media within the building are the structural steel frame with corrugated metal siding and roofing and the concrete floor. Building 65 is a storage area; it is, therefore, considered a dry process area and a concrete chip will be taken

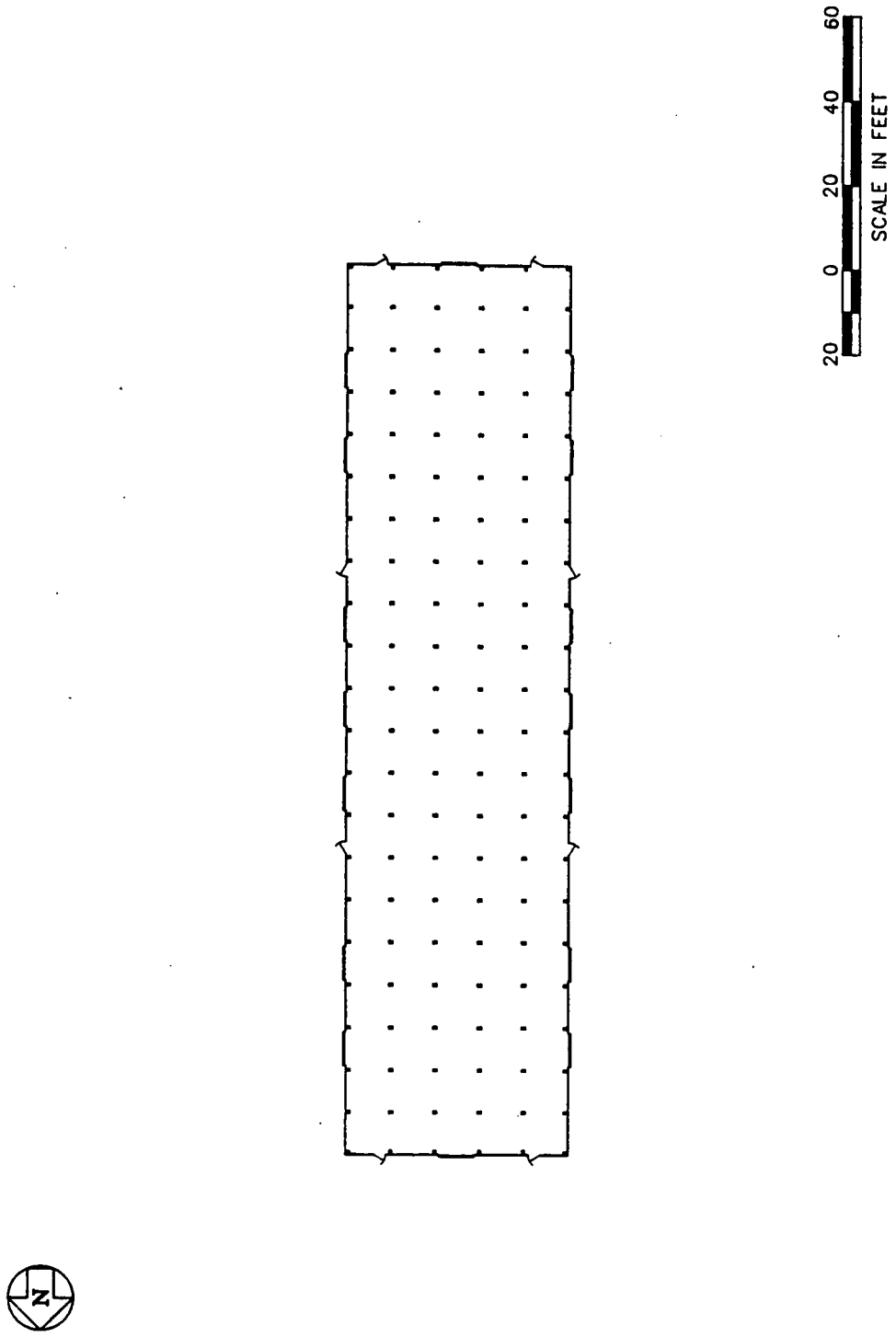

FIGURE 65-1 Layout of Building 65

from the floor. Also, a surface scraping will be taken from the structural steel supports. No visual inspection of the building could be done because of the high radioactivity levels. Sampling will need to be well planned so that it can be done as quickly as possible to minimize the radiation exposure to the technicians. Table 65-1 summarizes the planned sampling program for Building 65. Supplemental sampling possibilities will be assessed at the time of sampling.

TABLE 65-1 Sample Types and Quantities for Building 65

Sample Type	Drum Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.2.24 Building 67 — Plant 1 Thorium Warehouse

Component Description

Building 67 (Plant 1 Thorium Warehouse) is a single-story building shown on the Grid 24 map in Appendix C. It is rectangular, measuring approximately 40 × 100 ft and 22 ft high (Figure 67-1), and consists of a structural steel frame on a reinforced poured concrete base and floor; noninsulated, corrugated metal siding and roofing; and glass windows (Type C building).

Process Area Description

Building 67 is a thorium storage building and is considered an HWMU because it has stored 35 cans of thorium material for more than 12 months. The thorium materials have remained in storage in Building 67 longer than 12 months to avoid risk to human health and safety during handling of the thorium. Damaged and unused white metal boxes (WMBs) are stored around the building (as well as a concrete block wall on the east end) to protect personnel from radiation originating from the thorium material contained within.

Major Media Types per Process Area

The two major media for Building 67 are the structural steel frame and the concrete floor.

Summary of Available Radiological Data

Building 67 has not been routinely surveyed for removable alpha and total beta-gamma contamination because of high radioactivity from thorium compounds. Results from a June 1992 survey form the basis for identifying hot spots. In the building, 46 removable alpha measurements were performed, 26 on the concrete and 20 on drums of thorium. The data have been assembled, and the hot spot for the concrete is identified in Figure 67-1. The highest removable alpha measurement for the concrete medium was determined to be 31,506 dpm in the northwestern corner of the building. No information was available for total beta-gamma readings. To prevent technician exposure to unnecessary large doses of radiation, data will be reassessed and sampling will occur only if thorium material is removed from this location before the start of sampling activities.

Summary of Sampling for Building 67

One airborne particulate sample will be taken in the building and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1.

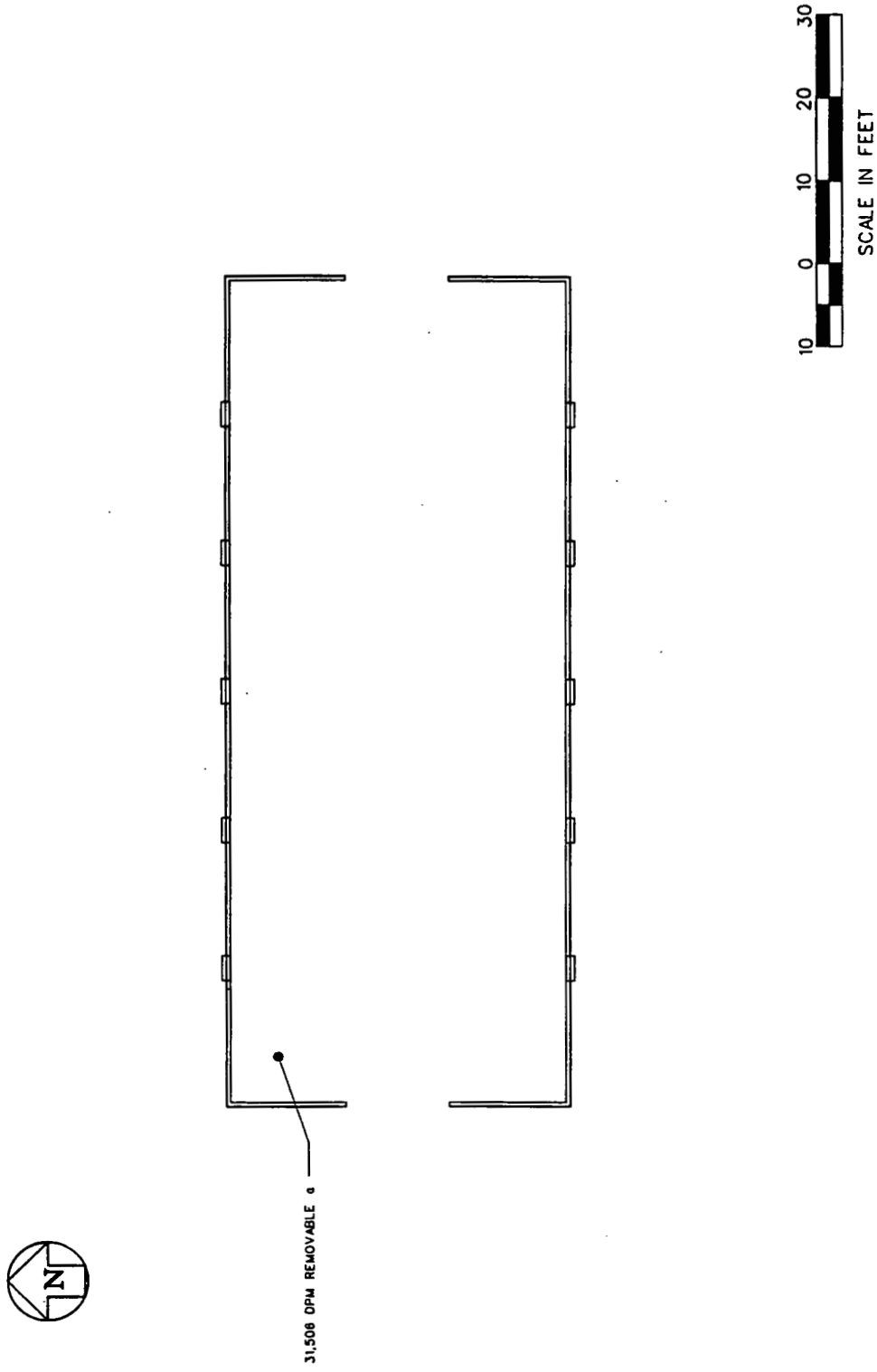

FIGURE 67-1 Layout of Building 67

Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Because Building 67 is a storage area, it is considered a dry process area; therefore, a concrete chip will be taken from the floor. Also, a surface scraping will be taken from the structural steel supports. No visual inspection of the component could be performed because of high radioactivity levels. Therefore, supplemental sampling will be assessed at the time of sampling. Sampling will need to be well planned so that it can be done as quickly as possible to minimize the radiation exposure to the technicians. Table 67-1 summarizes the planned sampling program for Building 67.

TABLE 67-1 Sample Types and Quantities for Building 67

Sample Type	Thorium Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.2.25 Building 68 — Pilot Plant Warehouse

Component Description

Building 68 (Pilot Plant Warehouse) is located south of the Pilot Plant Complex, as shown on the Grid 26 map in Appendix C. It is a single-level, rectangular building 50 × 100 ft and 14 ft high, with an attached enclosure, 7.5 × 17.5 ft, at its northwestern corner (Figure 68-1). Building 68 consists of reinforced, poured concrete footings and floor, a structural steel frame, and transite walls and roof panels (Type A building). The walls are dual-panel construction with an insulation layer between the inner and outer panels. The building interior consists of an open bay structure, except for a small radiographic control booth in the northwestern corner. An area on the north side of the warehouse is fenced; it is roughly the size of the concrete apron, 30 × 120 ft. The attached structure is within the barbed-wire-topped fenced area.

Process Area Description

Building 68 stored thorium compounds, Pilot Plant equipment, and RCRA-mixed waste; the attached structure housed a cobalt-60 radiographic source. The building currently stores thorium compounds and RCRA-mixed waste in drums. Anticipated contaminants for Building 68 are summarized in Table A.3. The building is flanked on the east and south sides with a soil berm and concrete walls, respectively, to shield personnel housed in nearby trailers from radiation. No trenches or sumps are in the building or within the concrete-based fenced area.

Major Media Types by Process Area

Major media in Building 68 include the concrete floor and structural steel frame. Because the transite is addressed as a separate supplemental sampling activity, it is omitted as a major medium for Building 68 in this document.

Summary of Available Radiological Data

The Pilot Plant Warehouse, Building 68, is routinely surveyed for removable alpha contamination on the concrete floor; however, no data are available for total beta-gamma contamination and data have not been generated for the structural steel medium. Results of the most recent surveys have been analyzed to identify a hot spot location for intrusive sampling of concrete; 46 removable alpha and removable beta-gamma measurements were taken on the concrete floor of the building. These data indicate that the highest removable alpha value was 1,096 dpm, detected near the southwestern corner of the building between rows of palleted drums (Figure 68-1). Ongoing routine radiological surveys will be assessed before sampling the component.

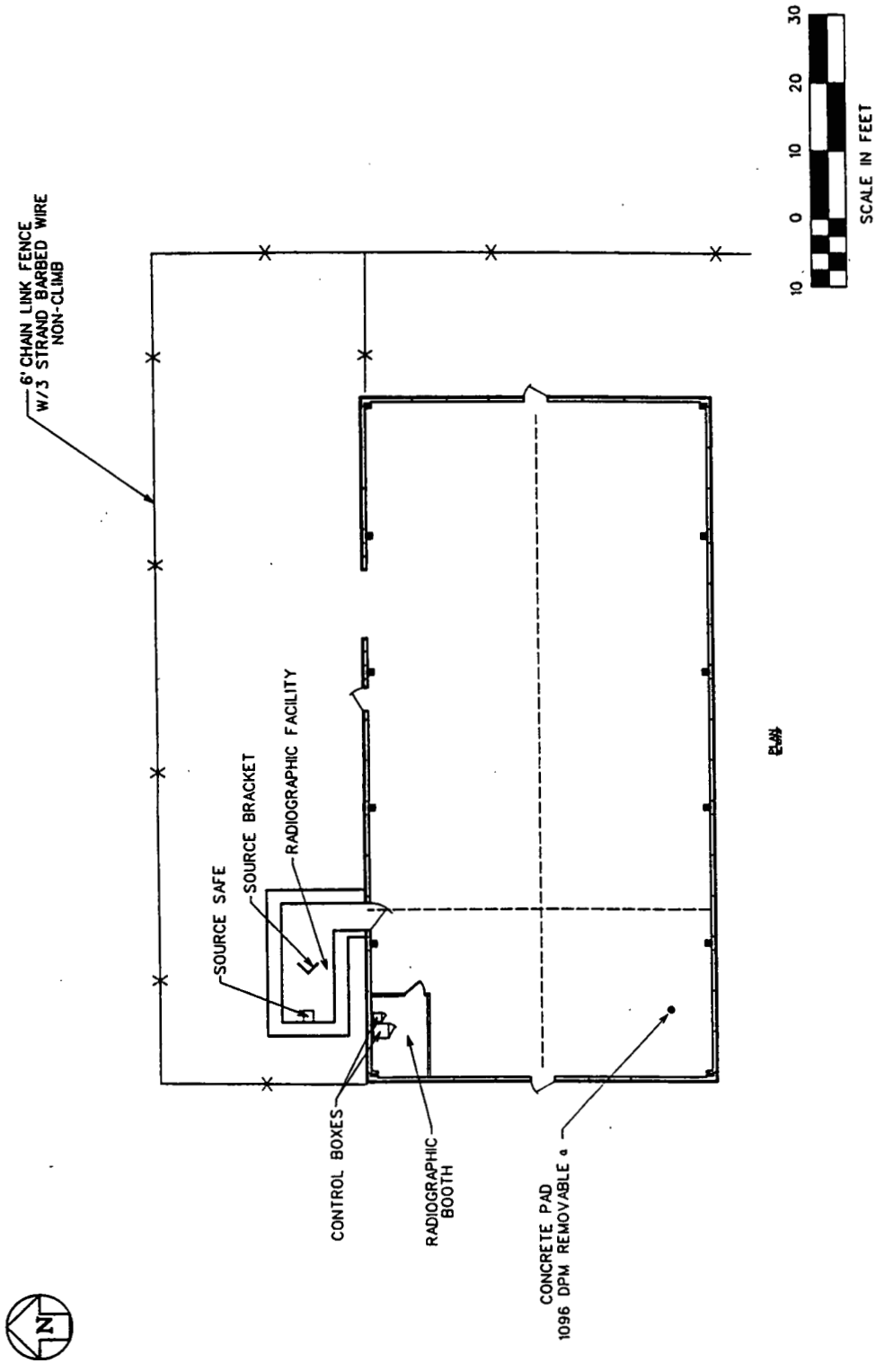

FIGURE 68-1 Layout of Building 68

Summary of Sampling for Building 68

One particulate air sample will be collected in the warehouse and analyzed for radiological and inorganic contaminants, as well as asbestos, with Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail the final intrusive sampling locations. Because the Pilot Plant Warehouse is a storage area, it is considered a dry process area; therefore, a concrete chip will be the intrusive sample taken at the identified hot spot floor location. A structural steel scraping sample will be collected from a hot spot to be identified. No supplemental sampling locations have been identified; a task-specific inspection was not conducted because of the presence of higher radiation thorium compounds. Table 68-1 summarizes the planned sampling program for Building 68.

TABLE 68-1 Sample Types and Quantities for Building 68

Sample Type	Storage Warehouse	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.2.26 Building 71 — General In-Process Warehouse

Component Description

Building 71 (General In-Process Warehouse) is a single-story building located west of B Street and north of 2nd Street, as shown on the Grid 27 map in Appendix C. It is rectangular and measures approximately 100 x 241 ft and 13 ft high. The building consists of concrete block walls, which rest directly on a poured concrete floor, and a bar-joist truss roof system. The inside is one large open area except for the Isotopic Verification Room (41 x 27 ft) in the southwestern corner of the building (Figure 71-1).

Process Area Description

Building 71 was built in 1964 and historically performed dry processes. The Isotopic Verification Room was used to verify various enrichments of uranium materials. Although this area now serves as a radiological "frisking" area, it still contains an unused lab bench with a hood and HEPA filter, as well as a container. Most of the building is used for storage (including unused fuel rods) and staging for shipping drums of fissile materials to other facilities. Nonirradiated fuel assemblies were also manually disassembled in the main building area to feed recycle processes in the Preparation Plant (Component 1A).

Major Media Types per Process Area

Building 71 major media include the cement block walls and the reinforced poured concrete floors. The steel of the roof is not considered a major medium for the component.

Summary of Available Radiological Data

Building 71 is routinely surveyed for removable alpha and total beta-gamma contamination. Results of these surveys are summarized in Tables A.4.0 and A.4.1 and are the basis for identifying hot spots. From 1989 through 1992, 326 removable alpha and 258 total beta-gamma survey measurements were performed in Building 71. The data have been assembled, and the hot spots for the concrete are identified in Figure 71-1. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys.

The highest total beta-gamma survey result for the concrete floor in the Isotopic Verification area was determined to be 799,000 dpm, with a corresponding removable alpha survey result of 12,000 dpm. The highest total beta-gamma survey result for the concrete media in the storage area was determined to be 169,000 dpm, with a corresponding removable alpha survey result of 200 dpm.

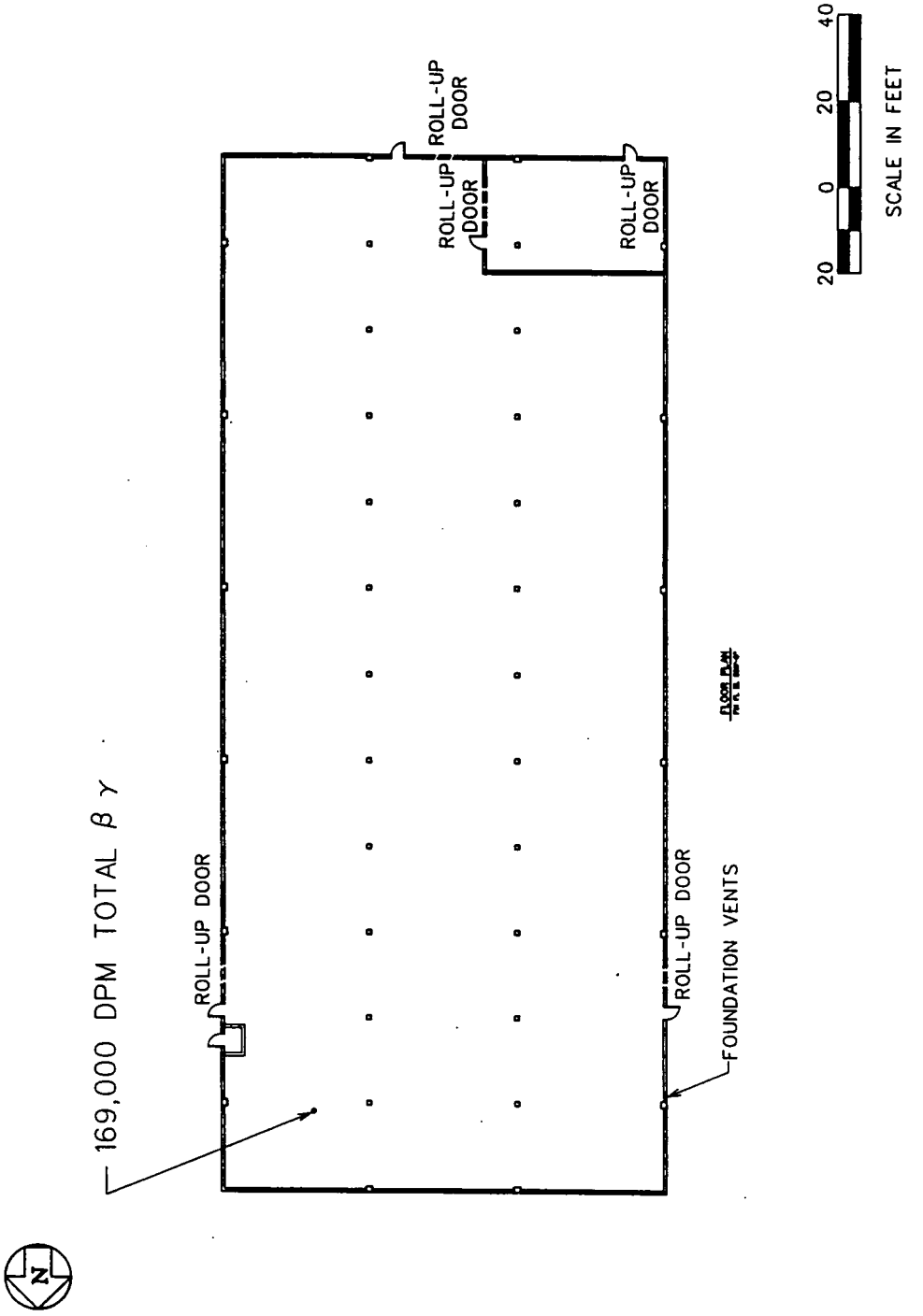

FIGURE 71-1 Layout of Building 71

Summary of Sampling for Building 71

One airborne particulate sample will be taken and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Because Building 71 is a staging and storage area, it is considered a dry process area; therefore, concrete chips will be taken from the floor. Visual inspection of the component identified no supplemental sampling requirements. Table 71-1 summarizes the planned sampling program for Building 71.

TABLE 71-1 Sample Types and Quantities for Building 71

Sample Type	Isotopic Verification	Storage	Component Totals
Nonintrusive[a]			
Radiological surveys	b	b	NA[c]
Chemical surveys	b	b	NA
Air particulates	NA	NA	1
Swipes	2	2	4
Lab composite swipes	NA	NA	1
Intrusive[a]			
Concrete chips	1	1	2
Concrete cores	NA	NA	NA
Masonry	1	1	2
Steel surface scraping	NA	NA	NA
Supplemental			
Liquid sample	NA	NA	NA
Loose media	NA	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.2.27 Building 72 — Drum Storage Building

Component Description

Building 72 (Drum Storage Building) is a single-story building shown on the Grid 27 map in Appendix C and measures 31 × 41 ft and 11 ft high (Figure 72-1). It consists of a structural steel frame on a reinforced poured concrete base, reinforced poured concrete ground floor, and transite siding and roofing (Type A building).

Process Area Description

Building 72 historically has been a storage facility. Originally, it contained industrial cleaning equipment and control panels for ore silo operation. It now stores drums of enriched and normal fuel rods.

Major Media Types per Process Area

The major media for Building 72 are the structural steel frame and concrete. Because transite is addressed on a site-wide basis as a separate supplemental sampling activity, it is not included as a major medium for this building.

Summary of Available Radiological Data

Building 72 has not been routinely surveyed for removable alpha and total beta-gamma contamination. Because no recent data are available, the radiological hot spot will be determined from field measurements conducted before sampling occurs. Also, if data are acquired from other radiological surveys, any newly identified hot spots will be incorporated into the sampling plans.

Summary of Sampling for Building 72

One airborne particulate sample will be taken in the building and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. The two major media within the building are the structural steel frame and concrete. Because Building 72 is a storage area, it is considered a dry process area; therefore, a concrete chip will be taken from the floor. Also, a surface scraping will be taken from the structural steel supports. No visual inspection of the component could be done because of the high levels of radioactivity. Therefore, supplemental sampling will be assessed at the time of sampling. Also, sampling activities will need to be well planned so that they can be done as quickly as possible to minimize the radiation exposure to the technicians. Table 72-1 summarizes the planned sampling program for Building 72.

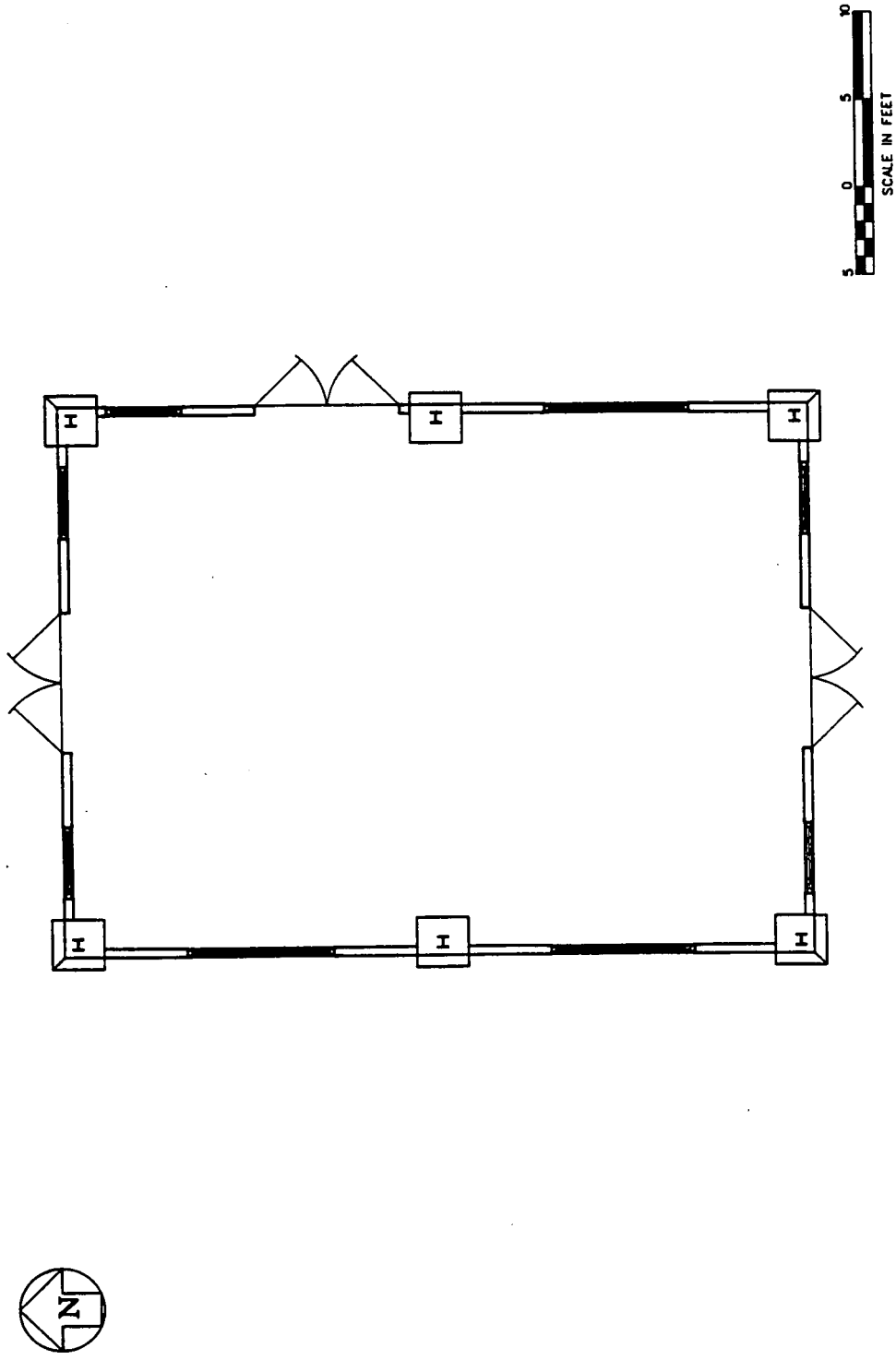

FIGURE 72-1 Layout of Building 72

TABLE 72-1 Sample Types and Quantities for Building 72

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.2.28 Building 77 — Finished Products Warehouse (4A Warehouse)

Component Description

Building 77 (Finished Products Warehouse/4A Warehouse) is a single-story building shown on the Grid 3 map in Appendix C. It is rectangular, measuring approximately 120 × 162 ft and 12 ft high (Figure 77-1). The building consists of a structural steel frame on a reinforced poured concrete base and floor with noninsulated, corrugated metal siding and roofing (Type C building).

Process Area Description

Building 77 was constructed as a storage warehouse for flat uranium ingot products awaiting shipment and miscellaneous reject products, as well as the interim storage of uranium materials awaiting processing. The anticipated contaminants for Building 77 are summarized in Table A.3.

Major Media Types per Process Area

Building 77 has a steel frame and a concrete base and floor.

Summary of Available Radiological Data

Building 77 is routinely surveyed for removable alpha contamination. Data from the 1991 and 1992 surveys have been assembled and indicate that all 29 removable alpha survey readings were below the MDA of 60 dpm. Building 77 has not been surveyed for total beta-gamma contamination. Data will be taken and assessed before sampling to determine the location of the radiological hot spot or to verify nondetectable levels.

Summary of Sampling for Building 77

One airborne particulate sample will be taken in the building and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF radiological surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. The two media within the building are the structural steel frame and roofing and the concrete floor. Intrusive sampling will be performed in the radiological hot spot for the concrete medium, as shown in Figure 77-1. Because Building 77 contains only storage, it is considered a dry process area; therefore, a concrete chip will be taken from the floor. Also, a surface scraping will be taken from the structural steel supports. Visual inspection of the component identified no supplemental samples. Table 77-1 summarizes the planned sampling program for Building 77.

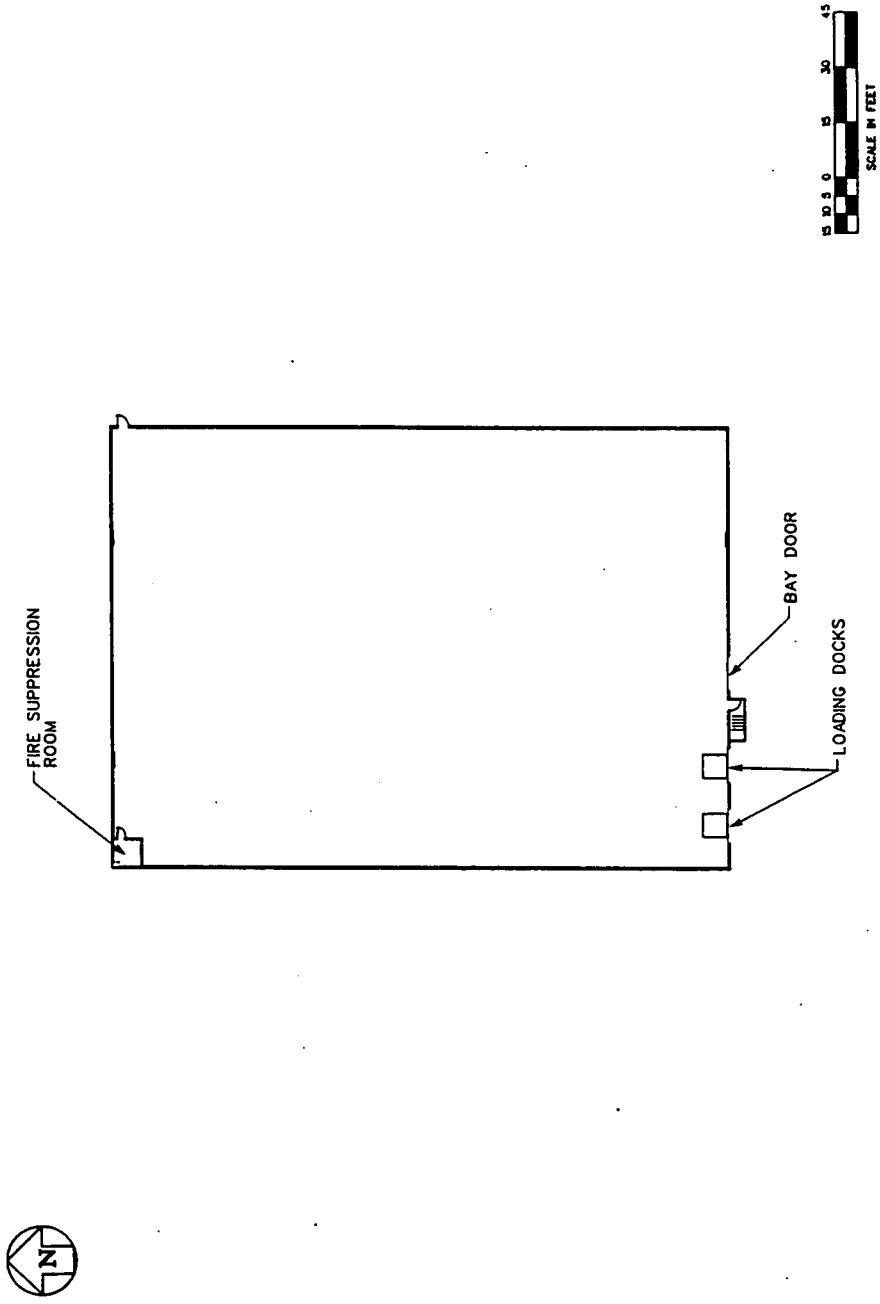

FIGURE 77-1 Layout of Building 77

TABLE 77-1 Sample Types and Quantities for Building 77

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.2.29 Building 79 — Plant 6 Warehouse

Component Description

Building 79 (Plant 6 Warehouse) is a single-story building; its location is shown on the Grid 4 map in Appendix C. The rectangular building measures approximately 100 × 170 ft and 15 ft high (Figure 79-1). It consists of a structural steel frame with noninsulated, corrugated metal siding and roofing on a reinforced poured concrete base and floor (Type C building).

Process Area Description

Building 79 is considered one process area and functions as an interim status RCRA storage facility. Hazardous wastes have been stored in excess of 90 days in the building. Anticipated contaminants are summarized in Table A.3.

Major Media Types per Process Area

Major media for Building 79 are a steel frame and reinforced concrete base and floor.

Summary of Available Radiological Data

Building 79 is routinely surveyed for removable alpha and total beta-gamma contamination. Results from the most recent surveys are summarized in Work Plan Addendum Appendix tables and are the basis for identifying hot spots. As indicated, 26 removable alpha and 26 total beta-gamma survey measurements were performed in Building 79 from 1989 through 1991. All removable alpha radiological data collected in 1992 were below the MDA of 57.5 dpm. Total beta-gamma radiological data were not collected in 1992. The data have been assembled, and the hot spot for the concrete is identified in Figure 79-1. Before sampling, data will be reassessed to include data gathered from ongoing radiological surveys. The hot spot had removable alpha and total beta-gamma readings of 59 and 65,000 dpm, respectively, for the concrete media.

Summary of Sampling for Building 79

One air sample will be taken in the component and analyzed for airborne radiological and chemical contaminants on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. The two media within the building are the structural steel frame and the concrete floor. Building 79 is a storage area; therefore, it is considered a dry process area and a concrete chip will be taken

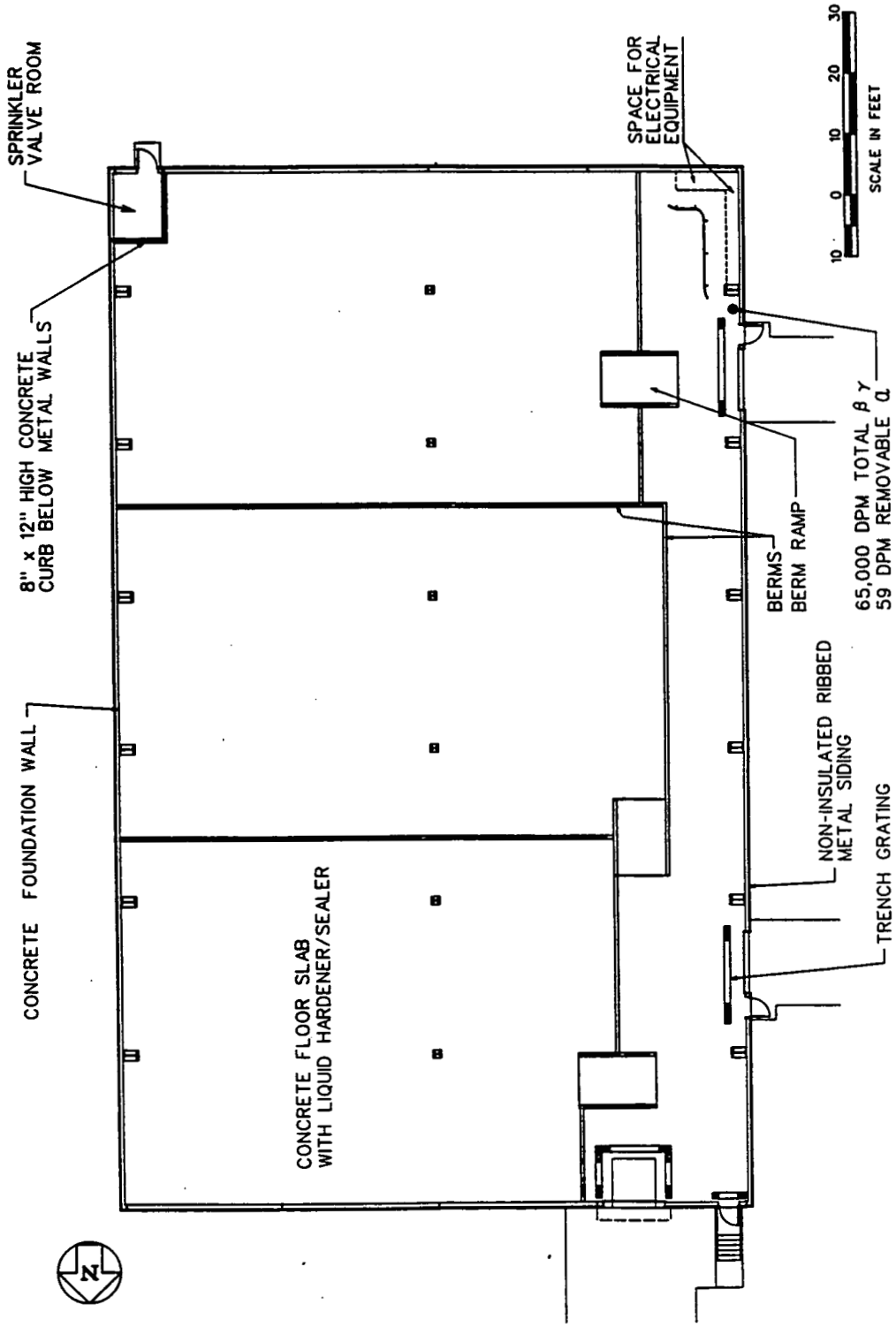

FIGURE 79-1 Layout of Building 79

from the floor. Also, a surface scraping will be taken from the structural steel supports. Visual inspection of the component identified no supplemental samples. Table 79-1 summarizes the planned sampling program for Building 79.

TABLE 79-1 Sample Types and Quantities for Building 79

Sample Type	Drum Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.2.30 Building 80 — Plant 8 Warehouse

Component Description

Building 80 (Plant 8 Warehouse) is a single-story building located southwest of the Recovery Plant (Component 8A), as shown on the Grid 20 map in Appendix C. The rectangular building measures approximately 60 × 170 ft and 15 ft high and consists of a structural steel frame on a reinforced poured concrete base and floor with noninsulated corrugated metal siding and roofing (Type C building). Building 80 was built in 1989 for use as a drum storage unit for nonliquid RCRA hazardous wastes. A small office trailer has been placed in the southwestern corner of the building. The floor plan for the building is provided in Figure 80-1.

Process Area Description

Building 80 is considered one process area and functions as an interim status RCRA storage facility. All dikes, berms, and floors have been coated with an epoxy sealant to resist penetration and chemical attack by any spilled material. Building 80 has a drum capacity of 2,580 (55-gal) drums and currently contains solid wastes. The anticipated contaminants for Building 80 are summarized in Table A.3.

A 15 × 20 ft staging, sampling, and transfer area has been established in the southwestern corner of the building. Individual drums are placed in the staging area and opened for sampling or addition of wastes from smaller containers. Whenever survey results indicate high contamination levels, the Visqueen liner on the floor and any spilled material are removed and the staging area is relined.

Major Media Types per Process Area

Major media for Building 80 include the sealed concrete floor and structural steel wall and roof supports.

Summary of Available Radiological Data

Building 80 is routinely surveyed for removable alpha contamination and to date no detectable activity has been found. No data are available for total beta-gamma contamination. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys. The data will be assembled to determine the radiological hot spot and the final intrusive sampling location for the concrete medium.

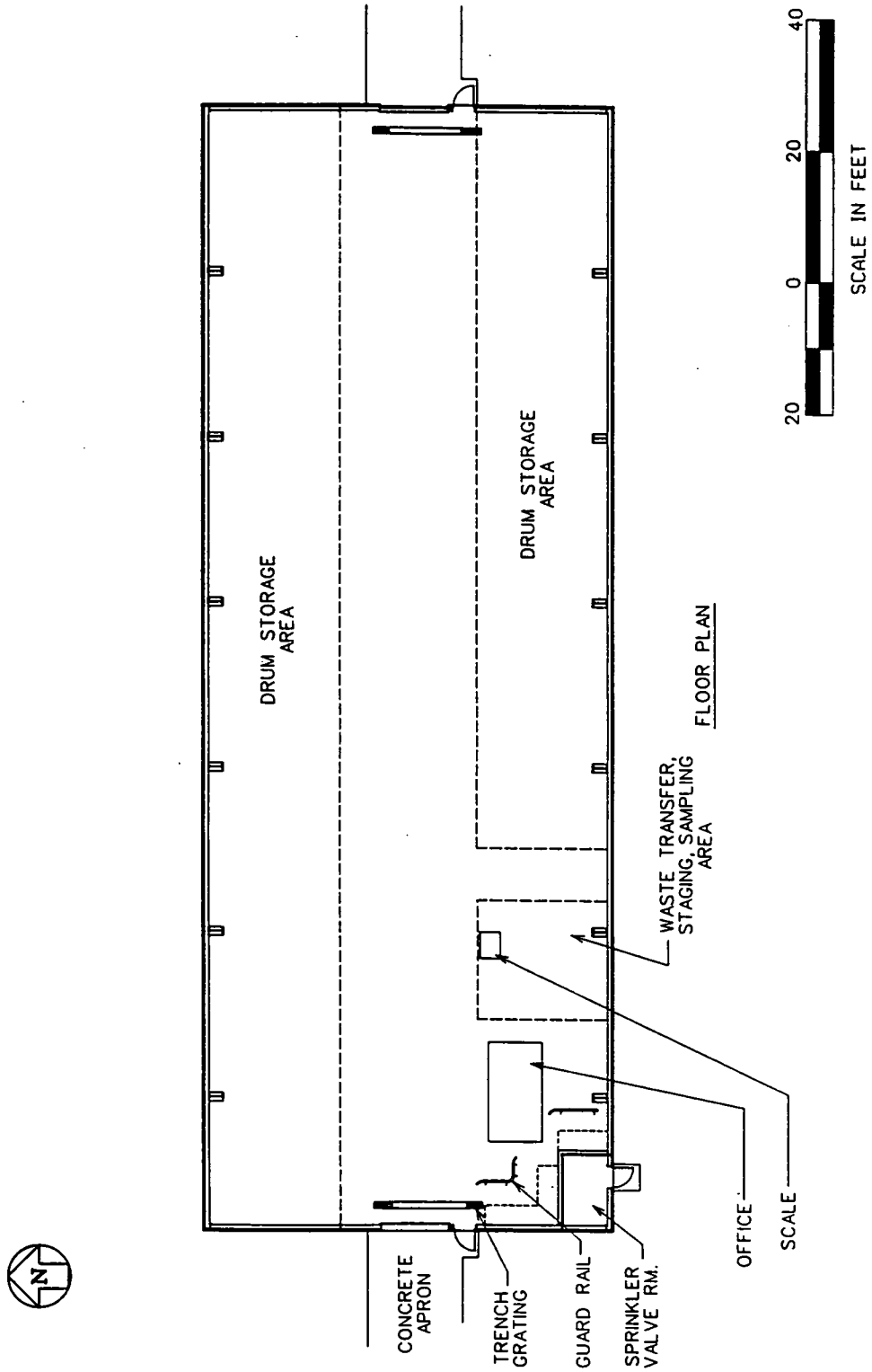

FIGURE 80-1 Layout of Building 80

Summary of Sampling for Building 80

One airborne particulate sample will be taken in the component and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipes samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Building 80 is used only for storage of nonliquid wastes; therefore, it is considered a dry process area and a concrete chip will be taken from the floor. Also, a surface scraping will be taken from the structural steel supports. Visual inspection of the component identified no supplemental samples. Table 80-1 summarizes the planned sampling program for Building 80.

TABLE 80-1 Sample Types and Quantities for Building 80

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.2.31 Building 81 — Plant 9 Warehouse

Component Description

Building 81 (Plant 9 Warehouse) is a single-story building; its location is shown on the Grid 3 map in Appendix C. The rectangular building measures approximately 80 × 100 ft and 15 ft high (Figure 81-1). It consists of a structural steel frame with noninsulated, corrugated metal siding and roofing on a reinforced poured concrete base and floor (Type C building). It was originally constructed as a storage warehouse for uranium materials (e.g., primary ingots, derbies, cores, and green salt). Modifications were made (e.g., to dikes and berms) to meet site standards for RCRA warehouses in 1990 for hazardous waste storage.

Process Area Description

Building 81 is considered one process area and functions as an interim status RCRA storage facility. Originally constructed as a storage warehouse for uranium materials, Building 81 was modified to meet RCRA warehouse site standards for hazardous waste storage in 1990. All dikes, berms, and floors have been coated with an epoxy sealant. Neither of the two collection sumps leads to the wastewater treatment system. Building 81 has a drum capacity of 1,704 (55-gal) drums and currently contains both liquid and solid wastes. The anticipated contaminants for Building 81 are summarized in Table A.3.

Major Media Types per Process Area

Building 81 has a steel frame covered with noninsulating, corrugated metal siding and roofing. It also has a reinforced concrete base and floor.

Summary of Available Radiological Data

Building 81 is routinely surveyed for removable alpha and total beta-gamma contamination. Results from the 1992 survey are summarized in Table A.4.1 and are the basis for identifying hot spots. As indicated in Table A.4.1, 26 removable alpha and 26 total beta-gamma survey measurements were performed in Building 81 from 1989 through 1992. The data have been assembled, and the hot spot for the concrete is identified in Figure 81-1. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys.

The highest total beta-gamma reading for the concrete media was determined to be 10,000 dpm, while the average was 3,000 dpm. All 26 removable alpha measurements were below the detectable limit of 53 dpm.

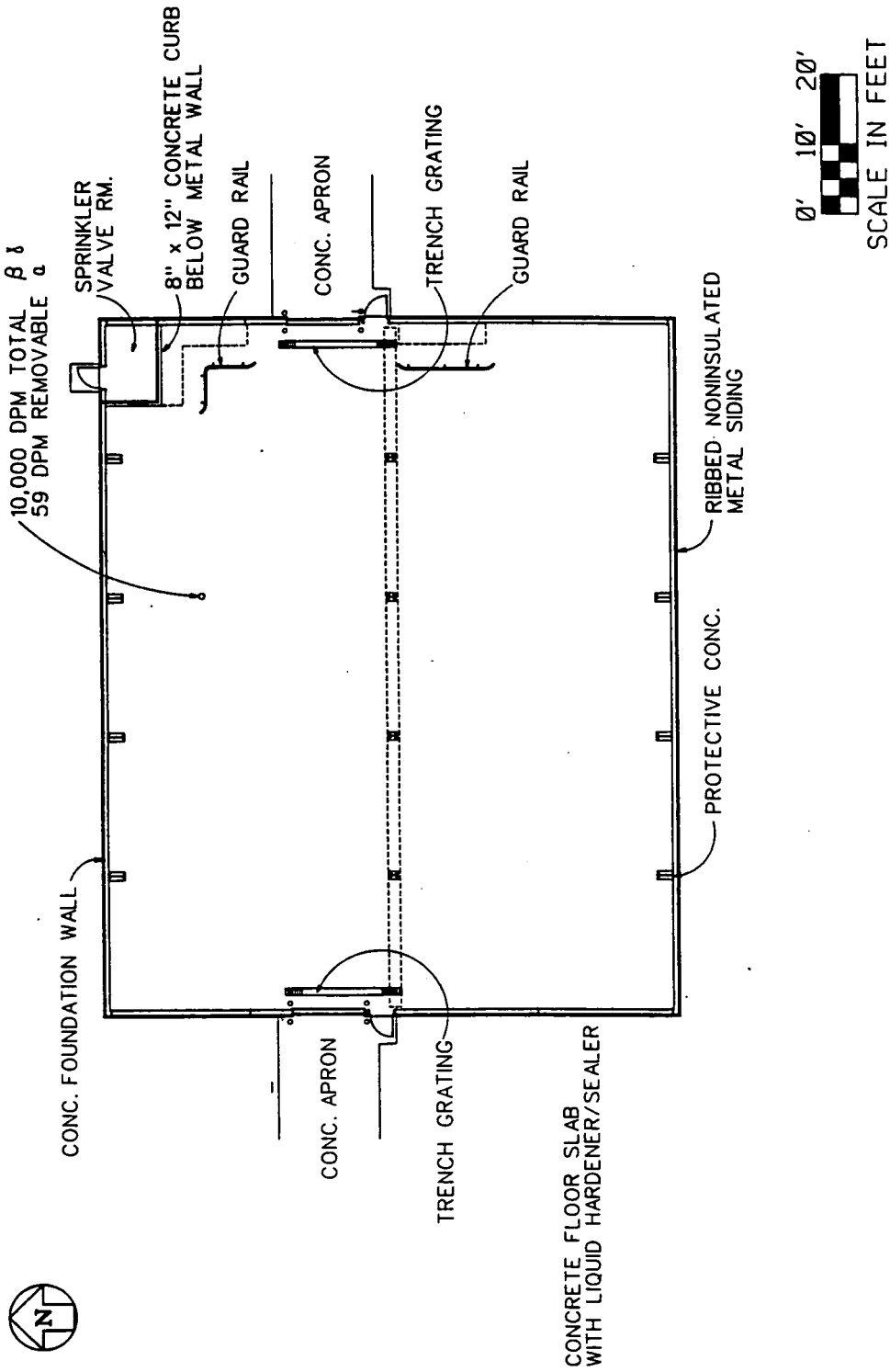

FIGURE 81-1 Layout of Building 81

Summary of Sampling for Building 81

One airborne particulate sample will be taken in the component and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Building 81 is a storage area; therefore, it is considered a dry process area and a concrete chip will be taken from the floor. Also, a surface scraping will be taken from the structural steel supports. Visual inspection of the component identified no supplemental samples. Table 81-1 summarizes the planned sampling program for Building 81.

TABLE 81-1 Sample Types and Quantities for Building 81

Sample Type	Drum Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.2.32 Component TS-001 — Tension Support Structure 1

Component Description

Component TS-001 (Tension Support Structure 1) is a single-level, self-supporting canvas-covered structure, approximately 90 × 300 ft. This component is located on the Plant 1 Pad, as shown on the Grid 17 and 27 maps in Appendix C, but does not include the pad in the component designation.

Process Area Description

The component is a sprung structure designed to cover and prevent weathering of drums on the Plant 1 Pad. The pads under the support structures will be characterized as part of the Plant 1 Pad sampling program.

Summary of Sampling for Component TS-001

This component does not require sampling. The contaminants expected for the component are of low toxicity, and the component exhibits little or no evidence of contamination.

D.9.2.33 Component TS-002 — Tension Support Structure 2

Component Description

Component TS-002 (Tension Support Structure 2) is a single-level, self-supporting, canvas-covered structure, approximately 90 × 300 ft. This component is located on the Plant 1 Pad, as shown on the Grid 17 and 27 maps in Appendix C, but does not include the pad in the component designation.

Process Area Description

The component is a sprung structure designed to cover and prevent weathering of drums on the Plant 1 Pad. The pads under the support structures will be characterized as part of the Plant 1 Pad sampling program.

Summary of Sampling for Component TS-002

This component does not require sampling. The contaminants expected for the component are of low toxicity, and the component exhibits little or no evidence of contamination.

D.9.2.34 Component TS-003 — Tension Support Structure 3

Component Description

Component TS-003 (Tension Support Structure 3) is a single-level, self-supporting, canvas-covered structure, approximately 90 x 300 ft. This component is located on the Plant 1 Pad, as shown on the Grid 17 and 18 maps in Appendix C, but does not include the pad in the component designation.

Process Area Description

The component is a sprung structure designed to cover and prevent weathering of drums on the Plant 1 Pad. The pads under the support structures will be characterized as part of the Plant 1 Pad sampling program.

Summary of Sampling for Component TS-003

This component does not require sampling. The contaminants expected for the component are of low toxicity, and the component exhibits little or no evidence of contamination.

D.9.3 PROCESS BUILDINGS

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D.9.3.1 Building 1A — Preparation Plant

Component Description

Building 1A (Preparation Plant) is a four-story building located north of 2nd Street and east of A street, as shown on the Grid 27 map in Appendix C. Its shape is irregular, measuring approximately 82 x 202 ft and 50 ft high. The building consists of a structural steel frame with transite panels and a concrete base (Type A building). The floor plans for the building are provided in Figures 1A-1 through 1A-4.

All enriched uranium materials to be processed at the facility were received in Building 1A. Ore concentrates and recycled materials were weighed, sampled, and milled in this plant for distribution to other processes. Uranyl nitrate (UNH) solution was also prepared in Building 1A for use in the Ore Refinery Plant (Component 2A). Several other supporting operations were performed in the plant, including drum sampling and washing, solvent recovery, repackaging, and wastewater treatment.

Process Area Description

Building 1A has seven process areas. Three are dry: drum sampling, crushing/milling, and repackaging. The other process areas are wet: enriched materials reclamation, drum washing, solvent reclamation, and wastewater handling. Anticipated contaminants from these processes are summarized in Table A.3.

Drum Sampling. A main function of the Preparation Plant was to sample and weigh recycle and feed materials, both those produced by the facility and those from off-site vendors. The level

"U"-shaped roller drum conveyor, two drum pushers, a set of inline scales, an automatic closed auger sampling station, a dust enclosure and collector, an air-capping device, and a drum roller/mixer. Materials received in large quantities were sampled with this automatic sampling unit. Smaller lot sizes and wet materials were sampled manually on the sampling pad outside the northwestern corner of Building 1A.

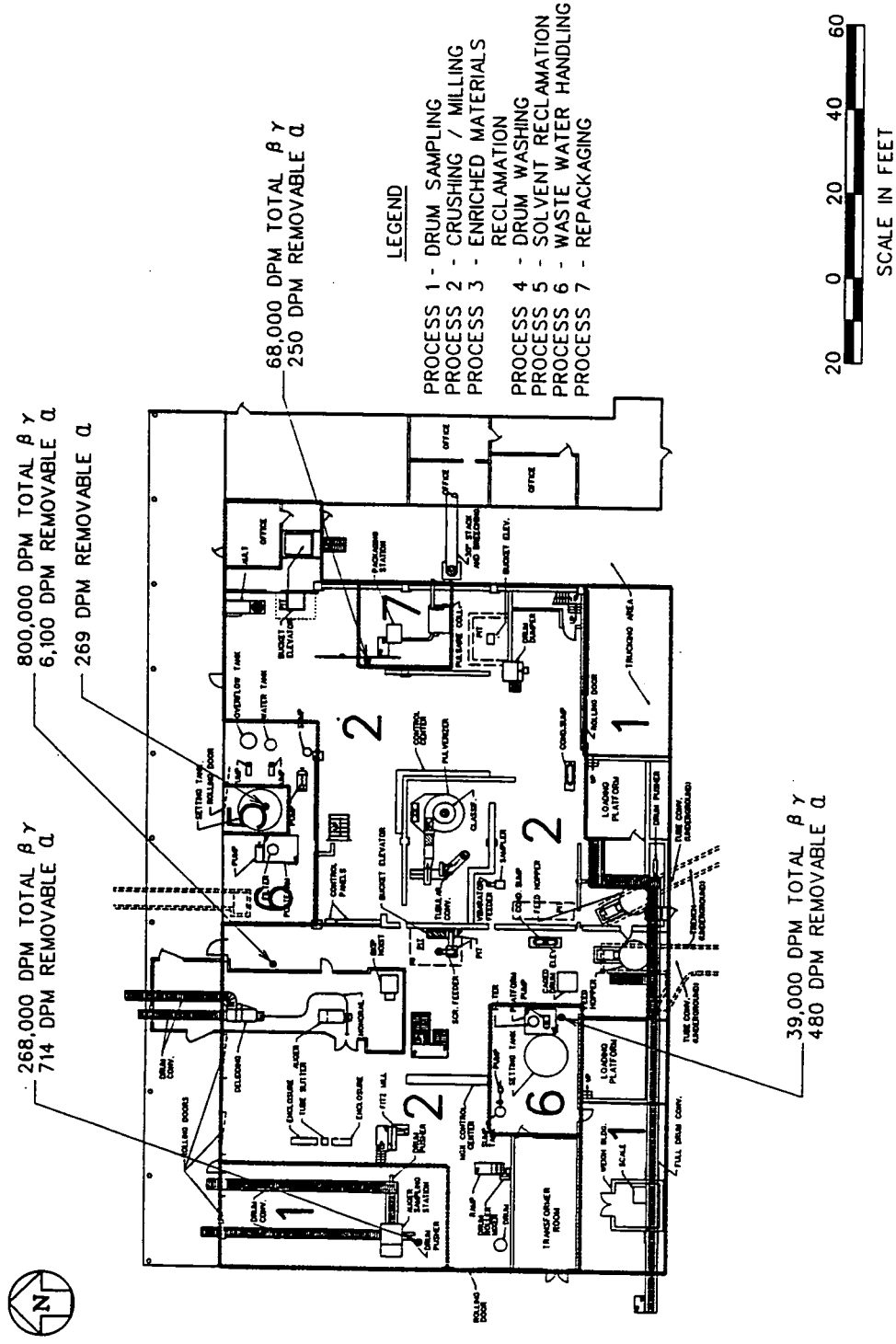

FIGURE 1A-1 Layout of Building 1A — First Floor

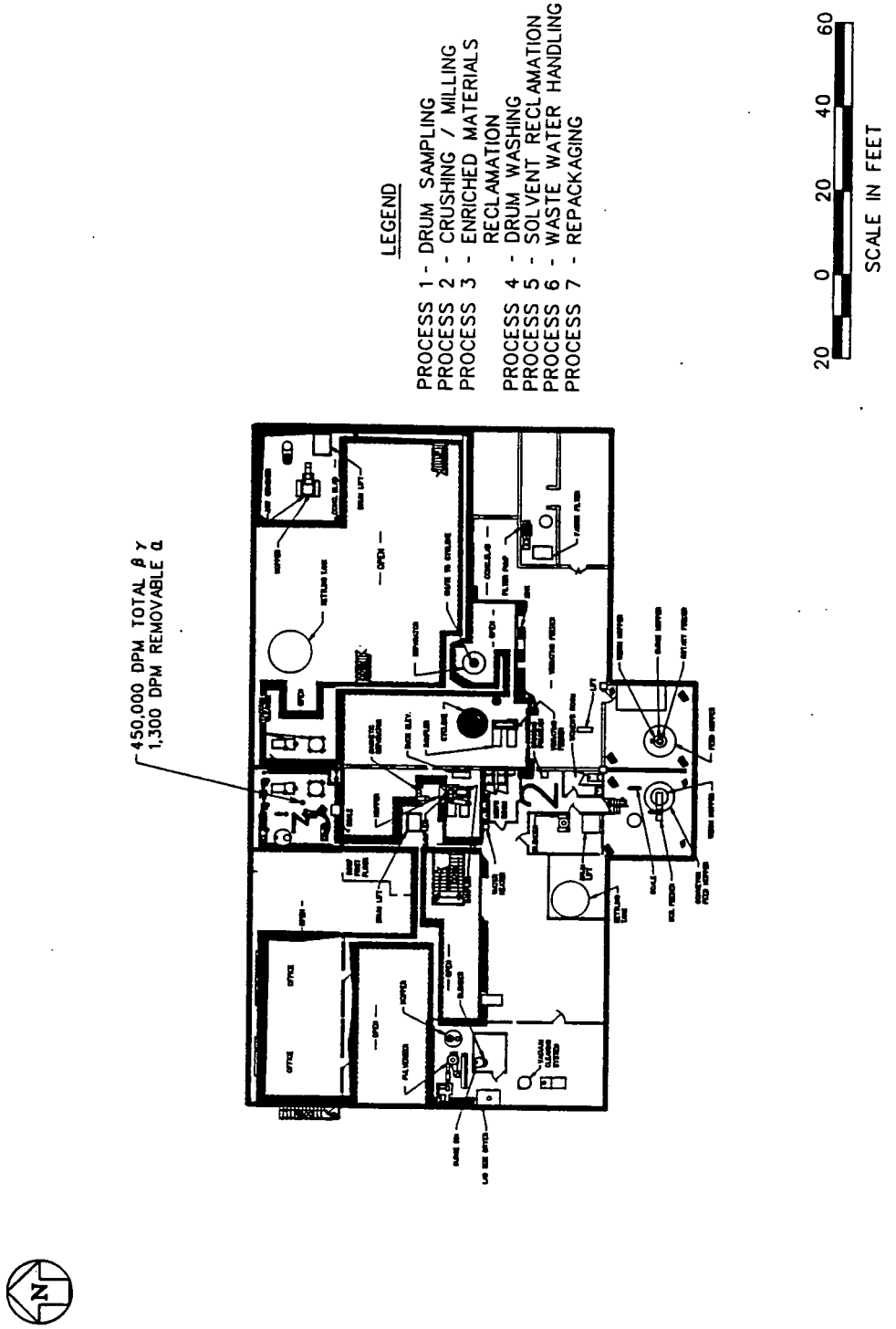

FIGURE 1A-2 Layout of Building 1A — Second Floor

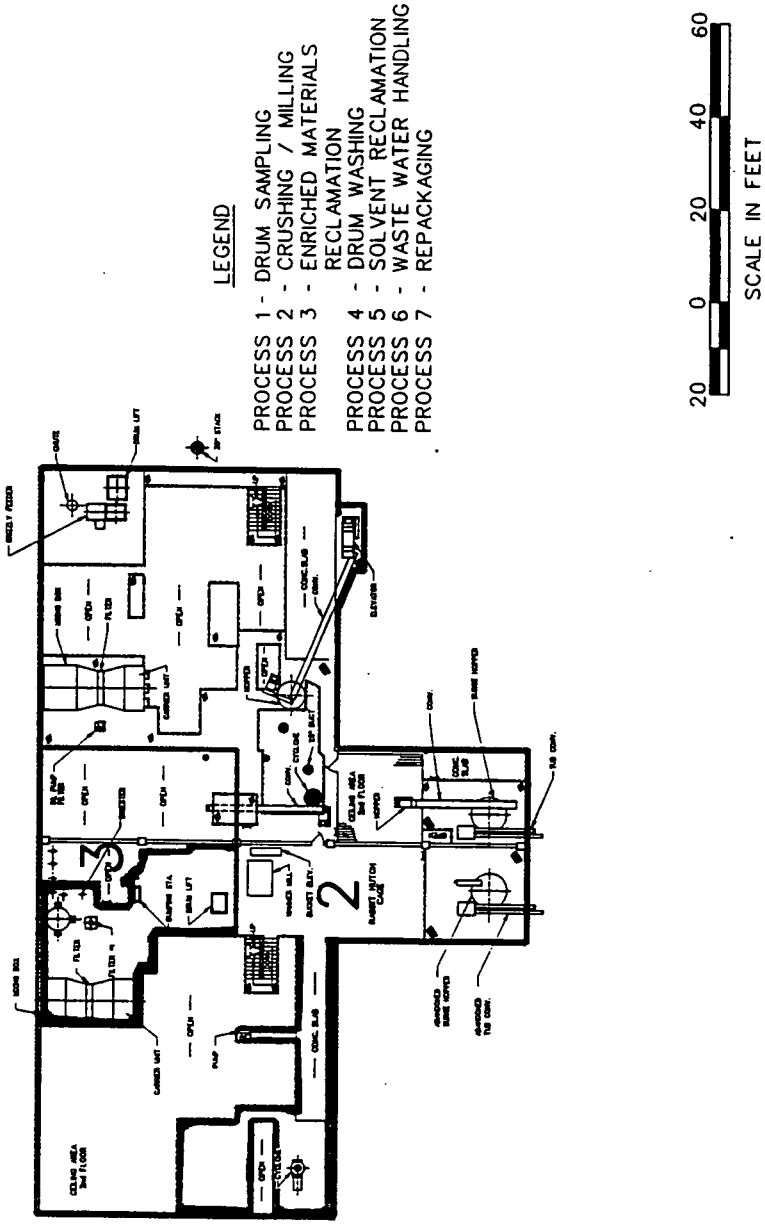

FIGURE 1A-3 Layout of Building 1A — Third Floor

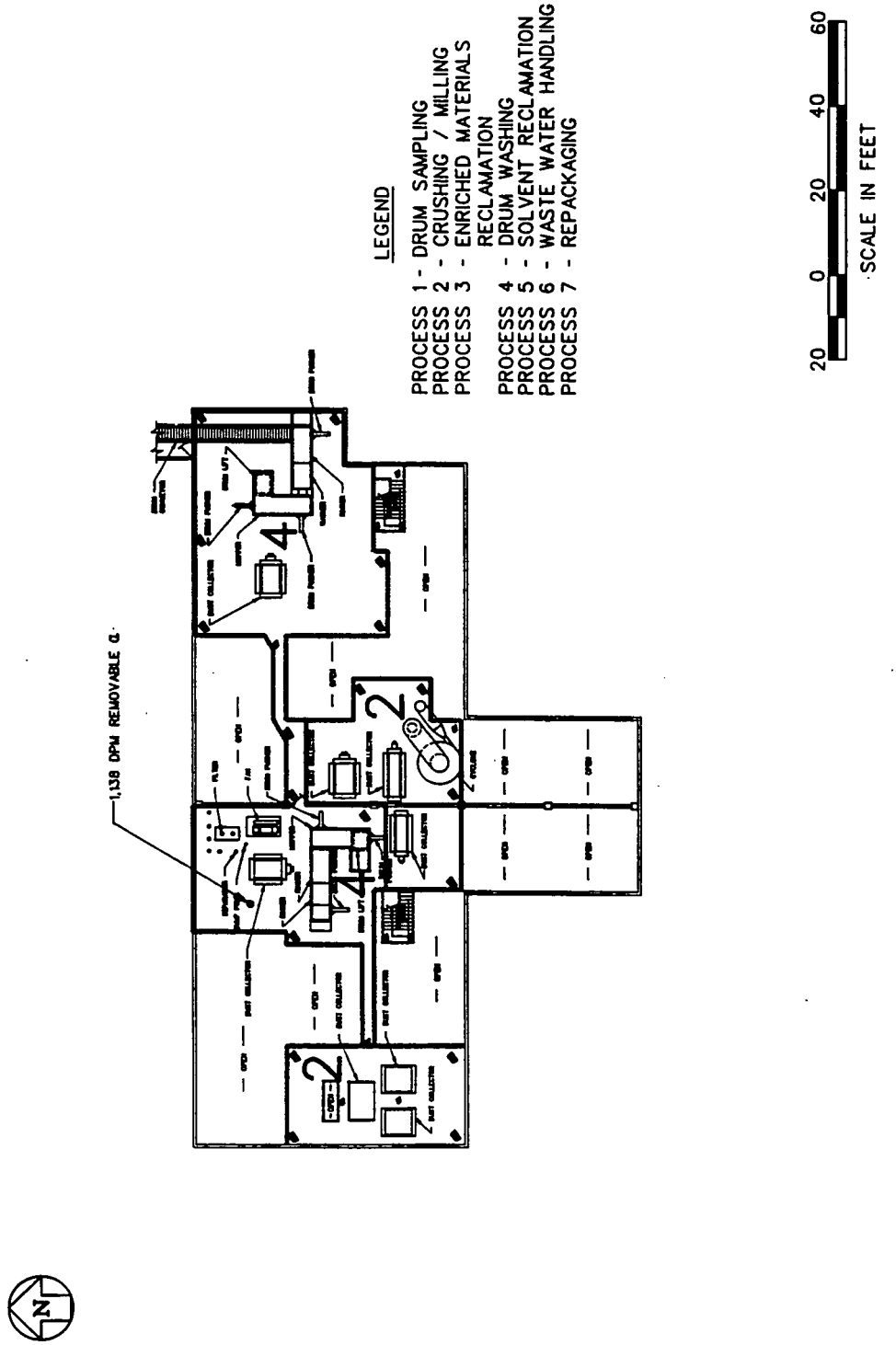

FIGURE 1A-4 Layout of Building 1A — Fourth Floor

Crushing/Milling. Building 1A housed six milling operations to produce smaller-sized particles. Enriched uranium materials, magnesium fluoride (MgF_2), and orange oxide (UO_3) were among the materials milled.

The Thor Mill was used to prepare spent uranium dioxide (UO_2) for recovery. The uranium dioxide arrived as spent fuel pellets, encased in tubes, that originated from other nuclear facilities. The tubes were run through the Pincutter, which divided the tubes into manageable sections. The sections were then processed through the Thor Mill, and the spent uranium pellets were removed. The Sly dust collector controlled dust generated during this process.

The Fitzpatrick Hammer Mill milled uranium materials with enrichment less than 20%. The material to be milled was fed into the mill through twin screw feeders, milled, and discharged to the safe geometry digester unit. The Fitzpatrick Hammer Mill has been replaced, and the new mill was never operated. The Sly dust collector also serviced this process.

The Williams-Titan Mill processed magnesium fluoride (MgF_2) slag leach from the Metals Production Plant (Component 5A). Other materials that contained uranium enrichments of 2.1% or less were also periodically processed. The mill facilitated several pieces of equipment for receiving raw material, feeding the material to the mill, pulverizing, classifying, discharging product, product packaging, dust collection, and explosion suppression. Among the equipment used were the pulverizer, hopper, and cyclone system. All processed material from this mill was either sent back to the Metals Production Plant for reuse as reduction pot liner material or digested for uranium recovery in the Ore Refinery Plant.

Three smaller mills were also historically associated with Building 1A. The Zenith Mill, located on the second floor, was used to process UO_3. The jaw crusher and Hammer Mill, both located on the third floor, were used to process ore materials.

Enriched Materials Reclamation. The safe geometry digestion unit was used in Building 1A to digest uranium enriched up to 10%. Uranyl nitrate was produced by adding nitric acid to uranium compounds such as UO_2, UO_3, and U_3O_8. The resulting UNH slurry was pumped to the Ore Refinery Plant for processing. The safe geometry digestion unit was used to prevent concentrations of enriched product from reaching nuclear criticality levels during the process. As the name suggests, the machine was designed with thick steel walls to protect personnel working in the area. A sump was operated with this system. The enriched materials reclamation unit process ceased in the early 1980s.

Drum Washing. Drum washers were used to clean ore concentrate drums for reuse. Most of the ore received in Building 1A was delivered in drums. The drums were lifted to the fourth floor, where a series of rinsers and washers were located. The wastewater

generated during the process was transferred to the wastewater treatment system on the first floor.

Solvent Reclamation. Solvents were reclaimed in the Detrex Still located on the first floor of Building 1A. Spent dry-cleaning solvents were entered into the still to be purified for reuse in other processing plants. The Detrex Still is considered an HWMU under RCRA regulations.

Wastewater Handling. Two liquid waste treatment facilities served Building 1A. The systems were identical except for their sources of influent. One system collected wastes from the eastern half of the building, and the other collected from the western half of the building. Liquid wastes were collected in sumps and transferred by pumps to the settling tanks until the tanks became full. At this point, the water was recirculated through a filter using slurry pumps. When the filtrate appeared clear, recirculation of the wastewater through the filter was discontinued and the filtrate was discharged to the General Sump (Component 18B). The filter cake that was generated was spread into drying pans, dried in the drying oven, and reprocessed through the system.

Repackaging. A repackaging system for two types of materials was used in Building 1A. One type of repackaging pertained to those materials from Building 1A, and the other pertained to materials associated with the Plant 1 Pad (Component 74T). The materials requiring repackaging included materials milled in Building 1A and materials received from off-site vendors. Materials with varying uranium enrichments required repackaging to meet feed specifications of the plant or process where further processing was to be done. Only enriched materials to be used in other plant processes were handled in this area. The materials associated with the Plant 1 Pad that required repackaging were leaking drums found on the pad. These drums were overpacked in this area with a barrel-turning truck. During repackaging operations, any damaged containers were emptied of all materials before disposal.

Major Media Types per Process Area

The major media for all seven processes in Building 1A are structural steel and concrete. The floors have varying amounts of concrete. The transite siding will be addressed as a separate supplemental sampling activity and is therefore not considered as a major medium in Building 1A.

Summary of Available Radiological Data

Building 1A is routinely sampled for removable alpha and total beta-gamma contamination. Results from the most recent surveys are summarized in Tables A.4.0 and A.4.1 and are the basis for identifying hot spots. The total number of removable alpha and

total beta-gamma survey measurements for the concrete floor medium were 779 and 738 dpm, respectively. These survey measurements were performed in Building 1A from 1989 through 1992. The data have been assembled, and the hot spots for the concrete floor in each process area are identified in Figures 1A-1 and 1A-3.

Overall, the first floor in Building 1A has the highest total beta-gamma contamination. Although the second floor has similar processes, contamination levels are considerably lower; one exception is the area near the safe geometry digestion unit, which has significantly higher contamination. The third floor also reports fairly low levels of contamination with respect to the first floor. Finally, the fourth floor has no total beta-gamma data available; therefore, a comparison cannot be made at this time. The hot spots for the radiological data from 1989 to 1992 for the concrete floor medium have been determined per process area and are described as follows.

The drum sampling process area reported a high total beta-gamma reading of 268,000 dpm. The corresponding removable alpha reading was 714 dpm. This reading was detected near the auger sampling station, as shown in Figure 1A-1.

The crushing/milling process area, which took up most of Building 1A, reported the highest beta-gamma level for the entire building. The total beta-gamma and corresponding removable alpha readings were 800,000 dpm and 6,100 dpm, respectively. Several other high readings, ranging between 200,000 and 450,000 dpm, were detected in this process area.

The enriched materials reclamation process area, which contained the safe geometry digestion unit, reported fairly high total beta-gamma readings. The highest was 450,000 dpm. A reading of 1,300 dpm was detected for the corresponding removable alpha. The safe geometry digestion unit extends several floors, starting at the second, where the high readings were detected.

The drum washing process area occupied most of the fourth floor. The fourth floor had no available total beta-gamma data. The highest removable alpha reading was 1,138 dpm.

The solvent reclamation process area was a small area located in the north-central section of the first floor. No total beta-gamma data were available for this area, either. A single removable alpha reading of 269 dpm was reported for the entire process area.

The wastewater handling process area encompassed the two main sump systems in Building 1A. One sump was located in the northeastern section and the other in the southwestern. The highest total beta-gamma reading for the process area was 39,000 dpm in the southwestern section. The corresponding removable alpha reading was 480 dpm. The highest total beta-gamma measurement for the northeastern section was 18,000 dpm.

The last process area, repackaging, occupied a small section of the eastern half of the building. Total beta-gamma and removable alpha readings were recorded in this area. The highest readings were 68,000 and 250 dpm, respectively.

All data will be reassessed before sampling to include data gathered from ongoing radiological surveys.

Summary of Sampling for Building 1A

One air sample will be taken in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, radiological surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive samples will be performed at the radiological hot spots for the concrete floor medium illustrated in Figures 1A-1 and 1A-3. Concrete chips will be collected from the three dry process areas, and concrete cores will be collected from the four wet process areas. Structural steel scrapings and swipe samples will be collected on the basis of Protocols 1 and 3.

Supplemental liquid samples will be collected from the two main sumps that routed wastewater generated in Building 1A. One sample from each sump will be collected and composited. A loose media supplemental sample will be taken of residues in the metal trough around the safe geometry unit on the second floor. Also, a supplemental sample will be taken of loose debris that has collected around the grizzly feeder in the northeastern corner of the third floor. The grizzly feeder was equipment associated with the jaw crusher as part of the crushing/milling process area. Table 1A-1 summarizes the planned sampling program for Building 1A.

TABLE 1A-1 Sample Types and Quantities for Building 1A

Sample Type	Storage	Component Totals	Enriched Materials Reclamation	Drum Washing	Solvent Reclamation	Waste-water Handling	Repack-aging	Component Totals
Nonintrusive[a]								
Radiological surveys	b	b	b	b	b	b	b	NA[c]
Chemical surveys	b	b	b	b	b	b	b	NA
Air particulates	NA	NA	NA	NA	NA	NA	NA	1
Swipes	2	2	2	2	2	2	2	14
Lab composite swipes	NA	NA	NA	NA	NA	NA	NA	1
Intrusive[a]								
Concrete chips	1	1	NA	NA	NA	NA	1	3
Concrete cores	NA	NA	1	1	1	1	NA	4
Masonry	NA	NA	NA	NA	NA	NA	NA	NA
Steel surface scraping	1	1	1	1	1	1	1	7
Supplemental								
Liquid sample	NA	NA	NA	NA	NA	1	NA	1
Loose media	NA	1	1	NA	NA	NA	NA	2

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.3.2 Building 2A — Ore Refinery Plant

Component Description

Building 2A (Ore Refinery Plant) consists of a structural steel frame with transite panel outside walls and roof (Type A building) that is approximately 62 × 382 ft and 50 ft high. It is a multilevel building with five levels and a penthouse. The interior of the building is divided into three areas separated by transite walls. The building floor is a combination of acid brick and concrete. The building is located south of 2nd Street, east of A Street, and west of B Street, as shown on the Grid 19 map in Appendix C. Building 2A operations used nitric acid digestion processes to convert uranium ores, oxides, metal, and residues into uranyl nitrate solutions, which were then purified. The layout of Building 2A is shown on Figures 2A-1 through 2A-4.

Process Area Description

Five processes have been identified in Building 2A: digestion, drum digestion, extraction, denitration, and enriched calcining. The anticipated contaminants from the five processes in Building 2A are summarized in Table A.3.

Digestion. The digestion area is located in the west portion of Building 2A and is divided into two distinct processions. The northern half of the plant was used for digesting uranium ores and residues that had a high radium content (the "hot" side). The southern half of the building handled uranium materials with little to no radium (the "cold" side). Uranium ores and residues were received on the top floor of Building 2A from the bucket elevators associated with the cold side ore conveyor (Component 2F) and the hot side ore conveyor (Component 2G). The digestion process prepared dilute uranyl nitrate (UNH) by dissolving these uranium ores and uranium-bearing residues in nitric acid. The UNH was then transferred to the extraction area for purification processing.

Drum Digestion. The drum digestion area, also known as the minidigestion area, is located in the middle of the first floor of the ore refinery digestion area. It is a diked area, with a metal floor and stations for eight drum digester tanks. The drum digestion area was used to digest highly enriched uranium materials (up to 2.5% ^{235}U) received from the Preparation Plant (Component 1A).

Premeasured batches of specified materials were received in the drum digester tanks from the Preparation Plant. Nitric acid and water were added to the tanks and then thoroughly mixed. When the digestion process was complete, the material was recycled through a plate-and-frame filter or through a cartridge filter until it was clear. Then the material was pumped through one of two polishing cartridges filters and into tank F1-12,

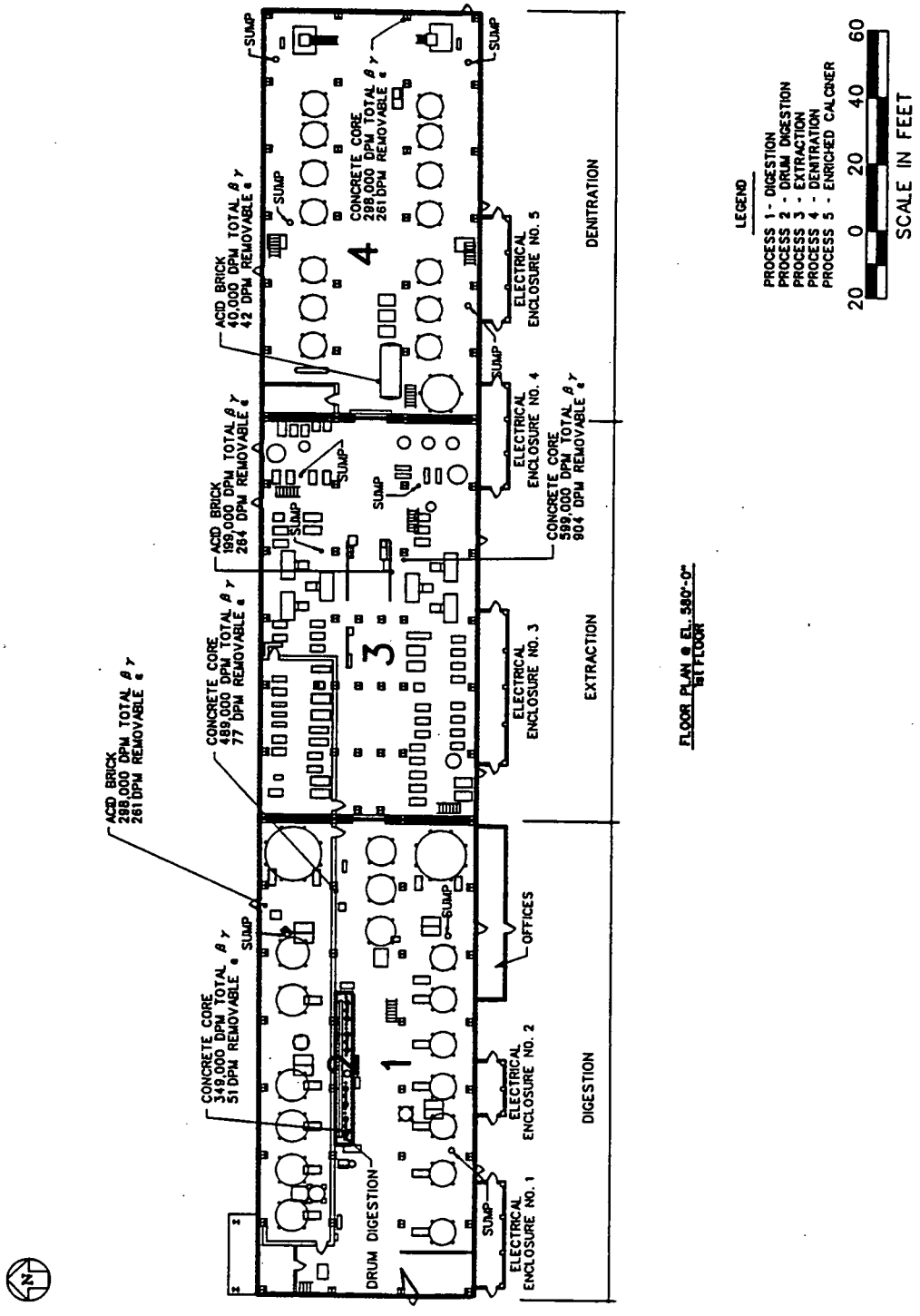

FIGURE 2A-1 Layout of Building 2A — First Floor

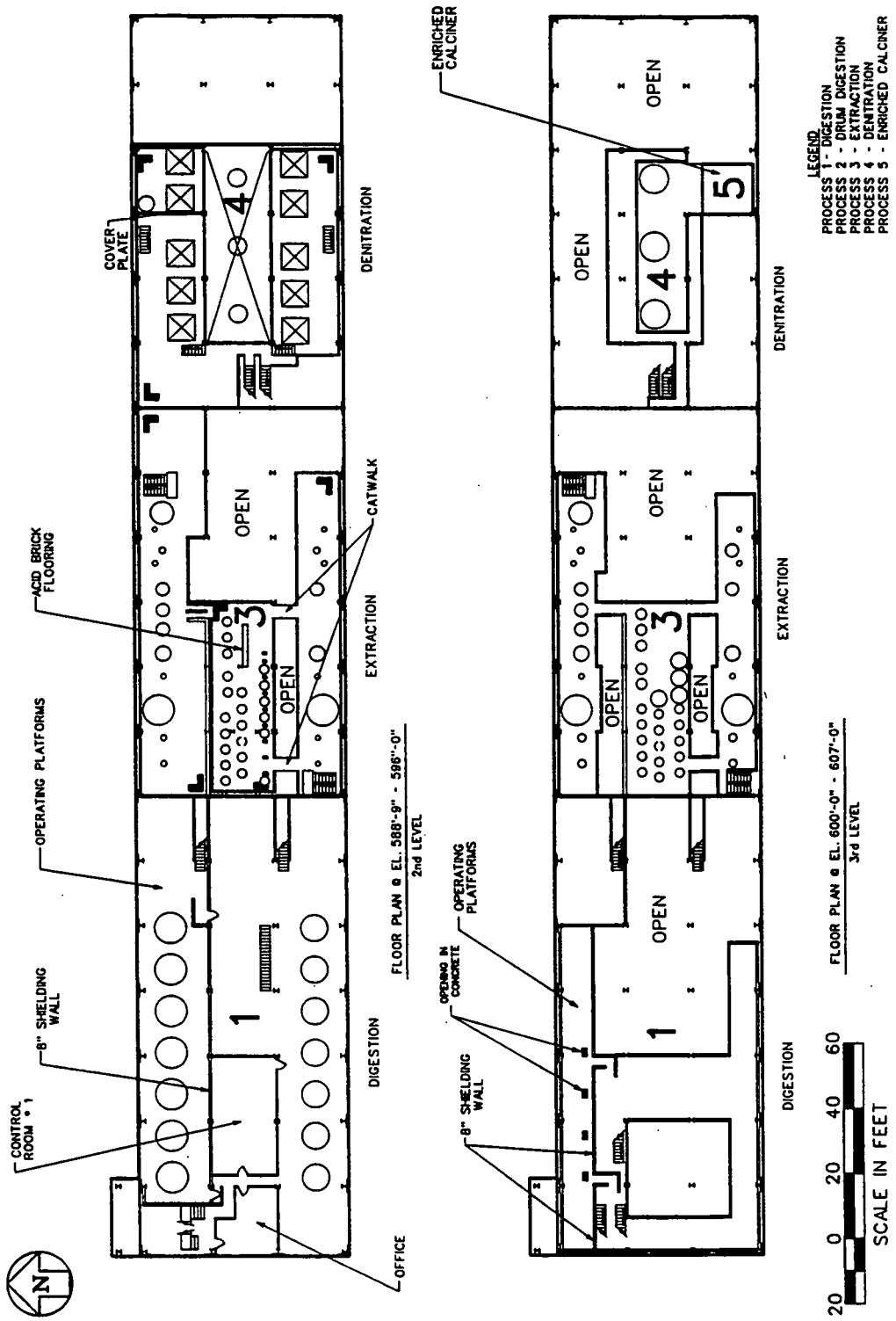

FIGURE 2A-2 Layout of Building 2A — Second and Third Floors

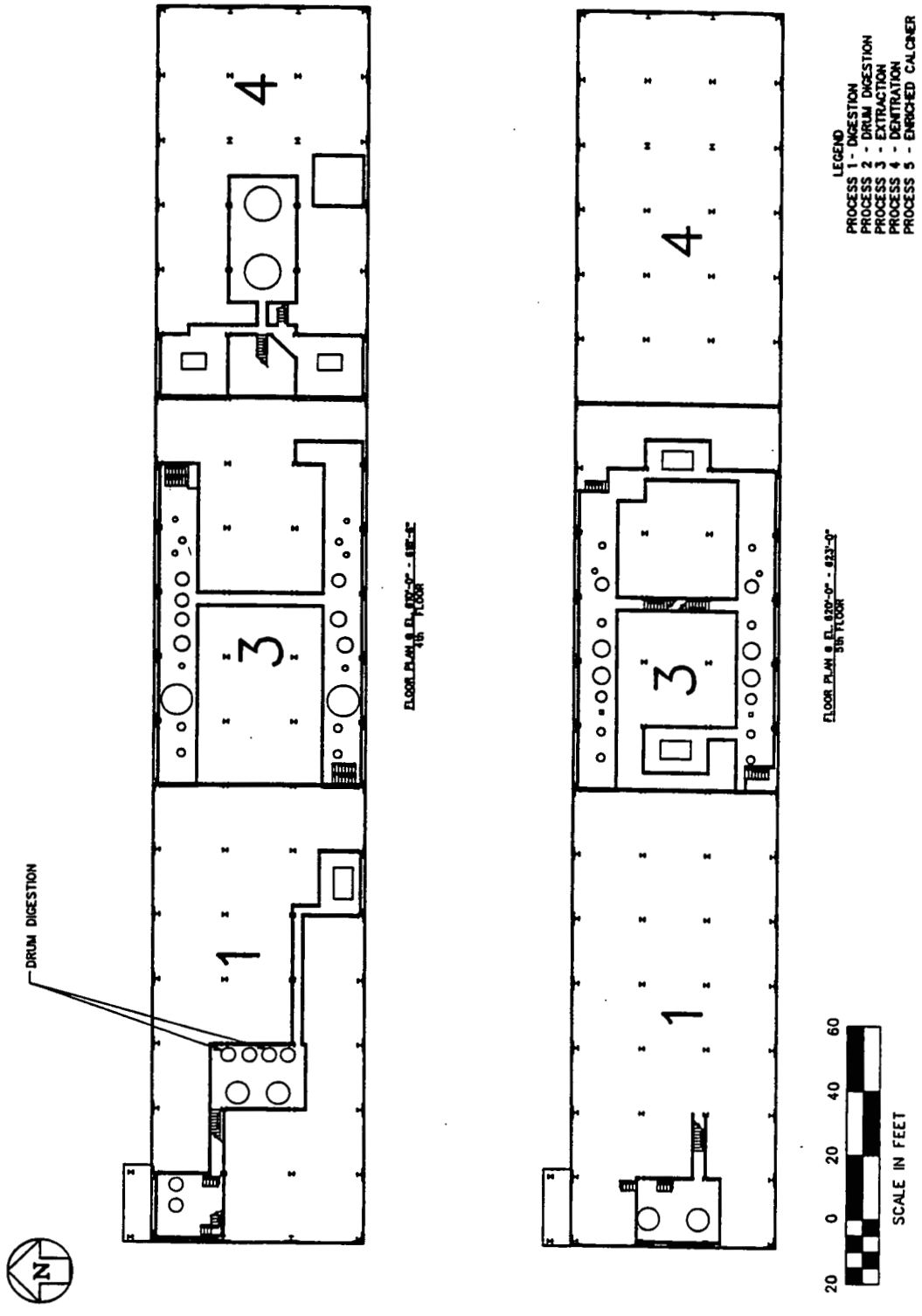

FIGURE 2A-3 Layout of Building 2A — Fourth and Fifth Floors

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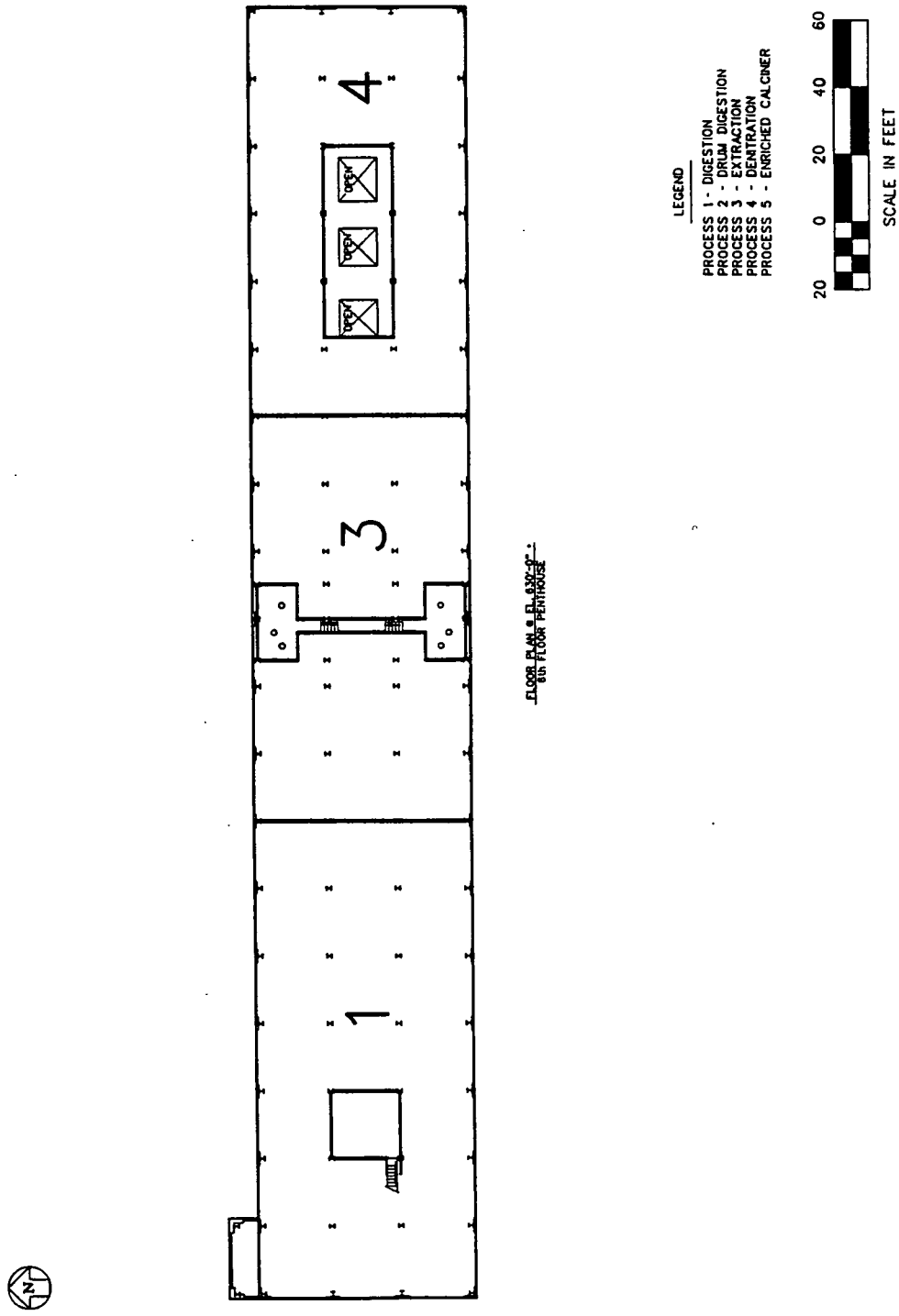

FIGURE 2A-4 Layout of Building 2A — Penthouse

located in the middle of the drum digestion area. The material was then pumped into other tanks for storage or into tanks to be blended with other digestion products for extraction feed. The drum digestion process occurred until the early 1980s.

Extraction. The extraction area is located in the central portion of Building 2A. The extraction process is carried out with equipment located on the north side of the building. The south side of the extraction area is totally abandoned except for the deionizer equipment, which is located in the southeastern corner of the first floor. The purpose of the liquid-liquid countercurrent solvent extraction operation is to purify uranyl nitrate solution. This is accomplished by contacting the solution with organic solvent (tributyl phosphate in kerosene) in stainless steel, perforated plate pulse columns. In so doing, uranyl nitrate transfers to the solvent phase, leaving most of the impurities in the aqueous raffinate. The solvent phase is then scrubbed by contacting it with a small amount of deionized water to remove residual contaminants. Degraded solvent is recovered through an acid-charcoal treatment. A black-extraction process is used to return the uranyl nitrate to an aqueous solution by contacting the uranium-rich solvent with hot, deionized water, yielding a solution of uranyl nitrate.

Denitration. The denitration area is located in the eastern portion of Building 2A. Purified aqueous uranyl nitrate solution is thermally decomposed into uranium trioxide (UO_3) powder in the denitration area. The main elements of denitration equipment are 2 boildown tanks, 3 sparge tanks, and 14 denitration pots. Feed material is cascaded from the boildown tanks, through the sparge tanks, and to the denitration pots by gravity. Concentration of pure uranyl nitrate solution is accomplished in the boildown tanks and sparge tanks. Molten uranyl nitrate hydride is fed to denitration pots for conversion to UO_3. From the denitration pot, UO_3 is gulped and packaged for further processing.

Enriched Calcining. The safe geometry rotary calciner, in which up to 10% enriched UNH solution was calcined to produce black oxide (U_3O_8) for use as sweetener, is located on the southern side of the third level in the denitration area.

Major Media Types per Process Area

The major media identified for Building 2A are the acid brick, concrete floor and walls, and structural steel. Because transite will be addressed on a site-wide basis as a supplemental sample, it will not be included as a major medium for Building 2A's sampling activities.

Summary of Available Radiological Data

Building 2A is routinely surveyed for removable alpha and total beta-gamma contamination. Results are summarized in Tables A.4.0 and A.4.1 and are the basis for identifying hot spots. From 1989 to 1992, 729 removable alpha measurements were

performed on the floor media; the highest removable alpha measurement was recorded at 42,184 dpm. In 1991, 674 total beta-gamma measurements were performed, with an average of 85,000 dpm and a highest measurement of 999,000 dpm.

In the digestion area, 195 removable alpha measurements were performed on the floor media, with the highest removable alpha measurement recorded at 2,255 dpm. In 1991, 196 total beta-gamma measurements were performed, with an average of 91,000 dpm and a highest measurement of 469,000 dpm.

In the drum digestion area, two removable alpha and total beta-gamma measurements were performed on the floor media. The highest measurement recorded for removable alpha was 655 dpm; the highest for total beta-gamma was 349,000 dpm.

In the extraction area, 323 removable alpha measurements were performed on the floor media, with the highest removable alpha measurement recorded at 1,209 dpm. In 1991, 313 total beta-gamma measurements were performed, with an average of 94,000 dpm and a highest measurement of 999,000 dpm.

In the denitration area, 211 removable alpha measurements were performed on the floor media; the highest removable alpha measurement was recorded at 42,184 dpm. In 1991, 165 total beta-gamma measurements were performed; the average was 62,000 dpm, and the highest measurement was 349,000 dpm.

No radiological measurements were collected in the enriched calcining area for either removable alpha or total beta-gamma. This area will be surveyed to determine the sampling locations.

The data have been assembled, and the hot spots for the acid brick and concrete are identified in Figures 2A-1 through 2A-3. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys.

Summary of Sampling for Building 2A

One airborne particulate sample will be collected in the building and analyzed per process area for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail a final intrusive sampling location for each process area.

In the digestion, extraction, and denitration areas, the major media were identified as the concrete floor and walls, acid brick, and structural steel. Because of the use of nitric acid, one concrete core sample will be collected per process area from the concrete floor or wall. One acid brick masonry sample and one structural steel surface scraping will be collected per process area. In the drum digestion area, the major medium identified was the concrete dike and walls. One concrete core sample will be collected. In the enriched

calcining area, the major medium identified was structural steel; a structural steel surface scraping will be collected from the steel supports.

Visual inspection of the building identified ten sumps in the digestion, extraction, and denitration areas. A composite liquid sample will be collected from the sumps within each area. In the denitration area, some yellow staining of acid brick occurred; a supplemental sample of the yellow material will be collected. Table 2A-1 summarizes the planned sampling program for Building 2A.

TABLE 2A-1 Sample Types and Quantities for Building 2A

Sample Type	Digestion	Drum Digestion	Extraction	Denitration	Enriched Calcining	Component Totals
Nonintrusive[a]						
Radiological surveys	b	b	b	b	b	NA[c]
Chemical surveys	b	b	b	b	b	NA
Air particulates	NA	NA	NA	NA	NA	1
Swipes	3	1	3	3	1	11
Lab composite swipes	NA	NA	NA	NA	NA	1
Intrusive[a]						
Concrete chips	NA	NA	NA	NA	NA	NA
Concrete cores	1	1	1	1	1	4
Masonry	1	NA	1	1	NA	3
Steel surface scraping	1	NA	1	1	1	4
Supplemental						
Liquid sample	1	NA	1	1	NA	3
Loose media	NA	NA	NA	1	NA	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.3.3 Building 2D — Metal Dissolver Building

Component Description

Building 2D (Metal Dissolver Building) is a two-story building located south of 2nd Street (Grid 19 map of Appendix C). Its shape is irregular, measuring approximately 39 × 50 ft and 20 ft high. The building consists of a structural steel frame with transite panels on a poured concrete base (Type A building). The interior of the building is essentially one room with a diamond plate mezzanine. The floor plan for the building is shown in Figure 2D-1. Building 2D housed operations that digested or dissolved uranium-containing materials. Three dissolution processes have been identified in Building 2D: metal dissolution, west metal dissolution, and charcoal treatment.

Process Area Description

The operations practiced in Building 2D used nitric acid solution to promote dissolution of uranium or other metal contaminants. Anticipated contaminants from these processes are summarized in Table A.3.

Metal Dissolution. The metal dissolver tank received solid uranium scrap metal from the metal production plant (Component 5A). Top crops, derbies, slugs, and out-of-specification ingots and fuel rods were among the products received. The scrap metal was sprayed with nitric acid in the metal dissolver tank to dissolve the uranium into uranyl nitrate (UNH). Temperature controls were used to optimize the performance of the nitric acid to reach the specified concentration of 250 to 400 g/L U required before the solution was diverted to the digestion process in the Ore Refinery Plant (Component 2A). The nitric oxide fumes were routed through a condenser, and the acid was reformed. The nitric gases went through the Venturi fume scrubber and on to the NAR Towers (Component 3D). The metal dissolver tank was replaced in 1990 with a new tank, which was never used. The original metal dissolver tank was located in the southwestern section of Building 2D; the new metal dissolver tank is located in the north-central section. An electrical control room is also included as part of this process area.

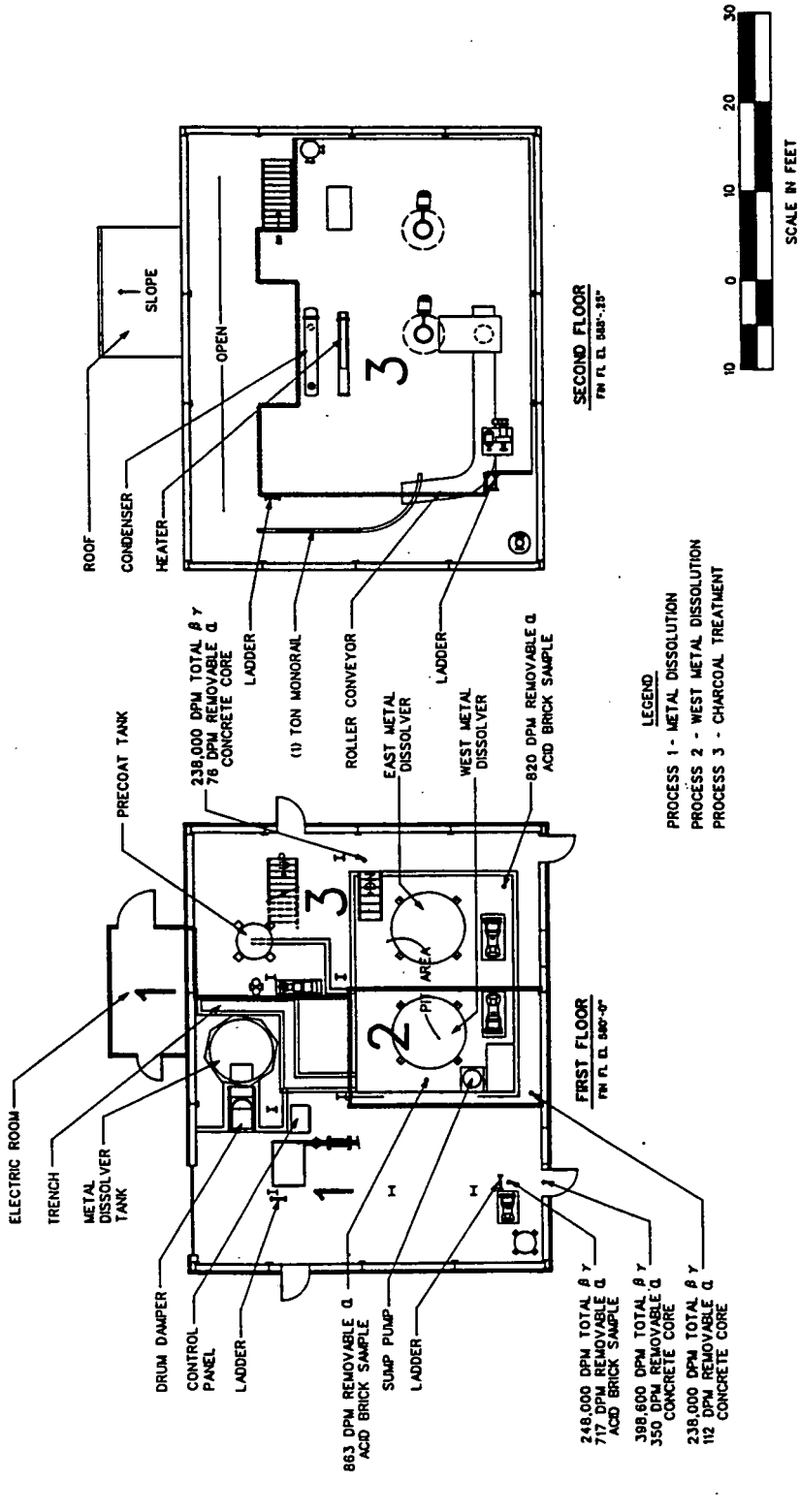

FIGURE 2D-1 Layout of Building 2D

West Metal Dissolution. The west metal dissolver tank received various end products from the Recovery Plant (Component 8A), primarily black oxides and calcium uranate. The west metal dissolver tank was filled with heated UNH solution from the digestion process in the Ore Refinery Plant. Additional nitric acid was added to dissolve the metal oxides. If fluorine was known to be present, alumina was also added to the solution. The solution was required to reach 200 g/L U for use as product solution.

Charcoal Treatment. Contaminated solvents from the extraction process in the Ore Refinery Plant were reclaimed through the charcoal treatment process. The spent material was composed of tributyl phosphate (TBP) and kerosene. The spent solvents were mixed with nitric acid in the east metal dissolver tank. Charcoal was added to adsorb the solvent contaminants. The resulting slurry was filtered through a small rotary drum vacuum filter located on the second floor. The filtrate was routed through an in-line carbon polishing system and reused. The filtered solids were disposed of in drums. During the building inspection, oil was found collecting in the tray beneath the filter.

Major Media Types per Process Area

Building 2D has a steel frame with transite panels for the roof and exterior walls. The first floor is concrete except for the acid brick located in the area previously occupied by the original metal dissolver and in the pit around the west and east metal dissolvers. A mezzanine, constructed of diamond plate, extends more than halfway across the building from the south wall. The structural steel, concrete, and acid brick are considered the major media for the component. Because the transite siding is addressed as a separate supplemental sampling activity, it is not considered as a major medium in Building 2D.

Summary of Available Radiological Data

Building 2D is routinely sampled for removable alpha and total beta-gamma contamination. Results from these surveys are summarized in the Work Plan Addendum and are the basis for identifying hot spots. From 1989 through 1992, 30 survey measurements were performed for both removable alpha and total beta-gamma for the concrete floor medium in Building 2D. The total number of survey measurements for the acid brick floor medium in Building 2D was 22 for removable alpha and 7 for total beta-gamma. The data have been assembled, and the hot spots for the acid brick and concrete are identified in Figure 2D-1. Radiological data do not exist for the control room. The control room is isolated from the process areas and, therefore, considered to have little impact on the hot spot determinations. All data will be reassessed before sampling to include data gathered from ongoing radiological surveys.

The highest total beta-gamma readings obtained from surveying the concrete floor in the three process areas were 398,600 dpm for metal dissolution, 238,000 dpm for west metal dissolution, and 238,000 dpm for charcoal treatment. The corresponding removable

alpha survey readings, per process area respectively, were 350, 112, and 76 dpm. High total beta-gamma readings were associated with the concrete bordering the acid brick pit, which contains the west and east metal dissolver tanks.

The highest total beta-gamma reading, determined from the 1989 to 1992 survey measurements, for the acid brick medium in the metal dissolution process area is 248,000 dpm. An alpha removable reading of 717 dpm correlates with this data point. Total beta-gamma readings have not been collected from the acid brick pit in the west metal dissolution or charcoal treatment process areas. The highest accessible removable alpha readings for the acid brick medium in these two process areas were 863 and 820 dpm, respectively. The acid brick, in both of these process areas, averages near 450 dpm.

Summary of Sampling for Building 2D

One air sample will be taken in the component and analyzed for airborne radiological and chemical contaminants on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, radiological surveys, and swipes, will be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive samples will be performed in the locations identified by the radiological hot spots for the concrete and the acid brick media shown in Figure 2D-1 and as discussed above. Because Building 2D contained wet, acidic processes, three concrete cores (one per process area) will be taken for the concrete intrusive samples. Three acid brick samples will also be collected. Structural steel scrapings and swipe samples will be collected on the basis of Protocols 1 and 3.

On the basis of the building inspection, a supplemental liquid sample will be taken from the trench surrounding the acid brick-lined pit. A supplemental loose media sample will be taken near the south wall on the second floor. Table 2D-1 summarizes the planned sampling program for Building 2D.

TABLE 2D-1 Sample Types and Quantities for Building 2D

Sample Type	Metal Dissolution	West Metal Dissolution	Charcoal Treatment	Component Totals
Nonintrusive[a]				
Radiological surveys	b	b	b	NA[c]
Chemical surveys	b	b	b	NA
Air particulates	NA	NA	NA	1
Swipes	3	3	3	9
Lab composite swipes	NA	NA	NA	1
Intrusive[a]				
Concrete chips	NA	NA	NA	NA
Concrete cores	1	1	1	3
Masonry	1	1	1	3
Steel surface scraping	1	1	1	3
Supplemental				
Liquid sample	NA	1	NA	1
Loose media	NA	NA	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.3.4 Building 3E — Hot Raffinate Building

Component Description

Building 3E (Hot Raffinate Building) is a three-story building located north of 2nd Street and shown on the Grid 19 map in Appendix C. Its shape is irregular, measuring approximately 50 × 90 ft and 60 ft high at its greatest dimensions. The building consists of a structural steel frame with a poured concrete base. The building's architectural features, such as heavy concrete walls and dividers and double-pane, water-filled windows, protected operators from radiological dose from high-radium raffinate streams. The floor plans for the building are provided in Figures 3E-1 through 3E-3. Building 3E housed one process — filtration — that used a combination of several filters, pumps, and tanks.

Process Area Description

Building 3E houses a system of tanks, pumps, and filters that were used to filter insolubles from raffinate solutions, uranyl nitrate solutions (UNH), and slag leaching solutions. The anticipated contaminants for Building 3E are summarized in Table A.3.

Building 3E received raffinate solutions from the Ore Refinery Plant (Component 2A) following the extraction process. Originally, raffinates from natural uranium ores and ore concentrates were processed in the filtering process. Later, the process equipment was used for other purposes, including slightly enriched UNH solution filtration; currently, the filter feed tanks are used as storage tanks for UNH. In the process, the initial solution was held in the filter feed tanks located on the first floor along the east wall. The solution was filtered through two separate filtering systems. The first system was the Oliver rotary drum vacuum filters; Dicalite was used as the filter aid. From the combined filtrate holding tanks, the solution was transferred through porocarbon polishing filters for final filtering. The filter cake, containing the filtered insolubles from both filtering processes, was deposited in the cake slurry holding tanks. Initial processing during the early 1950s involved pumping high-radium raffinate slurry to K-65 Silos 1 and 2 through the utility trench (Component 22E). Decant from the K-65 Silos was returned through the trench and collected in the tank located on the northwestern corner of Building 3E before being transferred for treatment. Subsequently, low-radium raffinate slurry was pumped to the Building 39A Pad (Component 74W) for drying in a spray calciner. The solids were then pneumatically conveyed out to Silo 3. In later years, the raffinate slurry was neutralized with lime before being pumped out for storage in the pit area (Grid 31 map in Appendix C).

Another solution that was filtered through Building 3E originated from the slag leaching process. Magnesium fluoride slag from the Metals Production Plant (Component 5A) reduction process, containing up to 5% uranium by weight, was milled by the Preparation Plant (Component 1A) and digested in acid in the Ore Refinery Plant (Component 2A) before arriving at Building 3E where the filtering process began.

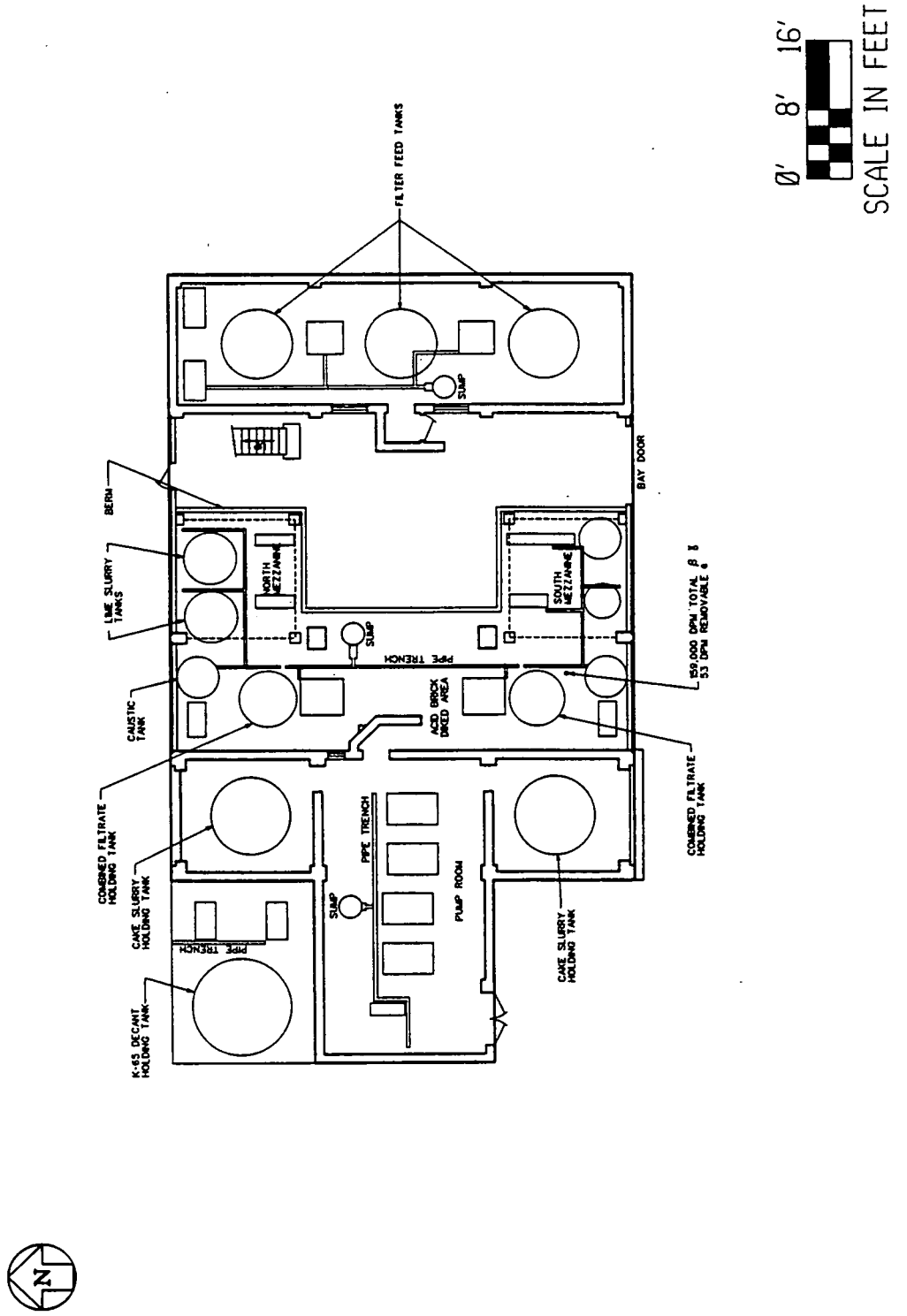

FIGURE 3E-1 Layout of Building 3E — First Floor

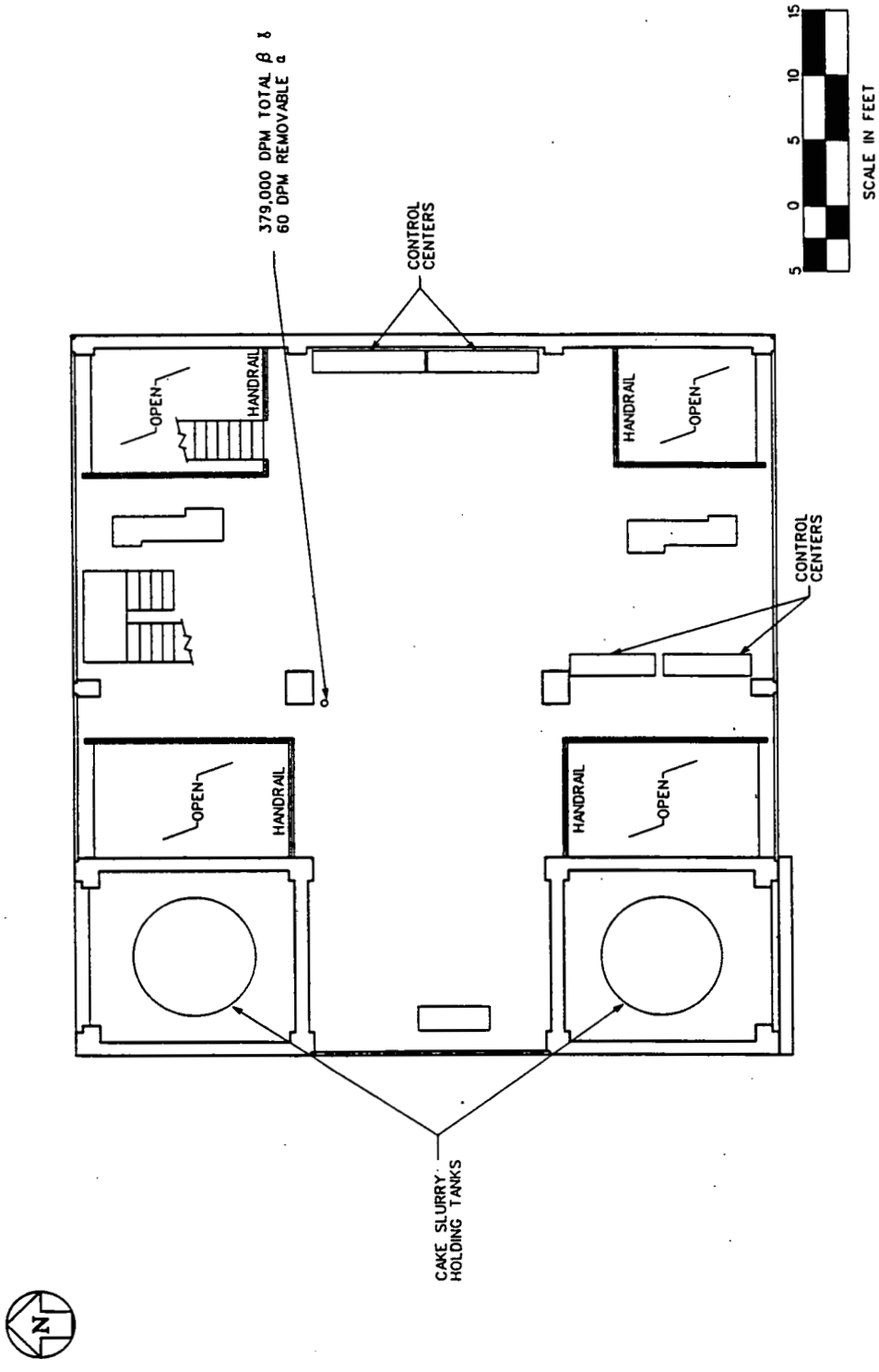

FIGURE 3E-2 Layout of Building 3E — Second Floor

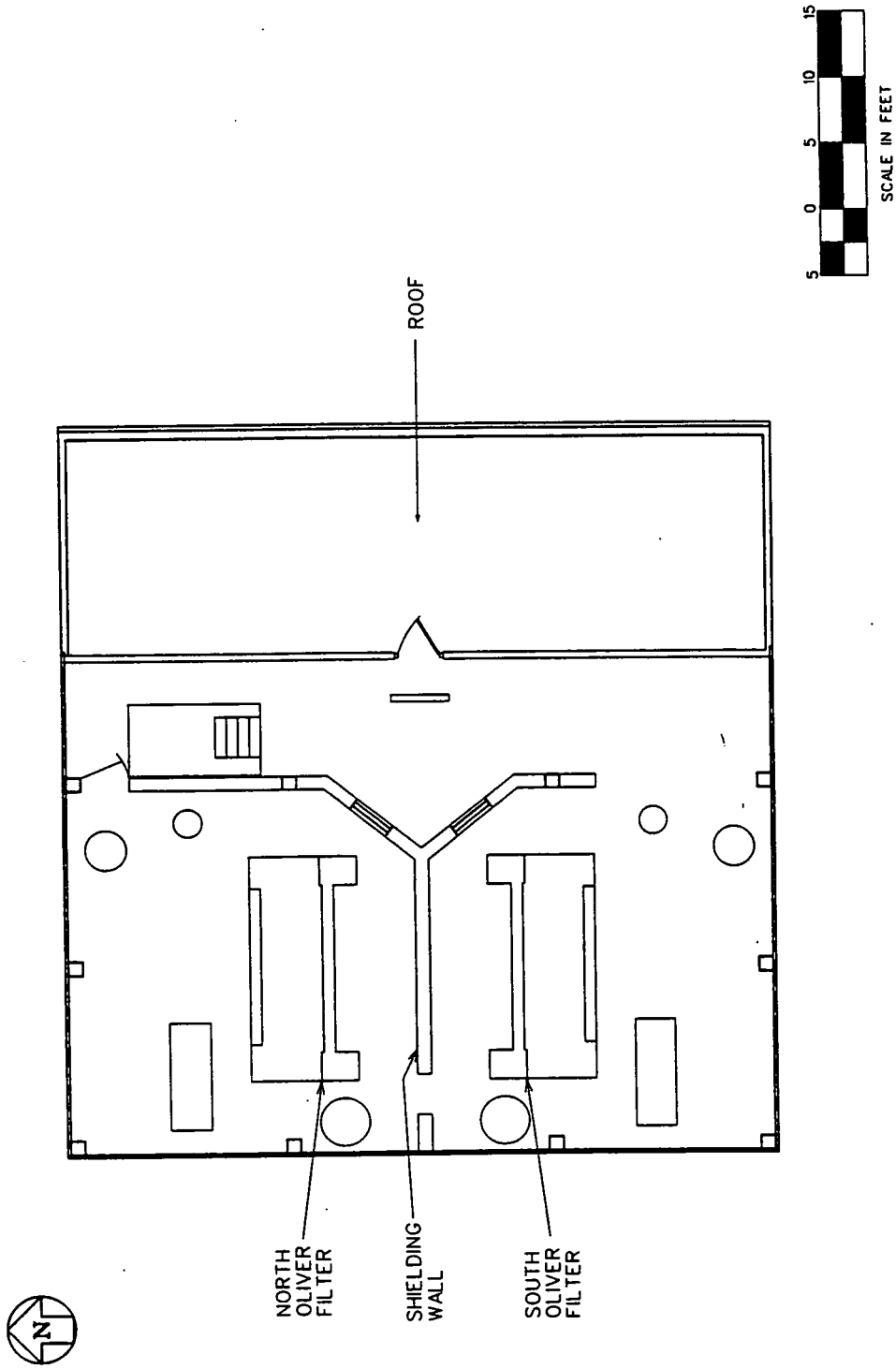

FIGURE 3E-3 Layout of Building 3E — Third Floor

The filtering process used a scrubber system to neutralize nitric acid fumes generated by the filtrate coming from the Oliver filters. The scrubber system used sodium hydroxide (NaOH) as the neutralizing agent; the NaOH was stored in a 250-gal tank on the first floor of Building 3E.

Major Media Types per Process Area

Building 3E has a steel frame with transite panels for the roof and most of the outer wall. For shielding purposes, the walls surrounding the two cake slurry holding tanks and the remainder of the inner walls are concrete. The three floors are primarily concrete except for the acid brick-lined diked area on the first floor, where several process support tanks were located. The structural steel, concrete, and acid brick are considered the major media for the component. Because the transite siding is addressed as a separate supplemental sampling activity, it is not considered as a major medium in Building 3E.

Summary of Available Radiological Data

Building 3E is routinely sampled for removable alpha and total beta-gamma contamination. Results from the 1992 survey are summarized in Table A.4-1 and are the basis for identifying hot spots. As indicated in Table A.4-1, 81 total beta-gamma and 80 removable alpha survey measurements were performed on the floor media in Building 3E from 1989 through 1992. Subsequently, 36 total beta-gamma and 37 removable alpha survey measurements were performed on accessible areas. The data have been assembled, and the hot spots for the acid brick and concrete are identified in Figures 3E-1 and 3E-2. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys.

The highest total beta-gamma contamination for the concrete medium was determined to be in the center of the second floor of Building 3E, as indicated on Figure 3E-2. At this location, the total beta-gamma and removable alpha readings were 379,000 and 60 dpm, respectively. During a visual inspection of Building 3E, the field team noted yellow staining in this area, indicative of uranyl nitrate. Total beta-gamma readings on the first floor were generally one order of magnitude lower than that of the second floor hot spot, except for the walls and floor surrounding the two cake slurry holding tanks, which were only slightly lower. The concrete third floor has total beta-gamma contamination that is also only slightly lower than the concrete hot spot.

The highest total beta-gamma contamination for the acid brick medium was determined to be in a corroded area of brick near the south combined filtrate holding tank on the first floor. The total beta-gamma and removable alpha readings for this spot were 159,000 and 53 dpm, respectively. The other 15 acid brick measurements were well below this level.

Summary of Sampling for Building 3E

One airborne particulate sample will be taken in the component and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, radiological surveys, and swipes, will be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive sampling will be performed in the locations identified by the radiological hot spots for the concrete and the acid brick media shown in Figures 3E-1 and 3E-2 as discussed. Because Building 3E contains a wet, acidic process, a concrete core will be taken for the concrete intrusive sample. A structural steel scraping and swipe samples will be collected on the basis of Protocols 1 and 3.

On the basis of the building inspection, a composite liquid supplemental sample will be taken from the three sumps located on the first floor. Also identified during the inspection was a measurable amount of liquid on the acid brick floor, located next to the north caustic tank. A second supplemental liquid sample will be collected from this area. No significant loose solid media was observed during the building inspection. Table 3E-1 summarizes the planned sampling program for Building 3E.

TABLE 3E-1 Sample Types and Quantities for Building 3E

Sample Type	Filter Process	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	3	3
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	1	1
Steel surface scraping	1	1
Supplemental		
Liquid sample	2	2
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.3.5 Building 4A — Green Salt Plant

Component Description

Building 4A (Green Salt Plant) is a seven-level, five-story, rectangular structure measuring 146 × 194 ft and 71 ft high. It is constructed of a structural steel frame enclosed by transite siding and roofing panels and is supported on a reinforced poured concrete base (Type A building). The floors of the first level (ground floor) of Building 4A are concrete. The floors of the other six levels are either steel diamond plating or steel catwalks. Building 4A is located south of 2nd Street between B Street and C Street near the central portion of the FEMP production area, as shown on the Grid 13 map in Appendix C.

Building 4A housed the hydrofluorination process at Fernald and was used until 1988 for the conversion of uranium trioxide (UO_3, orange oxide) to uranium tetrafluoride (UF_4, green salt). Production of metal-grade UF_4 was initially only possible with the UO_3 produced at the Ore Refinery Plant (Component 2A). As processes were optimized around the FEMP site and the hydrofluorination process was adjusted to compensate for lower-quality feeds, UO_3 feeds from the Port Hope Refinery, Richland Operations, and the Savannah River Plant were received and processed. During the mid-1960s, Building 4A was able to handle many different feed types simultaneously, with as many as five different isotopic levels run in parallel without significant crossover. Building 4A was also used during 1954 for the hydrofluorination of thorium oxide. Floor plans for the building are provided in Figures 4A-1 through 4A-7.

Process Area Description

Building 4A contained 11 processes, some of which were in use for a limited time. The building is also equipped with a dust collector system and dust collector drumming stations. Fourteen dust collectors serviced the work areas, chemical reactor banks, and the three UF_4 packaging stations located in Building 4A. Several dust collector drumming stations were also located on the first floor.

The processes are described in detail in the following sections and have been segregated for sampling into three process areas as shown in Table 4A-1 and Figure 4A-1. The anticipated contaminants for Building 4A are summarized in Table A.3.

Hydrofluorination Process Area. This process area includes most of the Building 4A facility, including the 12 reactor banks.

Hydrofluorination Banks. In general, the hydrofluorination process involved contacting UO_3 at high temperature with hydrogen gas (generated from dissociated ammonia) in a two-stage fluidized bed reactor to form uranium dioxide (UO_2, brown oxide). The UO_2 passed through a Cocoa reactor while in a hydrogen atmosphere and was then processed

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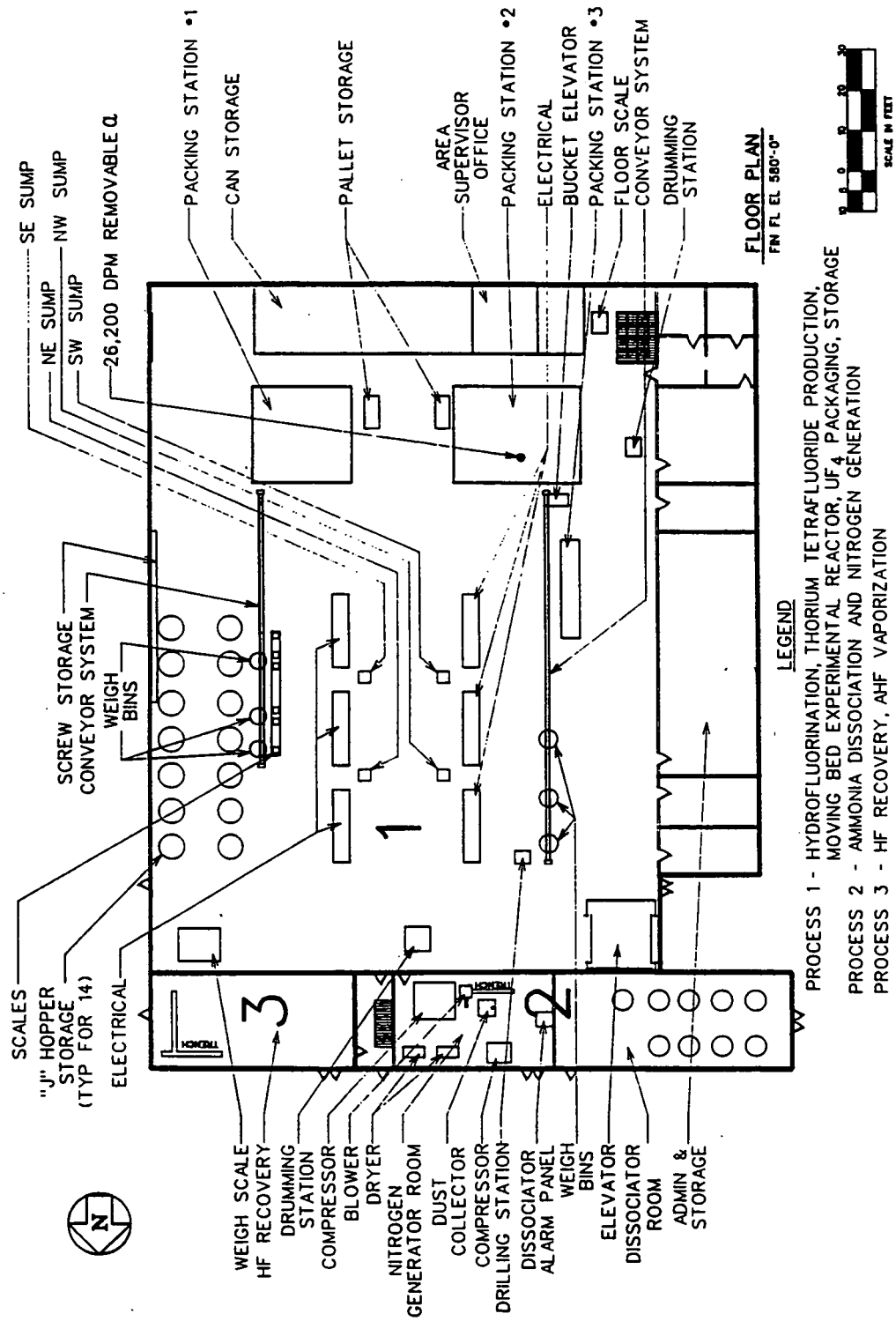

FIGURE 4A-1 Layout of Building 4A — First Floor

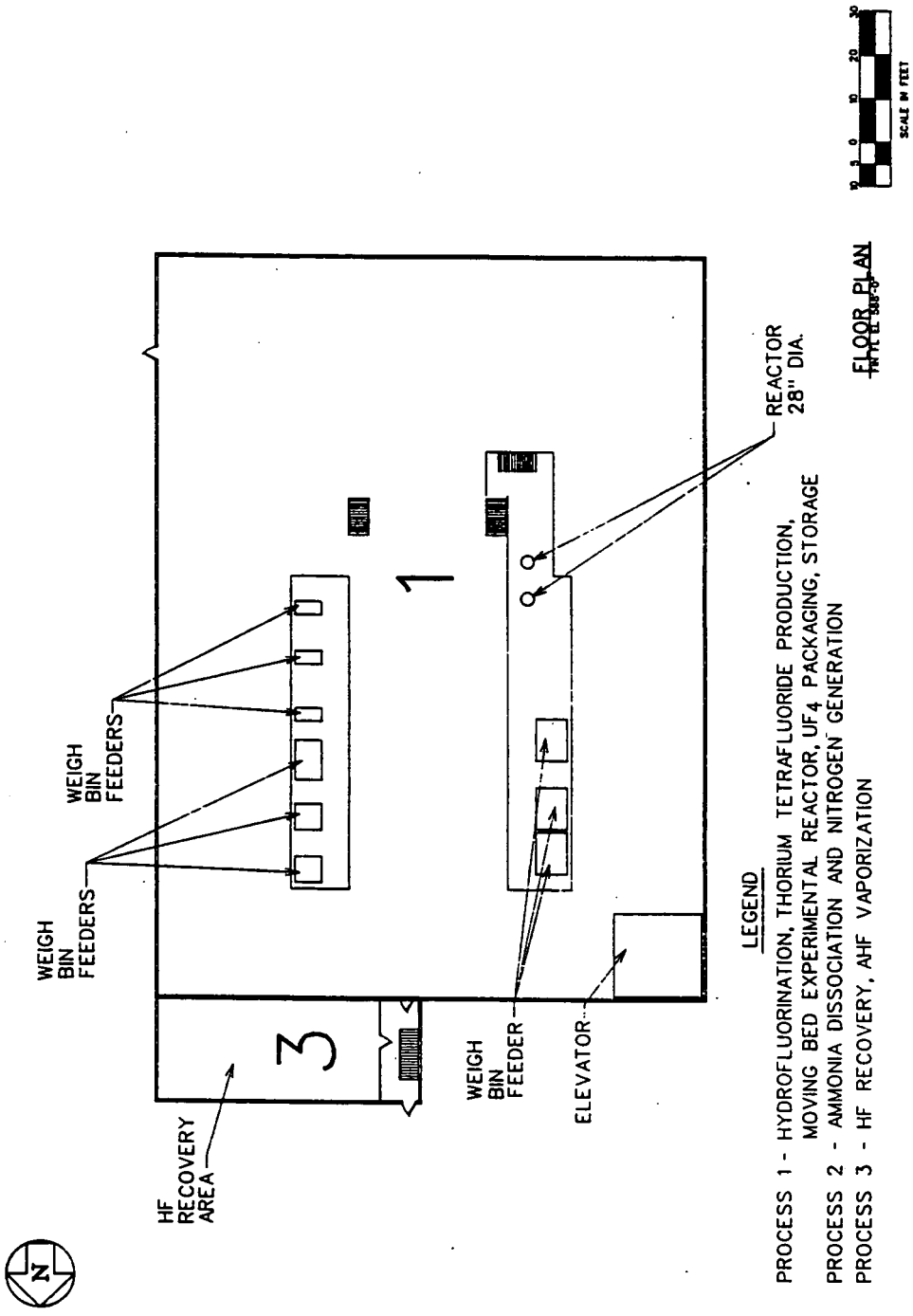

FIGURE 4A-2 Layout of Building 4A — Second Floor

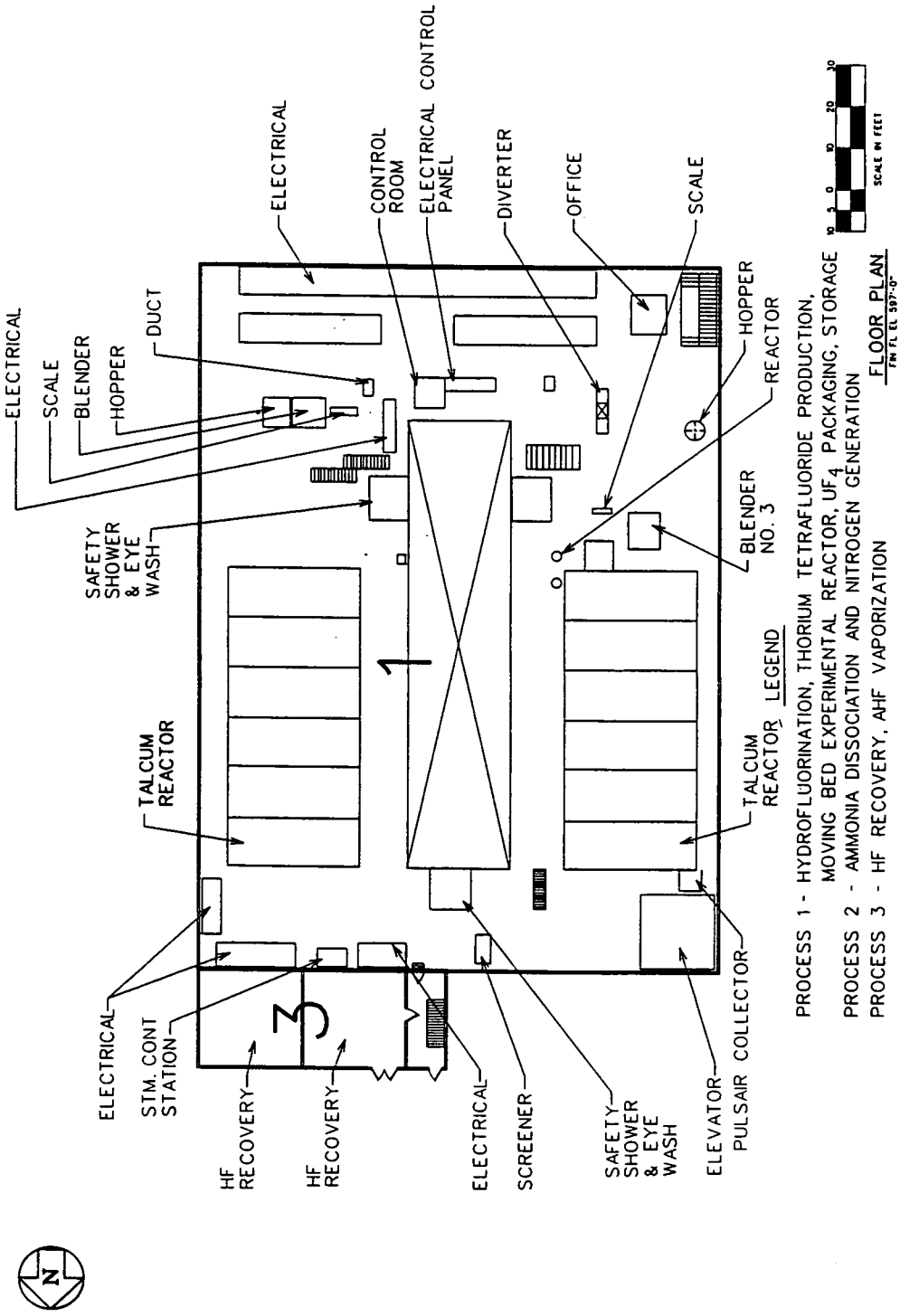

FIGURE 4A-3 Layout of Building 4A — Third Floor

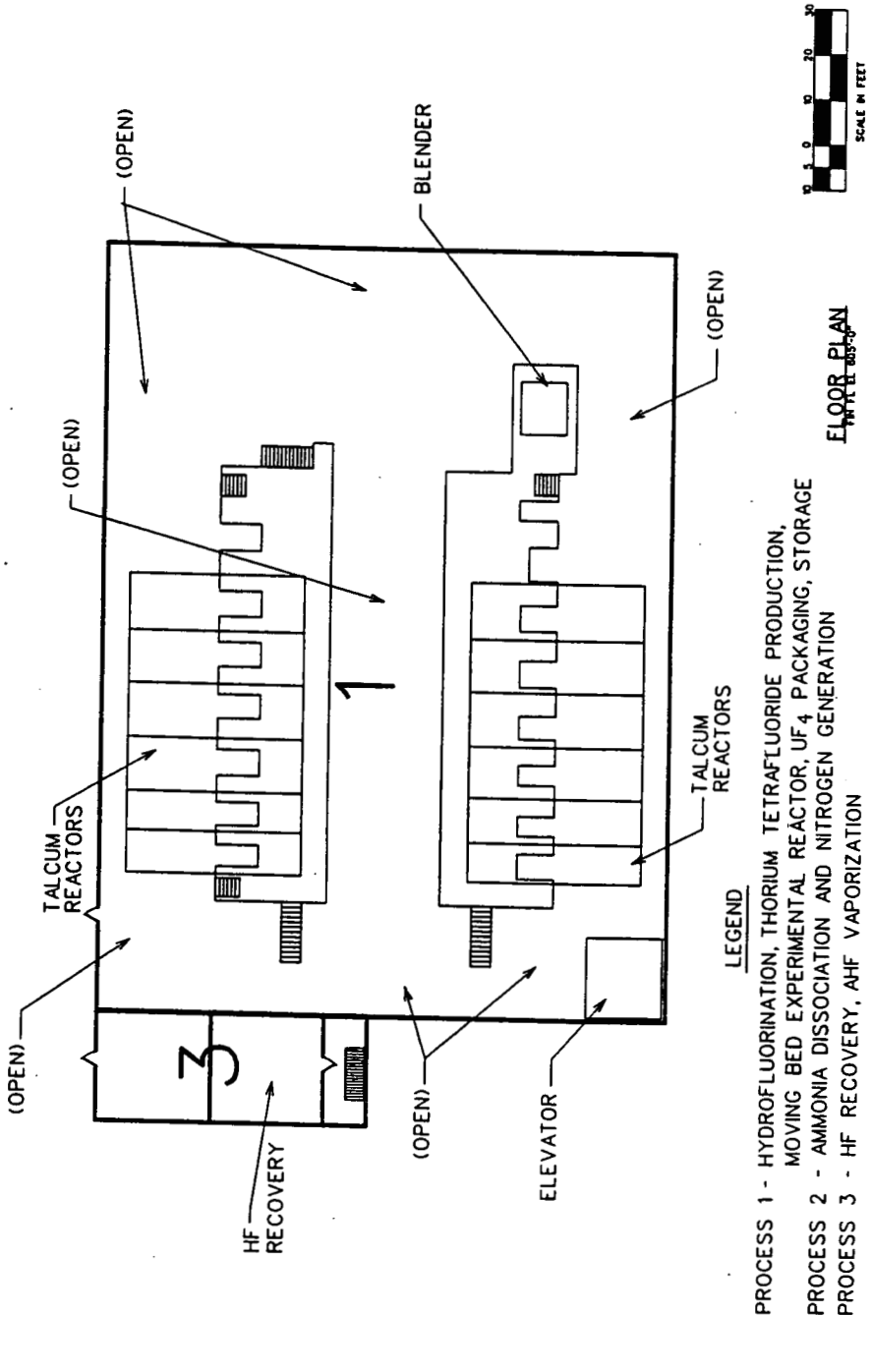

FIGURE 4A-4 Layout of Building 4A — Fourth Floor

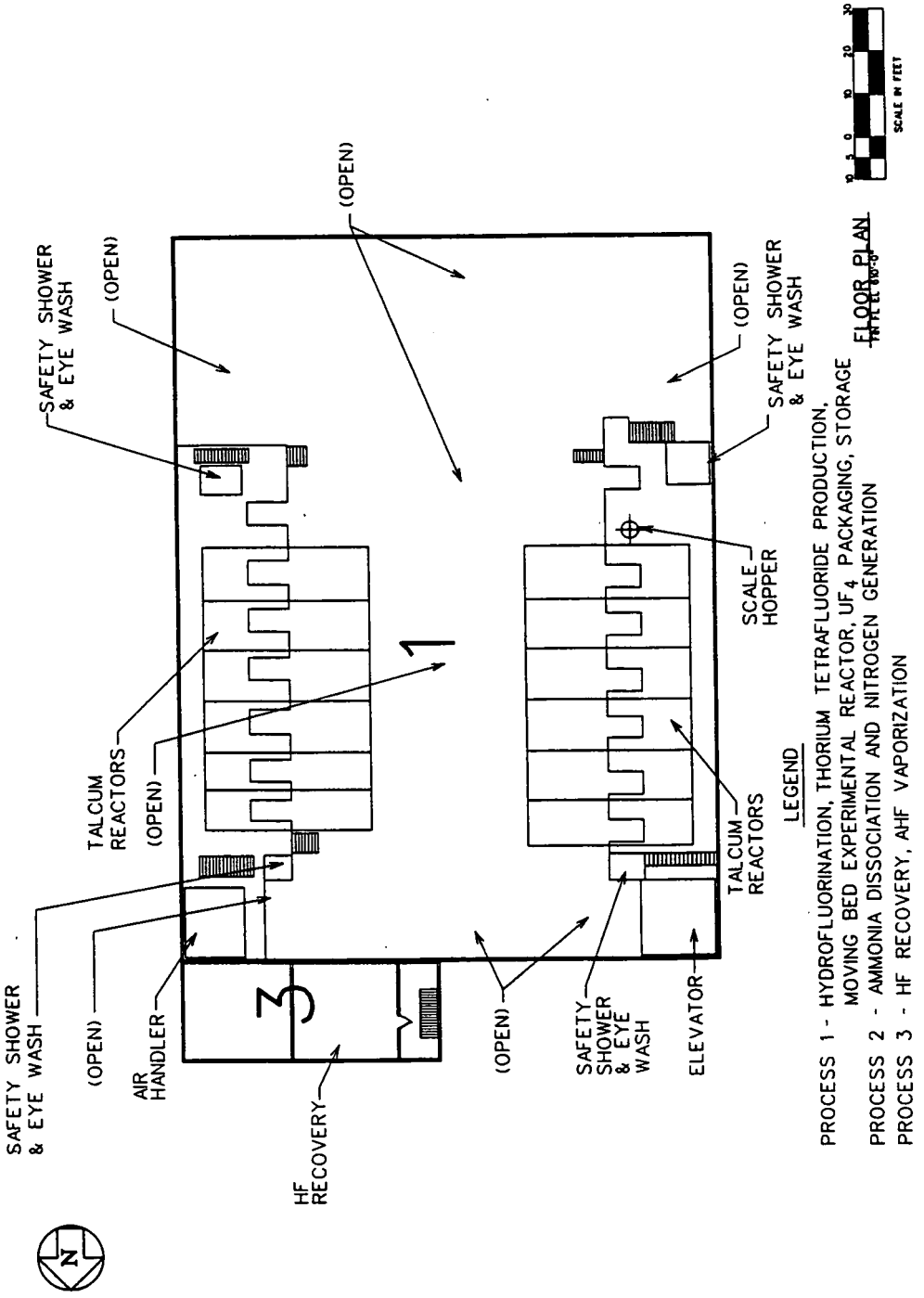

FIGURE 4A-5 Layout of Building 4A — Fifth Floor

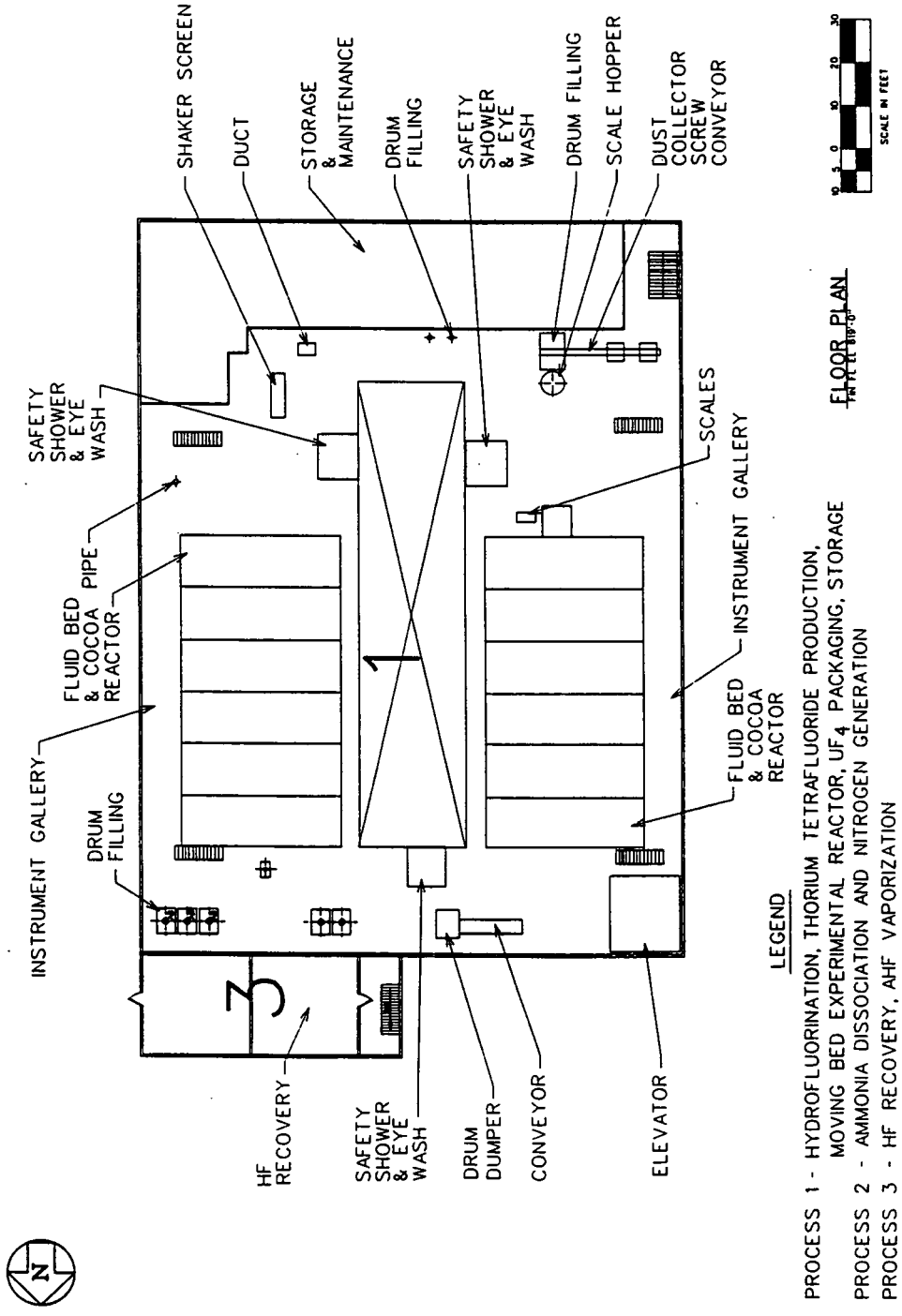

FIGURE 4A-6 Layout of Building 4A — Sixth Floor

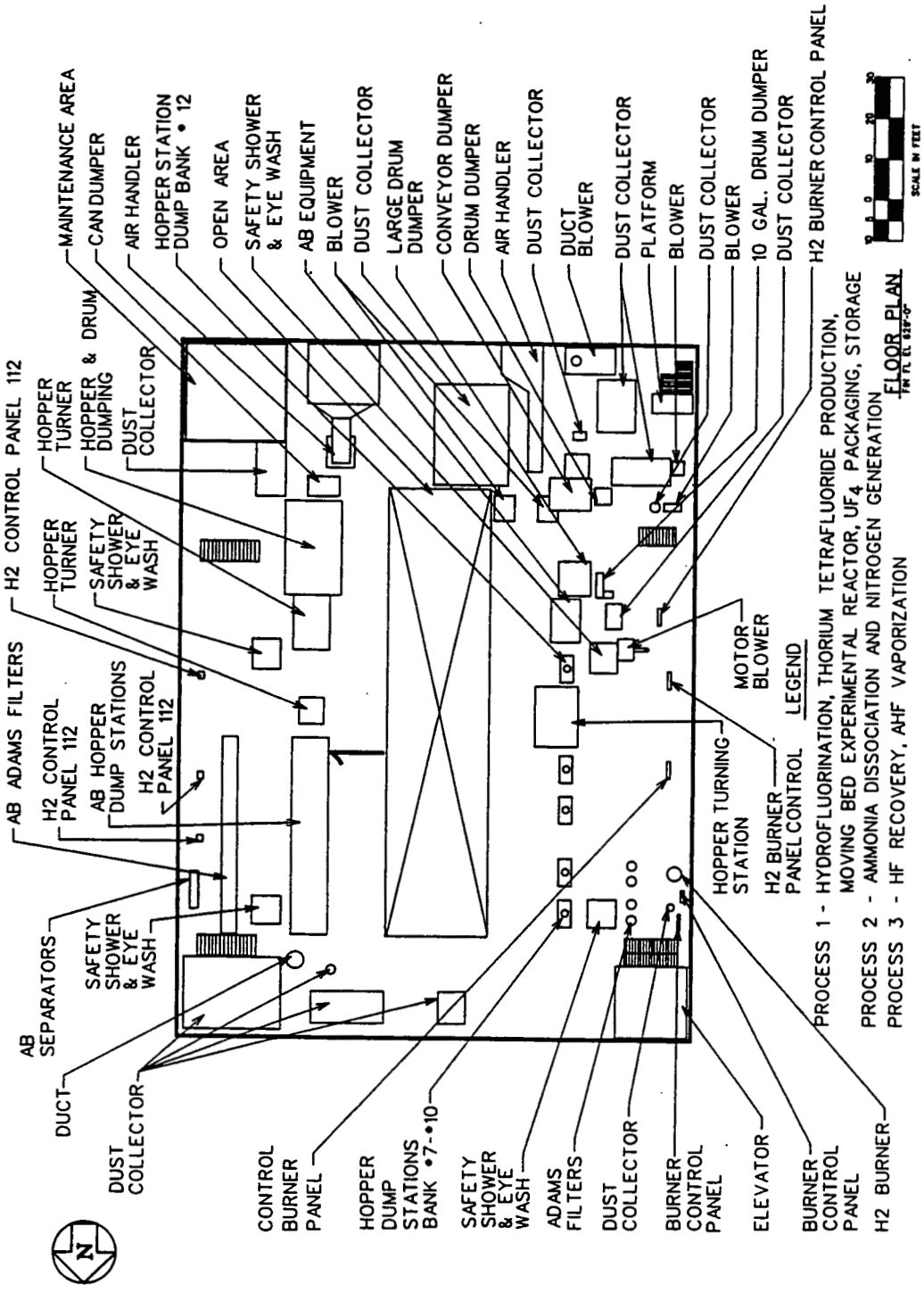

FIGURE 4A-7 Layout of Building 4A — Seventh Floor

through a bank of heated, four-zone reactors (Talcum reactors) with countercurrent anhydrous hydrofluoric acid (AHF) to produce UF_4. The UF_4 was packaged, and the excess hydrofluoric acid from the conversion of UO_3 to UF_4 was scrubbed and stored in the original Bulk Tank Farm located north of Building 4A.

Twleve chemical reactor banks were used in Building 4A for the production of UF_4. Chemical Reactor Banks 1 through 6 and 7 through 12 (east and west, respectively), were composed mainly of a fluid bed reactor, a Cocoa reactor, and three Talcum reactors with a countercurrent AHF stream and were used for the conversion of UO_3 to UF_4. Chemical Reactor Banks 7, 8, and 9 were used most recently. Bank 8 was reconfigured for processing UO_3 to U_3O_8 (black oxide) to allow processing of Hanford UO_3 in the system. Each chemical reactor bank spans several floors within Building 4A because of the numerous equipment pieces that make up each bank. Banks 4, 5, 6, 10, 11, and 12 were emptied and abandoned in place (AIP) in 1967, and Banks 1, 2, and 3 were emptied and AIP in 1974.

Thorium Tetrafluoride Production. In 1954, dry thorium oxide from the Special Products Plant (Component 9A) was hydrofluorinated in Bank 7 to dry thorium tetrafluoride. The thorium tetrafluoride was returned to the Special Products Plant and subsequently used to produce thorium metal.

Moving Bed Experimental Reactor. From 1955 through 1958, a vertical packed-bed reactor was tested for use in the hydrofluorination process. The reactor is located on the second level within the hydrofluorination area, although ancillary equipment associated with the reactor has been removed.

UF_4 Packaging. The three packaging stations (Packaging Stations 1, 2, and 3), located on the first floor of Building 4A within the hydrofluorination area, were used for the packaging or repackaging of depleted and enriched UF_4. UF_4 was transferred to any of the three packaging stations from T-hoppers, drums, or cans. UF_4 was also delivered to Packing Station 2 by conveyor from the Talcum weigh bins under Banks 7, 8, and 9. In the packaging stations, green salt was weighed, blended according to specification, sampled, and packaged into 10-gal cans.

Depleted UF_4 received in 55-gal drums from the DOE Paducah facility was blended and repackaged into 10-gal cans to ensure quality control. Packaging Station 1 and its associated dust collector were used for this process. Components of the packaging stations included weigh hoppers, blenders, package station hold hoppers, package hoppers, and a series of conveyors and feed screws.

Storage. Drummed materials and hoppers with residual material have been stored at various times in many areas and floors of Building 4A. Stored materials included UF_4, UO_3, and 19 drums of AHF residue generated in February 1989 during the emptying and cleaning of the AHF storage tanks located at the Old North Tank Farm (Component 19D).

Water Treatment (Plant 4 Sump System). The sump system comprises six floor sumps and one sump tank. The six floor sumps are located on the first floor. The collection

sump tank, also known as the east sump water tank, is located in the HF recovery area of Building 4A. Originally, two sump tanks, the collection sump tank and a filtrate sump tank (also known as the west sump tank), were located in the HF recovery area. Floor sump liquids were neutralized with lime in the collection sump tank and filtered through a plate-and-frame filter; then, the filtrate was collected in the filtrate sump tank, which was removed sometime after 1986. The collection sump tank also received water from the HF filters via the KOH recirculation tank and wash waters from the UF_4 hoppers. Filtrate collected in the filtrate sump tank was subsequently discharged to the General Sump (Component 18B). Solids collected during filtration were drummed, sampled, and sent to the Recovery Plant (Component 8A) for recovery. Water from the HF scrubber was directed to the KOH recirculation tank and discharged directly to the General Sump.

In more recent years, after production ceased and the filtrate sump tank had been removed, liquids collected in the collection sump tank were directly discharged to either the General Sump or to the recovery plant. The sump system shows signs of deterioration, especially around the northwest and southeast sumps located in the crane bay area on the first floor of Building 4A. Visual observations include the presence of cracked and settling concrete and surface stains.

Ammonia Dissociation and Nitrogen Generation Process Area. This process area is located on the first floor of Building 4A in the northwestern section. Anhydrous ammonia provided the feed material for both subprocesses.

Ammonia Dissociation System. Hydrogen gas was required in the hydrofluorination system fluid bed reactors to reduce UO_3 to uranium dioxide (UO_2, brown oxide). Hydrogen was generated for the fluid bed reactors by passing vaporized ammonia over an electrically heated nickel catalyst bed at a controlled temperature. The vaporized ammonia was cracked to hydrogen and nitrogen in a 3 to 1 ratio, and the hot gases were passed through a heat exchanger to heat fresh ammonia entering the ammonia dissociation system before introducing the hydrogen and nitrogen into the hydrofluorination system. The supply of ammonia was normally stored in storage tanks located in the original 1950s Bulk Tank Farm; however, for a certain period, ammonia was supplied to the ammonia dissociation system by the Pilot Plant Ammonia Tank Farm (Component 19B). A large above ground horizontal tank located outside Plant 4 at the southwestern corner also stored anhydrous ammonia for use in the ammonia dissociation system. A newly constructed ammonia dissociator system was never used in the production process.

Nitrogen Generation. The nitrogen generation system used dissociated ammonia (hydrogen and nitrogen gas) supplied by the Plant 4 ammonia dissociation system to produce and store nitrogen gas for use during plant purging operations. The original nitrogen generator system was replaced with a new system, located along the north outside wall of the nitrogen generation room, but never placed into operational use.

Hydrofluoric Acid Recovery Processes. This process area includes the subprocesses associated with hydrofluoric acid handling and is located on multiple floors in the northeastern section of Building 4A.

AHF Vaporization System. Vaporized AHF was required in the hydrofluorination system fluid bed reactors to convert UO_3 or U_3O_8 to uranium tetrafluoride (UF_4, green salt). Liquid AHF was vaporized with four vaporizers, and the vaporized AHF was then heated using two of three superheaters to obtain the required hydrofluorination process temperature. Upon exiting the superheaters, the vaporized AHF entered the hydrofluorination process at the end of the Talcum A and C reactors. The vaporizers and superheaters are located in the HF recovery area on the third and fourth levels, respectively.

Hydrofluoric Acid Recovery System. The hydrofluoric acid recovery system was designed and used to collect unreacted hydrogen fluoride (HF) gas exiting the production process. AHF vapor, which moved countercurrent to the production flow, exited each chemical reactor bank as dilute hydrogen fluoride. The HF exited each chemical reactor bank at the beginning of the first chemical reactor in the series (the Talcum A reactor), and the vapors were routed through Adams filters and through carbon-tubed Karbate condensers. Residual vapors that passed through the Karbate condensers were scrubbed with water to form dilute hydrofluoric acid (DHF). The gas stream was further processed through KOH scrubber units for recovery and neutralization of previously unrecovered HF vapors from the HF scrubber and recovery system and for the recovery and neutralization of fugitive KOH vapors from the KOH recirculation system. The KOH scrubber system consists of two venturi scrubbers (which were operated in series); a KOH recirculation tank; and an extensive network of pipes, valves, and pumps.

HF Refrigeration. The HF refrigeration system was used to reclaim HF fumes as AHF from Building 4A and Plant 7 (Component 7A) operations. The equipment used during this process has been removed from Building 4A.

Major Media Types per Process Area

The major media for Building 4A include the structural steel frame, a poured reinforced concrete base, and transite siding and roofing. Because the structural steel frame and concrete are uniform across the component, all processes are considered to contain these major media. Because transite is addressed as a separate supplemental sampling activity, it is not considered a major medium in this component. Further, because the steel plating and catwalks that form the floors of the upper levels constitute a small fraction of the total building media and are difficult to decontaminate, these materials are not considered major media for Building 4A.

Summary of Available Radiological Data

Building 4A is routinely surveyed for removable alpha and removable beta-gamma contamination, but no recent data for total beta-gamma contamination are available. Recent data (1991 and 1992) have been assembled and used to determine the radiological hot spot. No recent data for the ammonia dissociator and nitrogen generation area or the HF Recovery Area are available, but the radiological hot spots for these areas will be determined from field measurements to be taken before sampling occurs. Also, as data are acquired from ongoing radiological surveys taken for health physics needs, the identified hot spot will be reassessed before sampling begins.

Of the 310 removable alpha readings taken from the first-level floor in the hydrofluorination area, the highest removable alpha reading was 26,200 dpm, with an associated removable beta-gamma reading of 89,200 dpm. Twelve other removable alpha readings exceeded 1,000 dpm, with a range of 1,073 to 3,521 dpm. The location of the highest removable alpha reading is indicated on Figure 4A-1.

Summary of Sampling for Building 4A

One airborne particulate sample will be taken in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, radiological surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. The two media within Building 4A are the structural steel frame and the concrete floor. Intrusive sampling will be performed in each process area and will consist of concrete core samples from wet process areas and concrete chip samples from dry process areas. Surface scraping will also be taken from the structural steel in the various process areas. The component visual inspection revealed liquids and sludges in the six floor sumps located within Building 4A, as well as residual green salt in many first floor areas. A supplemental liquid sample of the sumps will be taken and composited over the process areas. Also, a loose media sample of the green salt will be taken and composited over the process areas. Additional supplemental samples may be identified by field crews during sampling activities. Table 4A-1 summarizes the planned sampling program for Building 4A.

TABLE 4A-1 Sample Types and Quantities for Building 4A

Sample Type	Hydro-fluorination Area	Ammonia Dissociation and Nitrogen Generation Area	HF Recovery Area	Component Totals
Nonintrusive[a]				
Radiological surveys	b	b	b	NA[c]
Chemical surveys	b	b	b	NA
Air particulates	NA	NA	NA	1
Swipes	2	2	2	6
Lab composite swipes	NA	NA	NA	1
Intrusive[a]				
Concrete chips	1	NA	NA	1
Concrete cores	NA	1	1	2
Masonry	NA	NA	NA	NA
Steel surface scraping	1	1	1	3
Supplemental				
Liquid sample	1	NA	1	2
Loose media	1	NA	1	2

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.3.6 Building 5A — Metals Production Plant

Component Description

Building 5A (Metals Production Plant) is a three-story building shown on the Grid 12 map in Appendix C. It is irregularly shaped, measuring approximately 100 × 560 ft and 34 ft high. The building consists of a structural steel frame with transite siding and roofing panels on a poured concrete base (Type A building). The first floor, the partial third floor, and a portion of the second floor are made of poured concrete, while diamond plate steel grating makes up the remainder of the second floor. The floor plans for the building are provided in Figures 5A-1 and 5A-2.

The main functions of Building 5A were reduction of uranium tetrafluoride (UF_4) to produce uranium metal derbies and remelting derbies and recycled uranium for casting into ingots. Other processes within Building 5A included sawing ingots into various sizes, machining graphite components used in ingot casting, derby breakout, preparation of used magnesium fluoride (MgF_2) for milling (recycling) and reuse in lining reduction vessels, and sampling metal products for quality.

Process Area Description

Building 5A contains 12 process areas shown in Figures 5A-1 and 5A-2 and described as follows. The anticipated contaminants for Building 5A are summarized in Table A.3.

Reduction. The reduction area occupies the southern portion of Building 5A. Two distinct process lines existed, on the east and west sides. The east process line generally processed depleted uranium materials, while the west side processed depleted, enriched, and normal uranium materials. Steel reduction pots were lined with MgF_2 slag, filled with a mixture of UF_4 and Mg, and capped with more MgF_2 slag. The pots were lidded and then heated in resistance element furnaces to initiate the exothermic reaction, which resulted in a chemical reduction reaction and the formation of uranium derbies. The pots were subsequently cooled in an air tank and then a water tank. After cooling, the derbies and the MgF_2 slag were "broken out" in the derby breakout booth to separate the uranium metal derby from the slag. The MgF_2 was screened and sized for transfer to the Slag Recycling Building (Component 55A), where it was milled and returned to the reduction area for reuse. Currently, a large portion of the floor space in the reduction area is used for waste materials drum storage.

Casting (Remelt). The remelt area occupies a large portion of the northern half of Building 5A. There are 28 vacuum induction remelt furnaces, 14 each on the east and west sides, and supporting equipment. The furnaces on the east side generally processed depleted and normal uranium; those on the west side processed enriched uranium. The tops

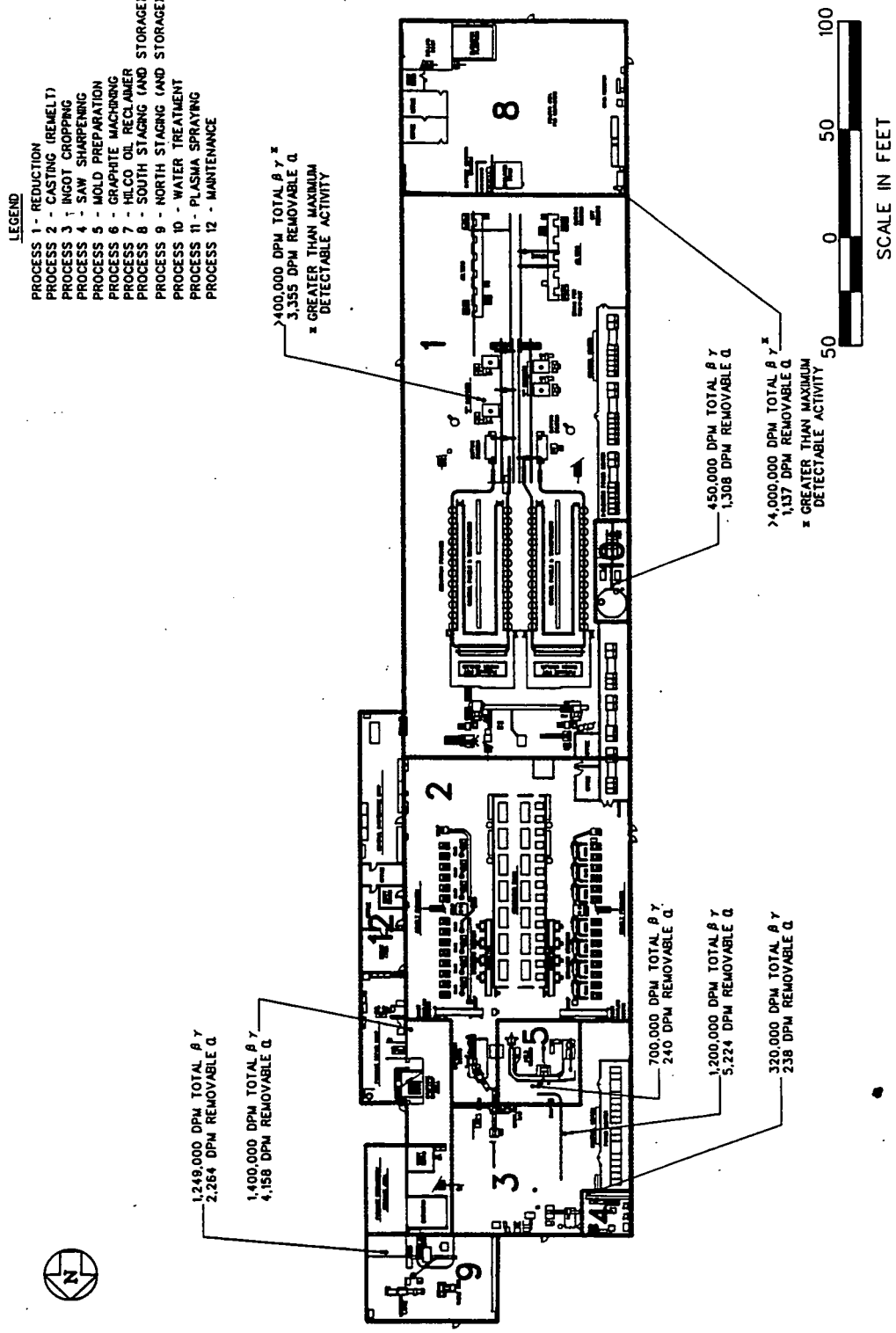

FIGURE 5A-1 Layout of Building 5A — First Floor

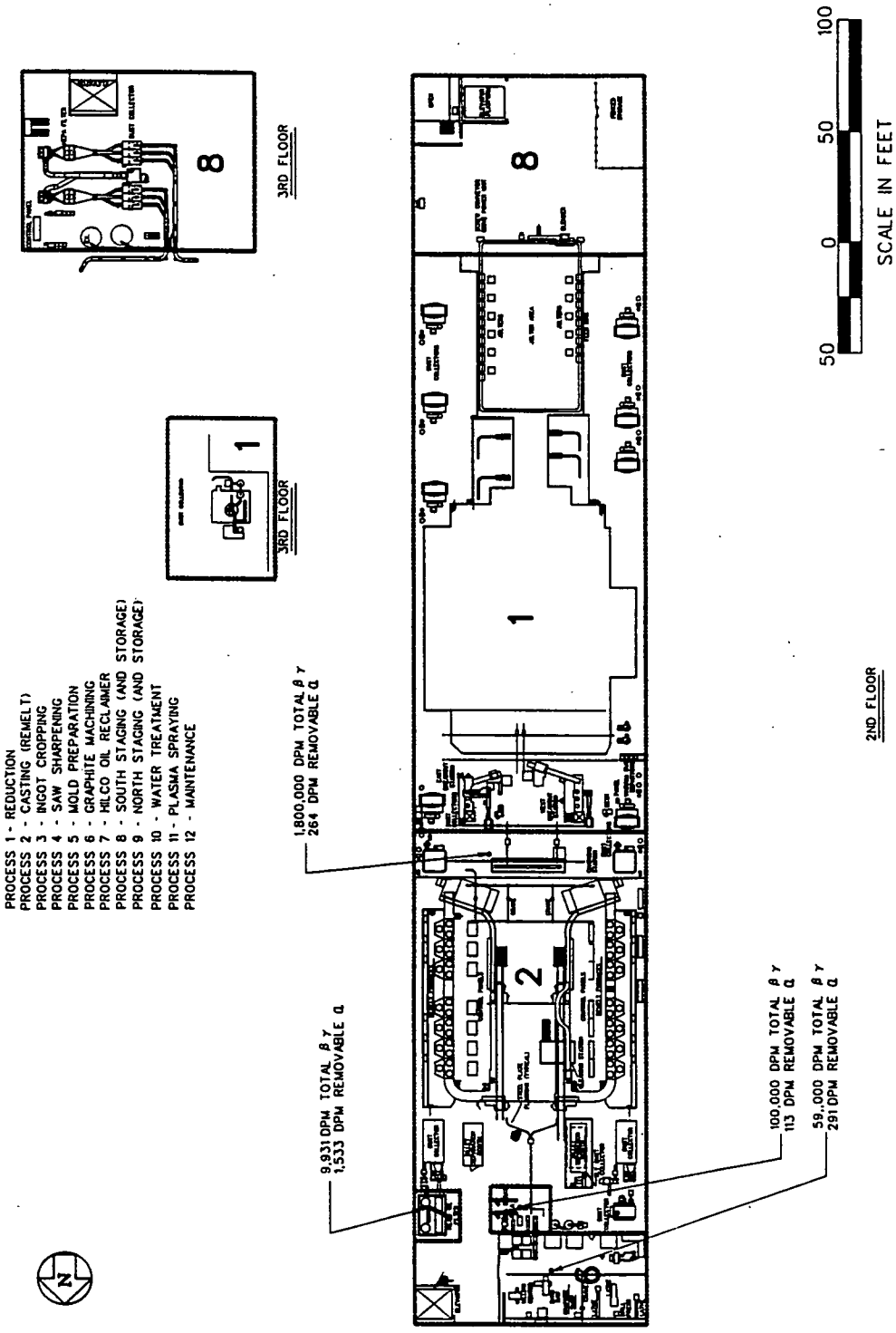

FIGURE 5A-2 Layout of Building 5A — Second and Third Floors

of the remelt furnaces (2nd-floor level) are connected by an oval-shaped enclosure. Within the continuous-loop enclosure, the uranium derbies and recycled uranium were loaded into graphite crucibles, then conveyed to vacuum induction furnaces for melting and pouring to coated graphite molds. Cast uranium ingots were then removed from the molds and sent to be cropped. The molds were cleaned and recoated in the mold preparation process area. Residual uranium in crucibles was flame oxidized for removal. The furnaces are currently empty; however, two partially fired steel reduction pots (containing UF_4, Mg, and MgF_2) remain adjacent to the east bank of remelt furnaces.

Ingot Cropping. After casting, the uranium ingots were cut to remove the upper portions (top crops), which contained higher concentrations of impurities and shrinkage cavities. Long ingots were also cut to form two smaller billets. The ingots were cut by one of three (3-ft diameter) ingot saws. During cutting, the saws used a water soluble coolant that was filtered and recirculated within the unit. Saw chips filtered from the coolant were sent to the Metals Fabrication Plant (Component 6A), where they were pickled and pressed into briquettes to be remelted for recycle.

Saw Sharpening. The ingot saws were sharpened, retoothed, and otherwise maintained in the saw sharpening area. Additional stored items include spare saws and saw repair equipment. The saw sharpener (Rotoclone) and the saw sharpener dust collector were removed in 1989.

Mold Preparation. The mold cleaning booth is located on the first floor of Building 5A, north of the separation booths. After molds and ingots were separated, molds entered the mold cleaning booth to remove the mold release agent and black oxide (U_3O_8). There the molds were rotated (on the mold rotator unit), scraped clean, recoated with terrapaint (zirconia silicate), and dried for reuse. The mold cleaning booth currently contains the mold rotator unit and a small amount of residual dust from the last time it was used in production. The associated dust collector has been removed.

Graphite Machining. The graphite machining area occupies the northwestern corner of the Building 5A second floor. Graphite blanks for crucibles, molds, and pour plugs were machined to specifications. Currently, stored equipment includes several lathes, drills, and saws.

Hilco Oil Reclaimer. The Hilco Oil Reclaimer occupies an area in the northeastern corner of the Building 5A second floor. Used oil from the remelt furnace vacuum pumps was collected in a tank and processed for recovery (heated and filtered). The used oil remaining in this tank and the materials collected on the filters have been declared hazardous wastes, and the entire system has been reported as an HWMU (storage). The processed oil was stored in a clean oil tank for reuse by the vacuum pumps.

South Staging (and Storage). The south staging and storage area resides in the south end of Building 5A on all three floors. Originally, the area stored raw materials (UF_4, Mg, and MgF_2) and spare equipment for the reduction processes. Currently, the area is being used for drum storage (enriched, normal, and depleted uranium) and storage of other uranium items on pallets.

North Staging (and Storage). The north staging and storage area resides in the north end of the Building 5A first floor. Originally, the area stored graphite for machining and staged molds, crucibles, and metal for the remelt process. Currently, the area is being used for drum storage (enriched, normal, and depleted uranium) and storage of other uranium items on pallets.

Water Treatment. All Building 5A floor sumps were pumped to a 6,000-gal stainless steel tank that pumped through a plate and frame filter to the General Sump. Since 1983, the collected material has been pumped to the Metals Fabrication Plant for treatment.

Plasma Spraying. The plasma spraying unit is new, unused equipment, similar to that used in the Pilot Plant Annex (Component 37). The unit was installed to plasma coat graphite crucibles with inert materials.

Maintenance. The maintenance area was used to maintain all Building 5A equipment. Tools, equipment, and spare parts are stored there.

Major Media Types per Process Area

Building 5A consists of a structural steel frame with transite panels covering the walls and roof and forming the interior walls. The base, first floor, and third floor are made of poured concrete, while the second floor is made of poured concrete and diamond plate steel grating. Because concrete, transite, and steel are relatively uniform across the component, all processes are considered to contain these major media. Additionally, acid brick is used for flooring in the water treatment process area. Transite, however, is addressed as a separate supplemental sampling activity and will not be considered among the Building 5A major media.

Summary of Available Radiological Data

Building 5A is routinely surveyed for removable alpha and total beta-gamma contamination. Results from the most recent surveys are summarized in Tables A.4.0 and A.4.1 and provide the basis for identifying radiological hot spots. As indicated, 2,359 (floor) removable alpha and 2,120 total (floor) beta-gamma survey measurements were performed

in Building 5A from 1989 through 1992. On the basis of the assembled data, the process area hot spots are identified in Figures 5A-1 and 5A-2. Visual inspection of the Building 5A radiological data indicated that approximately 90% of the total beta-gamma measurements are below 200,000 dpm. Data will be reassessed before sampling to include any data from ongoing radiological surveys.

Reduction Area. The radiological hot spot measured higher than 4,000,000 dpm total beta-gamma (greater than the maximum detectable activity) and is located on the first floor at the base of an F-Machine. The corresponding removable alpha measurement is 3,355 dpm (Figure 5A-1).

Casting Area. The radiological hot spot measured 1,800,000 dpm total beta-gamma and is located on the second floor near the power center. The corresponding removable alpha measurement is 264 dpm (Figure 5A-2).

Ingot Cropping. The radiological hot spot measured 1,200,000 dpm total beta-gamma and is located on the first floor near the monorail. The corresponding removable alpha measurement is 5,224 dpm (Figure 5A-1).

Saw Sharpening. The radiological hot spot measured 320,000 dpm total beta-gamma and is located on the north end of the first floor. The corresponding removable alpha measurement is 238 dpm (Figure 5A-1).

Mold Preparation. The radiological hot spot measured 700,000 dpm total beta-gamma. The corresponding removable alpha measurement is 240 dpm (Figure 5A-1).

Graphite Machining. The radiological hot spot measured 59,000 dpm total beta-gamma and is located near the northwestern corner of the second floor. The corresponding removable alpha measurement is 291 dpm (Figure 5A-2).

Hilco Oil Reclaimer. The radiological hot spot measured 9,931 dpm removable beta-gamma (only swipe samples were taken), with a corresponding removable alpha measurement of 1,533 dpm (Figure 5A-2).

South Staging (and Storage). The radiological hot spot measured greater than 4,000,000 dpm total beta-gamma (greater than the maximum detectable activity). The corresponding removable alpha measurement is 1,137 dpm (Figure 5A-1).

North Staging (and Storage). The radiological hot spot measured 1,249,000 dpm total beta-gamma. The corresponding removable alpha measurement is 2,264 dpm (Figure 5A-1.).

Water Treatment. The radiological hot spot measured 450,000 dpm total beta-gamma. The corresponding removable alpha measurement is 1,308 dpm (Figure 5A-1.).

Plasma Spraying. The radiological hot spot measured 100,000 dpm total beta-gamma. The corresponding removable alpha measurement is 113 dpm (Figure 5A-2).

Maintenance. The radiological hot spot measured 1,400,000 dpm total beta-gamma. The corresponding removable alpha measurement is 4,158 dpm (Figure 5A-1).

Summary of Sampling for Building 5A

One airborne particulate sample will be taken and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive sampling for the concrete medium will be performed at the radiological hot spots shown in Figures 5A-1 and 5A-2. Except for water treatment, ingot cropping, and the Hilco Oil Reclaimer, the processes in Building 5A are dry. Concrete cores and concrete chip samples will be taken for the wet and dry processes, respectively. Additionally, structural steel scrapings and swipe samples will be collected (where applicable) on the basis of Protocols 1 and 3.

On the basis of visual building inspection, composite liquid supplemental samples will be taken from the Building 5A sumps. The sumps will be divided into three areas: the reduction area, the remelt area, and the machining area. One composite supplemental liquid sample and one supplemental sediment will be taken from each sump area. Additional supplemental samples may be identified at the time of sampling. Tables 5A-1 and 5A-2 summarize the planned sampling program for Building 5A.

TABLE 5A-1 Sample Types and Quantities for Building 5A, Part 1

Sample Type	Reduction	Remelt	Ingot Cropping	Saw Sharpening	Mold Prepara-tion	Graphite Machining	Hilco Oil Reclaimer
Nonintrusive[a]							
Radiological surveys	b	b	b	b	b	b	b
Chemical surveys	b	b	b	b	b	b	b
Air particulates	NA[c]	NA	NA	NA	NA	NA	NA
Swipes	2	2	2	2	2	2	2
Lab composite swipes	NA	NA	NA	NA	NA	NA	NA
Intrusive[a]							
Concrete chips	1	1	NA	1	1	1	NA
Concrete cores	NA	NA	1	NA	NA	NA	1
Masonry	NA	NA	NA	NA	NA	NA	NA
Steel surface scraping	1	1	1	1	1	1	1
Supplemental							
Liquid sample	1	1	NA	NA	NA	1	NA
Loose media	1	1	NA	NA	NA	1	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

TABLE 5A-2 Sample Types and Quantities for Building 5A, Part 2

Sample Type	South Staging	North Staging	Water Treatment	Plasma Spraying	Maintenance	Component Totals
Nonintrusive[a]						
Radiological surveys	b	b	b	b	b	NA
Chemical surveys	b	b	b	b	b	NA
Air particulates	NA	NA	NA	NA	NA	1
Swipes	2	2	3	2	2	25
Lab composite swipes	NA	NA	NA	NA	NA	1
Intrusive[a]						
Concrete chips	1	1	NA	1	1	9
Concrete cores	NA	NA	1	NA	NA	3
Masonry	NA	NA	1	NA	NA	1
Steel surface scraping	1	1	1	1	1	12
Supplemental						
Liquid sample	NA	NA	NA	NA	NA	3
Loose media	NA	NA	NA	NA	NA	3

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.3.7 Building 6A — Metals Fabrication Plant

Component Description

Building 6A (Metals Fabrication Plant) is a single-level building shown on the Grid 6 map in Appendix C. It is irregularly shaped, measuring approximately 350 × 620 ft and 50 ft high, with a partial basement 20 ft belowgrade. Building 6A consists of a structural steel frame on a reinforced poured concrete base and floor with transite siding and roofing (Type A building). A floor plan for Building 6A is provided in Figure 6A-1.

Process Area Description

Building 6A was designed to perform major uranium metal fabrication processes, including rolling, machining, heat treating, pickling, scrap metal briquetting, and inspection/packaging of products. All processes were discontinued in 1989; however, the process equipment has not been dismantled or removed from the building. Some machining equipment has been removed to clear Building 6A for drum storage.

The major processes performed in Building 6A, including many of the subprocesses that were involved (Figure 6A-1), are described as follows. The anticipated contaminants for Building 6A are summarized in Table A.3.

Rolling Mill Process Area. The Rolling Mill was constructed in 1952 to roll uranium ingots (received from Plant 5) into rods, flats, or ovals as required. The Rolling Mill was constructed in, and currently occupies, the majority of the western half of Building 6A (known as the Mill Room). The equipment has been abandoned in place and is largely inaccessible because of uranium dust contamination. Consequently, a portion of the information provided by this report has not been field verified. A 1,000-mCi radiation source remains in the ingot inspection area of the mill (south of the control booth). Subgrade access to the mill exists throughout most of the Rolling Mill bay; this also was not visually inspected.

Production from the Rolling Mill was permanently shut down in the 1970s; however, materials were generally not removed from tanks, furnaces, and other equipment. Additionally, the NuSal Furnace (originally part of the Rolling Mill process area) was used during the 1980s for beta heat treating ingots before shipment for extrusion. The Rolling Mill process area includes the subprocesses detailed below.

New Ingot Furnace. Uranium metal (in the form of ingots) was received by the ingot storage area to be scheduled for rolling. The ingots were stored until they were charged to the ingot furnace. The New (automatic) Ingot Furnace was an electrically heated, continuous liquid bath furnace that heated the ingots sufficiently to allow rolling. A salt bath of lithium carbonate (Li_2CO_3) and potassium carbonate (K_2CO_3) was used as the heating medium. The New Ingot Furnace delivered the heated ingot to the Blooming Mill approach table.

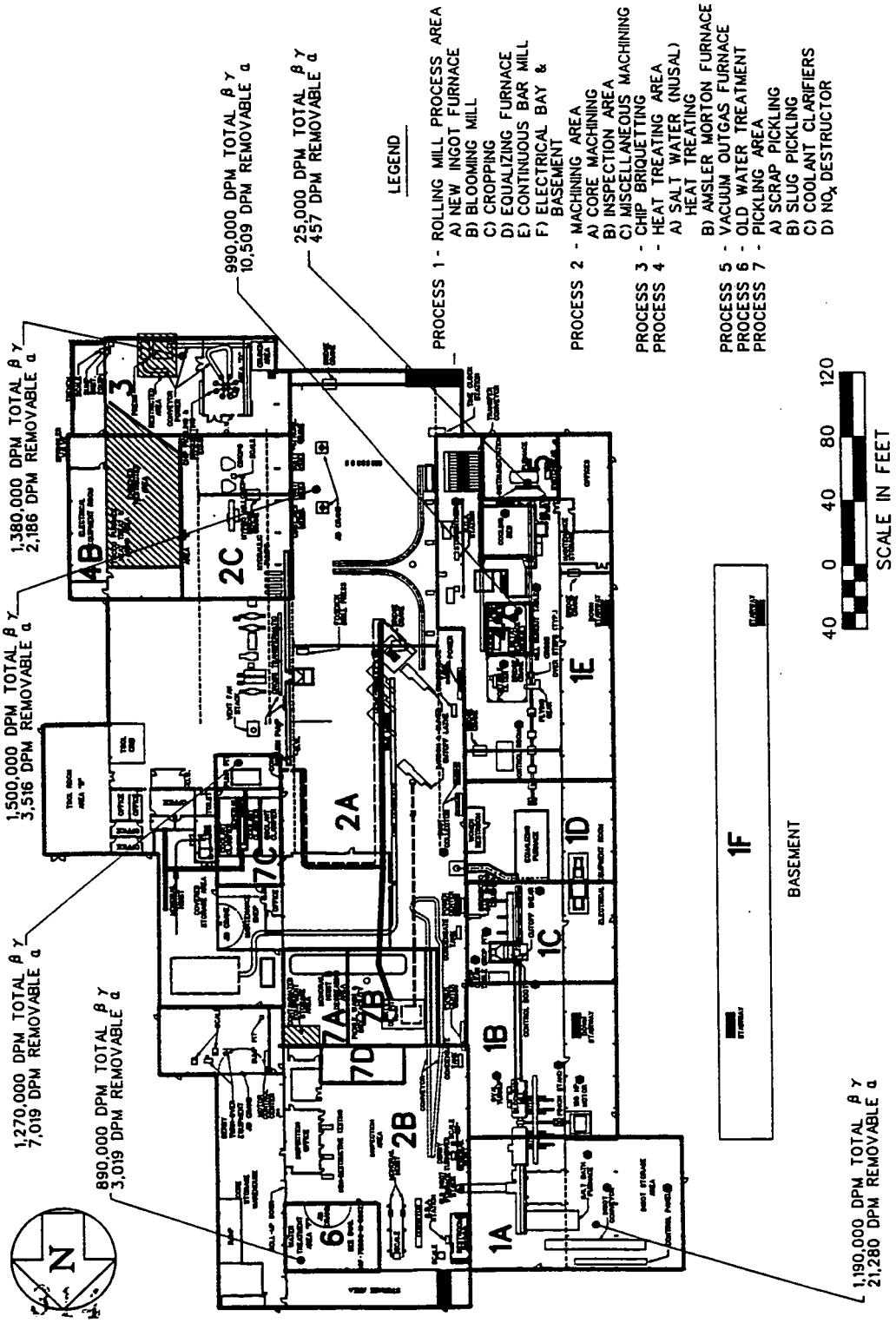

FIGURE 6A-1 Layout of Building 6A

Blooming Mill. The function of the reversing Blooming (billet) Mill was to reduce the cross-sectional area of a heated ingot (as received from the New Ingot Furnace) to a point where the size and shape of the pieces were suitable for further cross-sectional reduction in the Continuous Bar Mill. The ingots were discharged from the Blooming Mill onto the runout table.

Cropping. The cropping step followed rough rolling in the Blooming Mill and removed the end portion of the billet that had been distorted or "fish-tailed" during the blooming process. Cropping was accomplished with 60-ton up and down cut shears. The subsequent cropped material was sent for further processing in the Metals Fabrication Plant. The crop ends were cooled in a water-filled tank and sent to the Metals Production Plant (Component 5A) casting area for recycling.

Equalizing Furnace. The function of the Equalizing Furnace was to receive the oval billets (after they had been rolled, cropped, and cut into lengths) and increase their temperature. The furnace was also used on occasion to reheat round bars, which had already been run through the Continuous Bar Mill but required a further reduction in cross section. Like the New Ingot Furnace, the Equalizing Furnace was electrically heated and used a salt bath of Li_2CO_3 and K_2CO_3 for a heating medium.

Continuous Bar Mill. The function of the continuous Bar Mill was to convert oval billets (as received from the Blooming Mill) to round bars so that they could be fed to the Core Machining process to produce slugs. The continuous Bar Mill received billets rolled by the Blooming Mill, cropped and cut to length by the Crop Shear, and brought to the correct temperature in the Equalizing Furnace. The Continuous Bar Mill consisted of alternate vertical and horizontal rollstands set in a straight line. Oval passes were cut in the vertical rolls at stands 1, 3, and 5, while round passes were cut in the horizontal rolls at stands 2, 4, and 6. This mill was designated "continuous" because the billet passed from stand to stand and was not reversed for multiple passes through a single stand.

Electrical Bay and Basement. The extreme western north-south bays of Building 6A contain the electrical switching, transformer, and disconnect apparatus for support of the Rolling Mill operation. In addition, a basement area exists under a portion of the electrical bay.

Machining Area. The machining process area makes up much of the area in the eastern portion of Building 6A and includes the following subprocesses.

Core Machining. The primary function of the machines in the Core Machining area was to fabricate uranium rods into finished slugs. Rods were received from the Rolling Mill; more recently, tubes were received from Reactive Metals Inc. (RMI). The routing of a slug through the machining area was dependent on the specifications to be met.

The Core Machining area currently contains two cutoff lathes separated by three earlier cutoff lathes, a drill press, a lathe, a chip conveyor, two vacuum cleaner units, a

condensate tank, and a robot. This equipment has been generally cleaned of metal waste, and coolant oil has been drained. However, machine oil remains within the casings of these machines. The chip conveyor has also been cleaned, but the vacuum cleaner units may not have been cleaned out.

Inspection Area. The Inspection Area covers a large portion of the northeastern quadrant of Building 6A. The primary operations of the area were to inspect finished slugs and to ensure that the slugs met all specifications established by both the FMPC and its respective customers. Although the specific layout of inspection equipment and stored product areas changed over the years, this area of the plant was always used primarily for inspection operations. As recently as 1989, equipment in the Inspection Area consisted of a roller conveyor with gravity and powered sections, a gauging jig, ultrasonic testing machines, scales, and wheeled carts for transporting shipping boxes.

Miscellaneous Machining. Flat cropping and sampling operations were performed on horizontal milling machines located in the southeastern areas of Building 6A. Cropping entailed cutting the rough or top end of a flat billet resulting from the casting process in Plant 5 (Component 5A). Sampling was accomplished by drilling and cutting a small piece from the flat, for laboratory testing. Milling machines in the 4A Program (tank shielding) machined uranium flats for the U.S. Army in the 1980s.

Maintenance Shop and Tool Machining. A local maintenance area is located northeast of the main portion of the core machining area. This shop provided specialized maintenance for Building 6A machines and processes. A large machining area was also associated with the maintenance shop to provide the cutting tools and jigs necessary for machining of uranium metal in the main machining operations.

Chip Briquetting. Uranium turnings, machining chips, and uranium sawdust from the operations of Buildings 5A, 6A, and 9A were collected, washed, pickled (in nitric acid), and crushed to form dense metal briquettes for remelt casting feed. This process was performed in the southeastern corner of Building 6A.

Heat Treating Area. The Heat Treating process area included two subprocesses performed in the south of Building 6A.

Salt Water (NuSal) Heat Treating. The purpose of Beta Heat Treating was to transform the grain structure and relieve stresses of uranium rod stock by heat treating the rods in a salt bath furnace. Beta Heat Treating facilities were not included in the original (1952) plant layout; however, the facilities were in place by 1958. During the years of Rolling Mill operations, the Beta Heat Treating facilities were used to process rods as they left the flying shear. The Beta or Salt-Water (NuSal) Heat Treating System consisted primarily of a furnace and a water quench tank. The furnace used a 50/50 blend of sodium chloride (NaCl) and potassium chloride (KCl) as a heating medium.

Amsler-Morton Furnace. The Amsler-Morton Furnace is adjacent to the Enriched Uranium Restricted Area in the southeastern corner of Building 6A. The area is inaccessible because of high radiation exposure rates; consequently, information in this report has not been field verified. The furnace was used to heat-treat cores until its shutdown in 1970. Like the NuSal Heat Treating Furnace, the Amsler-Morton Furnace used a 50/50 blend of NaCl and KCl. The area also houses a water quench tank.

Vacuum Outgas Furnace. The Vacuum Outgas Furnace has a refractory-lined heating zone and a water-cooled cooling zone. The furnace and associated instrumentation are currently located at the extreme southern end of Building 6A. The furnace was used for outgassing and baking mold coatings of graphite molds that were used in Buildings 5A and 9A. The Vacuum Outgas Furnace is currently empty.

Old Water Treatment. The Old Water Treatment Plant, also known as the Plant 6 Sump, is located in a separate room in the northwestern corner of Building 6A. The Old Water Treatment facility started up when the plant opened in 1952. Some components of the facility currently remain in use.

During the production era, typical wastes sent to the water treatment process included acidified wastewater from the briquetting carousel sumps, slug washer tank fluids, and scrap pickling tank fluids. The aforementioned liquids were pumped to the 6,000-gal acid-hold tank or to the Scrap Pickling outside spent acid tank. Other treated liquids included nonacid and/or oily wastewater from floor sumps, nearby buildings, pads (storm runoff and fire deluge), oil clarifiers, and the Rolling Mill. These liquids were pumped to the 10,000-gal inside settling tank or temporarily to the outside tank.

Pickling Area. The Pickling process area includes two pickling processes, an acid gas handling process, and the machining processes coolant clarifier process.

Scrap Pickling. The Scrap Pickling equipment consists of a three-compartment stainless steel rectangular tank that rests on the floor such that the uncovered top is approximately waist-high. Uranium scraps, ingots, and debris were routinely cleaned of surface oxidation in the Scrap Pickling area. The pieces were processed in mesh baskets or trays and then submerged in and moved between the tanks by an overhead track/hoist system. The entire Scrap Pickling system was drained at plant shutdown in 1989. The tanks are free of visible residue. The trench behind the unit is visibly empty; however, the sump pump area currently contains liquids.

Slug Pickling. Various types of uranium cores (collectively known as "slugs") were cleaned in this assembly line process. The slug washer used a concentrated caustic spray solution as the first step for removal of residual oil, dirt, and salt from the slugs. Following a water spray rinse, some products were moved off-line if pickling was not required, but most passed through a concentrated nitric acid dip, followed by a water rinse. The process continued with a neutralization rinse, followed by a hot water spray-and-dip rinse, and ended

with hot air drying. The fluids in all of the Slug Pickling tanks, and the fan-forced air in the dryer, were heated by steam and/or hot-water internal heat exchangers.

Coolant Clarifiers. Three coolant clarifiers with rakes and pumps are located near the east side of Building 6A. The coolant oil from the Acme-Gridley machines, Turret Lathes, Heald Boremat machines, Centerless Grinders, and Cross Transfermatic machine went through clarifiers, where the insoluble oil layer was skimmed with rakes. The Coolant Clarifier units consisted of three primary components: a tank, flotation cell, and sludge scraper mechanism. The tank was constructed with two compartments, for dirty and clean coolant. The flotation cell included a motor drive rotor-stator assembly that provided a froth to entrain the insolubles and two skimmers driven by a separate motor. The sludge scraper mechanism contained a series of scrapers mounted on a drag chain conveyor that was driven at slow speed by a separate motor.

NO_x Destructor. The NO_x Destructor equipment was installed to serve various acid-related pickling processes in Building 6A: the Scrap Pickling operation, part of the Briquetting Carousel, and part of the Slug Washer line. Fumes from collection hoods over those processes were ducted directly to the bottom of the NO_x Destructor's first scrubbing tower. Flow through the system was provided by a blower in the roof-mounted exhaust stack. The fumes travelled up the first scrubber, exited at the top, entered the bottom of the second scrubber, and finally exited. Sodium sulfide (Na_2S) solution provided the NO_x destruction capability.

Major Media Types per Process Area

Building 6A consists of a poured concrete base and a structural steel frame with transite panels covering the roof and walls. For shielding purposes, several concrete walls separate some of the process areas. The floors are poured concrete, except for three process areas that have acid-brick-lined diked areas (Scrap Pickling, Old Water Treatment, and Chip Briquetting). Steel and concrete are considered major media for all process areas in Building 6A. Because transite is addressed as a separate supplemental sampling activity, it is not considered among the Building 6A major media.

Summary of Available Radiological Data

Building 6A is routinely surveyed for removable alpha and total beta-gamma contamination. Results from the most recent surveys are summarized in the Work Plan Addendum Appendix Tables and provide the basis for identifying radiological hot spots. As indicated, 1,183 removable alpha and 627 total beta-gamma survey measurements were performed in Building 6A from 1989 through 1992. On the basis of the assembled data, each process area hot spot is identified on Figure 6A-1. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys. The highest measured concentrations of contamination are 21,280 and 1,500,000 dpm for removable alpha and total beta-gamma contamination, respectively. The highest measured concentrations for removable

alpha as well as total beta-gamma were generally in the Salt Water Heat Treating and Continuous Bar Mill process areas.

Rolling Mill Area. The radiological hot spot for the Rolling Mill Area measured 1,190,000 dpm total beta-gamma radiation and is located near the salt bath furnace. The corresponding removable alpha radiation measurement is 21,280 dpm (Figure 6A-1).

Machining Area. The radiological hot spot for the Machining Area measured 1,500,000 dpm total beta-gamma radiation and is located near the vertical lathe. The corresponding removable alpha radiation measurement is 3,516 dpm (Figure 6A-1).

Chip Briquetting. The radiological hot spot for the Chip Briquetting Area measured 1,380,000 dpm total beta-gamma radiation. The corresponding removable alpha radiation measurement is 2,186 dpm (Figure 6A-1).

Heat Treating. The radiological hot spot for the Heat Treating Area measured 990,000 dpm total beta-gamma radiation. The corresponding removable alpha radiation measurement is 10,509 dpm (Figure 6A-1).

Vacuum Outgas Furnace. The radiological hot spot for the Vacuum Outgas Furnace measured 25,000 dpm total beta-gamma radiation. The corresponding removable alpha radiation measurement is 457 dpm (Figure 6A-1).

Old Water Treatment. The radiological hot spot for the Old Water Treatment Area measured 890,000 dpm total beta-gamma radiation. The corresponding removable alpha radiation measurement is 3,019 dpm (Figure 6A-1).

Pickling Area. The radiological hot spot for the Pickling Area measured 1,270,000 dpm total beta-gamma radiation and is located near the coolant clarifiers. The corresponding removable alpha radiation measurement is 7,019 dpm (Figure 6A-1).

Summary of Sampling for Building 6A

For Building 6A, one airborne particulate sample will be taken and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive sampling for the concrete medium will be performed in the location identified by the radiological hot spots shown in Figure 6A-l. Because the processes

in Building 6A were both wet and dry, the concrete samples will be cores and chips, respectively (Table 6A-1). Structural steel scrapings and swipe samples will be collected (where applicable) on the basis of Protocols 1 and 3. On the basis of visual building inspection, composite liquid supplemental samples will be taken from the Building 6A sumps.

TABLE 6A-1 Sample Types and Quantities for Building 6A

Sample Type	Rolling Mill Area	Machining Area	Chip Briquetting	Heat Treating Area	Vacuum Outgas Furnace	Old Water Treatment	Pickling Area	Component Totals
Nonintrusive[a]								
Radiological surveys	b	b	b	b	b	b	b	NA[c]
Chemical surveys	b	b	b	b	b	b	b	NA
Air particulates	NA	NA	NA	NA	NA	NA	NA	1
Swipes	2	2	2	2	2	2	2	14
Lab composite swipes	NA	NA	NA	NA	NA	NA	NA	1
Intrusive[a]								
Concrete chips	1	1	1	1	1	NA	NA	5
Concrete cores	NA	NA	NA	NA	NA	1	1	2
Masonry	NA	NA	NA	NA	NA	NA	NA	NA
Steel surface scraping	1	1	1	1	1	1	1	7
Supplemental								
Liquid sample	1	1	NA	NA	1	NA	NA	3
Loose media	NA	NA	NA	NA	NA	NA	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.3.8 Building 6C — Plant 6 Electrostatic Precipitator South

Component Description

Building 6C (Plant 6 Electrostatic Precipitator South) is a single-level building measuring approximately 16 × 30 ft and 14 ft high. Building 6C is adjacent to the east side of the Metals Fabrication Plant (Component 6A), as shown on the Grid 6 map in Appendix C, and consists of a poured concrete base and floor, a structural steel frame, and corrugated steel siding and roofing (Type C building). Figure 6C-1 shows the floor plan of Building 6C.

Process Area Description

Building 6C contains one process area, an electrostatic precipitator (Precipitron), which handled exhausts vented from the machining processes in the Metals Fabrication Plant. The electrostatic elements were typically not powered because exhausts contained moisture. Building 6C currently contains the Precipitron and air filters. Anticipated contaminants for Building 6C are summarized in Table A.3.

Major Media Types per Process Area

The major media for Building 6C are the structural steel and the concrete that make up the base and floor.

Summary of Available Radiological Data

Building 6C has not been routinely surveyed for removable alpha and total beta-gamma contamination. Because no recent data are available, any data collected from ongoing radiological surveys will be incorporated in the determination of the radiological hot spot before sampling activities. Also, radiological screening will be performed before sampling to determine a hot spot.

Summary of Sampling for Building 6C

For Building 6C, one airborne particulate sample will be taken and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, PCB field test kit measurements, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive sampling for the concrete medium will be performed in the location determined from the radiological screening. Because the process in Building 6C is dry, a concrete chip will be taken from the

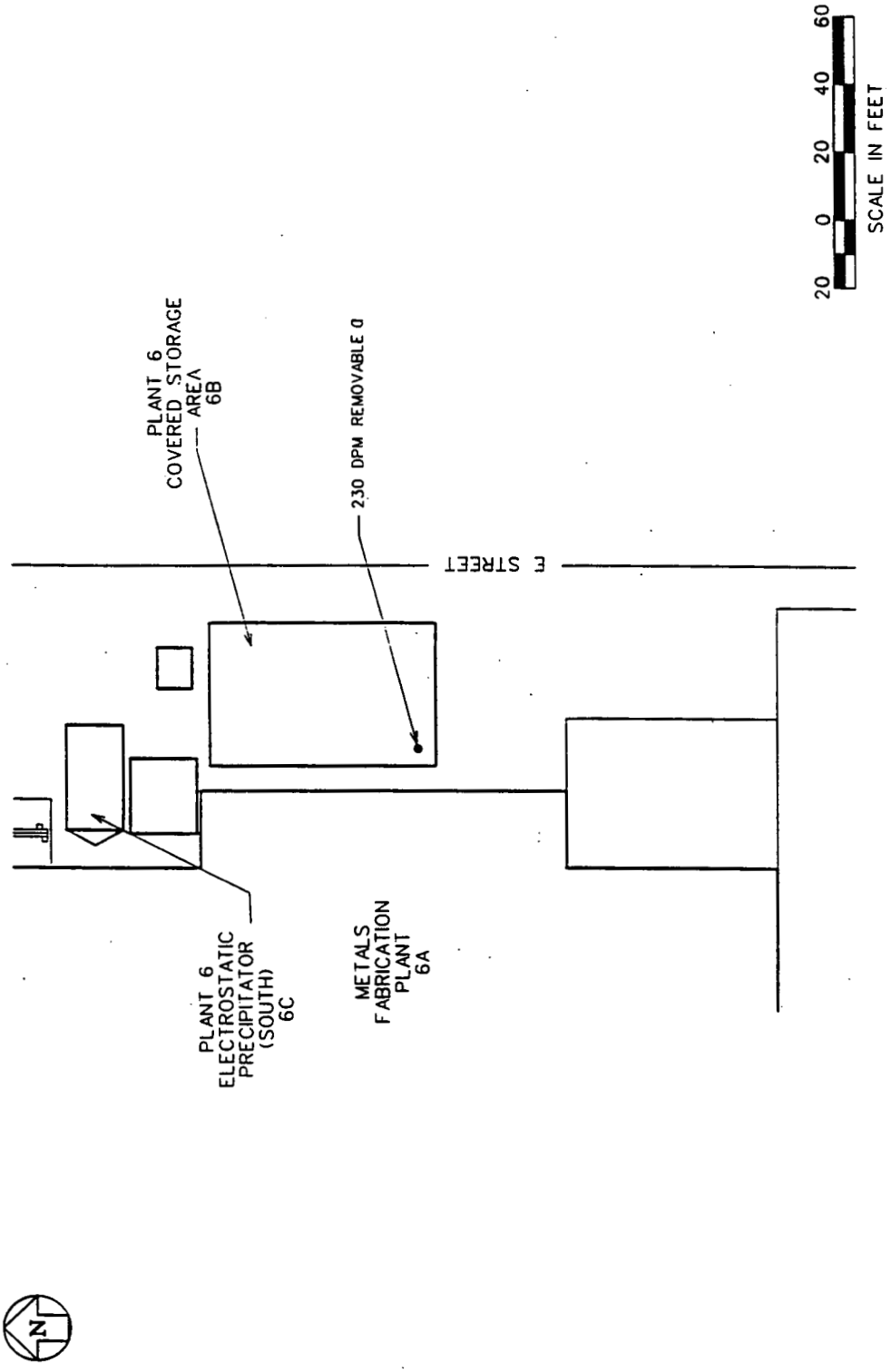

FIGURE 6C-1 Layout of Building 6C

floor. Structural steel scrapings and swipe samples will be collected on the basis of Protocols 1 and 3. Visual inspection of the component identified no supplemental samples. Table 6C-1 summarizes the planned sampling program for Building 6C.

TABLE 6C-1 Sample Types and Quantities for Building 6C

Sample Type	Electrostatic Precipitator	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.3.9 Building 6E — Plant 6 Electrostatic Precipitator North

Component Description

Building 6E (Plant 6 Electrostatic Precipitator North) is a single-level building measuring approximately 16 × 30 ft and 14 ft high. Building 6E is adjacent to the east side of the Metals Fabrication Plant (Component 6A), as shown on the Grid 6 map in Appendix C, and consists of a poured concrete base and floor, a structural steel frame, and corrugated steel siding and roofing (Type C building). Figure 6E-1 shows the floor plan of Building 6E.

Process Area Description

Building 6E contains one process area, an electrostatic precipitator (Precipitron), which handled exhausts vented from the machining processes in the Metals Fabrication Plant. The electrostatic elements were typically not powered because exhausts contained moisture. Building 6E currently contains the Precipitron and air filters. The anticipated contaminants for Building 6E are summarized in Table A.3.

Major Media Types per Process Area

The major media for Building 6E are the structural steel and the concrete that make up the base and floor.

Summary of Available Radiological Data

Building 6E has not been routinely surveyed for removable alpha and total beta-gamma contamination. Because no recent data are available, any data collected from ongoing radiological surveys will be incorporated in the determination of the radiological hot spot before sampling activities. Also, radiological screening will be performed before sampling to determine a hot spot.

Summary of Sampling for Building 6E

For Building 6E, one airborne particulate sample will be taken and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, PCB field test kit measurements, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive sampling for the concrete medium will be performed in the location determined from the radiological screening. Because the process in Building 6E is dry, a concrete chip will be taken from the

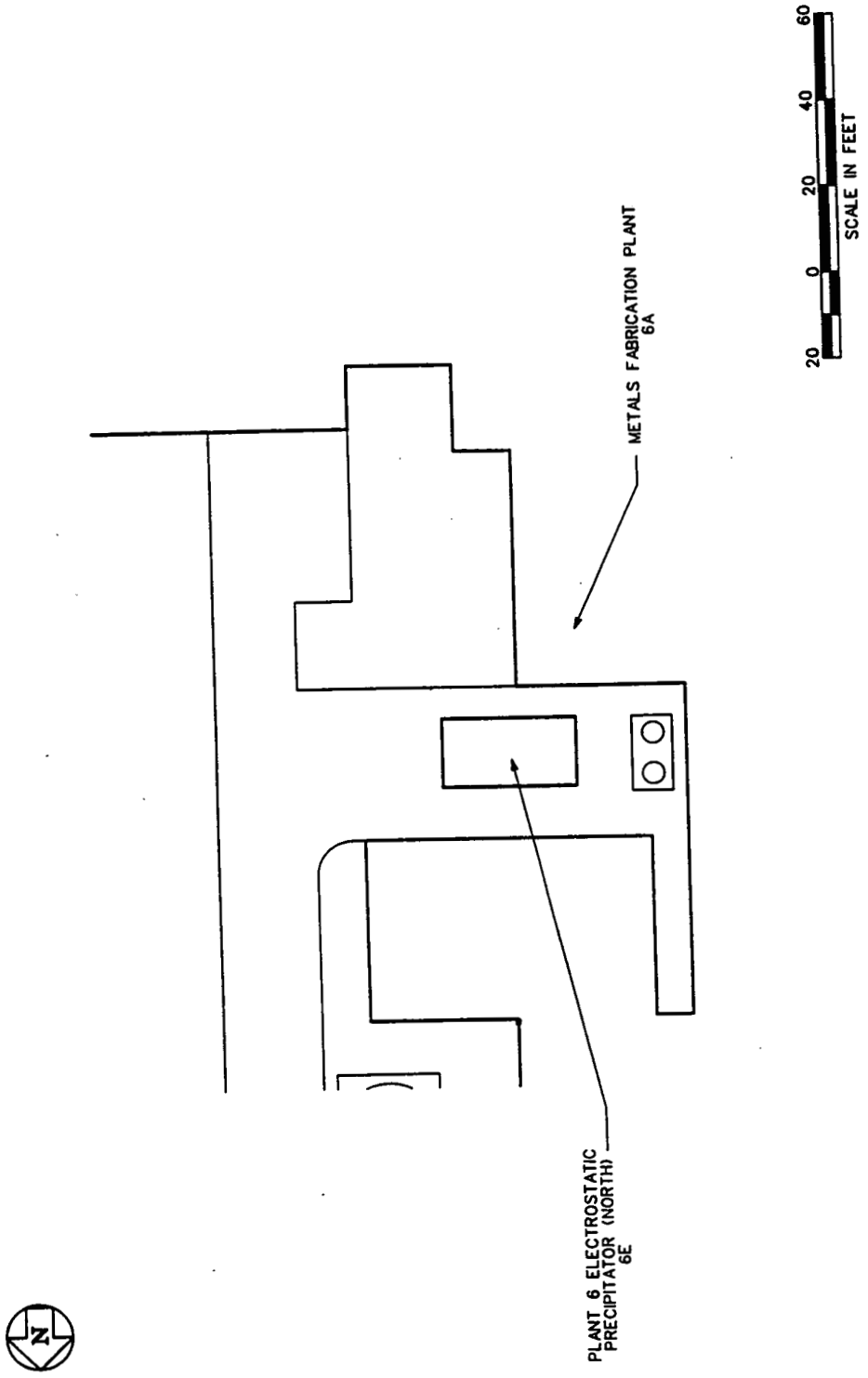

FIGURE 6E-1 Layout of Building 6E

floor. Structural steel scrapings and swipe samples will be collected on the basis of Protocols 1 and 3. Visual inspection of the component identified no supplemental samples. Table 6E-1 summarizes the planned sampling program for Building 6E.

TABLE 6E-1 Sample Types and Quantities for Building 6E

Sample Type	Electrostatic Precipitator	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.3.10 Building 6F — Salt-Oil Heat Treatment Building

Component Description

Building 6F (Salt-Oil Heat Treatment Building) is a single-level building that adjoins the south end of the Metals Fabrication Plant (Component 6A), as shown on the Grid 6 map in Appendix C. The rectangular building measures approximately 25 × 45 ft and 20 ft high. The building consists of a structural steel frame on a concrete base with transite siding and roofing panels (Type A building); the floor plan is provided in Figure 6F-1.

Process Area Description

Building 6F contains an immersion electrode salt furnace, a molten salt tank, an oil quench tank, a hot water washer with attached sump tank, two heat exchangers, a trenched floor sump, and a chain conveyor. All of the equipment is included in the salt-oil heat treating process. Anticipated contaminants for Building 6F are summarized in Table A.3.

Mark 31 Target Element Cores were processed in the Building 6F salt-oil heat treating system located at the south end of the Metals Fabrication Plant. This was the only production molten salt-dip operation at the site that used oil rather than water for quenching. Heat treating and quenching operational times and temperatures were strictly controlled to achieve uniform core grain properties. The Mark 31 cores were loaded into steel baskets and heated in a 50/50 molten salt mixture of sodium chloride and potassium chloride. The furnace was electric, with three pairs of water-cooled electrodes. The cores were quenched in 131°F oil recirculated for temperature control.

Major Media Types per Process Area

Building 6F major media comprise of structural steel, poured concrete, and acid brick. Because transite is addressed as a separate supplemental sampling activity, it will not be considered among the Building 6F major media.

Summary of Available Radiological Data

Building 6F is routinely sampled for removable alpha and total beta-gamma contamination. Results from the most recent surveys are summarized in Tables A.4.0 and A.4.1 and provide the basis for identifying radiological hot spots. A total of 26 removable alpha and 26 total beta-gamma survey measurements were performed in Building 6F from 1989 through 1992.

Figure 6F-1 identifies the hot spot for the acid brick and concrete media. The highest measured concentration of removable alpha and total beta-gamma contamination for

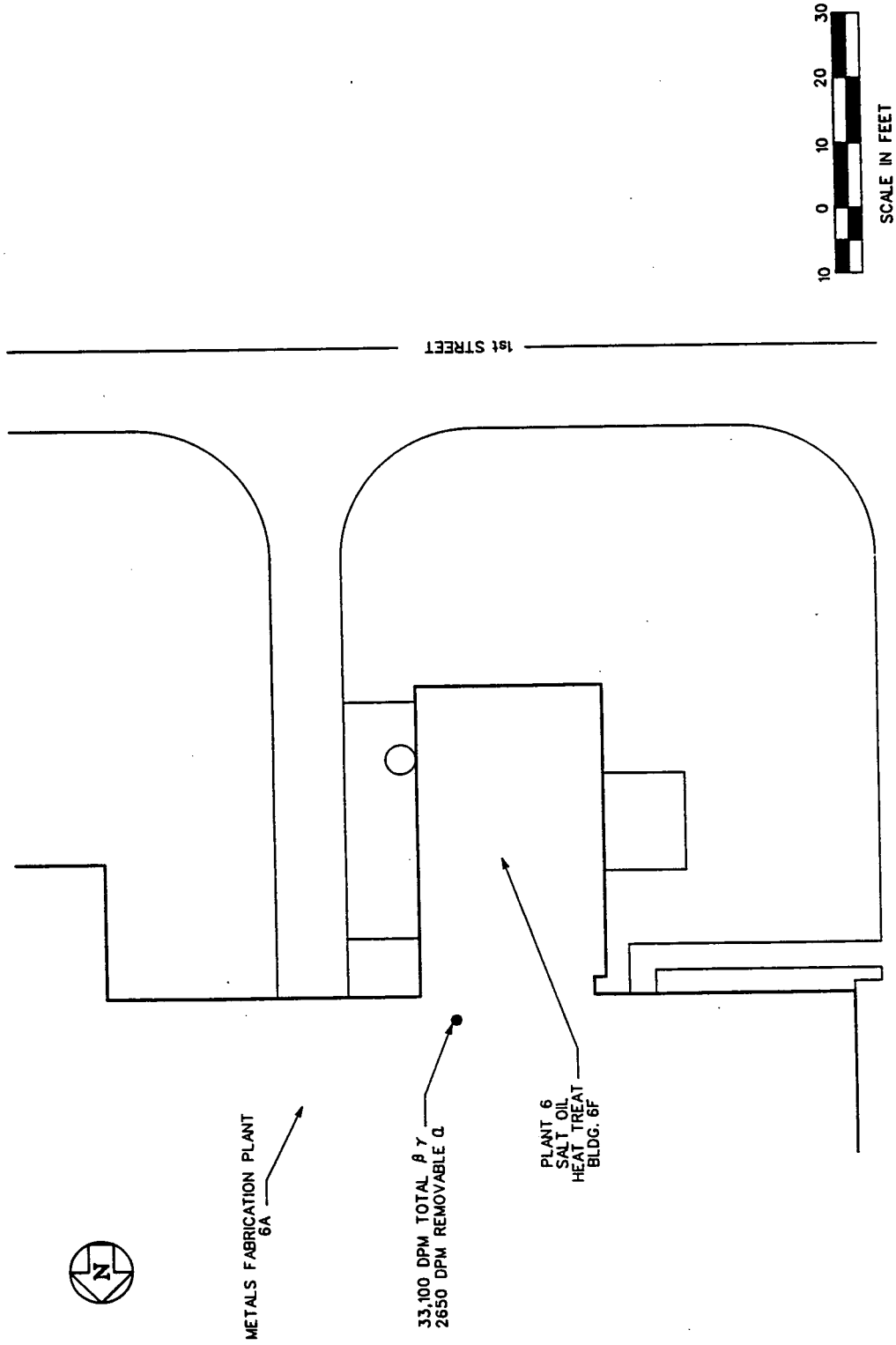

FIGURE 6F-1 Layout of Building 6F

the concrete medium was determined to be located at the north entrance of Building 6F. The removable alpha and total beta-gamma readings were 2,650 and 33,100 dpm, respectively. The highest removable alpha and total beta-gamma contamination for the acid brick medium was determined to be located in the trench near the south end of Building 6F. The highest removable alpha and total beta-gamma readings were 6,246 and 193,014 dpm, respectively. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys.

Summary of Sampling for Building 6F

One air sample will be taken in the component and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, radiological surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive sampling will be performed in the locations identified as the radiological hot spots for the acid brick and the concrete media shown in Figure 6F-1. Because Building 6F has been identified as a wet process area, a concrete core sample will be taken. Structural steel scrapings and swipe samples will be collected on the basis of Protocols 1 and 3. On the basis of a visual building inspection, a composite liquid supplemental sample will be taken from the one sump located within Building 6F. No substantial loose media were observed. Table 6F-1 summarizes the planned sampling program for Building 6F.

TABLE 6F-1 Sample Types and Quantities for Building 6F

Sample Type	Salt Oil Treating	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	3	3
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	1	1
Steel surface scraping	1	1
Supplemental		
Liquid sample	1	1
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.3.11 Building 6G — Plant 6 Sump Building

Component Description

Building 6G (Plant 6 Sump Building) is a multilevel, pre-engineered building consisting of a structural steel frame on a reinforced poured concrete base that is approximately 42 × 90 ft and 39 ft high. This building is a new addition to the Metals Fabrication Plant (Component 6A) designed to function as a separate facility. This building is located northwest of Plant 6A, as shown on the Grid 6 map in Appendix C.

Process Area Description

The Plant 6 Sump Building is a new addition to Plant 6, completed since production activities were halted. This addition was designed to replace the old process water treatment system in Plant 6. Wastewater processing has never occurred in the new facility.

Summary of Sampling for Building 6G

This component does not require sampling. The component has not been placed into service following recent completion of construction and exhibits little or no evidence of contamination.

D.9.3.12 Building 8A — Recovery Plant

Component Description

Building 8A (Recovery Plant), a two-story structure measuring 239 × 280 ft and 37 ft high, is located on the south side of 101st Street between A and B streets, as shown on the Grid 20 map in Appendix C. The building consists of a structural steel frame on a reinforced poured concrete foundation, reinforced concrete ground floors, transite interior and exterior siding panels (insulation material between panels), and transite roof panels (Type A building). The second floor is primarily steel grating with some concrete flooring. Building 8A is attached to the new Rotary Kiln/Drum Reconditioning Building (Component 8C), which is south of Building 8A; however, that component is not a priority target for media characterization sampling. Building 8A converted uranium-containing residues and off-specification and scrap uranium metal to more suitable chemical forms for recycling to the production process in the Ore Refinery Plant (Component 2A). The materials processed for recovery in Building 8A included mostly metal chips and turnings, off-specification green salt from the Hydrofluorination Plant (Component 4A), dust collector residues, and sump cakes.

Process Area Description

Building 8A contains 16 current and/or historical process areas (Figures 8A-1 and 8A-2), some of which hosted two or more processes during the history of the plant. The Recovery Plant consists of 16 process areas, some of which contain or contained more than one process unit during the history of Building 8A. Anticipated contaminants for Building 8A are summarized in Table A.3.

Oxidation Furnace No. 2. The oxidation furnace no. 2 is located near the east end of Building 8A, along the north wall. It is a six-hearth, refractory-brick-lined, industrial furnace that operated from the mid-1950s through 1987. The furnace is 54 in. in diameter and 25 ft high. Oxidation furnace equipment included a drum dumping station, from which the feed material was transported to the furnace via a flexible screw conveyor that discharged into the top hearth. Drop holes allowed the feed material to fall from one rotating hearth to another. Product exiting the furnace was discharged from the sixth hearth into a water-cooled screw, conveyed to a bucket elevator, and then lifted and dropped into the drum packaging station.

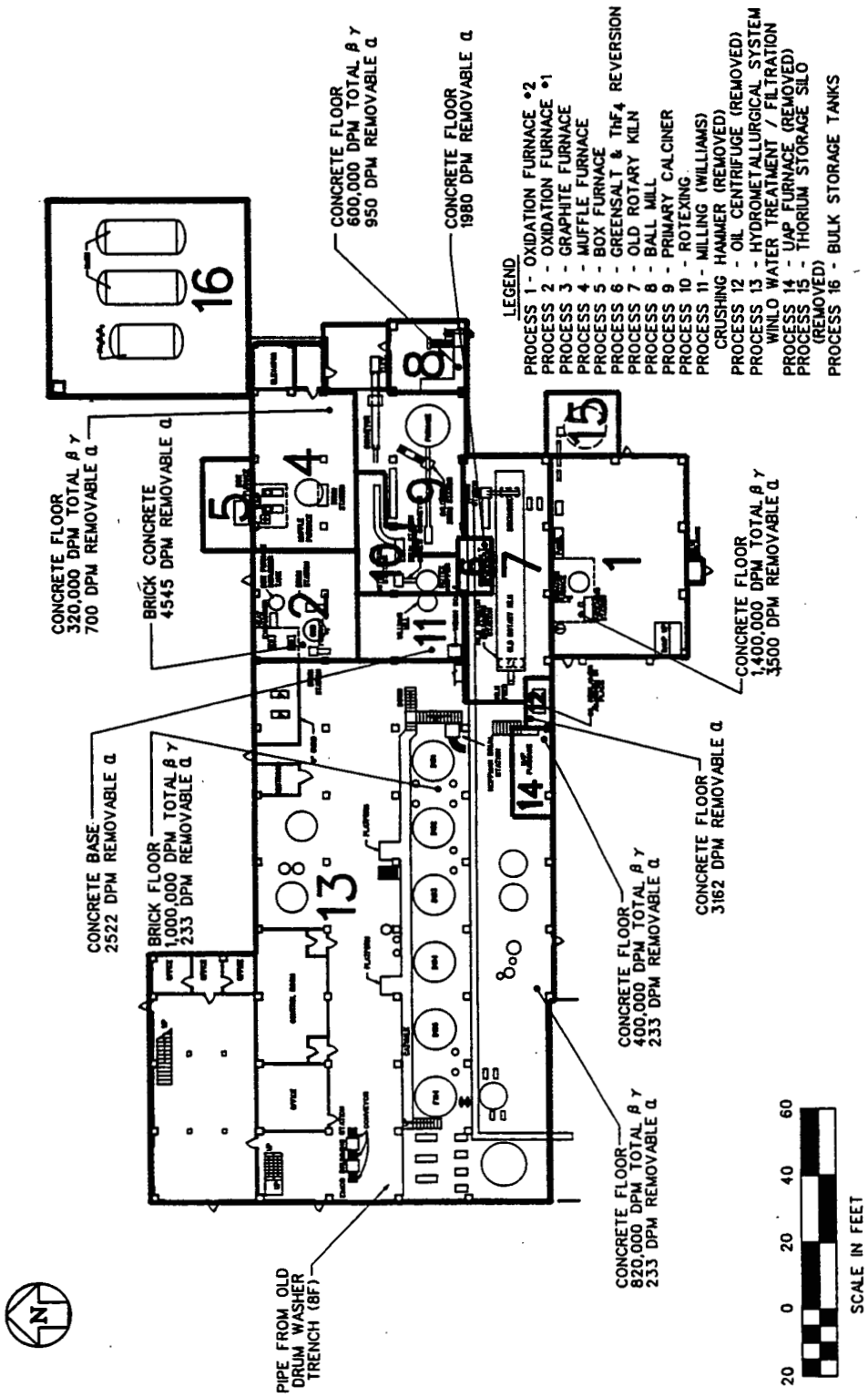

FIGURE 8A-1 Layout of Building 8A — First Floor

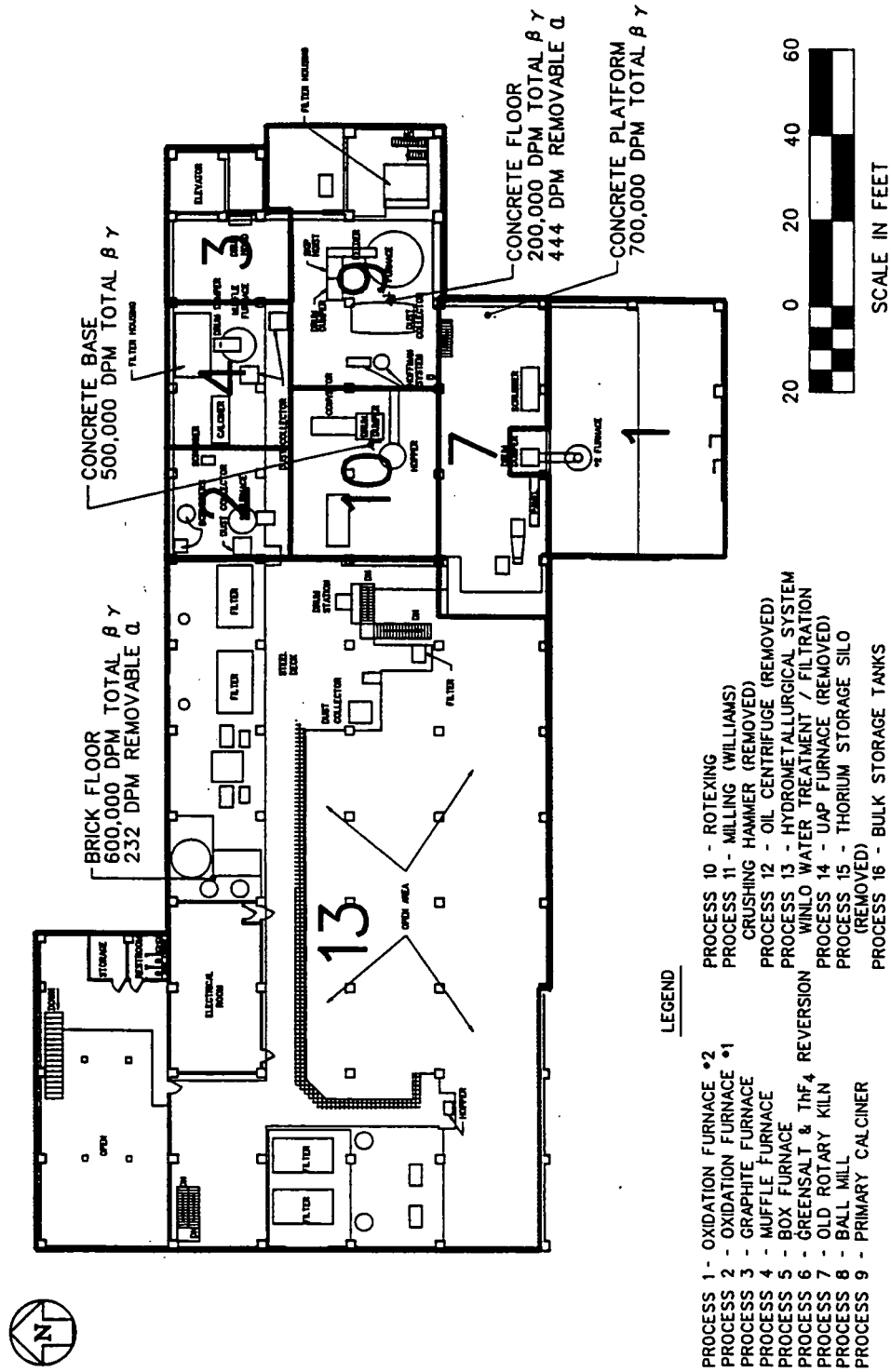

FIGURE 8A-2 Layout of Building 8A — Second Floor

Several types of enriched uranium feed materials were processed through oxidation furnace no. 2, including dust collector sludges, materials such as green salt with magnesium oxide from the Green Salt Plant, and off-specification uranium from various production plants. These materials were converted to calcium uranate for reprocessing through the Ore Refinery Plant.

A Wheelabrator dust collector and a scrubber system provided treatment of dust and off gases from oxidation furnace no. 2. The Wheelabrator unit collected dust from the furnace product drumming station and feed drum dumping station. The dedicated scrubber system was a venturi scrubber using 10% caustic (sodium hydroxide) as the scrubber solution for off gases from the furnace vents.

Oxidation Furnace No. 1. The oxidation furnace no. 1 was installed in 1953 in the southeastern corner of Building 8A. It is a six-hearth, refractory-brick-lined, industrial furnace used periodically until 1988 for the recovery of enriched uranium material and the treatment of depleted uranium waste. This furnace has the same design as the oxidation furnace no. 2.

Enriched uranium scraps from several production plants were oxidized to black oxide in furnace No. 1, screened by rotexing, and then reintroduced into the production process at the Ore Refinery Plant. Alternatively, depleted uranium waste was oxidized and/or dewatered for volume reduction and free water removal before packaging for transport to disposal or storage. Besides uranium in varying levels of enrichment, some of the materials fed to the oxidation furnace in these operations contained RCRA-listed chlorinated solvents; therefore, the equipment has been identified as an HWMU under RCRA statutes.

An Amerjet dust collector and a scrubber system treat the dust and off-gas streams from the furnace. Both are considered HWMUs. The dust collector provided ventilation for the drumming station, which receives collector dust discharges, and the product drumming station. The scrubber system was a dedicated venturi scrubber that used water as the scrubbing solution and received off gases directly from the furnace vents.

Graphite Furnace. Installed in 1953, the graphite furnace was used for only about three months in early 1960 and has been completely removed. The 2-ft-wide, 10-ft-long furnace was a moving hearth (chain grate) gas-fired furnace used for processing contaminated graphite. This graphite was mostly furnace crucibles that were jaw-crushed in the Metals Production Plant (Component 5A), as well as select feed material, processed for the recovery of black oxide.

Muffle Furnace. The muffle furnace is a single-hearth furnace built in the 1950s, used during the 1980s only for a three-week test period in 1983, and closed in-place in 1985. The unit design was a refractory-brick-lined, steel hearth capable of both forward and reverse

rabbling, 8.5 ft in diameter and 20 ft in height. The furnace was operated with variable retention times to obtain complete oxidation of the feed material.

Materials fed to the furnace during the 1983 test included enriched off-specification green salt and filter cake with a high lime content. Upon completion of the test, the furnace was run to "dead bed," thereby recovering the end product, calcium uranate. This material was returned to the production operation in the Ore Refinery Plant.

A scrubber system and two Amerjet dust collectors handled off gases and dust generated by muffle furnace operation. One dust collector controlled dust from the furnace feed drum dumping station, one of three access doors to the furnace hearth, and the dust drumming station beneath the dust collector itself. The other dust collector controlled dust from the two remaining furnace hearth access doors, the furnace product drumming station, and the dust drumming station for the scrubber itself. The dust collectors were removed in 1991. The Amerjet collectors use filter bags that, when spent, were processed through the box furnace. The scrubber for off gases from the muffle furnace was also used for the primary calciner. The scrubber was a venturi unit using, at different times, either water or 10% caustic for the scrubber solution. A holding tank collected scrubber solutions that passed through the venturi to allow reuse of the water and chemical. This scrubber system was dismantled and removed in 1991.

Box Furnace. The box furnace is a single, gas-fired furnace located outside Building 8A, immediately adjacent to the north wall of the building next to the muffle furnace. The box furnace is constructed of angle iron and sheet metal and is lined with refractory brick. It was installed in the mid-1950s and operated intermittently for more than 30 years, converting scrap uranium into black oxide and burning other contaminated materials into ash suitable for reprocessing in the Ore Refinery Plant. The box furnace operation was relatively simple, with batch feeding, manual rabbling, and hand raking of ash into product drums.

Scrap materials fed to the box furnace included off-specification uranium and thorium tetrafluoride, dirty prill, off-specification uranium derbies from the Metals Production Plant, high-uranium-content mill cleanout from the Preparation Plant (Component 1A), and partially oxidized metal oxidation feed. Contaminated materials included rags, filters, cloth, paper, and other burnable trash containing uranium; dust collector bags from air pollution control equipment; and Rockwell smelting furnace cleanings from the Metals Production Plant. The box furnace is considered to be an HWMU.

A dedicated venturi scrubber system handled off gases from the box furnace. Water was the scrubbing solution; a holding tank near oxidation furnace no. 1 collected used scrubber water for reuse and solids settling.

Green Salt and Thorium Tetrafluoride Reversion. The green salt reverter was a horizontal, electrically heated, ribbon flight retort reactor used to revert scrap green salt

to black oxide. Only operated for green salt reversion from 1956 to 1958, the reverter used superheated steam flowing countercurrent to the green salt feed material.

The reverter unit was used for 6 months in 1966 to process 59 metric tons of thorium tetrafluoride and produce thorium hydroxide, with hydrofluoric acid as a by-product. The green salt reverter was equipped with a dust collector and scrubber; all of this equipment has been removed.

Old Rotary Kiln. The old rotary kiln is located in the southeastern part of Building 8A and operated from 1952 to 1989. It is a 5.5-ft diameter, rotating steel cylindrical kiln and is lined with refractory brick. The kiln was used for the drying, roasting, and oxidation of recoverable materials, which were fed to the unit by a second-floor feed dumping station located at the west end of the kiln. The end products containing recoverable uranium exited the east end of the kiln at the first-floor product drumming station and were reused as feed stock in the Ore Refinery Plant. The old rotary kiln also treated waste by volume reduction (dewatering) before shipment off-site.

The old rotary kiln was equipped with both a dust collector and a scrubber system. The dust collector was configured to collect particulate emissions from the drum dumper, feed tray, breach chamber, and drum packaging station of the kiln as well as the primary calciner. The dust was handled either as recovered feed material for the Ore Refinery Plant or waste, depending on uranium levels. The dust collector has been removed. The scrubber system was similar to those discussed in the earlier sections.

The materials fed to the old rotary kiln consisted of a large variety of uranium and thorium process materials, including sump cakes, magnesium fluoride, machining chips and turnings, and thorium oxide, oxalate, and hydroxide. Dry material feeding was by screw conveyor, while wet feeding was by manual raking from a drum dump tray. Kiln products could be conveyed to a silo on the Plant 8 East Pad (Component 74C), which has been removed, in addition to being packed in drums.

Ball Mill. The ball mill was located on the east end of the first floor of Building 8A and was used for milling scrap uranium residues to facilitate dissolution in hydrochloric acid digesters. The ball mill has been removed. Two principal feeds to the ball mill, magnesium fluoride and crushed carbonate salts, were raked into the mill feed chute for wet milling (with water from a recycle tank) to a slurry that was transferred to a digester by pumping.

Primary Calciner. The primary calciner, installed in 1953, is located on the east side of Building 8A. Operated intermittently until 1989, the calciner consists of an eight-hearth, gas-fired industrial furnace with poured concrete hearth decks and an automatic rabble. The unit is 13.5 ft in diameter with a refractory-lined steel shell. The primary calciner was used for drying and roasting of recoverable uranium and thorium residues and wastes, but it was used exclusively for wastes processing after 1985. Many of the feeds were

the same as were fed to the old rotary kiln; some of the post-1985 wastes dried in the primary calciner included slag leach cake, neutralized raffinate, and sump cake from the Eimco filter in the water treatment/filtration process. Some of these wastes, such as spent solvents, contained hazardous constituents; therefore, the equipment has been classified as an HWMU. The primary calciner has a dust collector that also served the old rotary kiln, as described above. The scrubber system for the primary calciner was shared with the muffle furnace.

Rotex Screening. The vibrating rotex screening unit is located west of the primary calciner and spans both the first and second floors in Building 8A. The rotex screening unit operated intermittently from the mid-1950s to 1989, separating particles of reclaimed and waste material that are larger than 8 mesh from those smaller than 8 mesh. The latter was shipped to the Ore Refinery Plant, while the former was incinerated in Building 8A. An additional use of the rotex unit was for repackaging both recyclable and waste materials into drums.

Airborne emissions from the rotex screen were handled in a dust collector situated in the penthouse area on the roof of Building 8A. This unit uses filter bags, which have been placed on the unit since the rotex screen was shut down. During routine operation, collector residues were either reprocessed in the Ore Refinery Plant, sent to the Plant 8 Old Metal Dissolver Pad (Component 74Q), or drummed as waste for disposal off-site.

Williams Crushing Hammer Mill. The Williams crushing hammer mill is located on the first floor of Building 8A, between the old rotary kiln and oxidation furnace no. 1 process areas and was taken out of service in the 1960s. The Williams unit (also known as a slugger crusher) was designed for both wet and dry crushing of materials up to 6 in. in diameter. Feed materials were introduced into the mill via the drum dumper. Materials such as magnesium fluoride, sludge, contaminated graphite, incinerator ash, furnace salts, and dust collector sludges were reduced to fractional sizes of plus 0.5 in. and minus 0.5 in. Williams mill products were drummed and transferred to the digesters in the hydrometallurgical system for uranium recovery processing.

The Williams unit is equipped with blowers, ductwork, and a cyclone separator for dust control. Presumably, the air discharge from the cyclone vented to the atmosphere above the roof of Building 8A.

Oil Centrifuge. The oil centrifuge was located next to the uranyl ammonium phosphate (UAP) furnace and was intended to remove solids from waste oil for use as fuel for the UAP furnace. Contaminated waste oil was first held in a decant tank to remove water and then passed through the centrifuge and stored in two large storage tanks. The tanks were located on a diked concrete pad south of Building 8A. The centrifuged waste oil was never used in the UAP furnace and the centrifuge and tankage have been removed.

Hydrometallurgical System, WINLO, and Water Treatment/Filtration. This process area covers roughly the northwestern two-thirds of Building 8A and contains or contained most of the wet processing units for scrap recovery and water/wastewater treatment. Some of the units are still in operation for storm-water and wastewater treatment.

Hydrometallurgical System. The hydrometallurgical system was the wet processing system for uranium recovery from milled, crushed, and rotexed low-grade residues. Two processes, known as the ammonium diuranate (ADU) and UAP processes, were used and consisted generally of digestion (dissolution), precipitation, filtration, and wastewater neutralization.

The UAP process, used from 1958 to 1967, consisted of digestion of the residues with hydrochloric acid in the five digestion tanks (D101 through D105) on the first floor and filtration of the slurry through the two Eimco filters, which are rotary drum vacuum filters precoated with diatomaceous earth that are located on the second floor. The filter cake (tailings) was discarded to waste pits west of the production area, while the uranium-bearing filtrate was pumped to precipitation tanks that received ammonium hydroxide and phosphoric acid feeds. The resultant slurry, containing precipitates of UAP, was filtered on two Oliver precoat rotary drum vacuum filters located on the second floor south of the digestion tanks. The UAP cake was sent to the UAP furnace for drying, while the Oliver filtrate was neutralized with caustic or lime, filtered again on the Oliver filters, and pumped to the General Sump (Component 18B). The UAP Oliver filters have been removed, while most of the rest of the UAP process units and tanks are still in place and either in use for water treatment or abandoned in place.

The ADU process, used from 1955 to 1957 and again from 1967 to 1971, employed two tanks located on the second floor and west of the Oliver filters that are situated along the north wall of Building 8A. The filtered digestion liquor was heated and reacted with ammonium hydroxide to precipitate ADU, which was filtered on the west Oliver filter. The ADU cake was then sent to the UAP furnace, and the filtrate was treated as described above for the UAP process.

WINLO Process. From 1962 to 1964, the WINLO process was operated as a means of returning relatively pure, high-assay uranium materials to the Green Salt Plant. Black oxide from the furnaces and UAP and metal dissolver liquor were dissolved in hydrochloric and nitric acids and filtered on the Eimco filters. The filtrate containing uranium was then treated with 30% hydrofluoric acid, copper sulfate, and sulfur dioxide. The resultant green salt precipitate was filtered on a horizontal pan filter, passed through a dryer, and sent to the Green Salt Plant for further processing. Filtrate from the pan filter was neutralized with lime slurry and pumped to a waste settling pit. All related equipment (except the Eimco filters) and tankage, including a sulfur dioxide gas tank north of Building 8A, have been removed.

Water Treatment / Filtration. This process served as a wastewater treatment system for the site, including storm water, process water, and perched water. Portions of the system are still in use. Wastewater streams were pumped into the digesters, where hydrated lime was added for neutralization, and the wastewater was then filtered through the Oliver filters. The filtrate was transferred to holding tanks on the north side of the Recovery Plant before being pumped to the General Sump. The Oliver filter cake was drummed and sent to the old rotary kiln or primary calciner for drying.

An exception to the above process scheme for wastewaters from other plants is the handling of raffinate sump water from the Ore Refinery Plant during the 1980s. This raffinate sump water was transferred to Building 8A for the recovery of recyclable material and handled by first segregating the stream in holding tanks. Then the wastewater was treated with caustic at a pH of 10 to 11. The treated wastewater was filtered on the east Eimco filter, and the filtrate was analyzed for uranium, copper, and pH. The filtrate was pumped to the General Sump if it proved to be in-specification.

Wastewaters from the building were collected mostly in the main floor sump, except for the spent scrubber solutions and a few small diked and sump areas on the second floor, which were pumped directly from their points of generation. From 1955 through 1971 when the hydrometallurgical processes were in operation, these wastewaters were neutralized with caustic in a neutralization tank. After 1971, the wastewaters were treated in the digester tanks, filtered, sampled, and discharged to the General Sump like the other plant wastewaters.

The Plant 8 perched water treatment unit is situated in the northwestern corner of Building 8A. The system operates under the requirements of a CERCLA removal action. This particular area was not used during the historical operating period of Building 8A according to available plant records.

UAP Furnace. The UAP furnace was a 6-hearth, gas-fired furnace located west of the old rotary kiln along the south wall of Building 8A. As discussed above, the UAP furnace was used to dry UAP and ADU filter cakes from hydrometallurgical processing of residues. The UAP furnace had a dust collector but apparently not a scrubber system. The furnace and dust collector have been removed.

Thorium Storage Silo. Thorium compounds recovered in Building 8A processes were stored in an elevated steel silo located on the Plant 8 East Pad (Component 74C). The southeastern corner of the old rotary kiln area was the feed point for a conveyor that transferred the thorium materials outside to a bucket elevator. A raised conveyor system distributed the material for top entry into the silo. The silo and the conveyor/elevator system were removed in 1988. Because all equipment has been removed and this process area is located on another component (Plant 8 East Pad), no sampling will be proposed for this process area.

Bulk Storage Tanks. Four bulk storage tanks were located north of Building 8A within diked concrete containment areas with small corner sumps. Three horizontal cylindrical steel tanks currently occupy a location east of the filtrate tanks and the Plant 8 North Pad (Component 74R). Two of the tanks are 17,000 gal each and provide bulk storage for caustic. The third is a 12,250-gal sodium oxalate storage tank and is marked. Historically, this area was used for the bulk storage of phosphoric acid and sulfur dioxide. The phosphoric acid tank is now being used as the sodium carbonate tank. The sulfur dioxide tank has been removed.

Major Media Types per Process Area

Building 8A has a structural steel frame enclosed by transite siding and roof panels and is supported on a concrete foundation and base floor. Intermediate walkways and stairways are steel, and floors on the second story are made entirely of concrete and steel. A few concrete areas are surfaced with acid brick, including the floors and trench beneath the digester tanks and Eimco drumming station and the accountability tank outside the north wall of the building. The steel, concrete, and acid brick are considered the major media for Building 8A. Because transite is addressed as a separate supplemental sampling activity, it is not considered a major medium in Building 8A.

Summary of Available Radiological Data

Building 8A is routinely surveyed for removable alpha and total beta-gamma contamination. Results from recent surveys (1990 through 1992) have been reviewed to identify the locations of highest contamination in the various process areas. There have been 1,566 and 1,323 survey measurements taken on the floor media for removable alpha and total beta-gamma contamination, respectively. Also, 536 removable alpha and 736 total beta-gamma measurements have been taken for accessible areas throughout Building 8A.

The hot spots in each process area, except for the graphite furnace, box furnace, thorium storage silo, and bulk storage tanks process areas, are mapped on Figures 8A-1 and 8A-2. These locations are on the concrete and acid-brick-lined floors of the first and second levels of Building 8A. The total beta-gamma and removable alpha readings for the process area hot spots are listed as follows.

Oxidation Furnace No. 2. This process area has been surveyed for both removable alpha and total beta-gamma contamination. The total beta-gamma hot spot for the concrete is 1,400,000 dpm, and the associated removable alpha reading is 3,500 dpm.

Oxidation Furnace No. 1. The Oxidation Furnace No. 1 has only been surveyed for removable alpha contamination. The hot spot, was found to have a reading of 4,545 dpm, on the basis of the removable alpha data.

Graphite Furnace. This area has not been recently surveyed.

Muffle Furnace. This process area has been surveyed for both removable alpha and total beta-gamma contamination. The total beta-gamma hot spot for the concrete is 320,000 dpm, and the associated removable alpha reading is 700 dpm.

Box Furnace. The box furnace area has not been recently surveyed.

Green Salt and Thorium Tetrafluoride Reversion. This process area has only been surveyed for removable alpha contamination. The hot spot was found to have a reading of 1,980 dpm, on the basis of the removable alpha data.

Old Rotary Kiln. The old rotary kiln has been surveyed for both removable alpha and total beta-gamma contamination. The total beta-gamma hot spot for the concrete, located on the second floor, is 700,000 dpm; the associated removable alpha reading is below the MDA of 222 dpm.

Ball Mill. The ball mill area has been surveyed for both removable alpha and total beta-gamma contamination. The total beta-gamma hot spot for the concrete is 600,000 dpm, and the associated removable alpha reading is 950 dpm.

Primary Calciner. This process area has been surveyed for both removable alpha and total beta-gamma contamination. The total beta-gamma reading at the hot spot for concrete, located on the second floor, is 200,000 dpm, and the associated removable alpha reading is 444 dpm.

Rotex Screening. The rotex screening has been surveyed for both removable alpha and total beta-gamma contamination. The total beta-gamma hot spot for the concrete, located on the second floor, is 500,000 dpm; the associated removable alpha reading is below the MDA of 222 dpm.

Williams Crushing Hammer Mill. This process area has only been surveyed for removable alpha contamination. The hot spot was found to be 2,522 dpm, on the basis of the removable alpha data.

Oil Centrifuge. The oil centrifuge has only been surveyed for removable alpha contamination. The hot spot was found to have a reading of 3,162 dpm, on the basis of the removable alpha data.

Hydrometallurgical System, WINLO, and Water Treatment. This process area has been surveyed for both removable alpha and total beta-gamma contamination. The total beta-gamma hot spots for the concrete and acid brick media, both located on the first floor, are 820,000 and 1,000,000 dpm, respectively. The associated removable alpha readings are both 223 dpm.

UAP Furnace. The UAP furnace area has been surveyed for both removable alpha and total beta-gamma contamination. The total beta-gamma hot spot for the concrete is 400,000 dpm, and the associated removable alpha reading is 233 dpm.

Thorium Storage Silo. This area has not been recently surveyed.

Bulk Storage Tanks. This area has not been recently surveyed.

Summary of Sampling for Building 8A

One particulate air sample will be collected in the building and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including radiological and chemical surveys, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail intrusive sampling locations. Intrusive sampling will be performed at the radiological hot spots for the concrete, steel, and acid brick media. For the process areas not already surveyed, complete radiological and chemical surveys will be conducted first and the data analyzed to assess the need for additional intrusive sampling or replacement of one or more of the preselected intrusive sampling sites.

On the basis of the building inspection, several types of supplemental samples should be collected from a variety of Building 8A process areas. Sediment/loose media samples will be obtained from the floor trenches in the oxidation furnace no. 2 and the hydrometallurgical process areas. Also, measurable quantities of loose media were found in the old rotary kiln and oxidation furnace no. 1 process areas. A supplemental liquid sample will be taken from the old rotary kiln, the primary calciner, and the hydrometallurgical process areas. Table 8A-1 and 8A-2 summarize the sampling program for Building 8A.

TABLE 8A-1 Sample Types and Quantities for Building 8A, Part 1

Sample Type	Oxidation Furnace 2	Oxidation Furnace 1	Graphite Furnace	Muffle Furnace	Box Furnace	UF_4/ThF_4 Reversion	Old Rotary Kiln	Ball Mill
Nonintrusive[a]								
Radiological surveys	b	b	b	b	b	b	b	b
Chemical surveys	b	b	b	b	b	b	b	b
Air particulates	NA[c]	NA	NA	NA	NA	NA	NA	NA
Swipes	2	3	2	2	2	2	2	2
Lab composite swipes	NA	NA	NA	NA	NA	NA	NA	NA
Intrusive[a]								
Concrete chips	1	1	1	1	1	1	1	1
Concrete cores	NA	NA	NA	NA	NA	NA	NA	NA
Masonry	NA	1	NA	NA	NA	NA	NA	NA
Steel surface scraping	1	1	1	1	1	1	1	1
Supplemental								
Liquid sample	NA	NA	NA	NA	NA	NA	1	NA
Loose media	1	1	NA	NA	NA	NA	1	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

TABLE 8A-2 Sample Types and Quantities for Building 8A, Part 2

Sample Type	Primary Calciner	Rotex Screening	Williams Mill	Oil Centrifuge	Hydromet/ Treatment	UAP Furnace	Bulk Storage Tanks	Component Totals
Nonintrusive[a]								
Radiological surveys	b	b	b	b	b	b	b	NA
Chemical surveys	b	b	b	b	b	b	b	NA
Air particulates	NA	NA	NA	NA	NA	NA	NA	1
Swipes	2	2	2	2	3	2	2	32
Lab composite swipes	NA	NA	NA	NA	NA	NA	NA	1
Intrusive[a]								
Concrete chips	1	1	1	NA	NA	1	NA	12
Concrete cores	NA	NA	NA	1	1	NA	1	3
Masonry	NA	NA	NA	NA	1	NA	NA	2
Steel surface scraping	1	1	1	1	1	1	1	15
Supplemental								
Liquid sample	1	NA	NA	NA	1	NA	NA	3
Loose media	1	NA	NA	NA	1	NA	1	6

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.3.13 Building 8C — Rotary Kiln/Drum Reconditioning Building

Component Description

Building 8C (Rotary Kiln/Drum Reconditioning Building) is a multilevel, pre-engineered building consisting of a structural steel frame on a reinforced poured concrete base that is approximately 50 × 100 ft and 33 ft high. This building is a new addition to the Recovery Plant (Component 8A) that is designed to function as a separate facility. This building is located south of Plant 8A, as shown on the Grid 20 map in Appendix C.

Process Area Description

The Rotary Kiln/Drum Reconditioning Building is a new addition to Plant 8, completed since production activities were halted. This addition was designed to assist with remediation and interim activities on-site. The drum reconditioning process was designed to allow recycle of used drums for temporary storage or permanent disposal of wastes. The rotary kiln process was designed to oxidize and calcinate process residues and remediation wastes, to reduce volume and weight; and to stabilize materials for shipment, storage, and disposal. These processes in the addition have not been placed into service.

Summary of Sampling for Building 8C

This component does not require sampling. The component has not been placed into service following recent completion of construction and exhibits little or no evidence of contamination; moreover, radiological surveys do not exceed the criteria established for sampling.

D.9.3.14 Building 9A — Special Products Plant

Component Description

Building 9A (Special Products Plant) is a single-level building shown on the Grid 3 map in Appendix C. It is irregularly shaped, measuring approximately 200 × 260 ft and 20 ft high. The building consists of a structural steel frame with transite siding and roofing panels and a poured concrete base and floor (Type A building). The floor plan for the building is shown in Figures 9A-1 and 9A-2.

Process Area Description

Building 9A contains nine process areas. The primary purposes of Plant 9 were uranium reduction, uranium casting, and the following support processes: chip briquetting; scrap metal pickling; derby cleaning; Zirnlo decladding; and the production, machining, and heat treatment of uranium ingots. The recent and historical process areas are shown in Figures 9A-1 and 9A-2, respectively, and are described below. The anticipated contaminants for Building 9A are summarized in Table A.3.

Uranium Reduction and Derby Cleaning Area. These two processes used similar equipment and occurred in the same area.

Uranium Reduction. This process was similar to the one detailed for the Metals Production Plant (Component 5A). Originally, milled dolomite was used as a pot liner for the uranium reduction process. Later, MgF_2 (a reaction by-product) was used to line the reduction pots. Liners were formed in jolters, then filled with a blend of UF_4 and Mg, lidded, and furnaced. The uranium produced from the reduction reaction was cooled and separated from the MgF_2 and dolomite. The uranium reduction area currently contains 3 jolters, 6 liner hoppers, a pot filling/blending machine, a capping and lidding station, 13 reduction furnaces, cooling tanks, and a breakout booth.

Derby Cleaning. The uranium derbies were cleaned with a molten salt treatment that consisted of a 50/50 blend of lithium carbonate (Li_2CO_3) and potassium carbonate (K_2CO_3). The treatment removed any MgF_2 that adhered to the derbies. The operation was conducted in resistance element furnaces originally used for uranium reduction. Currently, eight Rockwell resistance furnaces are in the area.

Enriched Uranium Casting. Enriched uranium derbies and recycle metal were remelted to cast 11- and 13-in. (diameter) ingots for further processing. Graphite crucibles and zirconia-coated graphite molds were used in the induction-heated vacuum NPR furnaces. After pouring an ingot, crucibles were inverted and subjected to flame oxidation to "burn out"

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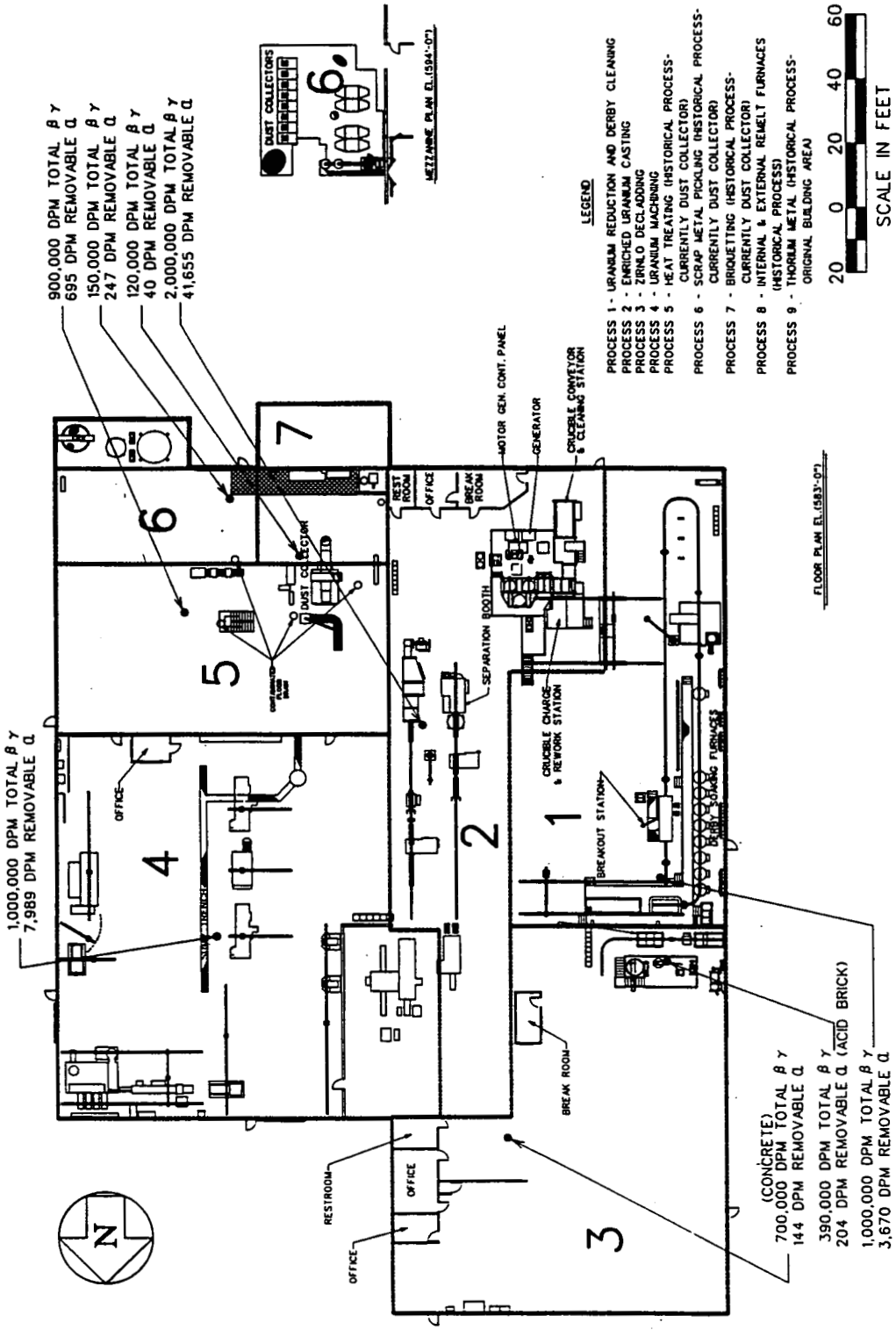

FIGURE 9A-1 Layout of Building 9A — Recent Process Areas

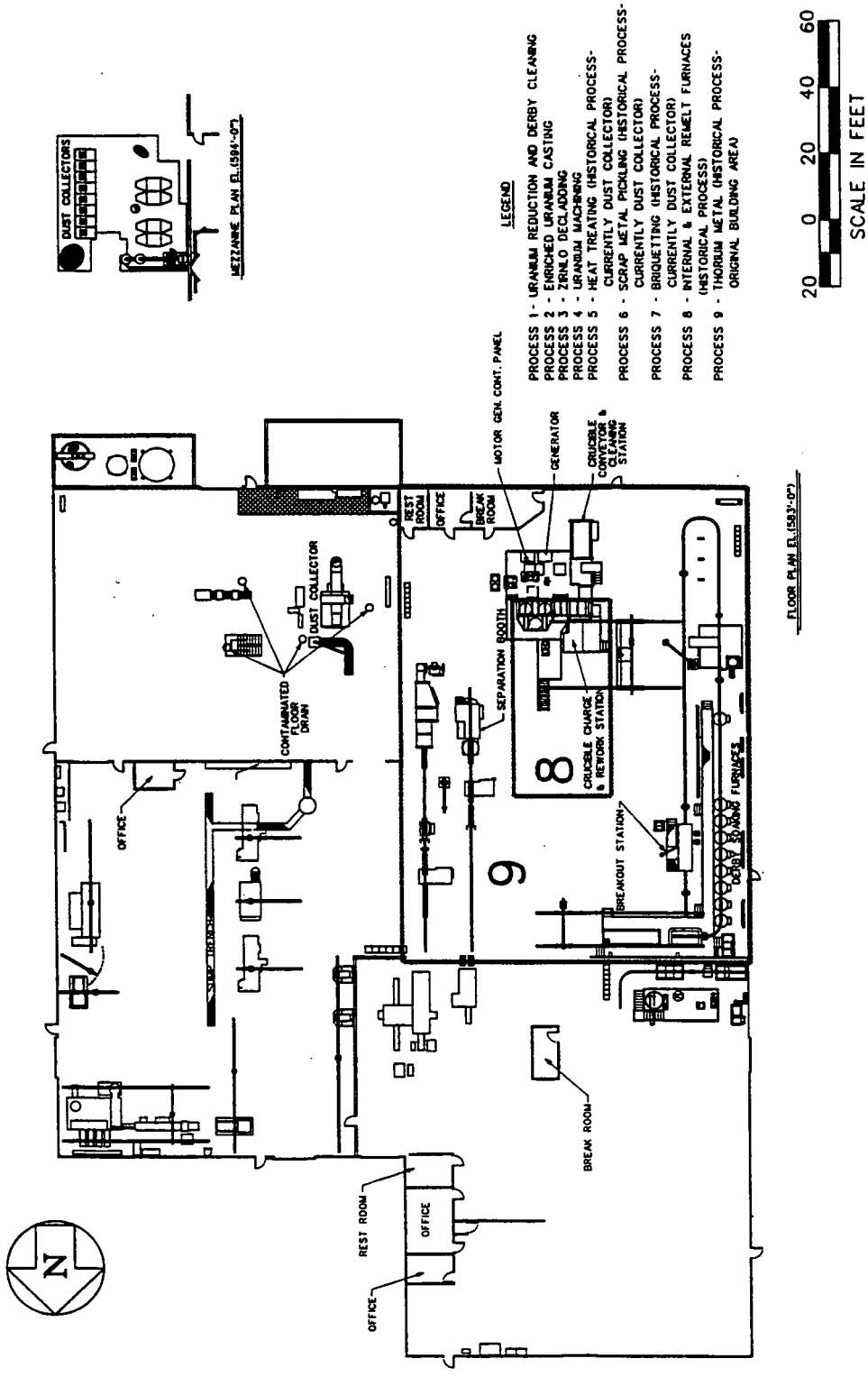

FIGURE 9A-2 Layout of Building 9A — Historical Process Areas

residual uranium. Ingots were cooled and separated from the molds and sent for machining. Molds were cleaned and recoated in Building 9A. Equipment in the area includes two induction furnaces, dust collection equipment, a vacuum system, and an oil reclaimer.

Zirnlo Decladding. The Zirnlo decladding process operated from 1963 to 1988 and was used for decladding nonirradiated fuel cores of copper and zirconium or nickel and aluminum cladding. Cores were sawed to size and placed sequentially in oxidizing and then reducing baths to remove the clad layers. Equipment in the area includes a reciprocating saw, open tanks, and holding tanks.

Uranium Machining. A variety of machining processes for uranium ingots was performed here, including top cropping, outer diameter turning, hole boring, and chamfering. Equipment includes saws, lathes, drills, and milling machines.

Triple Beta Heat Treating. Uranium ingots produced in Building 9A were beta heat treated in NuSal salt in an ingot heat-treating furnace. Originally, the ingots were beta heat treated three times, but later the treatment was a one-step process. The Building 9A ingot heat-treating furnace has been removed.

Scrap Metal Pickling. A nitric acid bath was used to remove surface oxidation from metal to be used for remelt feed. The pickling area currently contains a nitric acid tank, a rinse tank, and a fume scrubber.

Briquetting. Uranium chips from Building 9A machining were dumped into a crusher, put into baskets, centrifuged, and then bathed in nitric acid to remove oxides. The chips were then rinsed twice with water, centrifuged, and briquetted in a press. The nitric acid tank, two water rinse tanks, two centrifuges, chip crusher, briquette press, and fume scrubber have all been removed.

Internal and External Remelt Furnaces. All equipment has been removed from the internal and external remelt furnace area. Equipment included four vacuum induction furnaces, two vacuum pumps, a crucible "burnout" station, pot charging and mold cleaning stations, a separation booth, and an oil reclaimer (see Building 5A description). The Metals Production Plant (Component 5A) currently contains furnaces identical to those removed from the internal and external remelt furnace area. Because the process has been removed, sampling of this area is covered under the uranium reduction and derby cleaning and the enriched uranium casting areas.

Thorium Metal. Thorium was dissolved in nitric acid and precipitated as ThF_4 with HF. The ThF_4 was then dried, pulverized, blended with calcium and zinc chloride, and

thermally reduced to a zinc-thorium derby. The derby was subsequently dezinced and remelted in a vacuum furnace. Turnings from machining the thorium to a final form were acid washed and briquetted for return to the remelt cycle. The thorium metal process was performed during 1954 and 1955, and all equipment has been removed. Because the process has been removed, sampling of this area is covered under the uranium reduction and derby cleaning and the enriched uranium casting areas.

Major Media Types per Process Area

Building 9A major media consist of a structural steel frame and a poured concrete base and floor. Because concrete and steel are relatively uniform across the component, all processes are considered to contain these major media. Additionally, the acid brick floor and the cement block wall in the Zirnlo decladding area are considered major media for the process area. Because transite roofing and siding is addressed as a separate supplemental sampling activity, it will not be considered among the Building 9A major media.

Summary of Available Radiological Data

Building 9A is routinely surveyed for removable alpha and total beta-gamma contamination. Results from the most recent surveys are summarized in Tables A.4.0 and A.4.1 and provide the basis for identifying radiological hot spots for the concrete medium (and acid brick in the Zirnlo area). As indicated, 664 removable alpha and 438 total beta-gamma survey measurements were performed in Building 9A from 1989 through 1992. On the basis of the assembled data, each process area hot spot is identified on Figure 9A-1. Data will be reassessed before sampling to include any data from ongoing radiological surveys.

Uranium Reduction and Derby Washing Area. The radiological hot spot for the uranium reduction and derby washing area measured 1,000,000 dpm total beta-gamma and is located on the floor under the cooling area platform. The corresponding removable alpha measurement is 3,670 dpm.

Uranium Casting. The radiological hot spot for the uranium casting area measured 2,000,000 dpm total beta-gamma and is located near the ingot cooling turntable. The corresponding removable alpha measurement is 41,655 dpm.

Zirnlo Decladding. The radiological hot spots for the Zirnlo decladding area measured 700,000 and 390,000 dpm total beta-gamma for the concrete and acid-brick media, respectively. The corresponding removable alpha measurements are 144 and 204 dpm, respectively.

Uranium Machining. The radiological hot spot for the uranium machining area measured 1,000,000 dpm total beta-gamma and 7,989 dpm removable alpha.

Triple Beta Heat Treating. The radiological hot spot for the heat-treating area measured 900,000 dpm total beta-gamma and 695 dpm removable alpha.

Scrap Metal Pickling. The radiological hot spot for the scrap metal pickling area measured 150,000 dpm total beta-gamma and 247 dpm removable alpha.

Briquetting. The radiological hot spot for the briquetting area measured 120,000 dpm total beta-gamma and 40 dpm removable alpha.

Summary of Sampling for Building 9A

For Building 9A, one airborne particulate sample will be taken and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive sampling for the concrete medium will be performed in the locations identified by the radiological hot spots shown in Figure 9A-1. Because the processes in Building 9A were both wet and dry, the concrete samples will be cores and chips, respectively. Structural steel scrapings and swipe samples will be collected on the basis of Protocols 1 and 3.

On the basis of visual building inspection, composite liquid supplemental samples will be taken from the Building 9A sumps. The sumps will be divided into two areas: the uranium machining area and Zirnlo decladding area, each yielding one composite liquid supplemental sample. No substantial loose media were observed.

TABLE 9A-1 Sample Types and Quantities for Building 9A

Sample Type	Reduction and Derby Cleaning	Uranium Casting	Zirnlo Decladding	Uranium Machining	Heat Treating	Scrap Metal Pickling	Briquetting	Component Totals
Nonintrusive[a]	b	b	b	b	b	b	b	NA[c]
Radiological surveys	b	b	b	b	b	b	b	NA
Chemical surveys	NA	NA	NA	NA	NA	NA	NA	1
Air particulates	2	2	3	2	2	2	2	15
Swipes	NA	NA	NA	NA	NA	NA	NA	1
Lab composite swipes								
Intrusive[a]								
Concrete chips	NA	1	NA	1	NA	NA	NA	2
Concrete cores	1	NA	1	NA	1	1	1	5
Masonry	NA	NA	1	NA	NA	NA	NA	1
Steel surface scraping	1	1	1	1	1	1	1	7
Supplemental								
Liquid sample	NA	NA	1	1	NA	NA	NA	2
Loose media	NA	NA	NA	NA	NA	NA	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.3.15 Building 9B — Plant 9 Sump Treatment Facility

Component Description

Building 9B (Plant 9 Sump Treatment Facility) is a single-level building measuring approximately 20 × 30 ft and 20 ft high; its location is shown on the Grid 3 map in Appendix C. Building 9B adjoins the west side of the Special Products Plant (Component 9A) and consists of a structural steel frame on a poured concrete base and floor with transite walls and roofing (Type A building). Figure 9B-1 shows the floor plan of Building 9B.

Process Area Description

Building 9B treated wastewater from the Special Products Plant, originally with ammonium hydroxide (NH_4OH) and later with lime, to remove the bulk of the contaminants before wastewater transfer to the General Sump (Component 18B). Currently, the equipment remaining in Building 9B includes a decant tank, an acid tank, a mix tank, two plate and frame filters, and three filtrate tanks. A single process area has been identified for Building 9B. The anticipated contaminants for Building 9B are summarized in Table A.3.

Major Media Types per Process Area

The major media identified for Building 9B comprise a poured concrete base and floor, a structural steel frame, and acid brick masonry. Because transite is addressed as a separate supplemental sampling activity, it will not be considered among the Building 9B major media.

Summary of Available Radiological Data

Building 9B is surveyed for removable alpha and total beta-gamma contamination. Results from the most recent surveys are summarized in Appendix A.4.0 and provide the basis for identifying radiological hot spots. As indicated, 13 removable alpha and 13 total beta-gamma measurements were performed in Building 9B from 1989 through 1992. The highest measured concentrations for the total beta-gamma and removable alpha contamination were 600,000 and 799 dpm, respectively. On the basis of the data, the radiological hot spot is identified on Figure 9B-1. Data will be reassessed before sampling to include data from ongoing radiological surveys.

Summary of Sampling for Building 9B

One airborne particulate sample will be taken and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other

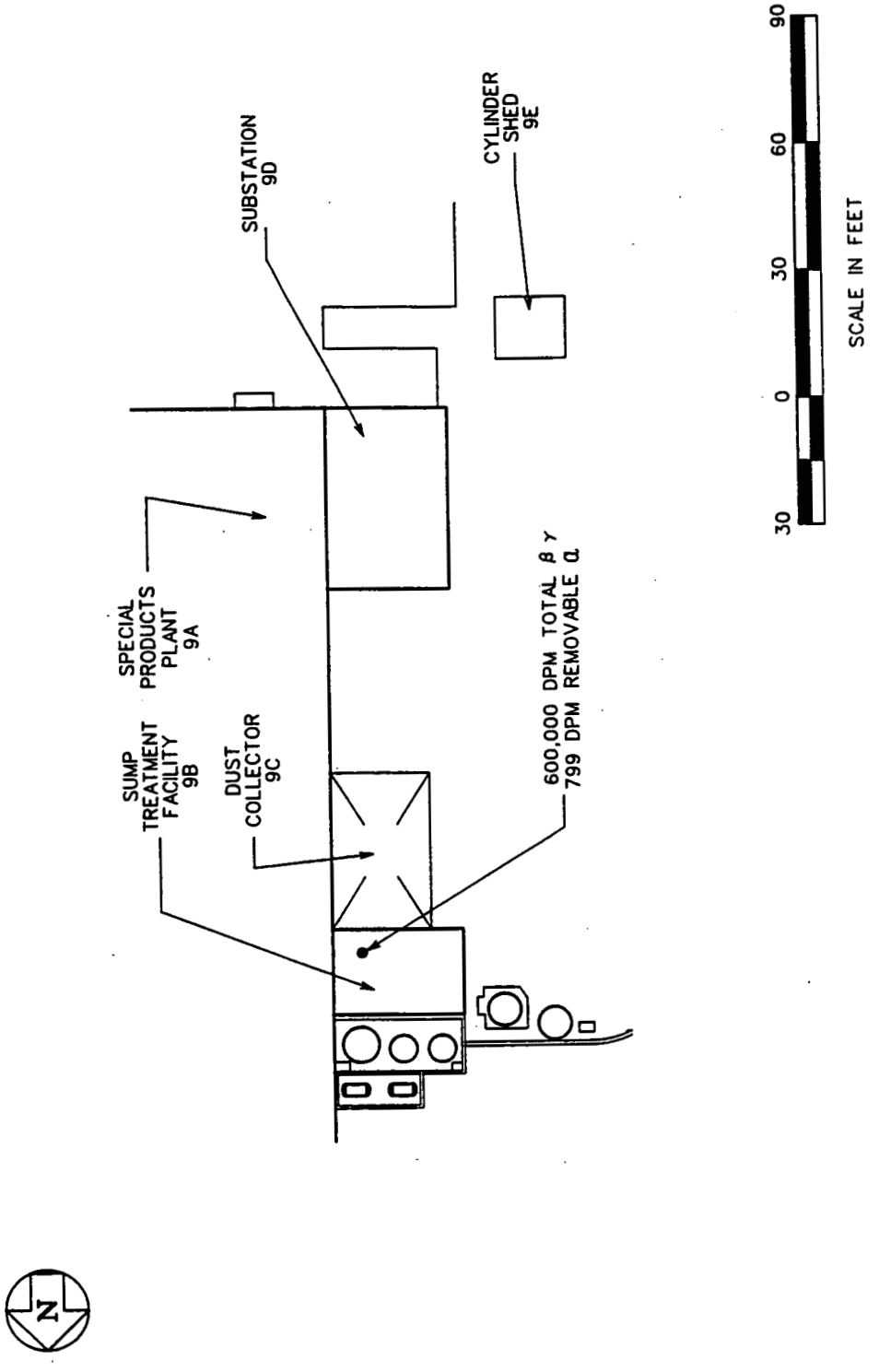

FIGURE 9B-1 Layout of Building 9B

nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive sampling for the concrete medium will be performed at the location identified as the radiological hot spot (Figure 9B-1). Because the process in Building 9B is considered wet, the concrete sample will be a core sample. Structural steel scrapings and a swipe sample will be collected on the basis of Protocols 1 and 3. Visual inspection identified no supplemental sample requirements. Table 9B-1 summarizes the planned sampling program for Building 9B.

TABLE 9B-1 Sample Types and Quantities for Building 9B

Sample Type	Sump Treatment	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	1	1
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.3.16 Building 9F — Plant 9 Electrostatic Precipitator

Component Description

Building 9F (Plant 9 Electrostatic Precipitator) measures approximately 20 × 35 ft and 25 ft high; its location is shown on the Grid 3 map in Appendix C. Building 9F is adjacent to the east side of the Special Products Plant (Component 9A) and consists of a poured concrete base and floor, a structural steel frame, and corrugated steel siding and roofing (Type C building). Figure 9F-1 shows the floor plan of Building 9F.

Process Area Description

Building 9F contains the electrostatic precipitator (Precipitron) that handled exhausts from vented machining equipment in Plant 9. The electrostatic elements were typically not electrically powered because exhausts contained moisture. Building 9F currently contains the Precipitron and air filters. The anticipated contaminants for Building 9F are summarized in Table A.3.

Major Media Types per Process Area

The Building 9F major media comprise a poured concrete base and floor and a structural steel frame.

Summary of Available Radiological Data

Building 9F has not been routinely surveyed for removable alpha and total beta-gamma contamination. Data will be gathered before sampling and will include any data gathered from ongoing radiological surveys.

Summary of Sampling for Building 9F

For Building 9F, one airborne particulate sample will be taken and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive sampling for the concrete medium will be performed at the location identified as the radiological hot spot. Because the process in Building 9F is dry, the concrete sample will be a chip sample. Structural steel scrapings and swipe samples will be collected on the basis of Protocols 1 and 3. Visual inspection identified no supplemental sample requirements. Table 9F-1 summarizes the planned sampling program for Building 9F.

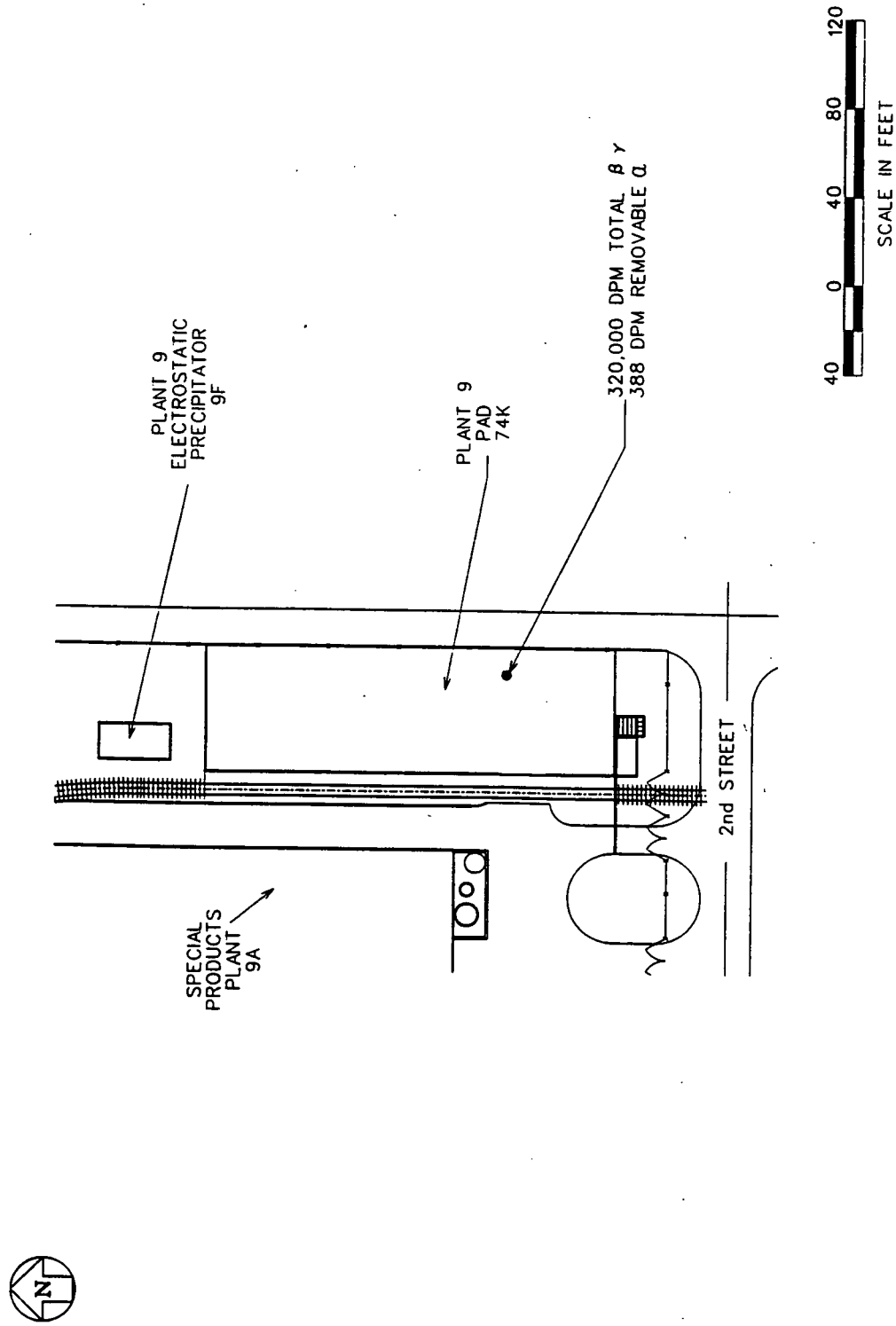

FIGURE 9F-1 Layout of Building 9F

TABLE 9F-1 Sample Types and Quantities for Building 9F

Sample Type	Electrical Precipitator	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.3.17 Building 13A — Pilot Plant Wet Side

Component Description

Building 13A (Pilot Plant Wet Side) is a multilevel processing facility, 63 × 155 ft, just south of 1st Street, located in the southeastern corner of the FEMP production area, as shown on the Grid 4 map in Appendix C. About 80% of the building is 35 ft high; the southern 20% of the building, where the solvent extraction process was located, is 53 ft high. The building is constructed of cement block on poured reinforced concrete floors and has a flat reinforced concrete roof. The mezzanine floor, of reinforced poured concrete, is supported by a structural steel frame. Figure 13A-1 shows the equipment layout on the ground floor and mezzanine of the building. For clarity, the mezzanine area is shown beside the first floor process units of the Central Area of Building 13A; it is actually situated above that area.

Process Area Description

The building has performed a wide variety of processing functions since Pilot Plant operations were initiated in October 1951. At different times, the processing involved size reduction, dissolution, precipitation, filtration, solvent extraction, and drying of numerous uranium, thorium, and zinc compounds. Because of the test nature of the processing operations, the long history of the building, and the rapid turnover of test projects, not all operations can be completely documented and are lost to history. We hope that the more important processing campaigns (in terms of generating contamination) have been identified, including at least a representative process from each general type and for each type of feed material.

Building 13A houses tanks, columns, filters, ovens, and size reduction equipment. These units were used to carry out solvent extraction purification of thorium- and uranium-bearing solutions; to process liquids from the building's floor drains; to digest thorium and uranium; to produce thorium oxalate, thorium hydroxide gel, thorium tetrafluoride, and zinc fluoride intermediate products; to size reduce calcium fluoride so it could be reused as pot liner material; to dissolve metals; to oxidize uranium compounds; and to treat barium chloride solutions. The contaminants anticipated in Building 13A as a result of these processing operations are listed in Table A.3. Because of the rapid turnover of test projects and because much of the equipment within Building 13A was reused as new test projects were brought on-line, the building has been divided into four representative process areas. Individual processes have been grouped according to the area of the building where they were/are located.

Southern Solvent Extraction Area. Solvent extraction operations were carried out in the southern third of Building 13A. A concrete block partition wall separates the southern two-thirds of the extraction area (the "high bay" area) from the northern third,

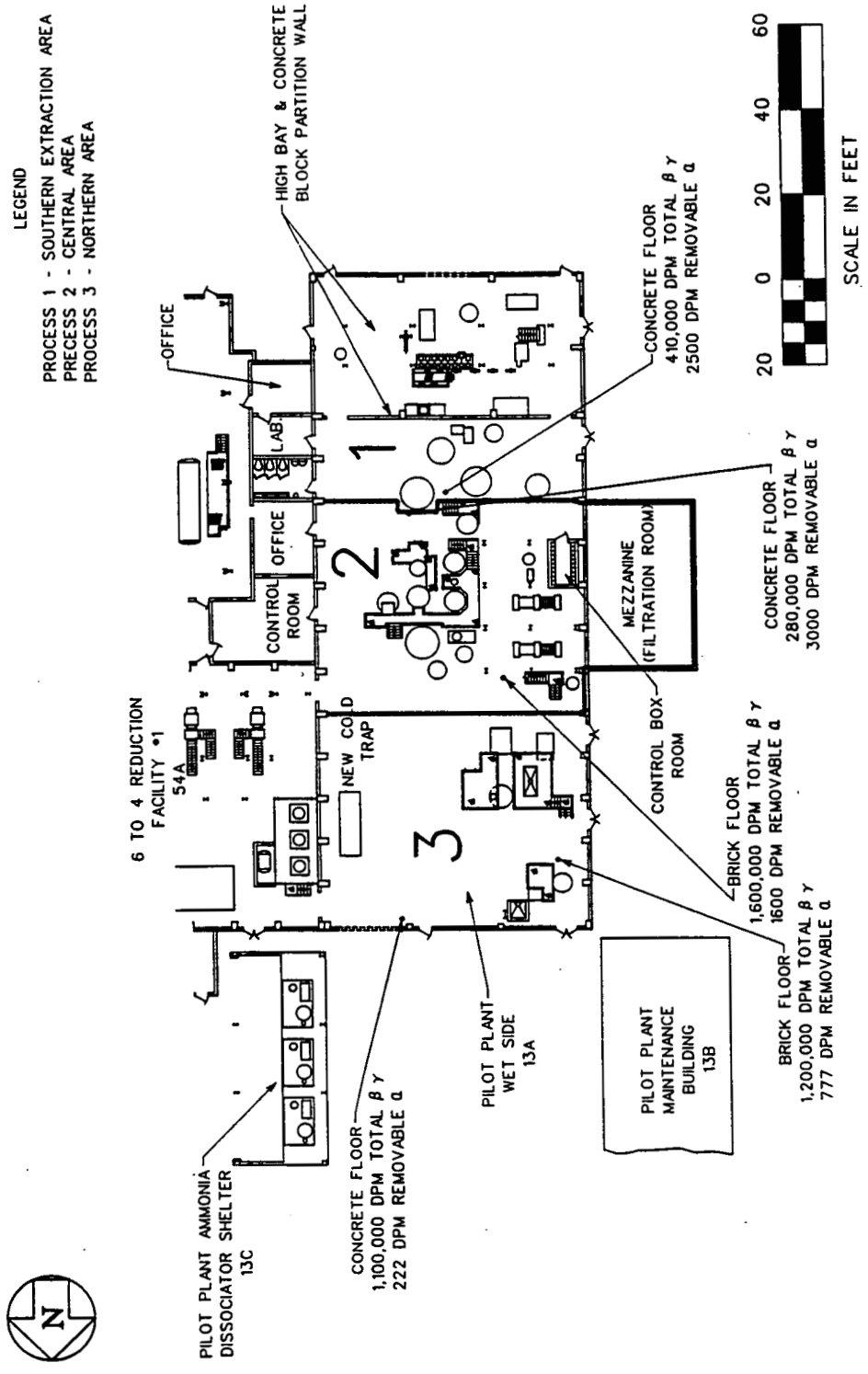

FIGURE 13A-1 Layout of Building 13A

which is contiguous with the Central and Northern Areas. Uranyl nitrate purification was carried out here in the 1950s (to carry out a development program in support of Ore Refinery [Component 2A] startup) and in the 1970s (to purify uranyl nitrate generated from various uranium processing operations). In the latter half of the 1960s, the extraction system was used to purify thorium nitrate. Although several tanks were added and some equipment modifications were made to process the thorium, the extraction operations involved in the 1950s, 1960s, and 1970s were similar.

Uranyl or thorium nitrate solutions containing undesirable contaminants were introduced into the top of the pulsed extraction column. The solvent — tributyl phosphate (TBP) in kerosene for uranyl solutions and Diamyl-amyl phosphonate (DAAP) in kerosene or di-sec-Butyl phenyl phosphonate (DSBPP) in kerosene for thorium — was introduced at the bottom. Uranium or thorium was transferred from the aqueous phase to the organic phase as the solutions passed through the column.

The depleted aqueous stream, called the raffinate, flowing out of the bottom of the column was washed with kerosene in a single mixer-settler stage to remove entrained TBP. The raffinate, containing most of the unwanted chemical impurities from the original nitrate feed, was then sent to a storage tank before being filtered. Then it was either treated for nitrate recovery or discarded through the waste treatment system after treatment with sodium hydroxide to remove copper and other impurities.

The uranium- or thorium-loaded organic was scrubbed with water to remove entrained acid. In some cases, the scrubbing was performed in the top section of the extraction column; in others, scrubbing was accomplished in a separate scrubber column. The organic was then sent to a stripping column, where the uranium or thorium was back extracted into hot water, producing a purified uranyl or thorium nitrate stream (OK liquor) that exited the bottom of the stripper. The OK liquor was contacted with kerosene (to remove entrained solvent) in the OK stripper before (1) boildown and transfer to the refinery, (2) transfer to the ADU precipitation process in Building 13A, or (3) being drummed for shipment as product. In 1966, a short campaign of OK liquor was converted to thorium nitrate tetrahydrate crystals, $Th(NO_3)_4 \cdot 4\ H_2O$, by boildown followed by crystallization.

Solvent exiting the top of the extractor was treated in a number of ways to remove impurities including (1) sodium carbonate wash in the mixer settler, (2) distillation in the kerosene fractionator, followed by sodium carbonate wash, or (3) storage in a holdup tank without treatment.

Processing of uranyl nitrate that contained uranium with less than 1% enrichment was carried out primarily in 6-in. columns; that with greater than 1% enrichment in 2-in. columns. Thorium processing was carried out in both 6- and 9-in. columns.

Building 13A Sump Processing System. The Pilot Plant sump system collected washwater, rainwater, spills, and sludges from Building 13A and from the Maintenance Building (Component 13B), the Sump Pump House (Component 13C), the UF_6 to UF_4

Reduction Facility (Component 54A), the Pilot Plant Shelter (Component 54B), the Pilot Plant Annex (Component 37), the Pilot Plant Warehouse (Component 68), and the Pilot Plant Thorium Tank Farm (Component 13D) on the west side of Building 13A. After 1968, most wastewaters were collected in one of four sumps located in the process area. Wastewaters from all five sumps and from the F-102 tank were transferred to one of two holding tanks according to the primary contaminant in the wastewater, uranium or thorium. These holding tanks, also known as sump tanks, are wooden tanks located inside a 4-ft-high concrete containment dike southwest of Building 13A.

The Pilot Plant sump system was refurbished in 1968. At this time, the old floor drain system was covered over, abandoned in place, and replaced with grating-covered floor trenches. A temporary, abandoned sump, located west of Building 13A and east of the existing Sump Pump House, was used during the refurbishment and is currently being remediated as an approved removal action because it contains radiological and hazardous wastes that could potentially contaminate surrounding soils.

Central Area. The central area was used to produce thorium oxalate and thorium hydroxide gel and to convert barium chloride, as discussed in the following subsections.

Thorium Oxalate. Equipment in the Pilot Plant to produce thorium oxalate was operated from 1970 to 1976. Thorium nitrate solution was mixed with an excess of oxalic acid solution. This produced a slurry of thorium oxalate particles in nitric acid, which was pumped to a plate-and-frame filter press located on the mezzanine where a thorium oxalate cake was produced. This filter cake was washed in the press and then dehydrated. This material was sent off-site to the General Electric Company in Evendale to be calcined to thorium oxide powder.

Thoria Gel and Ammonium Diuranate. The process for producing thorium hydroxide gel, located in the central portion of Building 13A, involved the chemical denitration of thorium nitrate by precipitation from solution with ammonium hydroxide and carbon dioxide.

The system of polyvinylidene chloride-lined piping, 1,000-gal rubber-lined tanks, and 900-gal rubber-lined vacuum tanks made up the major part of the 1.0-ton thorium/day facility. Other equipment used included a precipitation tank, two filter presses in the mezzanine area, and six tray driers.

Thorium nitrate from the Thorium Tank Farm was mixed with an aqueous ammonia solution, a sulfate solution, and carbon dioxide gas in the precipitation tank. Following precipitation, the material was transferred to the filter feed tank before processing in the filter presses. The solids from the filter presses were dried in the six drying ovens before packaging in product cans for shipment to the General Electric Evendale facility for densification by high-temperature firing. The filtrate was sent to two hold tanks and then to a polishing filter. The thorium cake from the polishing filter was recovered, and the filtrate went to the sump.

A uranium production run of dried ammonium diuranate (ADU) was performed in 1979 with the same precipitation, filtration, and drying equipment used for the production of thoria gel. The feed to the ADU process came from the Ore Refinery Plant (Component 2A) and was purified in the Pilot Plant 6-in. column system. ADU was precipitated by the addition of ammonium hydroxide to a solution of uranyl nitrate. Following precipitation, the ADU was filtered and washed in the plate-and-frame filter located in the Mezzanine. The ADU was placed in pans and dried, then milled and sent to the Green Salt Plant (Component 4A) for hydrofluorination.

Barium Chloride Conversion. From December 1985 through March 1986, barium chloride ($BaCl_2$) salts were converted to barium sulfate ($BaSO_4$) in a batch process that used equipment located in the northern and central areas of Building 13A. The $BaCl_2$ salts were generated from the cleanout of molten salt bath used in the uranium metal extrusion operation at Reactive Metals Incorporated (RMI) in Ashtabula, Ohio. The processing in the Pilot Plant converted the waste from a RCRA hazardous form to a nonhazardous form. This facility was considered a RCRA HWMU and underwent closure.

Northern Area. The northern area was used for thorium digestion, thorium tetrafluoride and zinc fluoride preparation, and various other processes, as discussed in the following subsections.

Thorium Digestion. Thorium digestion was carried out in an agitated tank, located in the northern third of Building 13A. The product of the digestion, a thorium nitrate solution, was sent to the solvent extraction process for removal of impurities. Most of the solid material fed to the digester was thorium nitrate crystals, $Th(NO_3)_4$. Thorium oxides and residues were also dissolved here in nitric acid (HNO_3) and hydrofluoric acid (HF).

Thorium Tetrafluoride and Zinc Fluoride Precipitation. A pilot facility for the precipitation of thorium tetrafluoride from thorium nitrate was located in the northern portion of Building 13A. This facility was also used for the precipitation of zinc fluoride from zinc oxide. The facility operated from 1969 to 1971, and all equipment items have been removed from this area in the Pilot Plant. The main equipment items were a precipitation tank, a hold tank, a thorium nitrate head tank, an HF head tank, three box filters, and a vacuum tank.

Thorium tetrafluoride was precipitated from a heated, agitated solution of thorium nitrate and hydrofluoric acid in the polypropylene precipitator tank. Following thorium tetrafluoride precipitation, the solution was allowed to settle, the mother liquor was decanted, and the concentrated slurry was filtered on a box filter. The filter cake was washed with deionized water to remove impurities. The wet cake was then ready to be dried. The filtrate was neutralized and sent to the sump system. The same equipment was also used for the precipitation of zinc fluoride hydrate from USP-grade zinc oxide using aqueous hydrofluoric acid.

Crushing and Milling/Pot Liner Preparation. Jaw crushers and a ball mill were located along the north wall of Building 13A. These units were used to size reduce slag from uranium processing (primarily uranium-contaminated magnesium fluoride from the Green Salt Plant) and calcium fluoride from thorium derby production from the Metals Production Plant (Component 5A). After size reduction, these materials were recycled back as pot liner materials to the processes from which they had originated. Before an upgrade of the ventilation system for the crushers and ball mill in 1959, these units exhausted dust-laden air to the atmosphere, creating uranium contaminated areas outside the building. The crushers and ball mill were removed by 1986.

Metal Dissolver/Decladding. A metal dissolver/pickling facility was located in the northern third of Building 13A and included a trough tank and associated equipment. Historically, this equipment was used for jobs such as special etching and cleaning of castings, accountability studies, dissolving Burn Pit Ash, and recovery of enriched scrap.

In 1973, the metal dissolver facility was modified to facilitate the decladding of cores by the addition of a constant volume pump, condenser, and filtrate receiver tank. Aluminum-canned cores were declad by placing them in the stainless steel-ventilated trough and circulating nitric acid and sodium hydroxide. The spent treatment solutions were pumped to the Pilot Plant sump system for reclamation of uranium. The metal dissolver equipment was moved out of the Pilot Plant in 1985.

Enriched Oxidation Furnace. A small, single-hearth, gas-fired furnace, installed in 1956 along the east wall in the northern area of Building 13A, was used to oxidize uranium scrap materials whose enrichment was too high to be processed in the Plant 8 furnaces. Materials were loaded into the furnace in trays. After oxidation of the materials, the trays were moved into an exit vestibule and lifted to an air cooling chamber. The black oxide (U_3O_8) they contained was subsequently dumped into a drum or can for transfer to a digestion system, either in Building 13A or the Ore Refinery Plant. Improvements to ventilation and dust control were installed later.

Major Media Types per Process Area

Building 13A is constructed of cinder block with poured concrete floors. It has a poured concrete roof and structural steel support beams. The high bay area in the southern portion of the building contains a steel structure, 5 levels high, with solid steel sheeting as floors for all but the ground floor. The floors in the southern solvent extraction processing area are acid-brick lined, and roughly the western 60% of the floors in the northern and central areas are acid-brick lined. Cinder block, poured concrete, structural steel, and acid brick are the major media for the component.

Summary of Available Radiological Data

Building 13A is routinely sampled for removable alpha and total beta-gamma contamination. Results from recent surveys (December 1990 through May 1992) have been assembled in Tables A.4.0 and A.4.1 and are the basis for identifying hot spots. In these surveys, 238 measurements for removable alpha on floors, 39 for removable alpha on other accessible surfaces, 217 for total beta-gamma on floors, and 24 for total beta-gamma on other accessible surfaces have been obtained. These data provide adequate information to identify hot spots for acid brick and concrete in the three general process areas (southern, central, and northern) and for the portion of the sump system contained within the three process areas. In addition, the dust collectors that are part of the northern process area have not been surveyed, while the associated fume scrubber system and the outside tankage for the central process area have been surveyed. The radiological data are not sufficient to identify hot spots for the other two major media, cinder block and structural steel.

The hot spots for the three general process areas of Building 13A, which are the anticipated locations for intrusive sampling of major media, are summarized in Table 13A-1 and plotted on Figure 13A.1. Shown are the total beta-gamma and removable alpha readings and location descriptions for the hot spots in the three process areas and associated outside areas. The locations of these hot spots will be reassessed on the basis of the results of continuing radiological surveys; for cinder block walls and structural steel, a new survey will be needed to define hot spots.

Summary of Sampling for Building 13A

One airborne particulate sample will be taken in both southern extraction area and north of the partition wall and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. A nonintrusive measurement program, including radiological and chemical surveys for alpha and beta-gamma contamination, XRF surveys, and swipe samples, will be performed and assessed in the field to delineate the final intrusive sample locations for concrete and acid-brick floors. For purposes of selecting the type of intrusive sample, Building 13A is considered to contain all wet process areas; therefore, the concrete hot spots will be sampled by collecting cores. Concrete base below the intrusive acid-brick sample locations will be cored, in addition to hot spots identified for the exposed concrete medium. Concrete cores are also planned for each outside tank containment area.

The nonintrusive measurement program will include the other major media, masonry (cinder block) and structural steel, allowing for the identification of hot spots that will be intrusively sampled in each of the three process areas. These media will be sampled in accordance with Protocols 1 and 3. The new survey results will also be used to identify a hot spot for the concrete containment beneath the outside dust collectors west of the northern process area, which is cracked and breached by vegetation growth.

TABLE 13A-1 Hot Spots in Building 13A Process Areas

Process Area	Location Description	Medium	Reading TBG (dpm) RA (dpm/100 cm^2)[a]
Southern extraction area	SW of Tank M-70	Acid brick	RA - 12,000
	E of Tank F-17	Concrete	TBG - 410,000
Central area	NE of Filter D4-6	Acid brick	TBG - 1,600,000
	E of Tank W-13A-162	Concrete	TBG - 170,000
Outside tankage	TNT tank containment	Concrete	RA - 1,106
Northern area	S of Tank D-16	Acid brick	TBG - 1,200,000
	Along N wall, W of rollup door	Concrete	TBG - 1,100,000
Outside tankage	Scrubber tower containment	Concrete	RA - 59

[a] TBG = total beta-gamma, RA = removable alpha.

Supplemental sampling will include composite residue samples from the sump system (grated floor trenches and pumping sumps) in each process area. Also, a composite aqueous liquid sample will be collected from the concrete containments for the sump tanks southwest of the southern extraction area. The types and numbers of samples to be collected for Building 13A are summarized in Table 13A-2.

TABLE 13A-2 Sample Types and Quantities for Building 13A

Sample Type	Southern Extraction Area	Central Area	Northern Area	Component Totals
Nonintrusive[a]				
Radiological surveys	b	b	b	NA[c]
Chemical surveys	b	b	b	NA
Air particulates	1	1	NA	2
Swipes	4	4	4	12
Lab composite swipes	NA	NA	NA	1
Intrusive[a]				
Concrete chips	NA	NA	NA	NA
Concrete cores	2	3	3	8
Masonry	2	2	2	6
Steel surface scraping	1	1	1	3
Supplemental				
Liquid sample	1	NA	NA	1
Loose media	1	1	1	3

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.3.18 Building 13C — Sump Pump House

Component Description

Building 13C (Sump Pump House) is located southwest of the Pilot Plant Wet Side (Component 13A) and just south of the Pilot Plant Thorium Tank Farm (Component 13D), as shown on the Grid 26 map in Appendix C. The Sump Pump House consists of a single-level, high concrete block (masonry) wall structure, 12 x 16 ft and 8 ft high, supported on reinforced concrete foundations, having a reinforced concrete floor and sloping shingled roof (Figure 13C-1). It contains three pumps on concrete pedestals that draw water from adjacent underground concrete sump tanks located just east of Building 13C. These underground tanks have been abandoned and filled with concrete. The purpose of Building 13C was to pump filtered sump system flows from treatment facilities inside the Pilot Plant Wet Side to the General Sump (Component 18B) for final treatment and discharge.

Process Area Description

Building 13C contains the pumps that handled all sump system flows from the Pilot Plant process areas. The pumps were configured to pump filtered sump water from two underground concrete sump tanks located just east of Building 13C (Figure 13C-1). The filtered sump water could be routed from the Pilot Plant Wet Side to segregate uncontaminated water in one of the underground tanks. The collected waters were sampled and pumped to the General Sump and routed to one of several tanks, depending on the water quality analyses. The underground tanks have been filled with concrete and are not targets for sampling.

During the history of the Pilot Plant Wet Side, the sump piping system was replaced with floor trenches, and a temporary underground sump was used during the renovation period. That sump is located east of the underground concrete sumps and may have been tied into the Sump Pump House. The temporary sump is now being remediated through a CERCLA removal action (No. 24). Anticipated contaminants for Building 13C are summarized in Table A.3.

Major Media Types per Process Area

The major media for Building 13C are the concrete in floors and pump bases and the concrete block (masonry) in the walls of the building.

Summary of Available Radiological Data

A radiological survey conducted in Building 13C in 1991 consisted of 11 concrete floor and pump base readings and 5 readings for overhead piping and the ceiling (considered

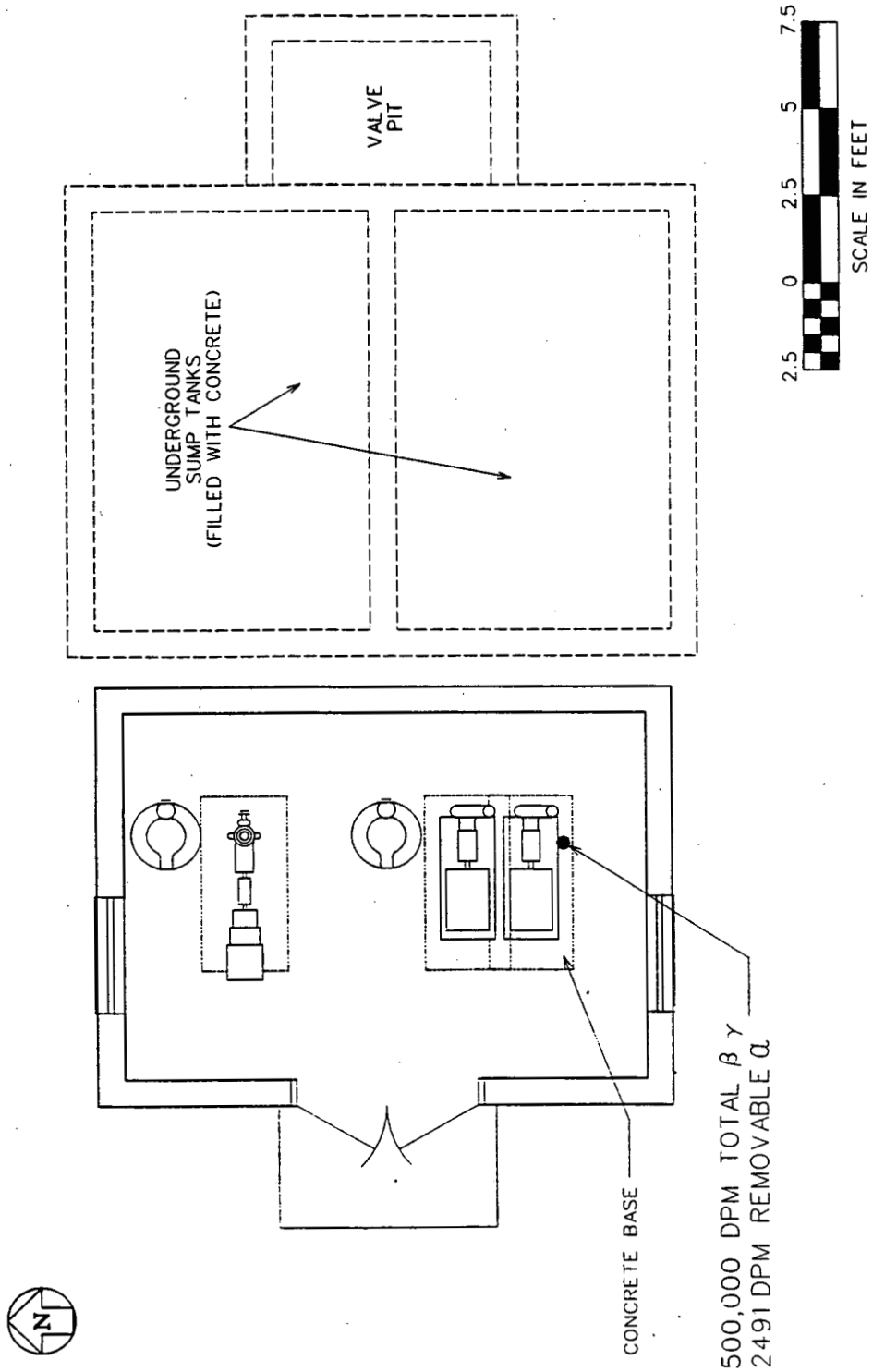

FIGURE 13C-1 Layout of Building 13C

inaccessible areas). All readings included both removable alpha and total beta-gamma measurements. No survey data are available for the masonry walls. Using the 11 data points for concrete, a hot spot has been identified for the concrete medium on the southernmost pump base (Figure 13C-1). The total beta-gamma reading for the hot spot is 500,000 dpm, while the removable alpha reading is 2,491 dpm. Data from ongoing radiological surveys will be assessed before sampling of the component, in addition to any surveys to be performed specifically to locate hot spots.

Summary of Sampling for Building 13C

One airborne particulate sample will be taken for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. A follow-up nonintrusive measurement program, including a radiological survey focused on masonry contamination and verification of the concrete hot spot location, an XRF survey, and swipe samples, will be performed and assessed in the field to delineate the final intrusive sample locations for concrete and masonry (concrete block). Because the function of Building 13C was pumping water, it is considered a wet process area; therefore, concrete will be sampled by coring. No supplemental sampling locations have been identified for Building 13C. Table 13C-1 summarizes the planned sampling program for Building 13C.

TABLE 13C-1 Sample Types and Quantities for Building 13C

Sample Type	Sump Pump	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	1	1
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.3.19 Building 15 — Laboratory

Building Description

Building 15 (Laboratory) houses the analytical, metallurgical, and chemical process laboratories for the FEMP and is located near the intersection of 1st Street and B Street, as shown on the Grid 21 map in Appendix C. Building 15 is a multilevel, irregularly shaped building (253 × 292 ft and 20 ft high) constructed of concrete block walls and concrete floors. The main floor of Building 15 is composed of north, central, and south, east/west corridors. Courtyards are located between the south and central corridors and between the central and north corridors. A basement area is located beneath the western portion of the building. Piping access tunnels, which are accessible through accessways located in the first floor east corridor, run at basement level below the north and central corridors and join the basement on the west. A laboratory sump is located in the north courtyard, and wastewaters collected in this sump are pumped to the General Sump (Component 18B). Building 15 is currently undergoing renovation; as part of this renovation, the northern portion of the building was extended and a second story addition constructed over the extended northern portion.

Process Area Description

Although Building 15 is currently undergoing renovation, the building is still generally divided into radiologically nonrestricted and restricted access areas. The dividing line for the two areas generally runs from the southwestern corner of the building to the northeastern corner of the building, with the unrestricted access area located to the east of the dividing line and the restricted access area located to the west of the dividing line. The basement of Building 15 has historically been used as a maintenance area and to store radioactive samples.

Eastern Nonrestricted Access Area. The eastern nonrestricted access area still contains a library, two conference rooms, and offices.

Western Restricted Access Area. Historically, the western restricted access area contained inorganic and isotopic laboratories, an organic laboratory added around 1990, some office space, several satellite accumulation areas, and the following:

- A mercury recycle unit located in Room W-22 and operated last in 1987.
- The Pilot Process, which was the pilot for the thorium process used in the Green Salt Plant (Component 4A), was developed and performed in Rooms W-4 (heat treating) and W-10 (wet chemistry) in 1967. These rooms are now inactive and are managed as exclusion zones because of the presence of radiological contamination.

- Before the laboratory renovations, a photo lab was located at the western end of the north corridor in Room N-27. For about one year (1989), an electrolytic silver recycling unit located in Room N-27 was used to recover silver from the spent photographic solutions that contained either silver nitrate or silver sulfate.

- Wastewaters generated at the numerous sinks within the various laboratories as a result of sample preparation and/or cleaning were and are conveyed to a central collection sump located in the north courtyard of Building 15.

The western restricted access area currently contains laboratories, some offices, various satellite accumulation areas, a chemical storage area (cabinets located in Room W-18 store excess, unused but usable, chemicals), and a few storage areas for radioactive materials (e.g., outdated uranium standards and samples of uranium products used to check for impurities). The rooms currently in use as radioactive material storage areas (C-18, S-43, and W-4) are managed as exclusion zones.

Basement. Until late in 1989, the Maintenance Department operated a maintenance shop located in the northern area of the basement. The shop also functioned as a satellite accumulation area, temporarily storing wastes such as spent solvents, used oil, and PCBs. The southern area of the basement was once equipped with caged areas that stored uranium products (e.g., green salt, orange oxide, and uranium turnings), thorium, and laboratory chemicals.

Major Media Types per Process Area

Building 15 is constructed of concrete block walls and concrete floors. The concrete block walls and concrete floors that are uniform across the unrestricted and restricted access areas are considered major media for these areas. The major medium for the basement is the concrete of the basement floor and walls.

Summary of Available Radiological Data

Some areas of Building 15 are routinely surveyed for removable alpha and total beta-gamma contamination. Data from the 1991 and 1992 surveys have been assembled in Tables A.4.0 and A.4.1; these data form the basis for identifying radiological hot spots for each process area (Figures 15-1 through 15-3). Also, as data are acquired from ongoing radiological surveys taken for health physics needs, the identified hot spots will be reassessed before sampling begins. Further, identified hot spots will have to be reassessed before sampling because the areas in Building 15 that are undergoing renovation reportedly are also being decontaminated as part of the renovation process.

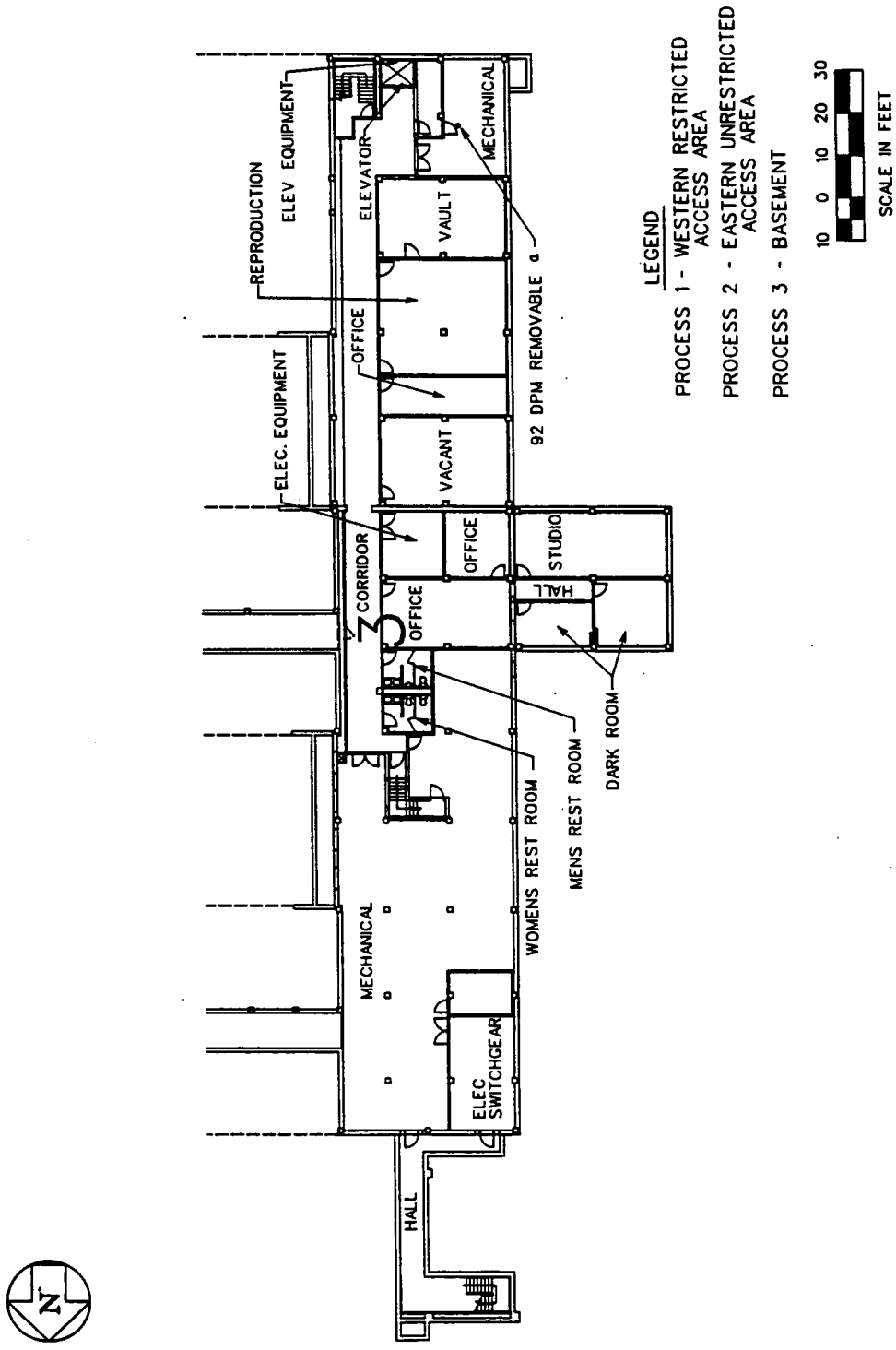

FIGURE 15-1 Layout of Building 15, Basement

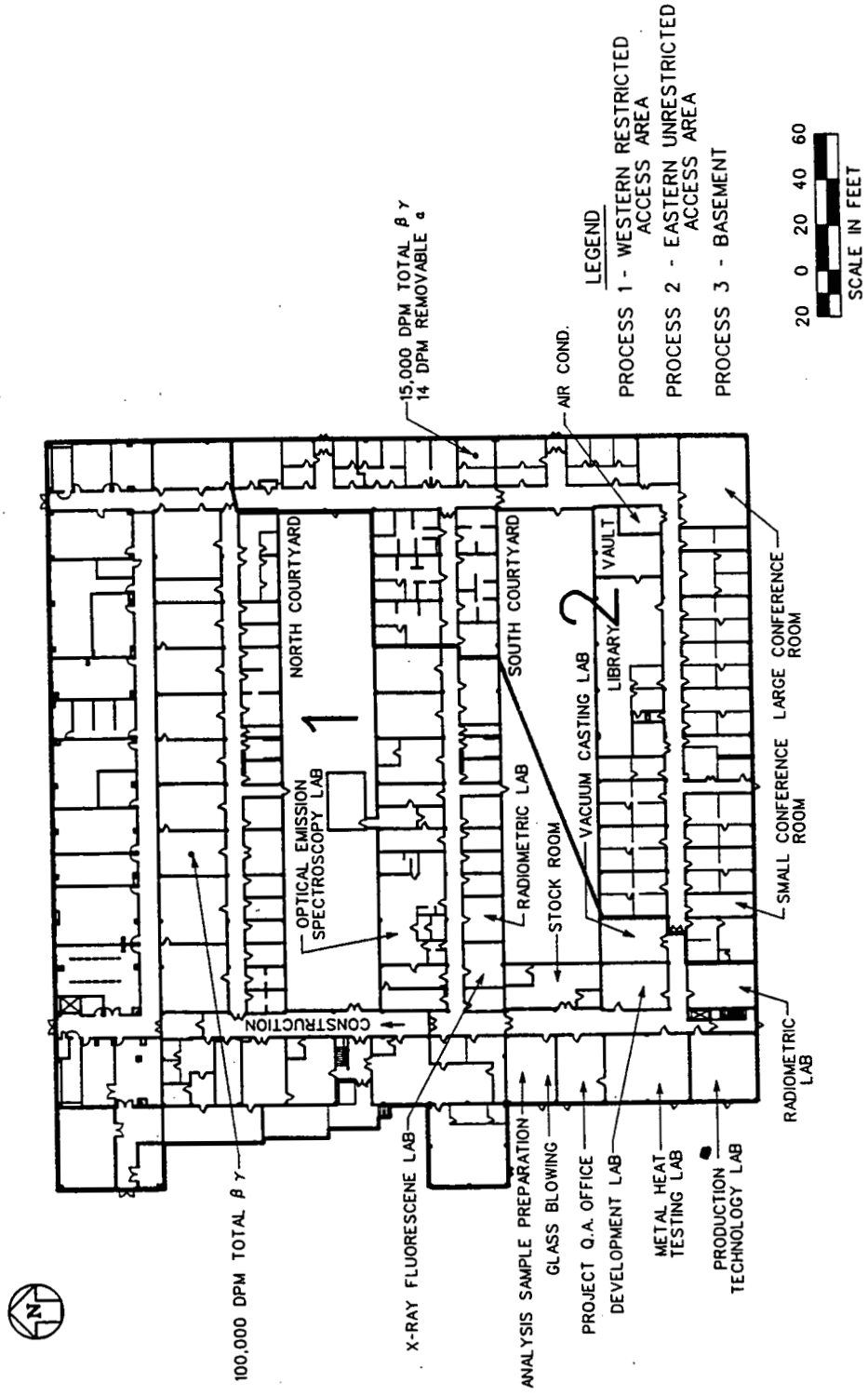

FIGURE 15-2 Layout of Building 15, First Floor

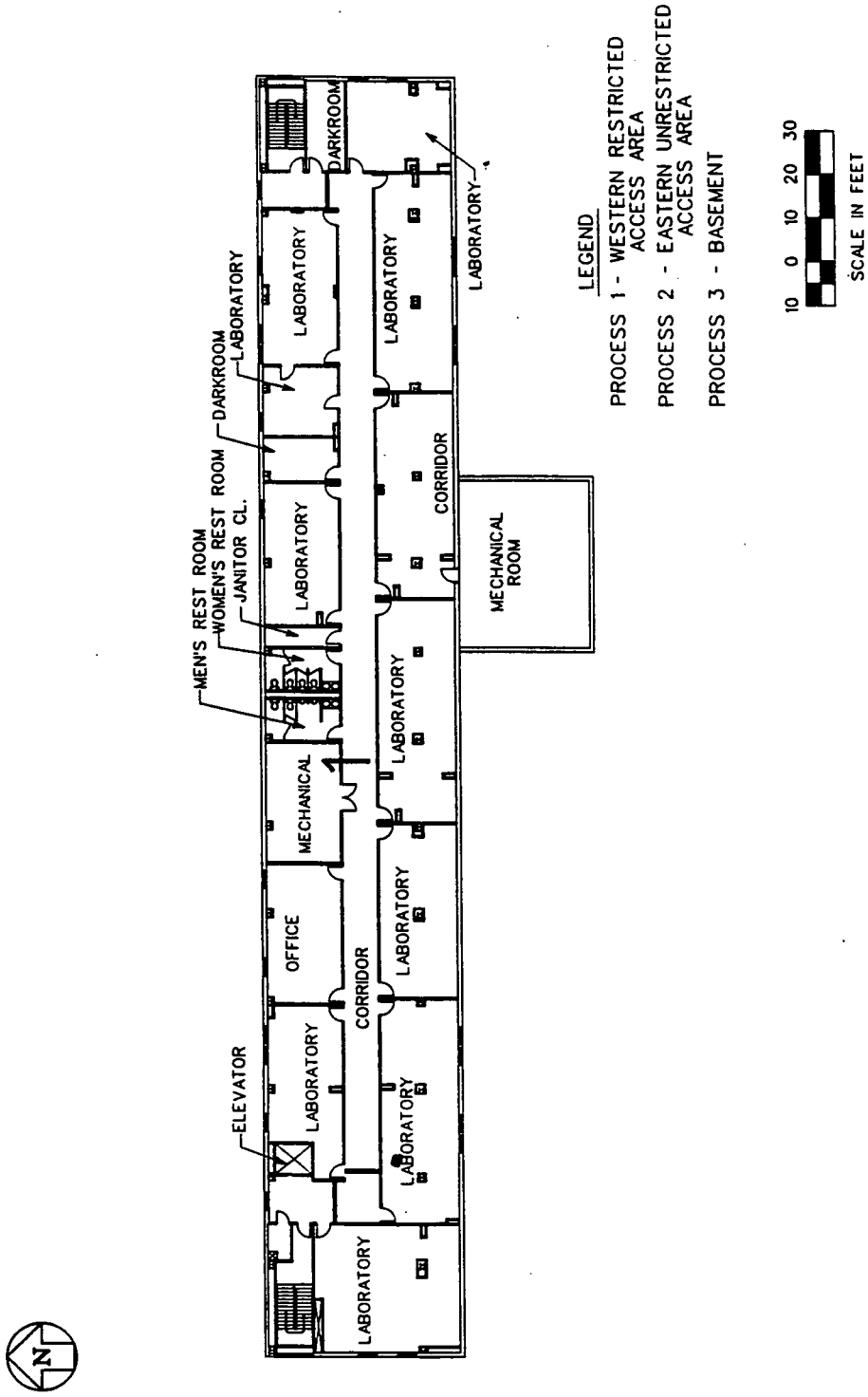

FIGURE 15-3 Layout of Building 15, Second Floor

Western Restricted Access Area. The highest reading of 65 total beta-gamma floor readings taken in the western restricted access area of Building 15 was 100,000 dpm with an associated removable alpha reading less than the MDA; the average of the 65 total beta-gamma readings was 7,400 dpm (taken in Room N-31, which is within the portion of the laboratory currently being renovated).

Eastern Nonrestricted Access Area. The highest reading of the 113 total beta-gamma floor readings taken in the eastern nonrestricted access area of Building 15 was 15,000 dpm, with an associated removable alpha reading of 14 dpm; the average of the readings was 2,600 dpm.

Basement. Although no total beta-gamma readings were taken from the concrete floors in the basement of Building 15, the highest reading of the five removable alpha floor readings taken was 92 dpm. The average of the five removable alpha readings was 56 dpm.

Summary of Sampling for Building 15

One airborne particulate sample will be taken in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, radiological surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. The media associated with the component are concrete and masonry. Intrusive sampling will consist of a concrete chip and masonry sample in the eastern nonrestricted area, a concrete core and masonry sample in the western restricted access area, and a concrete core and masonry sample in the basement. If analysis of radiological swipe samples detects elevated levels of removable contamination as outlined in Protocol 1, then the swipe samples will be combined over the process area for laboratory analysis. Supplemental liquid and sludge samples will be taken of the laboratory sump contents. Supplemental samples have been chosen on the basis of process knowledge because most of Building 15 could not be visually inspected as a result of construction activities. However, additional supplemental samples may be collected by the field crew during sampling activities. Table 15-1 summarizes the planned sampling program for Building 15.

TABLE 15-1 Sample Types and Quantities for Building 15

Sample Type	Eastern Unrestricted Access Area	Western Restricted Access Area	Basement	Component Totals
Nonintrusive[a]				
Radiological surveys	b	b	b	NA[c]
Chemical surveys	b	b	b	NA
Air particulates	NA	NA	NA	1
Swipes	2	2	1	5
Lab composite swipes	NA	NA	NA	1
Intrusive[a]				
Concrete chips	1	NA	NA	1
Concrete cores	NA	1	1	2
Masonry	1	1	NA	2
Steel surface scraping	NA	NA	NA	NA
Supplemental				
Liquid sample	NA	1	NA	1
Loose media	NA	1	NA	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.3.20 Building 18D — Biodenitrification Towers

Component Description

Building 18D (Biodenitrification Towers) is a multilevel (six-floor) building located on the Grid 19 map in Appendix C. It is irregularly shaped, measuring approximately 72 x 79 ft and 67 ft high (Figure 18D-1). Building 18D consists of a structural steel frame on a poured concrete base and floor with noninsulated, corrugated metal siding and roofing (Type C building).

Process Area Description

One process area has been identified for Building 18D. High nitrate wastewaters that are collected in the BDN Surge Lagoon (Component 18A) are mixed with methanol from the Methanol Tank (Component 18J) and are fed to Building 18D, where they enter one of four 30-ft towers that operate in series. The wastewaters flow up through the towers, fluidizing coal particles that have bacteria attached. The bacteria feeds off of and decomposes the methanol and nitrates to form carbon dioxide (CO_2) and nitrogen (N_2) gases, which bubble off the top of the towers and are released to the atmosphere. The anticipated contaminants for Building 18D are summarized in Table A.3.

Major Media Types per Process Area

Major media for Building 18D consist of a poured concrete base and floor and a structural steel frame.

Summary of Available Radiological Data

Building 18D is routinely surveyed for total beta-gamma and removable alpha contamination. Results from the most recent surveys are summarized in Table A.4.0 and provide the basis for identifying radiological hot spots. As indicated, 57 total beta-gamma and 112 removable alpha survey measurements were performed in Building 18D from 1989 through 1992. On the basis of the assembled data, the hot spot for the concrete media is identified on Figure 18D-1. The highest measured concentration of total beta-gamma contamination is 9,200 dpm, with a corresponding removable alpha measurement below the MDA of 58 dpm. Only 10 of the total beta-gamma measurements exceeded 1,000 dpm, while all 112 removable alpha measurements fell below the MDA. Any data gathered from ongoing radiological surveys will also be reassessed before systematic surveys of the component are conducted.

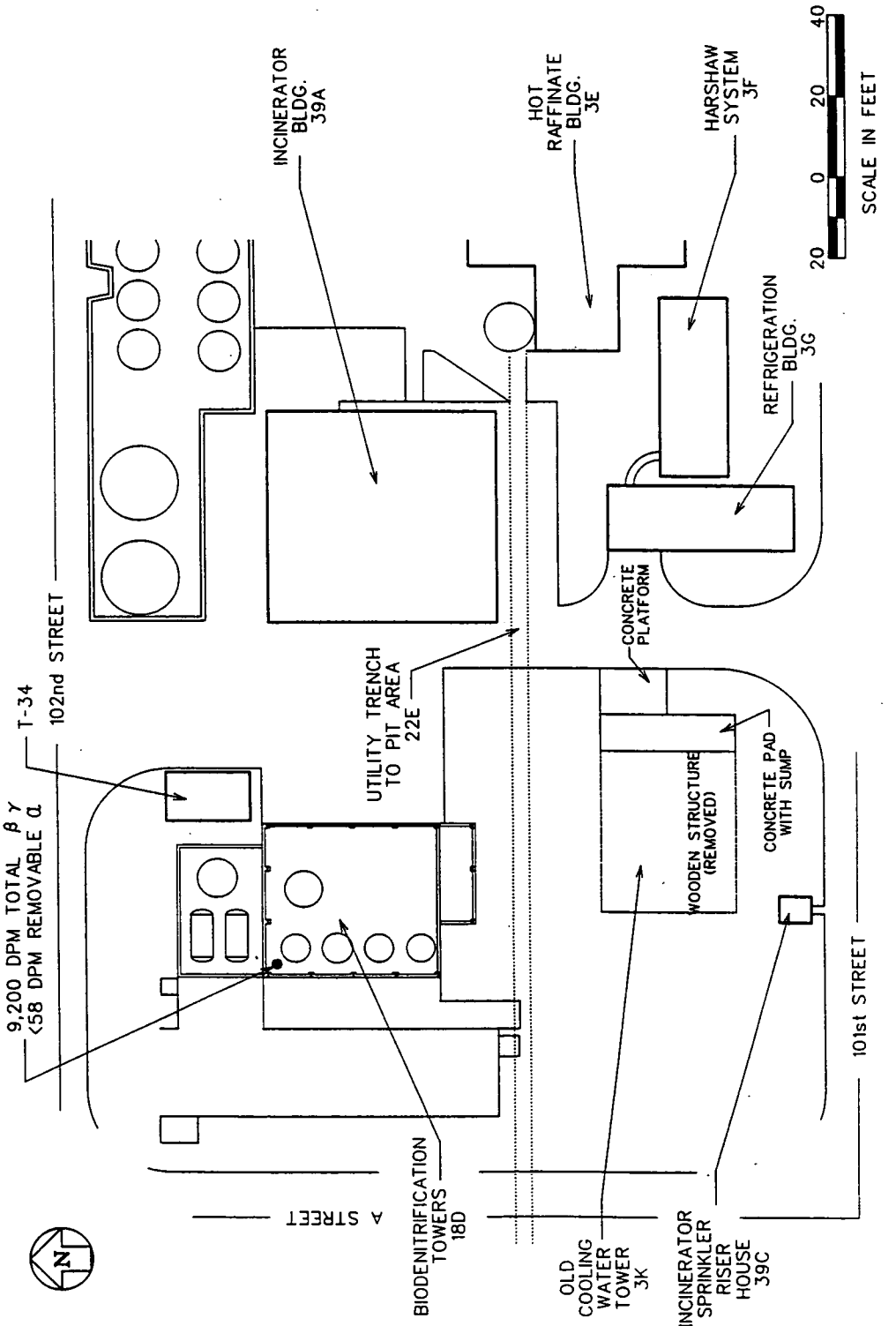

FIGURE 18D-1 Layout of Building 18D

D.9.3.21 Building 18G — Clearwell Pump House

Component Description

Building 18G (Clearwell Pump House) is a single-level, structural steel frame building with transite siding on a reinforced poured concrete floor that is approximately 10 x 22 ft and 15 ft high. The building is located south of the Clearwell, as shown on the Grid 31 map in Appendix C.

Process Area Description

The Clearwell Pump House pumps Clearwell surface water runoff to the Biodenitrification Surge Lagoon (Component 18A).

Summary of Sampling for Building 18G

This component does not require sampling because it is insignificant in size.

D.9.3.22 Building 18H — BDN Effluent Treatment Facility

Component Description

Building 18H (BDN Effluent Treatment Facility) is a single-level, pre-engineered building consisting of a structural steel frame on a reinforced poured concrete base that is approximately 30 × 50 ft and 15 ft high. This building is located west of Plant 8 (Component 8A), as shown on the Grid 20 map in Appendix C.

Process Area Description

The BDN Effluent Treatment Facility treats the biodenitrification system effluent to reduce biological oxygen demand and total suspended solids before transfer to sewage treatment to prevent overloading of system capabilities.

Summary of Sampling for Building 18H

This component does not require sampling because results of the radiological surveys performed for the component do not exceed the criteria established for sampling.

D.9.3.23 Building 31A — Engine House Garage

Component Description

Building 31A (Engine House Garage) is a single-story building located in the southeastern corner of the intersection of 1st Street and D Street, as shown on the Grid 7 map in Appendix C. Its shape is irregular, measuring approximately 62 × 123 ft and 17 ft high. The building is constructed of cinder blocks with a concrete roof and floor (Type B building). The floor plan for the building is provided in Figure 31A-1. Three aboveground fuel tanks, located just south of Building 31A, are associated with the building operations as is the concrete pad to the south and east of the building. Building 31A is operated as a garage for performing general maintenance on the on-site vehicles. The garage also houses the facility's ambulance and fire engine.

Process Area Description

Building 31A has one wet process area, the garage. The process is considered a wet process area because of the frequent use of solvents and oils. Anticipated contaminants from this process are summarized in Table A.3.

The garage performs repair work and preventive maintenance on the vehicles used in the process area. Fuel and motor oils are used throughout Building 31A. The fuel oil supply is stored in three aboveground tanks on the south side of the building. Each tank is contained separately in metal tubs for secondary containment. Spills, which occur on the concrete floor as a result of operations, are cleaned with floor scrubber units maintained in the building. However, stains were observed during the visual inspection of the building. Spare parts, such as motors and batteries, are stored for use in building operations. Leaking batteries, on the floor in the east-central section of the building, were also observed during the inspection. A sewer system in the building collects water from the floor. This water is pumped to a tank located just east of the building. A sample of this water is collected for testing before discharge.

Major Media Types per Process Area

Concrete and cinder blocks are the major media for Building 31A.

Summary of Available Radiological Data

Building 31A is routinely sampled for removable alpha and total beta-gamma contamination. Results from surveys performed in 1989 through 1992 are summarized in Tables A.4.0 and A.4.1 and are the basis for identifying hot spots. The total numbers of removable alpha and total beta-gamma survey measurements performed in Building 31A for

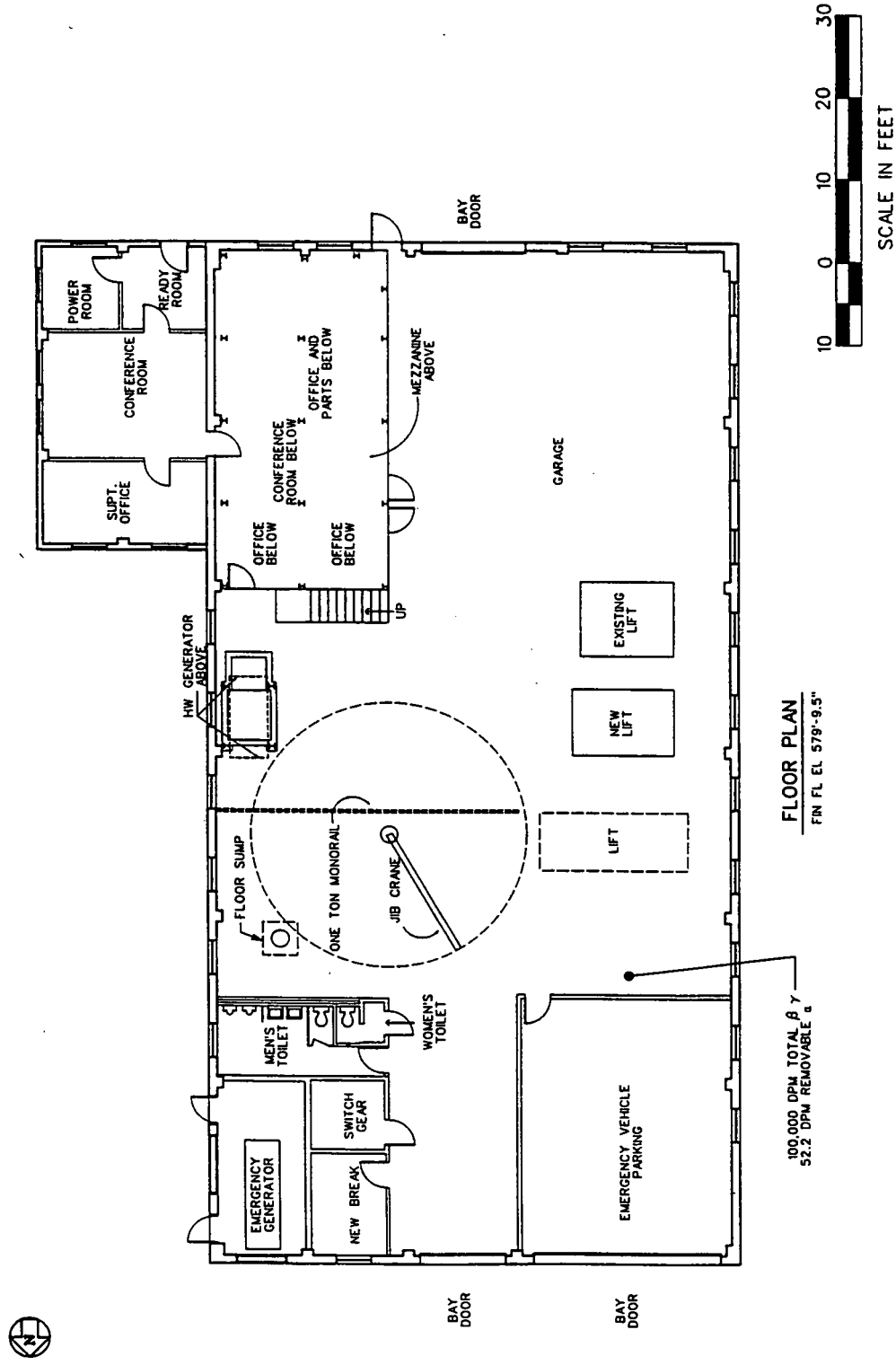

FIGURE 31A-1 Layout of Building 31A

the concrete floor medium were 92 and 52, respectively. The data have been assembled, and the hot spots for the concrete floor are identified in Figure 31A-1. All data will be reassessed before sampling to include data gathered from ongoing radiological surveys.

High beta-gamma survey readings were concentrated in the northwestern corner of the open garage area just south of the emergency vehicle parking. The highest total beta-gamma reading obtained from surveying the concrete floor medium was 100,000 dpm. The removable alpha reading associated with this location was reported at the MDA level of 52.2 dpm. The radiological data for 1992 reported all removable alpha readings less than the MDA of 200 dpm.

Summary of Sampling for Building 31A

One air sample will be taken and analyzed in the component for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, radiological surveys, and swipes, will be performed and assessed in the field to further detail final intrusive sampling locations. One intrusive sample, a concrete core, will be collected in Building 31A. Figure 31A-1 shows the location of this sample.

On the basis of the building inspection, a supplemental loose media sample will be taken in the area where the batteries were leaking. A supplemental liquid composite sample will be collected from the metal tubs that contain the aboveground fuel tanks. The second supplemental liquid sample will be taken from the floor sump located against the east wall of the building. Table 31A-1 summarizes the planned sampling program for Building 31A.

TABLE 31A-1 Sample Types and Quantities for Building 31A

Sample Type	Garage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	1	1
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	2	2
Loose media	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.3.24 Building 37 — Pilot Plant Annex

Component Description

Building 37 (Pilot Plant Annex) is a single-story building shown on the Grid 26 map in Appendix C. It is rectangular, measuring approximately 52 x 122 ft and 25 ft high (Figure 37-1), and consists of a structural steel frame anchored in a reinforced concrete foundation and a reinforced concrete floor and roof, cement block walls, and glass windows (Type B building). The building adjoins Components 54A and 13A to form a complex that serves Pilot Plant functions. The function of Building 37 was to test out new processes for uranium and thorium production and recovery, which were, in successful cases, implemented in the production plants at the FEMP. The processes in Building 37 were primarily dry, while those in Building 13A were wet.

Process Area Description

The Pilot Plant Annex contains six process areas plus additional processes that have been removed and associated equipment and tankage outside the building. The process areas that have not been removed are shown in Figure 37-1; a few of the removed units are also shown (indicated by dashed lines). The anticipated contaminants for the Pilot Plant Annex are summarized in Table A.3. Additional process units associated with Building 37 processes, but located outside, are several dust collectors. Like the other processing buildings in the Pilot Plant complex (Components 13A and 54A), Building 37 changed configuration frequently to meet its mission of testing processes for potential improvement of operations at other plants of the FEMP. Thus, the following process descriptions may be incomplete by omission of process units that were installed, tested, and dismantled many years ago.

East Wall Processes. Several processes were located along the east inside wall of Building 37, north of the center of the building.

Grit Blaster and Dust Collector. The grit blaster and dust collector are located along the east wall of the Pilot Plant Annex. The unit was designed to remove slag from thorium and uranium derbies and crucibles from Plant 5 with an abrasive mixture. The grit blaster contains approximately 300 lbs of spent coarse coal slag abrasive grit and uranium particles. The grit blaster equipment consisted of a ventilated glove-box-type booth in which the blasting was performed, a motor and drive that supplied the compressed air and coal slag grit used in the cleaning operation, and a holding tank for the grit. The equipment was shut down in 1989, when the Pilot Plant discontinued production operations.

The Wheelabrator dust collector, located outside on the southeastern corner of the Pilot Plant Annex, serviced the grit blasting unit, as well as the heat-treat furnace, briquetting press, shot blaster, charging station, and jolter. The latter two units have been removed. The dust collector may contain dust.

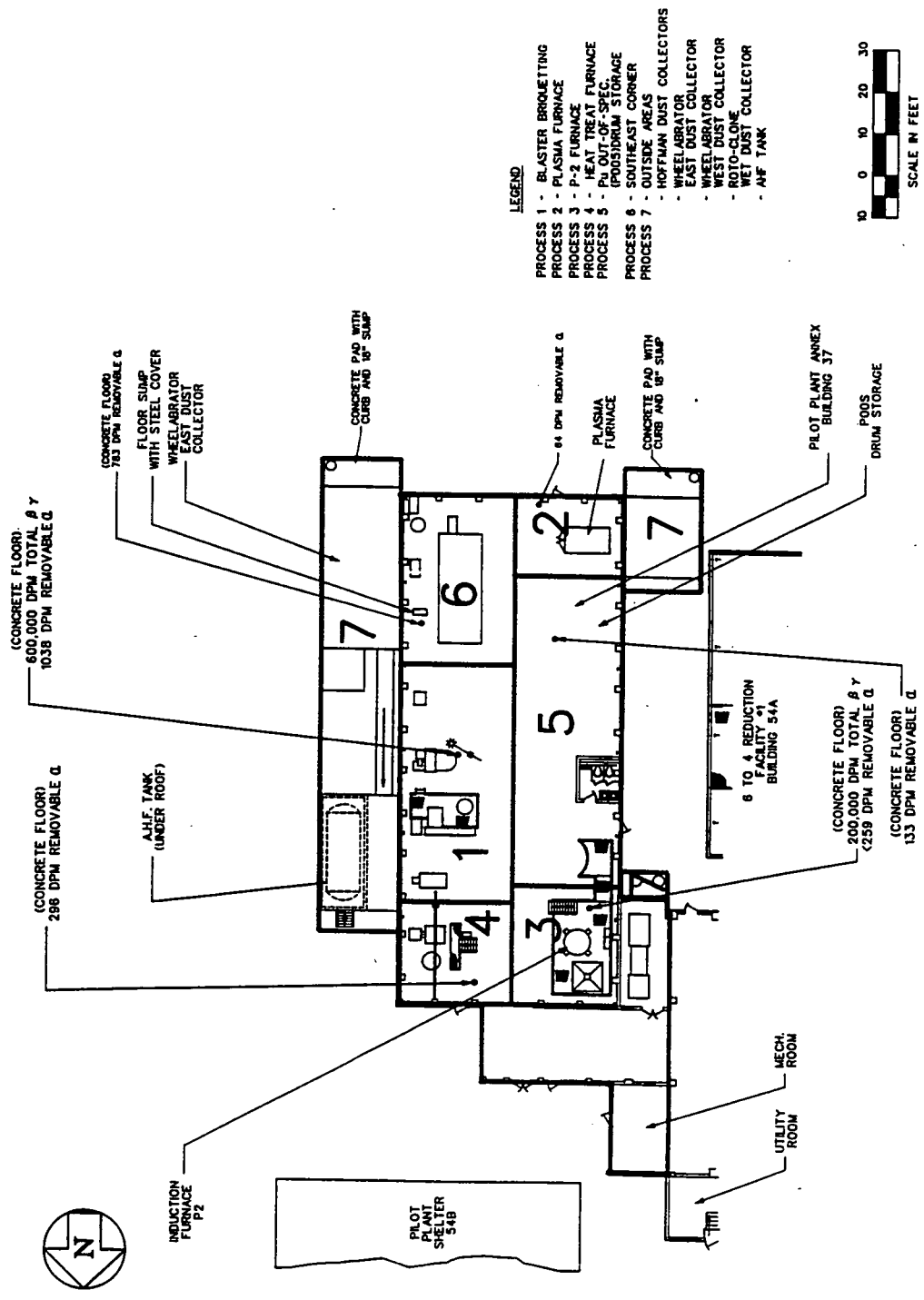

FIGURE 37-1 Layout of Building 37

Briquetting Unit. The briquetting unit is located along the east wall of the Pilot Plant Annex (Figure 37-1). It consists of a rotary briquetting press, a drumming station, and roller conveyors. The process involved UF_4 and magnesium blending and crushing into briquettes to make a high-density reduction charge, ultimately for use in the Metals Production Plant (Component 5A). The press compressed the uranium/magnesium blend into pillow-shaped briquettes. After the material was formed into briquettes, a vibrating-type conveyor with a stainless steel pan transferred the briquetted material to a drumming station. A dust enclosure was vented to the Wheelabrator east dust collector discussed in the section describing the grit blaster. Operation of the briquetting unit was discontinued in the late 1950s or early 1960s.

Roto (shot)-Blaster. The shot-blasting operation was performed on the east side of the Pilot Plant Annex (Figure 37-1). The unit process consisted of a Pangborn Rotoblast used to remove magnesium fluoride slag and magnesium plate from derbies on an enclosed work table. The unit was designed to accommodate work pieces up to 2 ft in height and 4,000 lb in weight. A 1-ton hoist on a swinging jib was used for material handling. The abrasive used in the blasting was uranium shot composed of prill from reduction furnaces in the Metals Production Plant.

The unit propelled 10,000 kg of shot per hour. The spent uranium was transported to a pneumatic separator, where dust and fines were removed by air current and the remaining shot was separated by size. Usable shot was returned to the storage bin, and the fine material was drawn away by the west Wheelabrator dust collector discussed in the grit blaster section; the Roto-clone dust collector located just north of the west Wheelabrator may also have serviced the rotoblaster (Figure 37-1). Fires occurred in the unit and ventilation ducts because very fine uranium dust would occasionally ignite less flammable uranium and magnesium salts. Cleaned derbies were returned to the Metals Production Plant for density determinations. Low-density derbies, indicating the presence of excessive slag, were returned to the rotoblaster for further processing.

Plasma Furnace and Dust Collector. The plasma spraying unit and dust collector were installed in 1962 in the southwestern corner of the Pilot Plant Annex. This process involved the application of protective coatings of molten ceramic particles to pour plugs and the interior of clean crucibles from the grit blasting unit. Once sprayed, the crucibles were returned to the Metals Production Plant. In 1965, an environmental chamber equipped for vacuum and inert-atmosphere operations was installed to permit the use of spray materials that either were toxic or would deteriorate when sprayed in air.

The environmental chamber, which was removed about 10 to 15 years ago, was used for a short time to spray on experimental uranium oxide coatings under high-temperature melting conditions. The remaining booth and spray system were shut down when the Pilot Plant production operations were discontinued in 1989. The spray booth is ventilated through the dust collector located outside of the southwestern corner of the Pilot Plant Annex.

Dezincing (P-2) Furnace. The dezincing operation performed in the Pilot Plant Annex was the same as the operation performed in Building 54A, except that a P-2 furnace was used. The P-2 furnace also removed excess hydrogen gas from 2- and 4-in.-thick flat castings of uranium metal. A small amount of water from a concrete ram pit under this furnace was removed with a portable sump pump and transferred to the Pilot Plant sump system for treatment. Two Hoffman dust collectors located in the alley between Buildings 37 and 54A, near the northwestern corner of the annex, were used to collect dust from the P-2 induction furnace.

NuSal Heat-Treat Furnace and Quench Tank. The NuSal salt furnace is located in the northeastern corner of the Pilot Plant Annex. This furnace, installed in January 1964, replaced the original heat-treating furnace. The heat-treating unit consists of an immersion electrode salt furnace, an oil quench tank, two wash water tanks, a heat exchanger to maintain the quench tank temperature, and a hoist. A 50/50 blend of molten sodium chloride and potassium chloride salts was used as a medium for heat-treating uranium core blanks on a pilot scale.

The pieces that were to be heat-treated were loaded into fixtures, and the fixtures were totally immersed into the salt bath. After a specified heating time, the fixtures and pieces were transferred from the salt bath to an oil or water quench tank. Sludge was removed to prevent it from interfering with the movement of pieces through the furnace or the attainment of the desired characteristics in the heat-treated pieces. The solidified sludge and salt were drummed and transferred to the waste pits.

West Wall Processes. The central area along the west inside wall of Building 37 is currently used for drum storage. The drums currently stored here are slightly higher in plutonium content than site specifications allow.

Southeast Corner Processes. A charging station and a jolter are the only remaining portions of the pilot-scale uranium reduction process originally located here.

Outside Equipment and Tank. Several pieces of equipment that supported process operations in the Pilot Plant Annex 37 are located outside the building, as discussed in the preceding sections. These units are shown on Figure 37-1 and listed as follows (all have concrete bases and low curbs):

- Hoffman Dust Collectors, which serviced the P-2 furnace, in the alley outside the northwestern corner of Building 37;
- Wheelabrator East Dust Collector, which serviced furnaces and blasting operations along the east wall of Building 37, outside the southeastern corner of the building;

- Roto-Clone Wet Dust Collector, which may have served the shot blaster, just north of the Wheelabrator West Dust Collector; and

- Wheelabrator West Dust Collector, which serviced Plasma Furnace, outside the southwestern corner of Building 37.

Removed Processes. Some of the unit processes formerly operated in the Pilot Plant Annex have been removed; most are not shown on Figure 37-1. The names of these processes and brief descriptions are as follows:

- *Oil Reclaimer.* Hilco oil reclaimer for vacuum pump oil was used in the P-2 furnace (portions may still be present but are not identified on available drawings);

- *Thorium Tetrafluoride Mill.* Dehydrated thorium tetrafluoride was milled and packaged for reduction in a mill that has been removed;

- *Calcium Metal Storage.* Drums of fine calcium metal were stored and weighed for the reduction process using a portable scale that has been removed;

- *Box Furnace.* The box furnace, which has been removed, was an electrically heated multipurpose furnace used for enriched uranium turnings and sawdust oxidation;

- *Enriched Derby Furnace.* The enriched derby furnace was a small-scale reduction furnace, now removed, which used to perform test runs for production of 5-in. diameter enriched uranium derbies up to 5% ^{235}U;

- *Centrifugal Casting Furnace.* No information is available for this unit, and a nearby tank shown on earlier drawings in the area where plutonium out-of-spec (POOS) materials drums are currently stored (Figure 37-1).

Major Media Types per Process Area

Major media for Building 37, the Pilot Plant Annex, include concrete in the floor and outside unit containment area and concrete block (masonry) walls. Building 37 has no acid-brick-lined areas, structural steel frame, or transite or other known asbestos-containing materials.

Summary of Available Radiological Data

Building 37 is routinely surveyed and sampled for removable alpha and total beta-gamma contamination. Results from recent surveys have been assembled in Tables A.4.0 and A.4.1 and assessed to identify hot spots. The data set includes 282 removable alpha radiation measurements (108 accessible equipment and 174 floor measurements) and 42 total beta-gamma radiation measurements (10 accessible equipment and 32 floor measurements).

For purposes of radiological data assessment and locating sample sites, the process areas of the Pilot Plant Annex have been divided up as shown by heavy dashed lines on Figure 37-1. Building 37 is a completely open bay; therefore, some areas have been grouped as probably having similar contamination conditions for the major media. The hot spots for the process areas are shown on Figure 37-1 on the basis of the recent surveys, with most hot spots based on removable alpha contamination results because few total beta-gamma results are available. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys.

East Wall Processes. In the area of the grit blaster, roto-blaster, and briquetter, a floor hot spot of 600,000 dpm was identified with a corresponding removable alpha radiation measurement of 1,038 dpm.

Plasma Furnace and Dust Collector. The hot spot for the floor media in the plasma furnace process area was identified as a 64-dpm removable alpha radiation measurement, a result of the absence of available total beta-gamma measurements in the process area.

Dezincing (P-2) Furnace. The total beta-gamma radiation hot spot for the floor in the P-2 furnace area was 200,000 dpm, with a corresponding removable alpha measurement of less than the MDA.

NuSal Heat-Treat Furnace and Quench Tank. The hot spot for the floor media in the NuSal Furnace process area was identified as a 296-dpm removable alpha radiation measurement, a result of the absence of available total beta-gamma measurements in the process area.

West Wall Process Area. The hot spot for this drum storage area floor media was identified as a 133-dpm removable alpha radiation measurement, a result of the absence of available total beta-gamma measurements in the process area.

Southeast Process Area. The hot spot for the southeast process area floor media was identified as a 783-dpm removable alpha radiation measurement, a result of the absence of total beta-gamma measurements in this process area.

Recent surveys do not provide suitable data for establishing hot spots for the other major medium of masonry walls. Also, readings are not available for the outside areas of the Pilot Plant Annex. A follow-up survey will be conducted in these areas to establish intrusive sampling locations.

Summary of Sampling for Building 37

One airborne particulate sample will be collected and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Because dry processes were operated inside the Pilot Plant Annex, a concrete chip sample will be collected in each process area.

Visual inspection of the component identified the need for supplemental samples from the sumps beneath the various dust collectors. One potential supplemental sample was identified for the process areas inside Building 37. Both Wheelabrator dust collectors have sumps that should be sampled. The containments beneath the Roto-clone and Hoffman dust collectors could not be inspected, so sampling in those areas will be done on a contingent basis if future inspection at the time of sampling indicates the need. The concrete pads beneath both Wheelabrator dust collectors are severely pitted and will be intrusively sampled by concrete chip collection. The potential supplemental sample location was identified for the southeastern corner (Charge Station) process area, where a floor sump is covered by steel plate adjacent to a wall-mounted sink and liquid dump point. Adjacent to the floor sump are a raised, cut-off pipe; a 3-in. diameter, open floor drain; and a wall-mounted steel funnel-like structure. The steel cover of the floor sump will be removed before sampling and, depending on its contents, sediment and/or aqueous liquid samples or an inorganic residue sample will be collected. Table 37-1 summarizes the planned sampling program for Building 37.

TABLE 37-1 Sample Types and Quantities for Building 37

Sample Type	East Wall Processes	Plasma Furnace	P-2 Furnace	NuSal Heat Treat Furnace	West Wall Processes	South-east Processes	Outside Areas	Component Totals
Nonintrusive[a]								
Radiological surveys	b	b	b	b	b	b	b	NA[c]
Chemical surveys	b	b	b	b	b	b	b	NA
Air particulates	NA	NA	NA	NA	NA	NA	NA	1
Swipes	2	2	2	2	2	2	1	13
Lab composite swipes	NA	NA	NA	NA	NA	NA	NA	1
Intrusive[a]								
Concrete chips	1	1	1	1	1	1	3	9
Concrete cores	NA	NA	NA	NA	NA	NA	NA	NA
Masonry	1	1	1	1	1	1	NA	6
Steel surface scraping	NA	NA	NA	NA	NA	NA	NA	NA
Supplemental								
Liquid sample	NA	NA	NA	NA	NA	1	2	3
Loose media	NA	NA	NA	NA	NA	1	NA	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.3.25 Building 39A — Incinerator Building

Component Description

Building 39A (Incinerator Building), a two-story square structure measuring approximately 53 × 53 ft and 25 ft high, is located within the west-central portion of the FEMP Production Area between the Ore Refinery Plant (Component 2A) and the Recovery Plant (Component 8A) and along 102nd Street, as shown on the Grid 19 map of Appendix C. The building consists of a structural steel frame on a reinforced poured concrete base and floor, transite interior and exterior siding panels (insulation materials between panels), and transite roof panels (Type A building).

Process Area Description

Building 39A contains four processes: the drum dryer, the trash baler, the liquid waste incinerator, and the solid waste incinerator. Initially, this facility was entirely devoted to the drum dryer process; once the drum dryer was removed, the trash baler and solid and liquid waste incinerators were added. The drum dryer and the liquid waste incinerator processes are considered wet processes. Figure 39A-1 shows the locations of the process boundaries and major pieces of equipment within Building 39A. Anticipated contaminants are summarized in Table A.3.

Drum Dryer. Aqueous raffinate slurry from the extraction process in the Ore Refinery Plant, which comprised acid insoluble solids, soluble acid nitrates, and excess nitric acid, was dried on two large rotary drums on the second floor in an acid-brick-lined diked area. A recycle surge tank was attached to the feed pan of each filter. As the dried raffinate cake was scraped off the rotary drum, it fell into one of two gas-fired rotary calciner furnaces located on the first floor, where it was further dried. Metal oxides were discharged from the rotary calciners into the William's hammer mill. The pulverized particles were pneumatically conveyed to Silo 3, a large, outdoor storage tank.

Nitric acid and water vapors from the drum driers and the rotary calciners were exhausted by means of a venturi-type scrubber, located on the diked pad north of Building 39A. A knife grinder, used to sharpen the filter cake knives on the filters, was located in the center of the second floor. All drum dryer process and associated equipment has been removed, leaving the second floor empty and allowing for the installation of the trash baler and the solid and liquid waste incinerators on the first floor.

Trash Baler. Solid wastes generated by site operations were transported to Building 39A in dumpsters for sorting and incineration or compaction. The dumpsters were emptied onto the conveyor component of Building 39A, which carried the solid wastes to the

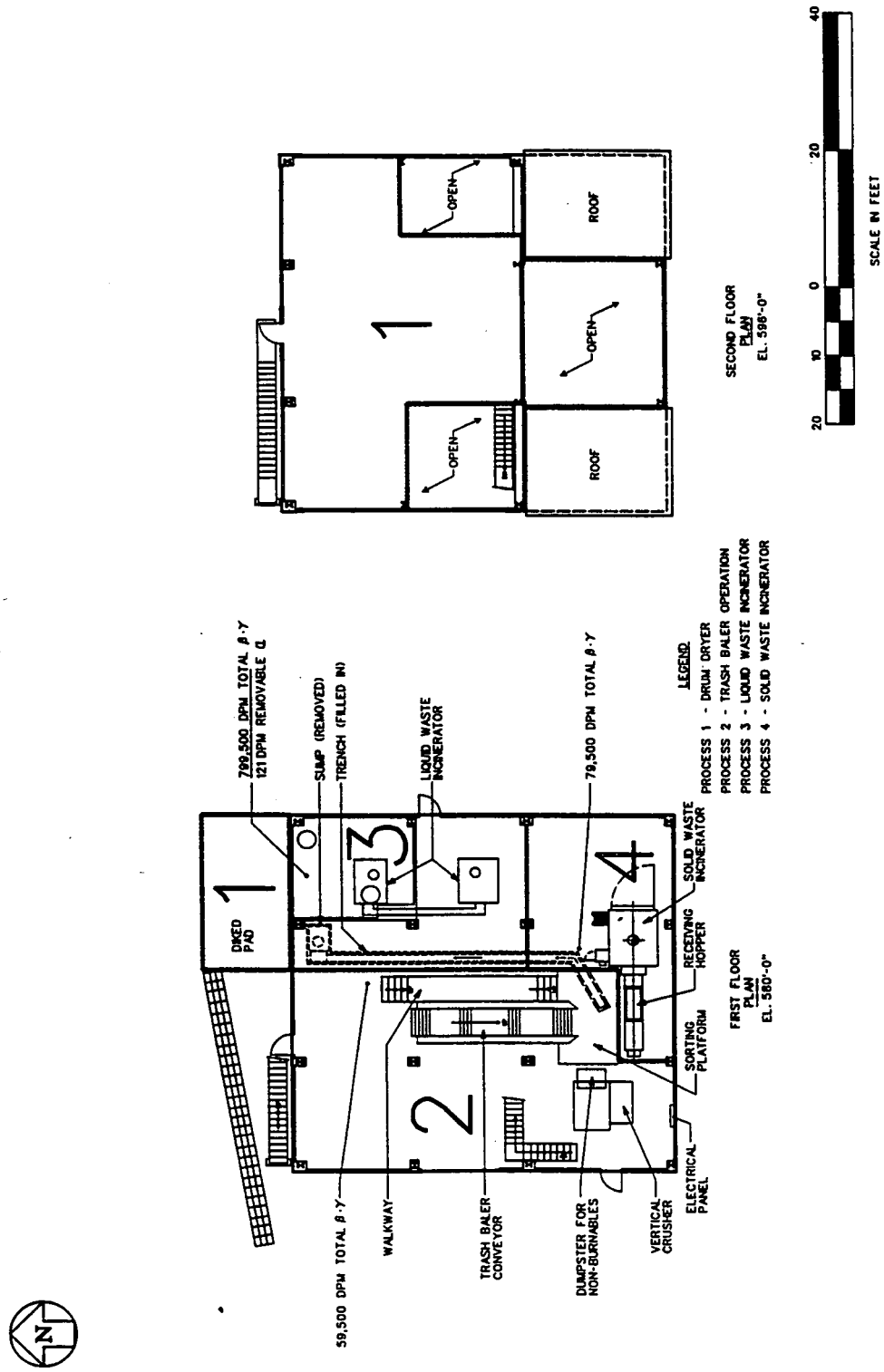

FIGURE 39A-1 Layout of Building 39A

sorting platform, where they were segregated into burnable and nonburnable piles. Solid wastes capable of being incinerated were taken to the solid waste incinerator, while nonburnables, such as metal, glass, and plastics, were placed in the vertical crusher of the trash baler. The vertical crusher remains in operation and is currently used to compact office type wastes (e.g., paper, trash) generated within the process area.

Liquid Waste Incinerator. The liquid waste incinerator (also referred to as the trane incinerator) is a gas-fired single-chamber unit consisting of a 50-gal feed tank, air intake ductwork and two blowers, a primary burn chamber, exhaust ductwork, a vertical discharge stack, a baghouse filter, and an electrical control panel. Other equipment associated with the liquid waste incinerator but not in Building 39A includes a 5,800-gal storage tank, a concrete storage pad located east of Building 39A, an oil/water separation unit in Building 39B, and an overhead oil transfer line that terminates at the 50-gal feed tank.

This process was used from 1980 to 1986 to incinerate waste oils generated by various plants. In general, waste oil was transported to the oil/water separator unit in the waste oil decant shelter (Component 39B), then pumped from the separation unit to the 5,800-gal storage tank or the 50-gal feed tank. The waste oil was then incinerated, and exhausts were directed to a baghouse filter for ash removal before being vented through a stack.

Drums of waste oil awaiting incineration were stored on the concrete pad east of Building 39A. Samples of the waste oil exhibited 1,1,1-trichloroethane and lead concentrations above regulatory threshold levels. Per RCRA regulations, the waste oils were classified as hazardous wastes, and the liquid waste incinerator and associated equipment were designated as an HWMU.

Solid Waste Incinerator. Vehicle loads of burnable materials were delivered into Building 39A and put onto the lower section of the trash baler conveyor. Burnables were then placed in the feed hopper to be fed into the main chamber of the solid waste incinerator (also referred to as the Kelley incinerator). A thermal reactor mounted above the main chamber burned the particulate matter before it entered the stack.

Major Media Types per Process Area

Building 39A is a steel structure frame covered with transite panels and has two reinforced concrete floors. As the steel, concrete, and transite are uniform across the component, all four processes are considered to contain these major media. Because transite siding is addressed as a separate supplemental sampling activity, it is not considered as a major medium in Building 39A. The drum dryer process area also contains substantial quantities of acid brick lining the diked areas. Therefore, the brick is considered to be the final major medium for this process area.

Summary of Available Radiological Data

Building 39A is routinely surveyed for removable and total alpha and beta-gamma contamination. Recent data (1991 and 1992) from these surveys have been assembled and summarized in Tables A.4.0 and A.4.1. In total, 17 removable alpha and 31 total beta-gamma survey measurements were performed for the floor media in Building 39A during that time. The data indicate the radiological hot spots for each process area as described below and indicated on Figure 39A-1. No recent data for the second floor or outside diked pad (drum dryer process) are available, but the radiological hot spot in this process area will be determined from field measurements before sampling occurs. Also, as data are acquired from ongoing radiological surveys taken for health physics needs, the identified hot spots will be reassessed before sampling begins.

Currently, the highest total beta-gamma readings obtained from surveying the concrete within the first floor processes are 59,500 dpm for the trash baler, 799,500 dpm for the liquid waste incinerator, and 79,500 dpm for the solid waste incinerator. The total beta-gamma hot spot reading for the liquid waste incinerator was one order of magnitude higher than any other point taken in Building 39A.

The highest removable alpha reading in the liquid waste incinerator is 121 dpm and corresponds to the beta-gamma hot spot. For the trash baler and solid waste incinerator process areas, the surveying has indicated removable alpha contamination to be below the MDA for the instruments used, 53 dpm. A majority of the removable alpha measurements taken for the facility were below the MDA.

Summary of Sampling for Building 39A

One airborne particulate sample will be taken in the component and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipes, will be performed and assessed in the field to further detail final intrusive sampling locations. In all four process areas, the floor medium is concrete. Masonry (acid brick) is also encountered in one process. Intrusive sampling will be performed for each process area and will consist of concrete cores in wet process areas, chips in dry process areas, and surface scrapings from structural steel. In addition, an intrusive sample will be taken from the masonry in the drum dryer process area. If analyses of radiological swipe samples determine elevated levels of removable contamination as outlined in Protocol 1, then the swipe samples will be combined over the process area for laboratory analysis.

Field evaluation of the facility also revealed that a supplemental liquid sample may be retrievable from the outside diked pad associated with the former drum dryer process. Additional supplemental samples may be identified by field crews at the time of sampling activities for residues not encountered in the visual inspection of the component. Table 39A-1 summarizes the planned sampling program for Building 39A.

TABLE 39A-1 Sample Types and Quantities for Building 39A

Sample Type	Drum Dryer	Trash Baler	Liquid Waste Incinerator	Solid Waste Incinerator	Component Totals
Nonintrusive[a]					
Radiological surveys	b	b	b	b	NA[c]
Chemical surveys	b	b	b	b	NA
Air particulates	NA	NA	NA	NA	1
Swipes	3	2	2	2	9
Lab composite swipes	NA	NA	NA	NA	1
Intrusive[a]					
Concrete chips	NA	1	NA	1	2
Concrete cores	1	NA	1	NA	2
Masonry	1	NA	NA	NA	1
Steel surface scraping	1	1	1	1	4
Supplemental					
Liquid sample	1	NA	NA	NA	1
Loose media	1	NA	NA	NA	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.3.26 Component 39B — Waste Oil Decant Shelter

Component Description

Component 39B (Waste Oil Decant Shelter) consists of a transite roof with steel supports over a concrete pad. The shelter is located just south of the Ore Refinery Plant (Component 2A), as shown on the Grid 19 map in Appendix C. The dimensions of the rectangular structure are 18 × 28 ft and 12 ft high. The floor plan for the shelter is provided in Figure 39B-1. Component 39B housed the oil/water separator. Oils and solvents were directed through the oil-water separation process before being incinerated in the Incinerator Building (Component 39A).

Process Area Description

The oil-water separation process, a wet process area, was the only process performed in Component 39B. Anticipated contaminants from this process are summarized in Table A.3. The oil-water separation process received waste oils from various operations site-wide. The oil and solvents were then processed through the oil-water separator in Component 39B. The oil and solvents were decanted, during the process, to remove the water fraction before incineration of the oils. The process has been declared an HWMU under RCRA regulations.

Major Media Types per Process Area

The structural steel and concrete are the major media for Component 39B. Because the transite roof is addressed as a separate supplemental sampling activity, it is not considered as a major medium in Component 39B.

Summary of Available Radiological Data

Component 39B has not been routinely surveyed for removable alpha and total beta-gamma contamination. Data will be gathered before sampling and will include any data gathered from ongoing radiological surveys.

Summary of Sampling for Component 39B

One air sample will be taken in the component and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, radiological surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Because the component is considered to

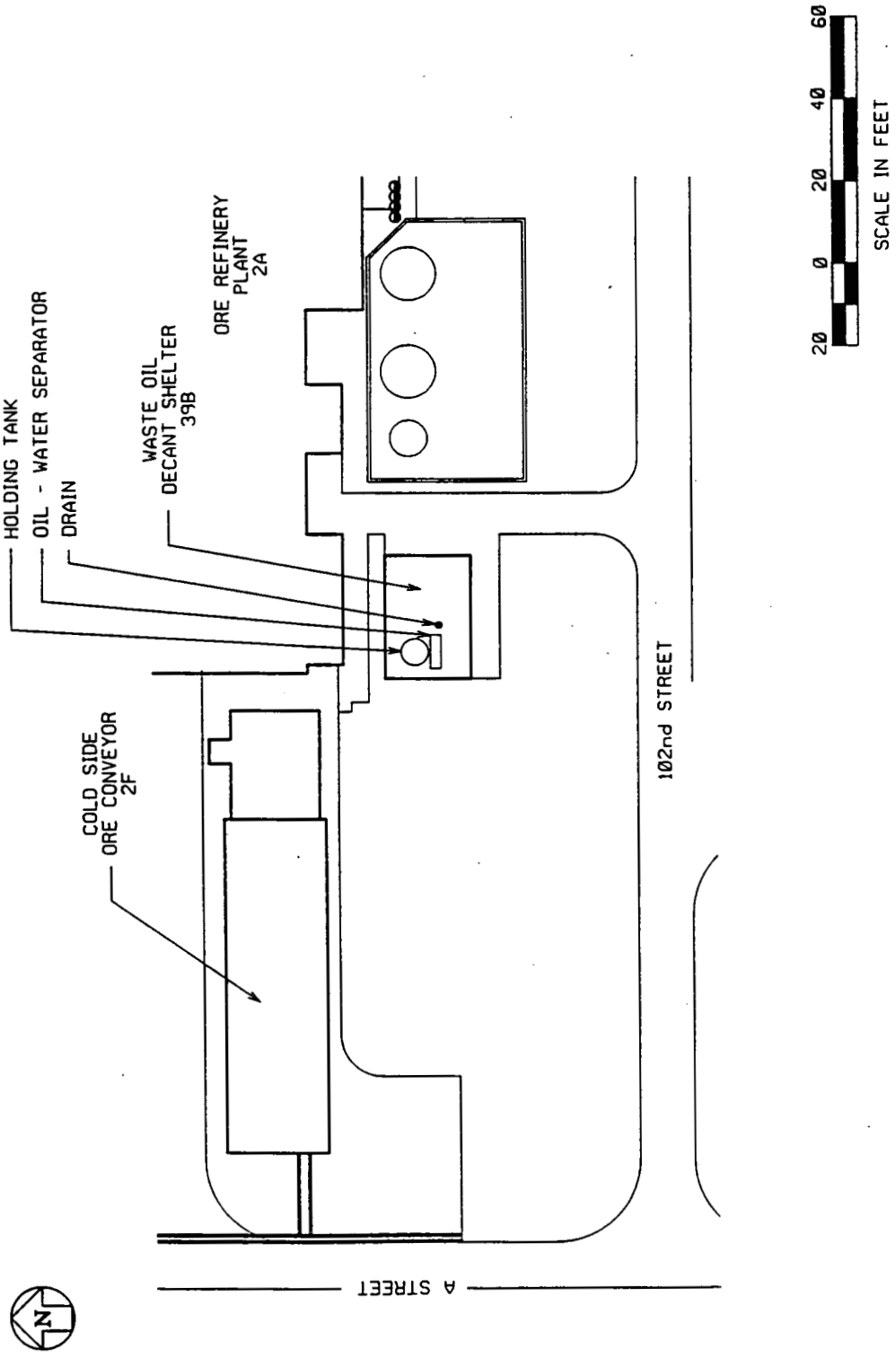

FIGURE 39B-1 Layout of Component 39B

contain a wet process, a concrete core will be taken from the pad beneath the oil-water separator. Structural steel scrapings and swipe samples will be collected on the basis of Protocols 1 and 3.

On the basis of the component inspection, a supplemental loose media sample will be collected from the saturated sediment near the oil-water separator. During the inspection, stains on the concrete were noted in the vicinity of the oil-water separator. Table 39B-1 summarizes the planned sampling program for Component 39B-1.

TABLE 39B-1 Sample Types and Quantities for Component 39B

Sample Type	Oil-Water Separation	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	1	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.3.27 Building 54A — Six to Four Reduction Facility 1

Component Description

Building 54A (Six to Four Reduction Facility 1 or the Pilot Plant UF_6 to UF_4 Facility) is a processing facility shown on the Grid 26 map in Appendix C, just south of 1st Street. Its shape is irregular, with overall maximum dimensions of 165 × 123 ft and 44 ft high. It shares its entire western wall with Component 13A and a small portion of its eastern wall with the Pilot Plant Annex (Component 37). The layout of Building 54A is shown in Figure 54A-1. The building has several distinct parts; the various parts of the overall building contain different types of construction materials.

The 61 × 81 ft main processing area (also referred to as North Building 54A) is 44 ft high and located in the northwestern part of the overall building. It consists of a structural steel frame on a reinforced concrete base, reinforced poured concrete floor, transite siding panels with insulation between the inner and outer panels, transite roof panels, lead bolt covers and sill moldings, and glass windows. The main processing area contains three three-level steel structures that house the hydrogen fluoride recovery system, the UF_6 to UF_4 reactors, and, attached to the reactor structure, the acid vapor scrubber equipment.

A transformer room and utility room are attached to the north wall of the main processing area. A mechanical room, a hallway, and a power generator room are attached to the east wall of the main processing area. A control room, electrical room, and battery room are attached to the south wall of the main processing area, and office and lab rooms are situated along the eastern common wall with the Pilot Plant Wet Side (Component 13A). The latter office and lab rooms are accessible from either building.

The autoclave section, the southern portion of Building 54A, was added when the UF_6 to UF_4 process was upgraded between 1982 and 1984. It is 32 ft high and consists of a structural steel frame on poured reinforced concrete base with poured reinforced concrete floor, steel siding panels, and a sloped steel roof. The roof is of composite construction, having a corrugated steel deck covered with rigid insulation and five-ply built-up roofing.

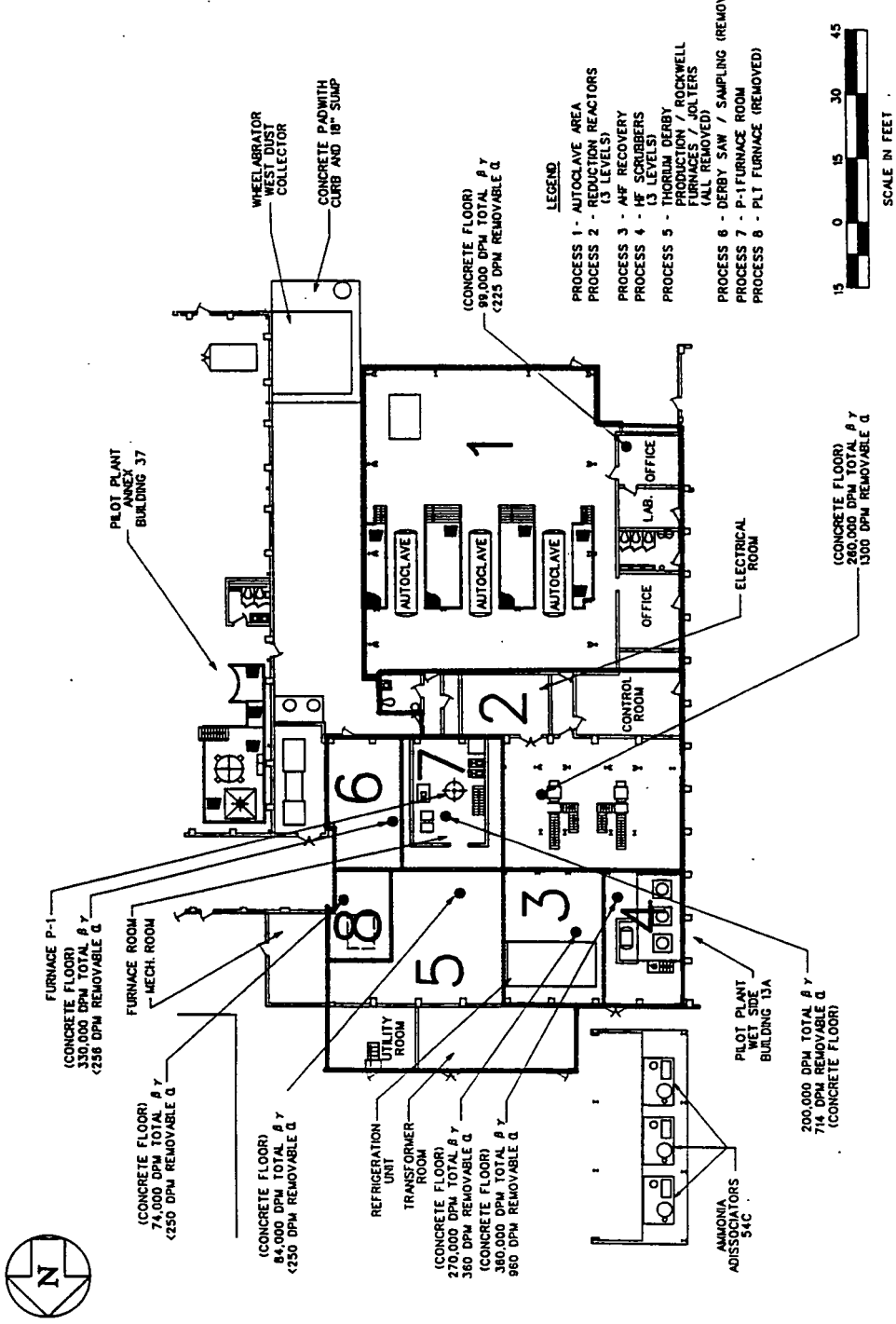

FIGURE 54A-1 Layout of Building 54A

Process Area Description

Processing in Building 54A occurred in two distinct periods: pre-1982 and 1982-1988. From 1952 to 1982, essentially all processing occurred within the main processing area. Uranium hexafluoride (UF_6) was reduced to uranium tetrafluoride (UF_4) from 1952 to 1957 and again from 1962 to 1967. During this time, Building 54A also contained a jolter, blender, and Rockwell furnaces where pots were lined, loaded with reactants, and used to produce zinc-thorium metal derbies; a power hacksaw to cut samples from the derbies; and an experimental furnace where a process to make uranium metal by a continuous process was tested.

From 1982 to 1984, Building 54A and its contents were significantly modified. The metals processing equipment and the old equipment for reducing UF_6 to UF_4 were removed. The Autoclave Building was added south of the original structure. The Dissociator Building (Component 54C) was added north of the original structure. An upgraded UF_6 to UF_4 process was also constructed. This new process, while incorporating basically the same type of equipment as the original, contained three ammonia dissociators (instead of one), three UF_6 vaporizing autoclaves (instead of one vaporizer of a different design), two reactors (instead of one), and a distributed control computer system. Operation of the upgraded facility began in 1984 and continued until 1988 when there was no longer a need for UF_4 production. The potential contaminants in Building 54A are presented in Table A.3.

In the subsections that follow, the existing facility for UF_6 and UF_4 conversion is described. Brief descriptions of the processing facilities used before 1982 are also provided in some cases.

UF_6 Vaporization. UF_6 cylinders, 10- and 14-ton capacities, were delivered from the gaseous diffusion plants at Portsmouth, Ohio; Oak Ridge, Tennessee; and Paducah, Kentucky; to the concrete Pilot Plant Pad (Component 74U) south of the autoclave section. The cylinders were placed in one of three low-pressure, steam-heated autoclave units located in the autoclave section of Building 54A. The autoclaves heated the UF_6 to vaporization at 113°C (235°F). The vaporized UF_6 was piped to a heated surge tank and from the tank to the reactors in the main process area.

During feed cylinder changeovers, the lines were first evacuated with two vacuum pumps located at the northwestern corner of the autoclave room; then the lines were pressurized with nitrogen. The vacuum pumps drew the vapors through a cold trap, then through a molecular sieve where Freon-11™ was used to cool a cylinder to 40°F to solidify the purged UF_6. Molecular sieves removed any UF_6 remaining after the cold trap. In the predecessor process, before 1982, the UF_6 cylinder heating process was carried out in a single steam-jacketed cubicle located outside the southwestern corner of the building on Pilot Plant Pad.

UF_6 Reduction Process. The reduction reaction was carried out in the two reactor vessels located in the southwestern quadrant of the original processing area, above where packaging stations and drum conveyors are shown on the first floor plan (Figure 54A-1). UF_6 feed gas was mixed with hydrogen, obtained from dissociated ammonia, and fed through a mixing head at the top of one of two vertical tube reaction vessels 15-in. in diameter and 20 ft high.

Heat was applied to the external surfaces of the reaction vessels to induce the reduction reaction. Reduction occurred between 815 and 870°C (1500 to 1600°F) in the upper reaction zones. Compressed air from a distribution ring located at the base of each zone removed excess reaction heat from the external surfaces of the reactors. This cooling minimized the corrosion and oxidation of the reactor and cooled the down-flowing gas-powder mixture. Pneumatic vibrators and cycling through heating/cooling cycles were used to dislodge UF_4 slag that accumulated on the walls of the reaction vessels.

UF_4 powder fell through the reaction vessel into a water-cooled, jacketed-screw conveyor and then passed through a sealed hopper, rotary valve, and pulverizer. The screw conveyor transported the UF_4 to one of the two packaging stations. The UF_4 was then packaged into 10-gal cans, weighed, and subsequently used in the Metals Production Plant (Component 5A). The packaging station was ventilated with the exhaust going to two bag-type dust collectors located northeast of the packing station, above the plant floor. Green salt, collected in the hopper at the base of the dust collector units, was placed in drums for subsequent use in the Green Salt Plant (Component 4A) or for disposal, depending upon its analysis.

AHF Recovery. Gases exiting the reactors passed through two cyclone separators, two sintered metal filters, and an activated carbon tube-type filter for removal of UF_4 dust and unreacted UF_6. The reaction gases were then cooled to condense out hydrogen fluoride as anhydrous (AHF). The AHF refrigeration systems are located along the north and west walls, also within a steel structure. A horizontal, cylindrical steel tank located outside the east wall, near the northeastern corner, of the Pilot Plant Annex (Grid 26 map in Appendix C) provided intermediate storage for the AHF, which was then pumped to the Old/Main Tank Farm for long-term storage using equipment located and controlled on a platform next to the tank.

DHF Recovery. The remaining off gas passed through a series of three aqueous scrubbers to remove residual HF. Scrubber effluent, dilute hydrofluoric acid (DHF), was collected in polyethylene tanks at the bases of the scrubbers. The scrubber equipment is located within a three-level steel structure along the west wall of the main processing facility. The process is considered wet.

Thorium Derby Production and Sampling. Equipment to line furnace pots with calcium fluoride, to blend thorium tetrafluoride with calcium and zinc fluoride, to load

furnace pots, to produce thorium metal derbies, and to sample thorium metal derbies was contained in the main processing area before 1982. Jolters, located in the northeastern corner of the building, were used to line furnace pots with calcium fluoride (CaF_2) or magnesium fluoride (MgF_2).

Thorium tetrafluoride was blended with calcium and zinc fluoride in an enclosed blender located near the jolters. An argon purge was used on the blender. The blended material was charged into the CaF_2-lined pots, capped with CaF_2, and enclosed with a lid in the same general area. The loaded pots were then heated in one of two Rockwell resistance type furnaces, also located in the northeastern quadrant of the main processing area, to produce a thorium zinc metal derby and CaF_2 slag. After cooling, the pots were taken to the Metals Production Plant where the metal and CaF_2 were removed. The CaF_2 was processed in the Pilot Plant Wet Side for recycle as pot liner, and the metal was returned to Building 54A for sampling.

Predried thorium tetrafluoride, produced in the Pilot Plant Wet Side, was placed in pans stacked in the Rockwell furnaces for further dehydration. The dried ThF_4 was then milled in the Pilot Plant Annex before use in derby production as described above.

Derby Saw/Sampling. A power hacksaw, located in the southeastern corner of the process area (between the Furnace Room and the east wall) was used to saw a thin slice from each thorium zinc derby for chemical analysis. Thorium/zinc dust from the sampling was drummed and sent to the Recovery Plant (Component 8A). It is believed that, before the UF_6 to UF_4 process upgrade in 1982, a scale located near the power hacksaw was removed and that the recession in the floor in which it was installed filled with concrete.

Dezincing of Zn-Th Derbies. From 1969 to 1971, the Zn-Th derbies from the Rockwell furnaces were placed in the P-1 vacuum furnace, located in the furnace room, to be heated to a sufficient temperature to vaporize away the zinc. The P-1 furnace was cooled with perchloroethylene circulated through a cooling jacket at one time because of the production of higher enrichment materials; otherwise, water was used. The purified thorium metal derbies were saw-sampled as discussed above. The process is considered a wet process.

Pressurized Low-Temperature (PLT) Furnace. The PLT furnace was located in the northeastern quadrant of the main processing area just north and west of the aisle that led to the rollup steel door in the east wall of the facility. In this furnace, a continuous process to produce uranium metal was tested. UF_4 and magnesium were fed continuously to the furnace, and molten uranium was continuously separated from molten MgF_2 on an experimental basis.

Major Media Types per Process Area

The Six to Four Reduction Facility consists of a composite of building types, which include several major media including concrete floors (and in the utility and office/lab additions, concrete roofs), concrete block walls, corrugated steel wall and roof panels, and structural steel frame.

Besides the major media that make up the floors and building shells, the structural steel frameworks that contain the reactor system, scrubbers, and AHF recovery systems within the main processing area constitute a significant amount of both volume and surface area for consideration in the sampling efforts. In addition to steel I-beams, these structures have steel gratings, solid steel sheets, brick, and concrete components.

In summary, the major media within Building 54A include structural steel, reinforced concrete, and concrete block (masonry). Because transite is addressed as a separate supplemental sampling activity, it is omitted as a major medium for Building 54A in this document. Also, the thin steel siding and roof decking is omitted as a major medium because it is not a likely target for development of treatment options during the remediation program.

Summary of Available Radiological Data

The Six to Four Reduction Facility 1 is routinely surveyed and sampled for removable alpha and total beta-gamma contamination. Results from recent surveys are assembled in Tables A.4.0 and A.4.1 and assessed to identify hot spots. The data set includes 1,094 removable alpha radiation measurements (418 for accessible equipment and 676 for floor media) and 1,008 total beta-gamma radiation measurements (383 for accessible equipment and 625 for floor media).

For purposes of radiological data assessment and locating sample sites, the process areas of Building 54A have been divided up as shown by heavy dashed lines on Figure 54A-1. Building 54A process areas have been divided up to match the descriptions in the preceding sections, including identification of process areas that have been removed and are now storage areas. The hot spots for intrusive sampling of the process area concrete floors are shown on Figure 54A-1, according to the recent surveys for total beta-gamma contamination. The process area names and numbers and the highest total beta-gamma contamination readings follow.

UF_6 Vaporization. The radiation hot spot for the floor media in the autoclave area was 99,000 dpm total beta-gamma radiation, located inside one of the rooms along the west wall. A corresponding removable alpha radiation measurement was less than the MDA for the instrument.

UF_6 Reduction. The hot spot for the floor media in the reactor area was 260,000 dpm total beta-gamma radiation, located east of the east packaging station. A corresponding removable alpha radiation measurement was less than the MDA.

AHF Recovery. The hot spot for the floor media in the AHF recovery area was 270,000 dpm total beta-gamma radiation, located south of the refrigeration unit.

DHF Recovery. The hot spot for the floor media in the DHF recovery area was 360,000 dpm total beta-gamma radiation, located southeast of the scrubber units.

Thorium Derby Production and Sampling. The hot spot for the floor media in the thorium derby production area was 84,000 dpm total beta-gamma radiation. A corresponding removable alpha radiation measurement was less than the MDA.

Derby Saw/Sampling. The hot spot for the floor media in the derby sampling area was 330,000 dpm total beta-gamma radiation. A corresponding removable alpha radiation measurement was less than the MDA.

Dezincing of Zn-Th Derbies. The hot spot for the floor media in the P-1 furnace area was 200,000 dpm total beta-gamma radiation. A corresponding removable alpha radiation measurement was less than the MDA.

PLT Furnace. The hot spot for the floor media in the PLT Furnace area was 74,000 dpm total beta-gamma radiation. A corresponding removable alpha radiation measurement was less than the MDA.

These data are all for concrete floors. The data set is inadequate to identify hot spots for structural steel in the three-level structures in process areas 4, 5, and 6 as well as the building structural frame. Likewise, no data are available for the masonry walls. Data will be reassessed and supplemented for the structural steel and masonry media before sampling to include data gathered from ongoing and focused radiological surveys.

Summary of Sampling for Building 54A

One particulate air sample will be collected and analyzed for radiological and inorganic contaminants, as well as asbestos, in the facility with Protocol 1. Nonintrusive measurements, including follow-up and focused radiological surveys, exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail the final intrusive sampling locations for concrete in each of the eight

process areas. The structural steel and masonry media will be intrusively sampled on the basis of a new radiological survey that focuses on those media.

The concrete samples will be either cores or chips, depending on the nature of the processing that occurred in each area. The structural steel hot spots to be identified on the basis of the new focused survey will be sampled by collection of steel scrape samples. Masonry samples are necessary for all process areas. No supplemental sample locations were identified during the site inspection. Table 54A-1 summarizes the planned sampling program for Building 54A.

TABLE 54A-1 Sample Types and Quantities for Building 54A

Sample Type	Autoclave Area	UF_6 Reduction Reactors	AHF Recovery	DHF Recovery	Th Derby Production	Derby Saw/ Sampling	P-1 Furnace Room	PLT Furnace	Component Totals
Nonintrusive[a]									
Radiological surveys	b	b	b	b	b	b	b	b	NA[c]
Chemical surveys	b	b	b	b	b	b	b	b	NA
Air particulates	NA	NA	NA	NA	NA	NA	NA	NA	1
Swipes	3	3	3	3	3	3	3	3	24
Lab composite swipes	NA	NA	NA	NA	NA	NA	NA	NA	1
Intrusive[a]									
Concrete chips	1	1	1	NA	1	1	NA	1	6
Concrete cores	NA	NA	NA	1	NA	NA	1	NA	2
Masonry	1	1	1	1	1	1	1	1	8
Steel surface scraping	1	1	1	1	1	1	1	1	8
Supplemental									
Liquid sample	NA	NA	NA	NA	NA	NA	NA	NA	
Loose media	NA	NA	NA	NA	NA	NA	NA	NA	

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

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D.9.3.28 Building 55A — Slag Recycling Building

Component Description

Building 55A (Slag Recycling Building) is a multilevel building shown on the Grid 12 map in Appendix C. It is rectangular, measuring approximately 32 × 62 ft and 42 ft high. The building consists of a structural steel frame on a poured concrete base with transite siding and roofing panels (Type A building). The first floor is made of poured concrete, while the second, third, and fourth floors are constructed of diamond plate steel grating. The floor plans for the building are shown in Figures 55A-1 through 55A-4. The Slag Recycling Pit/Elevator (Component 55B) is also shown in these figures for reference.

Process Area Description

Building 55A contains the slag milling process area. Magnesium fluoride (MgF_2) slag was received from the Metals Production Plant (Component 5A) breakout system via the Slag Recycling Pit/Elevator. The slag was separated into coarse and fine streams and then stored for processing. The coarse stream (representing material produced by the Metals Production Plant reduction reaction) was ball milled and passed through an air classifier to select the product particle distribution. The fine stream (representing pot liner material) was passed through the system, but only a small fraction was saved. Both products were stored in bins in Building 55A and subsequently air-veyed to conveyor feed bins in the Metals Production Plant. Excess fines, classified waste, and larger metal particles were drummed for dispositioning. Currently, Building 55A contains bucket elevators, storage bins, a ball mill, a Rotex vibrating screen, and conveyors (vibrating, flight, and pneumatic). The anticipated contaminants for Building 55A are summarized in Table A.3.

Major Media Types per Process Area

Building 55A major media consist of structural steel and poured concrete. Because transite siding and roofing panels are addressed as a separate supplemental sampling activity, they will not be considered among the Building 55A major media.

Summary of Available Radiological Data

Building 55A is routinely surveyed for removable alpha and total beta-gamma contamination. Results from the most recent of these surveys are summarized in Tables A.4.0 and A.4.1 and provide the basis for identifying radiological hot spots. As indicated, 68 removable alpha and 56 total beta-gamma survey measurements were performed on the floor in Building 55A from 1989 through 1992. On the basis of the assembled data, the radiological hot spot for the concrete floor in the slag recycling process

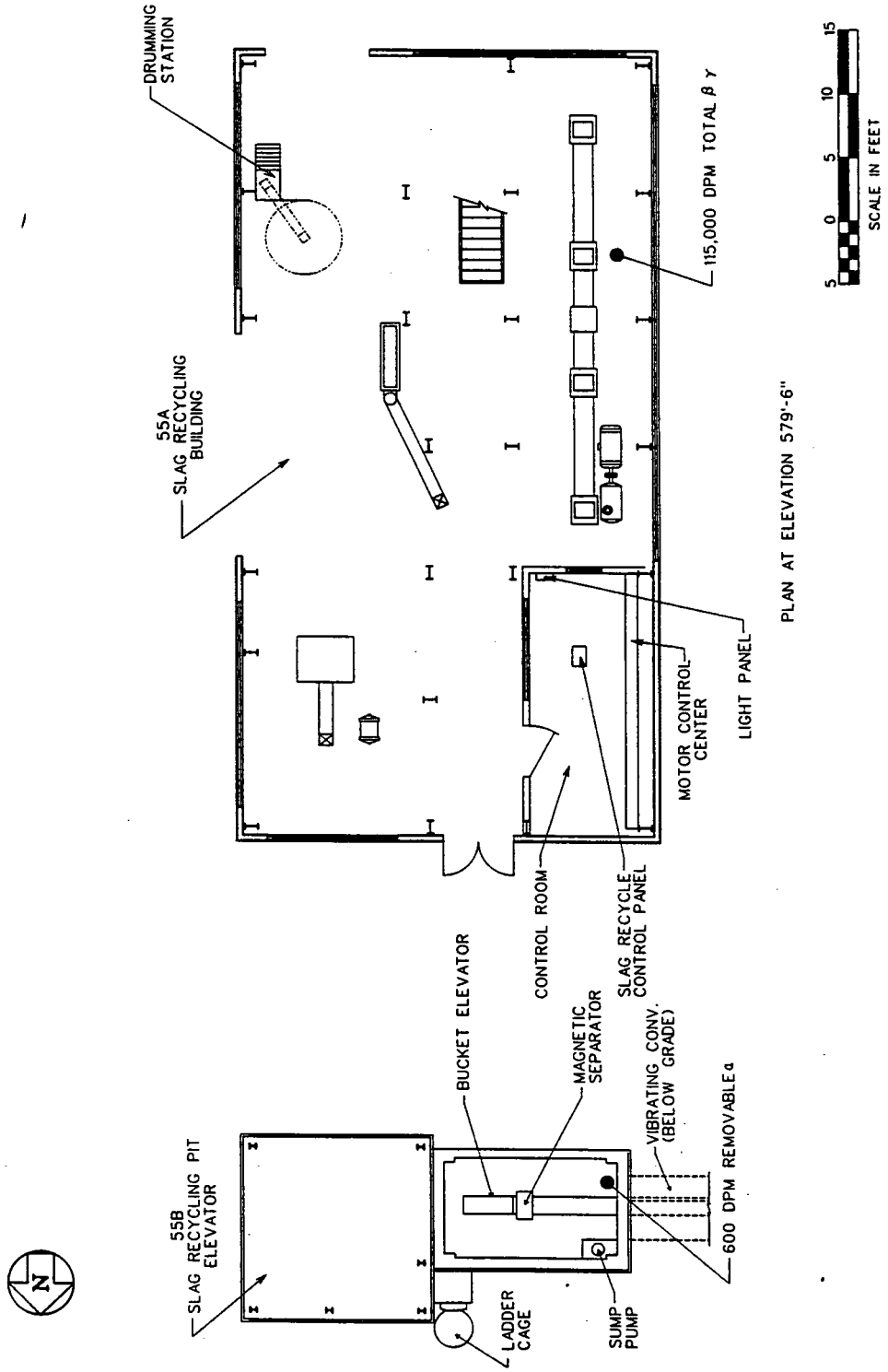

FIGURE 55A-1 Layout of Building 55A — First Floor

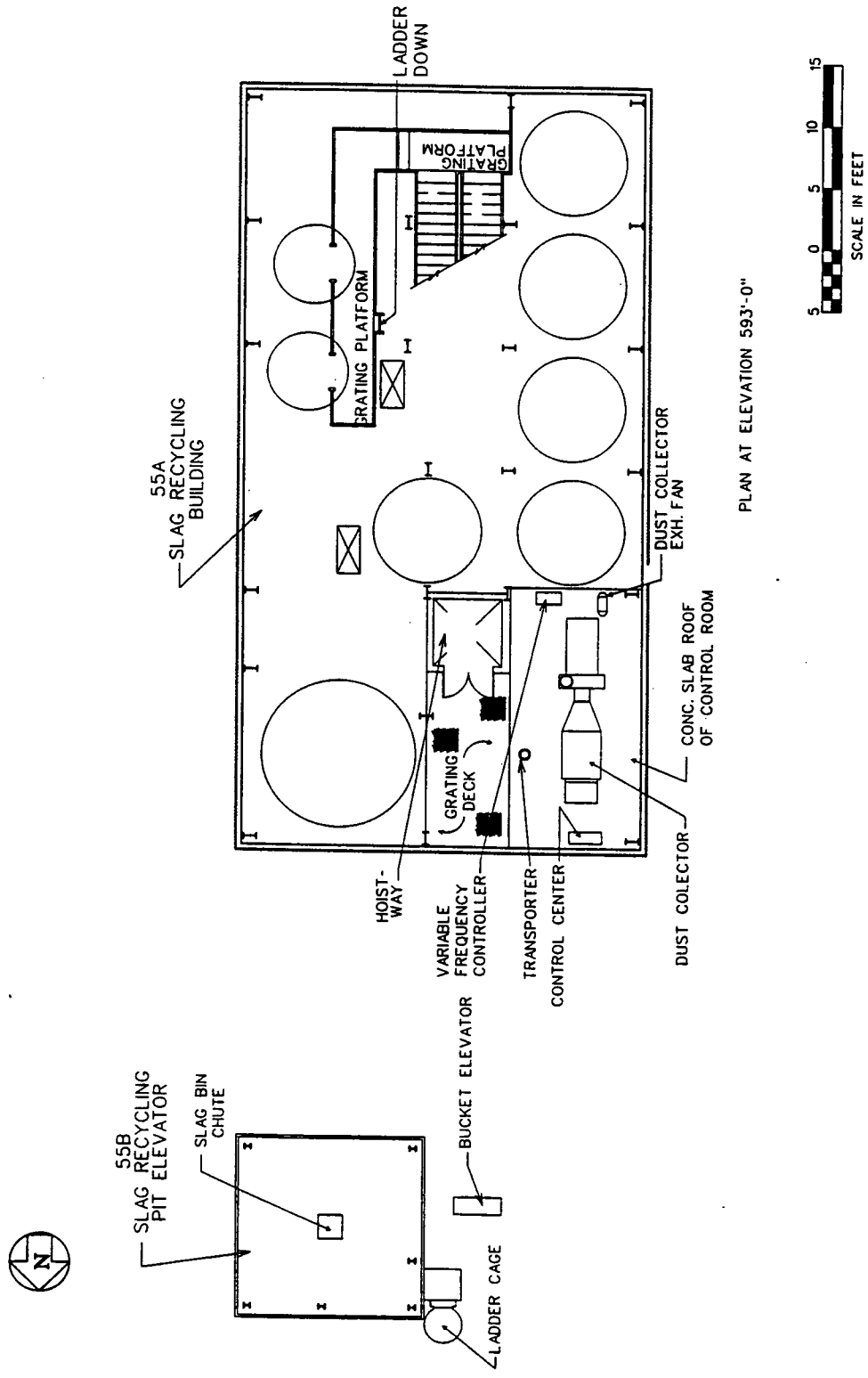

FIGURE 55A-2 Layout of Building 55A — Second Floor

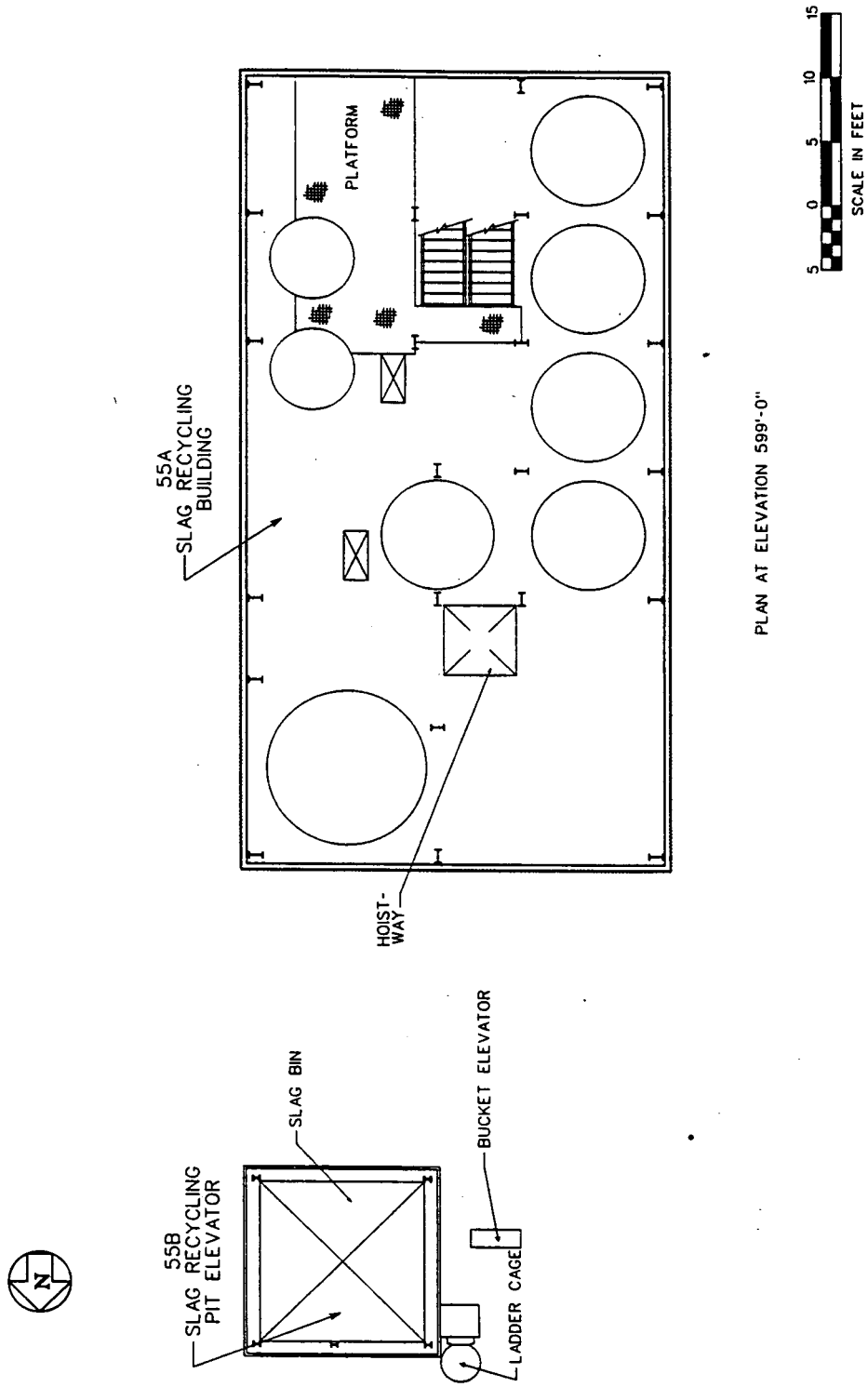

FIGURE 55A-3 Layout of Building 55A — Third Floor

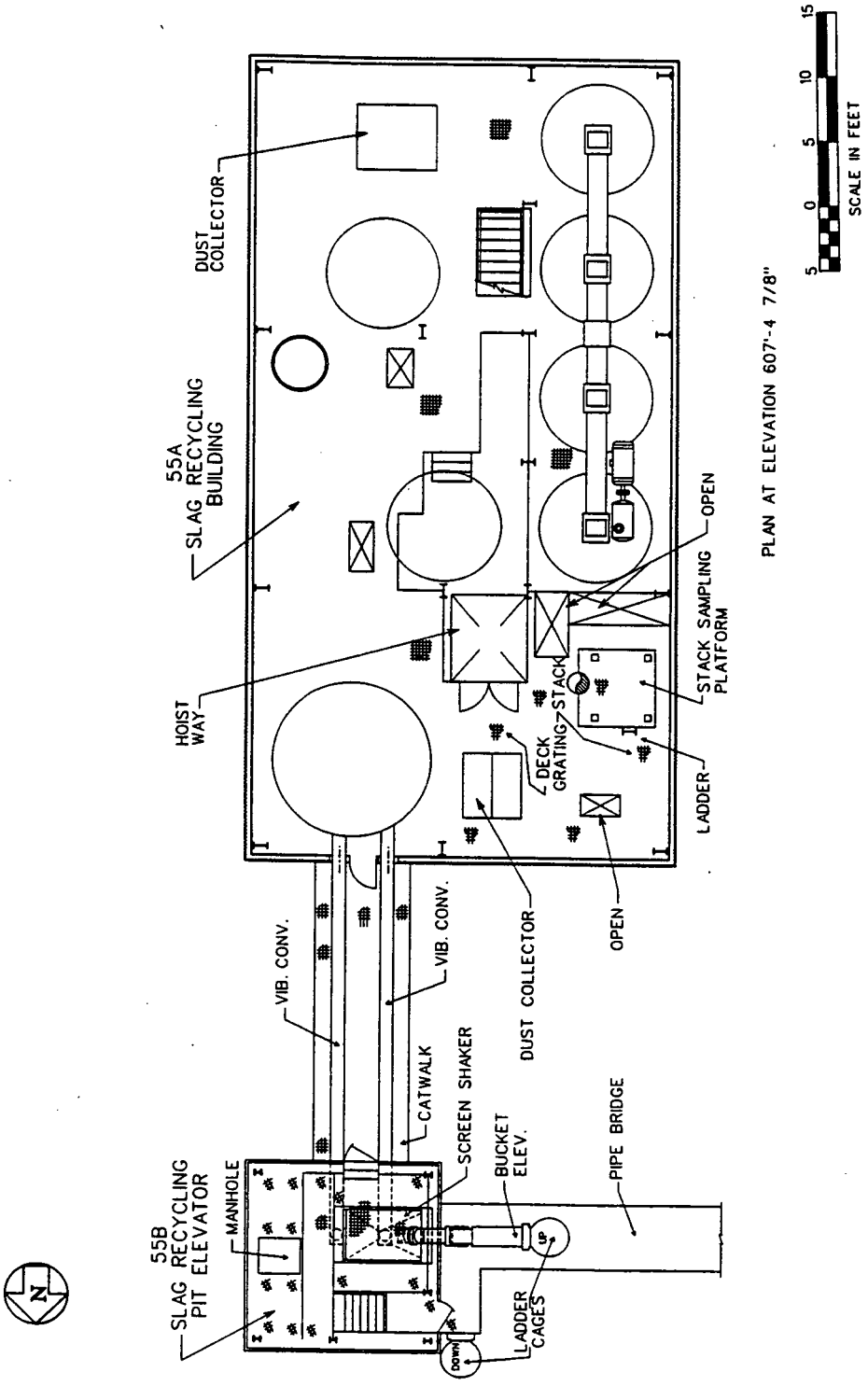

FIGURE 55A-4 Layout of Building 55A — Fourth Floor

is identified on Figure 55A-1. This spot measured 115,000 dpm total beta-gamma and 84 dpm removable alpha. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys.

Summary of Sampling for Building 55A

One airborne particulate sample will be taken and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive sampling for the concrete medium will be performed at the radiological hot spot shown in Figure 55A-1. Because the process in Building 55A is considered dry, the concrete sample will be a chip sample. Structural steel scrapings and swipe samples will be collected on the basis of Protocols 1 and 3. Table 55A-1 summarizes the planned sampling program for Building 55A.

TABLE 55A-1 Sample Types and Quantities for Building 55A

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.3.29 Building 55B — Slag Recycling Pit/Elevator

Component Description

Building 55B (Slag Recycling Pit/Elevator) is a multilevel building shown on the Grid 12 map in Appendix C. It is square, measuring approximately 12 × 12 ft and 38 ft high. The building consists of a structural steel frame on a poured concrete base with transite siding and roofing panels (Type A building). The first floor is made of poured concrete; the second, third, and fourth floors are made of diamond plate steel grating. The floor plans for the building are shown in Figures 55B-1 through 55B-4. The Slag Recycling Building (Component 55A) is also shown for reference.

Process Area Description

Building 55B contains the slag processing area. Magnesium fluoride (MgF_2) slag was received from the breakout system in the Metals Production Plant (Component 5A). The slag was screened into coarse and fine streams. The slag was then sent to the Slag Recycling Building for further processing, or the unsplit stream could be dispatched to mobile hoppers (for transport to waste pits). Building 55B also stored quantities of slag and conveyed slag to the screening process. Currently, Building 55B contains bucket elevators, a storage bin, and conveyors. The anticipated contaminants are summarized in Table A.3.

Major Media Types per Process Area

Building 55B major media consist of structural steel and poured concrete. Because transite siding and roofing panels are addressed as a separate supplemental sampling activity, they will not be considered among the Building 55B major media.

Summary of Available Radiological Data

Building 55B is routinely surveyed for removable alpha and total beta-gamma contamination. Results from the most recent surveys are summarized in Tables A.4.0 and A.4.1 and provide the basis for identifying radiological hot spots. From 1989 through 1992, two removable alpha and two removable beta-gamma survey measurements were performed in Building 55B. On the basis of the assembled data, the radiological hot spot for the floor is identified on Figure 55B-1; it measured 4,599 dpm removable beta-gamma and 600 dpm removable alpha. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys.

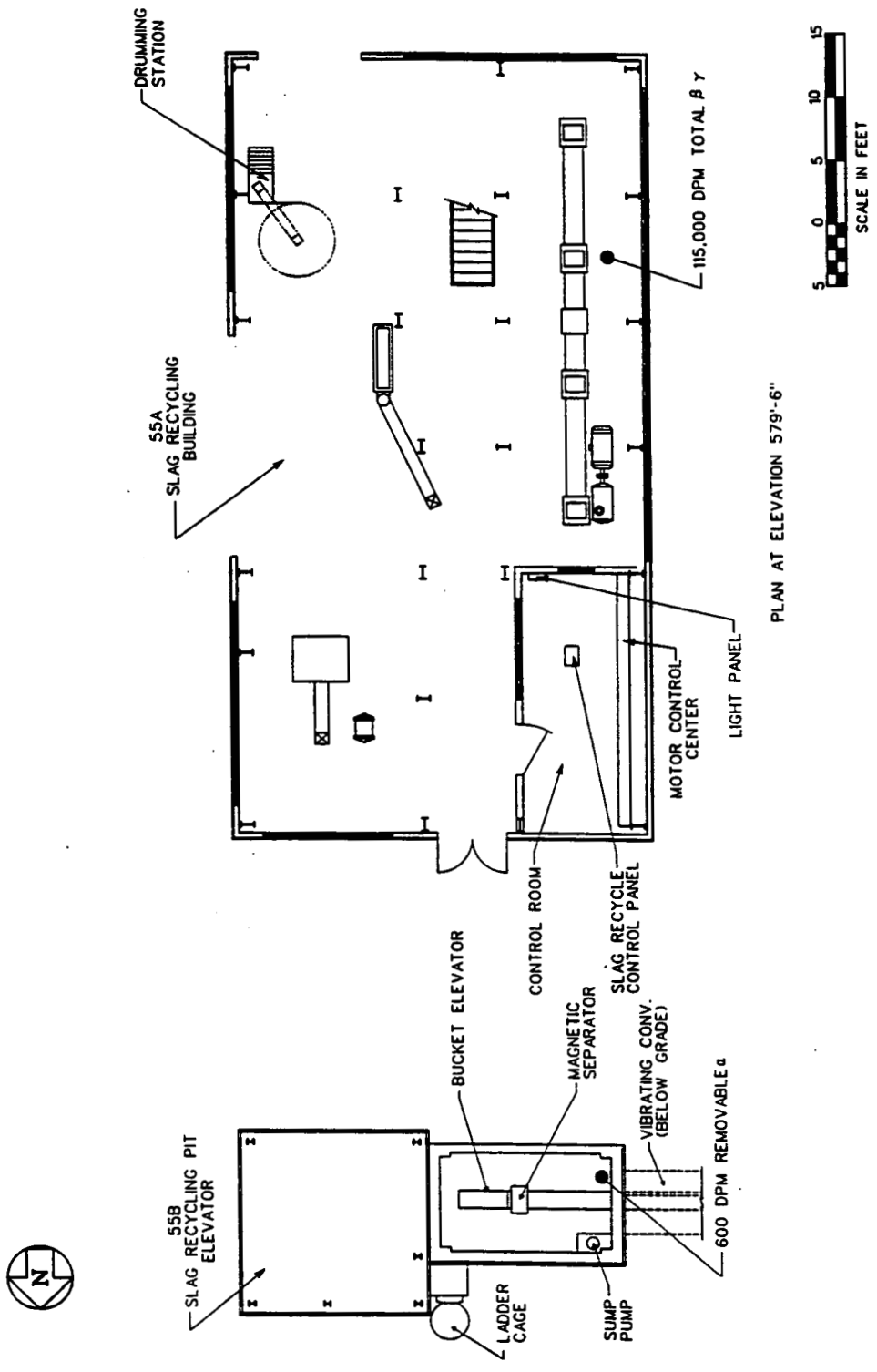

FIGURE 55B-1 Layout of Building 55B — First Floor

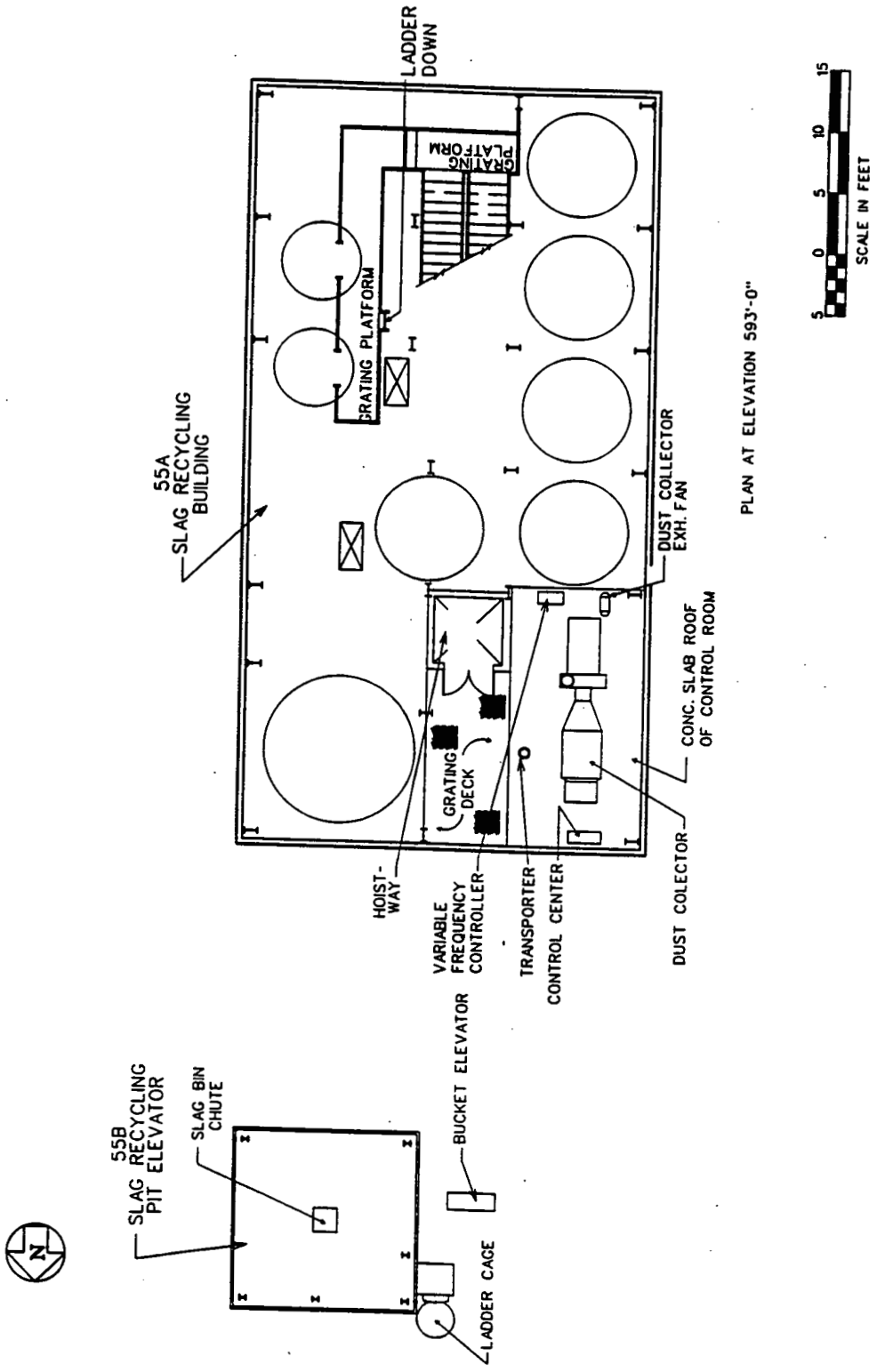

FIGURE 55B-2 Layout of Building 55B — Second Floor

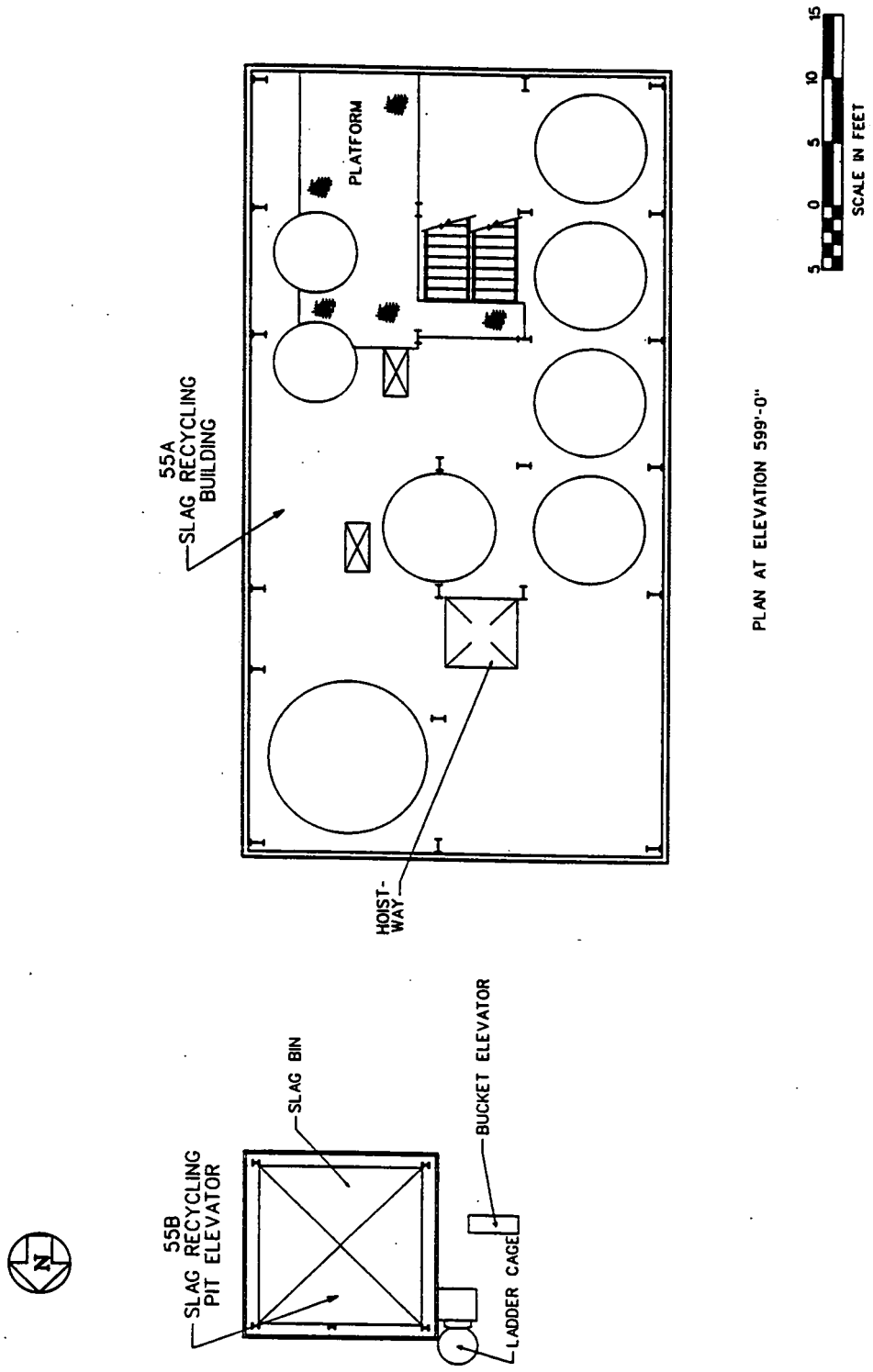

FIGURE 55B-3 Layout of Building 55B — Third Floor

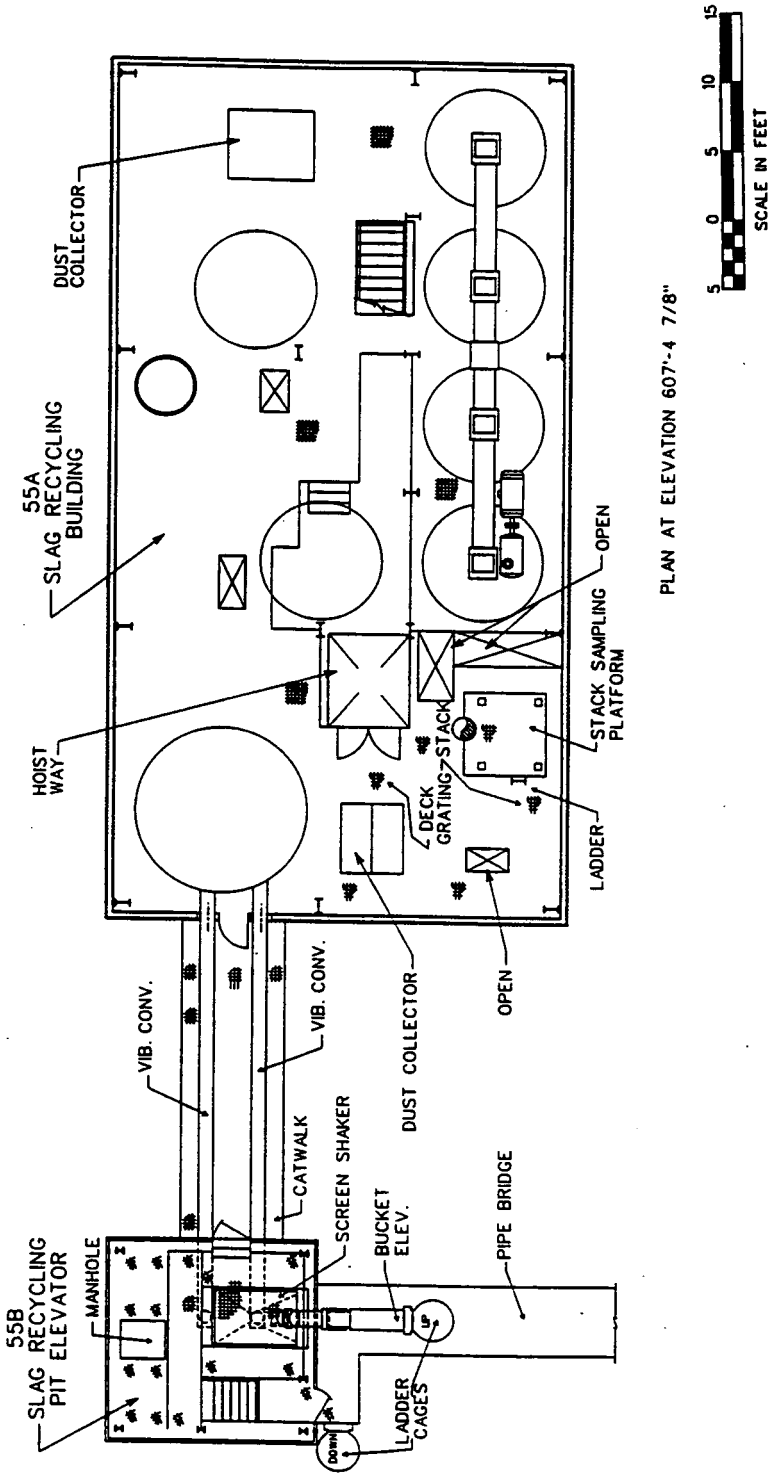

FIGURE 55B-4 Layout of Building 55B — Fourth Floor

Summary of Sampling for Building 55B

One airborne particulate sample will be taken and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive sampling for the concrete medium will be performed at the radiological hot spot shown in Figure 55B-1. Because the process in Building 55B is considered dry, the concrete sample will be a chip sample. Structural steel scrapings and swipe samples will be collected on the basis of Protocols 1 and 3. Table 55B-1 summarizes the planned sampling program for Building 55B.

TABLE 55B-1 Sample Types and Quantities for Building 55B

Sample Type	Slag Processing	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.3.30 Building 66 — Drum Reconditioning Building

Component Description

Building 66 (Drum Reconditioning Building) is a one-story building located north of the Plant 1 Storage Building (Component 1B), as shown on the Grid 27 map in Appendix C. It is rectangular, measuring approximately 38 × 100 ft and 13 ft high. The building is formed with a structural steel frame and steel side panels over a concrete base (Type C building). The floor plan for the building is provided in Figure 66-1. Building 66 operations entailed removing old paint from 30- and 55-gal drums, which were then repainted and dried or crushed if found not to be reusable. A solvent storage area is also associated with this building.

Process Area Description

Building 66 contains four process areas, illustrated in Figure 66-1. Three of the processes (shot blasting, drum baling, and solvent storage) are considered dry, and the other process (painting) is considered wet. Anticipated contaminants from these processes are summarized in Table A.3.

Shot Blasting. Shot blasting was performed by a Wheelabrator. The Wheelabrator bombarded the drums with a steel abrasive to remove old paint and any drum contents that were not removed during the decontamination process in the Recovery Plant (Component 8A). The material blasted off the drums was collected in the containment bin of the Wheelabrator. A Wheelabrator dust collector, located immediately east of Building 66, removed dust generated from this process.

Painting. As part of drum reconditioning, the drums were repainted. Solvent-based paints were applied to drums using a spray paint booth and oven. Black, white, or red enamels with a clear lacquer liner were applied. The spray paint booth was equipped with a water wall, which constantly flowed to remove the excess paint. The contaminated water was pumped into a sump. A protectant was applied to the other walls of the paint booth before painting. This protectant allowed the paint, which splattered on the other walls, to be peeled off and discarded. After painting was completed, the drums were transferred to the oven for drying. Paint drippings have been observed in the oven. In 1988, the solvent-based paints were replaced by water-based paints.

Drum Baling. Drums that were not deemed reusable were crushed and baled by the drum baler for disposal. Drums chosen to be baled were not always clean drums. Hydraulic oil has been reported to have leaked from the drum baler into a pit located beneath the baler.

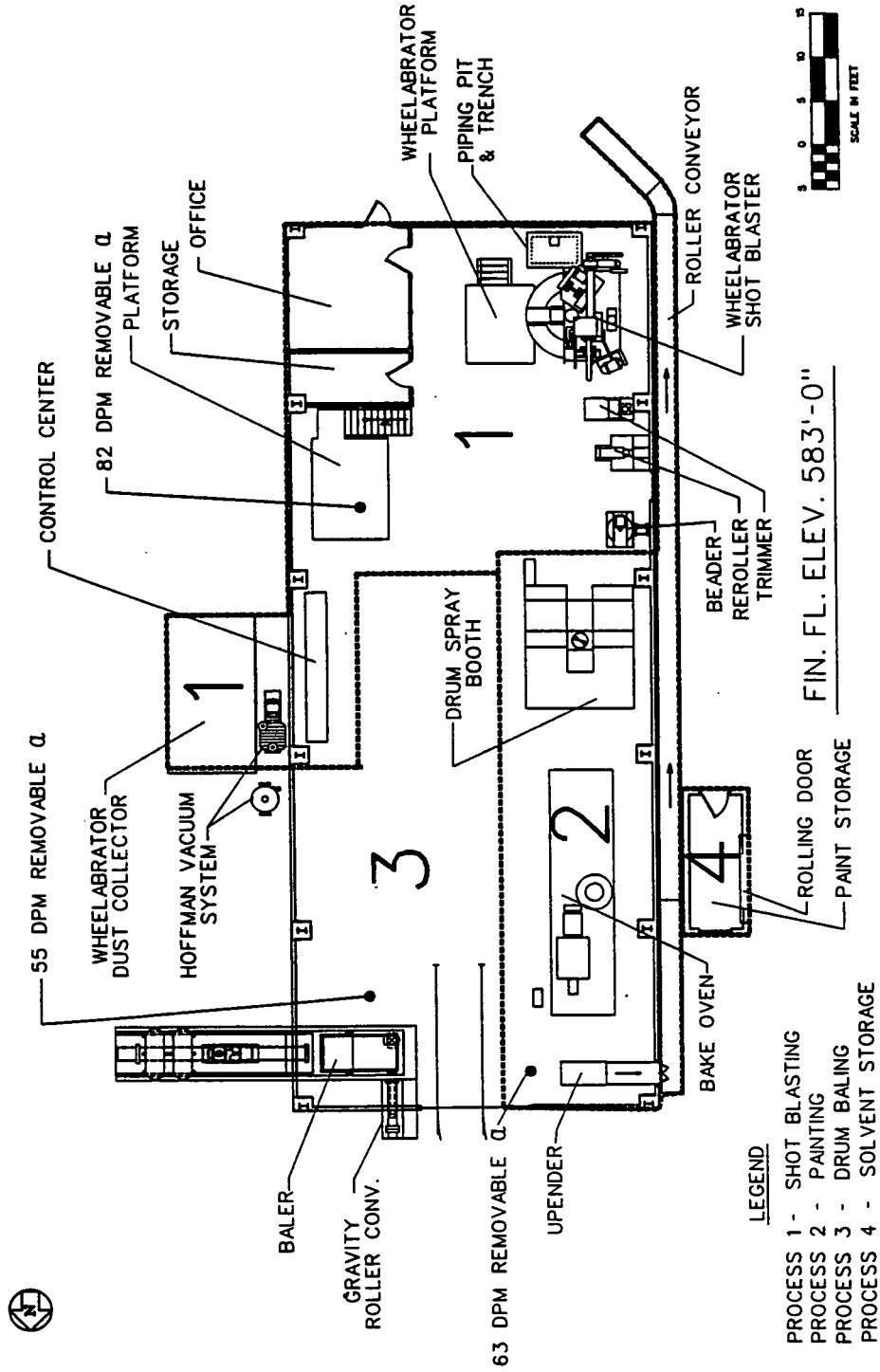

FIGURE 66-1 Layout of Building 66

Solvent Storage. The solvent storage area is a separate area; although it is attached to Building 66, it cannot be accessed through the building. The solvent storage area managed materials associated with the processes in Building 66. Paints, solvents, and scrap paint were housed in the area. Stains have also been reported on the floor of the storage area.

Major Media Types per Process Area

Building 66 has a structural steel frame with steel side panels, and the floor is concrete. The structural steel and concrete are considered the major media for all four processes within the component.

Summary of Available Radiological Data

Building 66 is routinely sampled for removable alpha contamination. No recent total beta-gamma survey measurements have been taken for Building 66. Results from the 28 removable alpha survey measurements on the concrete floor, performed from 1989 to 1992, are summarized in Tables A.4.0 and A.4.1 and are the basis for identifying the hot spots. The data have been assembled, and the hot spots are identified for the concrete medium in Figure 66-1. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys.

The highest removable alpha readings, obtained from surveying the concrete floor in three of the process areas, were 82 dpm for shot blasting, 63 dpm for painting, and 55 dpm for drum baling. Removable alpha readings do not exist for the solvent storage area. In total, 6 of the 28 removable alpha samples recorded for the concrete floor in Building 66 were above the MDA values.

Summary of Sampling for Building 66

One air sample will be taken in the component and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, radiological surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive samples will be performed in the locations identified by the radiological hot spots for the concrete medium. Three concrete chips will be obtained from each dry process area at the corresponding hot spots. A concrete core will be obtained from the wet process area. Structural steel scrapings and swipe samples will be collected on the basis of Protocols 1 and 3.

On the basis of the building inspection, a supplemental liquid sample will be taken from the pit beneath the drum baler. A second supplemental liquid sample will be collected from the sump associated with the spray paint booth in the painting process area. No

significant loose solid media were observed during the building inspection. Table 66-1 summarizes the planned sampling program for Building 66.

TABLE 66-1 Sample Types and Quantities for Building 66

Sample Type	Shot Blasting	Painting	Drum Baling	Solvent Storage	Component Totals
Nonintrusive[a]					
Radiological surveys	b	b	b	b	NA[c]
Chemical surveys	b	b	b	b	NA
Air particulates	NA	NA	NA	NA	1
Swipes	2	2	2	2	8
Lab composite swipes	NA	NA	NA	NA	1
Intrusive[a]					
Concrete chips	1	NA	1	1	3
Concrete cores	NA	1	NA	NA	1
Masonry	NA	NA	NA	NA	NA
Steel surface scraping	1	1	1	1	4
Supplemental					
Liquid sample	NA	1	1	NA	2
Loose media	NA	NA	NA	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.3.31 Building 69 — Decontamination Building

Component Description

Building 69 (Decontamination Building) is a single-story building shown on the Grid 1 map in Appendix C. It is rectangular, measuring approximately 43 × 83 ft and 18 ft high (Figure 69-1) and consisting of a structural steel frame, concrete block walls with glass windows, an acid brick and concrete floor, and corrugated metal roofing (Type B building). This facility was used as a decontamination and decommissioning facility.

Process Area Description

Building 69 is considered one process area and is used to decontaminate and/or decommission radiologically contaminated ferrous and nonferrous scrap metals, miscellaneous equipment, and vehicles. The primary operating units include five open-topped decontamination tanks (one caustic wash tank and four acid bath tanks), a bridge crane, a drainage system, a sump system, a caustic storage tank, steam cleaner/spray washers, fume exhaust ventilation systems and air handling units, a vacuum dust collector system, and a scale (Figure 69-1). Decontamination of smaller metal and equipment is conducted by immersion in acid or caustic baths. Larger pieces of metal, equipment, and vehicles are decontaminated by spray washing on the outside decontamination pad (Component 74P).

Items to be decontaminated are surveyed by radiological technicians to determine the contamination and hot spots. Depending on surface characteristics and materials of construction, the item may be soaked in one or more acidic/caustic tank solutions and/or steam sprayed for the decontamination to be complete. The decontaminated items are checked by radiological technicians to ensure that decontamination is complete. If so, the item is discarded or reused. If not, the item goes through this process again until it is considered decontaminated. Anticipated contaminants are summarized in Table A.3.

Major Media Types per Process Area

Building 69 has a steel frame, concrete block walls, an acid brick and concrete floor, and corrugated metal roofing. The steel frame, concrete block walls, and acid brick and concrete floors constitute the major media.

Summary of Available Radiological Data

Building 69 has been routinely surveyed for removable alpha and total beta-gamma contamination from December 1991 to May 1992. During this time, 55 removable alpha and 55 total beta-gamma survey measurements were conducted throughout Building 69, with an MDA of 222 and 1,000 dpm, respectively. Only 2 of the 55 removable alpha measurements

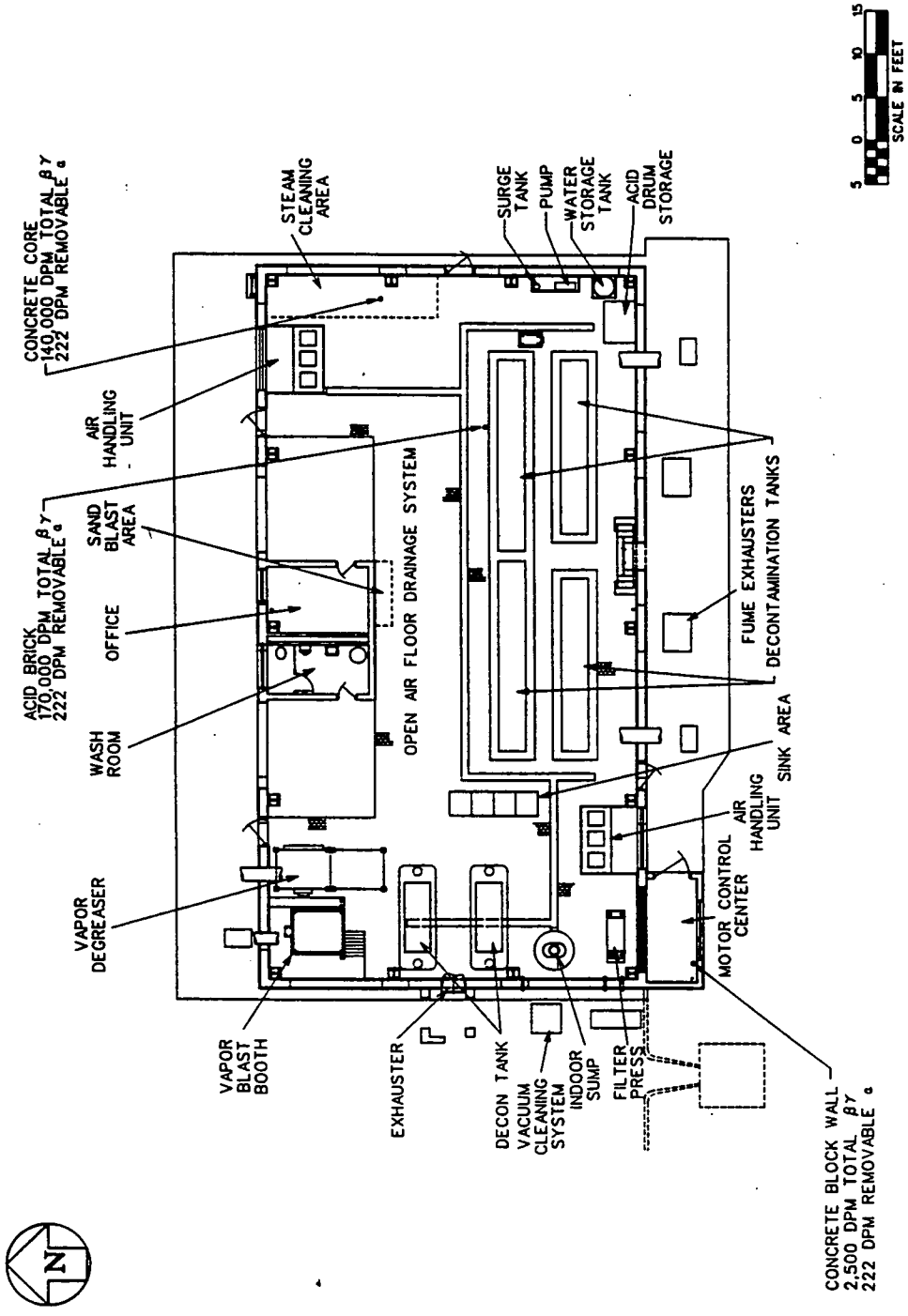

FIGURE 69-1 Layout of Building 69

were above the MDA, and they had readings of only 225 dpm. The concrete floor and the acid brick each had one 225-dpm removable alpha reading. Of the 55 total beta-gamma measurements, 52 were above the MDA. The concrete floor had 27 total beta-gamma measurements; 26 were above the MDA and had an average measurement of 17,000 dpm. The acid brick floor had 21 total beta-gamma measurements; all were above the MDA and had an average measurement of 14,000 dpm. The concrete block walls had seven total beta-gamma measurements; five were above the MDA and had an average measurement of 2,000 dpm.

The data are the basis for identifying hot spots, which are indicated on Figure 69-1. Also, as data are acquired from ongoing radiological surveys taken for health physics needs, the identified hot spots will be reassessed before sampling begins.

The hot spot for the concrete floor medium was determined to be near a cabinet on the east side of the building. The removable alpha and total beta-gamma readings were 222 and 140,000 dpm, respectively. The hot spot for the acid brick floor medium was determined to be near the HNO_3 tank. The removable alpha and total beta-gamma readings were 222 and 170,000 dpm, respectively. The hot spot for the concrete block wall medium was determined to be in the Motor Control Center. The removable alpha and total beta-gamma readings were 222 and 2,500 dpm, respectively.

Summary of Sampling for Building 69

One airborne particulate sample will be taken in the component and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive sampling will be performed in the locations identified by the radiological hot spots for the concrete, concrete block, and acid brick media shown in Figure 69-1. Because Building 69 contains wet, acidic, and caustic processes, it is considered a wet process area; therefore, concrete core samples will be taken from the floor. A structural steel scraping and swipe samples will be collected on the basis of Protocols 1 and 3.

On the basis of the building inspection, a composite liquid supplemental sample will be taken from the areas around the five tanks. No significant loose solid media were observed during the building inspection. Table 69-1 summarizes the planned sampling program for Building 69.

TABLE 69-1 Sample Types and Quantities for Building 69

Sample Type	Decontamination	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	4	4
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry[d]	1	1
Steel surface scraping	1	1
Supplemental		
Liquid sample	1	1
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

[d] One sample will be collected from each of the two media: concrete blocks and acid bricks.

D.9.4 PROCESS SUPPORT BUILDINGS

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D.9.4.1 Building 2B — General/Refinery Sump Control Building

Component Description

Building 2B (General/Refinery Sump Control Building) is a two-story building comprising an older original building and a newer annex attached on the south side. The original building consists of a concrete first floor and metal diamond plate second floor; it was constructed with a structural steel frame and transite panels for the walls and roof. This part of Building 2B is approximately 39 × 43 ft.

The annex is approximately 20 × 20 ft with a concrete floor covered with floor tile on the first floor and only concrete on the second floor. The walls consist of structural steel and wall board. The ceiling on the first floor is metal decking, while the second floor has metal decking covered with fiberglass insulation. The building is located south of the General Sump (Component 18B) and the Refinery Sump (Component 3H) and north of the Bulk Lime Handling Building (Building 2C). See the Grid 19 map in Appendix C and the floor plans in Figures 2b-1 and 2b-2.

Process Area Description

In Building 2B, the magnesium oxide and lime are mixed with water to form a slurry and then transferred to the refinery sump operation. The slurry is to be used for precipitation of uranium compounds from process wastewater and storm-water runoff. The annex holds new laboratory facilities to support the refinery sump. The anticipated contaminants for the building are listed in Table A.3.

Major Media Types per Process Area

The major media identified for Building 2B are the concrete floor and structural steel. Building 2B is constructed with transite panels; however, transite will be addressed on a site-wide basis as a separate supplemental sampling activity and will not be included as a major medium for Building 2B.

Summary of Available Radiological Data

Building 2B is routinely surveyed for removable alpha and total beta-gamma contamination. The results summarized in Table A.4.1 are the basis for identifying hot spots. From 1989 to 1992, 131 removable alpha measurements were performed, with an average value of 104 dpm. In 1991, 96 total beta-gamma measurements were performed, with an average of 9,000 dpm and a highest measurement of 190,000 dpm. The data have been assembled, and the hot spot for the concrete floor is identified in Figure 2B-1. Data will be reassessed before sampling to include those data gathered from future radiological surveys.

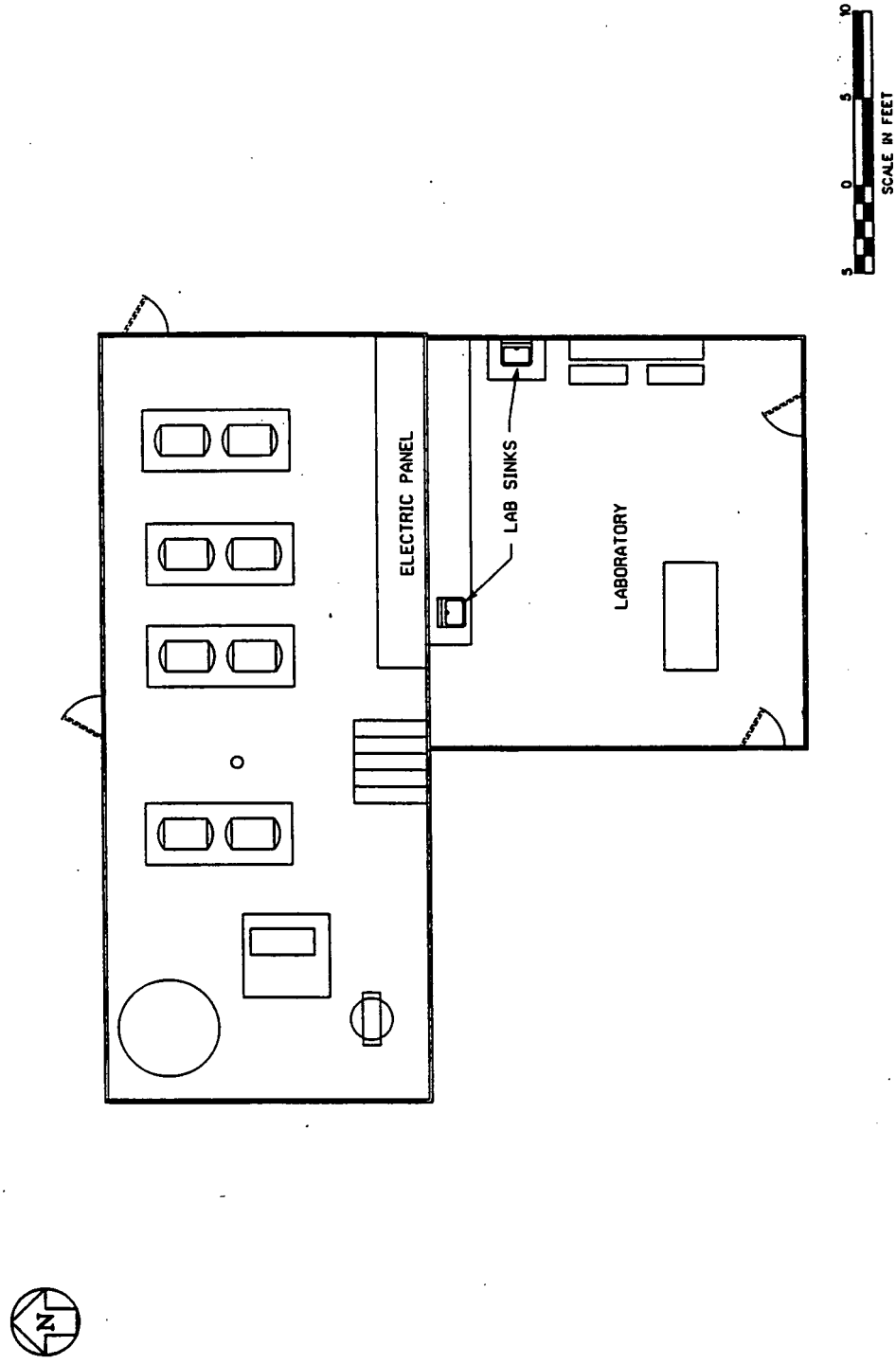

FIGURE 2B-1 Layout of Building 2B — First Floor

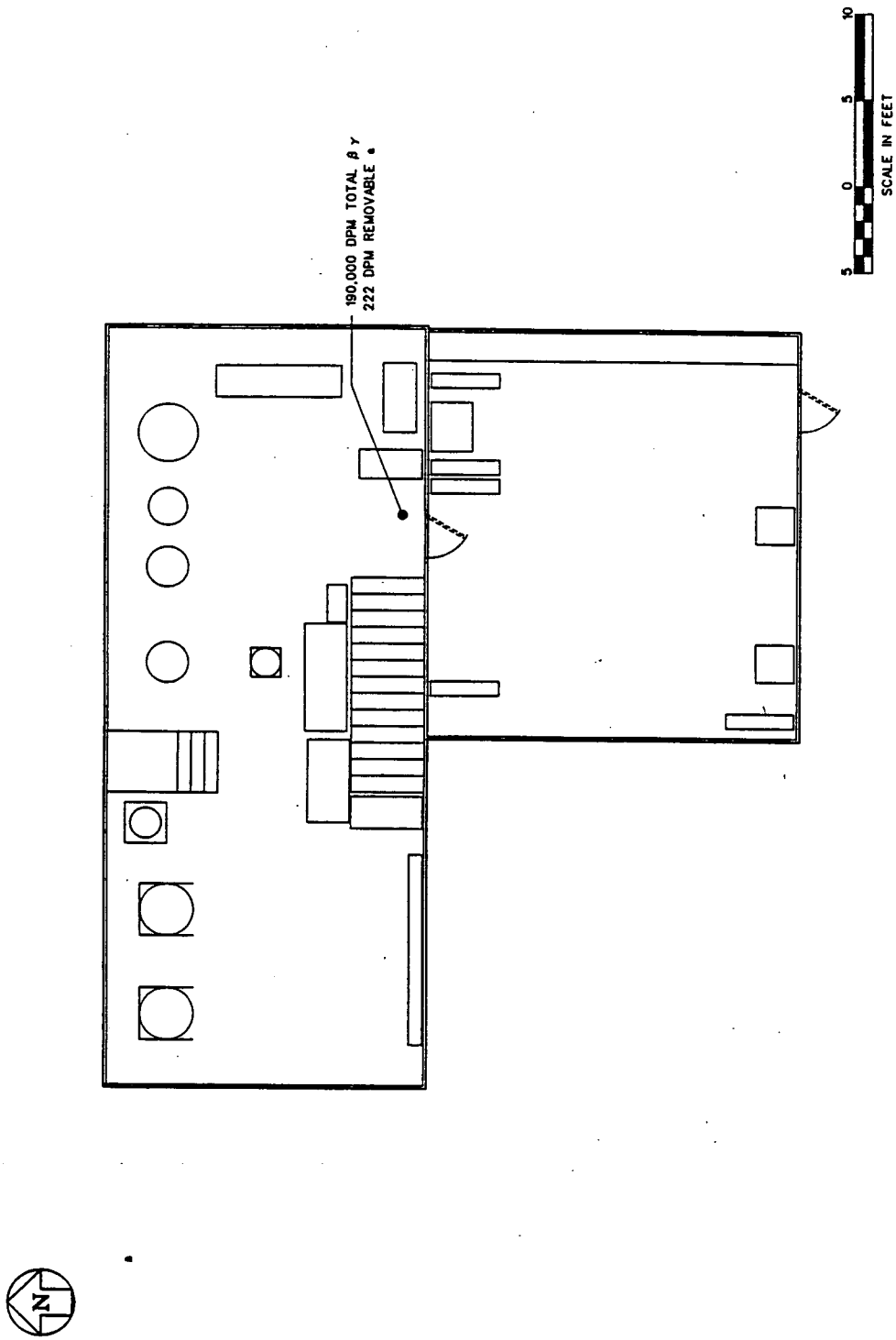

FIGURE 2B-2 Layout of Building 2B — Second Floor

Summary of Sampling for Building 2B

One airborne particulate sample will be collected in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail a final intrusive sampling location. Two media are within the building: the concrete floor and the structural steel. On the basis of process knowledge, this is considered a dry process area. Therefore, a concrete chip will be collected from the floor, and a surface scraping will be taken from the structural steel supports. Visual inspection of the component identified one supplemental sample to be collected from the sump located in the southwestern corner of the first floor. Table 2B-1 summarizes the planned sampling program for Building 2B.

TABLE 2B-1 Sample Types and Quantities for Building 2B

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	1	1
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.4.2 Building 2C — Bulk Lime Handling Building

Component Description

Building 2C (Bulk Lime Handling Building) is a three-level building located immediately south of the Refinery Sump Control Building (Component 2B) and east of the Maintenance Building (Component 3A), as shown on the Grid 19 map in Appendix C. The first and third levels of the building are rectangular, with dimensions of 17 × 28 × 10 ft. The second level constitutes a steel silo that is 50 ft tall and 18 ft wide. Building 2C has a structural steel frame, transite siding and roofing, and a concrete foundation (Type A building). The floor plans for the first and third floors of the building are provided in Figure 2C-1. A cement loading dock or pad for Building 2C is located east of the building.

Process Area Description

Building 2C has one wet process area, bulk lime handling. Anticipated contaminants from this process are summarized in Table A.3. The bulk lime handling process produced a lime slurry for several of the processes in the Ore Refinery Plant (Component 2A). Bulk lime (CaO), in the form of pebbles, was delivered via the truck loading dock to the building. A vacuum pump filled the silo with the lime. The silo released the lime proportionally to the lime slaker. The lime slaker mixed the lime with water to create a lime slurry. The slurry exited the lime slaker to the break tank for further agitating. When the slurry was completely mixed, it was pumped to a holding tank located immediately north of the building before being distributed to other process areas.

Major Media Types per Process Area

The major media for Building 2C include structural steel and concrete. Because the transite is addressed as a separate supplemental sampling activity, it is not considered as a major medium in Building 2C.

Summary of Available Radiological Data

Building 2C is routinely sampled for removable alpha and total beta-gamma contamination. Results from these surveys, performed in 1989 through 1992, are summarized in Tables A.4.0 and A.4.1 and are the basis for identifying hot spots. In total, 29 removable alpha and 8 total beta-gamma survey measurements were collected from the floor and pad for the concrete medium. All beta-gamma data for the concrete medium were collected from the floor inside the building. The data have been assembled, and the hot spots are identified for the concrete medium in Figure 2C-1. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys.

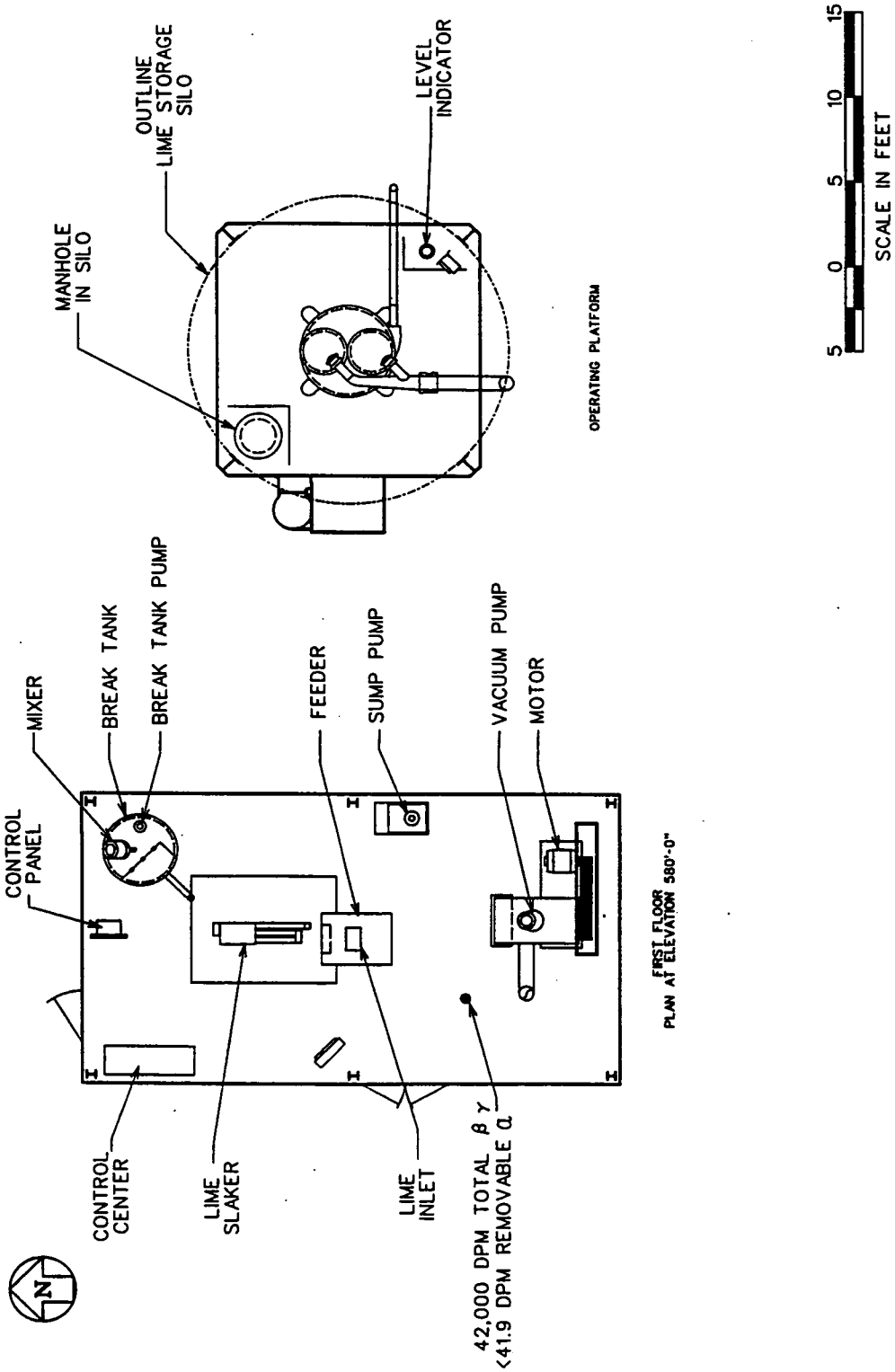

FIGURE 2C-1 Layout of Building 2C

The highest total beta-gamma reading was 42,000 dpm for the concrete medium. The corresponding removable alpha reading was below the MDA of 42.9 dpm. Total beta-gamma readings for the concrete floor inside the building ranged from 200 to 42,000 dpm. The removable alpha survey measurements for the concrete medium for the entire component, including the floor and pad, were all below the MDA of 250 dpm.

Summary of Sampling for Building 2C

One air sample will be taken in the component and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, radiological surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. One concrete core will be obtained for the wet process area in the location identified by the radiological hot spot. Structural steel scrapings and swipe samples will be collected on the basis of Protocols 1 and 3.

During the building inspection, water was noted in the building sump and in the diked area on the concrete pad. The pad area was diked to prevent water bleeding from a steam valve from running onto the loading dock. A composite liquid supplemental sample will be collected from these two locations. Table 2C-1 summarizes the planned sampling program for Building 2C.

TABLE 2C-1 Sample Types and Quantities for Building 2C

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	1	1
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.4.3 Building 3A — Refinery Maintenance Building

Component Description

Building 3A (Refinery Maintenance Building) is a single-story building located just north of 101st Street and west of the Bulk Lime Handling Building (Component 2C), as shown on the Grid 19 map in Appendix C. The building is square, measuring 60 × 60 ft and 14 ft high. Building 3A has a structural steel frame, with transite panels covering cinder block walls, and a concrete floor (Type A building). The building is one room except for some office space; also, two small steel-grate mezzanines provide storage for motors and pumps (Figure 3A-1).

Process Area Description

Building 3A is the maintenance facility for the Ore Refinery Plant (Component 2A). Repairs to various equipment used in the plant, including pumps and motors, are performed in this building. Among the tasks performed on the equipment are welding and electrical work. Solvents and oils are frequently used throughout the building. Tools and spare parts, required to repair and maintain the equipment, are also stored in Building 3A. Only one process area is identified for the building; because of the use of degreasing solvents in the maintenance activities, the process is considered wet. Anticipated contaminants for Building 3A are summarized in Table A.3.

Major Media Types per Process Area

The major media for Building 3A include structural steel, cinder block (masonry), and concrete. Because transite is addressed as a separate supplemental sampling activity, it is not considered as a major medium in Building 3A.

Summary of Available Radiological Data

Building 3A is routinely sampled for removable alpha contamination and total beta-gamma contamination. Results from recent surveys, performed in 1989 through 1992, are summarized in Tables A.4.0 and A.4.1 and are the basis for identifying hot spots. A total of 116 removable alpha and 34 total beta-gamma survey measurements were collected from the concrete floor medium in Building 3A. The data from the surveys have been assembled, and the hot spots are identified for the concrete medium in Figure 3A-1. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys.

High total beta-gamma readings were detected throughout the building. The highest total beta-gamma reading was 69,400 dpm for the concrete floor medium. This concentration was reported at three different locations in the building (Figure 3A-1). Removable alpha data

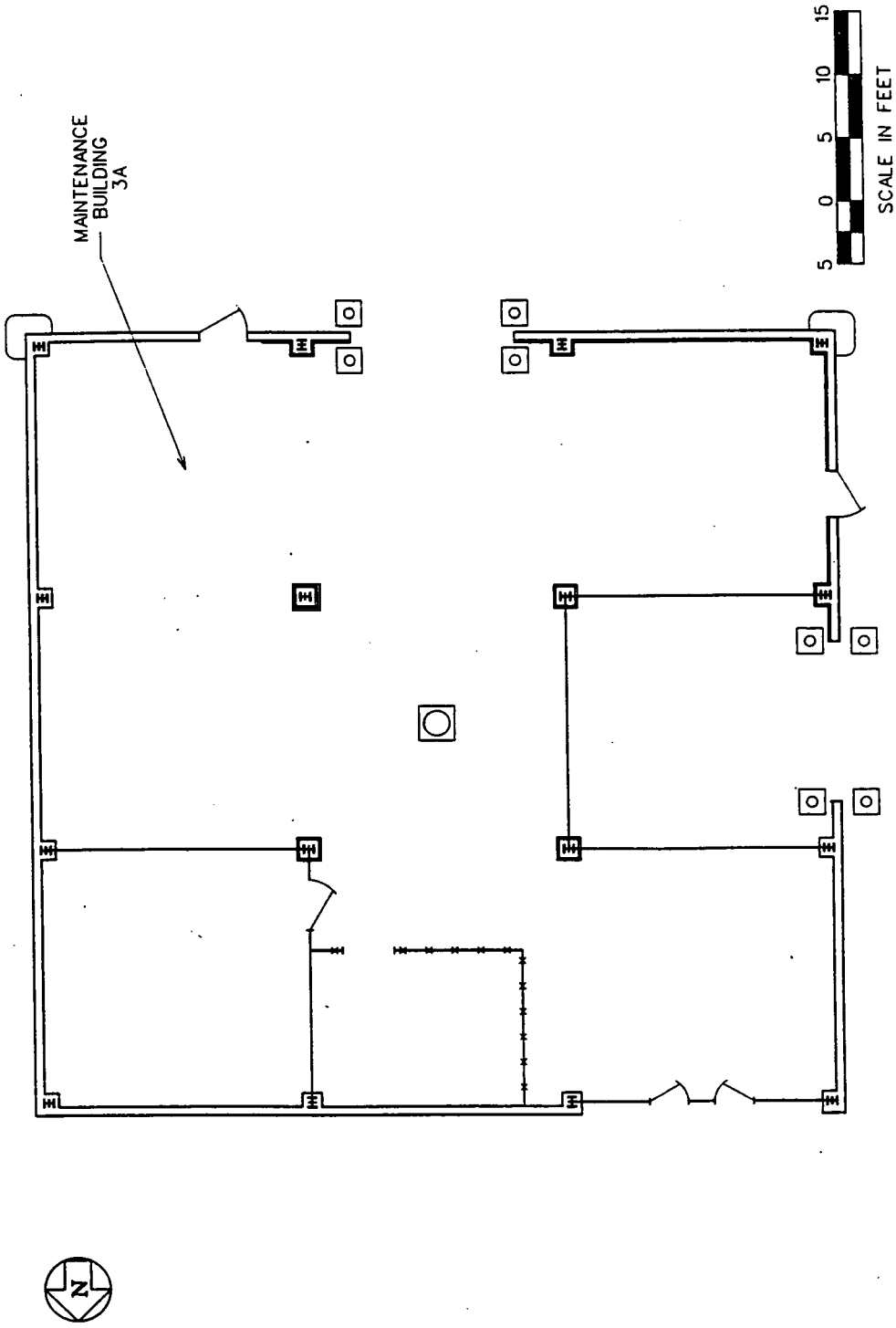

FIGURE 3A-1 Layout of Building 3A

were also available for two locations. The removable alpha reading was 60 dpm just outside of the west office, and the other was below the MDA of 53 dpm. Total beta-gamma readings for the concrete floor ranged from 500 to 69,400 dpm.

Summary of Sampling for Building 3A

One airborne particulate sample will be taken in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, radiological surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. The radiological data indicated three hot spots for the concrete floor medium. The location chosen for the intrusive sample was based on the concentrations of the samples surrounding these locations. Higher readings were associated with the location identified on Figure 3A-1. One concrete core will be obtained for the wet process area. Structural steel scrapings and swipe samples will be collected on the basis of Protocols 1 and 3.

No supplemental samples were identified during the building inspection. Oil stains on the concrete floor were considered uniform throughout the building; therefore, the sampling location was based solely on the radiological data. Table 3A-1 summarizes the planned sampling program for Building 3A.

TABLE 3A-1 Sample Types and Quantities for Building 3A

Sample Type	Maintenance and Spare Parts Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	3	3
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	1	1
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.4.4 Building 3B — Ozone Building

Component Description

Building 3B (Ozone Building) consists of a concrete floor and a structural steel frame with transite panel walls and roof (Type A building) that is approximately 27 × 33 ft and 14 ft high. The building originally housed an acid bleaching process, but that equipment has been removed. Currently, the building stores component industrial hygiene sampling equipment and supplies. The building is located north of the NAR Control House (Component 3C), as shown on the Grid 19 map in Appendix C. Figure 3B-1 illustrates the layout of the building.

Process Area Description

Building 3B originally housed an acid bleaching process. Ozone was created from the bleaching of nitric acid from the NAR Towers (Component 3D). The acid bleaching equipment was removed before 1975 on the basis of process knowledge. The building currently stores industrial hygiene sampling equipment and supplies. The anticipated contaminants for the building are listed in Table A.3.

Major Media Types per Process Area

The major media identified for Building 3B are the concrete floor and structural steel. Although Building 3B is constructed with transite panels, transite will be addressed on a site-wide basis as a supplemental sampling activity; therefore, it will not be included as a major medium for Building 3B.

Summary of Available Radiological Data

Building 3B is routinely surveyed for removable alpha and total beta-gamma contamination. Results summarized in Tables A.4.0 and A.4.1 are the basis for identifying hot spots. From 1989 to 1992, 28 removable alpha measurements were performed on the concrete floor media, with the highest removable alpha measurement recorded at 450 dpm. In 1991, 25 total beta-gamma measurements were performed, with an average of 17,000 dpm and a highest measurement of 199,500 dpm. The data have been assembled, and the hot spot for the concrete floor is identified in Figure 3B-1. Data will be reassessed before sampling to include those data gathered from future radiological surveys.

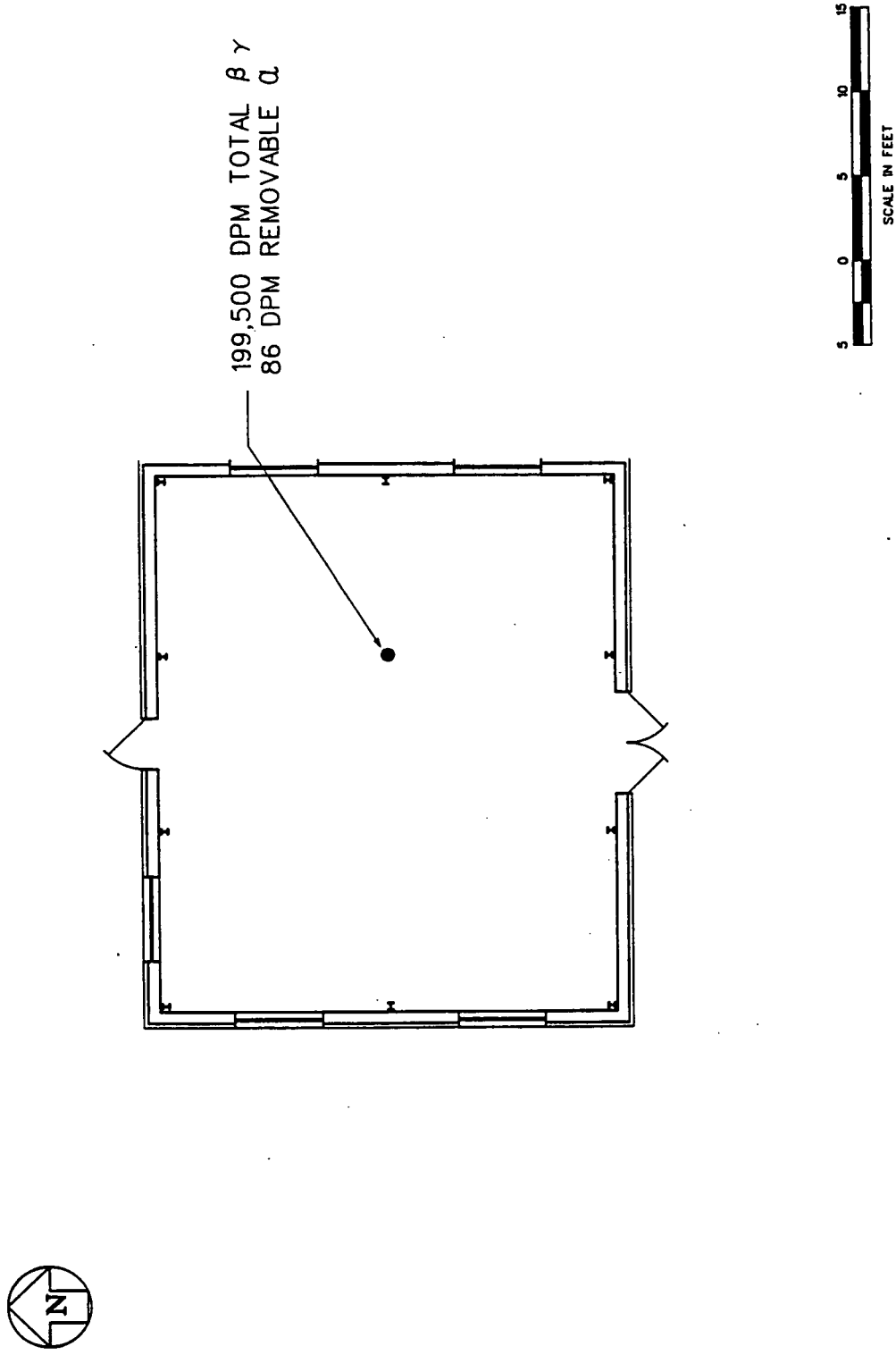

FIGURE 3B-1 Layout of Building 3B

Summary of Sampling for Building 3B

One airborne particulate sample will be collected in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail a final intrusive sampling location. The two media within the building are the concrete floor and the structural steel. As a result of the use of nitric acid as part of the acid bleaching process, one concrete core sample will be collected from the floor and a surface scraping will be taken from the structural steel supports. Visual inspection of the component identified no supplemental sample locations. Table 3B-1 summarizes the planned sampling program for Building 3B.

TABLE 3B-1 Sample Types and Quantities for Building 3B

Sample Type	Acid Bleaching	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.4.5 Building 3G — Refrigeration Building

Component Description

Building 3G (Refrigeration Building) is a transite building measuring approximately 16 x 44 ft and 11 ft high, with a concrete floor and a transite roof (Type A building). The building originally housed a refrigeration process, but that equipment has been removed. Currently, the building stores sampling equipment and supplies. The building is located west of the Harshaw Digestion Fume Recovery Tower (Component 3F), as shown on the Grid 19 map in Appendix C. The floor plan is shown in Figure 3G-1.

Process Area Description

Building 3G originally housed equipment that provided cooling support for the Harshaw nitric acid recovery process. The Harshaw process was active for only three years, from 1957 to 1960. Following the shutdown of the Harshaw process, the equipment in Building 3G was removed. The building housed an instrument repair shop until 1991. At that time, the building was converted to a storage area for sampling equipment and supplies. The anticipated contaminants for the building are listed in Table A.3.

Major Media Types per Process Area

The major media identified for Building 3G are the concrete floor and structural steel. Although Building 3G is constructed with transite panels, transite will be addressed on a site-wide basis as a separate supplemental sampling activity; therefore, it will not be included as a major medium for Building 3G.

Summary of Available Radiological Data

Building 3G is routinely surveyed for removable alpha and total beta-gamma contamination. Results summarized in Tables A.4.0 and A.4.1 are the basis for identifying hot spots. From 1989 to 1992, 47 removable alpha measurements were performed, with an average value of 112 dpm. Surveys that measured total beta-gamma were conducted in 1991. Seven total beta-gamma measurements were performed, with an average of 9,000 dpm and a highest measurement of 29,400 dpm. The data have been assembled, and the hot spot for the concrete floor is identified in Figure 3G-1. Data will be reassessed before sampling to include data gathered from future radiological surveys.

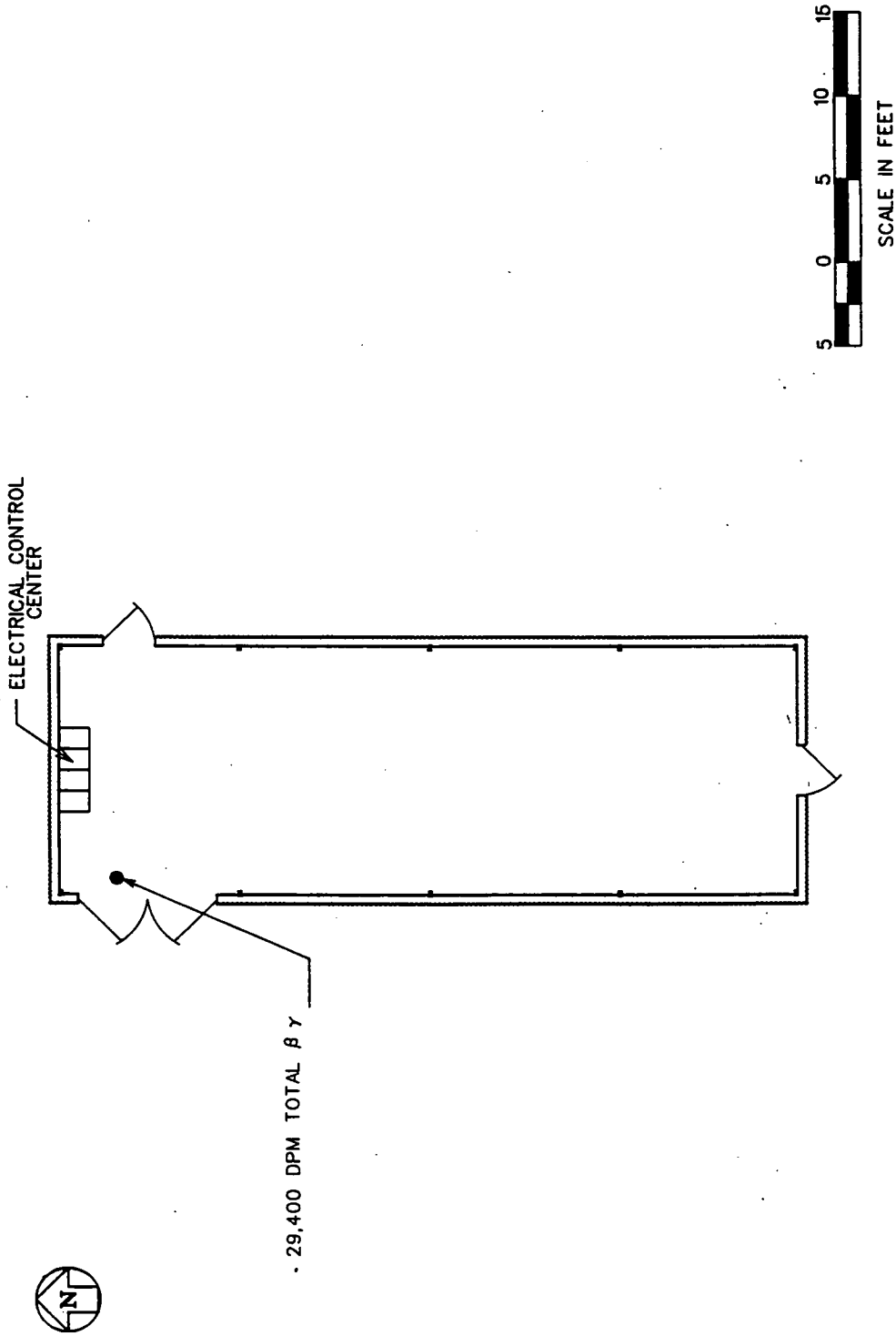

FIGURE 3G-1 Layout of Building 3G

Summary of Sampling for Building 3G

One airborne particulate sample will be collected in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail a final intrusive sampling location. The two media within the building are the concrete floor and the structural steel. A concrete core will be collected from the floor, and a surface scraping will be taken from the structural steel supports. Visual inspection of the component identified no supplemental sample locations. Table 3G-1 summarizes the planned sampling program for Building 3G.

TABLE 3G-1 Sample Types and Quantities for Building 3G

Sample Type	Refrigeration	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.4.6 Building 3L — Electrical Power Center Building

Component Description

Building 3L (Electrical Power Center Building) is a single-story building measuring approximately 24 × 91 ft and 10 ft high and consisting of a concrete floor and structural steel frame with transite siding and roof (Type A building). The component contains electrical meters, panels, and main circuit breakers. The building is attached to the north side of the Maintenance Building (Component 3A), as shown on the Grid 19 map in Appendix C.

Process Area Description

Building 3L is a secondary unit substation that receives 13.2 kV and transforms it down to 480 V to power general-use equipment, which includes lighting, receptacles, and miscellaneous equipment in the Ore Refinery Plant (Component 2A) and the Recovery Plant (Component 8A), as shown on the Grid 19 and 20 maps. Inside the building is a cinder block room currently used as a breakroom. The only anticipated contaminants for the component, listed in Table A.3 are PCBs because of the presence of electrical equipment.

Major Media Types per Process Area

The major media identified for Building 3L are the concrete floor, structural steel, and cinder block breakroom walls. Although Building 3L is constructed with transite panels, transite will be addressed on a site-wide basis as a supplemental sampling activity; therefore, it will not be included as a major medium for Building 3L.

Summary of Available Radiological Data

Building 3L was surveyed in 1991 for removable alpha and total beta-gamma contamination. Results from this survey summarized in Table A.4.1 are the basis for identifying hot spots. In 1991, 3 removable alpha and 20 total beta-gamma survey measurements were performed. The data have been assembled, and the hot spot for the concrete floor is identified in Figure 3L-1. Data will be reassessed before sampling to include data gathered from future radiological surveys.

The measurement of removable alpha for the fixed materials in Building 3L was below the MDA of 53 dpm. The highest total beta-gamma reading for the concrete media was determined to be 5,400 dpm, while the average was 2,700 dpm.

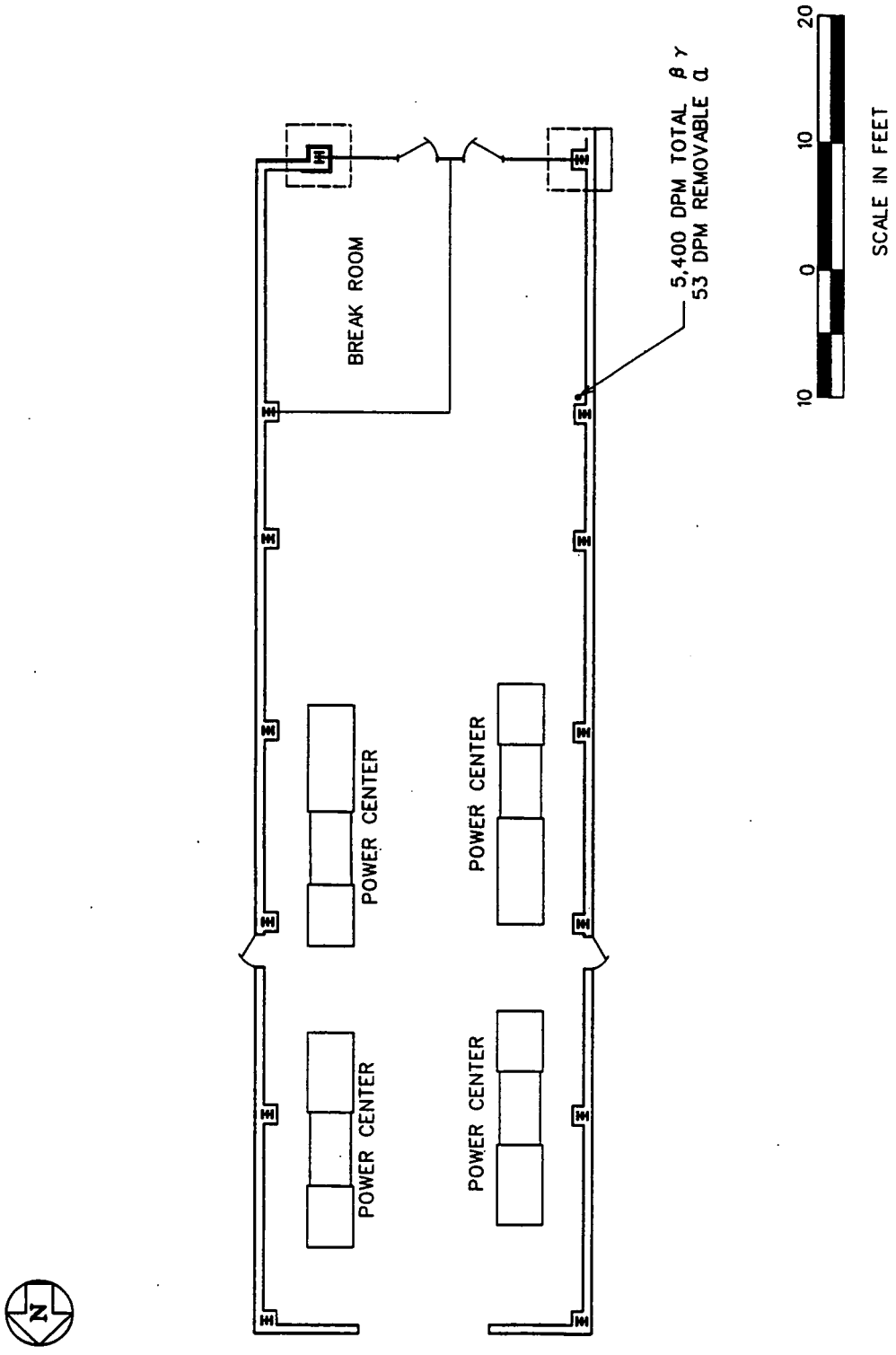

FIGURE 3L-1 Layout of Building 3L

Summary of Sampling for Building 3L

One airborne particulate sample will be collected in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, PCB field test kit measurements, and swipe samples, will be performed and assessed in the field to further detail a final intrusive sampling location. The three major media within the building are the concrete floor, the cinder block walls, and the structural steel. One masonry sample will be collected from the cinder block walls. Because Building 3L contains electrical equipment including transformers (and therefore may have released PCBs), a concrete chip will be collected from the floor. Also, a surface scraping will be taken from the structural steel supports. Visual inspection of the component identified no supplemental sample locations. Table 3L-1 summarizes the planned sampling program for Building 3L.

TABLE 3L-1 Sample Types and Quantities for Building 3L

Sample Type	Electrical Distribution	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	3	3
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	1	1
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.4.7 Building 4C — Plant 4 Maintenance Building

Component Description

Building 4C (Plant 4 Maintenance Building), a single-story structure measuring 60 × 60 ft and 14 ft high, is located south of the Green Salt Plant (Component 4A) and immediately west of the Plant 4 Warehouse (Component 4B), as shown on the Grid 13 map in Appendix C. Building 4C is constructed of a structural steel frame supported by a reinforced poured concrete base and has transite walls and roof (Type A building). The layout of the building is shown in Figure 4C-1.

Process Area Description

Building 4C housed the maintenance activities for the Green Salt Plant and other chemical process areas; it is currently the base for asbestos removal operations at the FEMP site. The maintenance building consists of a small office, a breakroom/conference area, and a large open area for maintenance activities. The building houses tools, maintenance equipment, an asbestos removal glove box, and two chemical storage cabinets. Hydraulic oils and several types of degreasing solvents, including trichloroethylene and 1,1,1-trichloroethane, were used and stored in Building 4C. Access to the maintenance area of Building 4C is restricted because of the asbestos operations based from the building. Anticipated contaminants for Building 4C are summarized in Table A.3.

Major Media Types per Process Area

The structural steel frame, concrete floor, and transite siding and roofing are considered major media for Building 4C. However, because transite is addressed as a separate supplemental sampling activity, it is not considered a major medium for Building 4C. Also, because the material (wood, plastic, and glass) forming the walls of the office and breakroom constitutes a small fraction of the total building media, this material is not considered a major medium for Building 4C.

Summary of Available Radiological Data

Building 4C is routinely surveyed for removable alpha contamination. Data from the 1991 and 1992 surveys have been assembled and indicate that no radiological hot spots exist on the floors of the component. All 28 removable alpha readings were below the MDA of the survey instruments. Before sampling begins, the identification of hot spots will be reassessed per data acquired from ongoing radiological surveys.

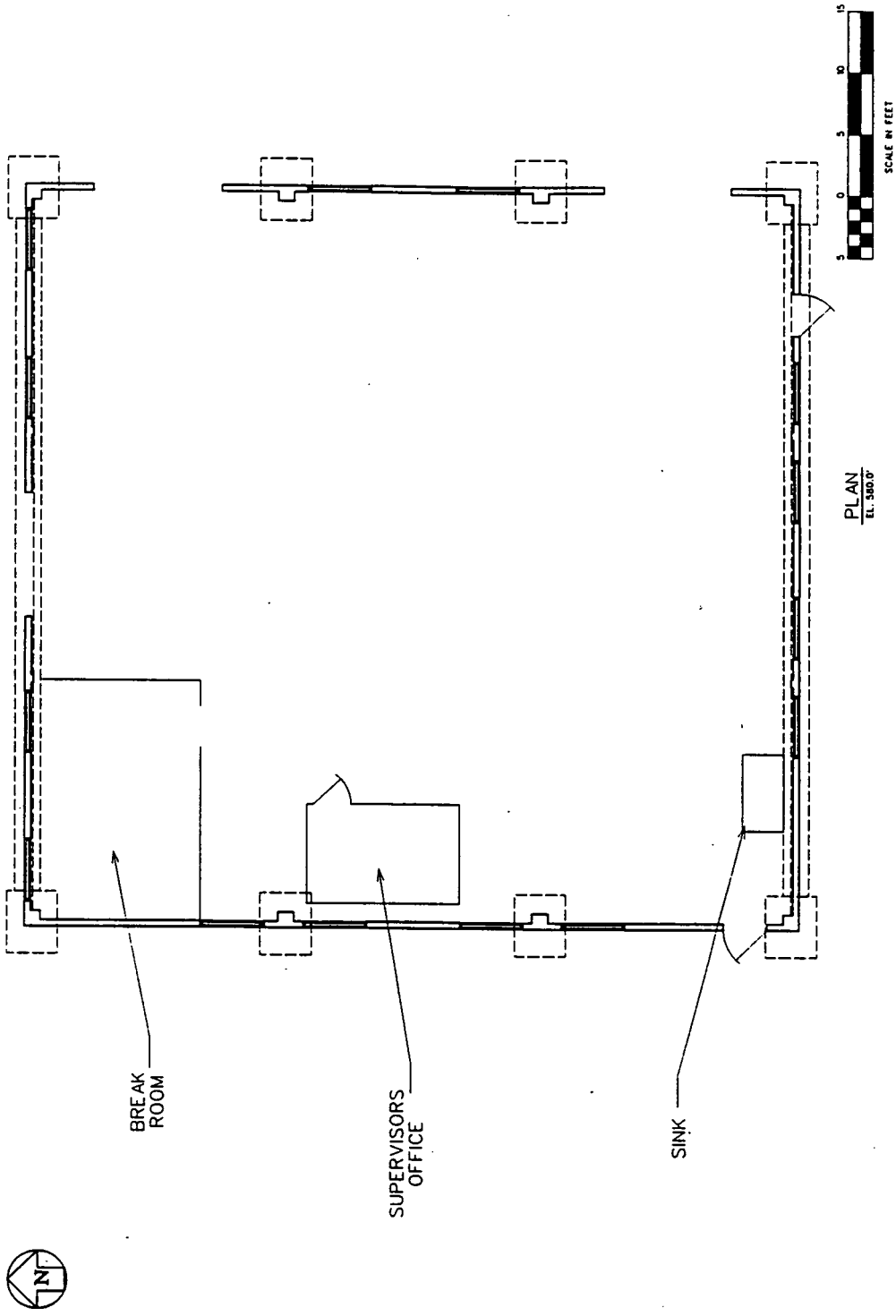

FIGURE 4C-1 Layout of Building 4C

Summary of Sampling for Building 4C

One airborne particulate sample will be collected in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, radiological surveys, and swipe samples, will be performed and assessed in the field to define final intrusive sampling locations. Intrusive sampling will be performed in the component and will consist of a concrete chip sample and a steel surface scraping. If analyses of radiological swipe samples detect elevated levels of removable contamination as outlined in Protocol 1, then the swipe samples will be combined over the component for laboratory analysis. No supplemental field samples were identified during the component inspection, although field sampling teams may identify supplemental samples to be collected during sampling activities. Table 4C-1 summarizes the planned sampling program for Building 4C.

TABLE 4C-1 Sample Types and Quantities for Building 4C

Sample Type	Maintenance	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.4.8 Building 5B — Plant 5 Ingot Pickling

Component Description

Building 5B (Plant 5 Ingot Pickling) is a multilevel, pre-engineered facility consisting of a structural steel frame on a reinforced poured concrete base that is approximately 28 × 62 ft and 15 ft high. This building has a partial basement within it. This building is a new addition to the Metals Production Plant (Component 5A) that is designed to be physically separate. This building is located west of Plant 5, as shown on the Grid 12 map in Appendix C.

Process Area Description

The Plant 5 Ingot Pickling building is a newer addition to Plant 5. This addition was designed for mold/ingot separation, mold cleaning, and ingot pickling for castings made in Plant 5. This facility currently stores unused equipment. The facility was never used.

Summary of Sampling for Building 5B

This component does not require sampling. The component has not been placed into service following the recent completion of construction and exhibits little or no evidence of contamination.

D.9.4.9 Building 5C — Plant 5 Electrical Substation

Component Description

Building 5C (Plant 5 Electrical Substation) is a single-story building measuring approximately 16 x 30 ft and 30 ft high; its location is shown on the Grid 12 map in Appendix C. Building 5C adjoins the Metals Production Plant (Component 5A) and comprises a structural steel frame on a poured concrete base and floor with transite siding and roofing (Type A building). Figure 5C-1 shows the floor plan of Building 5C.

Process Area Description

One process area was identified for Building 5C. The operation receives 13,200-V feeds from the main electrical station and feeds 480-V lines to the Metals Production Plant. Building 5C contains transformers and disconnects. Anticipated contaminants are summarized in Table A.3.

Major Media Types per Process Area

The major media in Building 5C consist of a poured concrete base and floor, a structural steel frame, and transite siding and roofing. Transite siding, however, is addressed as a separate supplemental sampling activity; therefore, it will not be considered among the Building 5C major media.

Summary of Available Radiological Data

Building 5C is routinely surveyed for removable alpha and total beta-gamma contamination. Results from the most recent surveys are summarized in Appendix A.4.0 and provide the basis for identifying radiological hot spots. As indicated, 31 removable alpha and 31 total beta-gamma survey measurement were performed in Building 5C from 1989 through 1992. The highest measured concentrations for total beta-gamma and removable alpha contamination were 28,700 and 424 dpm, respectively. On the basis of the data, the radiological hot spot is identified on Figure 5C-1. Data will be reassessed before sampling to include data from ongoing radiological surveys.

Summary of Sampling for Building 5C

One airborne particulate sample will be taken and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other non-intrusive measurements, including exposure rate measurements, PCB field kit measurements, XRF surveys, and swipe samples, will be performed and assessed in the field

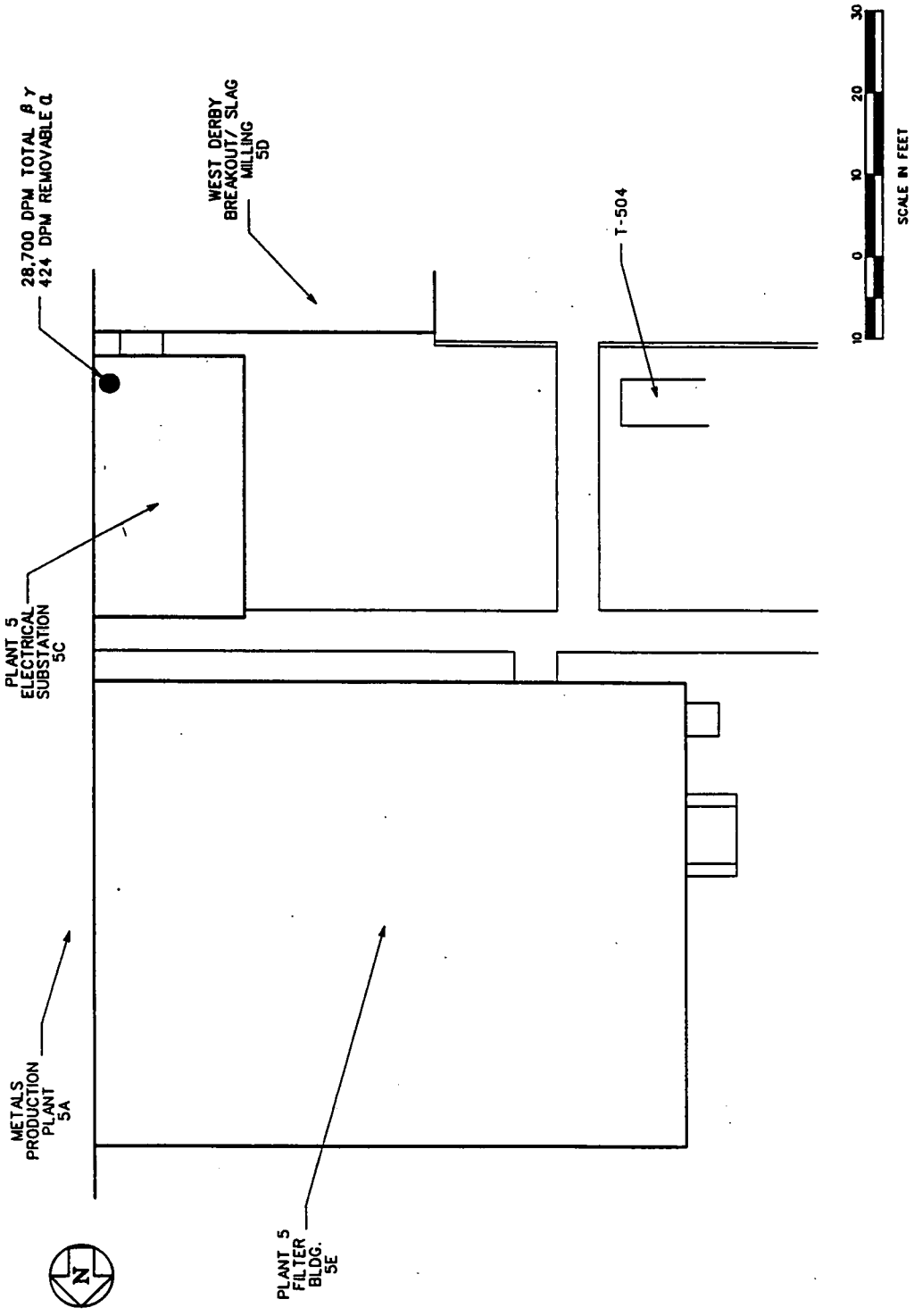

FIGURE 5C-1 Layout of Building 5C

to further detail final intrusive sampling locations. Intrusive sampling for the concrete medium will be performed at the radiological hot spot (Figure 5C-1). Because the process in Building 5C is considered dry, the concrete sample will be chips. Structural steel scrapings and swipe samples will be collected on the basis of Protocols 1 and 3. Visual inspection identified no supplemental sample requirements. Table 5C-1 summarizes the planned sampling program for Building 5C.

TABLE 5C-1 Sample Types and Quantities for Building 5C

Sample Type	Electrical Distribution	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.4.10 Building 5D — West Derby Breakout/ Slag Milling

Component Description

Building 5D (West Derby Breakout/Slag Milling) is a multilevel, pre-engineered facility consisting of a structural steel frame on a reinforced poured concrete base that is approximately 41 × 160 ft and 50 ft high. This building is a new addition to the Metals Production Plant (Component 5A) that is designed to function as a separate facility. This building is located west of Plant 5, as shown on the Grid 12 map in Appendix C.

Process Area Description

The West Derby Breakout/Slag Milling building is a new addition to Plant 5, completed since production activities were halted at the FEMP. This addition was intended to provide separation of uranium derby metal from magnesium fluoride slag and pot liner. A major portion of the facility was also to be used for milling, storage, and distribution of magnesium fluoride for subsequent reuse. This facility currently stores unused equipment and was never used for its intended purposes.

Summary of Sampling for Building 5D

This component does not require sampling. The component has not been placed into service following recent completion of construction and exhibits little or no evidence of contamination; moreover, results of the radiological surveys do not exceed the criteria established for sampling.

D.9.4.11 Building 8B — Plant 8 Maintenance Building

Component Description

Building 8B (Plant 8 Maintenance Building) is a single-story structure measuring 31 × 42 ft and 15 ft high. The building is located west of the Recovery Plant (Component 8A) and surrounded on three sides by the Plant 8 West Pad (Component 74D) (Grid 20 map in Appendix C), as shown on Figure 8B-1. Building 8B consists of cinder block walls supported on reinforced concrete footings, with a reinforced poured concrete floor and roof and glass windows. The purpose of the activity based in the building has always been maintenance of equipment in the Recovery Plant.

Process Area Description

Building 8B houses the maintenance activities for the Recovery Plant and is considered a single process area. The maintenance building consists of a small corner breakroom and an open room with a roll-up door to admit small to medium-sized pieces of equipment for servicing and repair. The building houses tools, maintenance equipment, spare parts, and service fluid (e.g., oils and greases) for motors and other rotating equipment in one drum or smaller quantities (on the basis of inspection). Since the CERCLA process began, Building 8B has been a pumping point for transfer of perched water pumped from a shallow well outside the northeastern corner of Building 8B to the Recovery Plant for treatment. A small (less than 50-gal) raised metal tank along the north wall receives the well discharge, and a small centrifugal pump mounted on the tank transfers the perched water to the northwestern corner of the Recovery Plant via pipeline.

A floor sump at the midpoint of the south wall is currently used as a pipeway for steam and condensate lines. The steel cover of the sump was not removed during the inspection, so its condition and contents (water or sediment) are not known. This sump may have been used to collect floor washings from maintenance activities when the Recovery Plant was in operation.

Although equipment was usually serviced in place in the Recovery Plant, smaller pieces of equipment, some of which may have been radiologically contaminated, were taken to Building 8B and may have spread contamination to the building. Several types of degreasing solvents and cleaners were used and stored in small quantities in Building 8B and are included in the anticipated contaminants listed in Table A.3.

Major Media Types per Process Area

The major media for Building 8B are the cinder block (masonry) walls and the concrete floor and roof. The walls of the corner office are wooden but constitute a relatively small fraction of the building volume. Thus, wood is not a major medium for Building 8B.

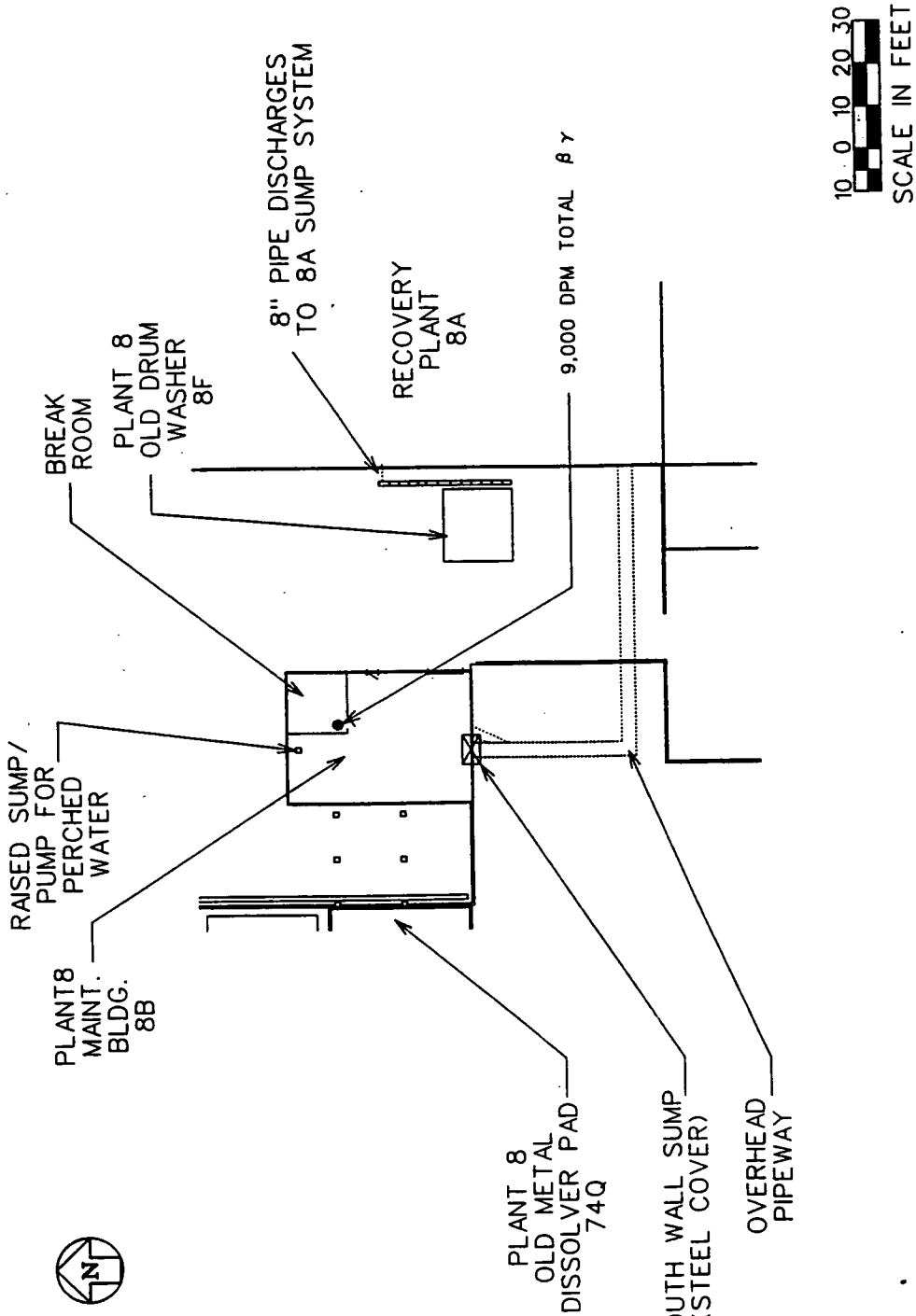

FIGURE 8B-1 Layout of Building 8B

Summary of Available Radiological Data

Radiological contamination surveys have been conducted in Building 8B during 1991 and 1992, including 29 removable alpha and 7 total beta-gamma contamination measurements on the concrete floor of Building 8B. An additional five removable alpha and five total beta-gamma readings were taken on raised accessible surfaces, some of which were for the masonry window ledges. Analyses of these data identify hot spots for the major media (concrete and masonry). The highest measurement for total beta-gamma contamination on the concrete floor was 9,000 dpm at the door of the breakroom, as shown on Figure 8B-1. The masonry walls, represented by samples taken on the window ledge in the breakroom, do not have a hot spot, as the readings were below the instrument background reading. No survey results are available for the sump along the south wall. Any additional radiological survey data collected by ongoing survey programs will be used in determining the hot spot for this component.

Summary of Sampling for Building 8B

One airborne particulate sample will be taken for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to delineate the final intrusive sample location. Building 8B is considered a dry process area, so the concrete sample will be a chip.

On the basis of visual inspection, (1) a supplemental liquid and sediment sample is anticipated for the sump and (2) a supplemental masonry sample is planned for an area of severe wall erosion near the southwestern corner of the building. Table 8B-1 summarizes the planned sampling program for Building 8B.

TABLE 8B-1 Sample Types and Quantities for Building 8B

Sample Type	Maintenance	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	2	2
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	1	1
Loose media	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.4.12 Building 8D — Plant 8 Railroad Filter Building

Component Description

Building 8D (Plant 8 Railroad Filter Building) is a single-level building measuring approximately 30 × 42 ft and 13 ft high. Associated with Building 8D are a subgrade Railroad Tank Car Wash Pit and a settling basin. Building 8D is shown on Figure 8D-1 and is located east of the Plant 8 East Pad (Component 74C) along B Street, as shown in the Grid 20 map of Appendix C. Building 8D is surrounded by a concrete pad on the south, east, and north sides; and the Railroad Tank Car Wash Pit is located on the west side of Building 8D between the building and the Plant 8 East Pad. The settling basin is located immediately east of Building 8D toward the center of the concrete pad. Building 8D is a pre-engineered structure consisting of a structural steel frame with steel siding panels and sloped steel roof panels. The building is supported on a reinforced poured concrete base (Type C building). The Railroad Tank Car Wash Pit is constructed of concrete that supports railroad tracks.

Process Area Description

Building 8D is considered one process area. Railroad gondolas filled with bulk MgF_2 from the Weldon Spring DOE facility were positioned over the Railroad Tank Car Wash Pit and unloaded onto the Plant 8 East Pad. The bulk MgF_2 was then drummed and processed. Residues from the railroad gondolas were washed into the Railroad Tank Car Wash Pit. Runoff from the pad also drains into the Railroad Tank Car Wash Pit. Washwater and pad runoff collected in the Railroad Tank Car Wash Pit were agitated and pumped from Building 8D to Plant 8 (Component 8A) for treatment and filtration. At one time, the collected washwater and pad runoff was sand filtered in the pit before being pumped to Plant 8. Anticipated contaminants for Component 8D are summarized in Table A.3.

Major Media Types per Process Area

The major media for Component 8D are the structural steel of Building 8D; the steel of the railroad track; and the concrete that makes up the Railroad Tank Car Wash Pit, the floor of Building 8D, the settling basin, and the pad surrounding Building 8D.

Summary of Available Radiological Data

Building 8D has not been routinely surveyed for removable alpha or total beta-gamma contamination.

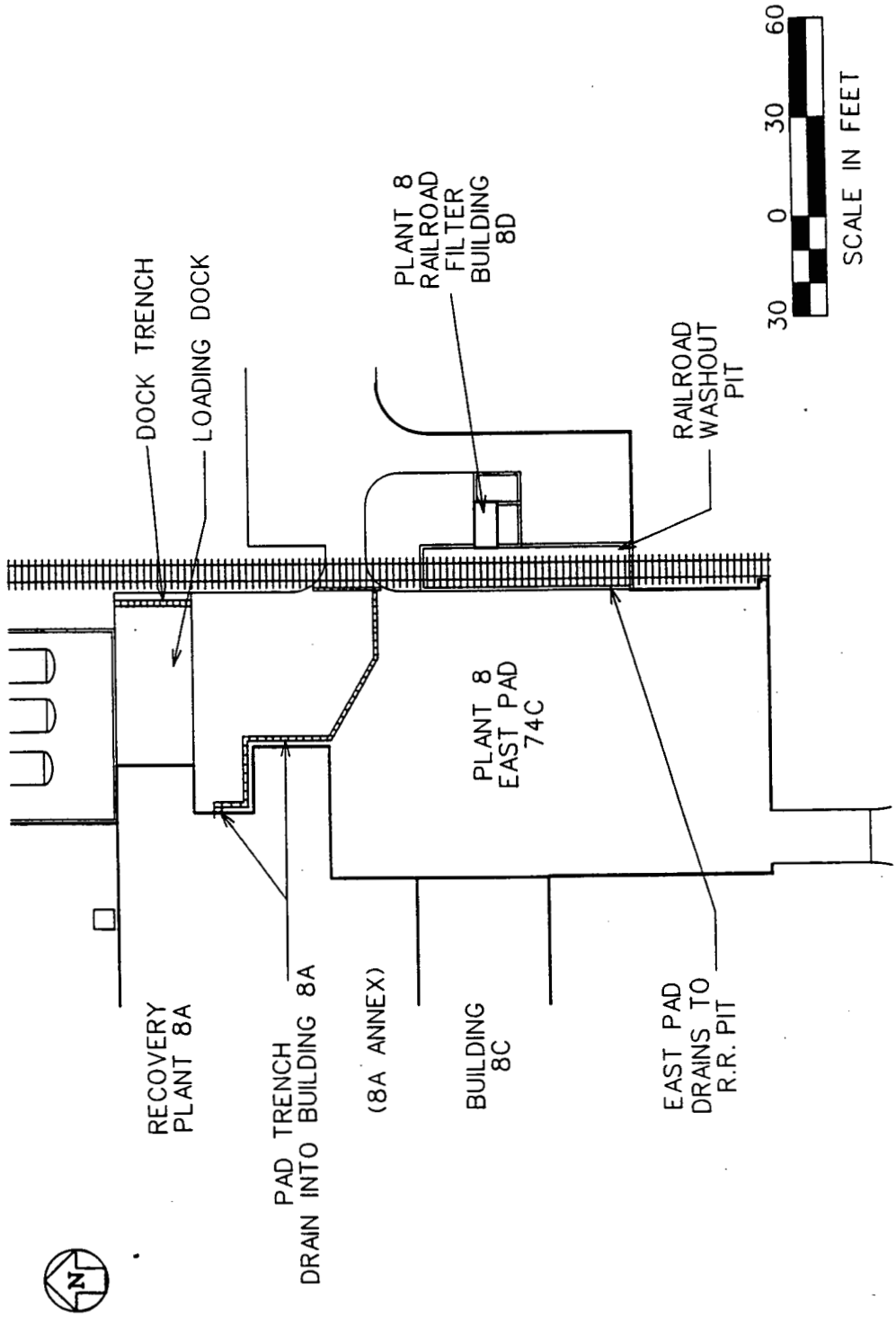

FIGURE 8D-1 Layout of Building 8D

D.9.4.13 Building 9D — Plant 9 Electrical Substation

Component Description

Building 9D (Plant 9 Electrical Substation) is a single-story building measuring approximately 16 x 30 ft and 30 ft high. Building 9D adjoins the Special Products Plant (Component 9A) (Grid 3 map in Appendix C) and consists of a structural steel frame on a poured concrete base and floor with transite roofing and siding (Type A building). Figure 9D-1 shows the floor plan of Building 9D.

Process Area Description

A single process area was identified for Building 9D. The transformers receive 13,200-V feeds from the Main Electrical Station (Component 16A) and feed 480 V to the Special Products Plant. The anticipated contaminants for Building 9D are summarized in Table A.3.

Major Media Types per Process Area

Major media identified in Building 9D consist of a poured concrete base and floor, a structural steel frame, and transite siding and roofing. Transite, however, is addressed as a separate supplemental sampling activity and will not be considered among the Building 9D major media.

Summary of Available Radiological Data

Building 9D is routinely surveyed for removable alpha and total beta-gamma contamination. Results from the most recent surveys are summarized in Appendix A.4.0 and provide the basis for identifying radiological hot spots. As indicated, 11 removable alpha and 11 total beta-gamma survey measurements were performed in Building 9D from 1989 to 1992. The highest measured concentrations for the total beta-gamma and removable alpha contamination were 60,000 and 424 dpm, respectively. On the basis of the data, the radiological hot spot is identified on Figure 9D-1. Data will be reassessed before sampling to include data from ongoing radiological surveys.

Summary of Sampling for Building 9D

One airborne particulate sample will be taken and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling

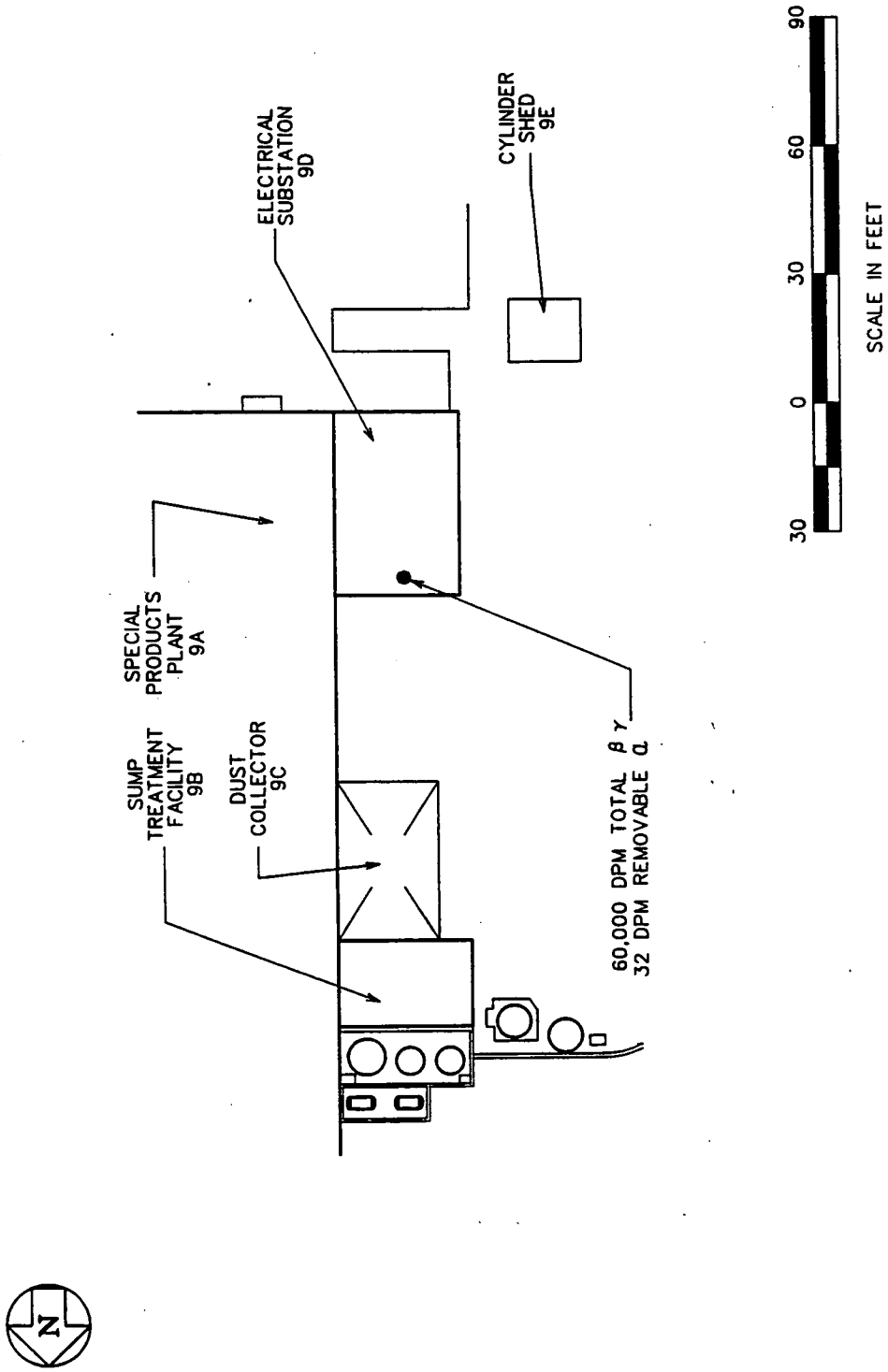

FIGURE 9D-1 Layout of Building 9D

locations. Intrusive sampling for the concrete medium will be performed at the radiological hot spot (Figure 9D-1). Because the process in Building 9D is considered dry, a concrete chip will be taken from the floor. Structural steel scrapings and swipe samples will be collected on the basis of Protocols 1 and 3. Visual inspection identified no supplemental samples. Table 9D-1 summarizes the planned sampling program for Building 9D.

TABLE 9D-1 Sample Types and Quantities for Building 9D

Sample Type	Electrical Substation	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.4.14 Building 9E — Plant 9 Cylinder Shed

Component Description

Building 9E (Plant 9 Cylinder Shed) is a single-level, three-sided, transite/steel shed that is approximately 5 × 10 ft and 8 ft high. The shed is located southwest of Plant 9A, as shown on the Grid 3 map in Appendix C.

Process Area Description

This component has been used to store full and empty cylinders for use in Plant 9. The cylinder racks are currently empty.

Summary of Sampling for Building 9E

This component does not require sampling because it is insignificant in size. The contaminants expected for the component are of low toxicity, and the component exhibits little or no evidence of contamination.

D.9.4.15 Building 10A — Boiler Plant

Component Description

Building 10A, the Boiler Plant, is a five-story building located directly west of the railroad tracks next to the Coal Pile (Component P-018), as shown on the Grid 10 map of Appendix C. The building is irregularly shaped, with approximate dimensions of 72 × 163 ft and 57 ft high. A railroad car receiving dock is attached to the building. Building 10A is constructed with a structural steel frame, transite panels, and a concrete floor (Type A building). The floor plans for Building 10A are provided in Figures 10A-1 through 10A-5.

Process Area Description

The steam production process in Building 10A encompasses four coal-fired steam boilers that provide the heat necessary to produce steam for the FEMP. Two of the four boilers are typically used. Building 10A receives water to create the steam from three sources, including the Water Plant (Component 20B), condensate return to the system, and process water. Anticipated contaminants from the steam production process, a wet process area, are summarized in Table A.3.

Major Media Types per Process Area

The major media for Building 10A are structural steel and concrete. Because transite siding will be addressed as a separate supplemental sampling activity, it is not considered as a major medium in Building 10A.

Summary of Available Radiological Data

Building 10A has been surveyed for removable alpha contamination. However, recent beta-gamma contamination data for the building do not exist. The surveys conducted from 1989 to 1992 yielded 162 removable alpha readings for the concrete floor medium, with a high removable alpha reading of 76 dpm from a measurement taken from the concrete on the second floor. Of the 162 survey measurements collected, 7 were above the MDA for the appropriate sampling event. Data are currently being collected from ongoing radiological surveys; these surveys will be assessed before systematic surveys of Building 10A are conducted.

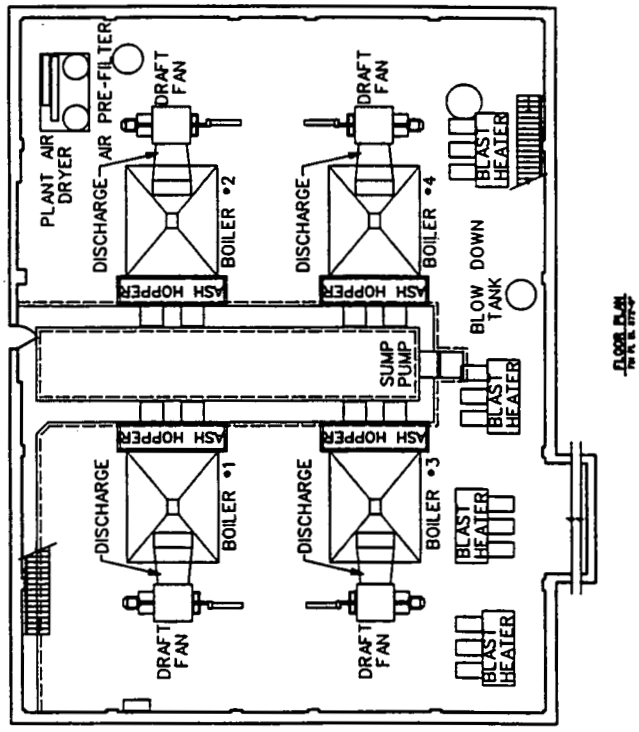

FIGURE 10A-1 Layout of Building 10A — Basement

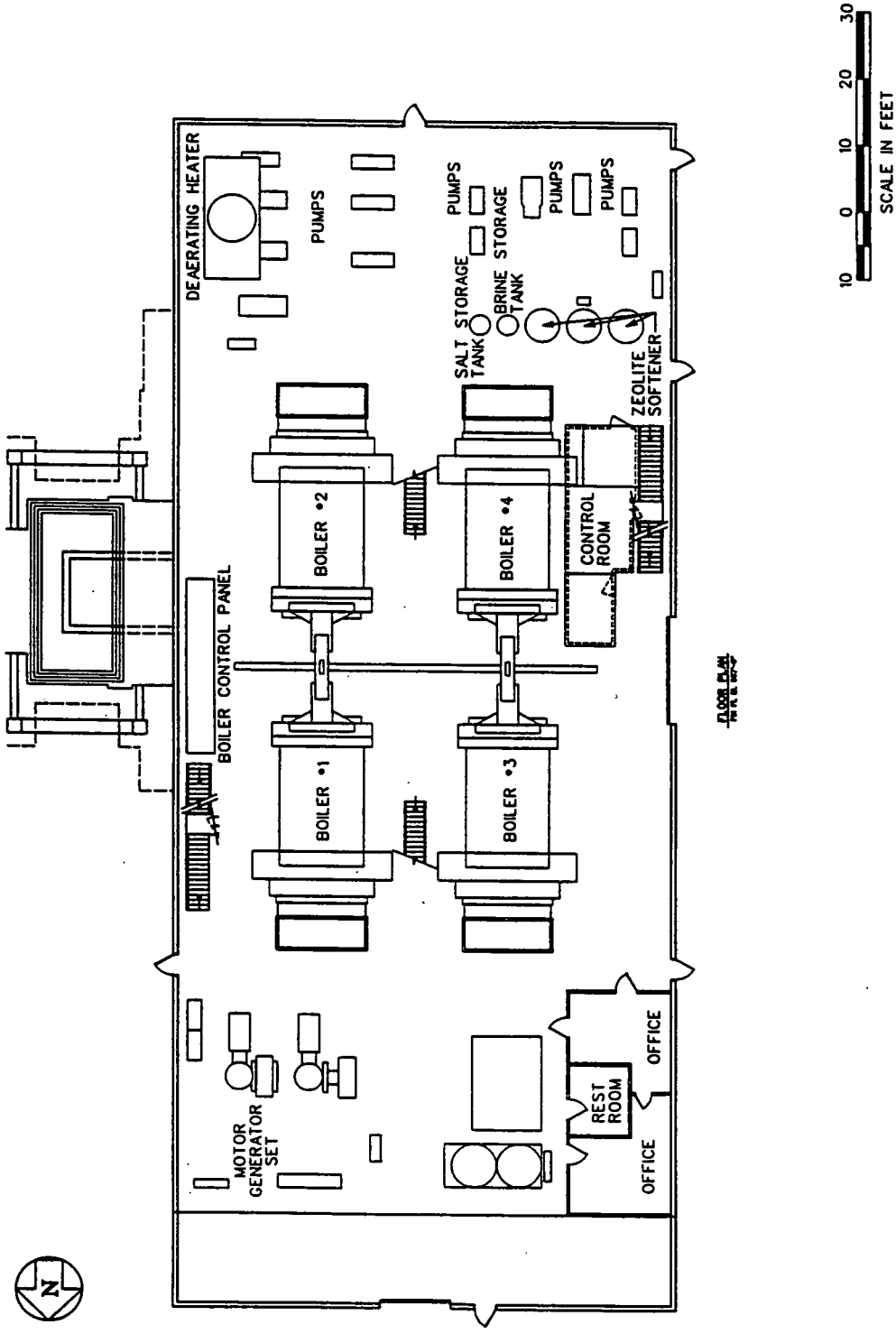

FIGURE 10A-2 Layout of Building 10A — First Floor

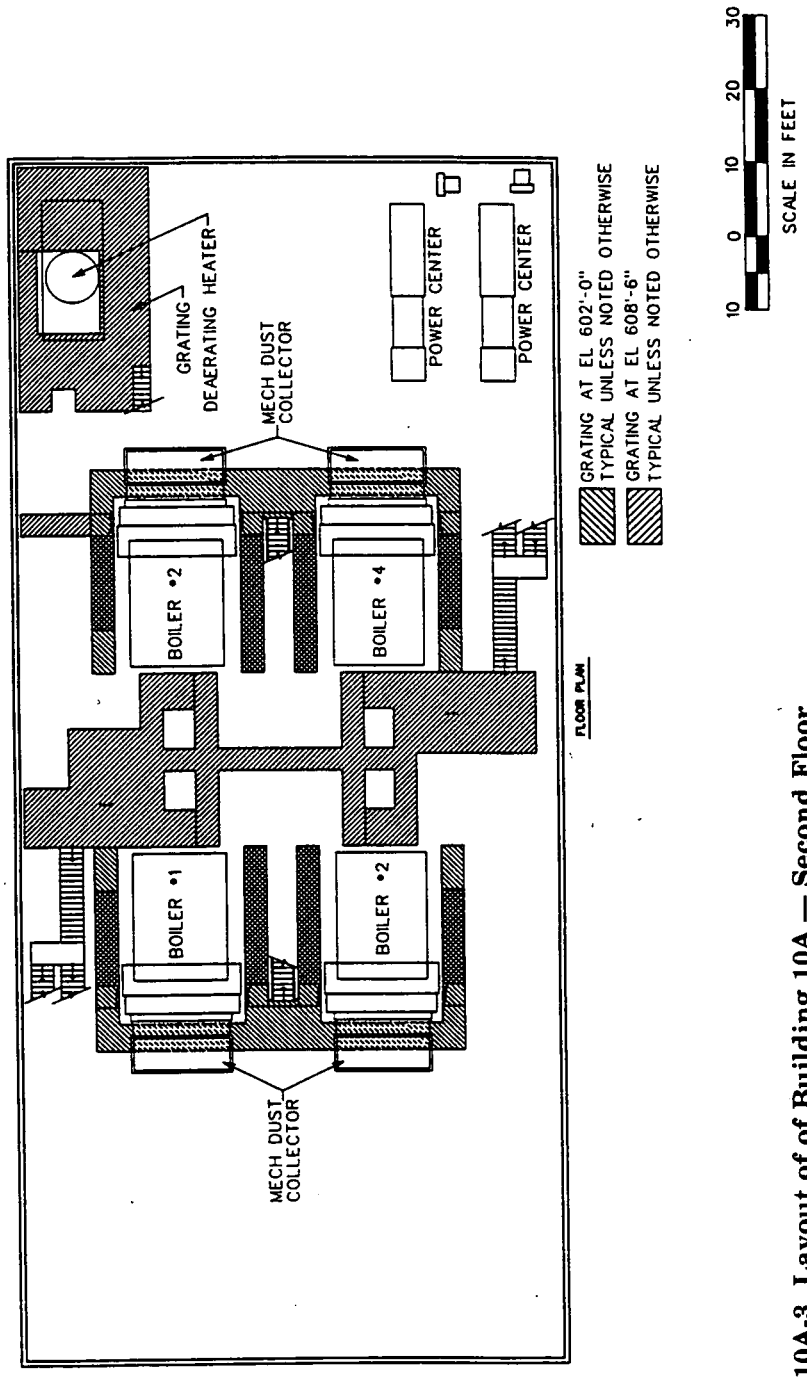

FIGURE 10A-3 Layout of of Building 10A — Second Floor

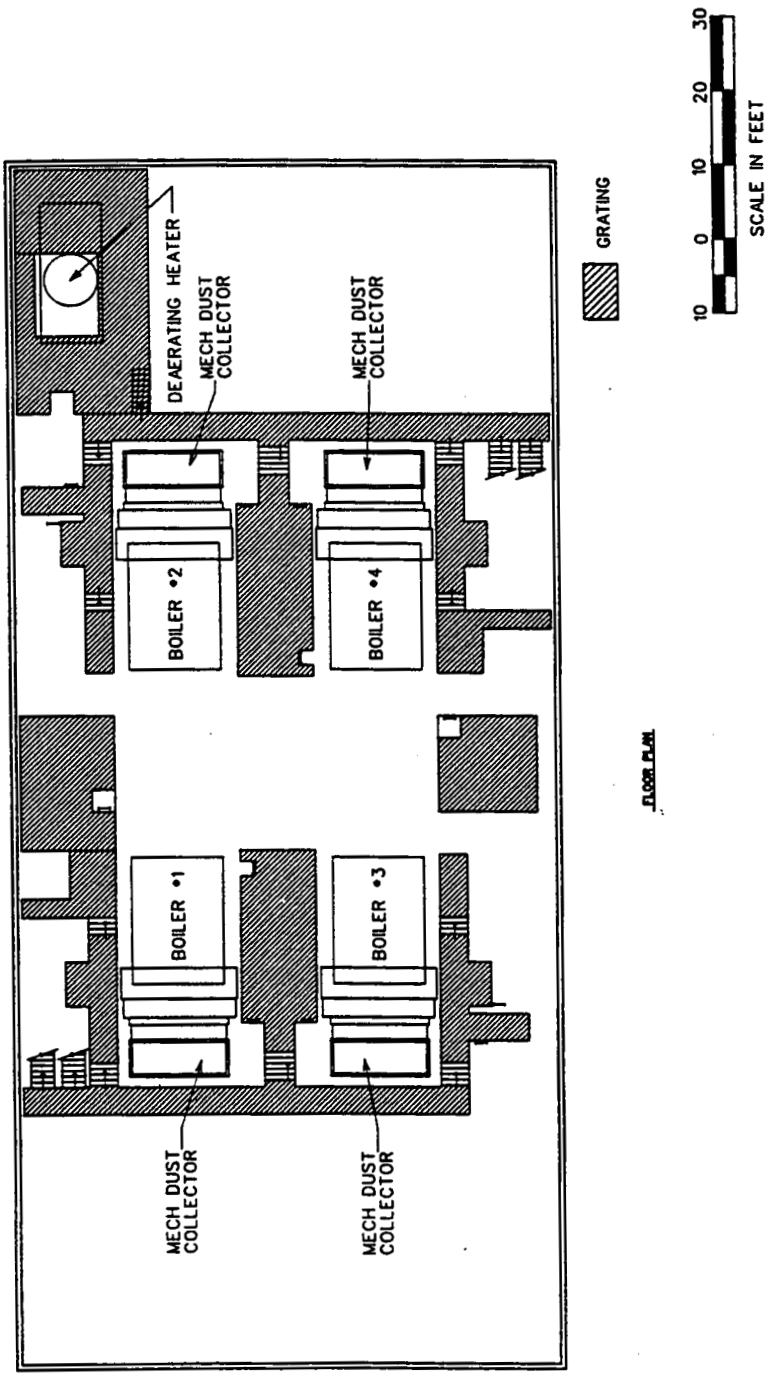

FIGURE 10A-4 Layout of of Building 10A — Third Floor

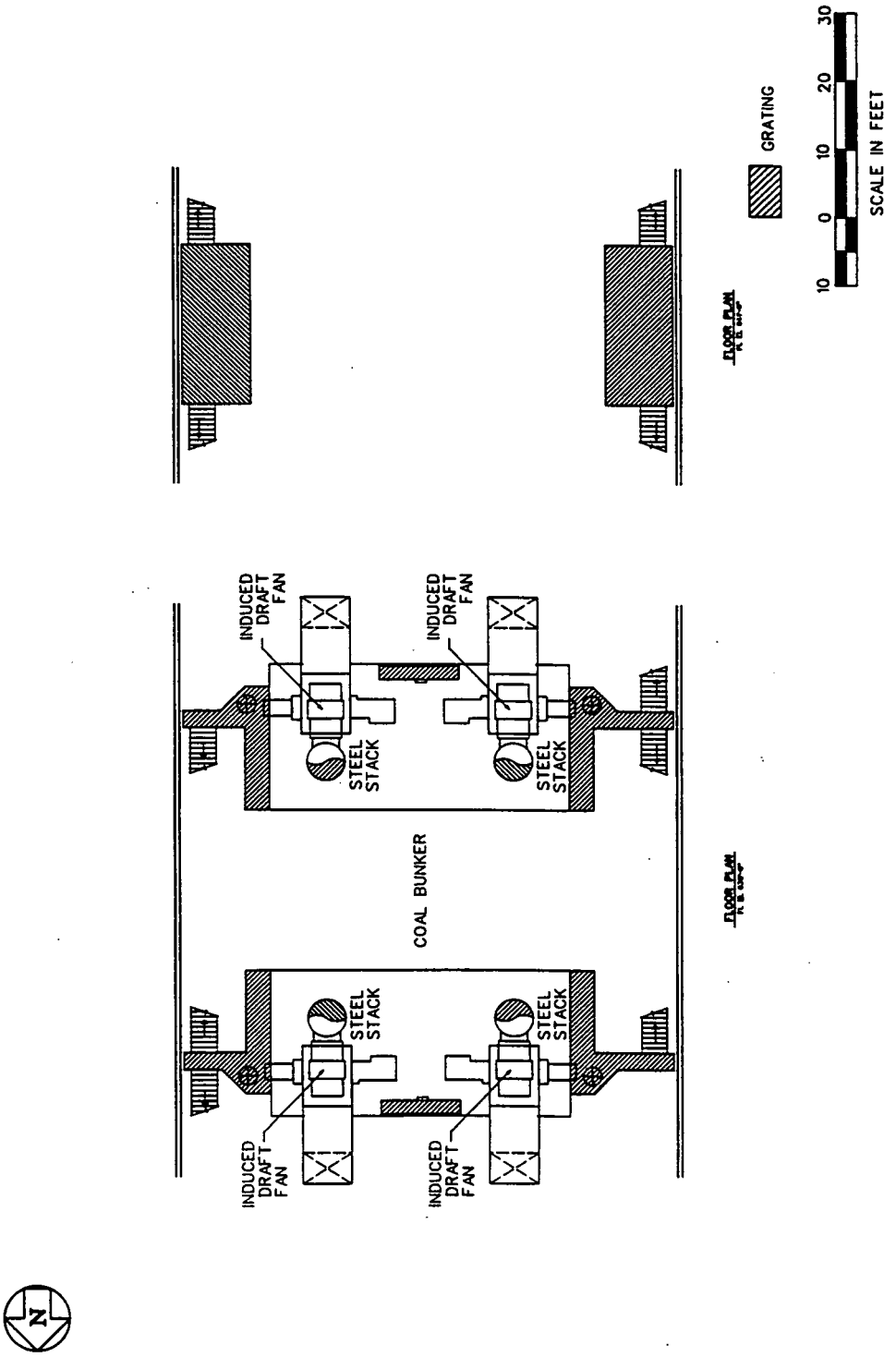

FIGURE 10A-5 Layout of of Building 10A — Fourth Floor

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D.9.4.16 Building 10B — Boiler Plant Maintenance Building

Component Description

Building 10B (Boiler Plant Maintenance Building) is a single-story building measuring approximately 40 × 60 ft and 16 ft high; its location is shown on the Grid 10 map in Appendix C. Building 10B is adjacent to the west side of the Boiler Plant (Component 10A) and consists of a poured concrete base and floor, a structural steel frame, and corrugated steel siding and roofing (Type C building). Figure 10B-1 shows the floor plan of Building 10B.

Process Area Description

One process area has been identified for Building 10B. The facility provides maintenance for the boiler plant operation and other utility operations. A variety of items are stored here, including tools, a vented basin for solvent cleaning of tools, and other equipment. The anticipated contaminants for Building 10B are summarized in Table A.3.

Major Media Types per Process Area

Major media for Building 10B consist of a poured concrete base and floor and a structural steel frame.

Summary of Available Radiological Data

Building 10B is routinely surveyed for removable alpha contamination. Results from recent surveys are summarized in Tables A.4.0 and A.4.1 and provide the basis for identifying radiological hot spots. As indicated, 89 removable alpha and no total beta-gamma survey measurements were performed in Building 10B from 1989 through 1992. On the basis of the assembled data, the hot spot for the floor media is identified on Figure 10B-1. The highest measured concentration of removable alpha contamination is 392 dpm. Any data gathered by ongoing radiological surveys performed for safety purposes will also be reassessed before sampling.

Summary of Sampling for Building 10B

One airborne particulate sample will be taken and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive sampling for the concrete medium will be performed at the radiological

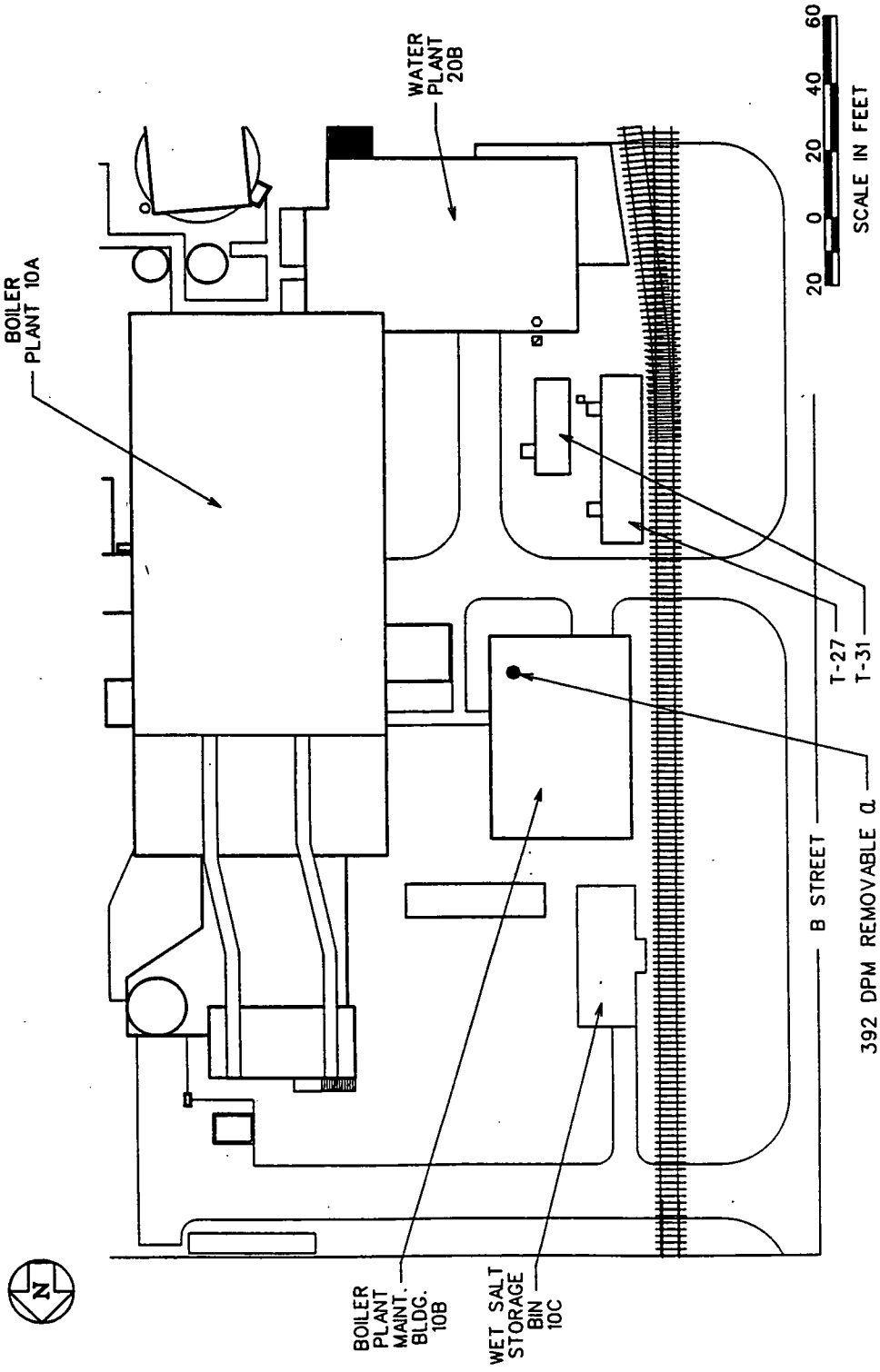

FIGURE 10B-1 Layout of Building 10B

hot spot shown in Figure 10B-1. Because Building 10B contained a solvent basin, the process is considered wet; consequently, the concrete sample will be a core sample. Structural steel scrapings and swipe samples will be collected on the basis of Protocols 1 and 3. Visual inspection of the building identified the need for a supplemental liquid sample of the solvent basin. Table 10B-1 summarizes the planned sampling program for Building 10B.

TABLE 10B-1 Sample Types and Quantities for Building 10B

Sample Type	Maintenance Area	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	1	1
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.4.17 Component 10C — Wet Salt Storage Bin

Component Description

Component 10C (Wet Salt Storage Bin) is a rectangular concrete tank for salt that is approximately 17 x 42 ft. The storage bin is located west of the Boiler Plant (Component 10A), as shown on the Grid 10 map in Appendix C.

Process Area Description

The storage bin is used to store salt solution for regenerating the water softener system. Sodium chloride is dissolved and stored in this bin.

Summary of Sampling for Component 10C

This component does not require sampling because it is insignificant in size. The contaminants expected for the component are of low toxicity.

D.9.4.18 Building 12A — Main Maintenance Building

Component Description

Building 12A (Main Maintenance Building) houses the main maintenance shops for the entire FEMP facility. Building 12A, a two-story rectangular structure (360 x 150 ft and 20 ft high) is constructed of cement blocks with concrete floors (mix between Type A and B buildings). It is located at the northwestern corner of the intersection of 2nd Street and D Street, near the central portion of the FEMP production area, as shown on the Grid 11 map of Appendix C. A second story area (40 x 75 ft) in the southeastern corner of the building houses offices and a conference room.

Process Area Description

Building 12A contains the main maintenance stores, shops, and associated offices and has been divided into six process areas according to the location of the various activities within the building (Figure 12A-1). These process areas are described in detail in the following subsections. Anticipated contaminants for Building 12A are summarized in Table A.3.

Decontamination Room and Emergency Generator Room. The decontamination room is located at the west end of Building 12A and has a separate entry. This room is currently referred to as the ladder room and stores various maintenance materials and tools. The room has a main door and an 8-ft-wide sliding door equipped with a pivoting beam hoist to transfer heavy equipment into the room. The interior walls are cinder block, and the outer wall is transite. The southern portion of the room has a concrete floor, while the northern portion has an acid-resistant tile floor. Across the opening of the sliding door is a shallow grated floor trench.

Historically, the decontamination room was used to decontaminate radioactive machinery before working on the machinery at the various shops within Building 12A. The parts were washed with acid, and the acid solution was then recycled in a closed loop system for acid and uranium recovery. The acid wash system consisted of a virgin acid tank, sump and sump pit, floor drain and trough, spent acid tank, and filter press. The acid wash system has been removed from the room; the sump was not visible during the inspection but may have been hidden by the large amount of equipment and tools in storage and the large work benches in the center of the room.

The emergency generator room is located in the northwestern corner of Building 12A. An aboveground emergency generator diesel fuel tank is located outside the northwestern corner of the emergency generator room. An underground gasoline storage tank was removed outside the northwestern corner.

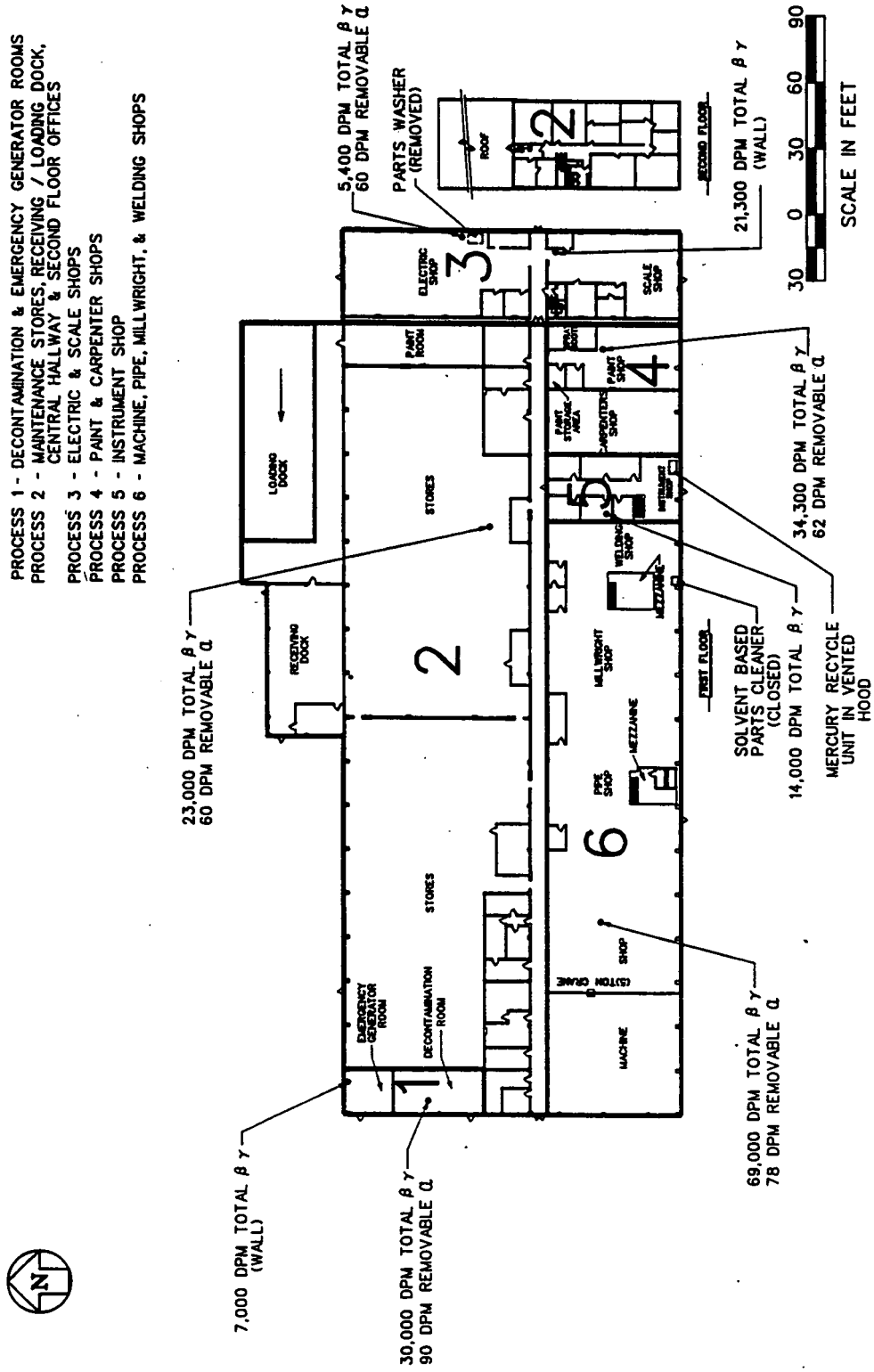

FIGURE 12A-1 Layout of Building 12A

Maintenance Stores, Receiving/Loading Dock, Central Hallway, and Second Floor Offices. The maintenance stores are used to warehouse materials bought in large lots and to maintain an inventory of spare equipment and replacement parts. Chemicals are stored in two general areas of the stores: (1) in the paint room, a diked room for flammable paint and solvents at the east end of the stores area, and (2) in the northwestern corner of the steel stores, where acids, oxidizers, alkaline cleaners, and copier chemicals are stored. Gas cylinders, including some for hazardous chemicals such as freon, are stored in the Cylinder Storage Building (Component 12B). Building 12A has loading and receiving docks, as well as the Building 12 North Pad (Component 74N), north of the maintenance stores area. The offices located on the second floor house the administration of the Site Services and Maintenance departments.

Electric Shop and Scale Shop. The electric shop houses the equipment and materials used in repair of electrical gear and, before 1991, a parts washer that used a chlorinated solvent. The parts washer, which was located against the east wall of the shop just north of the tool cage, was primarily used to degrease electric motor parts. The scale shop is used to repair and calibrate small weigh scales and contains a weight control room and a radio room.

Paint Shop and Carpenter Shop. The paint shop is equipped with a vent hood for smaller paint jobs and a paint spray booth for larger paint jobs. The paint spray booth is a large roof-vented chamber used to control both the emission of paint fumes/mists and external contamination (i.e., dust particles) from contacting freshly painted surfaces. The booth is constructed of sheet metal with conventional furnace/air conditioner type filters along the booth's south door. The paint spray booth has been in operation since 1952 but is currently out of service while air emissions are under regulatory review and permitting. One area of the paint shop is used as a satellite accumulation area (SAA) for the temporary storage of small quantities of hazardous waste generated during maintenance activities within the various shops. Wastes stored at the SAA range from paint cleaning equipment to solvent spill residues.

Instrument Shop. The instrument shop houses repair and testing equipment for instruments and gauges from the production facilities at FEMP. A mercury reclaiming unit is set up in a fan-vented hood with an airtight sliding door. The mercury recycling unit is used to recycle/reclaim mercury from contaminated mercury solutions generated during the filling of mercury manometers or from spillage of mercury on the floor during the dismantling of instruments containing mercury. The mercury recycling unit consists of a low-speed centrifugal mercury separator that uses acids under a vent hood. The unit has been in use since 1952.

Machine, Pipe, Millwright, and Welding Shops. The machine, pipe, millwright, and welding shops house equipment for fabricating, threading and milling, and welding of

primarily metal equipment and parts. Also, storage racks and tool cribs are located in these work areas. One area of the machine shop is used as an SAA for the temporary storage of small quantities of hazardous waste generated during maintenance activities within the various shops. Wastes stored at the SAA range from paint-cleaning equipment to solvent spill residues. The weld shop houses the equipment used for welding metal parts and a solvent-based parts cleaner. The parts cleaner, which was removed from service in May 1989, was primarily uses to degrease machine parts before welding.

Major Media Types per Process Area

Building 12A is constructed of cinder blocks (masonry) with concrete floors and structural steel at locations throughout. As the block walls, concrete floors, and structural steel are essentially uniform across the component, all six process areas are considered to contain these major media. The field inspection of Building 12A also revealed acid-resistant tiles on the floors and approximately 1 ft up the walls of the decontamination room.

Summary of Available Radiological Data

The Maintenance Building was surveyed extensively during 1991. Available radiological data include 1,738 total beta-gamma measurements (1,142 of which were taken on floor surfaces) and 771 removable alpha smear samples (459 of which were taken from floor surfaces). Ongoing surveys conducted during 1992 resulted in an additional 106 total beta-gamma measurements and 700 removable alpha smear samples. Radiological survey data for this component have been assembled in Tables A.4.0 and A.4.1. A number of hot spots were identified within this facility, as discussed below. As additional data are acquired during the course of ongoing radiological survey activities, they will be combined with the existing data, and the existing hot spots will be reevaluated.

Decontamination Room and Emergency Generator Room. The decontamination room and emergency generator room survey results indicate the presence of hot spots on the floor, walls, and structural steel beams. The maximum floor hot spot was located in the decontamination room and read 30,000 dpm total beta-gamma and a corresponding 90 dpm removable alpha. The wall hot spot was located on the north wall of the generator room and read 7,000 dpm total beta-gamma. A number of additional locations had total beta-gamma contamination greater than 10,000 dpm throughout this area.

Maintenance Stores, Receiving/Loading Dock, Central Hallway, and Second Floor Offices. The highest maintenance stores area hot spot is located on the floor just north of the cage window area and reads 23,000 dpm total beta-gamma and 60 dpm removable alpha. Levels of total beta-gamma contamination greater than 10,000 dpm were observed at several other locations scattered throughout this large area.

Electrical Shop and Scale Shop. The hot spot for the electrical shop and scale shop area was 21,300 dpm total beta-gamma and was located in the scale shop just inside the equipment door on the east wall. The scale shop also had several other localized spots of contamination greater than 10,000 dpm total beta-gamma, although the maximum reading for the floor of the electrical shop was 5,400 dpm total beta-gamma and 60 dpm removable alpha. No other hot spots greater than 10,000 dpm were identified within the electrical shop.

Paint Shop and Carpenter Shop. The hot spot for the paint shop and carpentry shop area was 34,300 dpm total beta-gamma and 62 dpm removable alpha and was located just south of the paint booth in the paint shop. A number of other hot spots greater than 10,000 dpm total beta-gamma were located within the paint shop and carpenter shop areas.

Instrument Shop. The hot spot for the instrument shop was 14,000 dpm total beta-gamma and was located on the floor in the southwestern corner of Room 12-23. Other localized spots of total beta-gamma contamination above 10,000 dpm were also located within this area.

Machine, Pipe, Millwright, and Welding Shops. The hot spot for the machine, pipe, millwright, and welding shop area was 69,000 dpm total beta-gamma, with an associated removable alpha reading of 78 dpm, and was located on the floor in the machine shop area near the west end of the building. As with the stores area, a number of additional hot spots of lesser magnitude but greater than 10,000 dpm total beta-gamma were scattered throughout this large process area.

Summary of Sampling for Building 12A

One airborne particulate sample will be taken within the component and analyzed for radiological and inorganic contamination, as well as asbestos. Nonintrusive measurements including exposure rate measurements, XRF surveys, radiological surveys, PID surveys, and swipe samples, will be performed and assessed in the field to further define final intrusive sampling locations. Intrusive sampling in each process area will consist of concrete core samples because all maintenance processes will be considered wet process areas. Masonry samples and steel surface scrapings will also be taken in each process area. Intrusive tile samples will be taken in the ladder (decontamination) room. If analysis of radiological swipe samples detects elevated levels of removable contamination as outlined in Protocol 1, then the swipe samples will be combined over the component for laboratory analysis.

A supplemental liquid sample will be needed for the paint booth trough. The possible existence of a sump in the ladder room should also be determined at the time of

sampling. Additional supplemental samples may be identified by the field crew during sampling activities. Table 12A-1 summarizes the planned sampling program for Building 12A.

Table 12A-1 Sample Types and Quantities for Building 12A

Sample Type	Decontamination Room and Emergency Generator Room	Maintenance Stores and Offices Areas	Electrical Shop and Scale Shop	Paint Shop and Carpentry Shop	Instrument Shop	Machine/Pipe/ Millwright Shop and Welding Shop	Component Totals
Nonintrusive[a]							
Radiological surveys	b	b	b	b	b	b	NA[c]
Chemical surveys	b	b	b	b	b	b	NA
Air particulates	NA	NA	NA	NA	NA	NA	1
Swipes	4	3	3	3	3	3	19
Lab composite swipes	NA	NA	NA	NA	NA	NA	1
Intrusive[a]							
Concrete chips	NA	NA	NA	NA	NA	NA	NA
Concrete cores	1	1	1	1	1	1	6
Masonry	2	1	1	1	1	1	7
Steel surface scraping	1	1	1	1	1	1	6
Supplemental							
Liquid sample	NA	NA	NA	1	NA	NA	1
Loose media	NA	NA	NA	NA	NA	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.4.19 Building 13B — Pilot Plant Maintenance Building

Component Description

Building 13B (Pilot Plant Maintenance Building) is a single-level structure measuring 30 × 60 ft and 11 ft high. It is located northwest of the Pilot Plant Wet Side (Component 13A) (Figure 13B-1) and is shown on the Grid 26 map in Appendix C. Building 13B consists of concrete block walls supported on reinforced concrete footings, with a reinforced poured concrete floor and roof, and glass windows (Type B building). The building has two 8-ft-wide roll-up doors on the east side facing a paved apron area on the north side of the Pilot Plant Wet Side.

During the Pilot Plant operating period, the activity based in Building 13B maintained equipment in the Pilot Plant Complex. The building has been converted for use as a base of operation for radiation technicians involved in renovation, removal actions, and remediation studies at the FEMP.

Process Area Description

Building 13B housed the maintenance activities for the Pilot Plant complex (in several adjacent buildings). The maintenance building consisted of a small corner breakroom and an open room with two roll-up doors to admit small to medium-sized pieces of plant equipment for servicing and repair. The building housed tools, maintenance equipment, spare parts, and fresh and used service fluids for motors and other rotating equipment (e.g., oils and greases) in small quantities (typically one drum or less). Although the Pilot Plant equipment was usually serviced in-place in the process buildings, smaller pieces of equipment, some of which may have been radiologically contaminated, were taken to Building 13B for service and repair.

Since the CERCLA process began, Building 13B has been used as an operating base for radiation technicians and is in the process of being decontaminated and renovated. Two tile-floored offices are enclosed in the building; the remainder of the building, which still has exposed concrete floors, is used for storage and calibration of equipment and supplies used in the FEMP health and safety program. The room in the northeastern corner of the building that opens to the east via a roll-up door is still used for storage of maintenance equipment. The area is considered a wet process because of the use of solvents in the operation.

Major Media Types per Process Area

Building 13B has concrete block (masonry) walls and a concrete floor and roof, so the major media for the Pilot Plant Maintenance Building are concrete and masonry. The walls of the breakroom and offices are wooden, wall board and composite materials, but constitute relatively small fractions of the building volume. Thus, those materials are not major media for Building 13B.

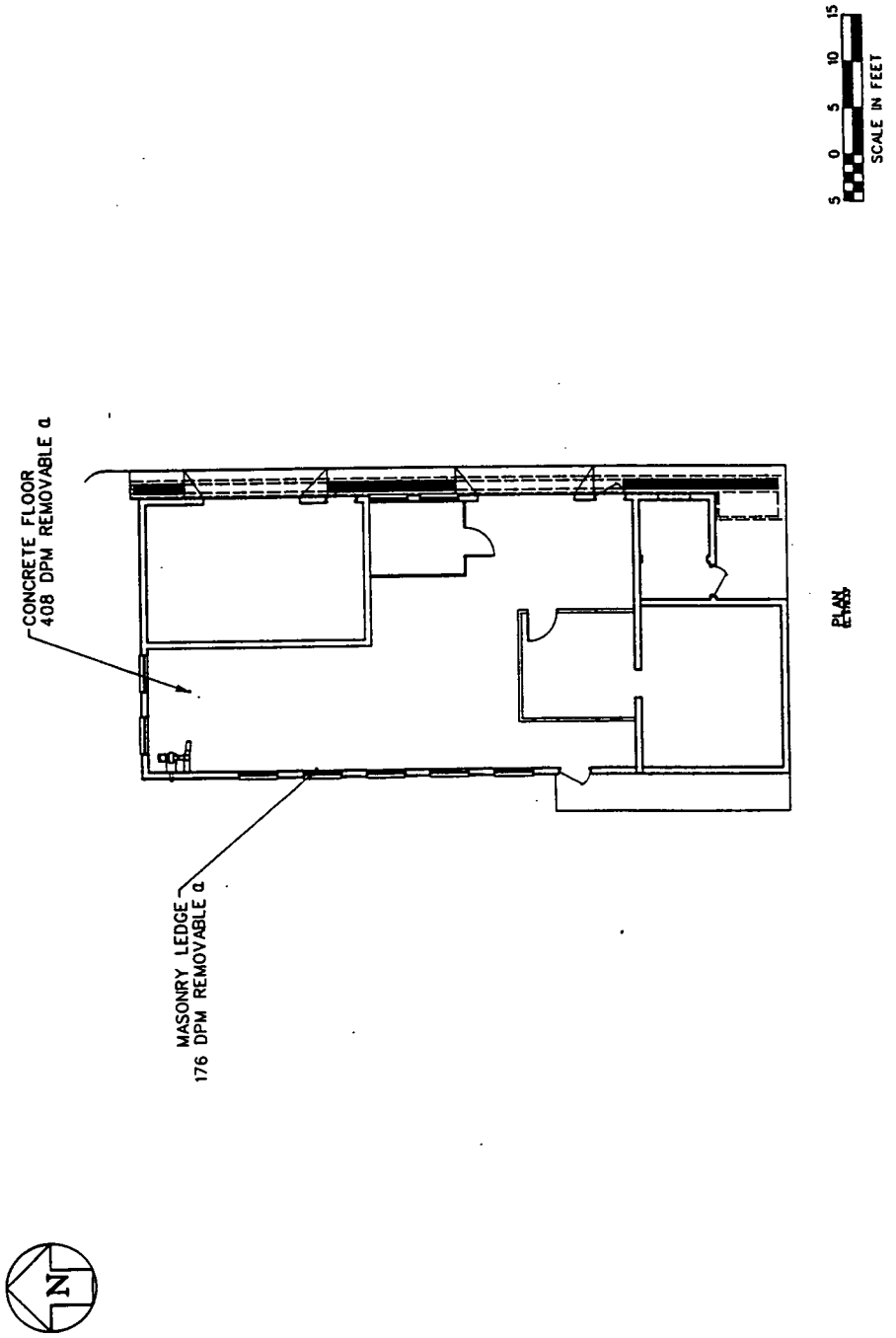

FIGURE 13B-1 Layout of Building 13B

Summary of Available Radiological Data

Radiological contamination surveys have been conducted in Building 13B during 1991 and 1992, including 15 removable alpha contamination measurements for the concrete floor and 3 removable alpha readings on other accessible surfaces. No contamination measurements were taken for total beta-gamma radiation. One accessible surface reading was for the masonry window ledge along the west wall.

Analysis of these data allow the identification of a hot spot for the concrete floor. The highest measurement for removable alpha contamination on the concrete floor was 408 dpm in the northwestern corner of the building (Figure 13B-1). The masonry walls are represented by only a single reading of 176 dpm taken on the window ledge on the west wall (Figure 13B-1). Additional data will be collected before component sampling, and any data generated by the ongoing radiological surveys will be reassessed at the time as well.

Summary of Sampling for Building 13B

One airborne particulate sample will be taken for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. A follow-up, nonintrusive measurement program, including radiological and chemical surveys, an XRF survey, and swipe samples, will be performed and assessed in the field to delineate the final intrusive sample locations for concrete and masonry (concrete block). For purposes of selecting the type of intrusive sample, Building 13B is considered a wet process area, so that the concrete floor hot spot will be sampled by collection of a concrete core. No supplemental sample locations were identified for Building 13B. Table 13B-1 summarizes the planned sampling program for Building 13B.

TABLE 13B-1 Sample Types and Quantities for Building 13B

Sample Type	Maintenance Area	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	1	1
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.4.20 Building 16B — Electrical Substation

Component Description

Building 16B (Electrical Substation) is a cinder block building with a concrete floor and metal sheet roof (Type B building) measuring approximately 20 × 40 ft. The component contains electrical meters, panels, and main circuit breakers. The building is located north of the Security Building (Component 28A), as shown on the Grid 14 map in Appendix C and Figure 16B-1.

Process Area Description

Building 16B is a secondary unit substation that receives 13.2 kV and transforms it down to 480 V to power the Health and Safety Building (Component 53A), Security Building, Human Resources Building (Component 28B), and east trailers as shown on the Grid 7 and 14 maps. The only anticipated contaminants for the component listed in Table A.3 are PCBs because of the presence of electrical equipment.

Major Media Types per Process Area

The major media identified for Building 16B are the concrete floor and the cinder block walls.

Summary of Available Radiological Data

Radiological surveys have not been conducted on or around Building 16B because of the belief that no local radiological sources exist. Data will be taken and assessed before sampling to determine the location of the radiological hot spots or to verify nondetectable levels.

Summary of Sampling for Building 16B

One airborne particulate sample will be collected in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, PCB field test kit measurements, and swipe samples, will be performed and assessed in the field to further detail a final intrusive sampling location. The two media within the building are the concrete floor and the cinder block walls. One masonry sample will be collected from the cinder block walls. Because Component 16B contains electrical equipment (including transformers) and therefore may have released PCBs, a concrete chip will be collected from the floor. Visual inspection of the component identified no supplemental sample locations. Table 16B-1 summarizes the planned sampling program for Building 16B.

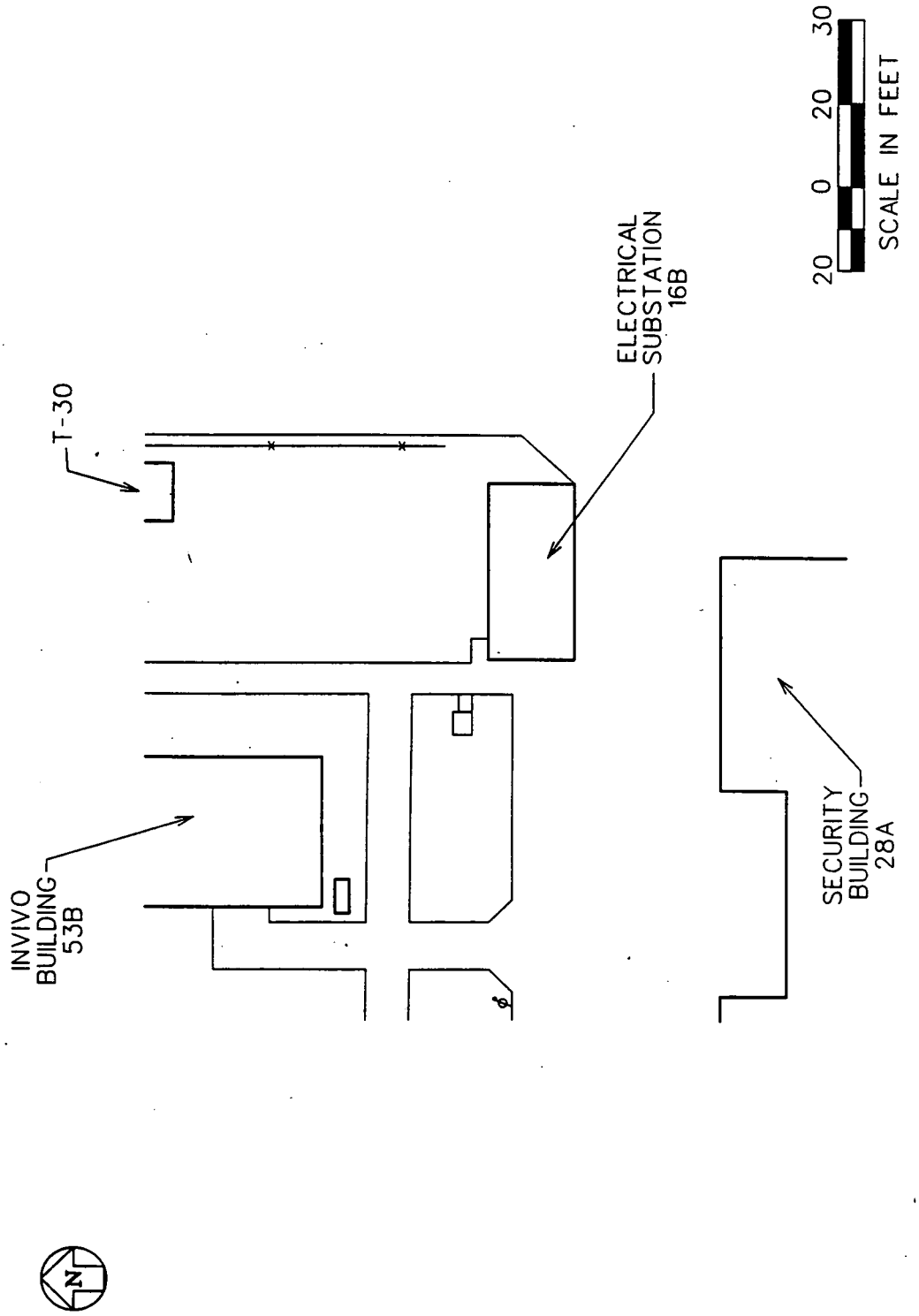

FIGURE 16B-1 Layout of Building 16B

TABLE 16B-1 Sample Types and Quantities for Building 16B

Sample Type	Electrical Distribution	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	1	1
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.4.21 Building 16D — Main Electrical Switch House

Component Description

Building 16D (Main Electrical Switch House) is a cinder block building with a concrete floor and a transite roof (Type B building) measuring approximately 15 × 30 ft. The building is divided into two rooms; the west room contains the electrical switching equipment, and the east room contains a group of lead-acid batteries used as a backup power supply. The building is located east of the Heavy Equipment Building (Component 46) and north of the Main Electrical Station (Component 16A). The building location is shown on the Grid 7 map in Appendix C, and its layout is provided on Figure 16D-1.

Process Area Description

Building 16D is the main electrical switch house for the site. The equipment in this building monitors and directs the electricity to the various substations around the site. The anticipated contaminants for the component are listed in Table A.3. During the visual building inspection, the floor underneath the backup battery supply had a white powder (crystals) that most likely resulted from the overfilling of the battery acid.

Major Media Types per Process Area

The major media identified for Building 16D are the concrete base and the cinder block walls. The transite roof is also considered a major medium but is addressed as a separate sampling activity.

Summary of Available Radiological Data

Radiological surveys have not been conducted on or around Building 16D because of the belief that no local radiological sources exist. Data will be taken and assessed before sampling to determine the locations of the radiological hot spots or to verify nondetectable levels.

Summary of Sampling for Building 16D

One airborne particulate sample will be collected in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, PCB field test kit measurements, and swipe samples, will be performed and assessed in the field to further detail a final intrusive sampling location. The two media within the building are the concrete floor and cinder block walls. A concrete chip sample will be collected from the

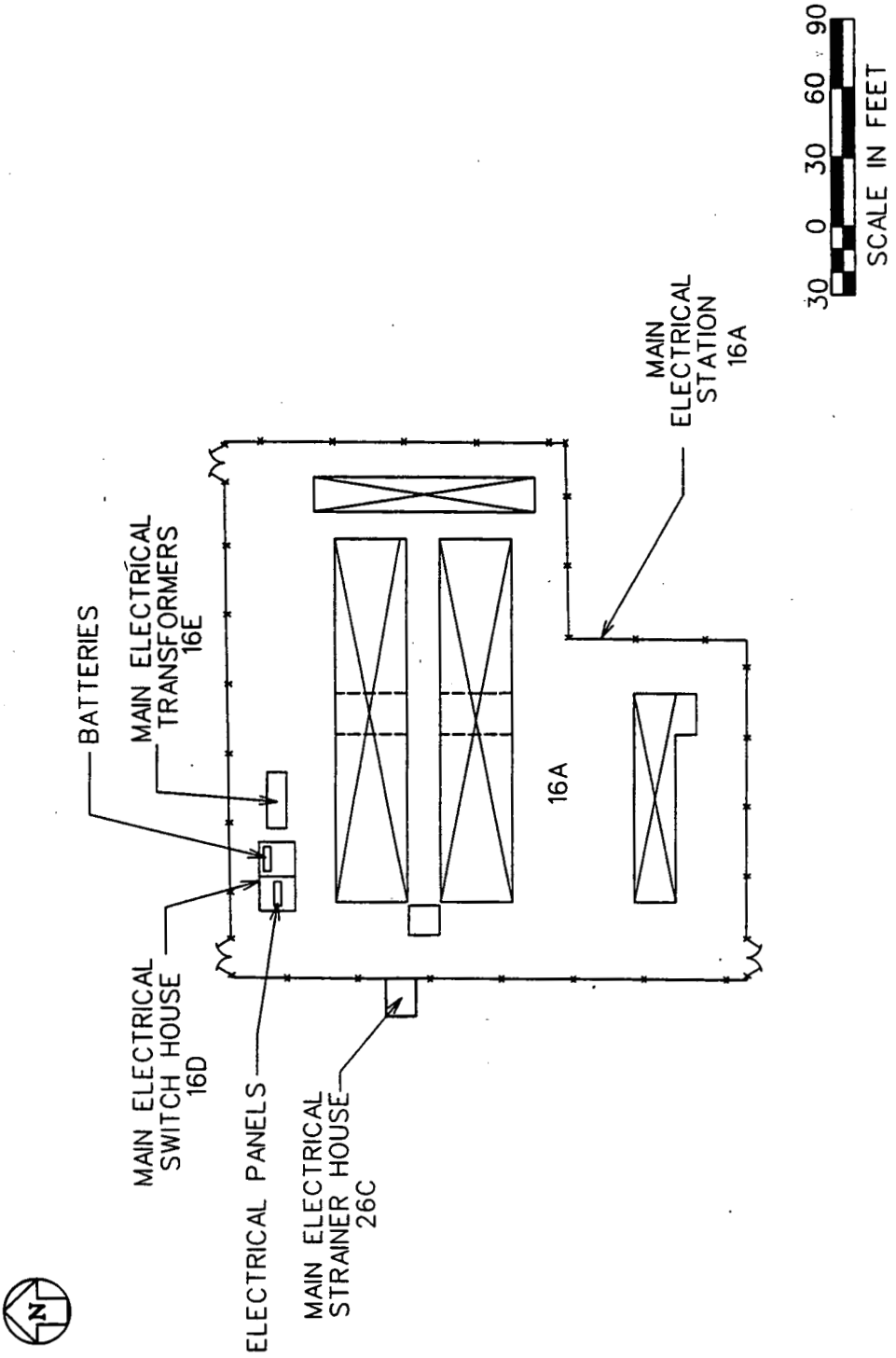

FIGURE 16D-1 Layout of Building 16D

concrete floor and a masonry sample of the walls. Visual inspection of the component determined that one supplemental surface scraping sample will be collected from the white powder (crystals) under the batteries. Table 16D-1 summarizes the planned sampling program for Building 16D.

TABLE 16D-1 Sample Types and Quantities for Building 16D

Sample Type	Electrical Distribution	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	1	1
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.4.22 Building 19C — Tank Farm Control House

Component Description

Building 19C (Tank Farm Control House) is a single-level, pre-engineered facility consisting of structural steel frame on a reinforced poured concrete base that is approximately 25 × 43 ft and 10 ft high. This building is located west of the Main Maintenance Building (Component 12A), as shown on the Grid 11 map in Appendix C.

Process Area Description

This component was installed when the Main Tank Farm (Component 19A) was renovated in 1986. This facility was to be the control center for the tank farm operations but has not been used in this capacity. The facility is currently used for office space.

Summary of Sampling for Building 19C

This component does not require sampling. The component has not been placed into service following the recent completion of construction and exhibits little or no evidence of contamination; moreover, results of the radiological surveys do not exceed the criteria established for sampling.

D.9.4.23 Building 20A — Pump Station and Power Center

Component Description

Building 20A (Pump Station and Power Center) is a single-level building consisting of a structural steel frame with transite siding panels on a reinforced poured concrete base that is approximately 17 × 83 ft and 12 ft high. The building is located south of the Boiler Plant (Component 10A), as shown on the Grid 11 map in Appendix C.

Process Area Description

This component houses the pumps for the sanitary system and chlorinator unit substation.

Summary of Sampling for Building 20A

This component does not require sampling because the results of radiological surveys performed for the component do not exceed the criteria established for sampling.

D.9.4.24 Building 20B — Water Plant Building

Component Description

Building 20B, the Water Plant Building, is a two-story building adjacent to the southwestern corner of the Boiler Plant (Component 10A). Building 20B is shown on the Grid 10 map of Appendix C. The building is rectangular, with approximate dimensions of 50 × 78 ft and 19 ft high. Building 20B is constructed with a structural steel frame, transite panels, and a concrete floor. Building 20B also has an aboveground concrete tank, located next to the main building, that stores about 750,000 gal of water for processing (Type A/C building). The floor plans for Building 20B are provided in Figure 20B-1.

Process Area Description

The water treatment process in Building 20B begins with water extracted from the three production wells at the facility. The extracted water is transferred to the aboveground concrete storage tank, where it is stored until further processing. The water pumped into Building 20B, from the storage tank, is adjusted with alumina and lime to produce water soft enough to be used by the boilers in the Boiler Plant. A laboratory is located in the building to maintain consistent water quality. The anticipated contaminants from the water treatment process, a wet process area, are summarized in Table A.3.

Major Media Types per Process Area

The major media for Building 20B are structural steel and concrete. Because the transite siding is addressed as a separate sampling activity, it is not considered as a major medium in Building 20B.

Summary of Available Radiological Data

Building 20B has been surveyed for removable alpha contamination. However, no recent beta-gamma contamination data for the building exist. The surveys conducted from 1989 to 1992 yielded 72 removable alpha readings for the concrete floor medium, with a high removable alpha reading of 24 dpm at the west end of the building (one reading from the first floor and the other from the second floor). Of the 72 survey measurements collected, 6 were above the MDA for the appropriate sampling event. Data are currently being collected from ongoing radiological surveys; these surveys will be assessed before systematic surveys of Building 20B are conducted.

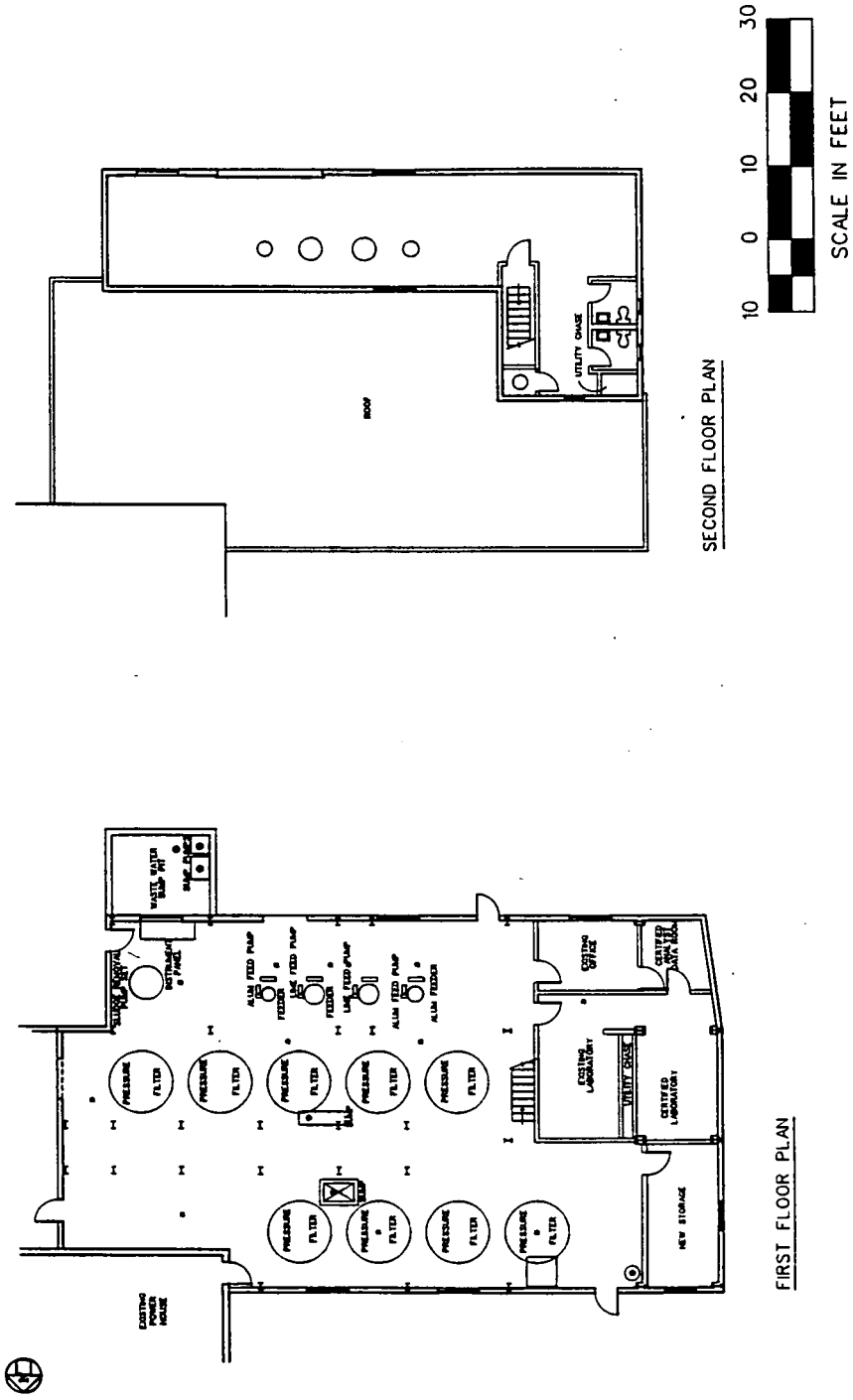

FIGURE 20B-1 Layout of Building 20B

D.9.4.25 Building 20E — Well House 1

Component Description

Building 20E (Well House 1) is a single-level, cement block building that is approximately 11 x 20 ft and 9 ft high. The building is located west of the Refinery Plant (Component 2A), as shown on the Grid 25 map in Appendix C.

Process Area Description

This component is one of three well pumping stations that supplies water for fire protection and potable uses on-site.

Summary of Sampling for Building 20E

This component does not require sampling because it exhibits little or no evidence of contamination and is of insignificant size. The results of radiological surveys for the component do not exceed the criteria established for sampling, and anticipated contaminants are of low toxicity.

D.9.4.26 Building 20F — Well House 2

Component Description

Building 20F (Well House 2) is a single-level, cement block building approximately 11 × 20 ft and 9 ft high. The building is located north of the Rust Engineering Building (Component 45), as shown on the Grid 25 map in Appendix C.

Process Area Description

This component is one of three well pumping stations that supplies water for fire protection and potable uses on-site.

Summary of Sampling for Building 20F

This component does not require sampling because it exhibits little or no evidence of contamination and is of insignificant size. Furthermore, the results of radiological surveys for the component do not exceed the criteria established for sampling, and anticipated contaminants are of low toxicity.

D.9.4.27 Building 20G — Well House 3

Component Description

Building 20G (Well House 3) is a single-level, cement block building that is approximately 11 × 20 ft and 9 ft high. The building is located west of the Pilot Plant Wet Side (Component 13A) on the Grid 26 map in Appendix C.

Process Area Description

This component is one of three well pumping stations that supplies water for fire protection and potable uses on-site.

Summary of Sampling for Building 20G

This component does not require sampling because it exhibits little or no evidence of contamination and is of insignificant size. Results of the radiological surveys for the component do not exceed the criteria established for sampling, and anticipated contaminants are of low toxicity.

D.9.4.28 Building 22A — Gas Meter Building

Component Description

Building 22A (Gas Meter Building) is a single-level, cement block structure that is approximately 16 × 20 ft and 11 ft high. The building is located northeast of Plant 6A, as shown on Grid 6 map in Appendix C.

Process Area Description

This component houses the main natural gas meter for the site and distribution piping to site uses.

Summary of Sampling for Building 22A

This component does not require sampling because it exhibits little or no evidence of contamination and is of insignificant size. Moreover, results of the radiological surveys for the component do not exceed the criteria established for sampling, and anticipated contaminants are of low toxicity.

D.9.4.29 Component 22B — Storm Sewer Lift Station

Component Description

Component 22B (Storm Sewer Lift Station) is a cement block building that is approximately 10 × 16 ft and 8 ft high. This building is west of the Service Building (Component 11), as shown on the Grid 14 map in Appendix C.

Process Area Description

This component pumps storm-water runoff to the river.

Summary of Sampling for Component 22B

This component does not require sampling because results of the radiological surveys performed for the component do not exceed the criteria established for sampling. The component is insignificant in size.

D.9.4.30 Component 22C — Truck Scale

Component Description

Component 22C (Truck Scale) is a belowgrade scale for weighing incoming and outgoing trucks that measure approximately 12 × 52 ft and 2 ft belowgrade. The scale is located south of the Receiving/Incoming Materials Inspection Building (Component 82), as shown on the Grid 4 map in Appendix C.

Process Area Description

This component is used to weigh incoming and outgoing trucks, as required. The scale is in the administration area located at the Receiving/Incoming Materials Inspection Building.

Summary of Sampling for Component 22C

This component does not require sampling because the component is located outside of radiologically controlled areas. The contaminants expected for the component are of low toxicity, and the component exhibits little or no evidence of contamination.

D.9.4.31 Building 22D — Scale House and Weigh Scale

Component Description

Building 22D (Scale House and Weigh Scale) is a single-level structure consisting of a structural steel frame with transite siding panels on a reinforced poured concrete base that is approximately 12 × 52 ft and 10 ft high. The building is located west of the Refinery Plant (Component 2A), as shown on the Grid 25 map in Appendix C.

Process Area Description

This component was used to weigh incoming and outgoing trucks as needed to verify shipments. This scale has been replaced by the Truck Scale (Component 22C) located at the Receiving/Incoming Materials Inspection Building (Component 82), except for weighing sea/land containers before loading on trucks for shipment.

Summary of Sampling for Building 22D

This component does not require sampling because the results of the radiological surveys performed for the component do not exceed the criteria established for sampling.

D.9.4.32 Building 24A — Railroad Scale House

Component Description

Building 24A (Railroad Scale House) is a single-level, cement block building that is approximately 13 × 14 ft and 9 ft high. The building is located north of the Plant 1 Pad (Component 1A), as shown on the Grid 16 map in Appendix C.

Process Area Description

This component weighed incoming and outgoing railcars.

Summary of Sampling for Building 24A

This component does not require sampling because results of the radiological surveys performed for the component do not exceed the criteria established for sampling. Also, the component is insignificant in size.

D.9.4.33 Building 24B — Railroad Engine Garage

Component Description

Building 24B (Railroad Engine Garage) is located northeast of the Main Maintenance Building (Component 12A), as shown on the Grid 11 map in Appendix C. Building 24B is built over the end of a railroad spur track and provided a covered storage and maintenance area for the site's locomotive. It is a single-story structure, measuring approximately 27 × 45 ft and 16 ft high; it comprises cement block walls, a reinforced poured concrete floor, and a steel frame roof structure with transite panels. The floor has a concrete trench 4 × 40 ft and 5 ft deep that facilitated locomotive maintenance. The floor plans for the building are provided in Figure 24B-1.

Process Area Description

Building 24B consists of a single process area that was used for locomotive storage and maintenance. The building contained maintenance fluids (ethylene glycol and lubricating oils) when the building was in use. The trench allowed maintenance personnel access to the undercarriage of the locomotive. A sump is located at the bottom of the trench for liquid collection. The main floor is equipped with drains that feed into the sump. Although only ethylene glycol and oils are chemicals documented as having been used in Building 24B, effective maintenance of the oily areas of the engine probably also required use of detergents and/or cleaning solvents that were petroleum- or chlorinated-hydrocarbon-based.

Major Media Types per Process Area

The major media for Building 24B are concrete floors, masonry (cement block) walls, and a structural steel frame for roofing. The transite roof is also considered a major medium but is addressed as a separate supplemental sampling activity.

Summary of Available Radiological Data

Building 24B is routinely surveyed for removable alpha and total beta-gamma contamination. From 1990 through 1992, 117 removable alpha and 92 total beta-gamma surveys have been completed in the component. Hot spots for the major media identified from the data set are represented on Figure 24B-1. Any additional data collected from ongoing radiological surveys will be incorporated in the determination of the radiological hot spots before sampling activities begin. Also, radiological screening will be performed before sampling to determine or verify the hot spots.

For the concrete media, the hot spot was recorded at the east side of the north roll-up door. The total beta-gamma and removable alpha were recorded as 30,000 and 33 dpm,

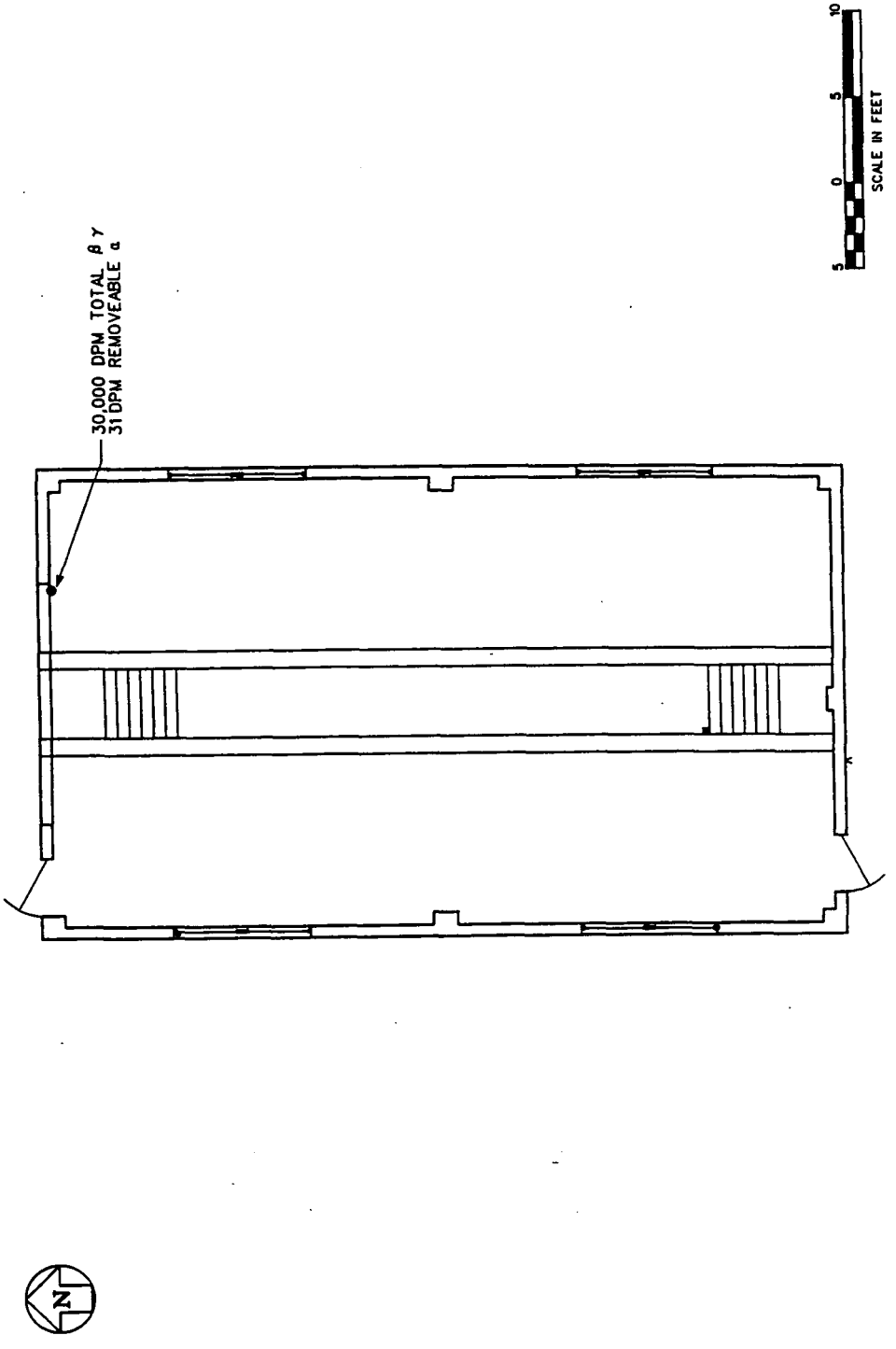

FIGURE 24B-1 Layout of Building 24B

respectively. For the masonry media, the hot spot was recorded for window sills on the west side of the building. The total beta-gamma and removable alpha were recorded as 3,000 and 50 dpm, respectively.

Summary of Sampling for Building 24B

One airborne particulate sample will be taken and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to delineate the final intrusive sample locations. Building 24B is considered a wet process area, so the concrete hot spot will be sampled by collection of a core.

Visual inspection of the garage revealed a dark stained area around the floor drain in the southeastern section of the building; if this area is not indicated as the concrete hot spot by the radiological survey, then a concrete chip sample will be collected. Table 24B-1 summarizes the planned sampling program for Building 24B.

TABLE 24B-1 Sample Types and Quantities for Building 24B

Sample Type	Engine Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	1	1
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.4.34 Building 25A — Chlorination Building

Component Description

Building 25A (Chlorination Building) is a single-level, cement block building that is approximately 6 × 8 ft and 8 ft high. The building is located in the sewage treatment plant area, as shown on the Grid 32 map in Appendix C.

Process Area Description

This component uses chlorine treatment on the sewage trickling filter effluent to destroy residual bacteria. The chlorination process has been replaced with an ultraviolet light disinfection system (Component 25D) and is only used as a backup for that system.

Summary of Sampling for Building 25A

This component does not require sampling because it is insignificant in size. The component exhibits little or no evidence of contamination.

D.9.4.35 Component 25B — Manhole 175 Effluent Line and Sampling Building

Component Description

Component 25B is a combination of three integrated entities that release the FEMP wastewater from the site into the Great Miami River. A single-level Sampling Building stands beside Manhole 175, as shown on the Grid 32 map in Appendix C. The building measures approximately 12 x 12 ft and 10 ft high, with manhole access to the 4,200-ft Effluent Line to the Great Miami River (Figure 25B-1). The Sampling Building consists of a structural steel frame on a poured concrete base and floor with noninsulated, corrugated metal siding and roofing (Type C building).

Process Area Description

Two processes have been identified for Component 25B as described below. The anticipated contaminants for Building 25B are summarized in Table A.3.

Manhole 175. Manhole 175 stands above the junction of the effluent from the Sewage Treatment Plant through the U.V. Disinfection Building (Component 25D) and the effluent from the Storm-Water Retention Basin (Compnent 18E). The associated Sampling Building pulls a representative sample from Manhole 175, on the basis of the flow rate of the combined stream, and monitors it according to NPDES regulations.

Effluent. The 16-in.-diameter, 4,200-ft-long Effluent Line, which begins at Manhole 175 and extends to the Great Miami River, is intended to handle all site liquid effluents. A series of manholes between the Sewage Treatment Plant and the river provide access to the line; however, Manhole 175 is the last access point to the Effluent Line that is located on the FEMP property.

Major Media Types per Process Area

Major media for the Manhole 175 process area consist of (1) concrete for the manhole and (2) a poured concrete base and floor and a structural steel frame for the Sampling Building. The Effluent Line does not contain any major media as defined by this project.

Summary of Available Radiological Data

Component 25B has been surveyed for total beta-gamma contamination. As indicated in Table A.4.0, only one total beta-gamma survey measurement was performed in the Sampling Building from 1989 through 1992. This measurement was below 1,000 dpm.

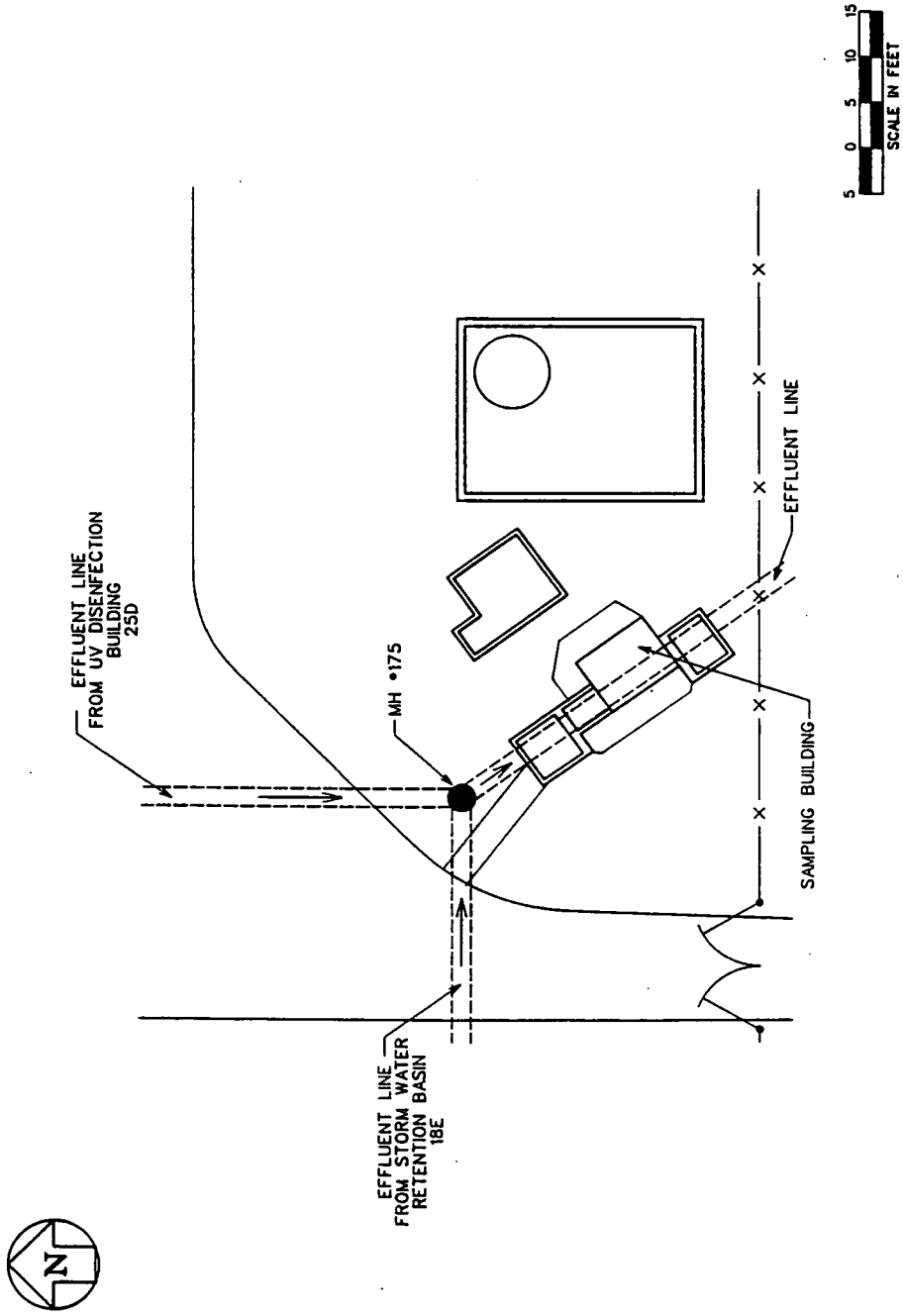

FIGURE 25B-1 Layout of Component 25B

D.9.4.36 Building 25C — Sewage Lift Station Building

Component Description

Building 25C (Sewage Lift Station Building) is a single-level, cement block building that is approximately 15 × 20 ft and 9 ft high. The building is located in the sewage treatment plant area, as shown on the Grid 32 map in Appendix C.

Process Area Description

This component pumps sanitary wastes from gravity flow systems around the site to the sewage plant for treatment.

Summary of Sampling for Building 25C

This component does not require sampling because results of the radiological surveys performed for the component do not exceed the criteria established for sampling. Also, the component is insignificant in size.

D.9.4.37 Building 25D — U.V. Disinfection Building

Component Description

Building 25D (U.V. Disinfection Building) is a single-level, poured concrete building that is approximately 13 × 15 ft and 9 ft high. The building is located in the sewage treatment plant area, as shown on the Grid 32 map in Appendix C.

Process Area Description

This component uses U.V. Disinfection to treat sewage trickling filter effluent to destroy residual bacteria. This treatment is the primary unit for treatment of the filter effluent.

Summary of Sampling for Building 25D

This component does not require sampling because results of the radiological surveys performed for the component do not exceed the criteria established for sampling. Also, the component is insignificant in size.

D.9.4.38 Building 25E — Digester and Control Building

Component Description

Building 25E (Digester and Control Building) is a multilevel building shown on the Grid 32 map in Appendix C and measuring approximately 61 x 40 ft and 16 ft high. Building 25E consists of cement block construction on reinforced poured concrete footers, flat reinforced poured concrete roofs, glass windows (Type B building), and a poured concrete upper level. The floor plan for the building is shown in Figure 25E-1.

Process Area Description

Building 25E houses a 27,000-gal water tank, the anaerobic bacterial digester for site sewage treatment, and the digester control room. Anticipated contaminants are summarized in Table A.3. The component is treated as a single process area.

Major Media Types per Process Area

The major media for Building 25E are the concrete base, the cement blocks, and the steel of the digester.

Summary of Available Radiological Data

Building 25E is routinely surveyed for removable alpha and beta-gamma contamination. Results from the most recent surveys are summarized in Tables A.4.0 and A.4.1 and are the basis for identifying radiological hot spots. As indicated, 11 removable alpha and 11 total beta-gamma radiological survey measurements were performed in Building 25E from 1989 through 1991. The data have been assembled, and the hot spot for the concrete medium is identified in Figure 25E-1. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys. The highest measured removable alpha and total beta-gamma readings for the concrete medium were determined to be 57 and 26,000 dpm, respectively.

Summary of Sampling for Building 25E

One airborne particulate sample will be taken in the building and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive sampling for the concrete and cement block media will be performed at the locations identified as the radiological hot spots shown in Figure 25E-1. Building 25E

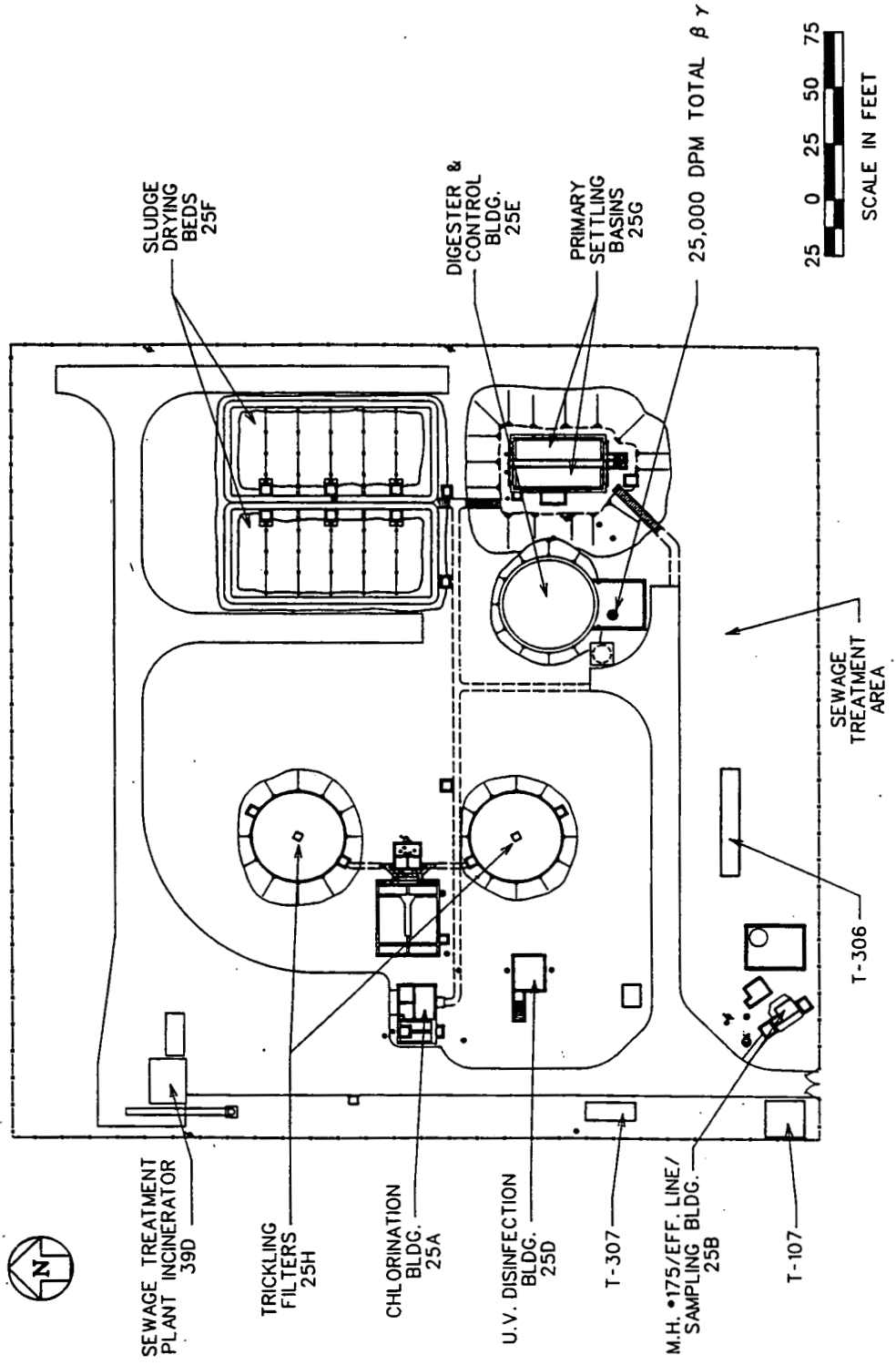

FIGURE 25E-1 Layout of Building 25E

is considered a wet process area; therefore, a concrete core will be taken. Additionally, a steel scraping will be taken from the digester. Table 25E-1 summarizes the sampling program planned for Building 25E.

TABLE 25-1 Sample Types and Quantities for Building 25E

Sample Type	Digester	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	3	3
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	1	1
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.4.39 Building 26A — Pump House-HP Fire Protection

Component Description

Building 26A (Pump House-HP Fire Protection) is a single-level, cement block building that is approximately 26 × 50 ft and 11 ft high. This building also includes a steel tank, 35 ft in diameter and 22 ft high. The building is located west of the Refinery Plant (Component 2A), as shown on the Grid 25 map in Appendix C.

Process Area Description

This component houses three pumps to supply water from the Holding Tank (Component 26B) for on-site fire fighting.

Summary of Sampling for Building 26A

This component does not require sampling. The component exhibits little or no evidence of contamination, results of the radiological surveys for the component do not exceed the criteria established for sampling, and anticipated contaminants are of low toxicity.

D.9.4.40 Building 26C — Main Electrical Strainer House

Component Description

Building 26C (Main Electrical Strainer House) is a cinder block building with a partial concrete floor and a transite roof, measuring approximately 10 × 12 ft and 10 ft high (Type B building). The component contains the fire protection main electrical deluge sprinkler values for the dry sprinkler system around the transformers in the Main Electrical Station (Component 16A). The building is shown on the Grid 7 map in Appendix C and on Figure 26C-1.

Process Area Description

Building 26C contains the control valves for the main electrical deluge fire protection system, which provides fire sprinkler protection for the Main Electrical Station. The building has a belowground water storage open surface tank. The tank is visible from the inside of the building through the partial metal floor grating. The only anticipated contaminant for the component that is listed in Table A.3 is halon, because of the presence of fire protection equipment.

Major Media Types per Process Area

The major media identified for Building 26C are the concrete floor and the cinder block walls. The transite roof is also considered a major medium but is addressed as a separate supplemental sampling activity.

Summary of Available Radiological Data

Radiological surveys have not been conducted on or around Building 26C because of the belief that no local radiological sources exist. Data will be taken and assessed before sampling to determine the location of the radiological hot spots or to verify nondetectable levels.

Summary of Sampling for Building 26C

One airborne particulate sample will be collected in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples,. will be performed and assessed in the field to further detail a final intrusive sampling location. The two media within the building are the concrete floor and the cinder block walls; one masonry sample will be collected from the cinder block walls, and one

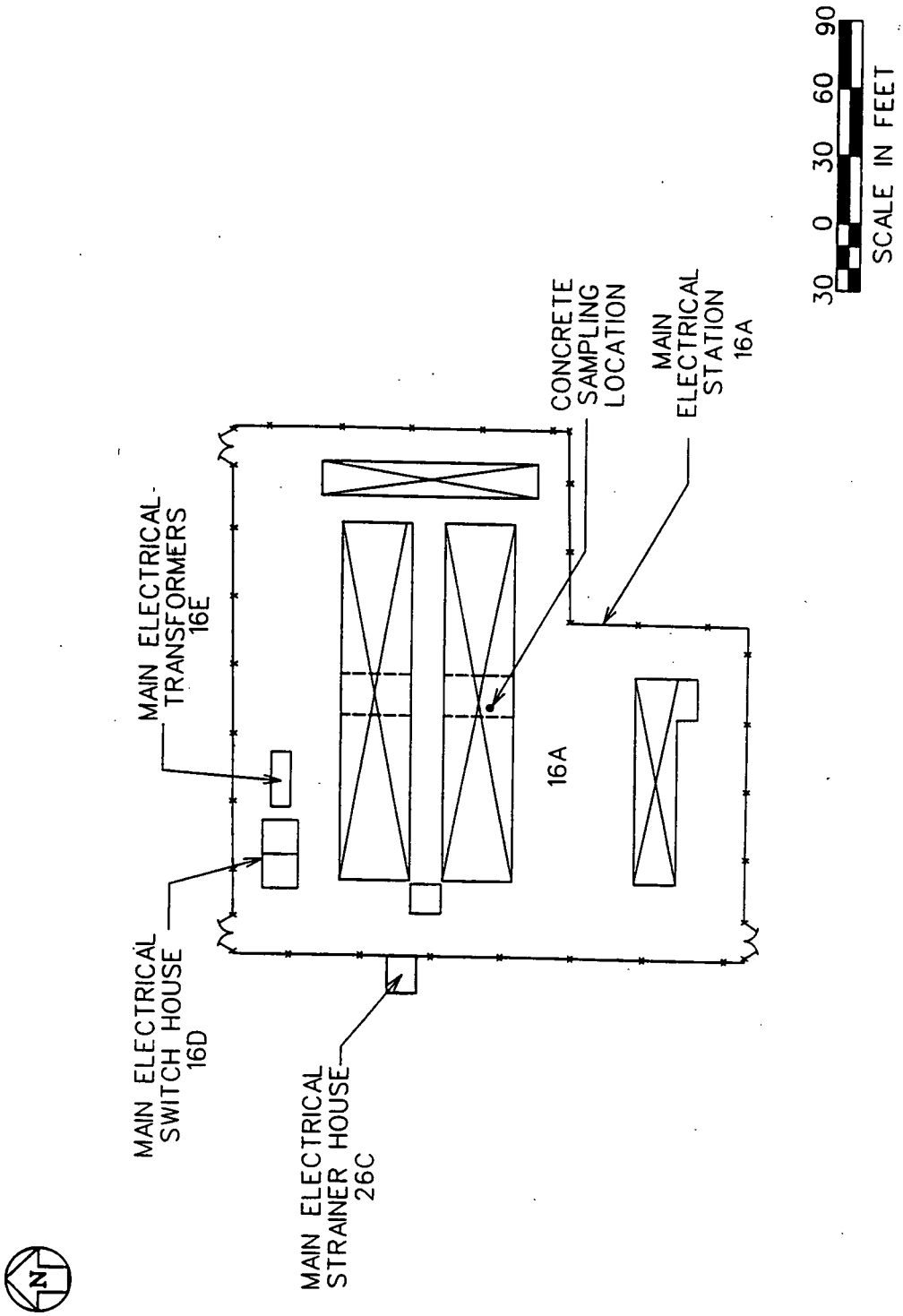

FIGURE 26C-1 Layout of Building 26C

concrete core sample will be collected from the floor. Visual inspection of the component determined that one supplemental sample will be collected from the liquid in the belowground tank. Table 26C-1 summarizes the planned sampling program for Building 26C.

TABLE 26C-1 Sample Types and Quantities for Building 26C

Sample Type	Electrical Deluge System	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	1	1
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	1	1
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.4.41 Building 28D — Guard Post (West End of 2nd Street)

Component Description

Building 28D, Guard Post, is a square building located at the west end of 2nd Street, as shown on the Grid 24 map of Appendix C. The dimensions of the building are 15 × 15 ft. Building 28D is constructed of wood framing and siding (Type D building).

Process Area Description

Historically, Building 28D was occupied by guards who used the building as a checkpoint area to provide access control to the K-65 Silo and waste pit areas. Currently, the building maintains radiological monitoring equipment for controlling contamination upon exiting the area. The anticipated contaminants from the checkpoint process area are summarized in Table A.3.

Major Media Types per Process Area

Building 28D is constructed of wood. Wood is not considered a major medium because limited treatment options exist.

Summary of Available Radiological Data

Radiological data from the 1989 through 1992 surveys do not exist for Building 28D.

D.9.4.42 Building 38A — Propane Storage

Component Description

Building 38A (Propane Storage) is a single-level cement block building that is approximately 23 × 33 ft and 10 ft high. This building also includes two steel tanks for propane storage and is associated with the adjacent Cylinder Filling Station (Component 38B). The building is located north of the Main Maintenance Building (Component 12A), as shown on the Grid 10 map in Appendix C.

Process Area Description

This facility stores propane in two steel tanks for use in site vehicles. The building contains monitoring and vaporization equipment and equipment that originally allowed distribution of propane gas to several other locations on-site.

Summary of Sampling for Building 38A

This component does not require sampling. The component exhibits little or no evidence of contamination, results of the radiological surveys for the component do not exceed the criteria established for sampling, and anticipated contaminants are of low toxicity.

D.9.4.43 Component 39C — Incinerator Sprinkler Riser House

Component Description

Component 39C (Incinerator Sprinkler Riser House) is a single-level, cement block structure that is approximately 6 × 8 ft and 8 ft high. The component is located south of the Incinerator Building (Building 39A), as shown on the Grid 19 map in Appendix C.

Process Area Description

This component originally supplied fire protection for the nearby wooden cooling tower but now supplies water for fire protection to the incinerator building (Component 39A).

Summary of Sampling for Component 39C

This component does not require sampling because it exhibits little or no evidence of contamination and is of insignificant size. Results of the radiological surveys for the component do not exceed the criteria established for sampling, and anticipated contaminants are of low toxicity.

D.9.4.44 Building 45B — Utility Shed East of Rust Trailers

Component Description

Building 45B (Utility Shed East of Rust Trailers) is a single-level, wood-framed shed that is approximately 15 × 15 ft and 10 ft high. The shed is located north of the Rust Engineering Building (Component 45A), as shown on the Grid 25 map in Appendix C.

Process Area Description

This component currently stores small construction equipment and office furniture.

Summary of Sampling for Building 45B

This component does not require sampling because it is insignificant in size. The contaminants expected for the component are of low toxicity and the component exhibits little or no evidence of contamination.

D.9.4.45 Building 46 — Heavy Equipment Building

Component Description

Building 46 (Heavy Equipment Building) is a single-story building, measuring approximately 220 x 59 ft. It is located near the Engine House/Garage (Component 31A), as shown on the Grid 7 map in Appendix C. It is a pre-engineered facility consisting of a structural steel frame on a reinforced poured concrete base, sloped steel roof panels, steel sliding panels, and glass windows (Type C building). Building 46 is divided into three separate sections; Figure 46-1 shows the floor plan of the building.

Process Area Description

Building 46 stores forklifts, trucks, and other heavy equipment associated with plant operations. The building is considered a single process area. Anticipated contaminants for Building 46 are summarized in Table A.3.0.

Major Media Types per Process Area

The major media identified for Building 46 are structural steel and concrete.

Summary of Available Radiological Data

Building 46 is routinely surveyed for removable alpha and total beta-gamma radiological contamination. The most recent survey results summarized in Tables A.4.0 and A.4.1 are the basis for identifying hot spots. From 1989 through 1992, 218 removable alpha and 201 total beta-gamma survey measurements were performed in Building 46. The data have been assembled, and the hot spot for the concrete floor is identified in Figure 46-1. The data will be reassessed before sampling to include data from ongoing radiological surveys. The highest removable alpha and total beta-gamma readings for the concrete floor media were determined to be 62 and 100,000 dpm, respectively. All 17 removable alpha surveys performed in 1992 reported less than the MDA.

Summary of Sampling for Component 46

One airborne particulate sample will be taken and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive sampling for the concrete medium will be performed at the radiological hot spot. Because of the potential for oil and solvent spills, the process in Building 46 is

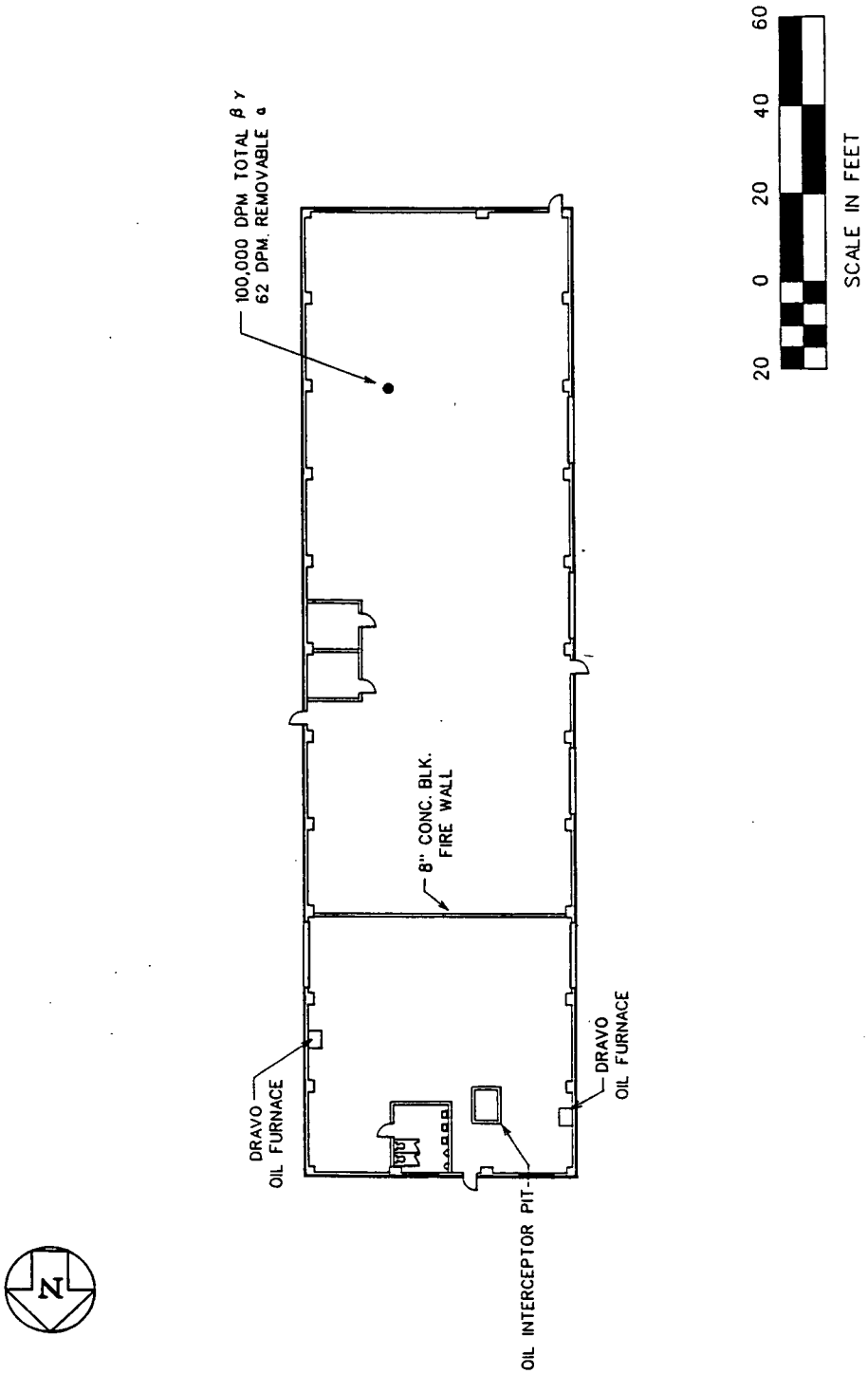

FIGURE 46-1 Layout of Building 46

considered wet; therefore, a concrete core will be taken at the hot spot. Visual inspection of the component identified no supplemental samples. Table 46-1 summarizes the planned sampling program for Building 46.

TABLE 46-1 Sample Types and Quantities for Building 46

Sample Type	Heavy Equipment Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.4.46 Building 51 — Six to Four Reduction Facility 2

Component Description

Building 51 (Six to Four Reduction Facility 2) is a single-level, pre-engineered building consisting of a structural steel frame on a reinforced poured concrete base that is approximately 165 x 244 ft and 30 ft high. The building is located southwest of the Pilot Plant Wet Side (Component 13A), as shown on the Grid 26 map in Appendix C.

Process Area Description

The Six to Four Reduction Facility 2 was partially constructed in 1986 and 1987 for uranium tetrafluoride production. The construction of the building was completed, but the process equipment was not fully installed. This facility currently stores unused equipment but will be converted for use as an advanced wastewater treatment facility for the site.

Summary of Sampling for Building 51

This component does not require sampling. The component has not been placed into service following recent completion of construction and is located outside of radiologically controlled areas. Results of the radiological surveys performed for the component do not exceed the criteria established for sampling, and the component exhibits little or no evidence of contamination.

D.9.4.47 Building 54C — Pilot Plant Dissociator Shelter

Component Description

Building 54C (Pilot Plant Dissociator Shelter), a pre-engineered single-story structure measuring 20 × 48 ft and 19 ft high, is located at the northwestern corner of the Six to Four Reduction Facility 1 (Component 54A) just south of 1st Street. Building 54C is constructed of a structural steel frame supported on a reinforced poured concrete base with a reinforced concrete floor, corrugated aluminum siding, and metal roof (Type C building). The east side of the building is open to the environment and is equipped with an aluminum canopy that shelters the open east side from weather. Miscellaneous equipment is currently staged at the east entrance of the building. Building 54C is shown on the Grid 26 map in Appendix C, and the layout of the building is presented in Figure 54C-1.

Process Area Description

Building 54C contains three ammonia dissociators that were used to catalytically dissociate or "crack" anhydrous ammonia to hydrogen and nitrogen for use in the Pilot Plant Six to Four Reduction Facility 1. Liquid anhydrous ammonia was first heated to vaporization. The vaporized ammonia was then passed over an electrically heated nickel catalyst bed at a controlled temperature, where it was "cracked" to hydrogen and nitrogen. The hot dissociated ammonia (e.g., hydrogen and nitrogen gas) was then passed through a heat exchanger to heat incoming liquid ammonia entering the ammonia dissociators. The dissociated ammonia was then passed through a water-cooled heat exchanger, where residual ammonia and moisture were absorbed onto one of two molecular sieves and then fed to one of two reaction vessels located in the UF_6 to UF_4 reduction process area.

Major Media Types per Process Area

The structural steel frame and concrete floor are considered the major media of the ammonia dissociation process that was operated in Building 54C.

Summary of Available Radiological Data

No recent radiological data are available for Building 54C. Data from ongoing radiological surveys will be assessed before field sampling.

Summary of Sampling for Building 54C

One airborne particulate sample will be taken in the building and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1.

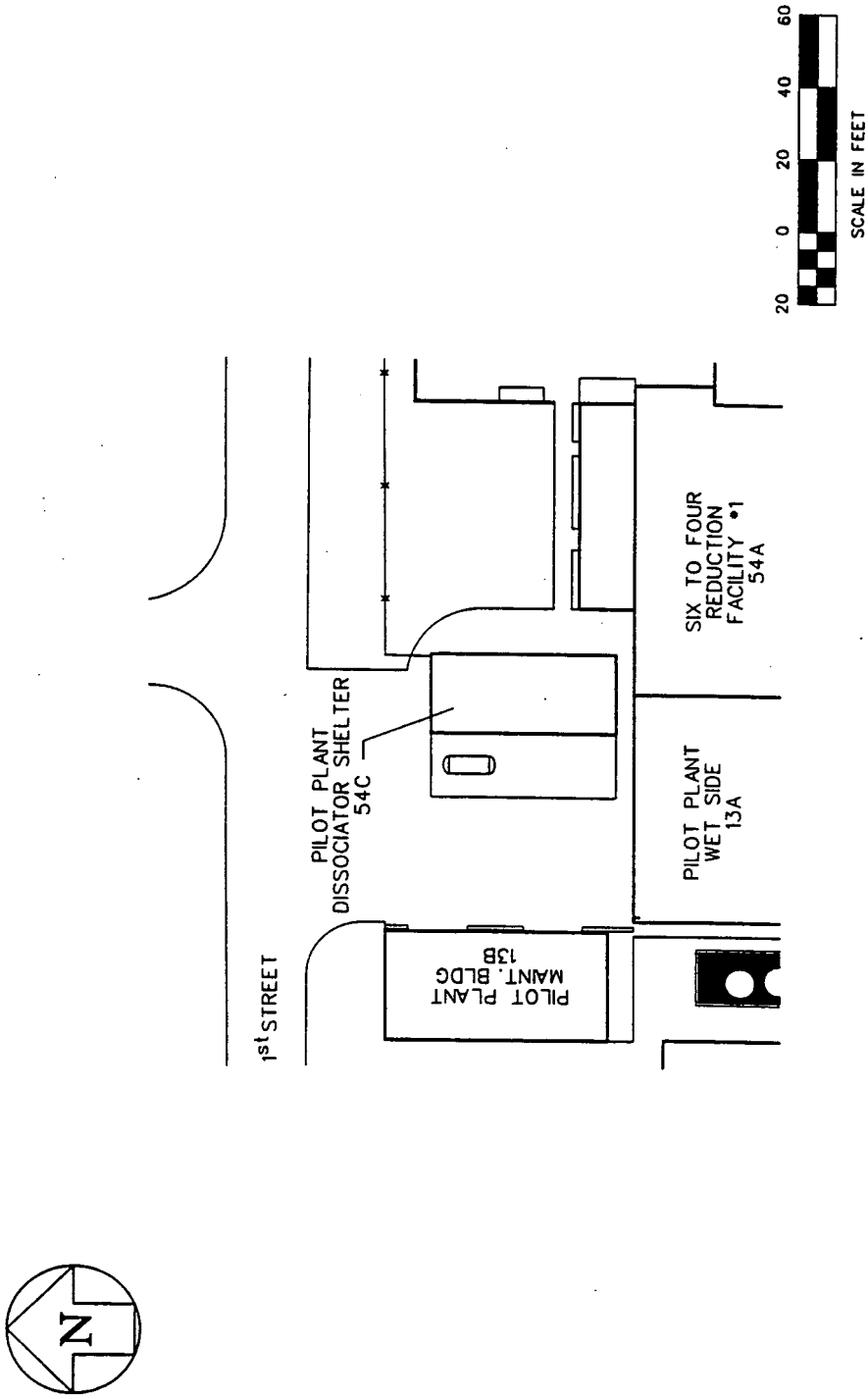

FIGURE 54C-1 Layout of Building 54C

Nonintrusive measurements, including exposure rate measurements, XRF surveys, radiological surveys, and swipe samples, will be performed and assessed in the field to define final intrusive sampling locations. The two media in the building are the structural steel frame and concrete floor. Building 54C is considered a dry process area; therefore, intrusive samples will consist of a concrete chip sample and structural steel surface scraping. If analysis of radiological swipe samples detects elevated levels of removable contamination as outlined in Protocol 1, then the swipe samples will be combined over the component for laboratory analysis. Visual inspection of the component identified no supplemental samples, although supplemental samples may be identified by the field team during sampling activities. Table 54C-1 summarizes the planned sampling program for Building 54C.

TABLE 54C-1 Sample Types and Quantities for Building 54C

Sample Type	Ammonia Dissociation	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.4.48 Building 78 — D and D Building (Under Construction)

Component Description

Building 78 (D and D Building) is a multilevel, cement block building that is approximately 80 × 100 ft and 21 ft high. The building is located north of the Special Products Plant (Component 9A), as shown on the Grid 2 map in Appendix C.

Process Area Description

This facility is currently under construction. The facility is intended to replace the current decontamination facility (Component 69).

Summary of Sampling for Building 78

This component does not require sampling because it has not been placed into service and exhibits little or no evidence of contamination.

D.9.4.49 Building 82 — Receiving/Incoming Materials Inspection

Component Description

Building 82 (Receiving/Incoming Materials Inspection) is a single-level, cement block building that is approximately 100 × 100 ft and 17 ft high. The building is located west of the Metals Fabrication Plant (Component 6A), as shown on the Grid 4 map in Appendix C.

Process Area Description

This facility was constructed to receive nonradioactive equipment and supplies on-site. The building is located outside of the radiologically controlled zone in the administrative area.

Summary of Sampling for Building 82

This component does not require sampling. The component is located outside of radiologically controlled areas, and results of the radiological surveys performed for the component do not exceed the criteria established for sampling. The contaminants expected for the component are of low toxicity, and the component exhibits little or no evidence of contamination.

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D.9.5 CONTAINERS AND CONTAINERIZED MATERIAL — ABOVEGROUND

D.9.5.1 Component 1C — Plant 1 Ore Silos

Component Description

Component 1C (Plant 1 Ore Silos) is a multilevel platform structure located south of the Preparation Plant (Component 1A) and east of A Street (Grid 27 map in Appendix C). It has a structural steel frame and support piers and a concrete pad for a base. The structure supports two groups of silos, including six concrete and eight tile silos. The open-steel frame structure rises over 80 ft high, covering an "L"-shaped area approximately 54 × 115 ft. A floor plan for the concrete base of the structure is provided in Figure 1C-1. Component 1C was temporarily used for overflow storage of cold metal oxides. The silos have not been used since 1962.

Process Area Description

Component 1C has one dry process area, milled ore storage. The silos were originally intended to store milled uranium ores for processing in the Ore Refinery Plant (Component 2A). Instead, the silos were used to temporarily store dried extraction raffinates with a low radium concentration (also referred to as "cold" metal oxides) from the raffinate treatment systems. This material is similar to material stored in Silo 3 of Operable Unit 4. Herculite dikes were placed under the silos in 1991 as a spill prevention measure for the deteriorating silos. Anticipated contaminants from this process are summarized in Table A.3.

Major Media Types per Process Area

Component 1C has a structural steel frame and support piers. A concrete base supports the silos. The first level has transite panels that enclose a control room. Transite panels also overhang to form a walkway on the south side of the structure. The structural steel, transite, and concrete are considered the major media for the component. However, because the transite siding is addressed as a separate supplemental sampling activity it is not considered a major medium in Component 1C.

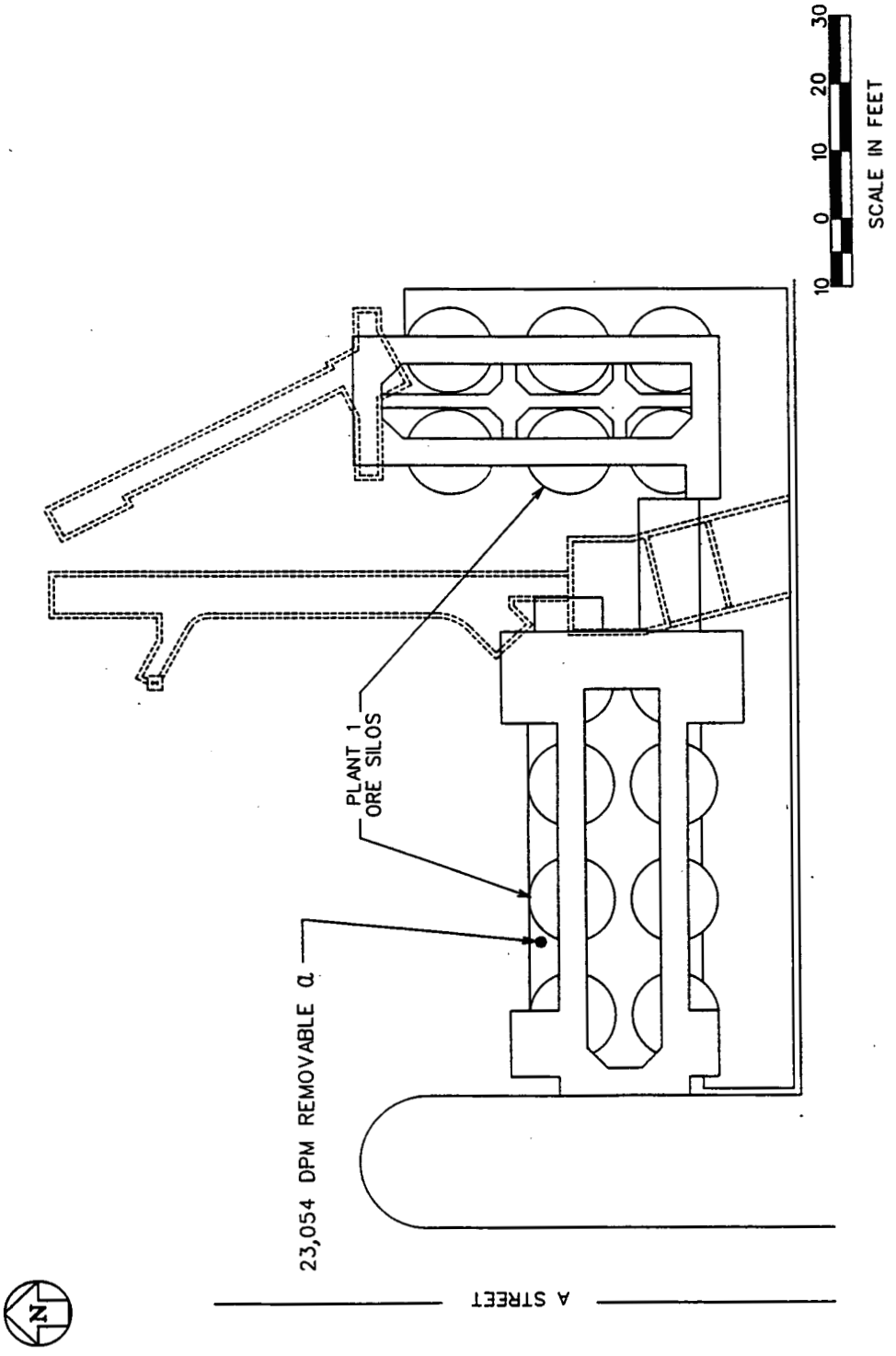


FIGURE 1C-1 Layout of Component 1C

Summary of Available Radiological Data

Component 1C is routinely sampled for removable alpha contamination. However, no total beta-gamma survey measurements from 1989 to 1992 exist for the component. Results from the removable alpha surveys performed in 1989 through 1992 are summarized in Tables A.4.0 and A.4.1. A total of 74 removable alpha survey measurements were collected from the concrete base under the steel silo structure. The data were assembled to determine the hot spot identified in Figure 1C-1. Component 1C is currently undergoing demolition as part of a removal action. The component, excluding the concrete base, will not be physically available for characterization within the OU3 RI/FS Field Characterization Program. Therefore, only data for the concrete base were considered. The highest removable alpha readings for the concrete base medium were concentrated on the northern half of the base. The highest removable alpha reading was 23,054 dpm.

Summary of Sampling for Component 1C

One air sample will be taken in the component and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, radiological surveys, and swipe samples, will be performed and assessed in the field to further detail the final intrusive sampling location. A concrete chip will be taken at the location identified by the radiological hot spot on the base for the concrete medium. Also, liquid supplemental samples will be collected from the herculite dikes and composited. Table 1C-1 summarizes the planned sampling program for Component 1C.

TABLE 1C-1 Sample Types and Quantities for Component 1C

Sample Type	Milled Ore Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	1	1
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.5.2 Component 2E — NFS Storage and Pump House

Component Description

Component 2E (NFS Storage and Pump House) consists of a pump house and four outside tanks. The pump house is a cinder block building with a concrete floor and ceiling (Type B building) that measures approximately 14 × 16 ft and 9 ft high. The tank area is approximately 51 × 61 ft, with a concrete dike where the four tanks are mounted. The building is located south of the Preparation Plant (Component 1A) and the Plant 1 Ore Silos (Component 1C), as shown on the Grid 27 map in Appendix C. Figure 2E-1 illustrates the layout of the component.

Process Area Description

Component 2E is the Nuclear Fuel Services (NFS) storage area where uranyl nitrate (UNH) was received from other DOE sites by tank truck and was stored in the four horizontally mounted tanks. From the storage tanks, the UNH was pumped to the enriched calciner located in Building 2A. Currently, the tanks store UNH that was produced from digestion processes on-site. The anticipated potential contaminants for the component are listed in Table A.3.

Major Media Types per Process Area

The major media identified for Component 2E are the cinder block walls and the concrete floor and ceiling in the pump house. Other major media include the concrete in the diked area and the structural steel that supports the tanks and an elevated walkway on the south side of the diked area.

Summary of Available Radiological Data

Component 2E has been surveyed for removable alpha contamination but not for total beta-gamma radiological contamination. The survey was conducted in the pump house only; no radiological surveys have been conducted in the tank area. Results from the survey indicated that four removable alpha measurements were performed, with the highest removable alpha measurement recorded at 242 dpm. The removable alpha hot spot for the concrete floor is identified in Figure 2E-1. Additional data will be taken and assessed before sampling to determine the radiological hot spots or to verify the existing data.

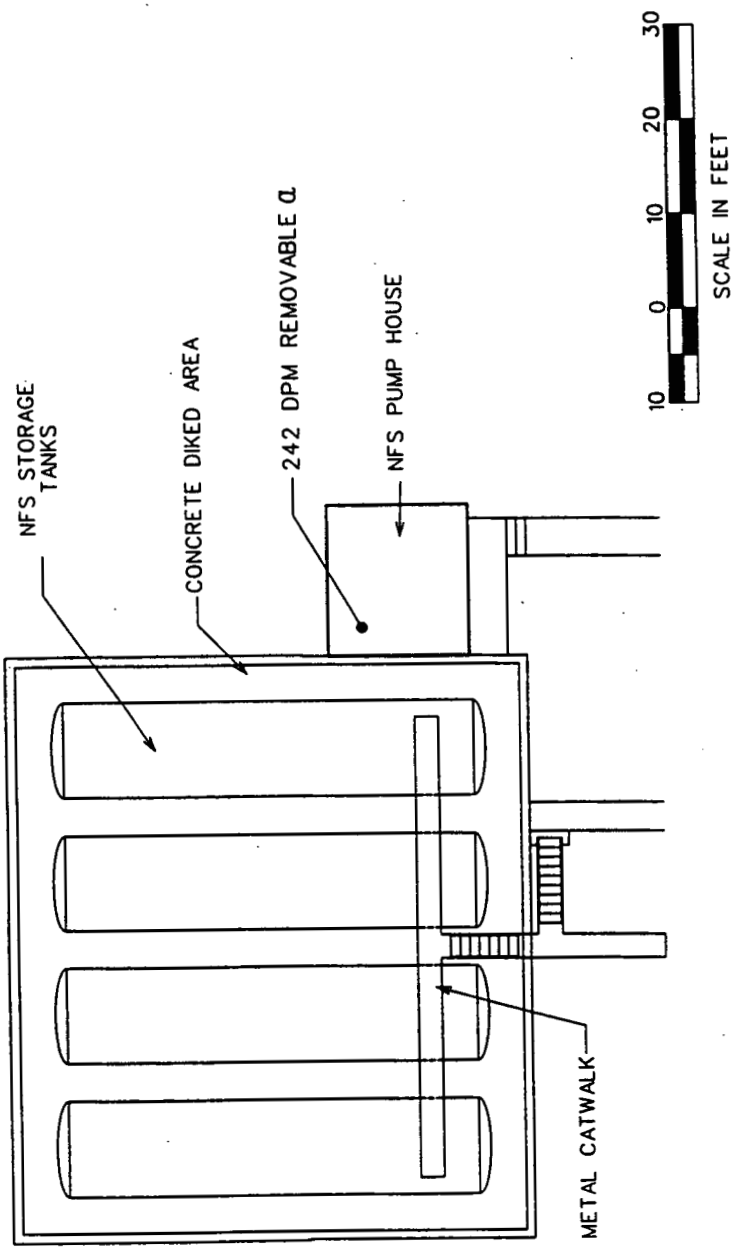


FIGURE 2E-1 Layout of Component 2E

Summary of Sampling for Component 2E

One airborne particulate sample will be collected in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail a final intrusive sampling location. The three major media within the component are the cinder block walls, concrete floor and ceiling, and the structural steel. One masonry sample will be collected from the cinder block walls. One concrete core sample will be collected from the hot spot from the floor or dike, and a surface scraping will be taken from the structural steel supports. Visual inspection of the component identified one supplemental sample of the liquid material in the dike and sump areas. Table 2E-1 summarizes the planned sampling program for Component 2E.

TABLE 2E-1 Sample Types and Quantities for Component 2E

Sample Type	NFS Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	3	3
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	1	1
Steel surface scraping	1	1
Supplemental		
Liquid sample	1	1
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.5.3 Component 3D — NAR Towers

Component Description

Component 3D (Nitric Acid Recovery Towers or NAR Towers) is a six-level open steel supported structure that is approximately 46 × 60 ft and 60 ft high. The ground floor of the structure is contained in a concrete diked area that is approximately 70 × 108 ft. The concrete dike is not covered with acid brick. The upper five levels have steel plating as flooring. The building is located north of the NAR Control House (Component 3C) and the Ozone Building (Component 3B), as shown on the Grid 19 map in Appendix C. The floor plans are illustrated in Figures 3D-1 through 3D-6.

Process Area Description

Component 3D was part of a closed-loop system designed to recover nitric acid. The system consisted of two absorber towers in which nitrogen oxide fumes were drawn through a series of bubble cap trays. The fumes were collected from the Metal Dissolver (Component 2D) and from the digestion and denitration processes in the Ore Refinery Plant (Component 2A). Nitric acid was recovered for reuse in the Ore Refinery Plant. The system was shut down in 1988. The anticipated contaminants for the component are listed in Table A.3.

Major Media Types per Process Area

The major media identified for Component 3D are the concrete pad and dike and the structural steel.

Summary of Available Radiological Data

Component 3D is routinely surveyed for removable alpha and total beta-gamma contamination. Results of these surveys are summarized in Tables A.4.0 and A.4.1 and are the basis for identifying hot spots. In 1992, 13 removable alpha measurements were performed, with an average value of 241 dpm. In 1991, 9 total beta-gamma measurements were performed, with an average of 3,500 dpm and a highest measurement of 10,500 dpm. The data have been assembled, and the hot spot for the concrete floor is identified in Figure 3D-1. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys.

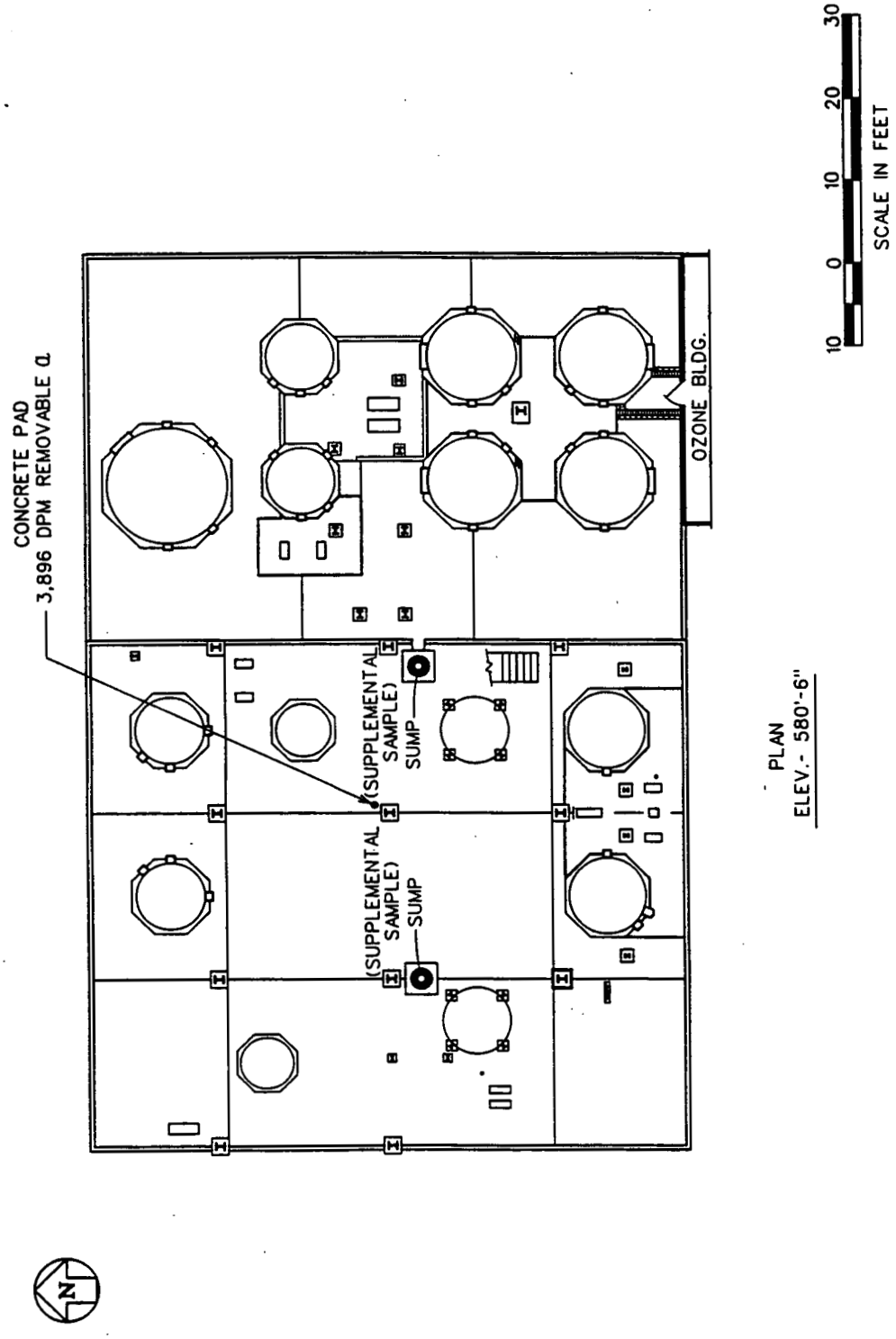


FIGURE 3D-1 Layout of Component 3D — First Floor

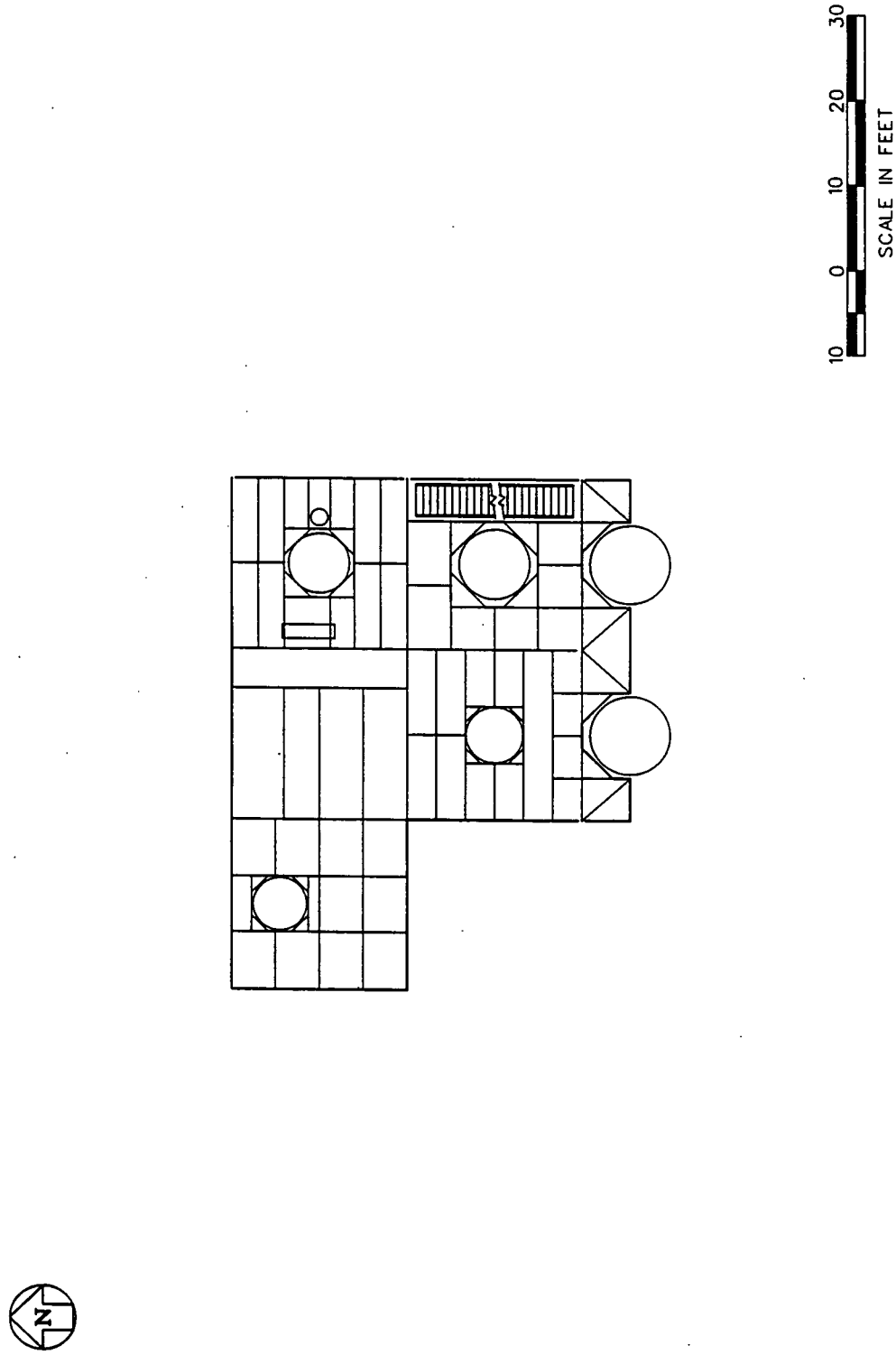


FIGURE 3D-2 Layout of Component 3D — Second Floor

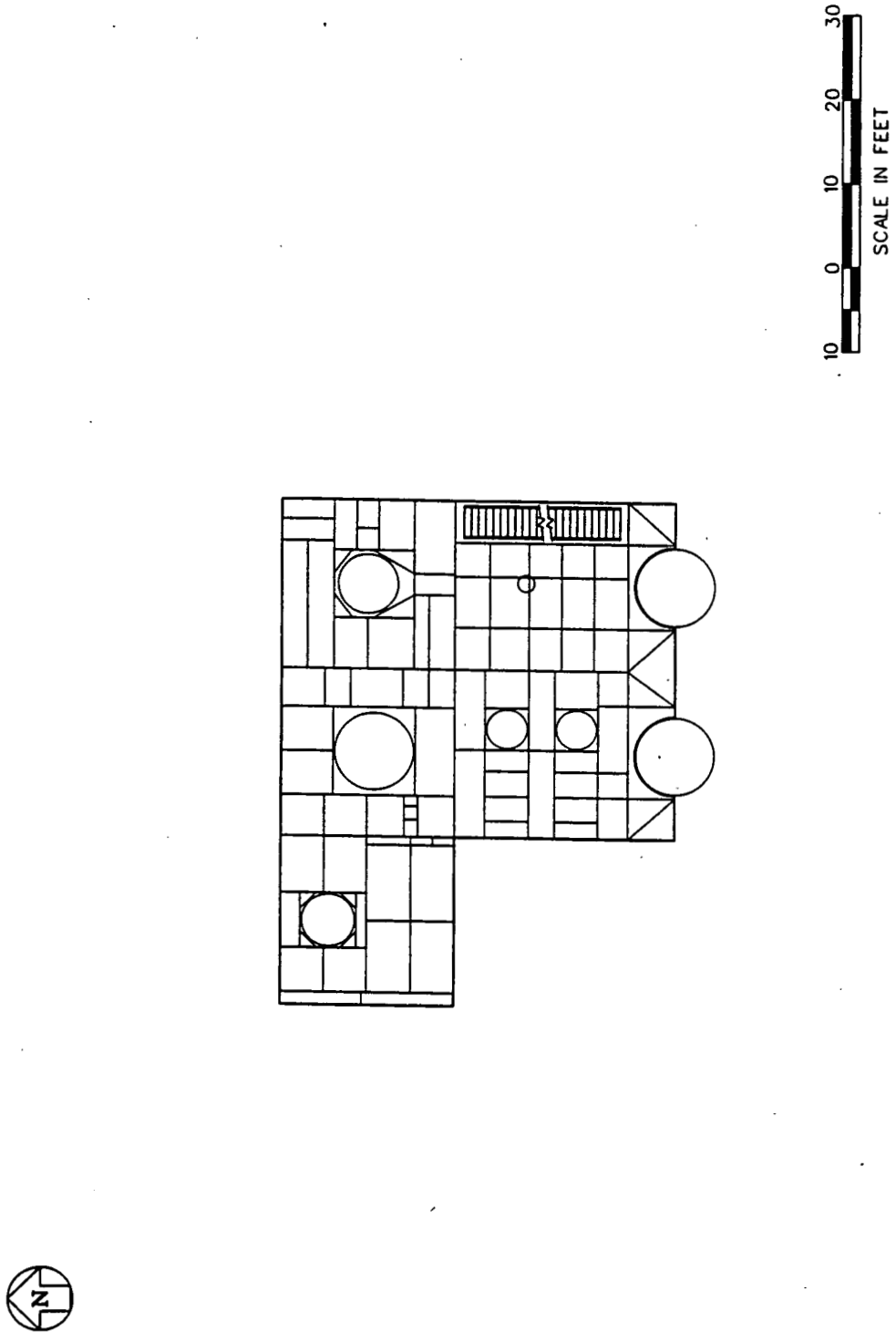
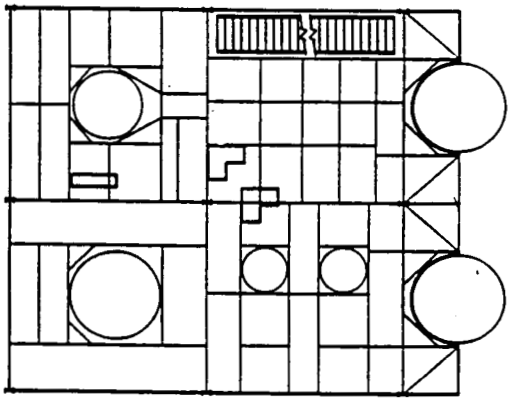


FIGURE 3D-3 Layout of Component 3D — Third Floor



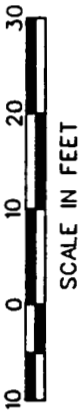


FIGURE 3D-4 Layout of Component 3D — Fourth Floor

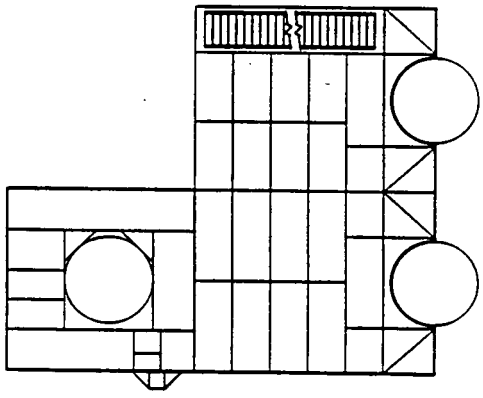
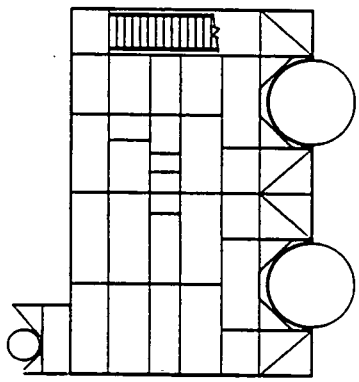


FIGURE 3D-5 Layout of Component 3D — Fifth Floor



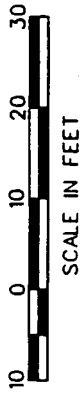


FIGURE 3D-6 Layout of Component 3D — Sixth Floor

Summary of Sampling for Component 3D

One airborne particulate sample will be collected in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail a final intrusive sampling location. The two major media within the component are the concrete floor and dike and the structural steel. A concrete core will be collected from the floor or dike because of the presence of nitric acid. A surface scraping will be taken from the structural steel supports. Visual inspection of the component identified two sumps in the diked area; one composite supplemental sample is to be collected from the two sumps. Table 3D-1 summarizes the planned sampling program for Component 3D.

TABLE 3D-1 Sample Types and Quantities for Component 3D

Sample Type	Nitric Acid Recovery	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	1	1
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.5.4 Component 3F — Harshaw Digestion Fume Recovery

Component Description

Component 3F (Harshaw Digestion Fume Recovery) is a multilevel open-steel structure that measures approximately 19 x 35 ft and 35 ft high. Under the structure is a concrete dike covered with acid brick. As shown on the Grid 19 map in Appendix C, Component 3F is located east of the Refrigeration Building (Component 3G). The floor plans are shown in Figures 3F-1 and 3F-2.

Process Area Description

Component 3F was installed in 1957 to relieve the fume load of the NAR Towers (Component 3D). Nitrogen oxide fumes from digestion processes in and around the Ore Refinery Plant (Component 2A) were collected to produce nitric acid. The process was shut down in 1960; since that time, the structure has not been used. The anticipated contaminants for the building are listed in Table A.3.

Major Media Types per Process Area

The major media identified for Component 3F are the concrete floor and dike, acid brick, and the structural steel.

Summary of Available Radiological Data

Component 3F is routinely surveyed for removable alpha and total beta-gamma contamination. Results summarized in Table A.4-1 are the basis for identifying hot spots. In 1992, 13 removable alpha measurements were performed, with an average value of 241 dpm. In 1991, nine total beta-gamma measurements were performed, with an average of 3,500 dpm and a highest measurement of 10,500 dpm. The data have been assembled, and the hot spots for the concrete floor and the acid brick are identified in Figure 3F-1. Data will be reassessed before sampling to include those data gathered from future radiological surveys.

The hot spot for the concrete is between two of the towers and measures 10,500 dpm total beta-gamma contamination. For the acid brick, the highest total beta-gamma survey reading was 1,500 dpm; the corresponding hot spot is near the pump in the southwestern corner of the dike.

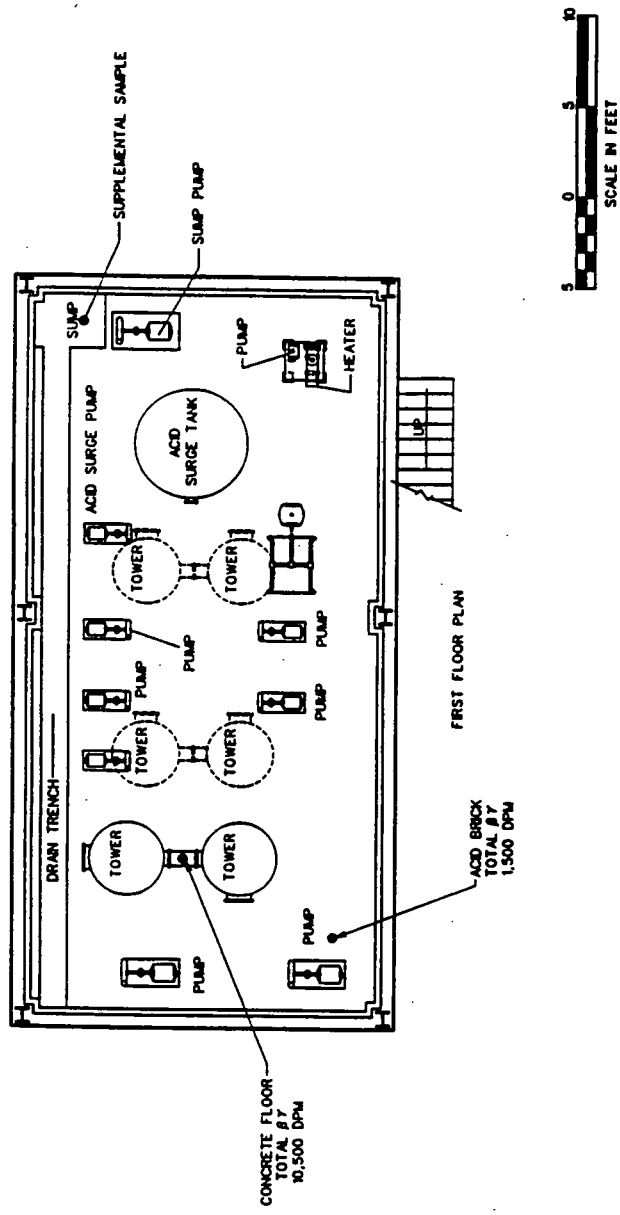


FIGURE 3F-1 Layout of Component 3F — First Floor

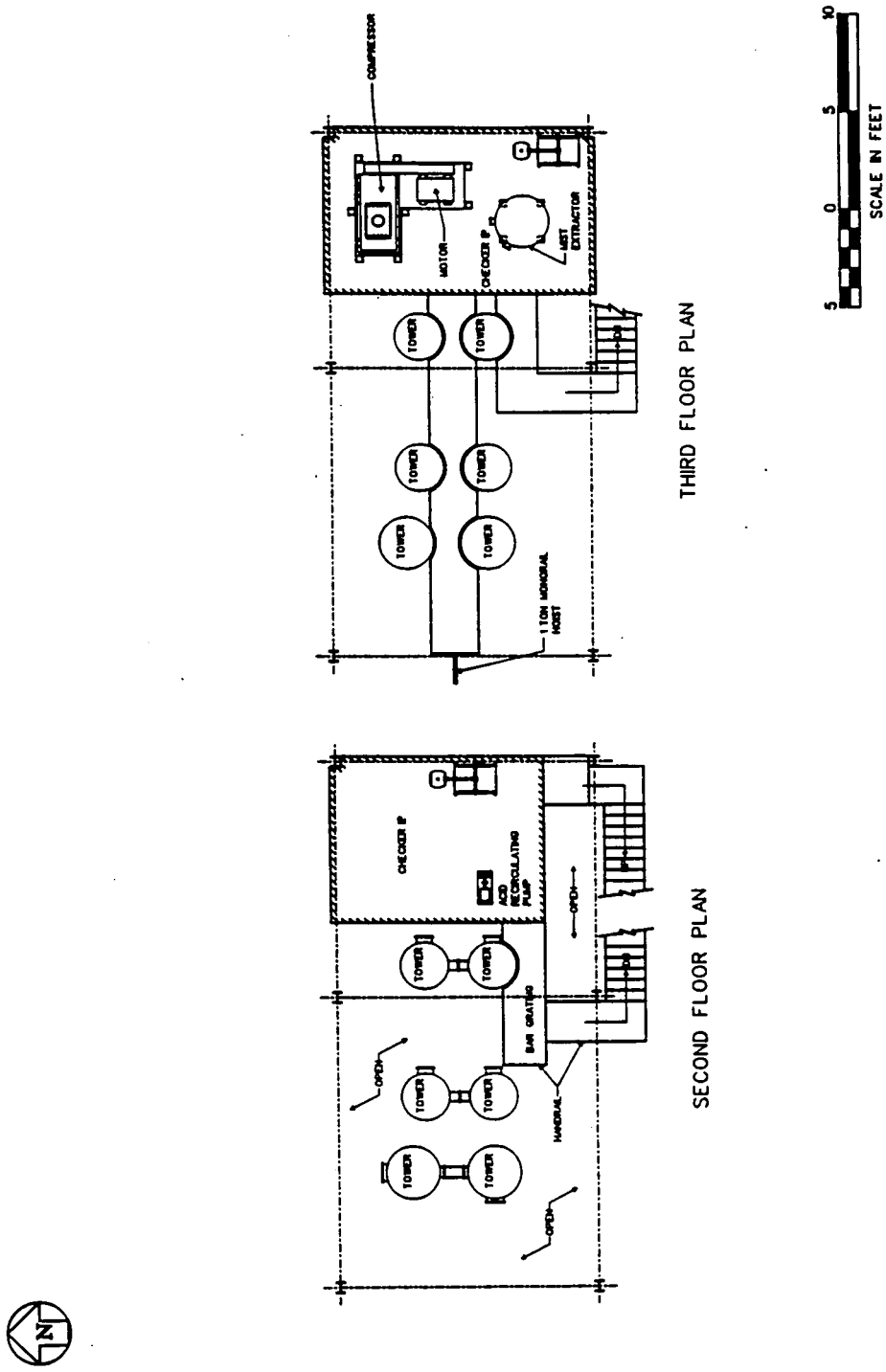


FIGURE 3F-2 Layout of Component 3F — Second and Third Floors

Summary of Sampling for Component 3F

One airborne particulate sample will be collected in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail a final intrusive sampling location. The three major media within the component are the concrete floor and dike, acid brick, and the structural steel. A concrete core will be collected from the floor or dike because of the presence of nitric acid. A masonry sample will be collected from the acid brick, and a surface scraping will be taken from the structural steel supports. Visual inspection of the component determined that one liquid supplemental sample be collected from the sump located in the northeastern corner of the diked area. Table 3F-1 summarizes the planned sampling program for Component 3F.

TABLE 3F-1 Sample Types and Quantities for Component 3F

Sample Type	Harshaw Fume Recovery	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	3	3
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	1	1
Steel surface scraping	1	1
Supplemental		
Liquid sample	1	1
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.5.5 Component 3H — Refinery Sump

Component Description

Component 3H (Refinery Sump) provides treatment of contaminated effluents from the Ore Refinery Plant (Component 2A) with MgO (magnesium oxide) to precipitate uranium. It is located south of the General Sump (Component 18B) and west of B Street, as shown on the Grid 19 map in Appendix C. The Refinery Sump comprises six tanks and is located outside in an acid brick containment area measuring 55 × 100 ft. Figure 3H-1 shows the locations of the tanks and containment area within the Refinery Sump.

Process Area Description

Effluents from the Ore Refinery Plant were transferred to Component 3H to be treated. The effluents were treated with MgO to precipitate the uranium. The MgO was slurried with water in the General/Refinery Sump Control Building (Component 2B) for use in the process. The treated Refinery Sump effluents were transferred to the adjacent General Sump for further treatment. The recovered uranium (as cake slurry) was recycled through the digestion area of the Ore Refinery Plant. Currently, several of the tanks that store uranyl nitrate (UNH) await processing. The anticipated contaminants for the component are summarized in Table A.3.

Major Media Types per Process Area

Component 3H major media include the acid brick and concrete of the containments and the steel of the tanks.

Summary of Available Radiological Data

Component 3H was surveyed for removable alpha contamination in April 1991; these results serve as the basis for identifying the hot spot. A total of 13 removable alpha survey measurements were performed on Component 3H, with an MDA of 53 dpm. Only 8 of the 13 removable alpha measurements were above the MDA, with an average measurement of 253 dpm. The data have been assembled, and the hot spot for the acid brick/concrete is identified in Figure 3H-1. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys. The hot spot for the acid brick and concrete media was determined to be on a pump footing between Component 2B and Tank F1-612, with a removable alpha reading of 602 dpm.

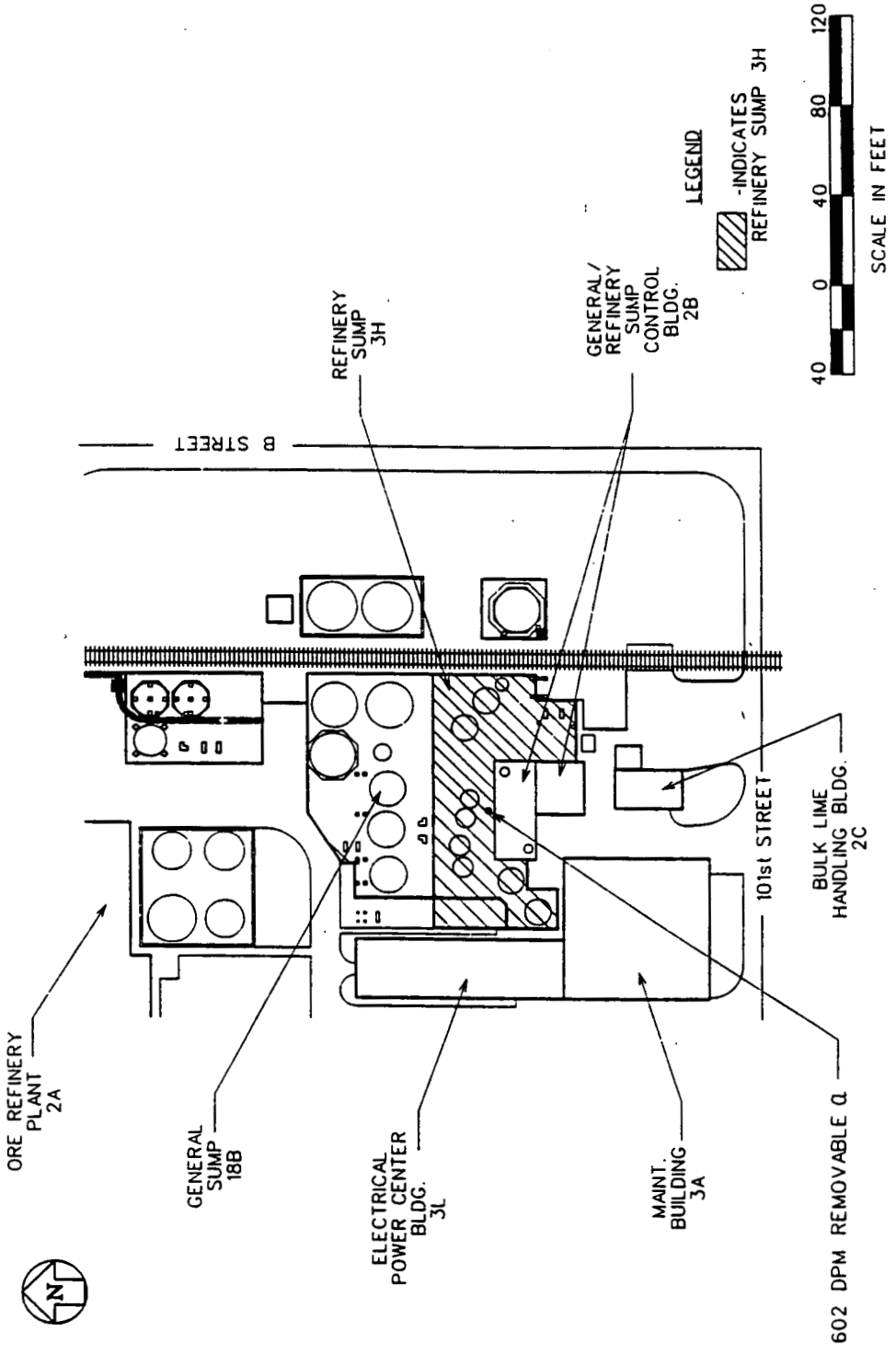


FIGURE 3H-1 Layout of Component 3H

Summary of Sampling for Component 3H

One airborne particulate sample will be taken and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, radiological surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Swipe samples will be collected on the basis of Protocols 1 and 3. The major media associated with the component are steel, acid brick, and concrete. Intrusive sampling will consist of one concrete core sample, one acid brick sample, and one steel scraping from the radiological hot spots. If analysis of radiological swipe samples detects elevated levels of removable contamination as outlined in Protocol 1, then the swipe samples will be combined over the component for laboratory analysis. A supplemental sediment sample from the containment area should be taken. Table 3H-1 summaries the planned sampling program for Component 3H.

TABLE 3H-1 Sample Types and Quantities for Component 3H

Sample Type	Wastewater Treatment	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	3	3
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	1	1
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.5.6 Component 3J — Combined Raffinate Tanks

Component Description

Component 3J (Combined Raffinate Tanks) is a multilevel open tank farm area measuring 39 × 169 ft and 20 ft high. Beneath the tanks is a concrete pad and dike covered with acid brick. Structural steel is used as the structural support for the 17 vertical tanks and the stairs and catwalks. The component is located north of the Hot Raffinate Building (Component 3E) and west of the NAR Towers (Component 3D), as shown on the Grid 19 map in Appendix C. Figure 3J-1 shows the tank layout.

Process Area Description

Component 3J received raffinates and slag leach filtrates and concentrated them by evaporation for reprocessing in the Ore Refinery Plant (Component 2A). Spent Zirnlo acid (high levels of copper digested in hydrofluoric acid) was transferred to the combined raffinate tanks from portable dumpsters from the Plant 9 Zirnlo process for use in this process. The anticipated contaminants for the component are listed in Table A.3.

Major Media Types per Process Area

The major media identified for Component 3J are the concrete pad and dike, acid brick, and structural steel.

Summary of Available Radiological Data

Component 3J is routinely surveyed for removable alpha contamination. No surveys have measured the total beta-gamma contamination. Results are summarized in Tables A.4.0 and A.4.1 and are the basis for identifying hot spots. In 1991 and 1992, 23 removable alpha measurements were performed, with an average value of 310 dpm and a highest measurement of 2,400 dpm. The data have been assembled, and the removable alpha hot spot for the acid brick floor is identified in Figure 3J-1. Additional data will be collected and assessed before sampling to determine the locations of the radiological hot spots or to verify the existing data.

Summary of Sampling for Component 3J

One airborne particulate sample will be collected in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail a final intrusive

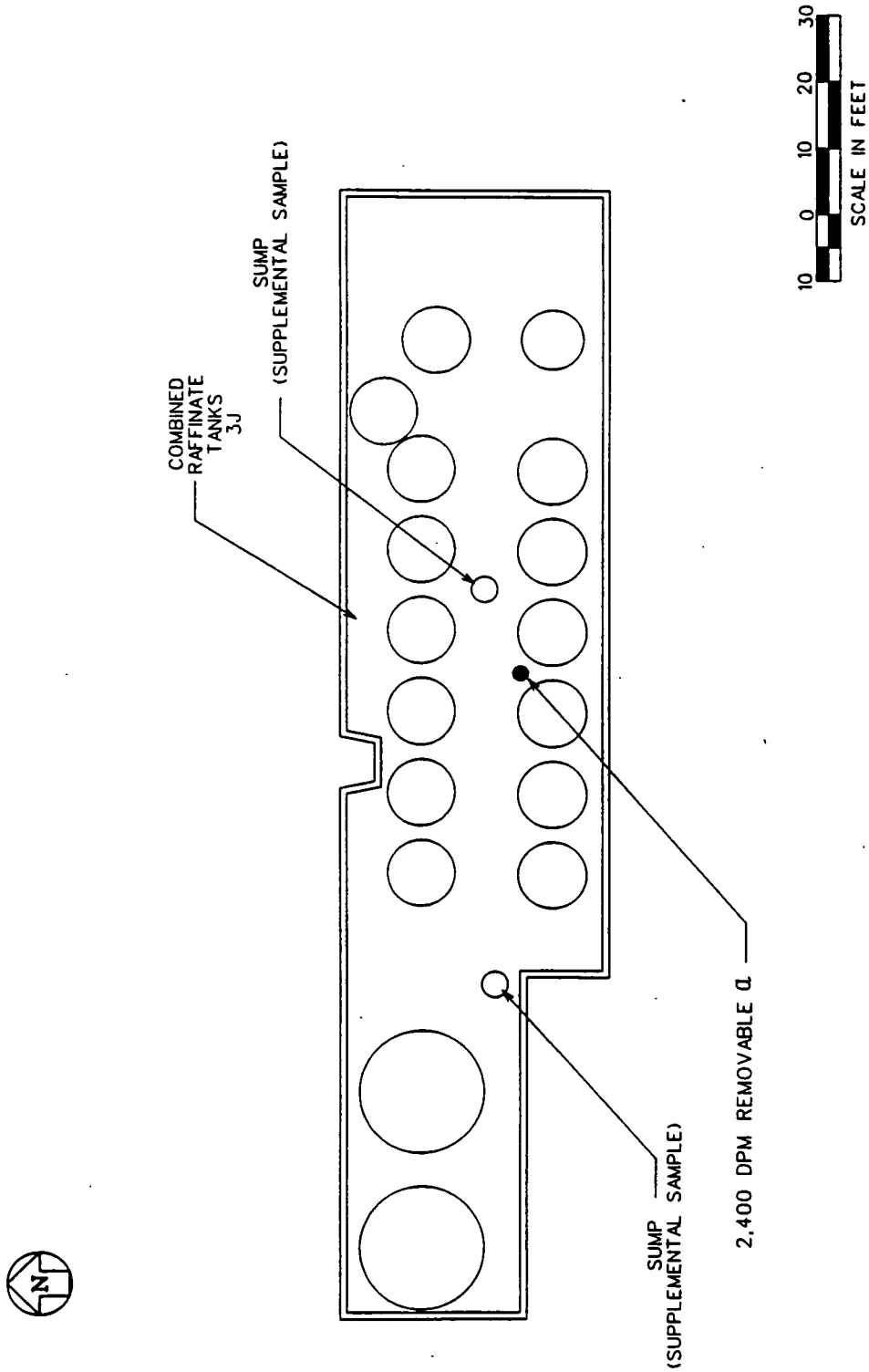


FIGURE 3J-1 Layout of Component 3J

sampling location. The three major media within the component are the concrete pad and dike, acid brick, and the structural steel. A concrete core and a masonry sample will be collected from the floor at the hot spot. A surface scraping will be taken from the structural steel supports. Visual inspection of the component identified two sumps in the diked area. One supplemental composite liquid sample will be collected from the two sumps located in the east and west sections of the diked area. Table 3J-1 summarizes the planned sampling program for Component 3J.

TABLE 3J-1 Sample Types and Quantities for Component 3J

Sample Type	Combined Raffinate	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	3	3
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	1	1
Steel surface scraping	1	1
Supplemental		
Liquid sample	1	1
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.5.7 Component 13D — Pilot Plant Thorium Tank Farm

Component Description

Component 13D (Pilot Plant Thorium Tank Farm) is an aboveground storage tank area west of the Pilot Plant Wet Side (Component 13A), as shown on the Grid 26 map of Appendix C. The tank farm consists of vertical cylindrical steel tanks inside a rectangular concrete containment area measuring 28 × 45 ft with a wall height of 18 in. aboveground (Figure 13D-1). The farm currently contains five tanks including two that are RCRA hazardous waste storage tanks because of the storage of spent solvents. Component 13D stored thorium nitrate tetrahydrate liquid, bulk process chemicals, and spent solvents.

Process Area Description

The Pilot Plant Thorium Tank Farm is an outside concrete containment area with three vertical cylindrical steel tanks on grade and two vertical cylindrical steel tanks on support columns, which historically were used to store thorium nitrate tetrahydrate, nitric acid, ammonia, sodium hydroxide, spent solvents, and deionized water, all of which were used or produced in the Pilot Plant Wet Side. The containment area has a shallow sump, 1 × 2 ft, in the southeastern corner. Portable pumping was used when spills or leakage occurred in the concrete containment area. Overhead piping was used to transfer the liquids between the tanks and Component 13A. Anticipated contaminants for Component 13D are summarized in Table A.3.

Major Media Types per Process Area

The only major medium for Building 13D is concrete. The steel tankage is considered process equipment, which is not handled as a major medium.

Summary of Available Radiological Data

No recent surveys have been taken of the thorium tank farm, although radiological surveys have been conducted for adjacent tankage areas outside the tank farm containment area. A radiological hot spot will be identified on the basis of ongoing radiological survey results or surveys conducted in support of the intrusive sampling effort.

Summary of Sampling for Component 13D

One airborne particulate sample will be collected in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including a new radiological and chemical survey, exposure rate

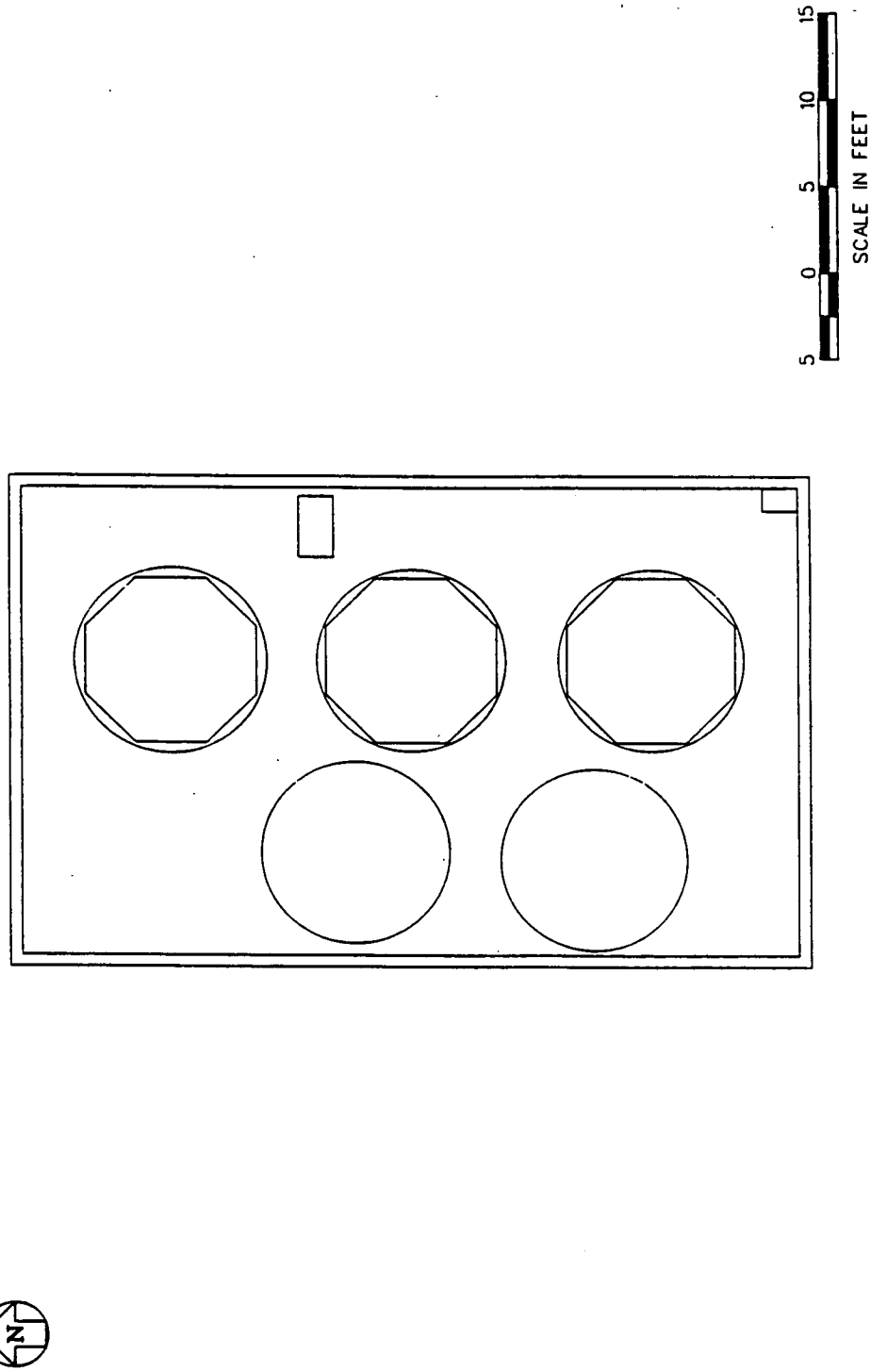


FIGURE 13D-1 Layout of Component 13D

measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to identify an intrusive sampling location for concrete. Because of the large quantities of liquids stored in Component 13D, the intrusive sample for concrete will be a core. Also, just before the sampling event, the containment bay and especially the corner sump will be inspected for liquid, which will be a supplemental sample if present. Table 13D-1 summarizes the planned sampling program for the Pilot Plant Thorium Tank Farm.

TABLE 13D-1 Sample Types and Quantities for Component 13D

Sample Type	Tank Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	1	1
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.5.8 Component 16A — Main Electrical Station

Component Description

Component 16A (Main Electrical Station) covers an area approximately 200 × 200 ft that is primarily covered with gravel. Some of the electrical equipment, transformers, and oil circuit breakers are mounted on concrete pads. The building is located east of the Heavy Equipment Building (Component 46). See the Grid 7 map in Appendix C and Figure 16A-1 for details.

Process Area Description

Component 16A provides the main electrical feed for the FEMP site. The station receives 132 kV feeds from off-site, transforms the electricity to 13.2 kV, and feeds the power to local substations around the facility. The only anticipated contaminants for the component that are listed in Table A.3 are PCBs.

Major Media Types per Process Area

The major media identified for Component 16A are the concrete pads and some structural steel to support the transformers.

Summary of Available Radiological Data

Radiological surveys have not been conducted on or around Component 16A because of the belief that no local radiological sources exist. Data will be taken and assessed before sampling to determine the location of the radiological hot spots or to verify nondetectable levels.

Summary of Sampling for Component 16A

One airborne particulate sample will be collected in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, PCB field test kit measurements, and swipe samples, will be performed and assessed in the field to further detail a final intrusive sampling location. The media within the component are the concrete pads and structural steel. Because Component 16A contained electrical equipment and therefore may have released PCBs, a concrete chip will be collected from the pad. The suggested sampling location identified on Figure 16A-1 is based on chemical contamination as a result of the absence of radiological measurements. Also, a structural steel scraping will be taken from the transformer supports. Visual inspection of the component determined that

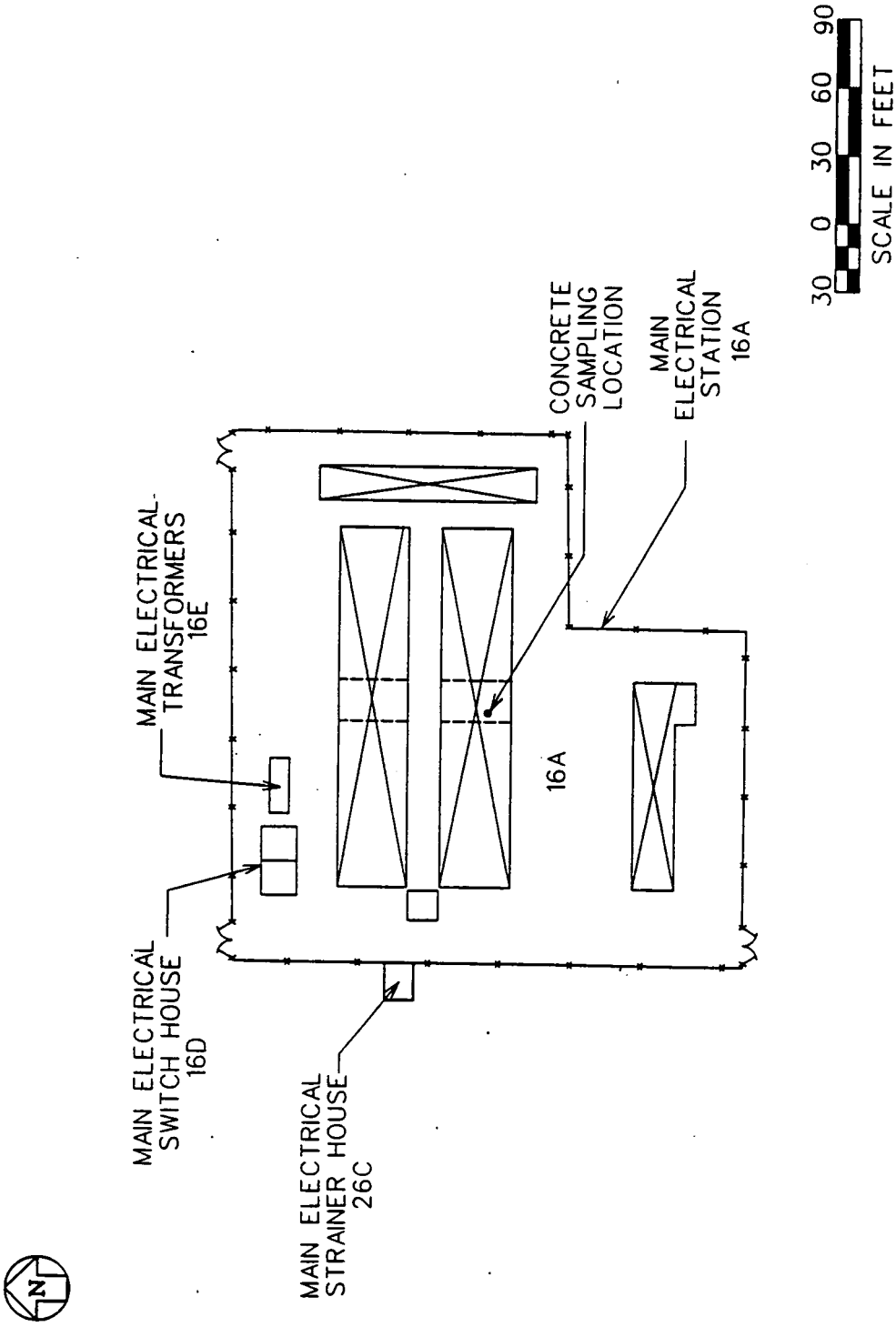


FIGURE 16A-1 Layout of Component 16A

one supplemental sample will be collected from the liquid located under transformer 1. The liquid was observed to have a slight oil sheen. Table 16A-1 summarizes the planned sampling program for Component 16A.

TABLE 16A-1 Sample Types and Quantities for Component 16A

Sample Type	Electrical Distribution	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	1	1
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.5.9 Component 18B — General Sump

Component Description

Component 18B (General Sump) provides treatment of contaminated site effluents other than sewage. The component is located north of the Recovery Plant (Component 8A) and west of B Street, as shown on the Grid 13 map in Appendix C. The General Sump comprises 16 tanks; most of the tanks are located outside in four separate concrete containment areas. The open area that makes up Component 18B is approximately 113 × 116 ft. Figure 18B-1 shows the locations of the tanks and containment areas within the General Sump.

Process Area Description

Effluents from the production plants were transferred to the General Sump and combined for batch processing. The effluents were then neutralized, and coagulants were added. After coagulant addition, the effluent was transferred to the recovery plant filter system for suspended solids and precipitant removal, and the resultant filtrate was transferred back to the General Sump. At Component 18B, treated effluent was segregated on the basis of nitrate concentration and routed to either the 8-million-gal low-nitrate Biodenitrification Surge Lagoon (Component 18A) or the 500,000-gal High-Nitrate Holding Tank (Component 18L). Some of the wastewater streams received at the General Sump (e.g., Cooling Tower [Component 20C] blowdown, Boiler Plant [Component 10A] blowdown, and coal pile runoff) were permitted to be discharged directly to the Great Miami River after coagulation and settling treatments. The anticipated contaminants for the General Sump are summarized in Table A.3.

Major Media Types per Process Area

The major media of Component 18B are the concrete of the containments and the steel of the tanks.

Summary of Available Radiological Data

Areas around Tank 5 in Component 18B were sampled for uranium and thorium concentrations, as required by the Removal Site Evaluation for Tank 5. Three concrete samples were taken from the concrete containment in the area of Tank 5; uranium levels ranged from 28 to 121 ppm, and all thorium concentrations were less than 18 ppm.

In 1992, part of Component 18B was surveyed for removable alpha contamination. Data from this survey have been assembled and indicate the radiological hot spots for the area. As data are acquired from ongoing radiological surveys, the identified hot spot will be reassessed before sampling activities begin.

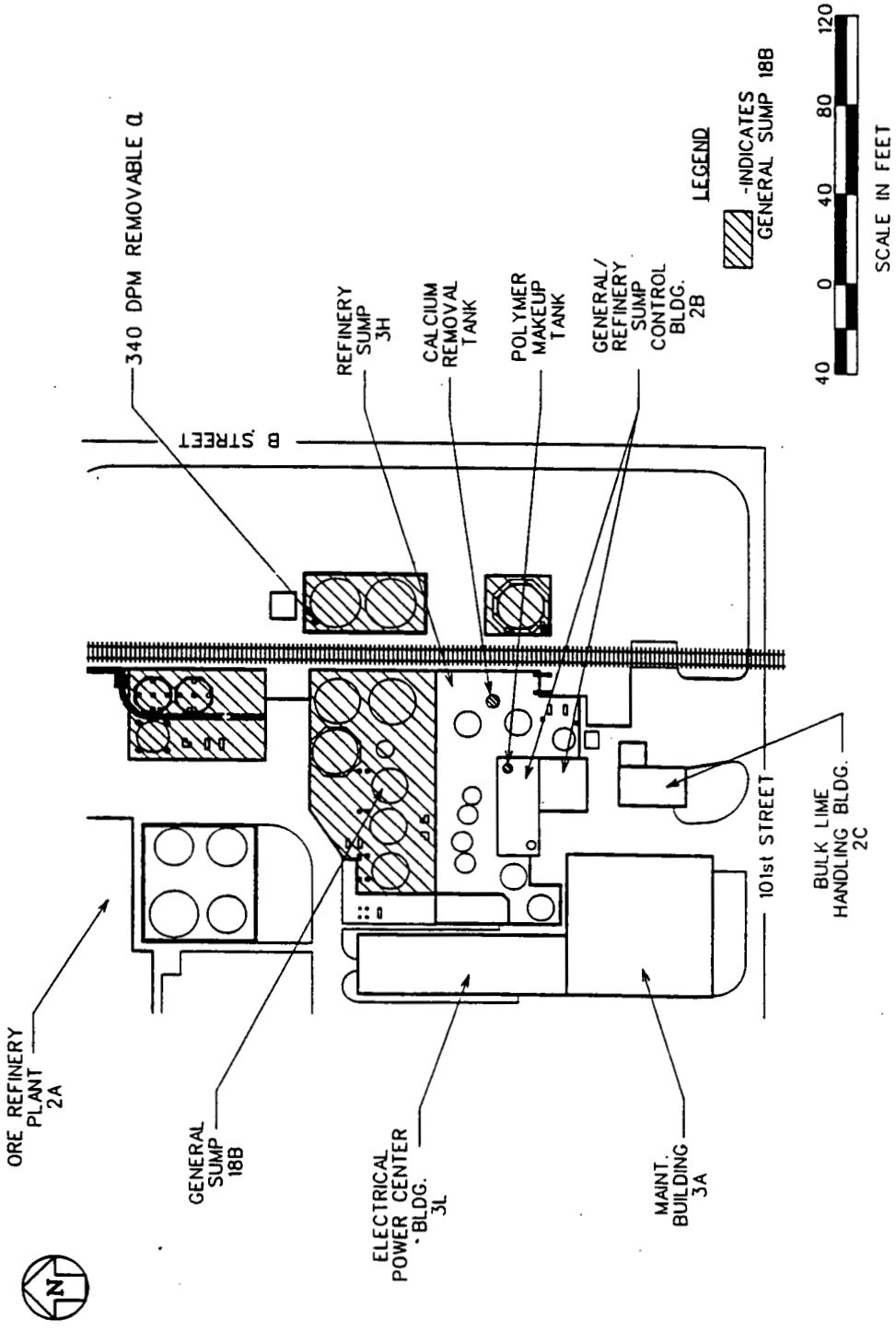


FIGURE 18B-1 Layout of Component 18B

For Tanks 8, 14, and 9, 30 readings were taken on the concrete containment areas. All readings from the concrete were below the MDA of 225 dpm for removable alpha. Eleven readings were taken from the base or walls of the tanks. The maximum removable alpha reading was 340 dpm; two readings had removable alpha readings of 230 dpm; and all other readings were less than the MDA of 225 dpm. The location of the highest removable alpha reading of 340 dpm (taken at the base of the tank) is depicted in Figure 18B-1.

Summary of Sampling for Component 18B

One airborne particulate sample will be taken and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, radiological surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Swipe samples will be collected on the basis of Protocols 1 and 3. The major media associated with the component are steel and concrete. Intrusive sampling will consist of one concrete core sample and one steel scraping from the radiological hot spots. If analysis of radiological swipe samples detects elevated levels of removable contamination as outlined in Protocol 1, then the swipe samples will be combined over the component for laboratory analysis. Supplemental samples will include one composite sediment sample from the trenches and sumps located within each containment area. Table 18B-1 summarizes the planned sampling program for Component 18B.

TABLE 18B-1 Sample Types and Quantities for Component 18B

Sample Type	Wastewater Treatment	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.5.10 Component 18J — Methanol Tank

Component Description

Component 18J (Methanol Tank) is an aboveground, stainless steel tank 20 ft in diameter and approximately 15 ft high. The tank is shown on the Grid 31 map in Appendix C at the southwestern corner of the Biodenitrification Surge Lagoon (Component 18A). Component 18J is situated in a concrete containment measuring 31 x 41 ft and approximately 8 ft high. The concrete floor of the containment area is sloped to a trench located inside the containment along the west wall, and this trench is sloped to a sump located in the northwestern corner of the containment. Liquids collected in the sump are pumped to the Biodenitrification Surge Lagoon. Component 18J is depicted in Figure 18J-1.

Process Area Description

Component 18J stores methanol that is used as a food source for the biomass colony in the FEMP biodenitrification process.

Major Media Types per Process Area

Component 18J major media include the steel of the tank and the concrete of the containment pad.

Summary of Available Radiological Data

No recent radiological data are available for Component 18J. Results from ongoing radiological surveys will be assessed before field sampling.

Summary of Sampling for Component 18J

One airborne particulate sample will be collected at Component 18J and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Because recent radiological data are not available for the component, nonintrusive measurements, including exposure rate measurements, XRF surveys, radiological surveys, and swipe samples, will be performed and assessed in the field to define final intrusive sampling locations. Intrusive sampling for the component will consist of a concrete chip and steel scrapings. If analysis of radiological swipe samples from the concrete detects elevated levels of removable contamination as outlined in Protocol 1, then the contaminated swipes will be combined over the component for laboratory analysis.

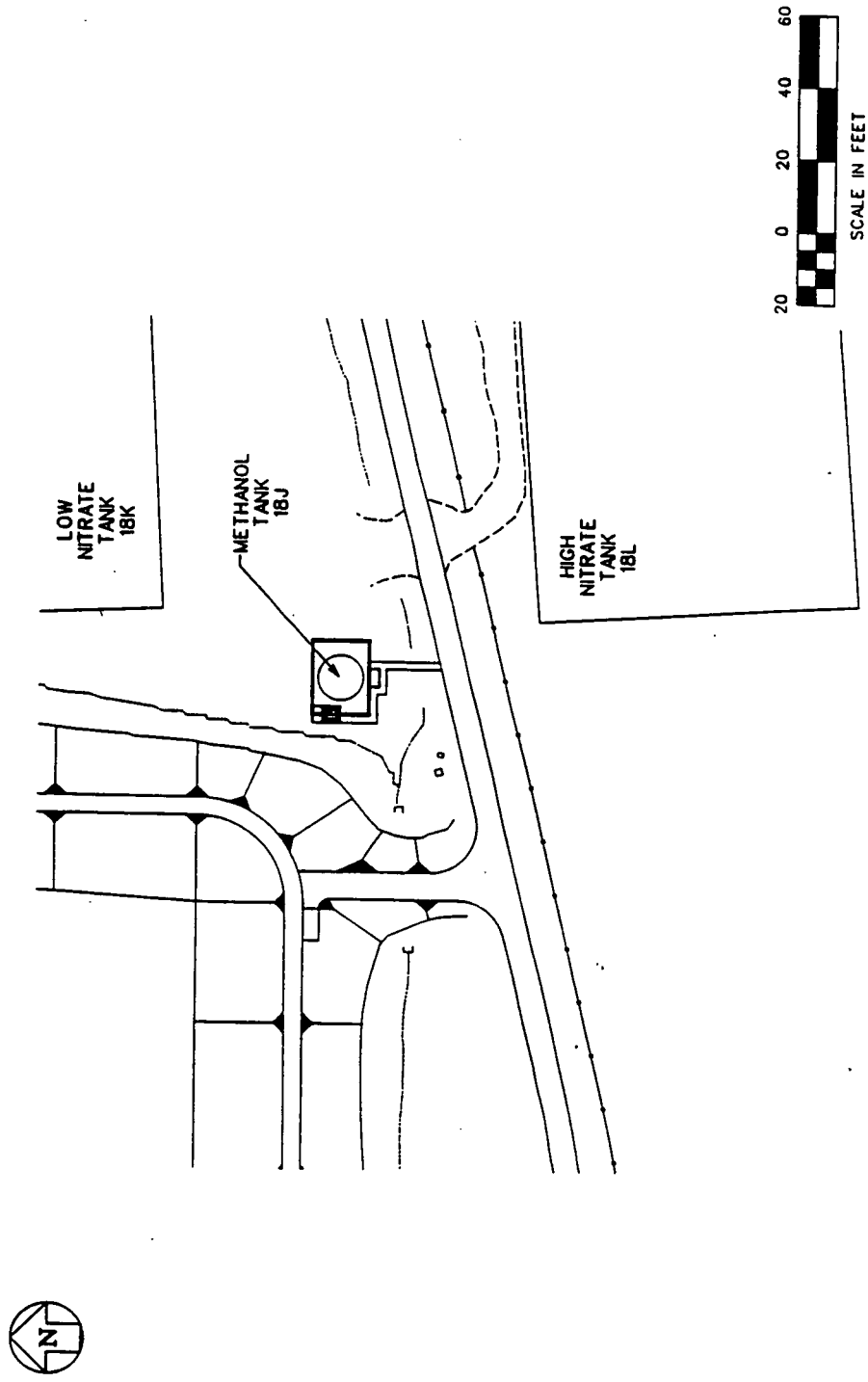


FIGURE 18J-1 Layout of Component 18J

Visual inspection of the component revealed accumulated liquid in the containment sump. Additional supplemental samples may be identified by the field team during sampling activities. Table 18J-1 summarizes the planned sampling program for Component 18J.

TABLE 18J-1 Sample Types and Quantities for Component 18J

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	1	1
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.5.11 Component 18M — High Nitrate Storage Tank

Component Description

Component 18M (High Nitrate Tank) is a 500,000-gal vertical steel tank measuring 60 ft in diameter. Its location is shown on the Grid 31 map in Appendix C. The tank rests on a poured concrete diked pad, measuring 112 × 112 ft (Figure 18M-1). The unit was constructed for auxiliary support of the biodenitrification processing but has not been activated because of reduced nitrate wastes as a result of production deactivation.

Process Area Description

Component 18M was intended to store high-nitrate wastes from the operation of the Ore Refinery Plant (Component 2A). The tank has not been used but is planned to provide interim storage of filtrate from the uranyl nitrate (UNH) neutralization project. The tank is considered one process area. The anticipated contaminants for Component 18M are summarized in Table A.3.

Major Media Types per Process Area

The major media for Component 18M are structural steel and concrete.

Summary of Available Radiological Data

Component 18M has not been routinely surveyed for removable alpha and total beta-gamma contamination. Data will be gathered before sampling and will include any data gathered from ongoing radiological surveys.

Summary of Sampling for Component 18M

One airborne particulate sample will be taken and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive sampling for the concrete medium will be performed at the radiological hot spot. Because Component 18M has not been activated, the concrete sample will be a chip sample. Structural steel scrapings and swipe samples will be collected on the basis of Protocols 1 and 3. Visual inspection of Component 18M did not determine a need for a supplemental sample. Table 18M-1 summarizes the planned sampling program for Component 18M.

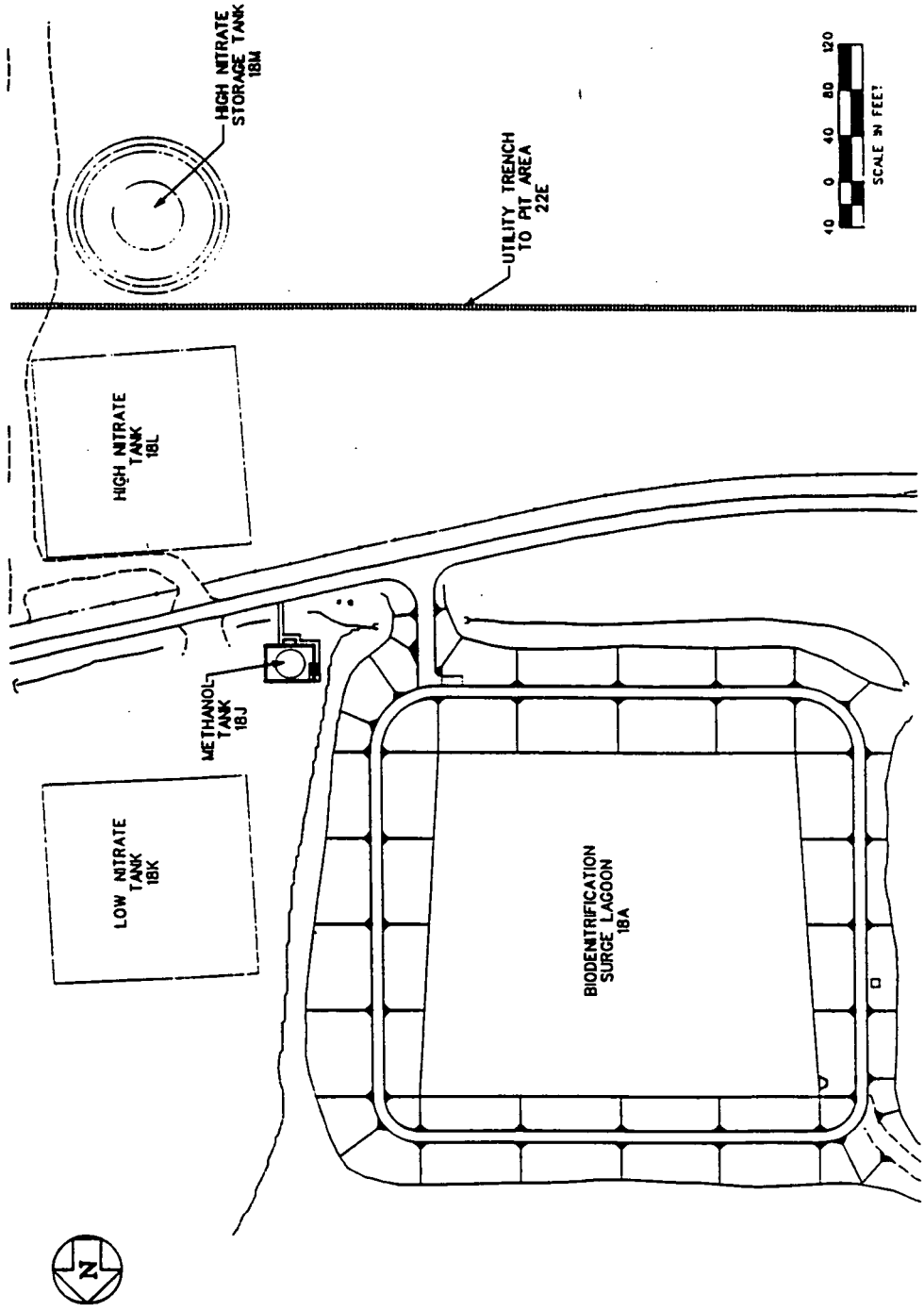


FIGURE 18M-1 Layout of Component 18M

TABLE 18M-1 Sample Types and Quantities for Component 18M

Sample Type	High Nitrate Storage Tank	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.5.12 Component 19A — Main Tank Farm

Component Description

Component 19A (Main Tank Farm) is an open concrete diked area, 140 by 190 ft, with five horizontal tanks and structures up to 20 ft high. The component is located west of the Main Maintenance Building (Component 12A), as shown on Grid 11 map in Appendix C.

Process Area Description

The Main Tank Farm was renovated in 1986 to replace the Old North Tank Farm (Component 19D) for receipt and storage of bulk liquid chemicals. These tanks have not been used.

Summary of Sampling for Component 19A

This component does not require sampling. The component has not been placed into service following recent completion of construction. Results of the radiological surveys performed for the component do not exceed the criteria established for sampling, and the component exhibits little or no evidence of contamination.

D.9.5.13 Component 19B — Pilot Plant Ammonia Tank Farm

Component Description

Component 19B (Pilot Plant Ammonia Tank Farm), constructed in 1986, contains two anhydrous ammonia tanks, approximately 20,000 gal each. The two tanks are located in the open in a concrete-diked, partially subgrade structure measuring approximately 40 × 51 ft. Component 19B is shown on Figure 19B-1 and is located southwest of the Pilot Plant complex (Components 13A, 37, and 54A), as shown on the Grid 28 map in Appendix C.

Process Area Description

Component 19B is considered to be one process area and briefly stored anhydrous ammonia to supply the Pilot Plant UF_6 to UF_4 operations and the Refinery. Anticipated contaminants for Component 19B are summarized in Table A.3.

Major Media Types per Process Area

The major media for Component 19B include the steel of the tanks and the concrete of the diked containment.

Summary of Available Radiological Data

Component 19B has not been routinely surveyed for removable alpha or total beta-gamma contamination.

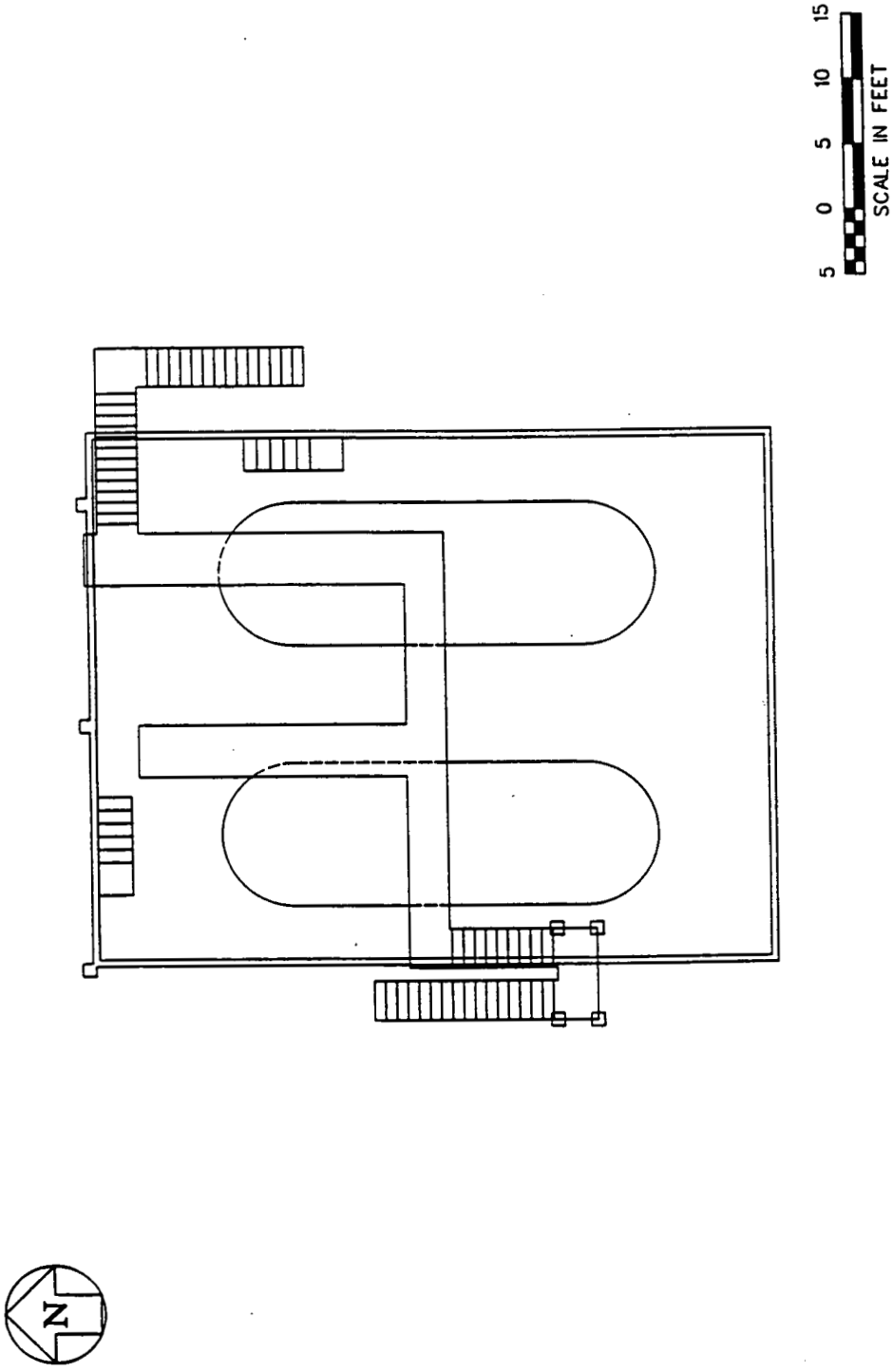


FIGURE 19B-1 Layout of Component 19B

D.9.5.14 Component 19D — Old North Tank Farm

Component Description

Component 19D (Old North Tank Farm), measuring approximately 130 × 130 ft, is located north of the Main Tank Farm (Component 19A) near the northeastern corner of 2nd Street and B Street. Component 19D is the remaining north portion of the original 1950s Bulk Tank Farm; its location is shown on the Grid 11 map in Appendix C. Figure 19D-1 depicts the present layout of Component 19D.

With the renovation of Component 19D, which began in 1991, seven of the eight aboveground horizontal tanks have been removed, leaving only the concrete foundations for the tanks. Component 19D currently contains one aboveground vertical tank (Tank 17), one aboveground horizontal tank (Tank 18), a sump, and the remaining portion of the original sump drainage ditch.

Process Area Description

Component 19D is divided into two process areas. The tank farm provided the bulk storage of liquid chemicals for use throughout the FEMP site and dilute hydrofluoric acid (DHF) recovered during operations of the Green Salt Plant (Component 4A). Also, the component has a sump and drainage ditch that collected storm-water runoff for eventual treatment.

Bulk Storage. Component 19D consisted of nine steel tanks that stored potassium fluoride, anhydrous hydrofluoric acid (AHF), DHF, and anhydrous ammonia. Because of renovations of the tank farm, except for the concrete tank supports, only Tanks 17 and 18 remain in the component. Tank 17, with a capacity of 98,000 gal, is constructed of steel and is rubber-lined. It has been used since the 1950s for temporary storage of liquids collected and neutralized in the sump before being pumped to the General Sump (Component 18B). Tank 18 has a capacity of 31,500 gal and was historically used to store HF. It currently contains HF residues and provides emergency containment for 4,400 gal of HF stored in a rail car immediately east of Component 19D.

Sump. The sump and drainage ditch were constructed in the 1950s as part of the original tank farm. The sump was used to collect storm-water runoff, tank car rinse water, and any spills from the Bulk Tank Farm. As originally constructed, all but one of the sloped walls of the sump were formed from impervious clay lined with gravel, and the impervious clay layer was laid directly over a hollowed-out surface impoundment. Much of the sump drainage ditch has either been removed or covered over as a result of the construction of the Main Tank Farm in 1986. Storm water collected in the sump is neutralized with lime and

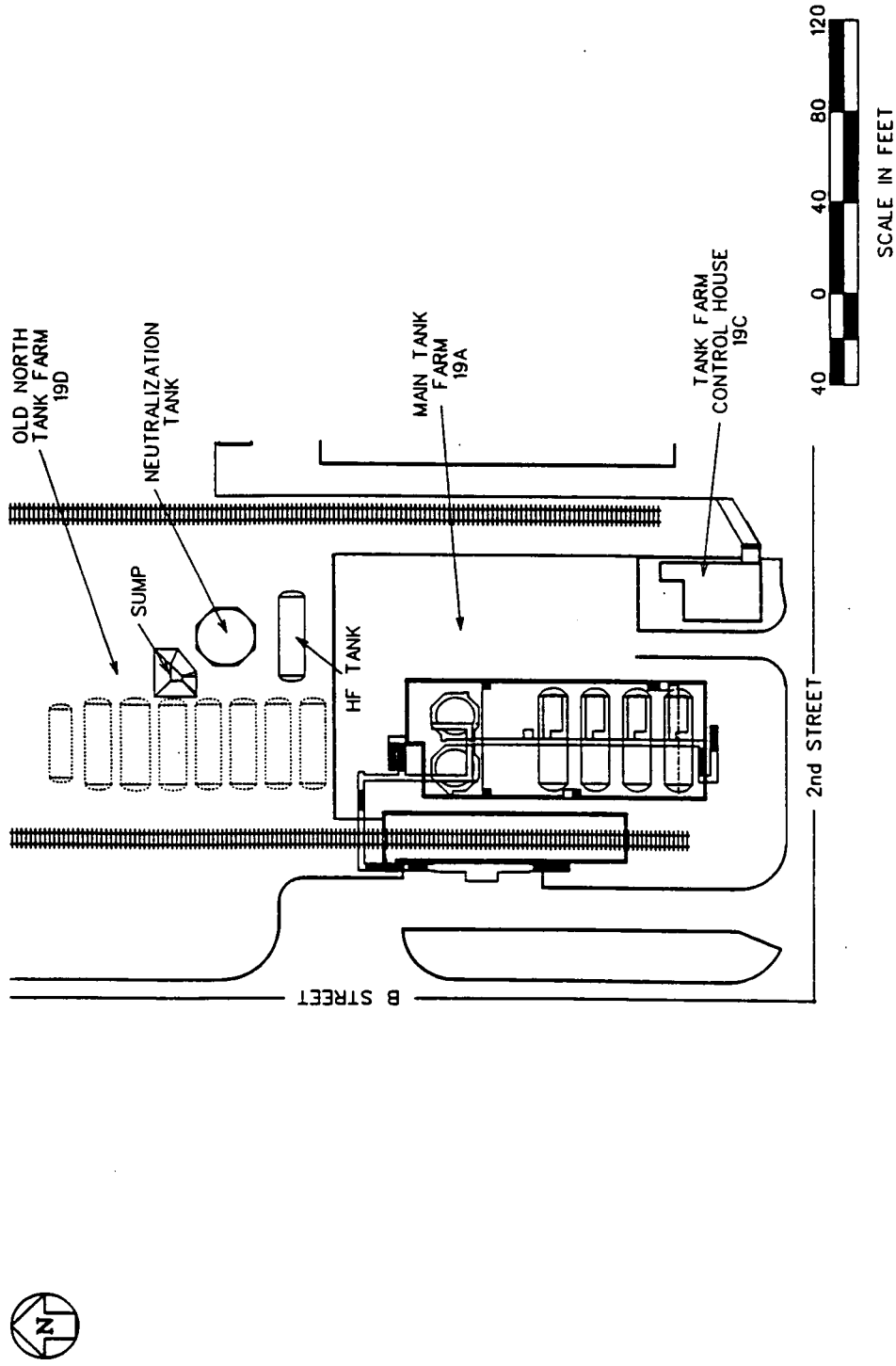


FIGURE 19D-1 Layout of Component 19D

then pumped into Tank 17, from which it was transferred to the General Sump. The sump and drainage ditch make up an HWMU because the unit has been used to neutralize acid runoff that included listed hazardous wastes.

Major Media Types per Process Area

The tanks were supported by concrete saddles on a concrete pad. The walls of the sump also contain some concrete. The two remaining steel tanks are also considered potentially recoverable material and will, therefore, be sampled accordingly.

Summary of Available Radiological Data

No current radiological data are available for Component 19D. Data will be reassessed before sampling to include data gathered from ongoing surveys. The data will be assembled to determine the radiological hot spots for the concrete medium.

Summary of Sampling for Component 19D

One airborne particulate sample will be taken in the component and analyzed for airborne radiological and inorganic contamination, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, radiological surveys, and swipe samples, will be performed and assessed in the field to define final intrusive sampling locations. Intrusive sampling for each process area will comprise two concrete core samples and a structural steel scraping from one of the remaining tanks. On the basis of the component visual inspection, supplemental liquid and sludge samples will be collected from the sump and drainage ditch. Additional supplemental samples may be identified by field crews during sampling activities. Table 19D-1 summarizes the planned sampling program for Component 19D.

TABLE 19D-1 Sample Types and Quantities for Component 19D

Sample Type	Bulk Storage	Sump	Component Totals
Nonintrusive[a]			
Radiological surveys	b	b	NA[c]
Chemical surveys	b	b	NA
Air particulates	NA	NA	1
Swipes	2	1	3
Lab composite swipes	NA	NA	1
Intrusive[a]			
Concrete chips	NA	NA	NA
Concrete cores	1	1	2
Masonry	NA	NA	NA
Steel surface scraping	1	NA	1
Supplemental			
Liquid sample	NA	1	1
Loose media	NA	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.5.15 Component 20D — Elevated Potable Storage Tank

Component Description

Component 20D (Elevated Potable Storage Tank) is a steel tank structure approximately 30 × 40 ft and 100 ft high. The component is located west of the Metals Fabrication Plant (Component 6A), as shown on the Grid 4 map in Appendix C.

Process Area Description

The elevated water storage tank contains water for on-site fire protection and potable uses.

Summary of Sampling for Component 20D

These components do not require sampling. The component exhibits little or no evidence of contamination, results of the radiological surveys for the component do not exceed the criteria established for sampling, and anticipated contaminants are of low toxicity.

D.9.5.16 Component 20H — Process Water Storage Tank

Component Description

Component 20H (Process Water Storage Tank) is a reinforced concrete tank structure approximately 80 ft in diameter and 20 ft high. The component is located south of the Boiler Plant (Component 10A), as shown on the Grid 10 map in Appendix C.

Process Area Description

The elevated water storage tank contains water for on-site fire protection and potable uses.

Summary of Sampling for Component 20H

This component does not require sampling. The component exhibits little or no evidence of contamination, results of the radiological surveys for the component do not exceed the criteria established for sampling, and anticipated contaminants are of low toxicity.

D.9.5.17 Component 25H — Trickling Filters

Component Description

Component 25H (Trickling Filters) comprises two trickling filters and a secondary clarifier unit and is located in the FEMP Sewage Treatment Area, as shown on the Grid 32 map in Appendix C. The two trickling filter tanks are each 40 ft in diameter and are constructed of concrete. The secondary clarifiers, also constructed of concrete, are located immediately west of the two trickling filters. The layout of Component 25H and the Sewage Treatment Area is detailed on Figure 25H-1.

Process Area Description

Component 25H provides aerobic bacterial digestion of domestic sewage from the FEMP site. The trickling filters are operated in series, and each trickling filter comprises an open concrete tank filled with a bed of porous slag pieces 3 to 4 in. in diameter, a four-arm rotary distributor, and an underdrain system. Decant from the two Primary Clarifier Basins (Component 25G) is pumped to a trickling filter and sprayed over the slag bed via nozzles located at regular intervals along the arms of the rotary distributor. Effluent exiting the underdrain system from the first trickling filter is then routed to the second trickling filter, and effluent is often recirculated through the trickling filter system three to four times for polishing. Effluent exiting the trickling filters is routed via in-ground concrete trenches to the secondary clarifiers for settling. The secondary clarifiers overflow to the Chlorination Building (Component 25A) for chlorination, and settled material is transferred to the head of the sewage treatment system for subsequent treatment.

Major Media Types per Process Area

The major media for Component 25H are the concrete of the trickling filter tanks, trenches, and secondary clarifiers.

Summary of Available Radiological Data

No current radiological survey data are available for Component 25H. Data will be reassessed before sampling to include data gathered from ongoing surveys. The data will be assembled to determine the radiological hot spot for the component.

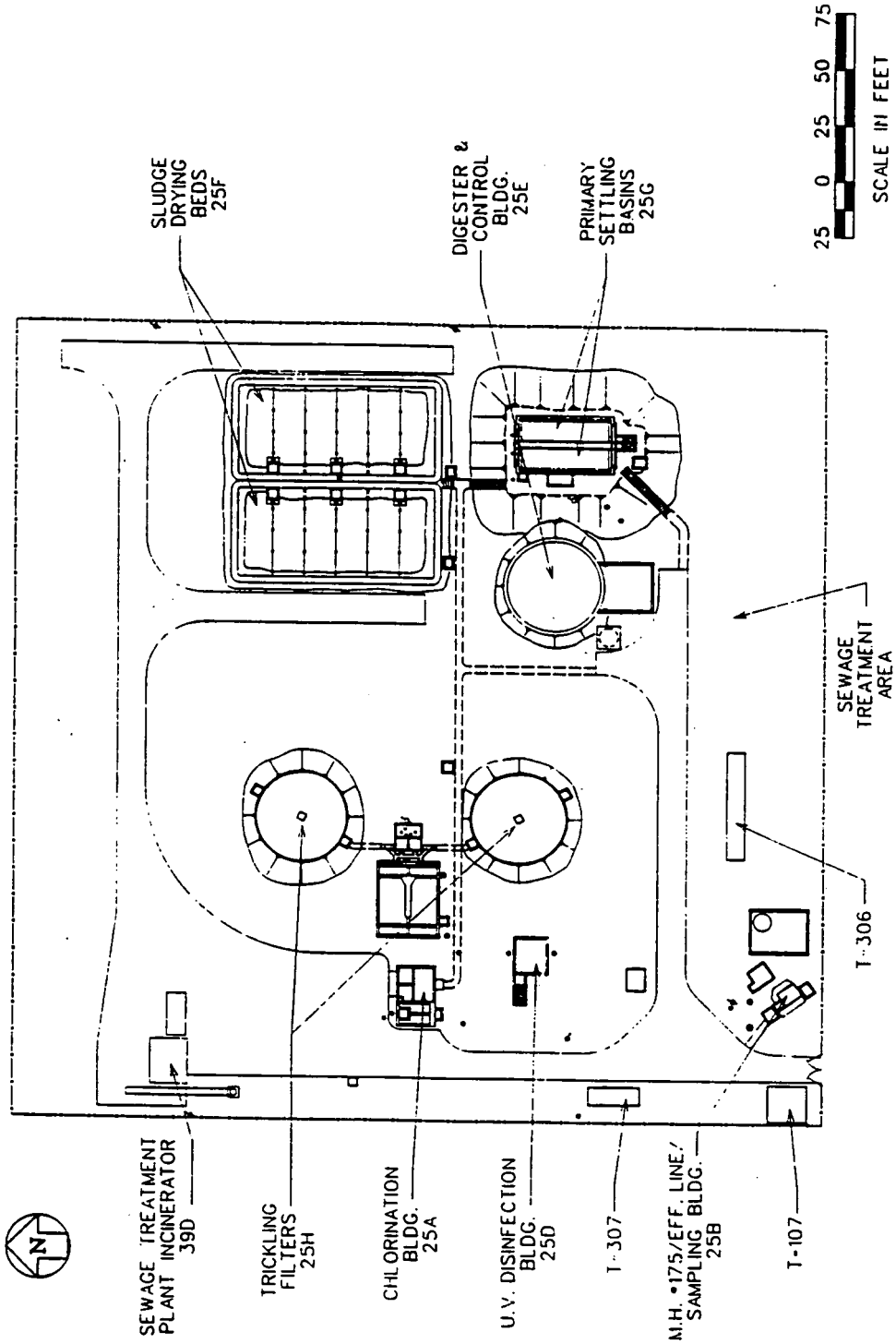


FIGURE 25H-1 Layout of Component 25H

Summary of Sampling for Component 25H

One airborne particulate sample will be taken in the component and analyzed for radiological and inorganic contaminants, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, radiological surveys, and swipe samples, will be performed and assessed in the field to further define final intrusive sampling locations. A concrete core will be taken from the component if this sampling activity does not interfere with the operation or demands of the Sewage Treatment Plant. One supplemental liquid sample and one supplemental sediment sample will be taken for Component 25H because the component is open to the environment. Additional supplemental samples may be identified by field crews during sampling activities. Table 25H-1 summarizes the planned sampling program for Component 25H.

TABLE 25H-1 Sample Types and Quantities for Component 25H

Sample Type	Sewage Treatment	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	1	1
Loose media	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.5.18 Component 26B — Elevated Water Storage Tank

Component Description

Component 26B (Elevated Water Storage Tank) is a steel tank structure approximately 60 ft in diameter and 265 ft abovegrade. The component is located west of the Refinery Plant (Component 2A), as shown on the Grid 25 map in Appendix C.

Process Area Description

The elevated water storage tank contains water for on-site fire protection and potable uses.

Summary of Sampling for Component 26B

This component does not require sampling. The component exhibits little or no evidence of contamination, results of the radiological surveys for the component do not exceed the criteria established for sampling, and anticipated contaminants are of low toxicity.

D.9.5.19 Component 73C — Fire Training Tank

Component Description

Component 73C (Fire Training Tank) is a small steel tank located in the middle of the 45-ft diameter Fire Training Pond (Component 73B) and drain pit. Component 73C is shown on Figure 73C-1 and is located near the northern boundary of the FEMP site, along B Street, as shown on the Grid 33 map in Appendix C.

Process Area Description

Component 73C is considered one process area and was used for training fire brigade members in fighting combustible liquid fires. The steel tank (which was never filled) was used to simulate a combustible liquid tank. Anticipated contaminants for Component 73C are summarized in Table A.3.

Major Media Types per Process Area

The major medium for Component 73C is steel.

Summary of Available Radiological Data

Component 73C has not been routinely surveyed for removable alpha or total beta-gamma contamination. Because no recent data exist, the data from ongoing radiological surveys will be assessed before systematic surveys of the component are conducted.

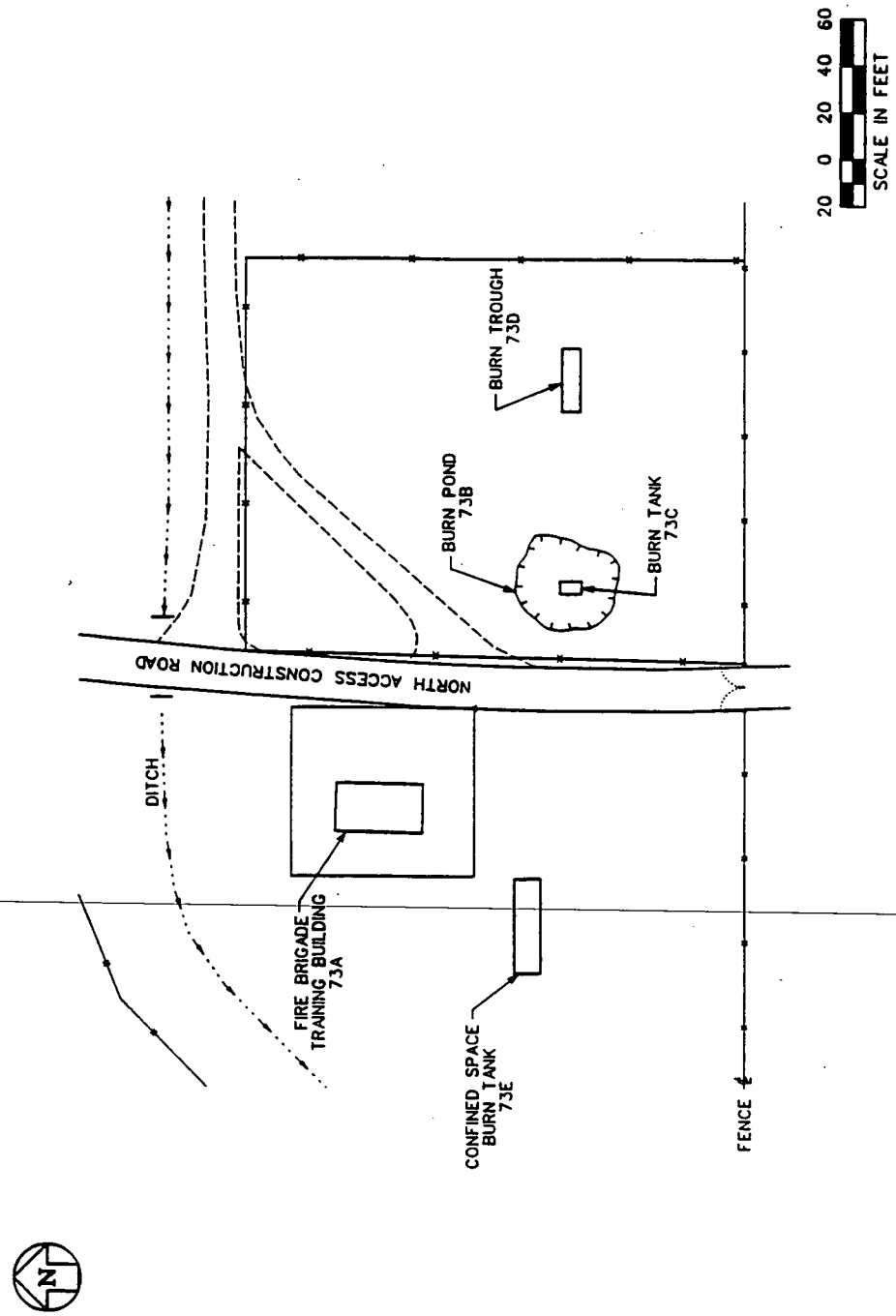


FIGURE 73C-1 Layout of Component 73C

D.9.5.20 Component 73E — Confined-Space Burn Tank

Component Description

Component 73E (Confined-Space Burn Tank) is a horizontal steel storage tank, 8 ft in diameter. The component is located north of the production area, as shown on Grid 33 map in Appendix C.

Process Area Description

This tank is part of the Fire Training Area and is a steel storage tank converted for use in simulating rescue training. This tank was formerly used in the Old North Tank Farm (Component 19D) and is now located outside of the production area. The tank was released from the site under DOE guidelines for release of materials without radiological restrictions following decontamination.

Summary of Sampling for Component 73E

This component does not require sampling because it is located outside of radiologically controlled areas, is insignificant in size, and exhibits little or no evidence of contamination. Moreover, the contaminants expected for the component are of low toxicity.

D.9.5.21 Component G-009 — Non-RCRA Drums

Component Description

Component G-009 (Non-RCRA Drums) is stored in or on many of the components in the operable unit. Drummed materials include recyclable residues from production and waste treatment activities, wastes, high-grade compounds, and contaminated materials. A majority of the Non-RCRA Drums are currently stored under roof at the Plant 1 Pad (Component 74T) or inside former production facilities, such as Building 5A (Metals Production Plant), Building 6A (Metals Fabrication Plant), and Building 9A (Special Products Plant). Non-RCRA Drums are typically standard 55-gal drums that may be overpacked in larger drums, if deteriorated. See Table A.5 for volume and contents information.

Because of programmatic sampling activities for determination of RCRA constituent and/or characteristic that are already under way and completed, no sampling plans under the OU3 RI/FS field characterization program have been identified. No process areas are defined for this component, and no major media are encountered.

D.9.5.22 Component G-010 — RCRA Drums

Component Description

Component G-010 (RCRA Drums) is located in specially designed and controlled facilities throughout the operable unit, including Building 63 (KC-2 Warehouse), Building 79 (Plant 6 Warehouse), Building 80 (Plant 8 Warehouse), Building 81 (Plant 9 Warehouse), and others. Most of this material is classified as mixed-RCRA and radiological waste; therefore, no immediate disposition has been identified. No sampling under the OU3 RI/FS characterization is planned because of the extensive characterizations under way for RCRA programmatic purposes. Table A.5.1 provides information on volume, RCRA designations, and contents. No process areas are defined for this component, and no major media are encountered.

D.9.5.23 Component G-011 — Inventory

Component Description

Component G-011 (Inventory) includes materials produced under the former production mission of the FEMP as product. Both uranium and thorium metal are encompassed in this category. These materials are stored throughout many of the components in the operable unit. Off-site disposition of most of this material is expected before the completion of the OU3 RI/FS characterization; therefore, no sampling is currently planned. See Table A.6 for locations and contents information. No process areas are defined for this component, and no major media are encountered.

D.9.5.24 Component G-012 — Mobile Containers (Sea-Land)

Component Description

Component G-012 (Mobile Sea-Land Containers) comprises steel containers used for waste shipment off-site. The containers are located throughout the site; the total number at a given time depends on site activities.

Process Area Description

Sea-land containers are used on-site for shipping and final disposal of FEMP wastes off-site. These containers are located throughout the site; the quantity and location of the containers fluctuate constantly. The containers are not contaminated when they enter the site and are screened and released off-site to permanent disposal facilities in accordance with DOE guidelines for release of materials without radiological restrictions and guidelines of the U.S. Department of Transportation.

Summary of Sampling for Component G-012

The component does not require sampling. The contaminants expected for the component are of low toxicity, and the component exhibits little or no evidence of contamination.

D.9.6 CONTAINERS AND CONTAINERIZED MATERIAL — BELOWGROUND

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D.9.6.1 Component 73D — Fire Training Burn Trough

Component Description

Component 73D (Fire Training Burn Trough) is a 4 × 20 ft steel trough used as a fire brigade training area. It is located on the northern boundary of the site on B Street (Figure 73D-1).

Process Area Description

Component 73D is considered one process area and was used for training fire brigade members in fighting volatile liquid fires. It is a steel trough, partly subgrade, where used oil was ignited for extinguisher training. Anticipated contaminants are summarized in Table A.3.

Major Media Types per Process Area

Component 73D is an open trough made of steel; however, it is not of a gauge thick enough to be considered a major medium.

Summary of Available Radiological Data

The trough has not been routinely surveyed for removable alpha and total beta-gamma contamination. No recent data are available, but the radiological hot spot will be determined from field measurements before sampling occurs.

Summary of Sampling for Component 73D

One airborne particulate sample will be taken in the component and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements and XRF surveys, will be performed and assessed in the field to further detail final intrusive sampling locations. Liquid and loose media supplemental samples will be necessary according to a visual inspection of the component. Table 73D-1 summarizes the planned sampling program for the Fire Training Burn Trough.

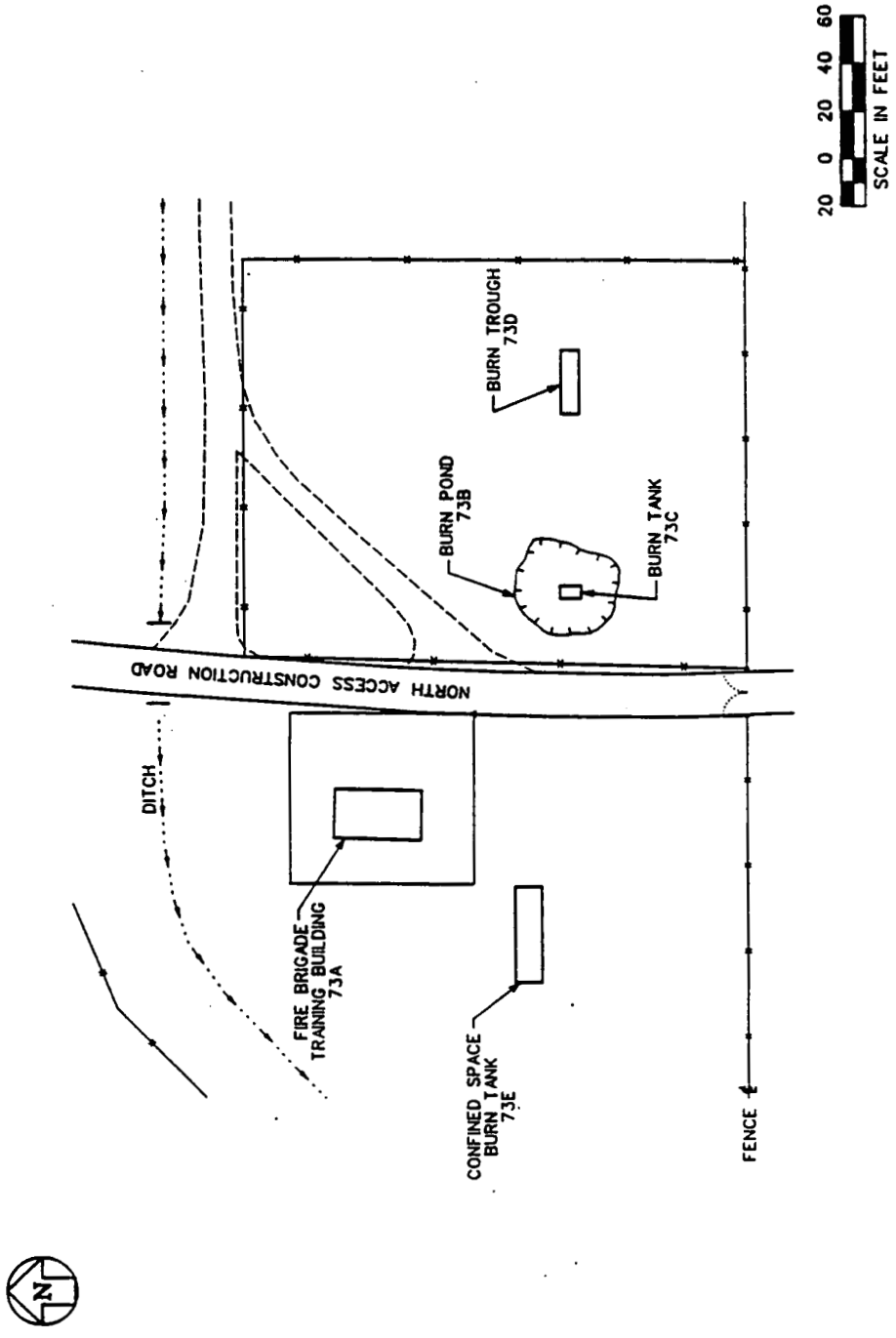

FIGURE 73D-1 Location of Component 73D

TABLE 73D-1 Sample Types and Quantities for Component 73D

Sample Type	Fire Training	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	NA	NA
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	1	1
Loose media	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.6.2 Component G-005 — Underground Storage Tanks

Component Description

Component G-005 (Underground Storage Tanks) currently comprises seven underground tanks. At one time, the FEMP site contained 17 underground tanks at various locations; however, 10 were removed in 1990 as part of the site-wide underground storage tank (UST) removal program. The surrounding areas from the removed underground tanks are undergoing interim remediation. Of the seven remaining underground tanks, four contain petroleum products and three contain wastewater residuals.

Process Area Description

Of the seven remaining underground tanks, four contain petroleum products and three contain wastewater residuals that may contain spent solvent residues, uranium, thorium, strontium-90, technetium-99, and radium. The anticipated contaminants for the underground tanks are summarized in Table A.3.

Major Media Types per Process Area

The major medium included in Component G-005 is the steel of the underground tanks; however, soils in the vicinity will represent the contamination on the exterior surfaces.

Summary of Available Radiological Data

No current data are available for the Component G-005 tanks. It is doubtful that nonintrusive samples or radiological surveys can be obtained to support intrusive sampling of these components.

Summary of Sampling for the Underground Tanks

Underground Storage Tanks are unavailable for nonintrusive sampling, but samples of soil (indicated as supplemental loose media samples in Table G-005-1) in the vicinity of the tanks will be collected to determine external contamination of the tanks. Supplemental samples may be collected by the field crew if any liquids or sludges contained in the tanks cannot be characterized by process knowledge. Table G-005-1 summarizes the planned sampling program for Component G-005.

TABLE G-005-1 Sample Types and Quantities for Component G-005

Sample Type	Underground Tanks	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	NA
Swipes	NA	NA
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	7	7

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

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D.9.7 BULK MATERIAL

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D.9.7.1 Component G-013 — Soil Piles

Component Description

Component G-013 (Soil, Rubble, and Construction Debris Piles) is a collected grouping of piles at the FEMP. Soil and debris have been generated on-site as a result of construction projects, removal actions, and routine maintenance. Component G-013 was defined as a grouping primarily because of ongoing activities involving continued generation and/or movement of these piles on-site. The primary elements of Component G-013 are the soil piles in the northwestern corner of the production area of the site on the Grid 16, 17, and 22 maps of Appendix C, including the 3rd Street Dirt Pile. Component G-013 does, however, include all such piles throughout the operable unit.

Process Area Description

Approximately 1,000,000 ft^3 of material is contained in the soil piles. The 12 primary current soil piles are discussed as follows. The anticipated contaminants for the soil piles are summarized in Table A.3.

East of Building 2A. The soil pile located east of the Plant 2 East Pad (Component 74A) and south of the corner of B Street and 2nd Street in Grid 19 consists of 393 ft^3 of dirt rubble.

Southwest of Building 8A. The soil pile located southwest of the Recovery Plant (Component 8A) and south of the Rotary Kiln/Drum Reconditioning Building (Component 8C) in Grid 20 consists of 62.3 ft^3 of dirt rubble.

South of Building 8A. The soil pile located south of the Recovery Plant, south of the Rotary Kiln/Drum Reconditioning Building, in Grid 20 consists of 265 ft^3 of dirt rubble.

Southeast of Building 8A. The soil pile located southeast of the Rotary Kiln/Drum Reconditioning Building and southwest of the Plant 8 East Pad (Component 74C) in Grid 20 consists of 2,945 ft^3 of dirt rubble.

South of Building 80. The soil pile located south of the Plant 8 Warehouse Building (Component 80) in Grid 20 consists of 6,412 ft^3 of dirt rubble.

West of Building 5A. The soil pile located south of the Plant 5 Covered Storage Pad (Component 5F), west of the Plant 5 Ingot Pickling Building (Component 5B), and north of the Plant 5 Filter Building (Component 5E) in Grid 12 consists of 1,244 ft^3 of dirt rubble.

North of Building 9A. The soil pile located southeast of the Plant 9 Warehouse Building (Component 81) and north of the Special Products Plant (Component 9A) in Grid 3 consists of 1,094 ft^3 of dirt rubble.

Between Railroad Tracks 6 and 9. The soil pile located north of the Boiler Plant (Component 10A) and south of the KC-2 Warehouse Building (Component 63) in Grid 9 consists of 160,363 ft^3 of dirt rubble.

East of Coal Pile Run Off Basin. The soil pile located east of the Coal Pile Runoff Basin (Component 18C) in Grid 11 consists of 187 ft^3 of dirt.

3rd Street Dirt Pile. The soil pile located south of Quonset Hut 3 (Component 62) and north of the Plant 1 Pad (Component 74T) in Grid 17 consists of 803,589 ft^3 of dirt rubble.

Southwest of Building 15. The soil pile located southwest of the Lab Building (Component 15) in Grid 21 consists of 84.3 ft^3 of dirt rubble.

North of Building 67. The soil pile located north of the Plant 1 Storage Pad (Component 74T) and north of the Plant 1 Thorium Warehouse (Component 67) in Grid 24 consists of 1,006 ft^3 of dirt rubble.

Major Media Types per Process Area

The major medium for Component G-013 is soil.

Summary of Available Radiological Data

No current data are available for the Component G-013 soil piles. Data will be reassessed before sampling to include data gathered from ongoing surveys. The data will be assembled to assist in determining a radiological hot spot for each soil pile.

Summary of Sampling for the Soil Piles

Nonintrusive measurements, including exposure rate measurements, XRF surveys, and radiological surveys, will be performed and assessed in the field to define final intrusive sampling locations for each soil pile. Intrusive sampling for each process area will consist of one dirt core sample from each soil pile, except for the 3rd Street Dirt Pile, which will have four intrusive core samples because of its size and nonhomogeneity. Although supplemental samples of liquids or sediments are not anticipated, additional supplemental samples may

be identified by field crews during sampling activities. Table G-013-1 summarizes the planned sampling program for the soil piles.

TABLE G-013-1 Sample Types and Quantities for Component G-013

Sample Type	East of 2A	SW of 8A	South of 8A	SE of 8A	South of 80	West of 5A	North of 9A	Between R.R. Tracks	East of 18C	Third St. Pile	SW of 15	North of 67	Component Totals
Nonintrusive[a]													
Radiological surveys	b	b	b	b	b	b	b	b	b	b	b	b	NA[c]
Chemical surveys	b	b	b	b	b	b	b	b	b	b	b	b	NA
Air particulates	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Swipes	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lab composite swipes	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Intrusive[a]													
Concrete chips	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Concrete cores	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Masonry	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Steel surface scraping	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Supplemental													
Liquid sample	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Loose media (soil core)	1	1	1	1	1	1	1	1	1	4	1	1	15

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.7.2 Component P-001 — Rock Salt Pile

Component Description

Component P-001 (Rock Salt Pile) is a pile of rock salt used during the winter for road maintenance. The pile is routinely supplemented from off-site sources to supply the site needs. This component is located north of the Plant 1 Pad (Component 74T), as shown on the Grid 16 map in Appendix C.

Process Area Description

See discussion above.

Summary of Sampling for Component P-001

This component does not require sampling because it is insignificant in size. The contaminants expected for the component are of low toxicity, and the component exhibits little or no evidence of contamination.

D.9.7.3 Component P-002 — Sand Piles

Component Description

Component P-002 (Sand Piles) is used on-site for fill and construction uses. The sand piles are routinely supplemented from off-site sources to supply the site needs. This component is located north of the Plant 1 Pad (Component 74T), as shown on the Grid 16 map in Appendix C.

Process Area Description

See discussion above.

Summary of Sampling for Component P-002

This component does not require sampling because it is insignificant in size. The contaminants expected for the component are of low toxicity, and the component exhibits little or no evidence of contamination.

D.9.7.4 Component P-003 — Gravel Pile

Component Description

Component P-003 (Gravel Pile) is used on-site for fill and construction uses. The gravel pile is routinely supplemented from off-site sources to supply the site needs. This component is located north of the Plant 1 Pad (Component 74T), as shown on the Grid 16 map in Appendix C.

Process Area Description

See discussion above.

Summary of Sampling for Component P-003

This component does not require sampling because it is insignificant in size. The contaminants expected for the component are of low toxicity, and the component exhibits little or no evidence of contamination.

D.9.7.5 Component P-004 — Copper Metal Scrap Pile

Component Description

Component P-004 (Copper Metal Scrap Pile) is located on the northwestern corner of the Plant 1 Pad (Component 74T), as shown on the Grid 17 map in Appendix C (Figure P-004-1). Component P-004 comprises two piles of scrap copper, associated coatings (insulation with between 1 and 80% amosite and chrysotile asbestos), and miscellaneous conduit. The piles are stored out in the open on top of the concrete pad and have no protective covering. A total of approximately 1,370 tons of low-level radioactively contaminated scrap copper are stored in the two piles, and the scrap copper piles are approximately 15 and 30 ft high.

Process Area Description

Component P-004 was generated from scrap metal resulting from the Cascade Improvements/Cascade Upgrades Project at the Gaseous Diffusion Plant in Paducah, Kentucky; the scrap metals were initially sent to the FEMP for shredding and casting. However, the casting operations were abandoned when locations for the disposition of the resultant castings could not be identified. As a result, the scrap copper is currently being stored on the Plant 1 storage pad. The anticipated contaminants for the Copper Metal Scrap Pile are summarized in Table A.3.

Major Media Types per Process Area

Because the Plant 1 Pad is a separate component, the only major medium for the component is the scrap copper.

Summary of Available Radiological Data

Component P-004 has been surveyed for total beta-gamma radiation. Data from the 1991 surveys have been assembled and indicate that the radiological hot spots for the storage area are as described below. Six total beta-gamma readings were taken for Component P-004. As data are acquired from ongoing radiological surveys, the identified hot spots will be reassessed before sampling activities begin.

The highest total beta-gamma reading obtained from surveying Component P-004 was 200,000 dpm and was associated with copper contaminated with UO_3. Of the remaining five total beta-gamma readings taken, two were 100,000 dpm, one was 4,000 dpm, and two were equal to or less than 1,000 dpm. The location of the highest total beta-gamma reading (200,000 dpm) cannot be determined from available radiological survey reports.

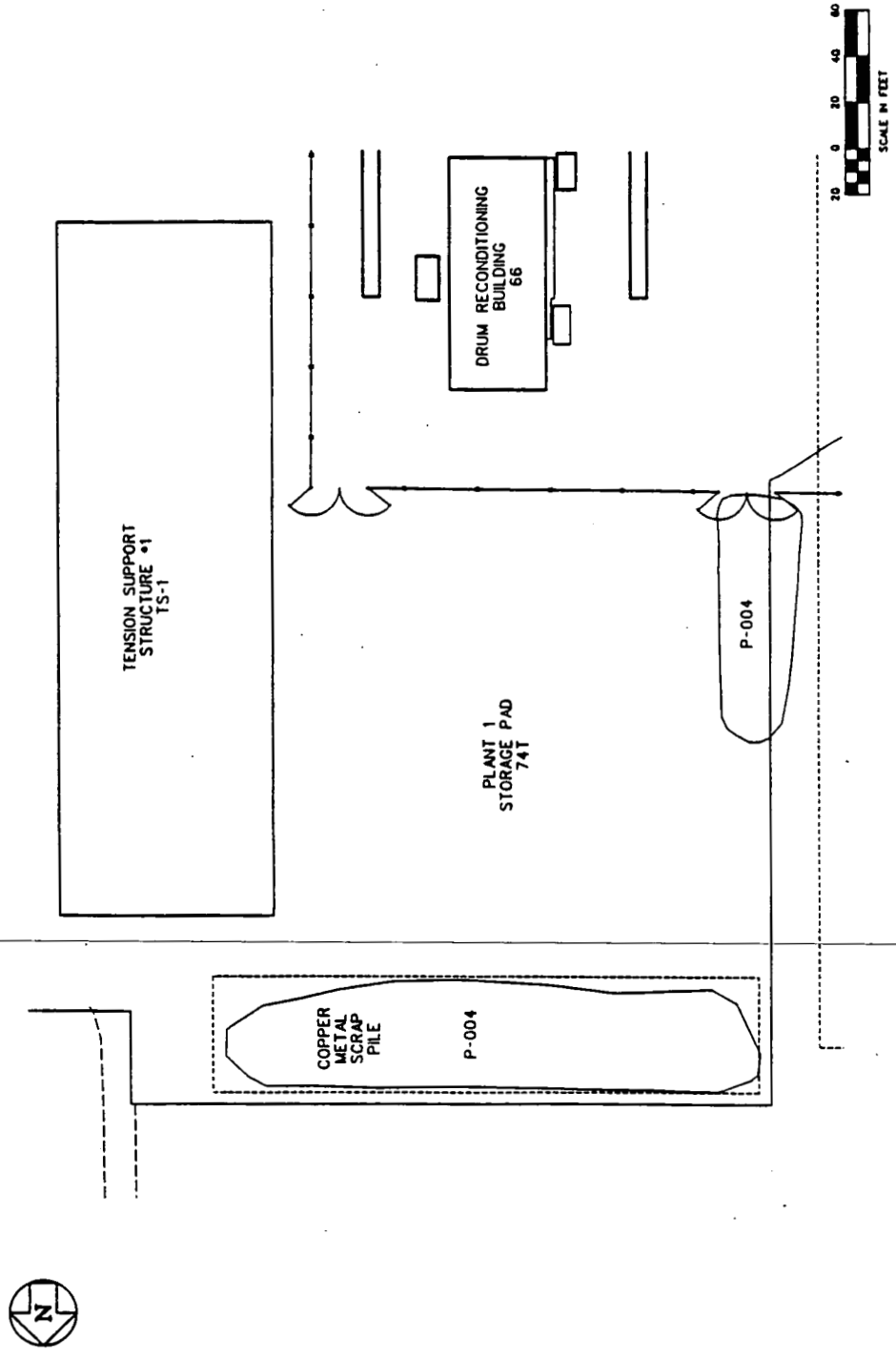

FIGURE P-004-1 Layout of Component P-004

Summary of Sampling for the Copper Metal Scrap Pile

Because of the presence of asbestos-containing insulation, an airborne particulate sample will be taken and analyzed for radiological and inorganic contamination, as well as asbestos, near the scrap copper piles on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and radiological surveys, will be performed and assessed in the field to further define two final supplemental sampling locations of the copper piles. Additional supplemental samples may be identified by field crews during sampling activities. Table P-004-1 summarizes the planned sampling program for Component P-004.

TABLE P-004-1 Sample Types and Quantities for Component P-004

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	NA	NA
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	2	2

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.7.6 Component P-005 — Coal Pile

Component Description

Component P-005 (Coal Pile) is located east of the Boiler Plant (Component 10A), and north of the Coal Pile Runoff Basin (Component 18C), as shown on the Grid 10 map of Appendix C. Approximately 115,000 ft^3 of coal are stored in one 10-ft-high pile. The coal pile is stored in the open on top of soil and has no protective covering. Most of the rainwater runoff from the coal pile and some of the runoff from the area immediately northeast of the coal pile drain along a small ditch located along the southeastern edge of the coal pile to a grated inlet and into the Coal Pile Runoff Basin. Some runoff from the area of the Water Plant (Component 20B) also drains toward the southern end of the coal pile. The locations of the Coal Pile, the Water Plant, and the Coal Pile Runoff Basin and associated grated inlet are depicted in Figure P-005-1.

Process Area Description

The coal stored in Component P-005 is used as fuel for the boilers in the Boiler Plant; the coal pile is considered a single process area. Anticipated contaminants for Component P-005 are summarized in Table A.3.

Major Media Types per Process Area

Although Component P-005 is stored on soil, in-place soils and other environmental media are characterized under Operable Unit 5. Therefore, no major medium is identified for Component P-005.

Summary of Available Radiological Data

~~No recent radiological data are available for Component P-005.~~

Summary of Sampling for Component P-005

No sampling is anticipated for the coal; however, liquid runoff from the coal pile will be collected and analyzed as a supplemental liquid sample. Additional supplemental samples may be identified by field crews during sampling activities. Table P-005-1 summarizes the planned sampling program for Component P-005.

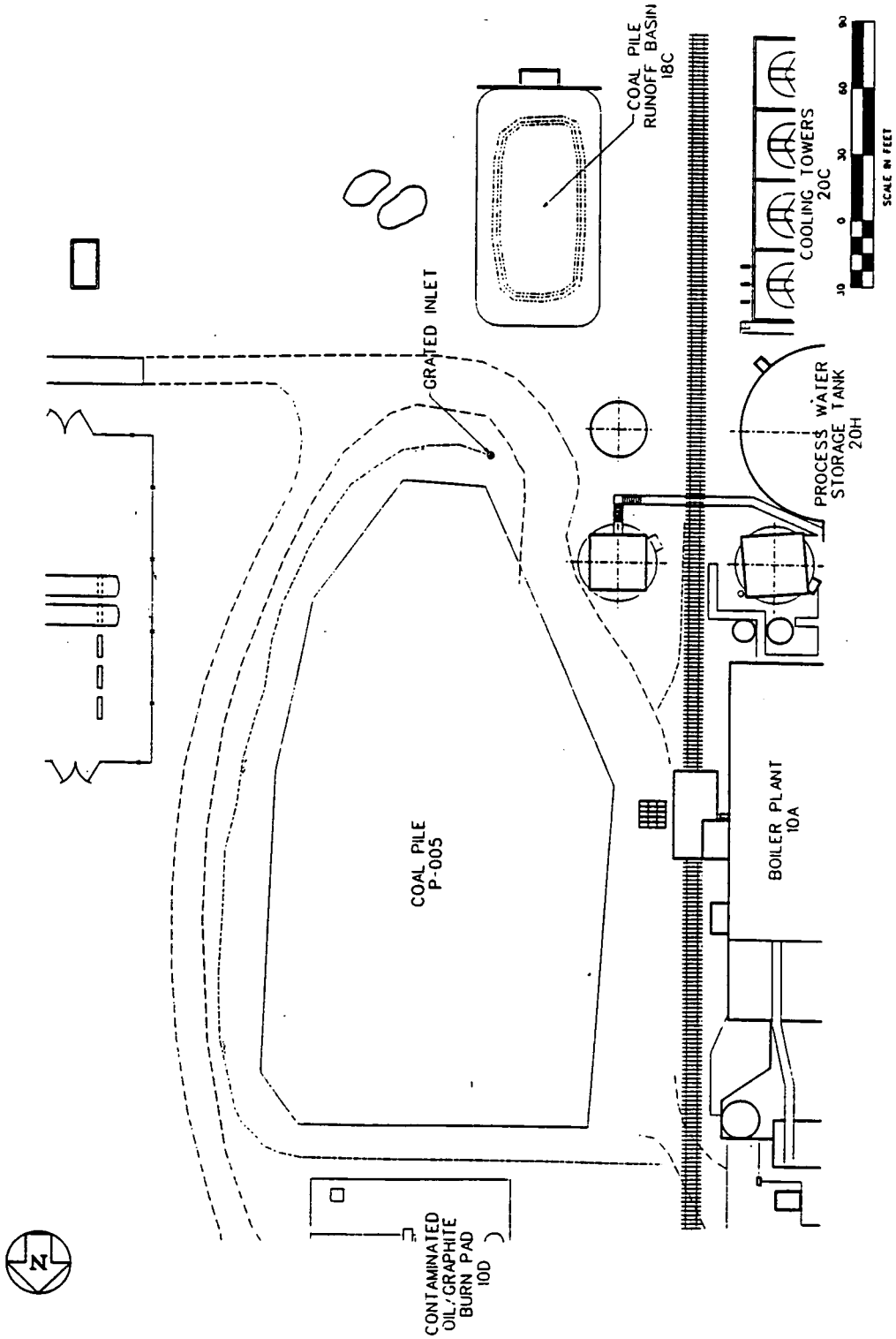

FIGURE P-005-1 Layout of Component P-005

TABLE P-005-1 Sample Types and Quantities for Component P-005

Sample Type	Coal Pile	Component Totals
Nonintrusive[a]		
Radiological surveys	NA[b]	NA
Chemical surveys	NA	NA
Air particulates	NA	NA
Swipes	NA	NA
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	1	1
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] Not applicable.

D.9.7.7 Component P-006 — Scrap Metal Pile

Component Description

Component P-006 (Scrap Metal Pile) is currently located on the Decontamination Pad (Component 74P) on the Grid 1 map of Appendix C. Approximately 3,274 tons (400,000 ft^3, uncompacted) of low-level radioactively contaminated scrap metal is stored in a pile 15 to 20 ft high. The pile is stored in the open on top of a curbed concrete storage pad and has no protective covering. The location of Component P-006 is shown in Figure P-006-1.

Process Area Description

Component P-006 was generated at the FEMP as a result of past on-site demolition projects, abandoned equipment, and the upgrade of facilities and vehicles. In May 1987, the scrap metals on the Decontamination Pad were segregated into recoverable and refuse categories. The recoverable scrap metal was further segregated into ferrous and nonferrous categories, and within each of these the metals were further segregated into high and low count. Anticipated contaminants for Component P-006 are summarized in Table A.3.

Major Media Types per Process Area

Because the Decontamination Pad is being addressed as a separate component and the metals in storage on the pad are generally nonstructural grades, no major media are identified for the component.

Summary of Available Radiological Data

Recent radiological data for Component P-006 are not available; however, the segregation of the piles will serve as a guide for selecting locations for sampling.

Summary of Sampling for Component P-006

Sampling of Component P-006 will be conducted under the supplemental sampling approach. Two supplemental loose media samples will be obtained to represent the component. Additional supplemental samples may be identified by field crews during sampling activities. Table P-006-1 summarizes the planned sampling program for Component P-006.

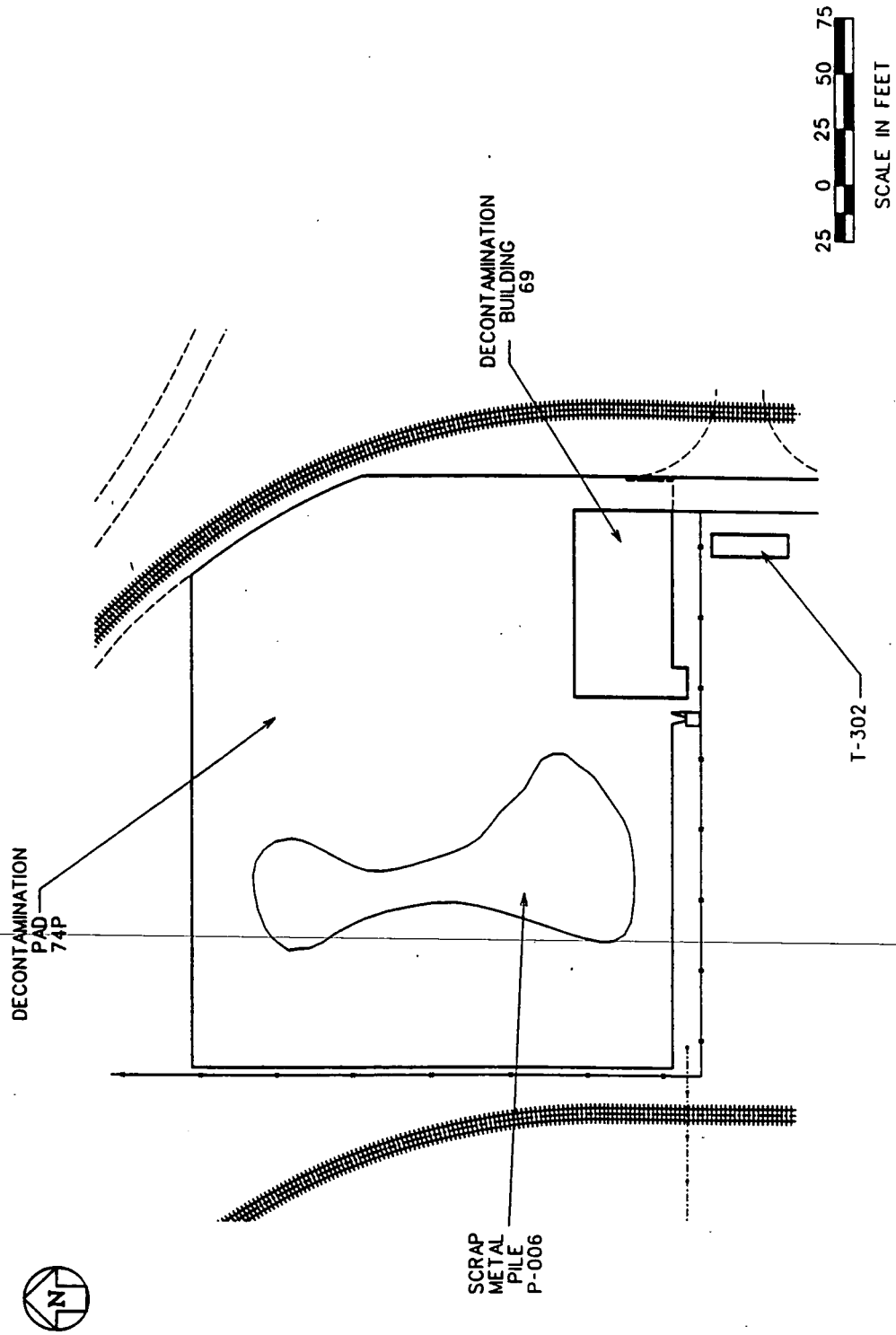

FIGURE P-006-1 Layout of Component P-006

TABLE P-006-1 Sample Types and Quantities for Component P-006

Sample Type	Scrap Metal Pile	Component Totals
Nonintrusive[a]		
Radiological surveys	NA[c]	NA
Chemical surveys	NA	NA
Air particulates	NA	NA
Swipes	NA	NA
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	2	2

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.7.8 Component P-007 — Outside Equipment Storage Area

Component Description

The Outside Equipment Storage Area (Component P-007) comprises two open field junkyards northeast and northwest of Building 69, as shown on the Grid 1 and 9 maps of Appendix C and in Figure P-007-1.

Process Area Description

Component P-007 is considered as one process area and stores junked contaminated vehicles and equipment. More than 150 contaminated and junked vehicles and wheeled equipment from site operations are stored on the field northwest of the Decontamination Building (Component 69). Contaminated and junked process equipment from past operations is stored on the field northeast of the Decontamination Facility Building (Component 69). Anticipated contaminants are summarized in Table A.3.

Major Media Types per Process Area

The media of Component P-007 are not defined as major media in this project. Soils associated with the component are Operable Unit 5.

Summary of Available Radiological Data

Component P-007 has not been routinely surveyed for removable alpha and total beta-gamma contamination.

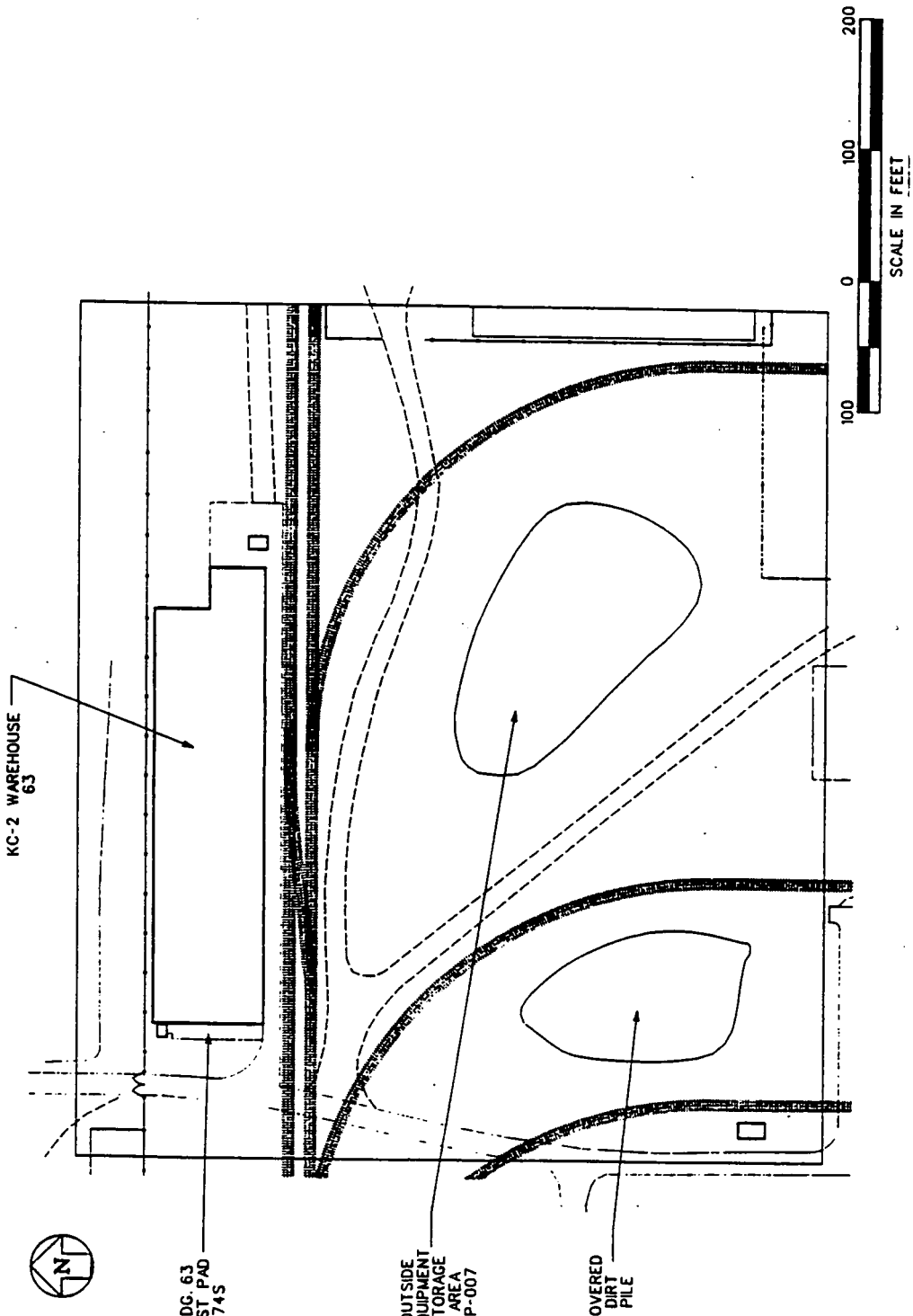

FIGURE P-007-1 Layout of Component P-007

D.9.8 STORAGE PADS, PARKING LOT, ROADS, AND RAILROADS

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D.9.8.1 Pad 10D — Contaminated Oil/Graphite Burner Pad

Component Description

Pad 10D (Contaminated Oil/Graphite Burner Pad) is a reinforced poured concrete pad located northeast of the Boiler Plant (Component 10A), as shown on the Grid 10 map in Appendix C. It is rectangular and measures approximately 55 × 85 ft (Figure 10D-1). It was constructed with berms, slopes, and grated trenches to contain any spilled liquid material and storm-water runoff.

Process Area Description

Pad 10D provides storage for materials and equipment associated with contaminated oil and graphite burning. This involved three operations, described as follows. The anticipated contaminants for the pad are summarized in Table A.3.

Graphite burning entailed using a small, open gas-fired furnace to oxidize scrap graphite crucible or molds for uranium recovery. Only the graphite burner from this process remains on Pad 10D.

In the oil burning process, a small refractory brick enclosure housed removable steel pots that were fed contaminated oil and solvent. Combustion was aided by an air jet into the steam-heated tank (where the oil was preheated) before going to the burner pot. Combustion was self-sustained. Ash was drummed for uranium recovery. Of this process, only the oil burner enclosure and tank remain. All other equipment was removed.

The third feature of the pad involved a sump that decanted surface water. This water was pumped from the subgrade pit into portable tanks and sent to the Recovery Plant (Component 8A) for wastewater treatment. The steam eductor from this process was removed.

Major Media Types per Process Area

The only major medium for Pad 10D is concrete; however, remaining process equipment includes brick and steel as well. The process equipment will not be considered as major media, although supplemental samples may be warranted.

Summary of Available Radiological Data

Pad 10D has not been routinely surveyed for removable alpha and total beta-gamma contamination. No recent data are available, but the radiological hot spot will be determined

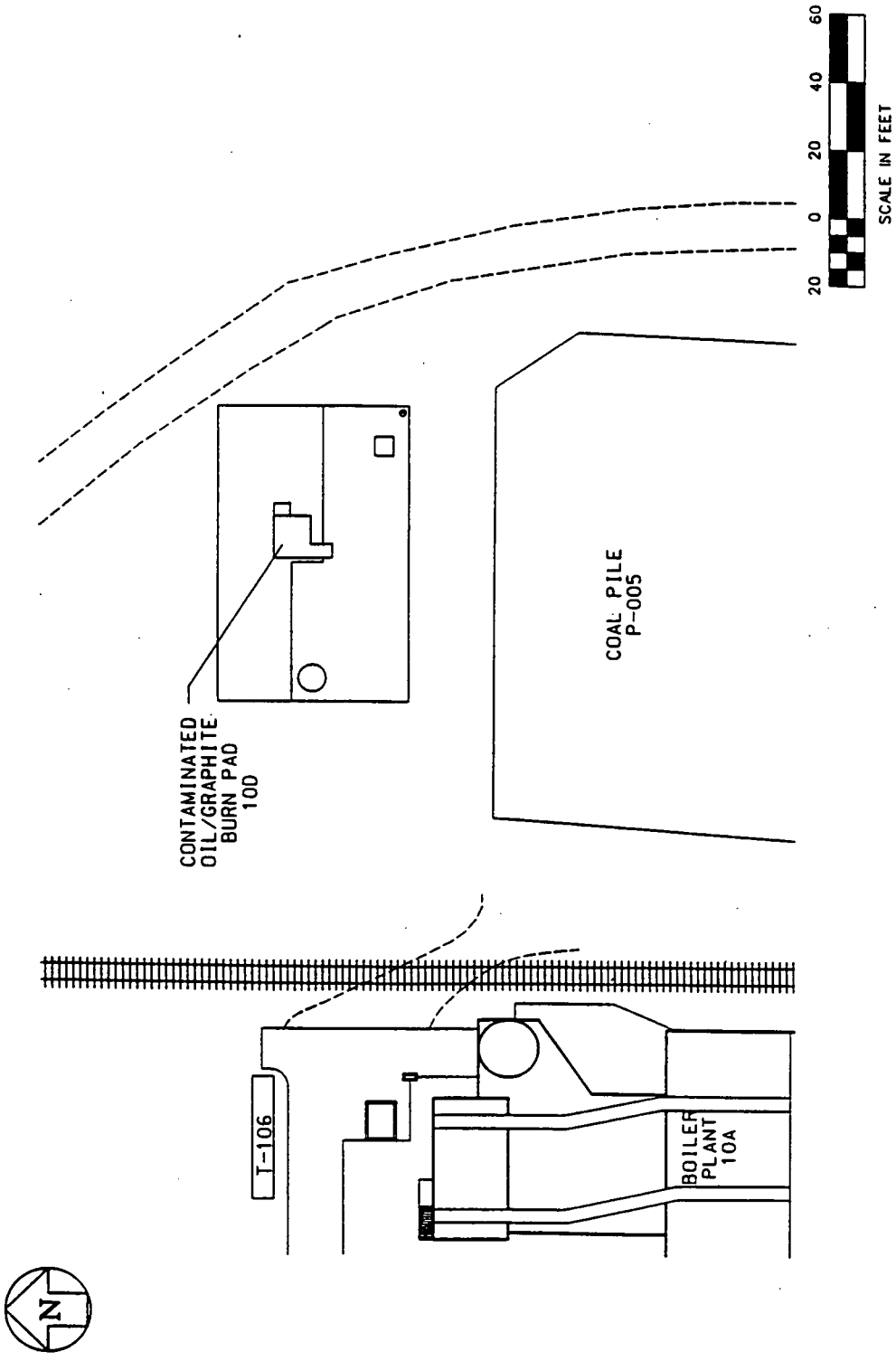

FIGURE 10D-1 Layout of Pad 10D

from field measurements before sampling occurs. Also, if data are acquired from other radiological surveys taken for health physics needs, the identified hot spots will be incorporated into the sampling plans.

Summary of Sampling for Pad 10D

One airborne particulate sample will be taken on the pad and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. The only medium within the pad is concrete. Because Pad 10D processes involved waste oils, it is considered a wet process area; therefore, a concrete core will be taken from the pad. This is an uncovered pad, and a lined pit near the brick oil burner has collected a substantial amount of rainwater; therefore, a supplemental liquid sample will be taken. Visual inspection of the component identified no other supplemental samples. Table 10D-1 summarizes the planned sampling program for Pad 10D.

TABLE 10D-1 Sample Types and Quantities for Pad 10D

Sample Type	Pad	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	1	1
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.8.2 Component 30C — Old Ten-Ton Scale

Component Description

Component 30C (Old Ten-Ton Scale) is a drive-on pallet-size scale for weighing incoming and outgoing shipment pallets. This component is located north of the Chemical Warehouse (Component 30A) near the railroad dock area, as shown on the Grid 18 map in Appendix C.

Process Area Description

This scale was used for weighing received materials on the shipping pallets.

Summary of Sampling for Component 30C

This component does not require sampling because it is insignificant in size.

D.9.8.3 Component 31B — Old Truck Scale

Component Description

Component 31B (Old Truck Scale) is a concrete platform approximately 15 × 140 ft. This component was located west of the Garage (Component 31A), as shown on the Grid 7 map in Appendix C.

Process Area Description

This component comprises the ramps and platform for a truck scale. The scale was moved to its present location (Component 22C) at the Receiving/Incoming Materials Inspection Building (Component 82).

Summary of Sampling for Component 31B

This component does not require sampling because it exhibits little or no evidence of contamination.

D.9.8.4 Pad 74A — Plant 2 East Pad

Component Description

Pad 74A (Plant 2 East Pad) is a reinforced poured concrete pad, located due east of the Ore Refinery Plant (Component 2A), as shown on the Grid 19 map in Appendix C. Its shape is rectangular, containing approximately 5,000 ft^2 of storage space (Figure 74A-1). It was constructed with berms, slopes, and grated trenches to contain any spilled liquid material and collect any storm-water runoff.

Process Area Description

Pad 74A was historically used as a staging area for UO_3 (black oxide) product produced in the denigration process of the Ore Refinery Plant. The UO_3 was stored in drums if the enrichment of the material exceeded 1.0% ^{235}U; otherwise, it was stored in drums or hoppers. The UO_3 was sent from Pad 74A to long-term storage on the Plant 1 Pad (Component 74T), to the Green Salt Plant (Component 4A) for conversion into UF_4 (green salt) or for off-site shipping for conversion to UF_6. Currently, Pad 74A is a drum storage area. The storm-water runoff collected in the grated trench is pumped to the Refinery Sump (Component 3H) for eventual wastewater treatment. The anticipated contaminants for the pad are summarized in Table A.3.

Major Media Types per Process Area

The only major medium for Pad 74A is concrete.

Summary of Available Radiological Data

Pad 74A is routinely surveyed for total beta-gamma contamination. Results from surveys conducted from 1989 through 1992 summarized in Tables A.4.0 and A.4.1 are the basis for identifying hot spots. As indicated in Table A.4.1, 51 total beta-gamma survey measurements were performed on Pad 74A during this period. The data have been assembled, and the hot spot for the concrete is identified in Figure 74A-1. No removable alpha swipe samples were conducted during this time. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys. The highest total beta-gamma reading for the concrete pad was determined to be 30,800 dpm.

Summary of Sampling for Pad 74A

One airborne particulate sample will be taken on the pad and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1.

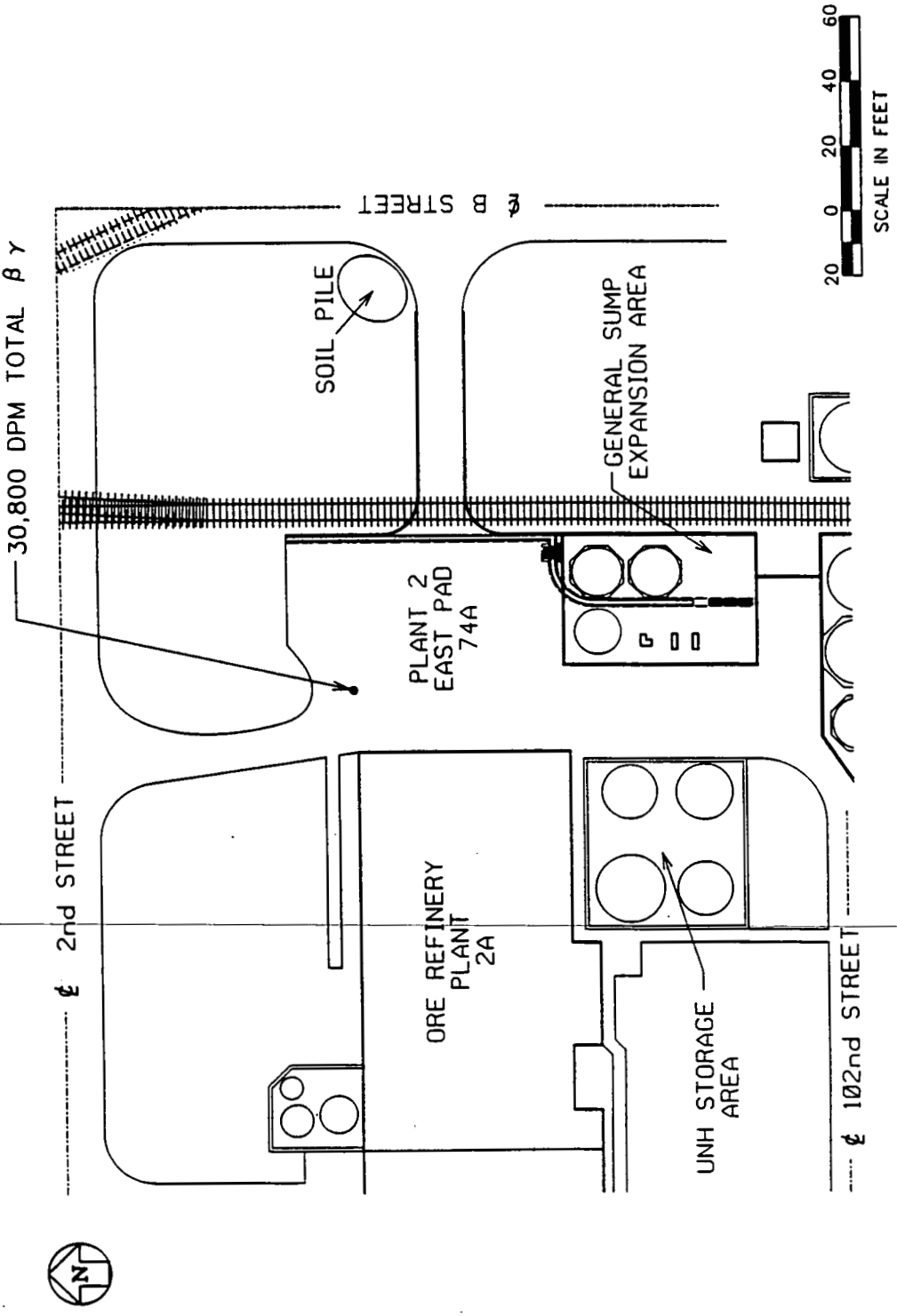

FIGURE 74A-1 Layout of Pad 74A

Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail the final intrusive sampling location. Because Pad 74A is a storage area, it is considered a dry process area; therefore, a concrete chip will be taken from the pad. Visual inspection of the component identified a measurable quantity of residues near the north berm of Pad 74A, which will be considered a supplemental sample. Table 74A-1 summarizes the planned sampling program for Pad 74A.

TABLE 74A-1 Sample Types and Quantities for Pad 74A

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.8.5 Pad 74B — Plant 2 West Pad

Component Description

Pad 74B (Plant 2 West Pad) is a reinforced poured concrete pad located northwest of the Ore Refinery Plant (Component 2A), as shown on the Grid 19 map in Appendix C. This rectangular pad contains approximately 10,000 ft^2 of storage space (Figure 74B-1). The pad was constructed with berms, slopes, and grated trenches to contain any spilled liquid material and collect any storm-water runoff.

Process Area Description

Pad 74B was historically used as the storage pad for drums that contained various types of milled uranium ores. The drums were loaded onto either the Hot Side Ore Conveyor (Component 2G) or the Cold Side Ore Conveyor (Component 2F) and dumped into bucket elevators that carried the powdered ore up to the top floor of the Ore Refinery Plant for digestion in nitric acid. The empty drums were then returned to Pad 74B to await removal for cleaning and reconditioning. Currently, Pad 74B is a Sealand storage area. The storm-water runoff collected in the grated trench is pumped to the Refinery Sump (Component 3H) for eventual wastewater treatment. The anticipated contaminants for the pad are summarized in Table A.3.

Major Media Types per Process Area

The only major medium for Pad 74B is concrete.

Summary of Available Radiological Data

Pad 74B is routinely surveyed for removable alpha and total beta-gamma contamination. Results from surveys conducted from 1989 through 1992 are summarized in Tables A.4.0 and A.4.1 and are the basis for identifying hot spots. As indicated in Table A.4.1, 110 total beta-gamma survey measurements were performed on Pad 74B during this period. Also, 92 removable alpha smear samples were taken and analyzed. The data have been assembled, and the hot spot for the concrete is identified in Figure 74B-1. Data will be reassessed before sampling to include those data gathered from ongoing radiological surveys.

The highest total beta-gamma reading for the concrete pad, 196,000 dpm, is located directly under the Hot Side Ore Conveyors. Total beta-gamma readings tend to be at least an order of magnitude higher around both the Hot and Cold Side conveyors than the rest of Pad 74B. Of the 92 removable alpha measurements, all but one were found to be below detectable limits; that one measurement was taken at the base of the Hot Side Ore Conveyor building and registered 60 dpm.

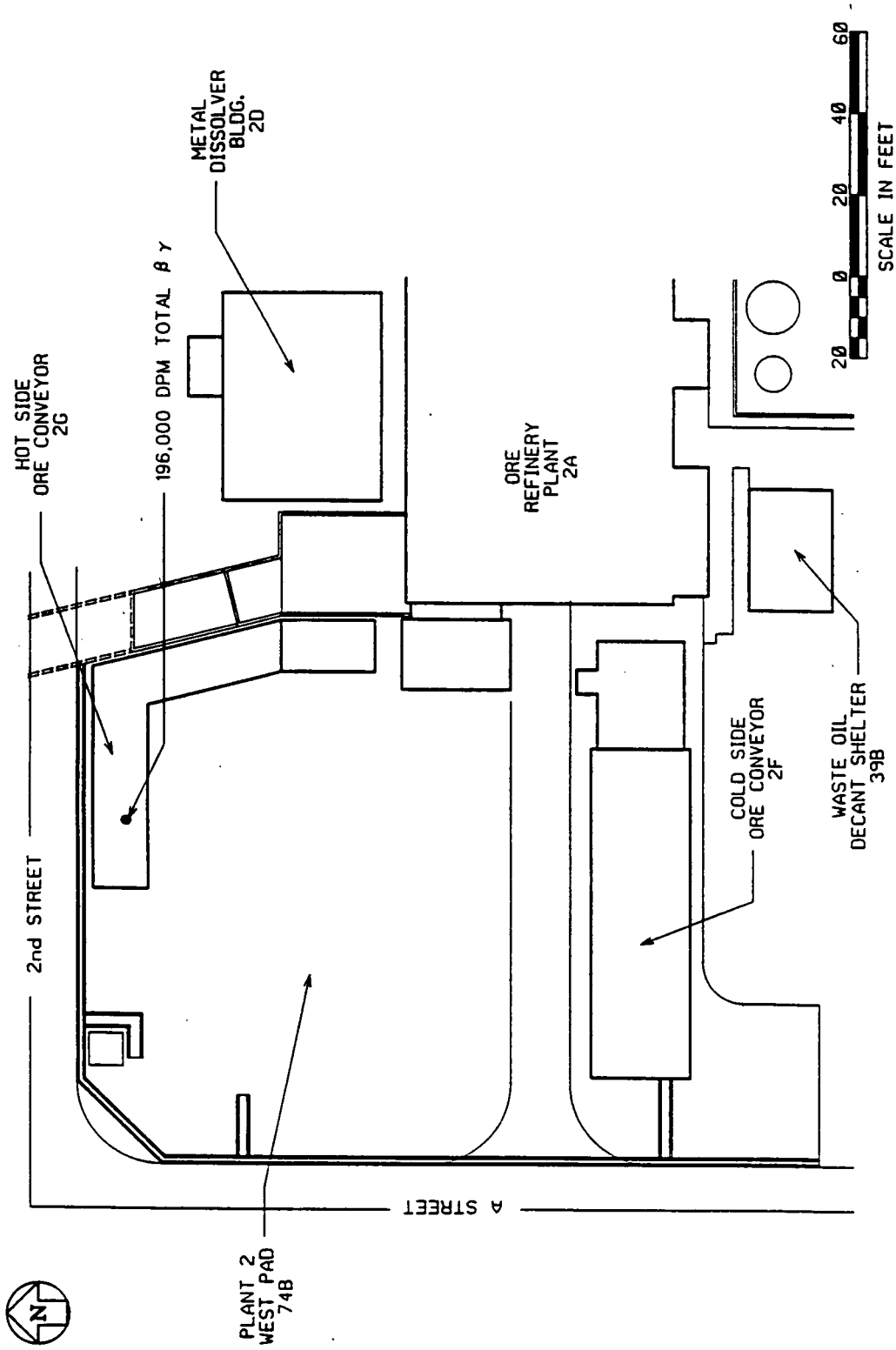

FIGURE 74B-1 Layout of Pad 74B

Summary of Sampling for Pad 74B

One airborne particulate sample will be taken on the pad and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail the final intrusive sampling location. Because Pad 74B is a storage area, it is considered a dry process area; therefore, a concrete chip will be taken from the pad. Visual inspection of the component identified no supplemental samples. Table 74B-1 summarizes the planned sampling program for Pad 74B.

TABLE 74B-1 Sample Types and Quantities for Pad 74B

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.8.6 Pad 74C — Plant 8 East Pad

Component Description

Pad 74C (Plant 8 East Pad) is a reinforced concrete pad located east of the Recovery Plant (Component 8A), as shown on the Grid 20 map in Appendix C. This irregularly shaped pad has about 10,000 ft^2 of storage space (Figure 74C-1). The pad is bordered on the east by a railroad track that ends at the south end of the pad; also, the Plant 8 Railroad Filter Building (Component 8D) is immediately across the track from the east pad. The loading dock for the Recovery Plant at the northern end of Pad 74C consists of reinforced concrete raised 3 to 4 ft above the pad and is considered part of the pad. One of the process areas of the Recovery Plant, the thorium storage silo, formerly was located on Pad 74C next to the east wall of Component 8A, as shown in dashed lines in Figure 74C-1. Pad 74C has grated concrete trenches for runoff-water collection.

Process Area Description

Three distinct processes have occurred on Pad 74C: storage of materials for processing, drumming of Weldon Spring "airport scrap," and storage of pyrophoric uranium for processing. Each activity used roughly the same areas of the pad. Anticipated contaminants from these activities are summarized in Table A.3.

Storage. The Plant 8 East Pad historically stored Recovery Plant products and large lots of drummed uranium and thorium residues that were to be processed in the Recovery Plant for recycling to the Ore Refinery Plant (Component 2A). Both enriched and depleted uranium materials (^{235}U content up to 1.25%) were stored. Later in the history of usage and in current practice, drummed and other containerized uranium residues were stored for shipment off-site. Additionally, magnesium fluoride (airport scrap), oil and uranium in water mixtures, and pyrophoric uranium materials (uranium chips, turnings, and saw dust) have been stored in drums and portable hoppers on Pad 74C. Both solid materials and materials containing free liquid were stored on the pad.

Airport Scrap. The airport scrap operation involved receipt of bulk MgF_2 from Weldon Spring in railroad gondola cars that were off-loaded to drums on Pad 74C. The gondola cars and other railroad cars were washed over the railroad filter building pit, decanted and filtered through sand filters in the Plant 8 Railroad Filter Building, and then pumped into the Recovery Plant for further treatment.

Pyrophoric Drum Sprinkler. Railroad Filter Pit water was circulated, by using the Plant 8 Railroad Filter Building filters and pumps, to a sprinkler system over the pyrophoric material drum storage area on the pad for use in cooling these drums. Drums of

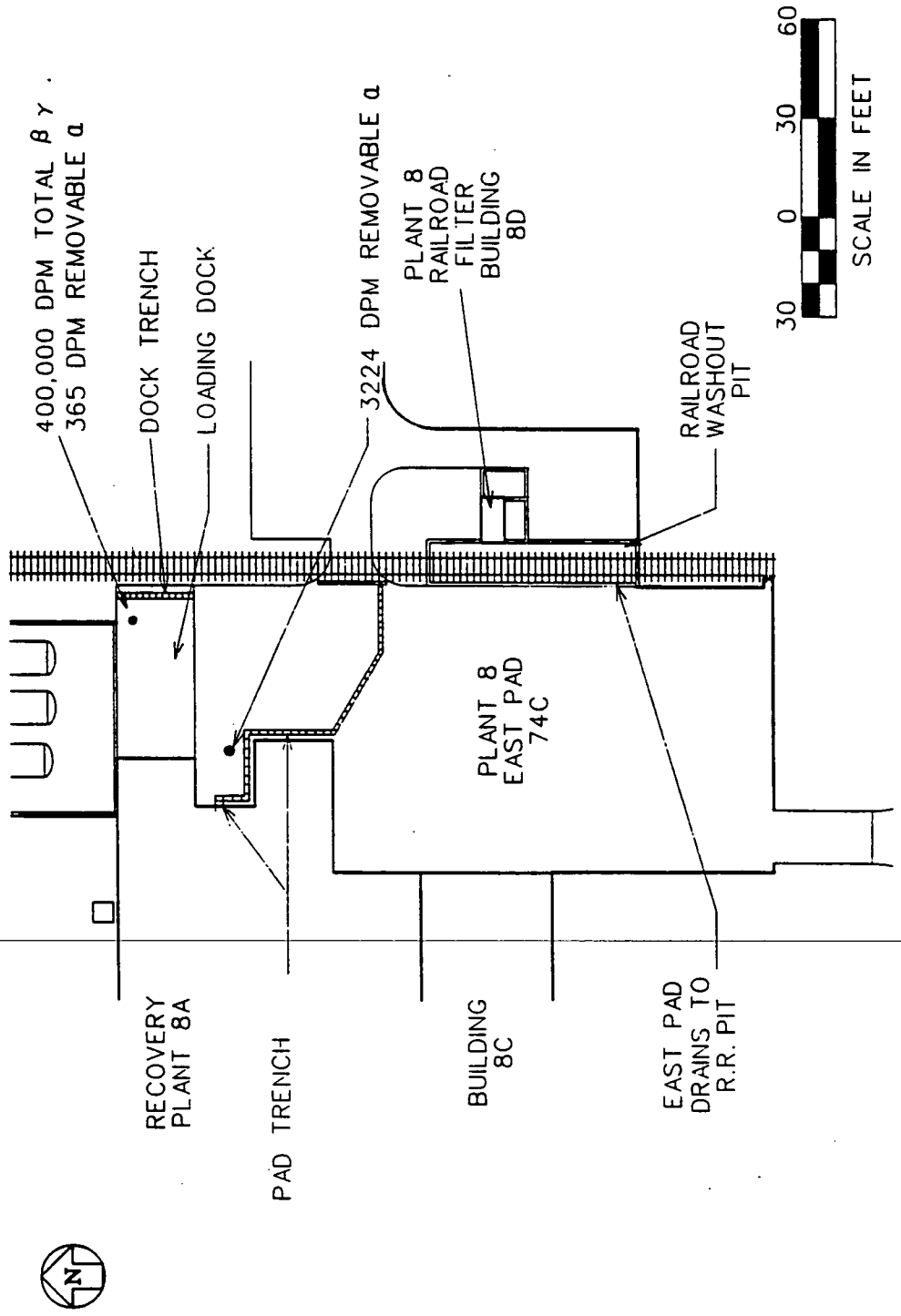

FIGURE 74C-1 Layout of Pad 74C

uranium metal fines produced in the Metals Fabrication Plant (Component 6A) and the Special Products Plant (Component 9A) machining operations were temporarily stored on the pad to await furnacing in the Recovery Plant (Component 8A). The fines were stored immersed in water.

Major Media Types per Process Area

The only major medium for Pad 74C is concrete.

Summary of Available Radiological Data

The Plant 8 East Pad is routinely surveyed for radiological contamination. Surveys conducted in 1991 and 1992 yielded 119 readings for removable alpha and 47 for total beta-gamma on the concrete base of the pad. The total beta-gamma measurements were taken mostly on the loading dock (37 readings), with only 10 total beta-gamma readings on the main level of Pad 74C (in the localized area of a minor spill of a container that held floor sweepings from the Recovery Plant). These data have been analyzed and are the basis for initial identification of hot spots. These data indicate that the hot spot for concrete on the pad is on a discolored area near the east end of the loading dock, with several total beta-gamma readings of 400,000 dpm (Figure 74C-1). Only removable contamination measurements were collected on the main pad; they yielded a highest reading of 3,224 dpm for alpha near the east wall of the Recovery Plant.

Summary of Sampling for Pad 74C

One airborne particulate sample will be taken on the pad and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail the final intrusive sampling locations for concrete on the loading dock and main pad. The only major medium for the pad is concrete. Because Pad 74C is a storage area, it is considered a dry process area; therefore, concrete chips will be the intrusive samples.

Visual inspection of the component determined that an aqueous liquid and composite sediment sample will be collected from the railroad car wash pit because it received drainage from the east pad. Table 74C-1 summarizes the planned sampling program for Pad 74C. Sampling on the pad is handled as one process area, rather than three, because the units overlap.

TABLE 74C-1 Sample Types and Quantities for Pad 74C

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	1	1
Loose media	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.8.7 Pad 74D — Plant 8 West Pad

Component Description

Component 74D (Plant 8 West Pad) is a reinforced concrete pad located west of the Recovery Plant (Component 8A), as shown on the Grid 20 map in Appendix C. This irregularly shaped pad has more than 10,000 ft^2 of storage space; Pad 74D surrounds the Plant 8 Maintenance Building (Component 8B) on three sides (Figure 74D-1). Also, the Old Drum Washer (Component 8F) unit is located on Pad 74D but is no longer used, having been abandoned in place in favor of a new drum reconditioning process. The pad has two grated trenches, one on the west and north edges and the other on the east edge.

Process Area Description

Pad 74D historically stored both full and empty drums in support of Recovery Plant operations and for waste storage before shipment off-site for disposal. Enriched and depleted recovery materials and hazardous wastes were stored here, both in solid form and materials containing free liquid. Empty and refurbished drums were also stored on the pad in conjunction with the Old Drum Washer. The grated trenches of the pad were used to transfer wash water from the Old Drum Washer and pad runoff and spillage to the Recovery Plant for treatment. Anticipated contaminants for the pad are summarized in Table A.3.

Major Media Types per Process Area

The only major medium for Pad 74D is concrete.

Summary of Available Radiological Data

Pad 74D surveys for removable alpha contamination have involved 80 measurements. No total beta-gamma contamination data are available for the pad. The highest removable alpha measurement was 262 dpm. Radiological surveys will be performed before component sampling to determine the hot spot for intrusive sampling. Any additional results from ongoing radiological surveys will be assessed before field sampling.

Summary of Sampling for Pad 74D

One airborne particulate sample will be collected for radiological and inorganic contamination, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail the final intrusive sampling location for concrete, the only major medium for the pad. Because Pad 74D is a storage area, it is considered a dry

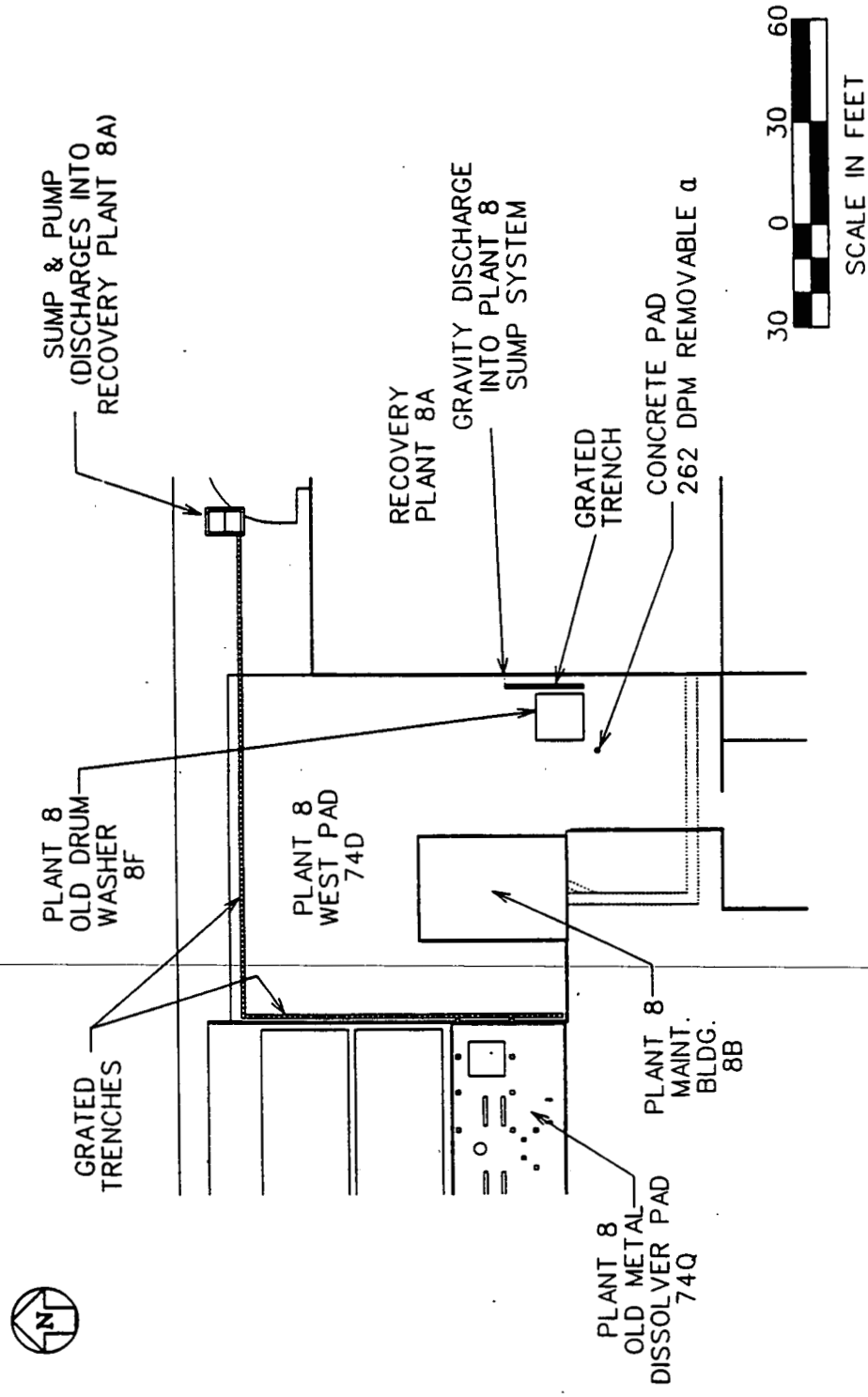

FIGURE 74D-1 Layout of Pad 74D

process area; therefore, a concrete chip will be the intrusive sample. Visual inspection of the pad indicated the presence of liquid in the sump at the northern edge of the pad. The sump is anticipated as a supplemental sample. Table 74D-1 summarizes the planned sampling program for Pad 74D.

TABLE 74D-1 Sample Types and Quantities for Pad 74D

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	1	1
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.8.8 Pad 74E — Plant 4 Pad

Component Description

Pad 74E (Plant 4 Pad) is a poured concrete and asphalt pad located due east of the Green Salt Plant (Component 4A) and extending south toward the Plant 4 Warehouse (Component 4B) and the Plant 4 Maintenance Building (Component 4C), as shown on the Grid 13 map in Appendix C. This irregularly shaped pad has approximately 15,000 ft^2 of storage space; it is constructed of asphalt in the northern portion and concrete in the southern portion (Figure 74E-1).

Process Area Description

Pad 74E was historically used as a temporary storage area for mobile T-hoppers and J-hoppers of UO_3 and depleted UF_4, drummed uranium residues, and drummed scrap UF_4. Currently, Pad 74E is being used as a storage area for white metal boxes (WMBs). Mobile hoppers are being stored on a gravel area north of the Plant 4 Warehouse and east of Pad 74E. The anticipated contaminants for the pad are summarized in Table A.3.

Major Media Types per Process Area

The major media for Pad 74E are concrete and asphalt.

Summary of Available Radiological Data

Pad 74E is routinely surveyed for removable alpha and total beta-gamma contamination. The 1991 data from these surveys have been assembled and indicate that the radiological hot spots for the storage area are as described below and as indicated in Figure 74E-1. A total of 40 alpha removable and total beta-gamma readings were taken on the asphalt in the northern portion of the pad, and 25 alpha removable and total beta-gamma readings were taken on the southern portion of the pad. Also, as data are acquired from ongoing radiological surveys, the identified hot spots will be reassessed before sampling occurs.

Of the 40 total beta-gamma readings taken on the asphalt, 14 exceeded 5,000 dpm, with a range from 5,100 to 32,000 dpm. Of the 25 total beta-gamma readings taken on the concrete, 6 equaled or exceeded 3,000 dpm, with a range from 3,000 to 10,000 dpm. The locations of the highest beta-gamma readings are depicted in Figure 74E-1.

Of the 40 alpha removable readings taken on the asphalt, all were less than the MDA of 60.1 dpm. Of the 25 total alpha removable readings taken on the concrete, only 1 reading of 96 dpm exceeded the MDA.

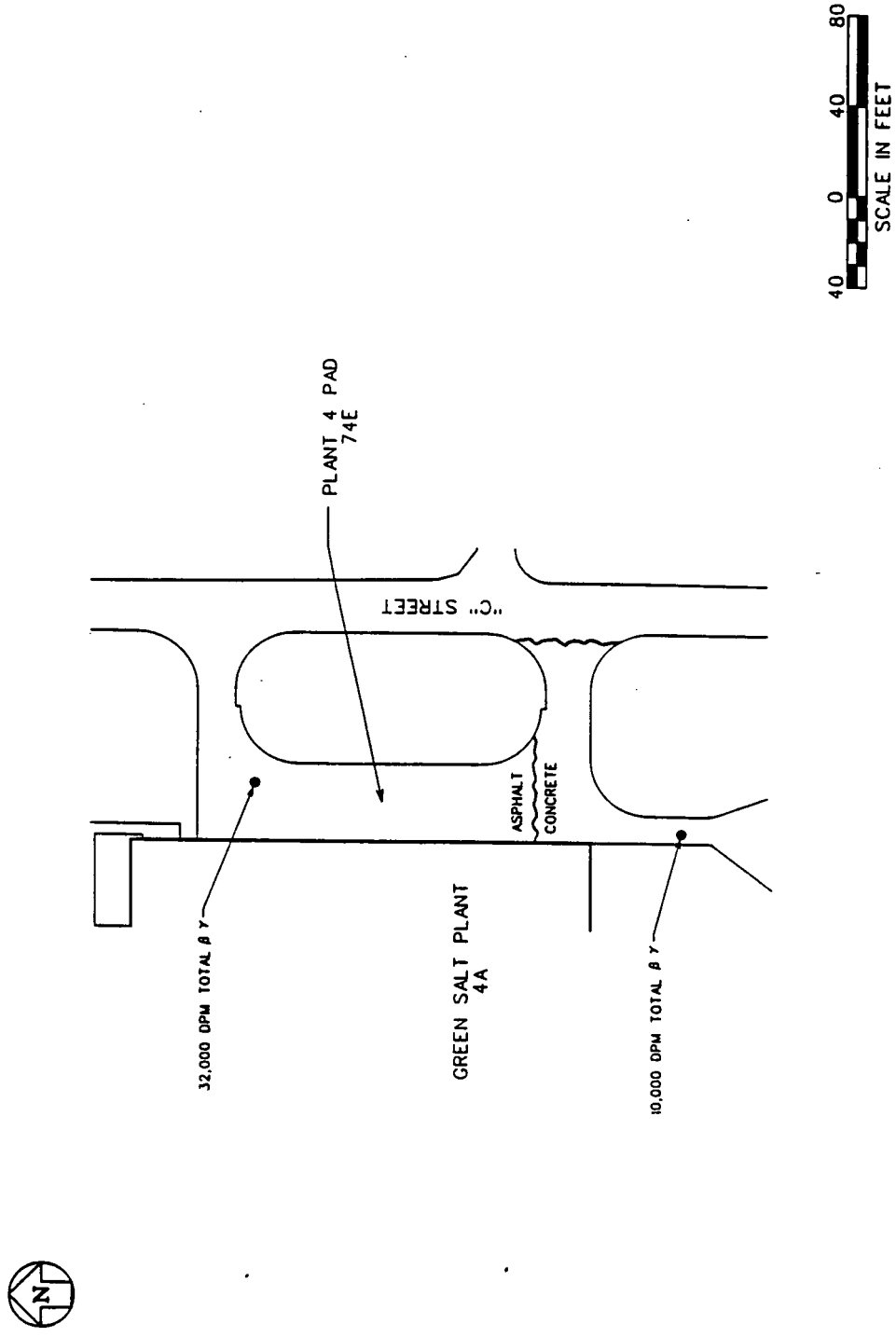

FIGURE 74E-1 Layout of Pad 74E

Summary of Sampling for Pad 74E

One airborne particulate sample will be taken on Pad 74E and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, radiological surveys, and swipes, will be performed and assessed in the field to further define final intrusive sampling locations. The media associated with Pad 74E are concrete and asphalt. Intrusive sampling will be performed for the storage area and will consist of concrete chips in the southern portion of the pad; intrusive sampling may consist of an intrusive asphalt sample for the northern portion of the pad. If analysis of radiological swipe samples from either the concrete or asphalt detects elevated levels of removable contamination as outlined in Protocol 1, the contaminated swipes will be combined over the component for laboratory analysis. Visual inspection of the pad indicated no supplemental samples other than the possible asphalt samples, although additional supplemental samples may be identified by field crews during sampling activities. Table 74E-1 summarizes the planned sampling program for Pad 74E.

TABLE 74E-1 Sample Types and Quantities for Pad 74E

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Asphalt	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.8.9 Pad 74F — Plant 7 Pad

Component Description

Pad 74F (Plant 7 Pad) is a reinforced poured concrete pad located west and south of Plant 7 (Component 7A), as shown on the Grid 13 map in Appendix C. This irregularly shaped pad (Figure 74F-1) is used as a staging (loading and unloading) pad for Plant 7.

Process Area Description

Pad 74F is considered one process area and is used for receiving, shipping, and storing UF_6 cylinders and T-hoppers that contain UF_4 from Paducah and UO_3 from Hanford. Before they were removed, four subgrade tanks collected condensate from steam-heated UF_6 autoclaves west of Plant 7. Currently, Pad 74F contains empty mobile hoppers, waste, empty UF_4 cans, J-hoppers, a cylinder dolly, three storage tanks, and a scale. The anticipated contaminants for the pad are summarized in Table A.3.

Major Media Types per Process Area

The only major medium for Pad 74F is concrete.

Summary of Available Radiological Data

Pad 74F was surveyed for removable alpha contamination in 1991; the results are the basis for identifying the hot spot. In total, 41 removable alpha survey measurements were performed on Pad 74F, with an MDA of 52 dpm. Only 10 of the 41 removable alpha measurements were above the MDA, with an average measurement of 100 dpm. The data have been assembled, and the hot spot for the concrete is identified in Figure 74F-1. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys. The hot spot for the concrete medium was determined to be near the south end of Plant 7, on the east side of the pad, with a removable alpha reading of 251 dpm.

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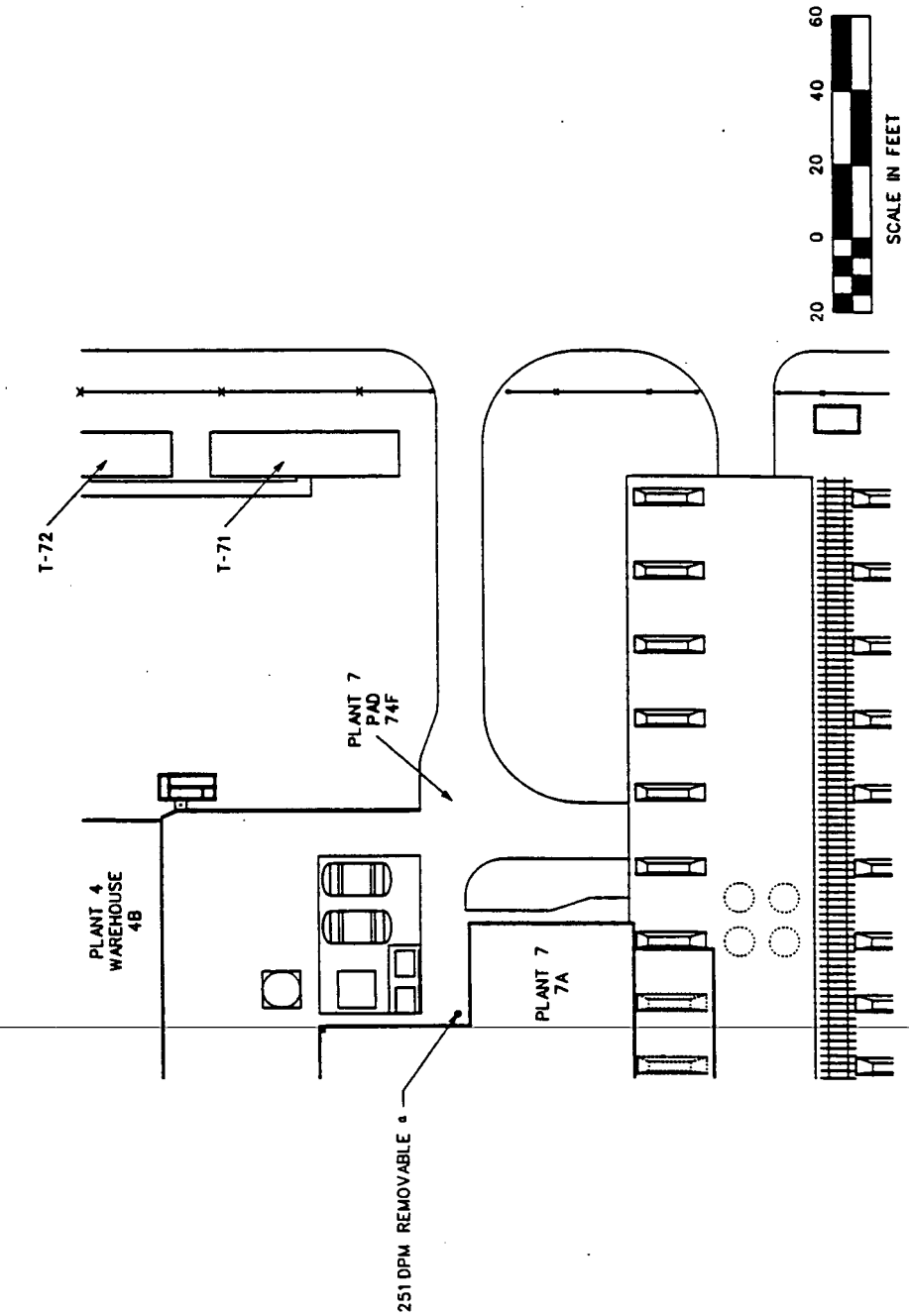

FIGURE 74F-1 Layout of Pad 74F

Summary of Sampling for Pad 74F

One airborne particulate sample will be taken on the pad and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Because Pad 74F is a storage area, it is considered a dry process area; therefore, a concrete chip will be taken from the pad. Visual inspection of the component identified no supplemental samples. Table 74F-1 summarizes the planned sampling program for Pad 74F.

TABLE 74F-1 Sample Types and Quantities for Pad 74F

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.8.10 Pad 74G — Plant 5 East Pad

Component Description

Pad 74G (Plant 5 East Pad) is a reinforced poured concrete pad, located east of the Metals Production Plant (Component 5A), as shown on the Grid 12 map in Appendix C. This rectangular pad contains more than 5,000 ft^2 of open storage area north of the Slag Recycling Building (Component 55A) (Figure 74G-1).

Process Area Description

Pad 74G is considered one process area; it was historically used for temporary storage of drummed residues and reduction pots from the Metals Production Plant and residues from the Slag Recycling Building. Currently, it stores uranium ingots, derbies, and other miscellaneous uranium products in drums and on steel skids. The anticipated contaminants for the pad are summarized in Table A.3.

Major Media Types per Process Area

The only major medium for Pad 74G is concrete.

Summary of Available Radiological Data

Pad 74G has not been routinely surveyed for removable alpha and total beta-gamma contamination. No recent data are available, but the radiological hot spot will be determined from field measurements before sampling.

Summary of Sampling for Pad 74G

One airborne particulate sample will be taken on the pad and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Because Pad 74G is a storage area, it is considered a dry process area; therefore, a concrete chip will be taken from the pad. Visual inspection of the component identified no supplemental samples. Table 74G-1 summarizes the planned sampling program for Pad 74G.

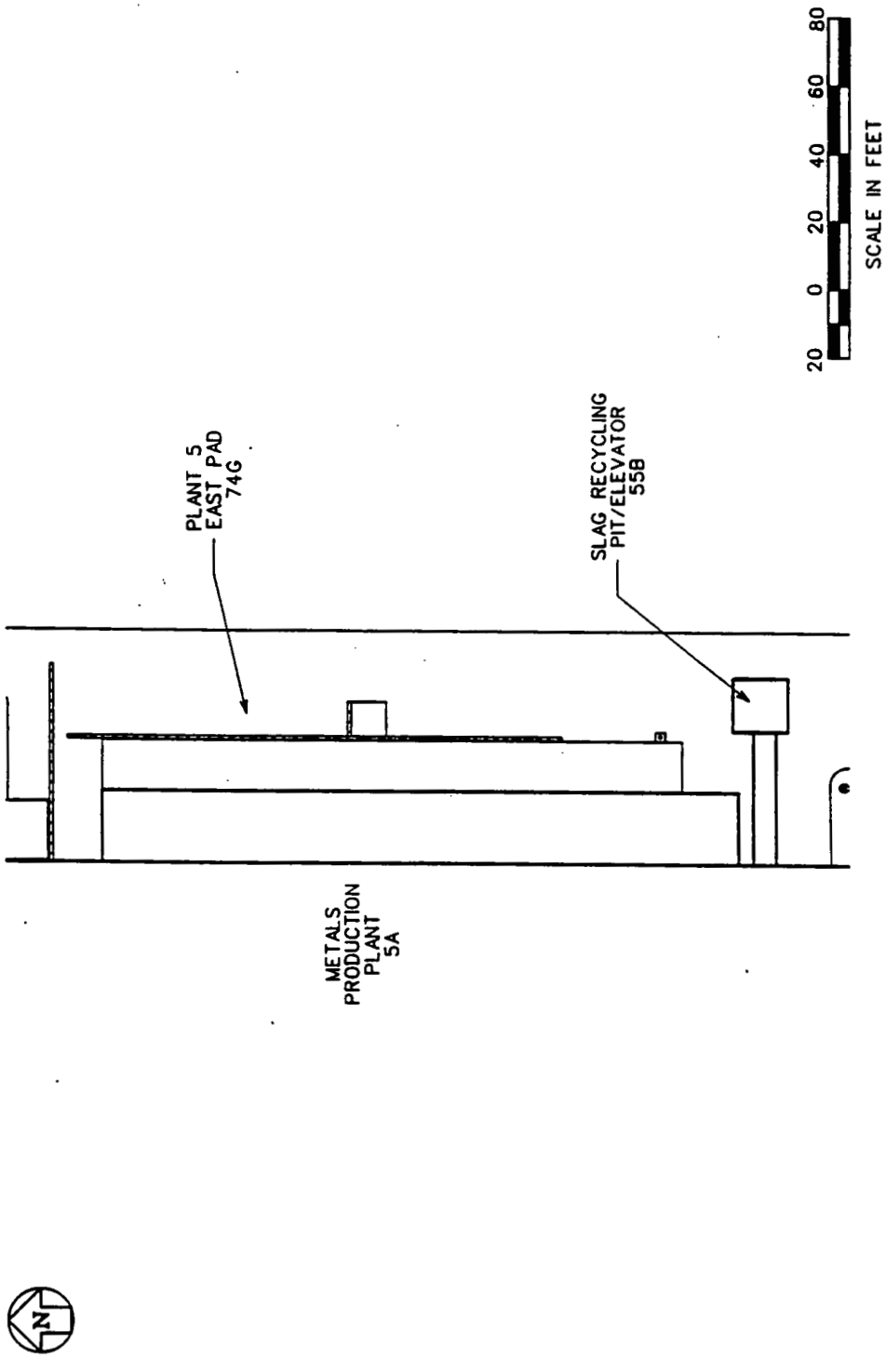

FIGURE 74G-1 Layout of Pad 74G

TABLE 74G-1 Sample Types and Quantities for Pad 74G

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.8.11 Pad 74H — Plant 5 South Pad

Component Description

Pad 74H (Plant 5 South Pad) is a reinforced poured concrete pad located south of the Metals Production Plant (Component 5A), as shown on the Grid 12 map in Appendix C. This irregularly shaped pad contains more than 2,000 ft^2 of open storage space (Figure 74H-1). Pad 74H is used as a staging (loading and unloading) pad for the Metals Production Plant.

Process Area Description

Pad 74H is considered one process area and was used for loading, unloading, and temporary storage of feed materials entering and exiting the south end of the Metals Production Plant (e.g., UF_4 and magnesium). Currently, Pad 74H contains dicalite, Sealand containers, structural steel, and pipe racks. The anticipated contaminants for the pad are summarized in Table A.3.

Major Media Types per Process Area

The only major medium for Pad 74H is concrete.

Summary of Available Radiological Data

Pad 74H has been routinely surveyed for removable alpha and total beta-gamma contamination from October 1991 to March 1992. During this time, 90 removable alpha and 93 total beta-gamma survey measurements were conducted throughout the concrete pad, with MDAs of 225 and 1,000 dpm, respectively. Only 7 of the 90 removable alpha measurements were above the MDA, with an average measurement of 500 dpm. Of the 93 total beta-gamma measurements, 68 were above the MDA, with an average measurement of 30,000 dpm. These data are the basis for identifying the hot spot, which is indicated in Figure 74H-1. Also, the identified hot spot will be reassessed before sampling begins as data are acquired from ongoing radiological surveys.

The hot spot for the concrete medium was determined to be near a crack filled with tar toward the north end of the pad. The total beta-gamma reading for this spot was 178,500 dpm. Note that all of the removable alpha measurements and the 10 highest total beta-gamma measurements were taken from or near cracks, filled with tar, in the concrete.

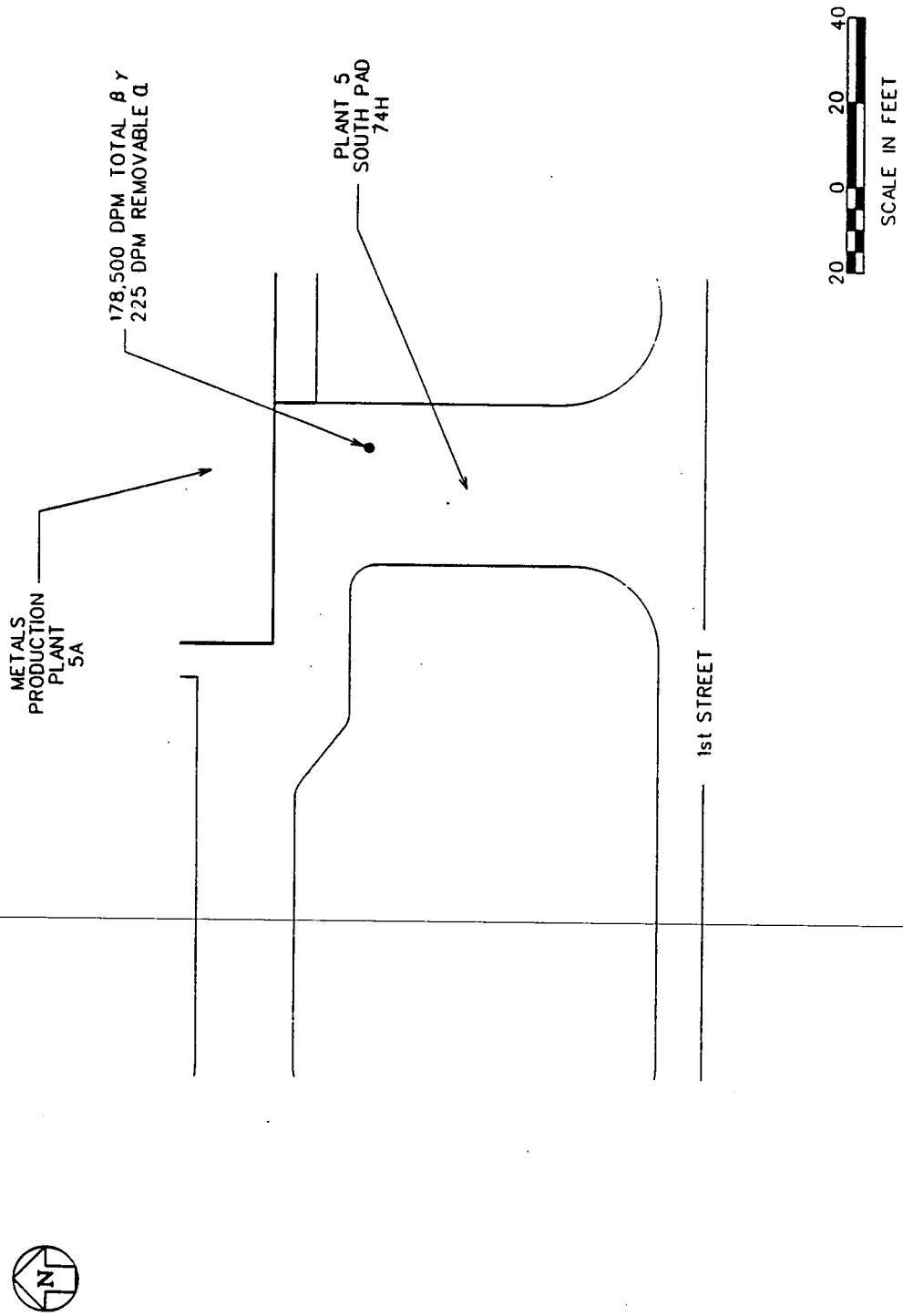

FIGURE 74H-1 Layout of Pad 74H

Summary of Sampling for Pad 74H

One airborne particulate sample will be taken on the pad and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Because Pad 74H is a storage area, it is considered a dry process area; therefore, a concrete chip will be taken from the pad. Visual inspection of the component identified no supplemental samples. Table 74H-1 summarizes the planned sampling program for Pad 74H.

TABLE 74H-1 Sample Types and Quantities for Pad 74H

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.8.12 Pad 74J — Plant 6 Pad

Component Description

Pad 74J (Plant 6 Pad) is located north of the Metals Fabrication Plant (Component 6A), as shown on the Grid 6 map in Appendix C. It is an irregularly shaped concrete storage pad (Figure 74J-1).

Process Area Description

Pad 74J is considered one process area and was used for temporary storage of uranium tubes (up to 1.25% enrichment) processed by extrusion fabrication off-site and machined in the Metals Fabrication Plant. The easternmost 6 ft of Pad 74J is part of the HWMU to the east of the pad, a result of lead contamination. The anticipated contaminants for the pad are summarized in Table A.3.

Major Media Types per Process Area

The only major medium for Pad 74J is concrete.

Summary of Available Radiological Data

Pad 74J was surveyed for removable alpha contamination in January 1992; the results of this survey are the basis for identifying the hot spot. A total of 19 removable alpha survey measurements were conducted throughout the concrete pad, with an MDA of 55 dpm. All 19 of the removable alpha contamination measurements were below the MDA. Data will be reassessed before sampling to include those data gathered from ongoing radiological surveys.

Summary of Sampling for Pad 74J

One airborne particulate sample will be taken on the pad and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. The only medium within the pad is concrete. Because Pad 74J is a storage area, it is considered a dry process area; therefore, a concrete chip will be taken from the pad. Visual inspection of the component identified no supplemental samples. Table 74J-1 summarizes the planned sampling program for Pad 74J.

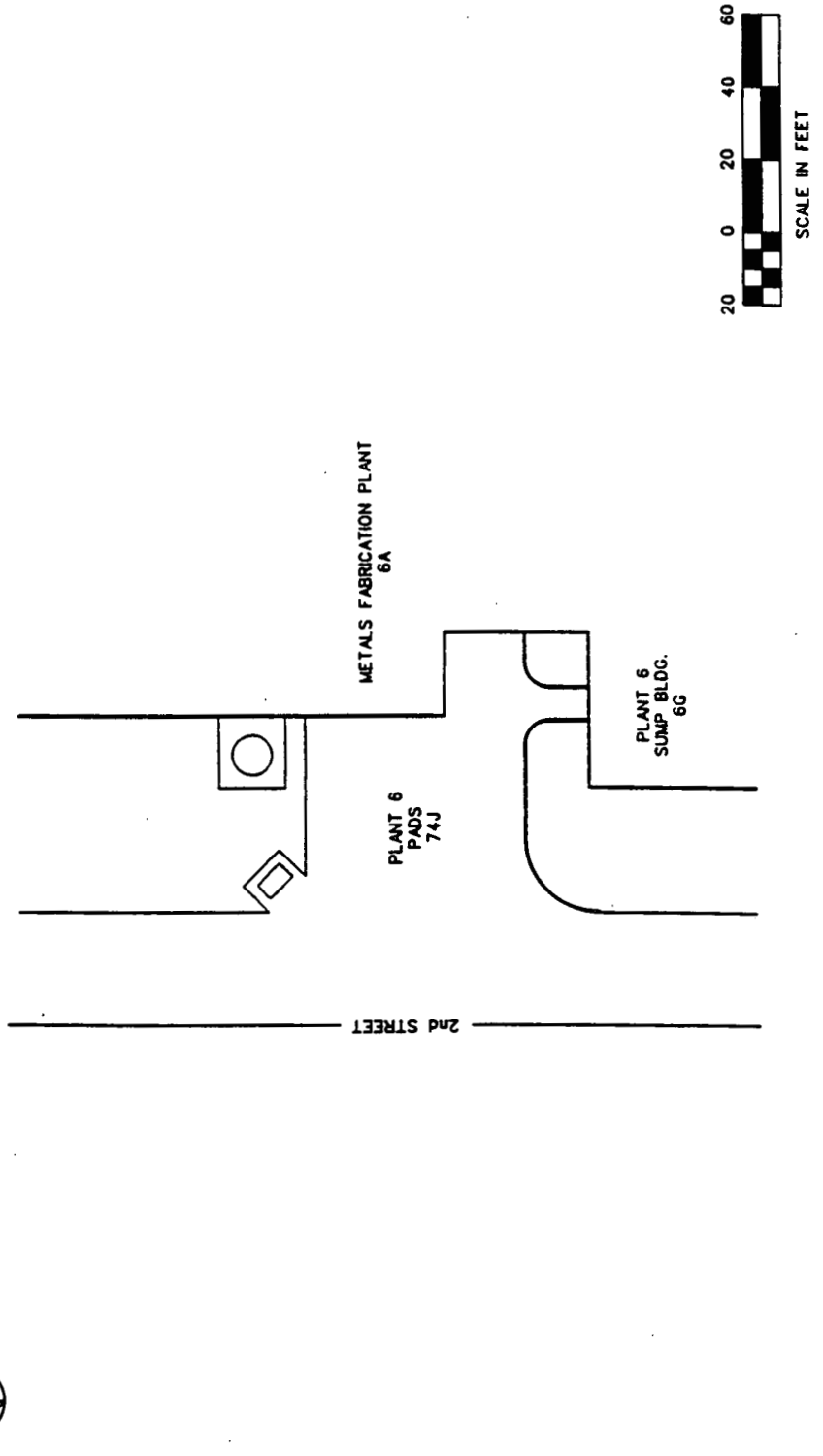

FIGURE 74J-1 Layout of Pad 74J

TABLE 74J-1 Sample Types and Quantities for Pad 74J

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.8.13 Pad 74K — Plant 9 Pad

Component Description

Pad 74K (Plant 9 Pad) is a reinforced poured concrete pad located southeast of the Special Products Plant (Component 9A), as shown on the Grid 3 map in Appendix C. This rectangular pad contains approximately 10,500 ft^2 of storage space (Figure 74K-1). The pad was constructed with berms, slopes, and grated trenches to contain any spilled liquid material and collect any storm-water runoff.

Process Area Description

Pad 74K is considered one process area and was historically used for temporary storage of process residues (e.g., CaF_2, MgF_2, thorium and uranium residues, and filter cake) and thorium and uranium chips and turnings. Metal fires were common on Pad 74K. Currently, Pad 74K contains pallets, baskets, and overpacks. The storm-water runoff collected in the grated trench is pumped to the Refinery Sump (Component 3H) for eventual wastewater treatment. The anticipated contaminants for the pad are summarized in Table A.3.

Major Media Types per Process Area

The only major medium for Pad 74K is concrete.

Summary of Available Radiological Data

Pad 74K was surveyed for removable alpha and total beta-gamma contamination in November 1989; the results of this survey are the basis for identifying the hot spot. A total of 25 removable alpha and 25 total beta-gamma survey measurements were performed on the concrete pad. Only 4 removable alpha measurements were below the MDA, with an average measurement of 120 dpm. All 25 total beta-gamma measurements were above the MDA, with an average measurement of 96,500 dpm. The corresponding hot spot is identified in Figure 74K-1. As data are acquired from ongoing radiological surveys, the identified hot spot will be reassessed before sampling.

The hot spot for the concrete medium was determined to be in the southeastern area of the pad. The removable alpha and total beta-gamma readings at the concrete hot spot location were 388 and 320,000 dpm, respectively.

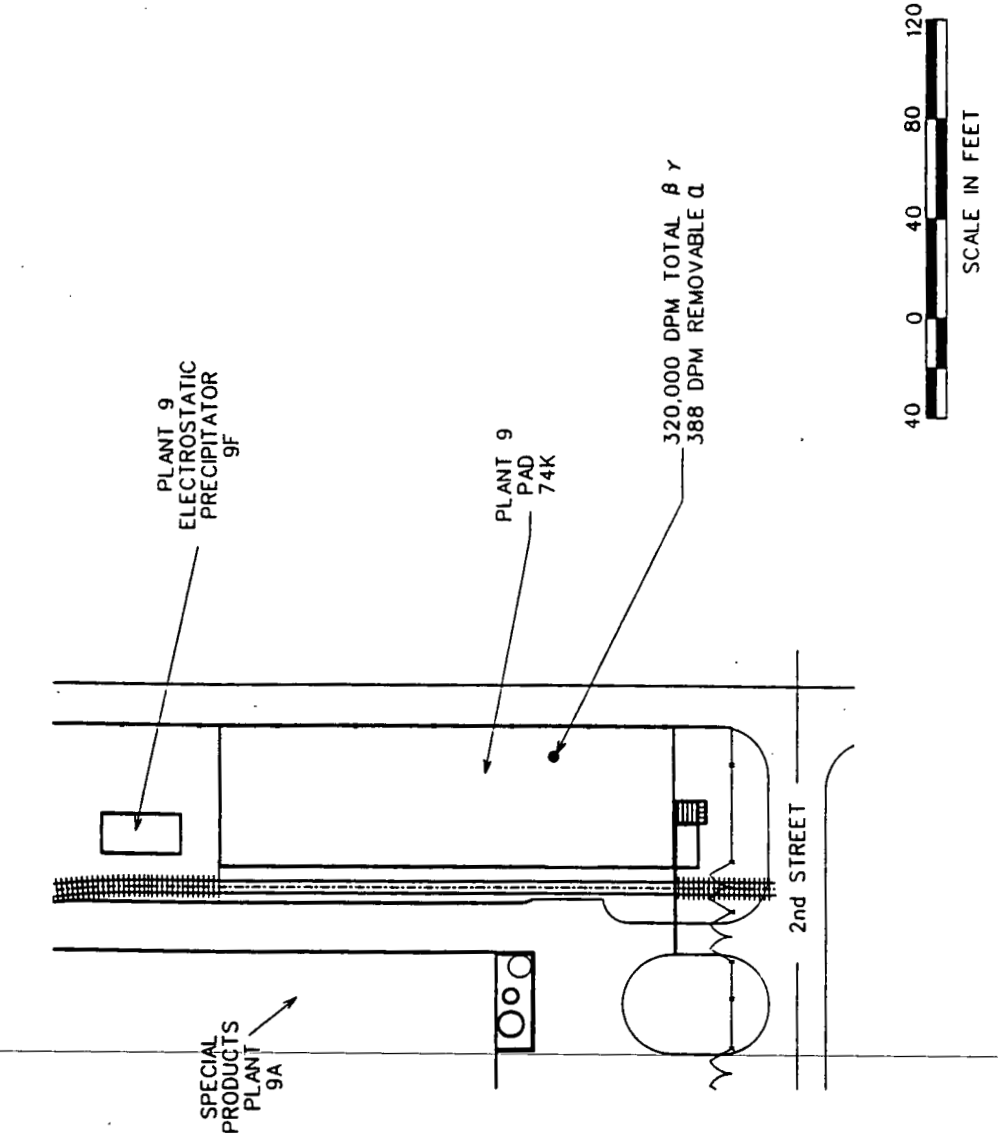

FIGURE 74K-1 Layout of Pad 74K

Summary of Sampling for Pad 74K

One airborne particulate sample will be taken on the pad and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Because Pad 74K is a storage area, it is considered a dry process area; therefore, a concrete chip will be taken from the pad. Visual inspection of the component identified a measurable quantity of sand and gravel near the south end of Pad 74K, which will be considered as a supplemental sample. Table 74K-1 summarizes the planned sampling program for Pad 74K.

TABLE 74K-1 Sample Types and Quantities for Pad 74K

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.8.14 Pad 74L — Building 65 West Pad

Component Description

Pad 74L (Building 65 West Pad) is a reinforced poured concrete pad located west of the Old Plant 5 Warehouse (Component 65), as shown on the Grid 2 map in Appendix C. It comprised approximately 20,000 ft^2 of storage space constructed with berms, slopes, and grated trenches to contain any spilled liquid material and collect any storm-water runoff (Figure 74L-1).

Process Area Description

Historically, Pad 74L stored remelt, top cores, reject cores, ingots, and some drums or residue materials awaiting analysis. Currently, Pad 74L stores baled scrap drums, scrap metal awaiting decontamination, and uranium and thorium residues. Excess equipment also is stored on the pad.

Major Media Types

The only major medium for Pad 74L is concrete.

Summary of Available Radiological Data

Pad 74L is routinely surveyed for removable alpha and total beta-gamma contamination. Results from the most recent surveys (1991 through June of 1992) are the basis for identifying hot spots. In the known contaminated area of Pad 74L, 19 removable alpha survey measurements were performed. The data have been assembled, and the radiological hot spot for the concrete is identified in Figure 74L-1. An additional 26 survey measurements were performed on the equipment stored in this area. The highest removable alpha for the concrete was 1,191 dpm in the north part of the pad, as shown on Figure 74L-1. No recent total beta-gamma data are available for Pad 74L, but the radiological hot spot will be determined from field survey measurements conducted before sampling occurs. Data will be reassessed before sampling to also include data from ongoing radiological surveys.

Summary of Sampling for Pad 74L

One airborne particulate sample will be taken for the pad and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF radiological surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. The only major medium of concern is concrete. Because

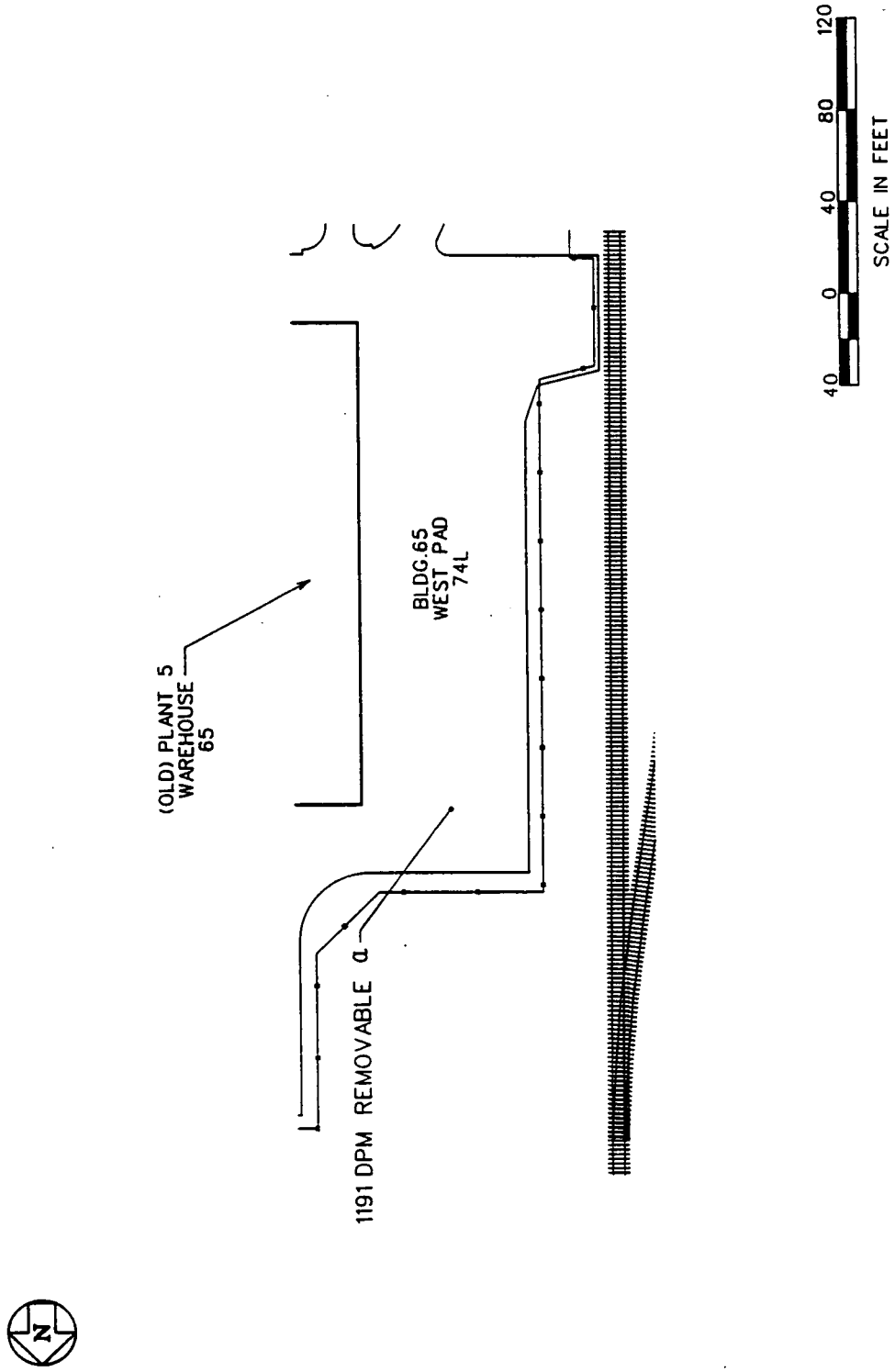

FIGURE 74L-1 Layout of Pad 74L

Pad 74L is a storage area, it is considered a dry process area; therefore, a concrete chip will be taken from the pad. Visual inspection of the component identified no supplemental samples. Table 74L-1 summarizes the planned sampling program for Pad 74L.

TABLE 74L-1 Sample Types and Quantities for Pad 74L

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.8.15 Pad 74M — Building 64 East Pad and Railroad Dock

Component Description

Pad 74M (Building 64 East Pad and Railroad Dock) is located along the eastern side of the Thorium Warehouse (Component 64), as shown on the Grid 2 map in Appendix C. It is a reinforced poured concrete pad that contains more than 32,000 ft^2 of concrete storage space (Figure 74M-1) and wraps around the north end of the Thorium Warehouse and the Old Plant 5 Warehouse (Component 65).

Process Area Description

Pad 74M stored the Special Products Plant (Component 9A) materials before the Plant 9 Warehouse (Component 81) was built. The stored material included up to 2.1% enriched uranium in the form of ingots, billets, and Zirnlo scrap from Hanford. More recently, after the Plant 9 Warehouse was built, Pad 74M has supported the Thorium Warehouse and Decontamination Building (Component 69) operations by storing drummed uranium and thorium residues awaiting repackaging and equipment awaiting decontamination. The railroad loading dock was intended to receive material from Hanford by rail; however, it was not used often. Most uranium was shipped to and from the site in trucks.

Major Media Types per Process Area

The only major medium for Pad 74M is concrete.

Summary of Available Radiological Data

Pad 74M is routinely surveyed for removable alpha contamination. Measurements from these surveys provide the basis for identifying hot spots. Fourty removable alpha survey measurements were performed on Pad 74M. The data have been assembled, and the hot spot for the concrete is identified in Figure 74M-1. The highest removable alpha for the concrete was 228 dpm, located by the northwestern corner of the Old Plant 5 Warehouse. No recent total beta-gamma data are available for Pad 74M, but the radiological hot spot on the pad will be determined from field measurements before sampling occurs. Data will be reassessed before sampling to also include data from ongoing radiological surveys.

Summary of Sampling for Pad 74M

One airborne particulate sample will be taken for the pad and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1.

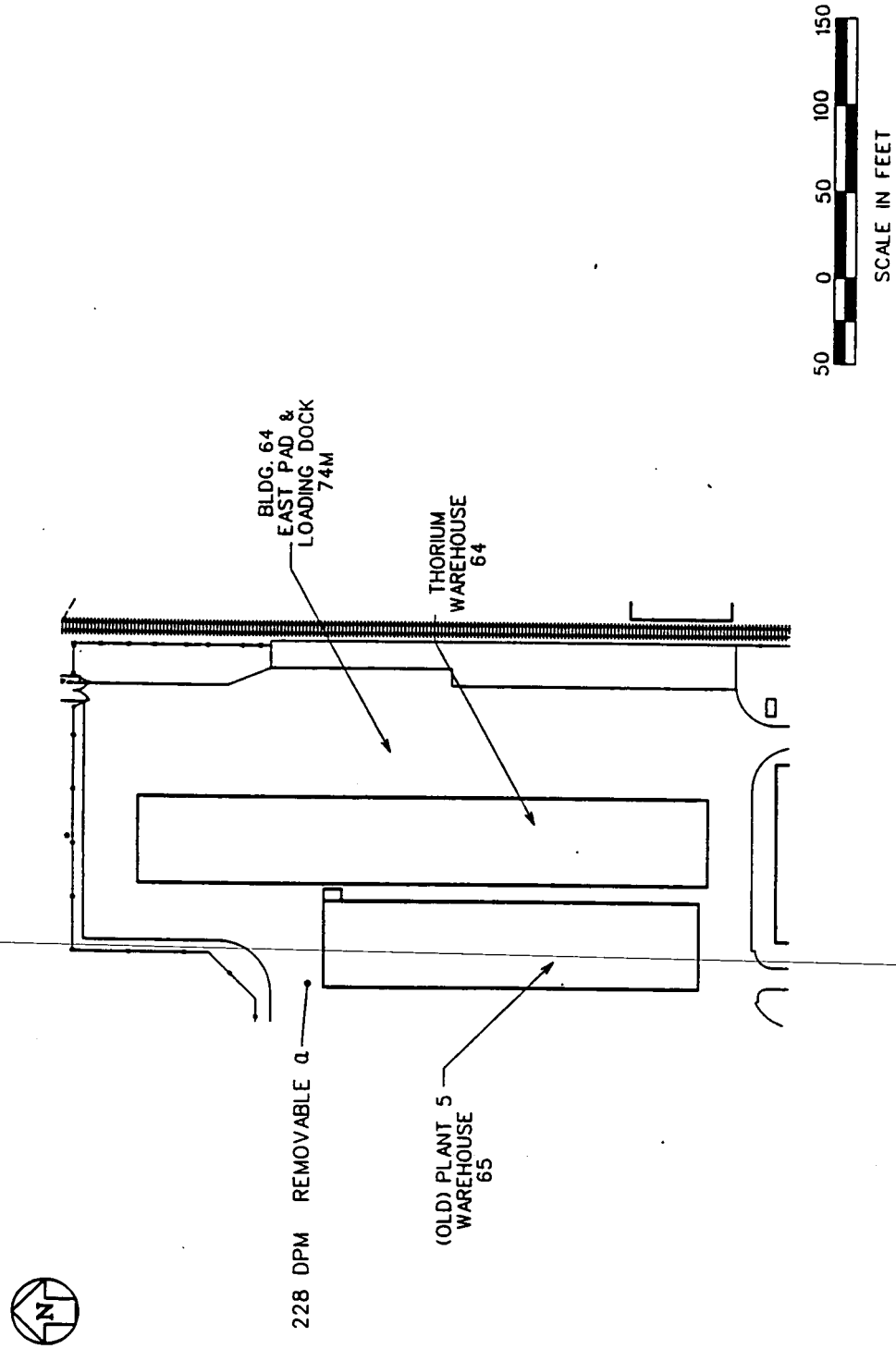

FIGURE 74M-1 Layout of Pad 74M

Nonintrusive measurements, including exposure rate measurements, XRF radiological surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. The only major medium of concern is concrete. Because Pad 74M is a storage area, it is considered a dry process area; therefore, a concrete chip will be taken from the pad at the hot spot. Visual inspection of the component identified no supplemental samples. Table 74M-1 summarizes the planned sampling program for Pad 74M.

TABLE 74M-1 Sample Types and Quantities for Pad 74M

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.8.16 Pad 74N — Building 12 North Pad

Component Description

Pad 74N (Building 12 North Pad) is a poured concrete pad located north of the Main Maintenance Building (Component 12A), as shown on the Grid 11 map in Appendix C. The rectangular pad contains approximately 7,000 ft^2 of storage space (Figure 74N-1). Areas of the pad have been patched with asphalt, and sections of the pad contain minor cracks. The western edge of the pad is only partially curbed because the concrete curb and pad near the historical location of the removed Underground Storage Tank (UST) Tank 6 is missing, although sandbags have been stacked in this area as a temporary curb. The northern edge of the pad is not curbed, and the southern edge of the pad borders the Main Maintenance Building.

Process Area Description

Pad 74N is used by plant stores, which is based in Building 12A, to store pipe (situated on pipe racks), drummed oils, returnable drums, and other nonradioactive materials for use on-site. The anticipated contaminants for Pad 74N are summarized in Table A.3.

Major Media Types per Process Area

The major medium for Pad 74N is concrete.

Summary of Available Radiological Data

Pad 74N is routinely surveyed for removable alpha and total beta-gamma contamination. Recent data (1989) from these surveys have been assembled and indicate that the radiological hot spots for the storage area are as follows. A total of 23 removable alpha and 23 total beta-gamma readings were taken on Pad 74N. As data are acquired from ongoing radiological surveys, the identified hot spots will be reassessed before sampling activities begin.

The highest total beta-gamma reading obtained from surveying Pad 74N was 100,000 dpm; two other readings exceeded or equaled 10,000 dpm: one at 40,000 dpm and one at 10,000 dpm. The remaining 20 readings were all less than 10,000 dpm. The location of the highest total beta-gamma reading (100,000 dpm) and the associated removable alpha reading (4 dpm) is depicted in Figure 74N-1.

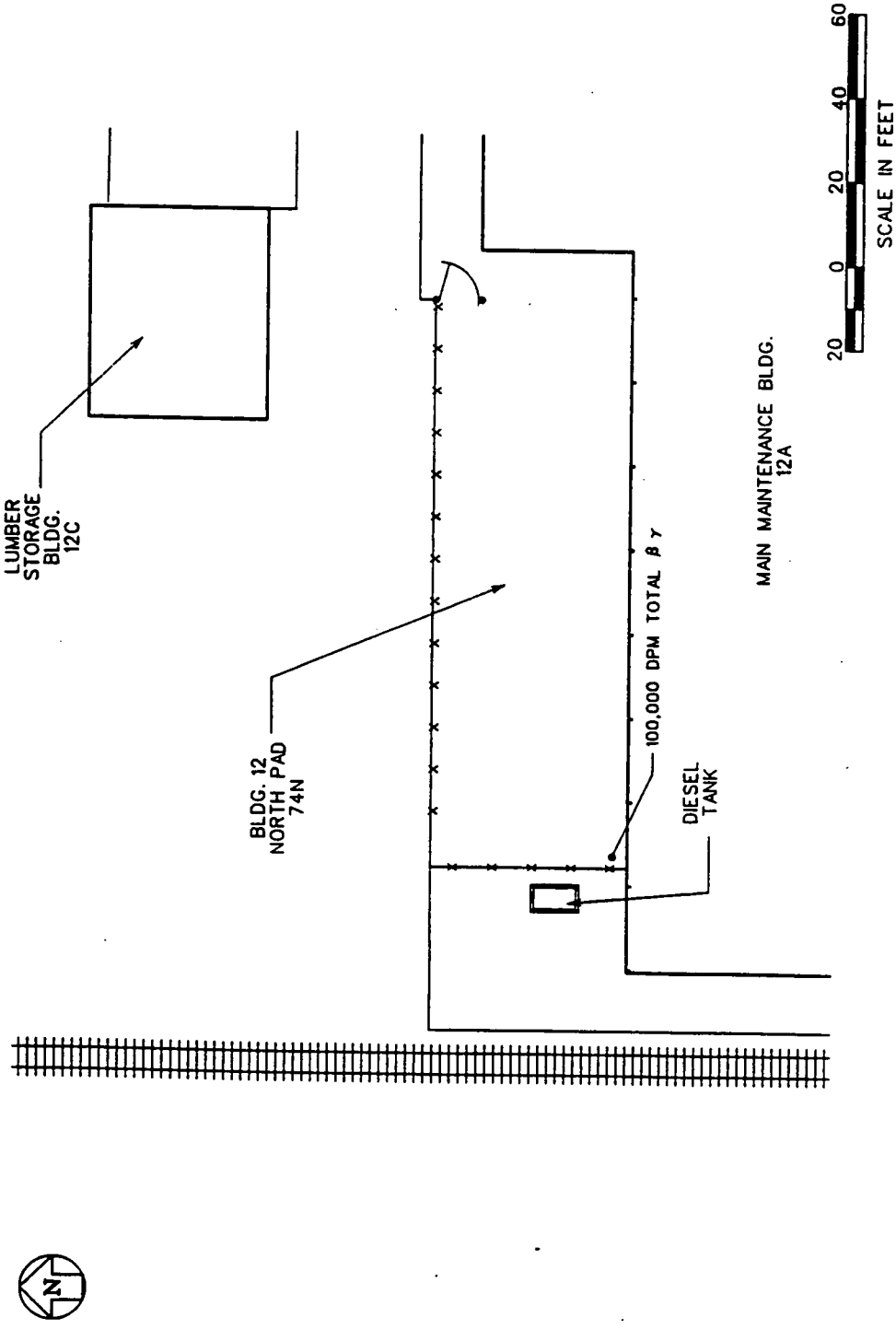

FIGURE 74N-1 Layout of Pad 74N

Summary of Sampling for Pad 74N

One airborne particulate sample will be taken and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, radiological surveys, and swipe samples, will be performed and assessed in the field to define final intrusive sampling locations. The only medium associated with the pad is concrete. Intrusive sampling will be performed and will consist of one concrete chip sample at the radiological hot spot. If analysis of radiological swipe samples detects elevated levels of removable contamination as outlined in Protocol 1, then the swipe samples will be combined over the component for laboratory analysis.

Field evaluation of the pad revealed metal-like particulate residues under the pipe racks and "oily" stains in the drum storage area. One loose media sample of the metal-like residue will be collected from under the pipe rack located at the western edge of the pad near the location of the highest total beta-gamma reading. An additional supplemental sample may be collected by the field sampling team in the area of the "oily" stains. Table 74N-1 summarizes the planned sampling program for Pad 74N.

TABLE 74N-1 Sample Types and Quantities for Pad 74N

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	1	1
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.8.17 Pad 74P — Decontamination Pad

Component Description

Pad 74P (Decontamination Pad) is located north and west of the Decontamination Building (Component 69), as shown on the Grid 1 map in Appendix C. This irregularly shaped pad contains approximately 50,000 ft^2 of controlled curbed concrete storage pad (Figure 74P-1). Pad 74P is used to decontaminate pieces of equipment and metal that are too large for the Decontamination Building. It also stores decontaminated scrap metal.

Process Area Description

Pad 74P contains two process areas (decontamination and storage). The anticipated contaminants for the pad are summarized in Table A.3.

Decontamination. The decontamination area is located just north of the Decontamination Building. This pad is used to decontaminate and decommission radiologically contaminated ferrous and nonferrous scrap metals going to the scrap piles and miscellaneous equipment that will go to maintenance for repair. These pieces of equipment and metal are cleaned with a steam cleaner/spray washer. If needed, caustic detergent or weak acid is added to the spray washer to augment cleaning. After being washed, the equipment is checked by a radiation safety technician to make sure it was correctly decontaminated before it is permitted to leave the pad. Wash waters and sludges are drained to the outside sump and mixed with the effluents from the Decontamination Building. The outside sump receives wastewater from the indoor sump, drainage from the outside pad, and runoff from the adjacent scrap metals pile and surrounding yard area. Outdoor sump effluents flow by gravity to the General Sump (Component 18B) located near the Recovery Plant (Component 8A).

Scrap Pile Storage. After ferrous and nonferrous scrap metals are decontaminated and/or decommissioned, they are stored on Pad 74P. Also, equipment that is old or no longer needed is taken apart, decontaminated, and stored on the pad. This storage area makes up approximately 90% of Pad 74P. Storm-water runoff from the scrap piles is collected in the outdoor sump, which is piped to the General Sump.

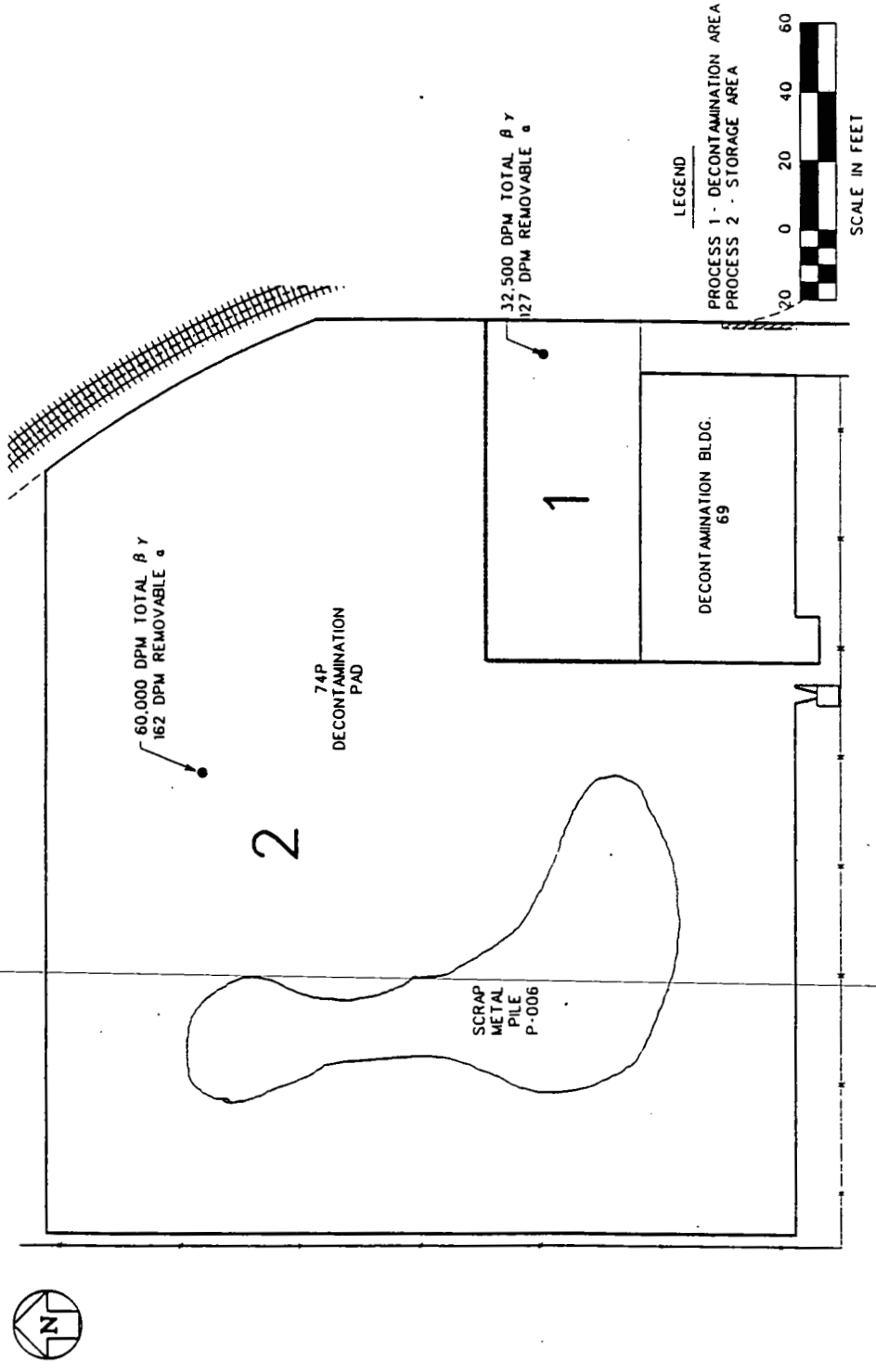

FIGURE 74P-1 Layout of Pad 74P

Major Media Types per Process Area

The only major medium for Pad 74P is concrete.

Summary of Available Radiological Data

Pad 74P was surveyed for removable alpha and total beta-gamma contamination in September 1991. A total of 31 removable alpha and 31 total beta-gamma survey measurements were conducted throughout the concrete pad, with MDAs of 35 and 350 dpm, respectively. Of the 31 removable alpha measurements, 19 were above the MDA, with an average measurement of 190 dpm. All of the total beta-gamma measurements were above the MDA, with an average measurement of 16,000 dpm. These data are the basis for identifying hot spots, which are identified in Figure 74P-1. Also, as data are acquired from ongoing radiological surveys taken for health physics needs, the identified hot spots will be reassessed before sampling begins.

The hot spot in the decontamination area was determined to be next to the office building. The removable alpha and total beta-gamma readings at this point were 127 and 32,500 dpm, respectively. The average of the three removable alpha readings was 94 dpm, while the average of the eight total beta-gamma readings was 9,600 dpm for this process area.

The hot spot in the storage area was determined to be on the north end of the pad next to a scrap pile. The removable alpha and total beta-gamma readings at this point were 162 and 60,000 dpm, respectively. The average of the 16 removable alpha readings was 220 dpm, while the average of the 23 total beta-gamma readings was 19,000 dpm for this process area.

Summary of Sampling for Pad 74P

One air sample will be taken on the pad and analyzed for airborne radiological and chemical contaminants on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. The only medium within the pad is concrete. The storage area of Pad 74P is considered a dry process area; therefore, a concrete chip will be taken from the pad. The decontamination area of the pad is considered a wet process area, requiring a concrete core sample to be taken of the concrete. Visual inspection of the component identified no supplemental samples. Table 74P-1 summarizes the planned sampling program for Pad 74P.

TABLE 74P-1 Sample Types and Quantities for Pad 74P

Sample Type	Decontamination	Scrap Pile Storage	Component Totals
Nonintrusive[a]			
Radiological surveys	b	b	NA[c]
Chemical surveys	b	b	NA
Air particulates	NA	NA	1
Swipes	1	1	2
Lab composite swipes	NA	NA	1
Intrusive[a]			
Concrete chips	NA	1	1
Concrete cores	1	NA	1
Masonry	NA	NA	NA
Steel surface scraping	NA	NA	NA
Supplemental			
Liquid sample	NA	NA	NA
Loose media	NA	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.8.18 Component 74Q — Plant 8 Old Metal Dissolver Pad

Component Description

Pad 74Q (Plant 8 Old Metal Dissolver Pad) is a reinforced concrete pad overlain by acid brick; it is located west of the Recovery Plant (Component 8A) and between the Plant 8 Maintenance Building (Component 8B) and the Biodenitrification (BDN) Effluent Treatment Facility (Component 18H), as shown on the Grid 20 map in Appendix C. This rectangular pad has dimensions of approximately 30 × 50 ft or 1,500 ft^2 (Figure 74Q-1). The pad contained a process used as part of the Recovery Plant scrap recovery processes.

Process Area Description

Pad 74Q was used from 1955 to 1959 for the dissolution of scrap uranium metal. Two wooden vessels on brick-faced concrete support pedestals received metal baskets containing the scrap uranium metal. Concentrated hydrochloric acid in the wooden vessels accomplished the dissolution; the heat of the exothermic dissolution reaction was controlled by cooling coils mounted in the dissolver vessels. An overhead hoist system was employed for handling materials. Following dissolution, the hydrochloric acid that contained uranium was transferred to the Recovery Plant. A brick-lined concrete tank 6 × 6 ft and 3 ft high on the east part of the pad was filled with water and used as a quench tank in the event of a fire in the materials. The wooden vessels and hoist system have been removed, but the quench tank and support ribs remain. Anticipated contaminants are summarized in Table A.3.

Major Media Types per Process Area

Major media for Pad 74Q include the concrete pad and the acid brick that overlays the entire pad, the support ribs, and the quench tank. The concrete will be included in the sampling activities because of the potential of the acid to penetrate the acid brick and mortar surface.

Summary of Available Radiological Data

No recent radiological contamination data are available for Pad 74Q in surveys from 1989 through 1992. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys. These data will be assembled to determine the radiological hot spot and final intrusive sampling location for the acid brick and concrete media.

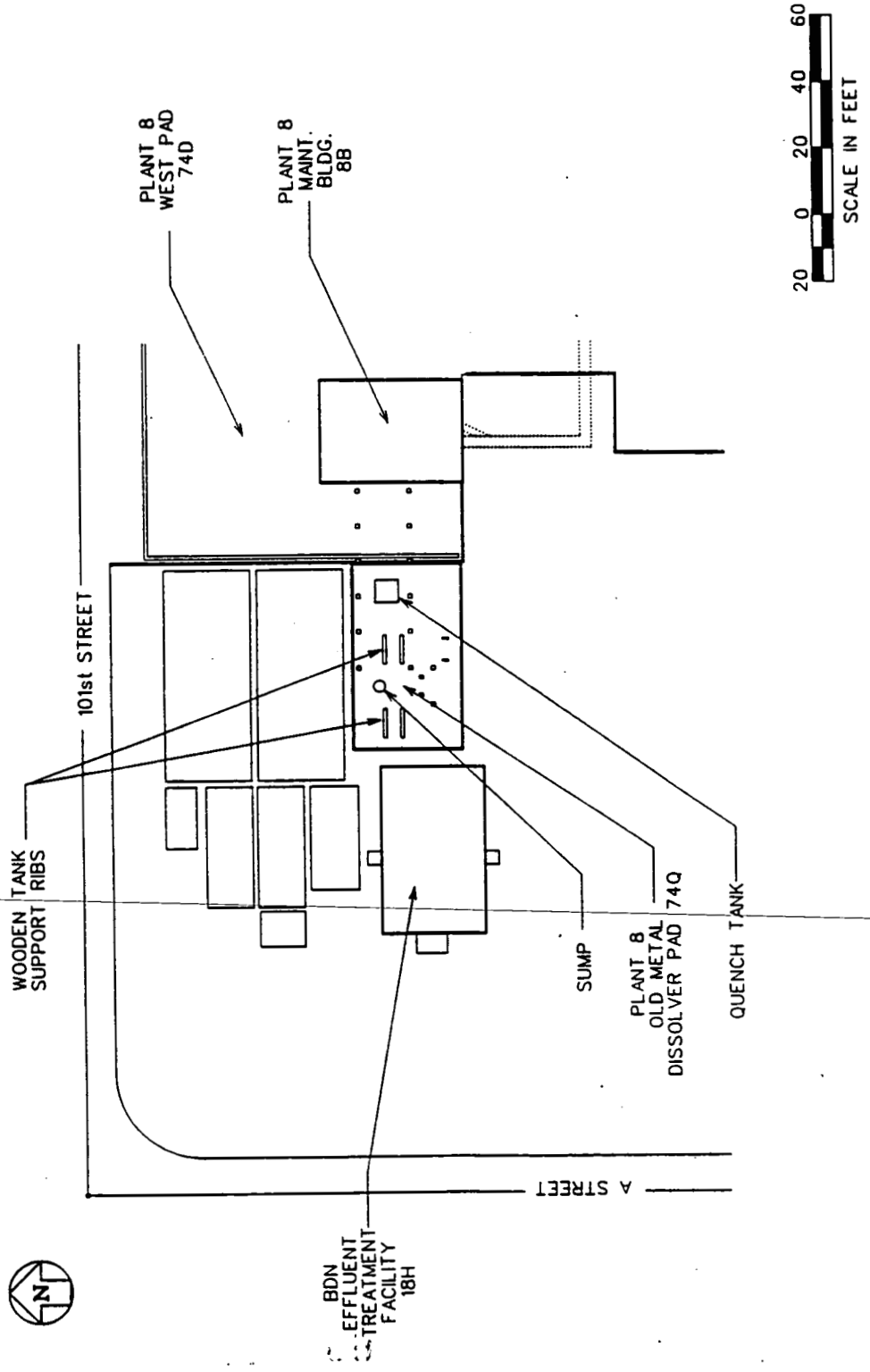

FIGURE 74Q-1 Layout of Pad 74Q

Summary of Sampling for Pad 74Q

One airborne particulate sample will be taken on the pad and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to delineate the final intrusive sample location.

The underlying concrete cannot be directly, nonintrusively surveyed. Thus, concrete will be intrusively sampled at the hot spot location identified for acid brick, under the assumption that the contamination of the acid brick also caused concrete contamination by liquid seepage through the acid bricks and/or surrounding mortar. Because the process performed on the pad was a wet process, the concrete sample will be a core.

Visual inspection of the pad indicated a 3-ft-diameter sump in the northwest quadrant of the pad, which currently contains liquid. A liquid supplemental sample will be taken from the sump. Parts of the pad contain loose, inorganic residue that will be composited as a supplemental sample. Table 74Q-1 summarizes the planned sampling program for Pad 4Q.

TABLE 74Q-1 Sample Types and Quantities for Pad 74Q

Sample Type	Metal Dissolver	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	1	1
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	1	1
Loose media	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.8.19 Pad 74R — Plant 8 North Pad

Component Description

Pad 74R (Plant 8 North Pad) is a reinforced concrete pad located north of the Recovery Plant (Component 8A), as shown on the Grid 20 map in Appendix C. It is rectangular and has a surface area of about 5,000 ft^2 (Figure 74R-1). Pad 74R stored Recovery Plant feed materials and product. Located on the pad are tank and pumping units that are part of the Recovery Plant water treatment/filtration process area: three vertical, cylindrical steel filtrate storage tanks and the filtrate pumps and pump house. The box furnace, a process area for the Recovery Plant, and fan and vent stack for one of the other processes inside the Recovery Plant are located next to the wall of the building on Pad 74R. The pad has a grated trench and sump/pump system along its northern perimeter but no containment curb or berm at the pad edge. On the east edge, the pad is contained by the wall for the bulk chemicals area.

Process Area Description

The Plant 8 North Pad historically stored Recovery Plant feed materials (drummed residues and scrap metal) and black oxide (U_3O_8) furnace products before transfer to the Ore Refinery Plant (Component 2A). Both enriched (^{235}U enrichment levels up to 1.25%) and depleted uranium materials were stored there. The filtrate storage tanks are tanks 21A, 22A, and 28A, which receive filtrate from the Oliver filters inside the Recovery Plant. They are vertical, cylindrical steel tanks on grade and located just north of the filtrate pump house. The trench and sump/pump system on the pad contains potential spills or leakage of the filtrate and collects storm-water runoff from the pad for treatment in the Recovery Plant water treatment/filtration system. Anticipated contaminants for Pad 74R are summarized in Table A.3.

Major Media Types per Process Area

The only major medium for Pad 74R is concrete.

Summary of Available Radiological Data

Pad 74R is routinely surveyed for removable alpha contamination. Results of the most recent surveys have been analyzed to identify a hot spot intrusive sampling location for concrete; 40 removable alpha measurements were taken on the concrete base of the pad. No total beta-gamma measurements were taken. These data indicate that the highest removable alpha value was 134 dpm, detected in the southeast corner of the pad, east of the fan and vent stack (Figure 74R-1). Data will be reassessed before sampling to include data gathered from ongoing radiological surveys.

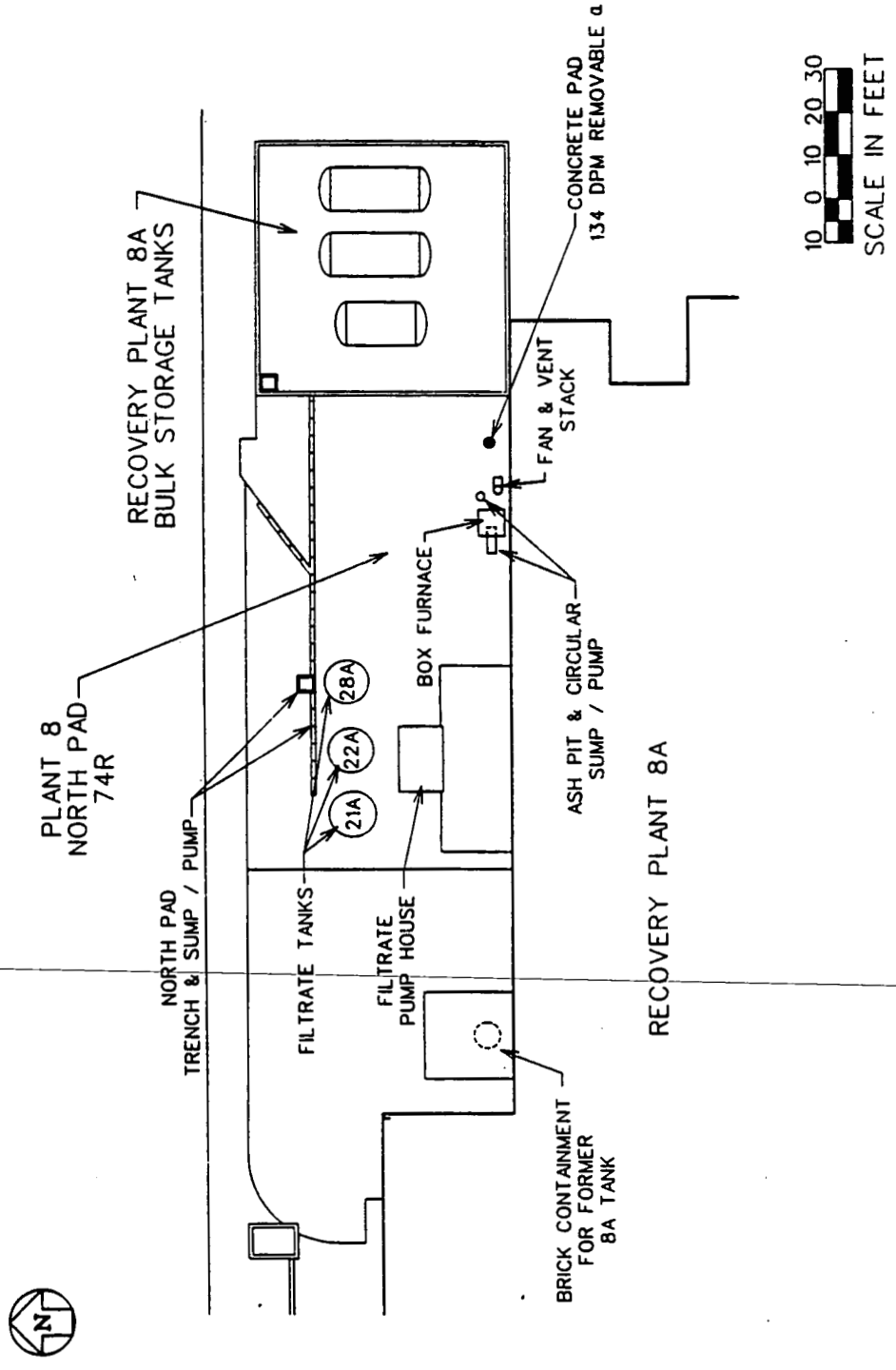

FIGURE 74R-1 Layout of Pad 74R

Summary of Sampling for Pad 74R

One airborne particulate sample will be taken on the pad and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail the final intrusive sampling location for concrete. The only medium within the pad is concrete. Pad 74R is considered a wet process area as a result of the storage and pumping of filtrate; therefore, a concrete core will be the intrusive sample.

Visual inspection of the component indicates that a supplemental composite sample or samples are needed of sediment and water (whichever is present during sampling) from the north perimeter sump/pump system. Table 74R-1 summarizes the planned sampling program for Pad 74R.

TABLE 74R-1 Sample Types and Quantities for Pad 74R

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	1	1
Loose media	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.8.20 Pad 74S — KC-2 Warehouse Pad

Component Description

Pad 74S (KC-2 Warehouse Pad) is a poured concrete pad located at the west end of the KC-2 Warehouse (Component 63), as shown on the Grid 9 map in Appendix C. This irregularly shaped pad contains approximately 2,000 ft^2 of storage space (Figure 74S-1).

Process Area Description

Pad 74S historically stored operations associated with the KC-2 Warehouse and has been identified as a single process area. The KC-2 Warehouse stored work order request materials, bulk items, drummed RCRA waste, PCB-contaminated equipment, drummed PCB-contaminated waste oils, and landscaping and snow removal equipment. The KC-2 Warehouse is currently undergoing renovation for use as a RCRA warehouse. Currently, Pad 74S contains a pipe rack, excess equipment, and refractory brick. The anticipated contaminants for the pad are summarized in Table A.3.

Major Media Types per Process Area

The only major medium for Pad 74S is concrete.

Summary of Available Radiological Data

No radiological survey data are available for Pad 74S from 1989 through 1992. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys. These data will be assembled to determine the radiological hot spot and final intrusive sampling location for the concrete media.

Summary of Sampling for Pad 74S

One airborne particulate sample will be taken on the pad and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, PCB field test kit measurements, and swipe samples, will be performed and assessed in the field to delineate the final intrusive sampling location. Because Pad 74S is a storage area, it is considered a dry process area; therefore, the intrusive sample for the pad will be a concrete chip. Visual inspection of the pad indicated no supplemental samples. Table 74S-1 summarizes the planned sampling program for Pad 74S.

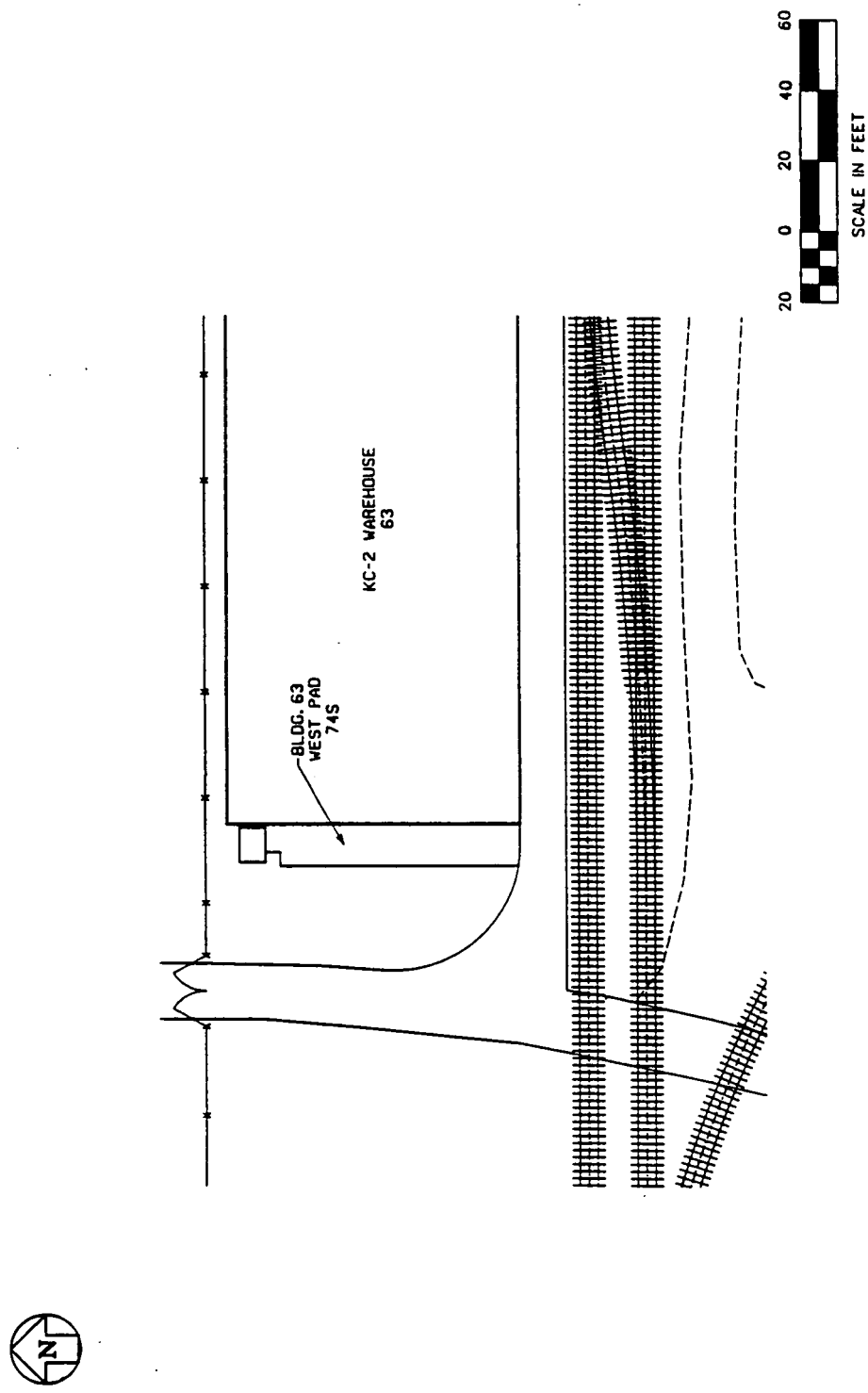

FIGURE 74S-1 Layout of Pad 74S

TABLE 74S-1 Sample Types and Quantities for Pad 74S

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.8.21 Pad 74T — Plant 1 Storage Pad

Component Description

Pad 74T (Plant 1 Storage Pad) is a reinforced poured concrete pad shown in Grids 17, 23, 24, and 27 of Appendix C. Pad 74T is irregularly shaped, containing approximately 375,000 ft^2 of storage space to the north, east, and west of the Preparation Plant (Component 1A). Figure 74T-1 illustrates the extent of Pad 74T. To cover the entire Pad 74T area, the pad has been divided into four process areas: the new drum storage area, copper shredder/drum straightener, copper pile storage, and old drum storage area. The old drum storage area takes up most of Pad 74T. This process area has been divided into four geographic quadrants.

Process Area Description

Pad 74T originally was the drum storage location for low-level wastes and recoverable uranium residues used to support the Preparation Plant operations. In 1990, several portions of the pad were repaired. The removed concrete was drummed for disposal. Currently, the pad receives drums from site-wide processes. Anticipated contaminants from these processes are summarized in Table A.3.

New Drum Storage Area. Two tension support structures have been constructed as an addition to Pad 74T. The tension support or sprung structures are built from a metal rod frame supporting an impermeable vinyl roof and sides. New concrete was poured northeast of the existing pad to support these structures. Concrete blocks were placed at every corner to provide tension support. Each structure is also surrounded by a concrete dike. The two rectangular sprung structures are designed to store a minimum of 2,500 drums. The drum contents include primarily uranium residues, non-RCRA process waste, waste oils, barium salts, and solid residues containing solvents. Herculite dikes surround the drummed liquid wastes in the new drum storage area.

Copper Shredder/Drum Straightener. The copper shredder/drum straightener area currently exists under the Plant 1 Storage Shelter (Component 1B). The copper shredder removed the insulation around the scrap copper wire. The copper would then be shredded for reclamation. A Panghorn Dust Collector unit, located just west of the Drum Reconditioning Building (Component 66), was used to contain the copper dust generated from the shredding process. Drum straightening equipment, associated with the Drum Reconditioning Building, was operated on Pad 74T. The equipment currently remains on the pad but is no longer used.

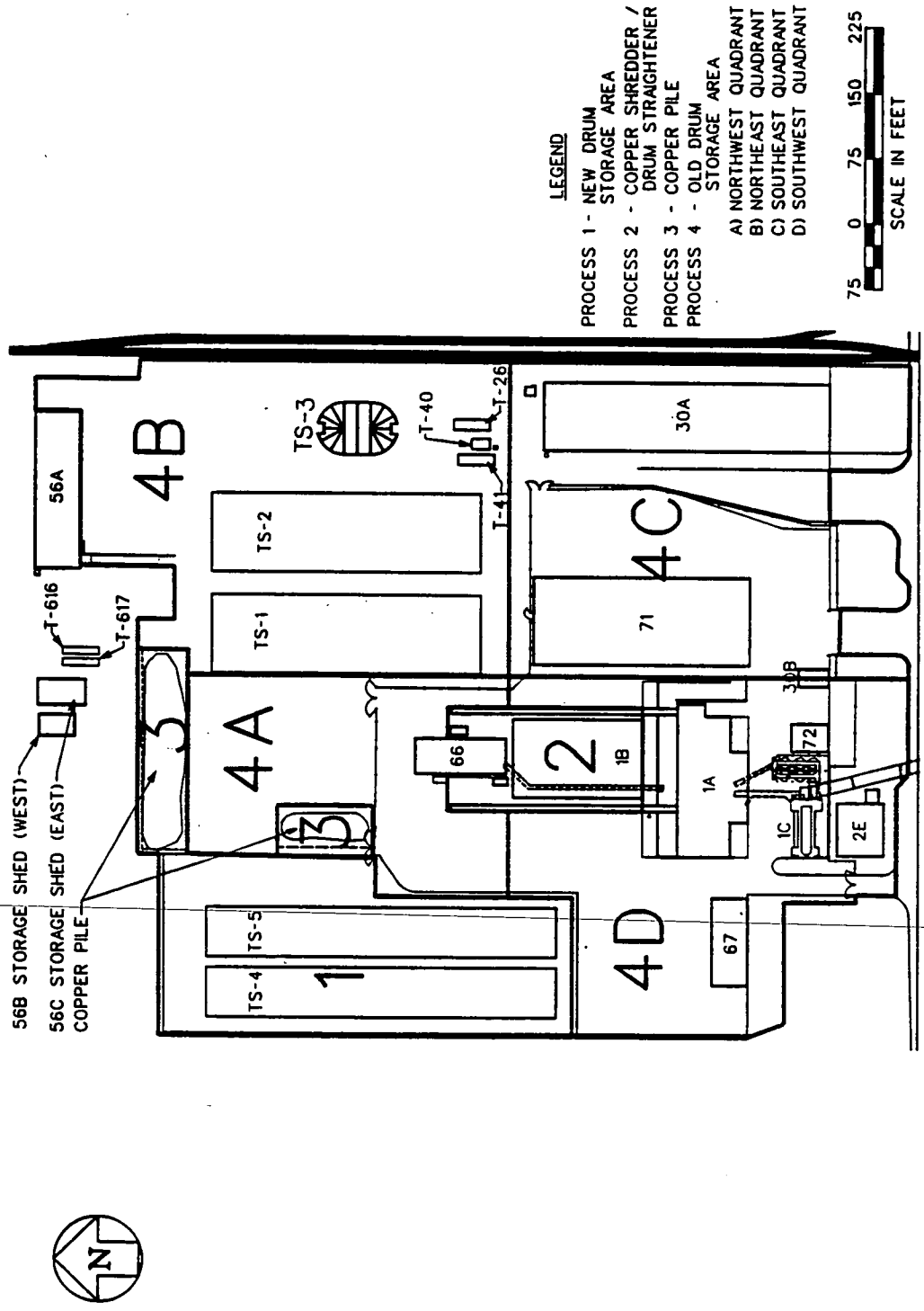

FIGURE 74T-1 Layout of Pad 74T

Copper Pile Storage. Two scrap piles of insulated copper metal wire exist on Pad 74T. These piles stored scrap copper metal that was to be processed through the copper shredder. The copper mainly was obtained from transformer windings and discarded wire and cable products. The copper piles themselves are Component P-004, but the concrete pad beneath the piles is part of Pad 74T.

Old Drum Storage Area. This area includes a vast storage area that holds all of the drums on Pad 74T except those stored in the two sprung structures in the new drum storage area. The old drum storage area covers such an extensive area that to evaluate the pad effectively, the area was divided into four geographic quadrants. The four quadrants store similar items. The drums contain an assortment of solid and liquid wastes, similar to those stored in the new drum storage area. Most of these drums are to be shipped or are awaiting evaluation. Many of the drums contain uranium residues from plant operations. Metal boxes are primarily stored in the southeastern quadrant area of Pad 74T (Figure 74T-1). Three sprung structures, two rectangular and one oval, are located in the northwestern quadrant. The two rectangular sprung structures provide cover to a maximum of 5,000 drums. The oval sprung structure is considerably smaller.

Major Media Types per Process Area

The only major media for Pad 74T is concrete.

Summary of Available Radiological Data

Radiological data do not exist for Pad 74T. However, for intrusive sampling purposes, a significant amount of radiological data will be obtained before determining a hot spot for each process area.

Summary of Sampling for Pad 74T

One airborne particulate sample will be taken on the pad and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, radiological surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. The only medium within the pad is concrete. Because Pad 74T is a storage area, the four process areas are considered dry. One concrete chip will be collected from each process area except for the old drum storage area. Four concrete chips, one per quadrant, will be collected from the old drum storage area. The sampling locations for Pad 74T will be determined after extensive radiological data have been obtained from the ongoing radiological surveys. At this time, observations made during the visual inspection will also be taken into consideration.

During the visual inspection of the pad, a supplemental liquid sampling location was identified in the copper piles storage area. The sample will be collected from the substantial amount of water that was noted on the concrete pad just south of the northernmost copper pile. Table 74T-1 summarizes the planned sampling program for Pad 74T.

TABLE 74T-1 Sample Types and Quantities for Pad 74T

Sample Type	New Drum Storage	Copper Shredder/ Drum Straightening	Copper Piles Storage	Old Drum Storage	Component Totals
Nonintrusive[a]					
Radiological surveys	b	b	b	b	NA[c]
Chemical surveys	b	b	b	b	NA
Air particulates	NA	NA	NA	NA	1
Swipes	1	1	1	4	7
Lab composite swipes	NA	NA	NA	NA	1
Intrusive[a]					
Concrete chips	1	1	1	4	7
Concrete cores	NA	NA	NA	NA	NA
Masonry	NA	NA	NA	NA	NA
Steel surface scraping	NA	NA	NA	NA	NA
Supplemental					
Liquid sample	NA	NA	1	NA	1
Loose media	NA	NA	NA	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.8.22 Pad 74U — Pilot Plant Pad

Component Description

Pad 74U (Pilot Plant Pad) is a reinforced concrete pad, located immediately south of the Pilot Plant Six to Four Reduction Facility 1 (Component 54A), as shown on the Grid 26 map in Appendix C. It is rectangular and comprises about 5,000 ft^3 of storage space (Figure 74U-1). Pad 74U is accessed by concrete driveways from the east and west, and a railroad track crosses the south end of the pad. On the east and west edges of the pad are steel columns and continuous rail beams that supported a track hoist system. The hoist system moved equipment and containers (e.g., cylinders of UF_6) between the autoclave room of Component 54A and the pad. The concrete apron of the Pilot Plant Warehouse (Component 68) borders the Pilot Plant Pad on the south.

Process Area Description

Historically, Pad 74U provided temporary storage of drummed uranium and thorium compounds, equipment, and operating supplies. Also, with the track hoist system and fork lifts, materials to be used in the Six to Four Reduction Facility operation were unloaded and staged on the pad. One such process operational use of Pad 74U was for unloading cylinders of UF_6 from rail cars with the hoist system. In the original configuration of the UF_6 to UF_4 reduction process in Component 54A before installation of the autoclaves in the southern part of the building, the cylinders were placed in a cubicle in the northwestern corner of the pad where they were heated to vaporize the UF_6, which was then piped inside the building for processing. The cubicle and the bridge hoist equipment have been removed. The potential contaminants on Pad 74U are UF_6 and other uranium and thorium compounds.

Pad 74U currently stores drums and white metal boxes that contain radiologically contaminated wastes. The storage area encompasses the main pad between the steel hoist support structures as well as concrete apron areas on the east and west sides of the southern half of the main pad. Drum storage areas contiguous with Pad 74U extend westward to the concrete apron area south of the Pilot Plant Wet Side (Component 13A). In selecting sampling locations for Pad 74U, the pad boundaries are assumed to be the main pad as shown by long, heavy dashed lines on Figure 74U-1. The Pilot Plant Pad has no berm, curb, trench, or sump for containment of runoff or spills.

Major Media Types per Process Area

The only major medium for Pad 74U is concrete.

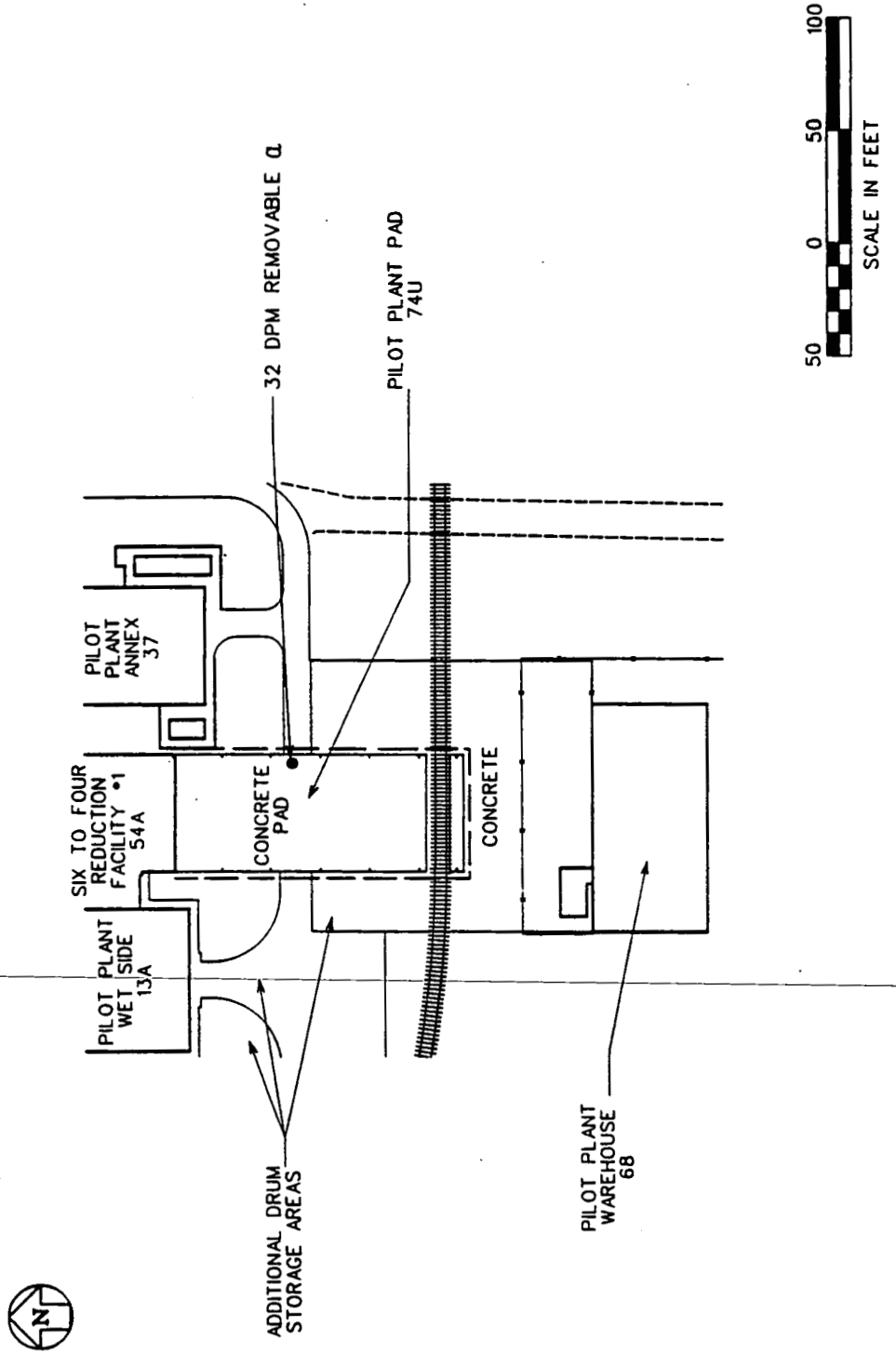

FIGURE 74U-1 Layout of Pad 74U

Summary of Available Radiological Data

Pad 74U is routinely surveyed for radiological contamination. Surveys conducted in 1992 yielded 57 readings for removable alpha on the main concrete pad but no total beta-gamma readings. These data have been analyzed and are the basis for initial identification of a hot spot for concrete sampling. These data indicate that the hot spot for concrete on the pad is under the east hoist supports on the access driveway, having a removable alpha reading of 32 dpm. This reading was only slightly above the instrument background reading of 26.1 dpm. Slightly higher readings up to 64 dpm were taken on the adjacent concrete aprons and additional storage areas; however, the whole concrete paved area has minimal removable alpha contamination.

Summary of Sampling for Pad 74U

One airborne particulate sample will be collected on the pad and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including follow-up radiological and chemical surveys, exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail the final intrusive sampling location for concrete on the pad. Because Pad 74U is a storage area, it is considered a dry process area; therefore, a concrete chip sample will be the intrusive sample. Visual inspection of the component did not indicate the need for supplemental samples. Table 74U-1 summarizes the planned sampling program for the Pilot Plant Pad 74U.

TABLE 74U-1 Sample Types and Quantities for Pad 74U

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.8.23 Pad 74V — Laboratory Pad

Component Description

The Laboratory Pad (Component 74V) is an irregularly shaped, 1,500-ft^2, reinforced concrete storage and loading area (Figure 74V-1). It is located on the west side of the Laboratory (Component 15), as shown on the Grid 21 map in Appendix C. Pad 74V forms a low area next to the Laboratory loading docks, which are at first floor level; the pad is not curbed or bermed and receives runoff from paved and unpaved areas, including the paved north-south access road that runs between the Laboratory and the Pilot Plant complex.

Process Area Description

Pad 74V has typically been used for storage and loading of drummed laboratory wastes and storage, loading, and unloading of laboratory materials. In the past several years, this area has served as a storage and staging area for a waste/contaminant removal action for the former basement waste storage area in the Laboratory and as a storage and staging area during construction/renovation activities in the laboratory basement and north/west corridor. The latter activity is ongoing. The contractor has lined much of the pad and dock area with heavy plastic sheeting and stone or ceramic tiles and has positioned a 20-yd^3 dumpster on the pad.

Except for the raised dock areas, the storage capacity of Pad 74V for drummed wastes is quite limited. The current processes used and the scale of hazardous substance handling in the Laboratory do not generate large quantities of hazardous and radioactive wastes that would require large staging areas for drums before shipment to designated FEMP storage areas or off-site.

Major Media Types per Process Area

The only major medium for Pad 74V is concrete.

Summary of Available Radiological Data

No recent surveys exist of radiological contamination for Pad 74V. A new radiological survey will be needed to identify the hot spot for intrusive sampling. To be effective, this survey will have to be conducted after the current Laboratory renovation program is completed.

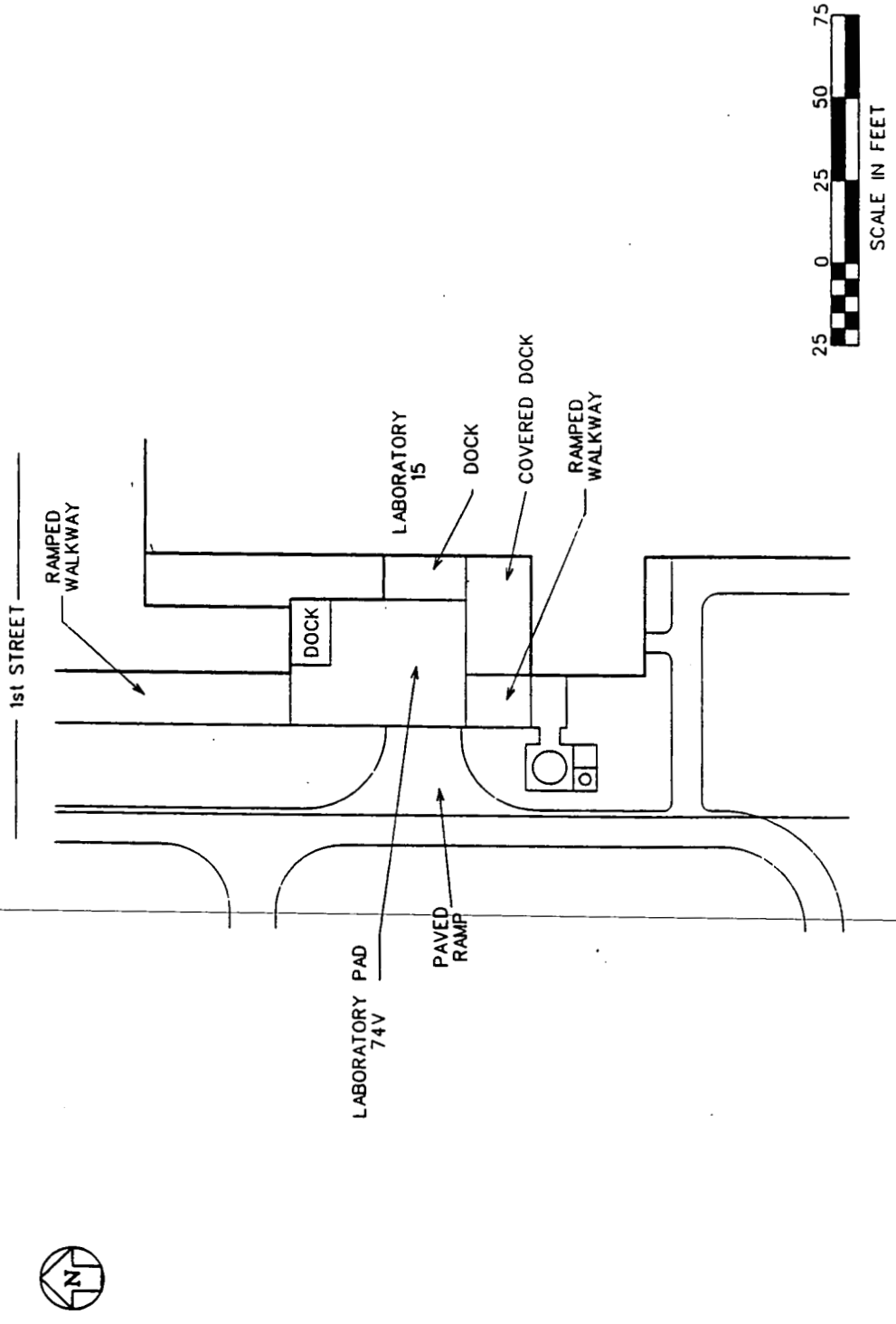

FIGURE 74V-1 Layout of Pad 74V

Summary of Sampling for Pad 74V

One airborne particulate sample will be taken on the pad and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail the final intrusive sampling location for concrete, the only major medium for the pad. Pad 74V is considered a dry process area; therefore, a concrete chip will be the intrusive sample. A comprehensive inspection was not possible as a result of construction activities; therefore, an inspection will be conducted during the radiological survey to assess the need for supplemental sampling. Table 74V-1 summarizes the planned sampling program for Pad 74V.

TABLE 74V-1 Sample Types and Quantities for Pad 74V

Sample Type	Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.8.24 Pad 74W — Building 39A Pad

Component Description

Pad 74W (Building 39A Pad) is a reinforced concrete pad shown on the Grid 19 map in Appendix C. Pad 74W is directly east of the Incinerator Building (Component 39A) and north of the Hot Raffinate Building (Component 3E). It is rectangular, having approximately 5,400 ft^2 of storage space (Figure 74W-1). Pad 74W stored drums of waste oil waiting to be incinerated in Building 39A. A spray calciner was also situated on Pad 74W for processing raffinate slurry from the Hot Raffinate Building (Component 3E).

Process Area Description

Pad 74W was historically used for two purposes. First, the pad contained a spray calciner in support of operations in the Hot Raffinate Building. Following the shutdown and removal of the calciner, the pad was primarily used for drum storage in support of Incinerator Building processes. Because these two processes successively occupied the same pad, the entire pad is treated as one process area. The anticipated contaminants for the pad are summarized in Table A.3.

Spray Calciner. A spray calciner located on Pad 74W dehydrated raffinate slurry with a very low radium content that was pumped from the Hot Raffinate Building. Lime was added to adjust the pH and to aid in drying out the raffinate slurry. The solids were then pneumatically conveyed to the Metal Oxide Storage Tank (Silo 3) in the FEMP waste pit area, shown on Grid 31.

Contaminated Oil Storage. Drums of waste oils, known to be contaminated with 1,1,1-trichloroethane and lead, were stored intermittently on the pad before being incinerated in the Liquid Waste Incinerator in the Incinerator Building. In 1986, on-site incineration ceased. Currently, Pad 74W is so badly deteriorated with large cracks and vegetation that the pad is deemed unusable for storage at the facility.

Major Media Types per Process Area

The only major medium for Pad 74W is concrete.

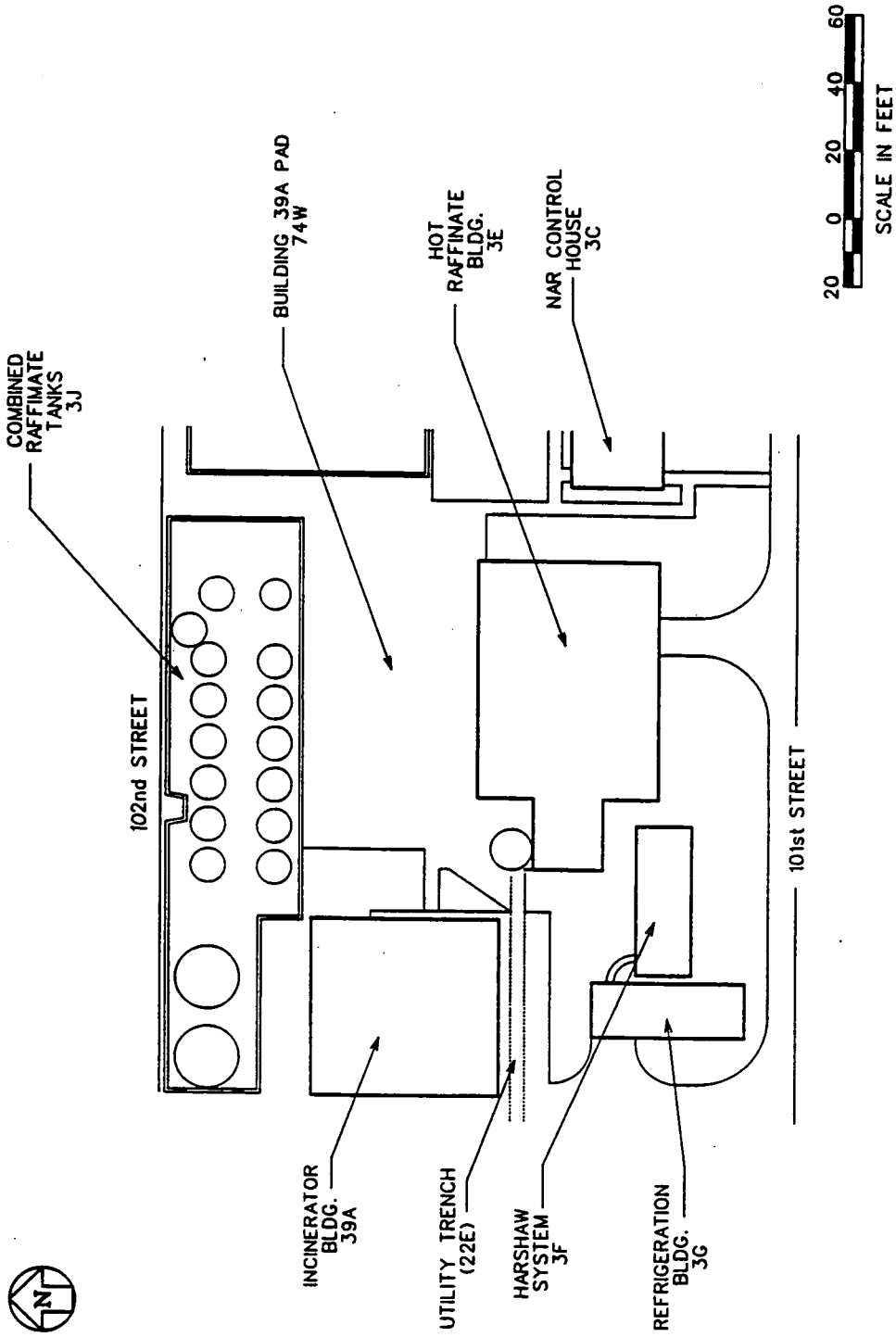

FIGURE 74W-1 Layout of Pad 74W

Summary of Available Radiological Data

Pad 74W has been surveyed for removable alpha contamination. However, total beta-gamma contamination data for the pad do not exist. The surveys conducted from 1989 to 1992 yielded 16 removable alpha readings for the pad. The data have been analyzed and are the basis for initial identification of a hot spot for the concrete medium: no removable alpha data exceeded the MDA of 241 dpm, and a hot spot could not be identified at this time. However, data from ongoing radiological surveys will be assessed before sampling Pad 74W.

Summary of Sampling for Pad 74W

One airborne particulate sample will be collected on the pad and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including follow-up radiological and chemical surveys, exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail the final intrusive sampling location for the concrete medium on the pad. Because the area contained liquid waste and solvent storage, as well as handling raffinate slurry, the pad is considered to be a wet, acidic process area. Therefore, a concrete core will be collected for the concrete medium. Visual inspection of the component did not indicate the need for supplemental samples. Table 74W-1 summarizes the planned sampling program for Pad 74W.

TABLE 74W-1 Sample Types and Quantities for Pad 74W

Sample Type	Pad 74W	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.8.25 Component 89 — Parking Lot

Component Description

Component 89 (Parking Lot) consists of two asphalt-paved car parking lots approximately 425 × 550 ft (east) and 500 × 700 ft (west), as shown on Grid 8 and 15 maps in Appendix C.

Process Area Description

The parking lot is located outside of the site administrative area. The parking lot surface is routinely resurfaced for maintenance purposes.

Summary of Sampling for Component 89

This component does not require sampling because (1) it is located outside of radiologically controlled areas and (2) results of the radiological surveys performed for the component do not exceed the criteria established for sampling. The contaminants expected for the component are of low toxicity, and the component exhibits little or no evidence of contamination.

D.9.8.26 Component G-001 — Railroad Tracks

Component Description

Component G-001 (Railroad Tracks) comprises approximately 3 mi of railroad track, ties, and associated hardware. The railroad tracks are located throughout the site and are shown on grid maps in Appendix C.

Process Area Description

The railroad tracks were used for access to the major process areas for incoming and outgoing railcars. The tracks will undergo extensive screening during segregation for final disposal.

Summary of Sampling for Component G-001

This component does not require sampling. Radiological surveys performed for the component do not exceed the criteria established for sampling.

D.9.8.27 Component G-002 — Site Roads

Component Description

Component G-002 (Site Roads) includes all the roadways that outline the facility and those roadways that are between process plants within the facility. More than 5.5 mi of paved roadways exist. A site-wide map indicates the roadways in Figure G-002-1.

Process Area Description

The original roads at the facility were constructed primarily of concrete. Site-wide road repairs at the facility led to the covering of the concrete roads with asphalt. The anticipated contaminants from the roads process, a wet process area, are summarized in Table A.3.

Major Media Types per Process Area

The major medium for Component G-002 is concrete. The asphalt is not considered a major medium because limited treatment options exist.

Summary of Available Radiological Data

Component G-002 has been surveyed for both removable alpha and total beta-gamma contamination. The surveys conducted from 1989 to 1992 yielded 260 removable alpha and 17 total beta-gamma readings for the concrete medium. These data have been analyzed and are the basis for initial identification of a hot spot for the concrete medium. The highest removable alpha reading was 132 dpm from a measurement taken from the concrete on the road southwest of the Plant 8 Warehouse (Component 80). Of the 260 removable alpha survey measurements collected, 9 were above the MDA for the appropriate sampling event. The total beta-gamma readings were all detected below the MDA of 1,000 dpm for the sampling event. Data are currently being collected from ongoing radiological surveys. These surveys will be assessed as part of the systematic surveys of Component G-002.

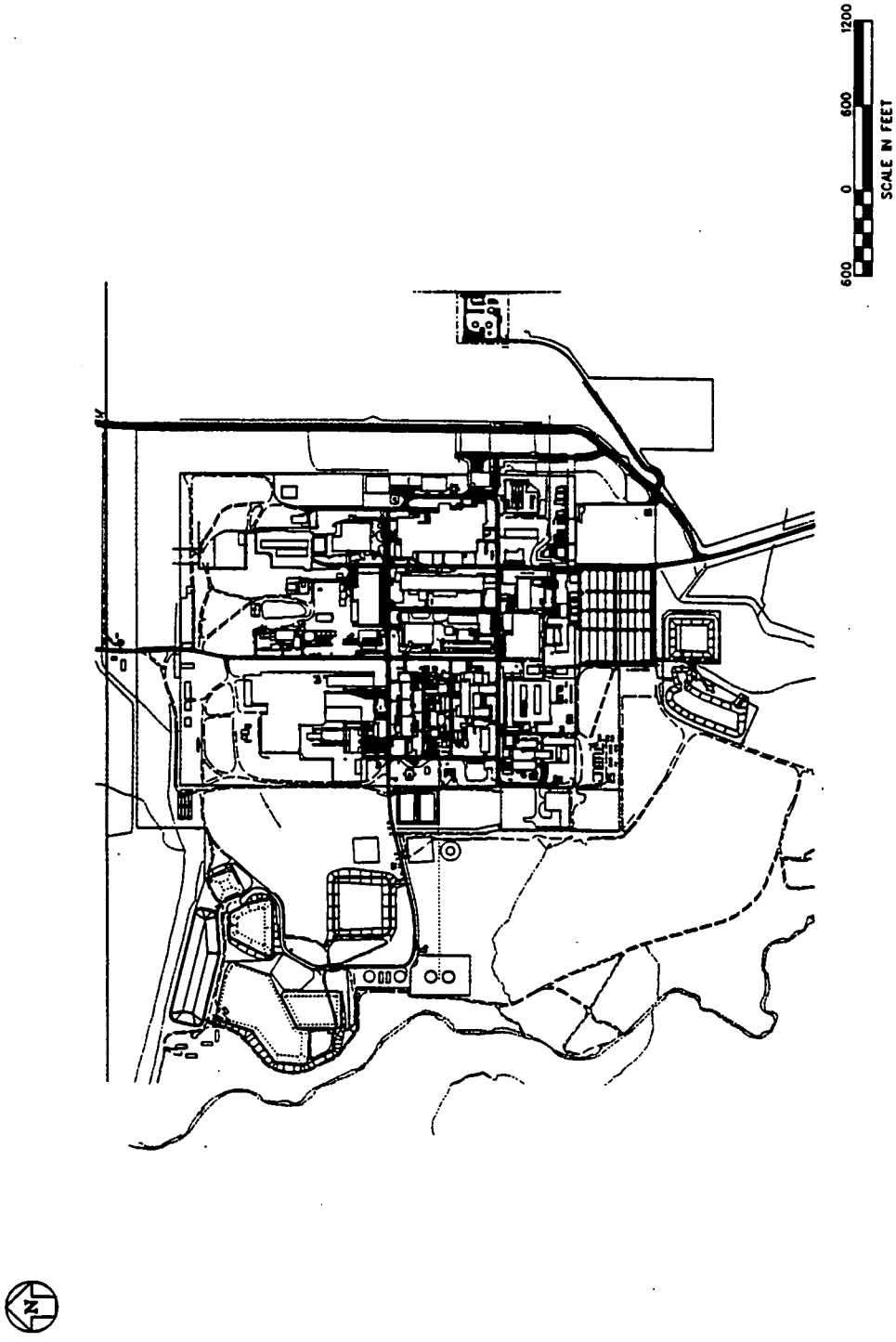

FIGURE G-002-1 Site Roads

D.9.9 PIPING, UTILITIES, AND EQUIPMENT — ABOVEGROUND

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D.9.9.1 Component 2F — Cold Side Ore Conveyor

Component Description

Component 2F (Cold Side Ore Conveyor) provided a means for uranium ores and residues to reach the digestion process in the Ore Refinery Plant (Component 2A). Shown on the Grid 19 map in Appendix C, it measures approximately 92 × 24 ft and sits on the Plant 2 West Pad (Component 74B) (Figure 2F-1). Though no longer functional, the following equipment remains: a drum conveyor, a bucket elevator, a drum dumper, a screw conveyor, a conveyor shed, the Drum Dumper Building, and a 20-ft deep elevator pit.

Process Area Description

The system was initially designed to handle drummed ores that contained very low levels of radium (referred to as "cold"). The drummed ores or residues were loaded onto the conveyor to be dumped into the bucket elevator system, which carried the material to the top floor of the Ore Refinery Plant for digestion in nitric acid.

Major Media Types per Process Area

The major media for Component 2F include concrete and structural steel. The concrete for the component is only within the Drum Dumper Building; the concrete beneath the exterior conveyor is considered part of the Plant 2 West Pad.

Summary of Available Radiological Data

The concrete within the Drum Dumper Building has not been routinely surveyed for removable alpha and total beta-gamma contamination. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys.

Summary of Sampling for Component 2F

One airborne particulate sample will be taken within the Drum Dumper Building and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. The two media within the component are structural steel and concrete. Component 2F is considered a dry process area; therefore, a concrete chip will be taken from the floor within the Drum Dumper Building. Also, a surface scraping will be taken from the steel conveyor or the structural steel of the Drum Dumper Building. Visual inspection of the component identified no supplemental samples. Table 2F-1 summarizes the planned sampling program for Component 2F.

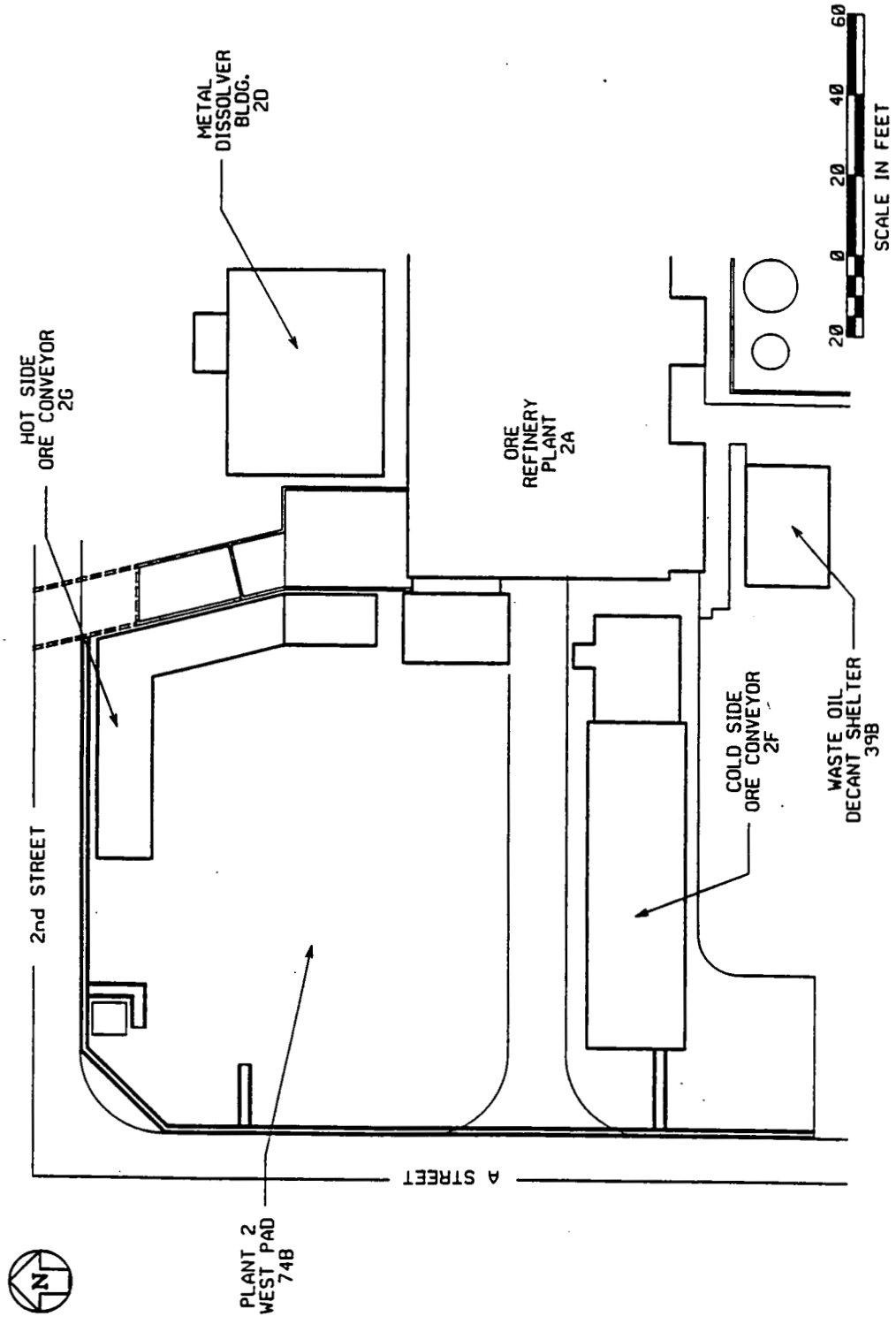

FIGURE 2F-1 Location of Component 2F

TABLE 2F-1 Sample Types and Quantities for Component 2F

Sample Type	Cold Ore Conveyor	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.9.2 Component 2G — Hot Side Ore Conveyor

Component Description

Component 2G (Hot Side Ore Conveyor) provided a means for uranium ores and residues to reach the digestion process in the Ore Refinery Plant (Component 2A). Shown on the Grid 19 map in Appendix C, it measures approximately 110 × 65 ft and sits on the Plant 2 West Pad (Component 74B) (Figure 2G-1). Though no longer functional, the following equipment remains: a drum conveyor, two bucket elevators, two drum dumpers, two screw conveyors, a conveyor shed, the Drum Dumper Building, and a 20-ft deep elevator pit.

Process Area Description

The system was initially designed to handle drummed ores that contained high levels of radium (referred to as "hot"). The drummed ores or residues were loaded onto the conveyor to be dumped into the bucket elevator system, which carried the material to the top floor of the Ore Refinery Plant for digestion in nitric acid.

Major Media Types per Process Area

The major media for Component 2G include concrete and structural steel. The concrete for the component is only within the Drum Dumper Building; the concrete beneath the exterior conveyor is considered part of the Plant 2 West Pad.

Summary of Available Radiological Data

The concrete within the Drum Dumper Building of Component 2G has not been routinely surveyed for removable alpha and total beta-gamma contamination. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys.

Summary of Sampling for Component 2G

One airborne particulate sample will be taken within the Drum Dumper Building and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. The two media within the component are structural steel and concrete. Component 2G is considered a dry process area; therefore, a concrete chip will be taken from the floor within the Drum Dumper Building. Also, a surface scraping will be taken from the steel conveyor or the structural steel of the Drum Dumper Building. Visual inspection of the component identified no supplemental samples. Table 2G-1 summarizes the planned sampling program for Component 2G.

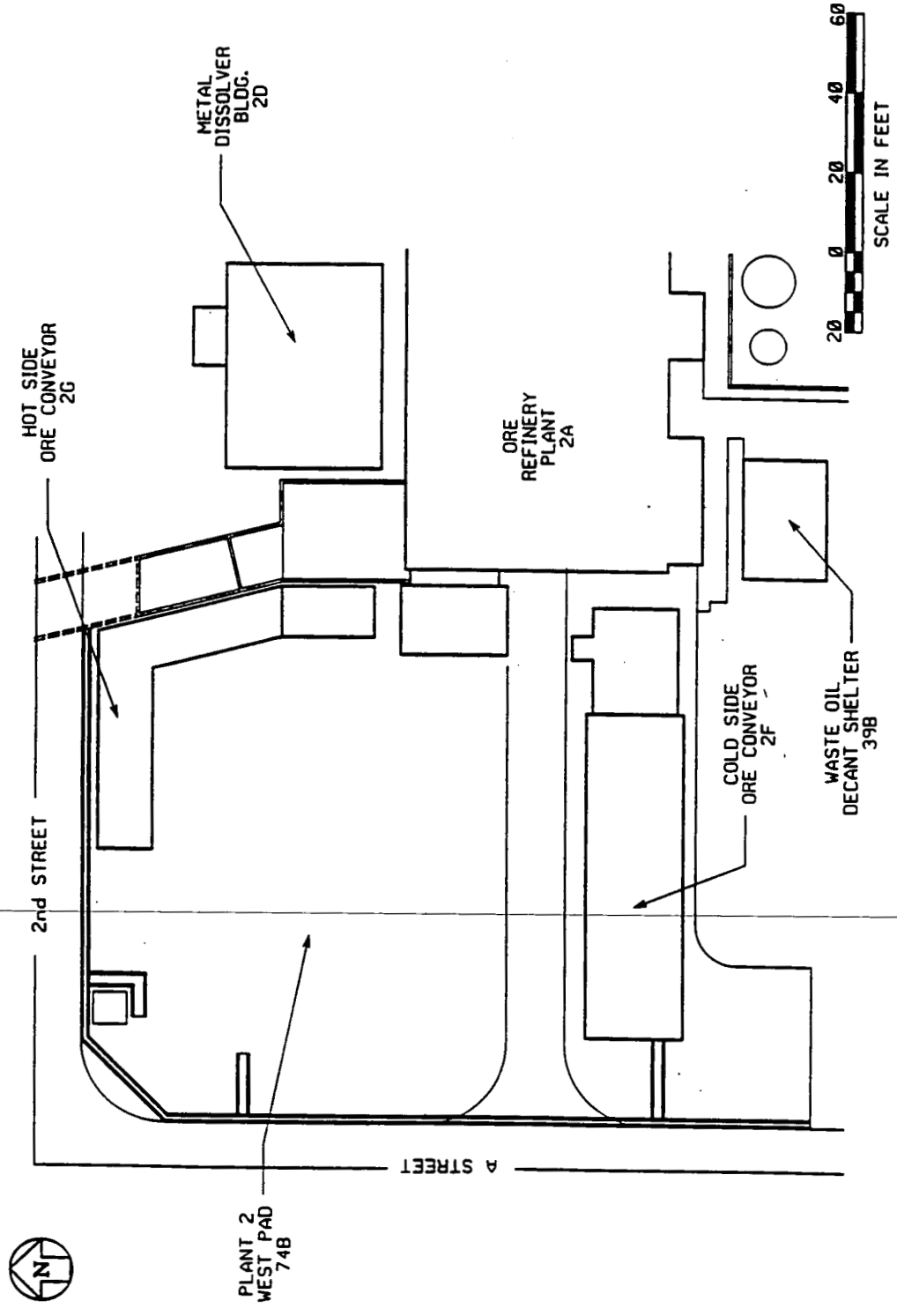

FIGURE 2G-1 Location of Component 2G

TABLE 2G-1 Sample Types and Quantities for Component 2G-1

Sample Type	Hot Ore Conveyor	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.9.3 Component 6D — Plant 6 Electrostatic Precipitator Central

Component Description

Component 6D (Plant 6 Electrostatic Precipitator Central) comprises a steel precipitator housing, approximately 12 × 20 ft and 15 ft high, and two cyclone separators in a concrete diked area. Building 6D is adjacent to the east side of the Metals Fabrication Plant (Component 6A), as shown on the Grid 6 map in Appendix C. Figure 6D-1 shows the floor plan of Component 6D.

Process Area Description

Component 6D contains one process area, an electrostatic precipitator (Precipitron) that handled exhausts vented from the machining processes in the Metals Fabrication Plant. The electrostatic elements were typically not powered because exhausts contained moisture. Building 6D currently contains the Precipitron, air filters, and two cyclones. Anticipated contaminants for Component 6D are summarized in Table A.3.

Major Media Types per Process Area

The only major medium for Component 6D is the concrete that makes up the diked area.

Summary of Available Radiological Data

Component 6D has not been routinely surveyed for removable alpha and total beta-gamma contamination. Because no recent data are available, any data collected from ongoing radiological surveys will be incorporated in determining the radiological hot spot before sampling activities. Also, radiological screening will be performed before sampling to determine a hot spot.

Summary of Sampling for Component 6D

For Component 6D, one airborne particulate sample will be taken and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, PCB field test kit measurements, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive sampling for the concrete medium will be performed in the location determined from the radiological screening. Because the process in Component 6D is considered dry, a concrete chip will be taken from the diked area. Visual inspection of the component identified no supplemental samples. Table 6D-1 summarizes the planned sampling program for Component 6D.

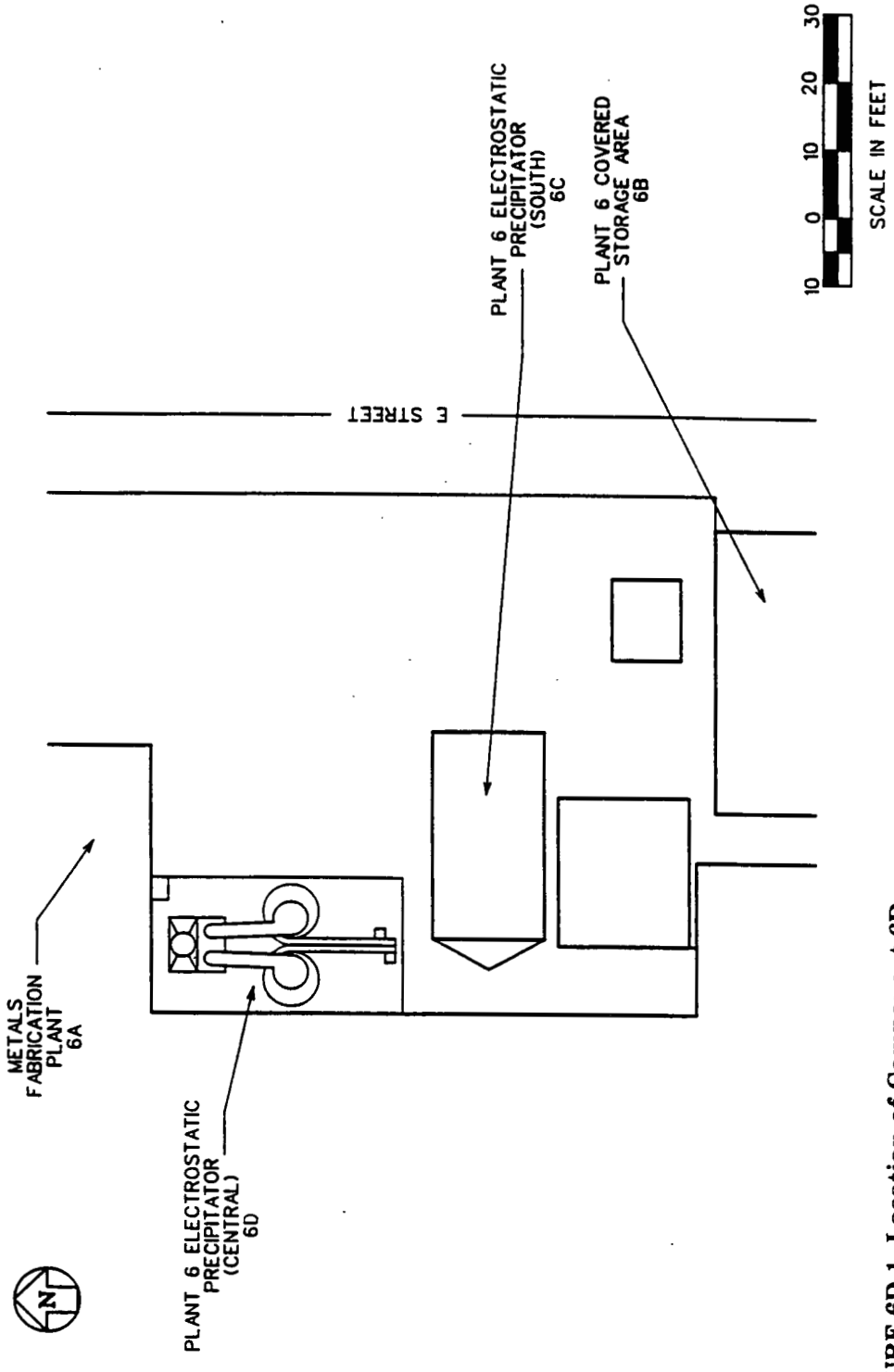

FIGURE 6D-1 Location of Component 6D

TABLE 6D-1 Sample Types and Quantities for Component 6D

Sample Type	Electrostatic Precipitator	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.9.4 Component 7B — Plant 7 Overhead Crane

Component Description

The Plant 7 Overhead Crane (Component 7B) is a 20-ton steel overhead bridge crane structure, 75 ft × 350 ft and 20 ft high on a concrete pad (75 × 350 ft), as shown on the Grid 13 map of Appendix C and Figure 7B-1.

Process Area Description

Component 7B is considered one process area and was used for loading and unloading UF_6 cylinders and depleted UF_4 hoppers that were shipped and received by truck or railroad car. Anticipated contaminants are summarized in Table A.3.

Major Media Types per Process Area

The major media of Component 7B include the steel overhead bridge crane structure and the concrete involved in the pad.

Summary of Available Radiological Data

Component 7B has not been routinely surveyed for removable alpha and total beta-gamma contamination; no recent data are available.

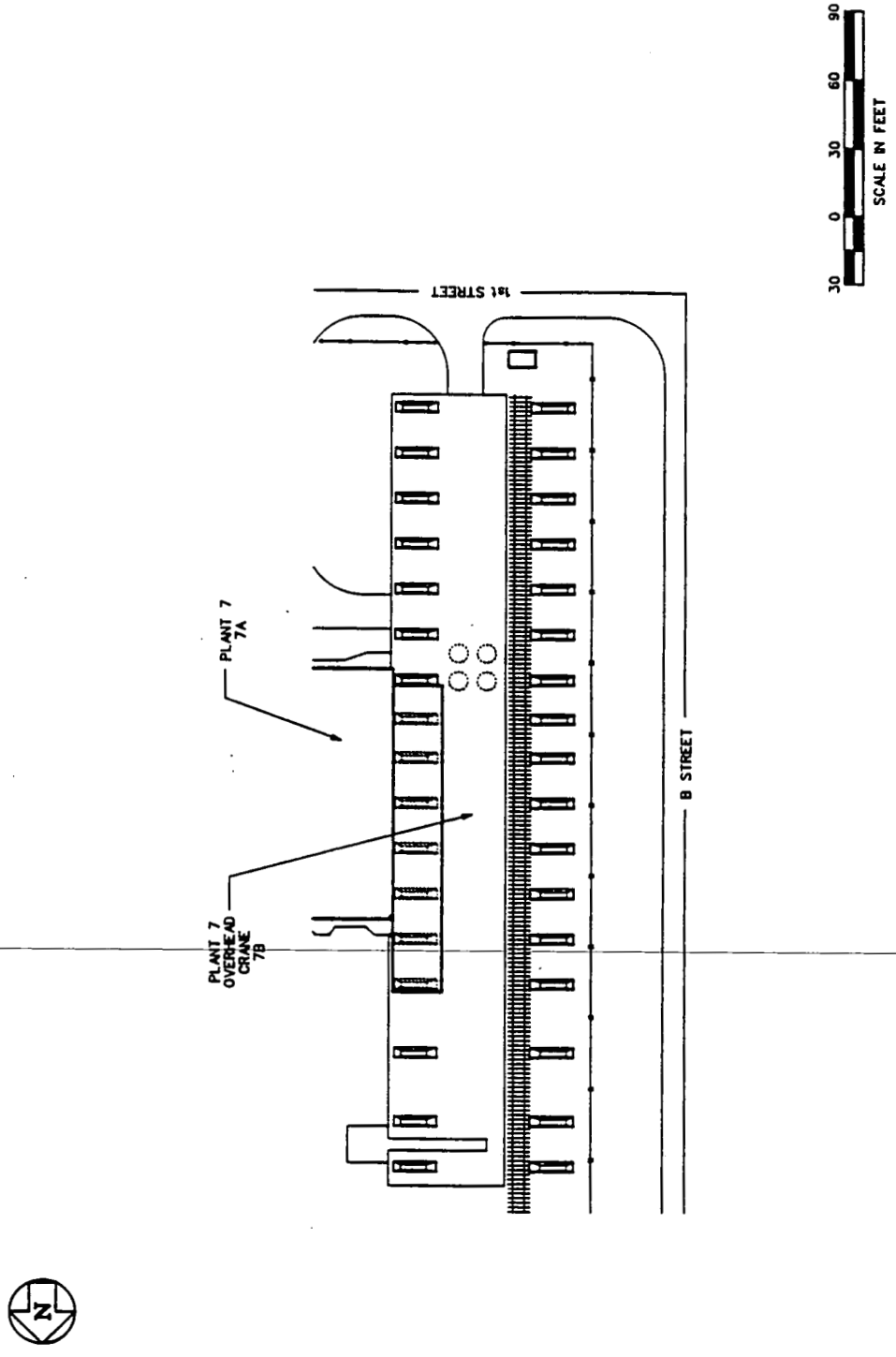

FIGURE FB-1 Layout of Component 7B

D.9.9.5 Component 8E — Drum Conveyor Shelter

Component Description

Component 8E (Drum Conveyor Shelter) is a single-level facility consisting of a structural steel frame on a reinforced poured concrete base that is approximately 10 × 10 ft and 15 ft high. The component is located adjacent to the Rotary Kiln/Drum Reconditioning Building (Component 8C), as shown on the Grid 20 map of Appendix C.

Process Area Description

The Drum Conveyor Shelter is a new addition to Plant 8 and is associated with the Rotary Kiln/Drum Reconditioning facility. This equipment has not been used.

Summary of Sampling for Component 8E

This component does not require sampling because it has not been placed into service following recent completion of construction, it is insignificant in size, and it exhibits little or no evidence of contamination.

D.9.9.6 Component 8F — Old Drum Washer

Component Description

Component 8F (Plant 8 Old Drum Washer) is located adjacent to the west wall of the Recovery Plant (Component 8A) on the Plant 8 West Pad (Component 74D), as shown in Figure 8F-1 and Grid 20 map in Appendix C. Component 8F is approximately 20 x 20 ft and 10 ft high and was used to wash drums from the Recovery Plant and site-wide for reuse. This unit has been abandoned in place because a new drum reconditioning unit has been installed in the Rotary Kiln/Drum Reconditioning Building (Component 8C) to the south. Because the unit is located on another component, Component 8F consists of the enclosed, steel equipment only and not the concrete beneath it.

Process Area Description

Component 8F constitutes a single process area used to wash empty drums in preparation for reconditioning at the Drum Reconditioning Building (Component 66). The drums were manually placed in the unit. Caustic (NaOH) and water were used to accomplish the washing, and the wash water was discharged to a grated concrete trench in Pad 74D that parallels the west wall of the Recovery Plant. That trench discharged into the Recovery Plant for treatment. Anticipated contaminants for the component are summarized in Table A.3.

Major Media Types per Process Area

Only one major medium is associated with the old drum washer: the unit consists mainly of steel, especially in the exposed walls of this enclosed wash system.

Summary of Available Radiological Data

Logs of the recent radiological surveys indicate that no radiological data exist for Component 8F. A new survey will be needed to assess radiological contamination levels on inner and outer surfaces of the old drum washer. Any survey results from ongoing radiological surveys will also be assessed before component sampling.

Summary of Sampling for Component 8F

Sampling for Component 8F, the Old Drum Washer, will be contingent upon the results of a new radiological survey of the exterior surfaces of the unit. The survey will be conducted in accordance with Protocol 2. An air sample taken for Pad 74D will also be relevant for Component 8F. Depending on the contamination levels detected, swipe and

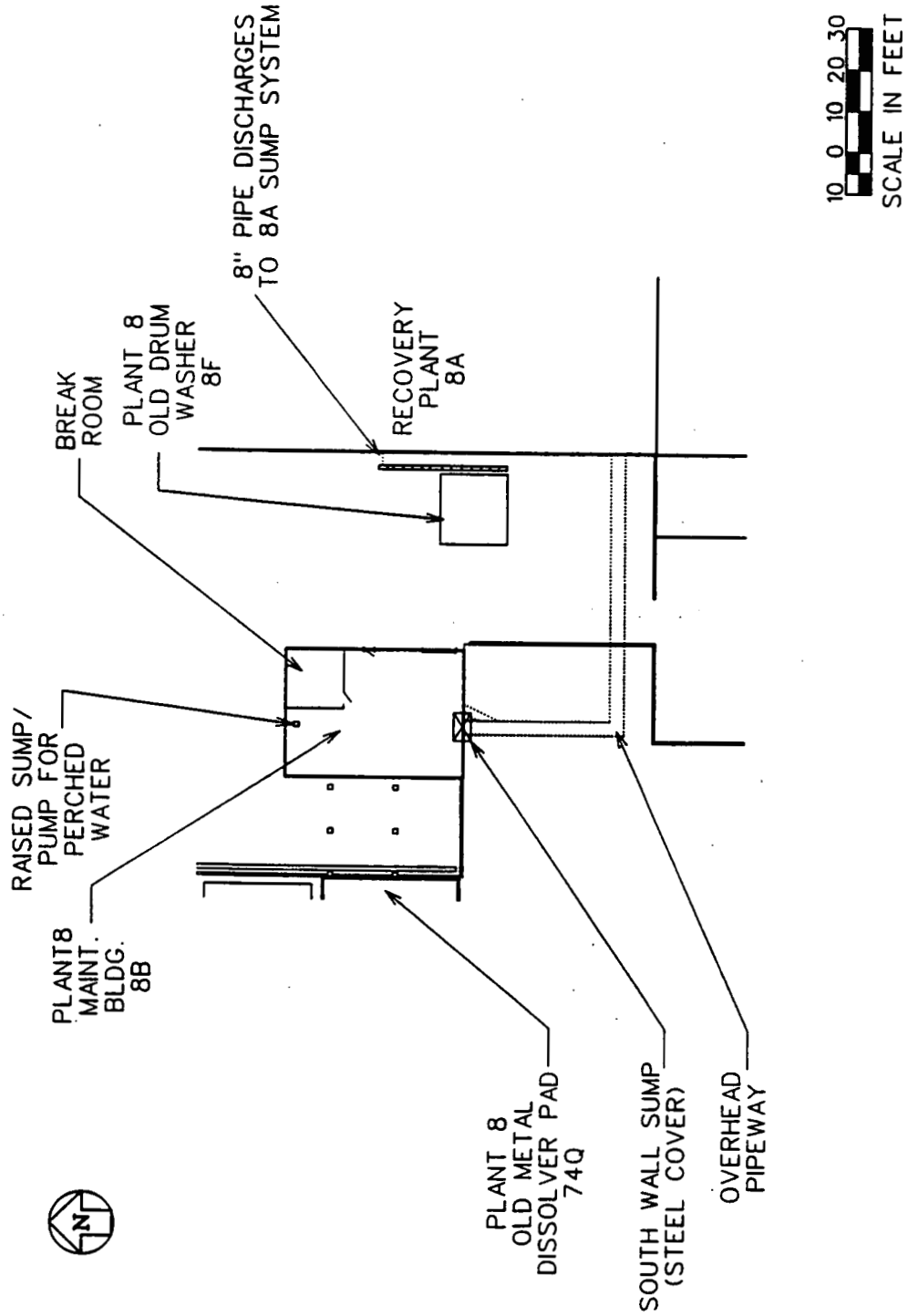

FIGURE 8F-1 Location of Component 8F

scrape samples may be collected from exterior steel surfaces. Inner surfaces and any internal residues would be sampled in a separate program not addressed in this document. Table 8F-1 summarizes the nonintrusive and potential intrusive samples that will be collected from Component 8F.

TABLE 8F-1 Sample Types and Quantities for Component 8F

Sample Type	Plant 8 Old Drum Washer	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	NA
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.9.7 Component 9C — Plant 9 Dust Collector

Component Description

Component 9C (Plant 9 Dust Collector) is shown on the Grid 3 map in Appendix C and measures approximately 20 x 35 ft and 25 ft high. Component 9C adjoins the west side of the Special Products Plant (Component 9A) and consists of a steel dust collector housing mounted on a poured concrete base and pad. Figure 9C-1 shows the floor plan of Component 9C.

Process Area Description

One process area has been identified for Component 9C. Component 9C contains the dust collector G42-615, a Hoffman vacuum pump, and two cyclones. The dust collector was used to filter exhausts from the Special Products Plant reduction processes. The anticipated contaminants for Building 9C are summarized in Table A.3.

Major Media Types per Process Area

The Component 9C major media are a poured concrete base and pad and a structural steel frame.

Summary of Available Radiological Data

Component 9C has not been routinely surveyed for removable alpha and total beta-gamma contamination. Data will be gathered before sampling and will include any data gathered from ongoing radiological surveys.

Summary of Sampling for Component 9C

One airborne particulate sample will be taken and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive sampling for the concrete medium will be performed at the radiological hot spot. Because the process in Component 9C is considered dry, the concrete sample will be a chip sample. Structural steel scrapings and swipe samples will be collected on the basis of Protocols 1 and 3. Visual inspection identified no supplemental sample requirements. Table 9C-1 summarizes the planned sampling program for Component 9C.

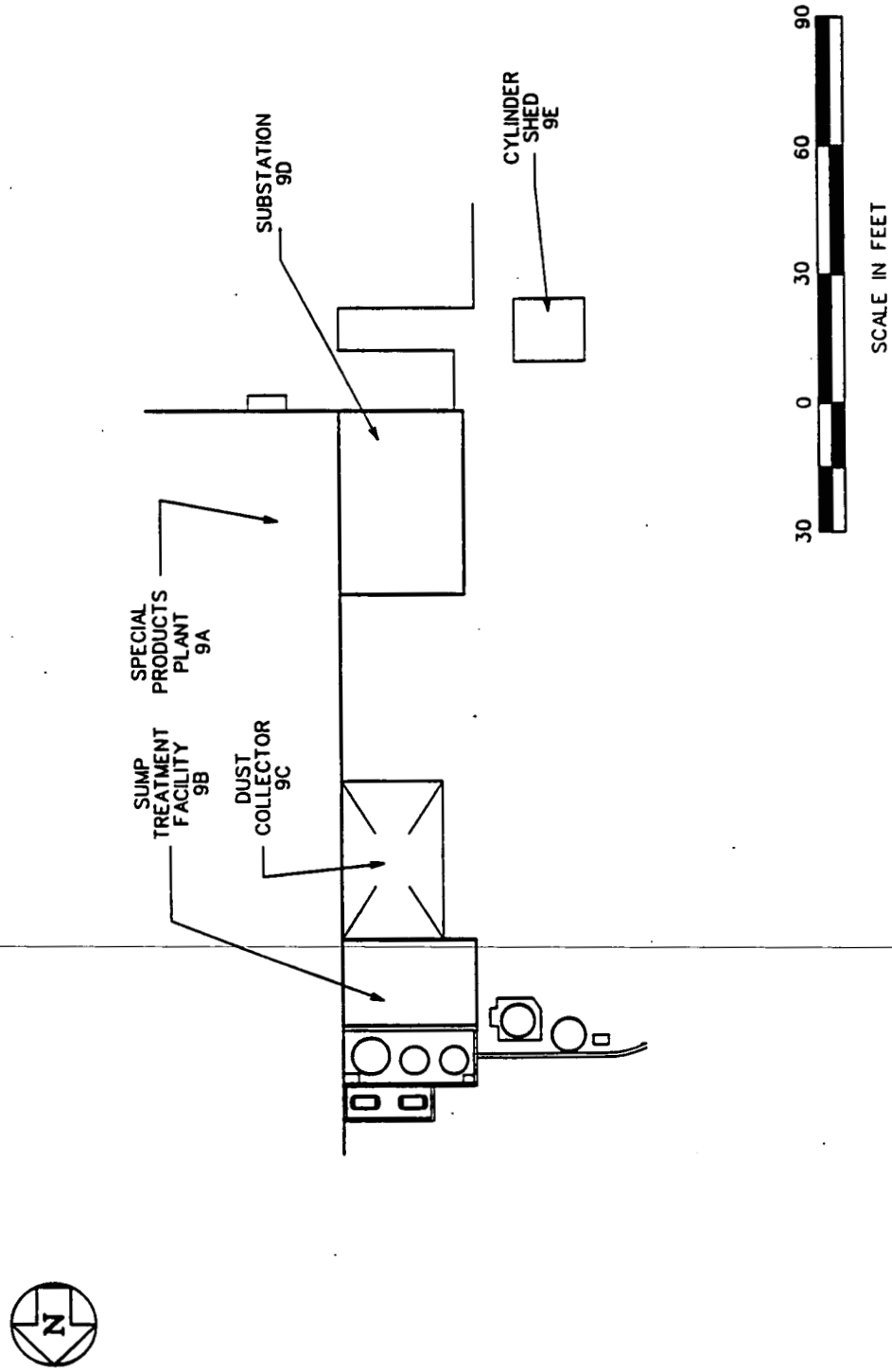

FIGURE 9C-1 Location of Component 9C

TABLE 9C-1 Sample Types and Quantities for Component 9C

Sample Type	Dust Collector	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.9.8 Component 14B — Building 14 EOC Generator Set

Component Description

Component 14B (Building 14 EOC Generator Set) is an electrical generator on a pad that is approximately 10 x 10 ft. The component is located north of the Administrative Building (Component 14A), as shown on the Grid 14 map in Appendix C.

Process Area Description

This generator is adjacent to the Administration Building and is within the administration area. This unit consists of a diesel engine, fuel tank, and electrical generator for use in emergency situations to power the emergency operations center.

Summary of Sampling for Component 14B

This component does not require sampling because it is located outside of radiologically controlled areas and is insignificant in size. The contaminants expected for the component are of low toxicity, and the component exhibits little or no evidence of contamination.

D.9.9.9 Component 16C — Electrical Panels and Transformer

Component Description

Component 16C (Electrical Panels and Transformer) is a wooden, two-sided structure on a concrete pad that is approximately 4 x 20 ft. It shelters a transformer and electrical meter. The component is located south of the Heavy Equipment Building (Component 46), as shown on the Grid 7 map in Appendix C.

Process Area Description

Component 16C was used as a secondary unit substation that received 480 V and transformed it down to 208 V to provide electrical power to the east Trailers, as shown on the Grid 7 map. The only anticipated contaminants for the component, listed in Table A.3, are PCBs because of the past presence of electrical equipment.

Major Media Types per Process Area

The major medium identified for Component 16C is the concrete pad.

Summary of Available Radiological Data

Radiological surveys have not been conducted on or around Component 16C because of the belief that no local radiological sources exist. Data will be taken and assessed before sampling to determine the location of the radiological hot spots or to verify nondetectable levels.

Summary of Sampling for Component 16C

Because of the relative size of the area, an air sample has been determined to be unnecessary. Nonintrusive measurements, including exposure rate measurements, XRF surveys, PCB field test kit measurements, and swipe samples, will be performed and assessed in the field to further detail a final intrusive sampling location. The only major medium within the component is the concrete pad. Because Component 16C contained electrical equipment and therefore may have released PCBs, a concrete chip will be collected from the pad. Visual inspection of the component identified no supplemental sample locations. Table 16C-1 summarizes the planned sampling program for Component 16C.

TABLE 16C-1 Sample Types and Quantities for Component 16C

Sample Type	Electrical Distribution	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	NA
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.9.10 Component 16E — Main Electrical Transformers

Component Description

Component 16E (Main Electrical Transformers) is a concrete pad approximately 4 × 25 ft, with the main site electrical transformers mounted on the concrete pad. The component is located within the fence that surrounds the Main Electrical Station (Component 16A). The component is located on the Grid 7 map in Appendix C and shown on Figure 16E-1.

Process Area Description

Component 16E receives the 132-kV main electrical feed and transforms it to 13.2-kV feeds to local substations around the facility. The only anticipated contaminants for the component, listed in Table A.3, are PCBs because of the presence of electrical equipment.

Major Media Types per Process Area

The only major medium identified for Component 16E is the concrete pad.

Summary of Available Radiological Data

Radiological surveys have not been conducted on or around Component 16E because of the belief that no local radiological sources exist. Data will be taken and assessed before sampling to determine the location of the radiological hot spots or to verify nondetectable levels.

Summary of Sampling for Component 16E

Because of the relative size of the area, an air sample has been determined to be unnecessary. Nonintrusive measurements, including exposure rate measurements, XRF surveys, PCB field test kit measurements, and swipe samples, will be performed and assessed in the field to further detail a final intrusive sampling location. The only medium within the component is the concrete pad. Because Component 16E contained electrical equipment and therefore may have released PCBs, a concrete chip will be collected from the pad. Visual inspection of the component identified no supplemental sample locations. Table 16E-1 summarizes the planned sampling program for Component 16E.

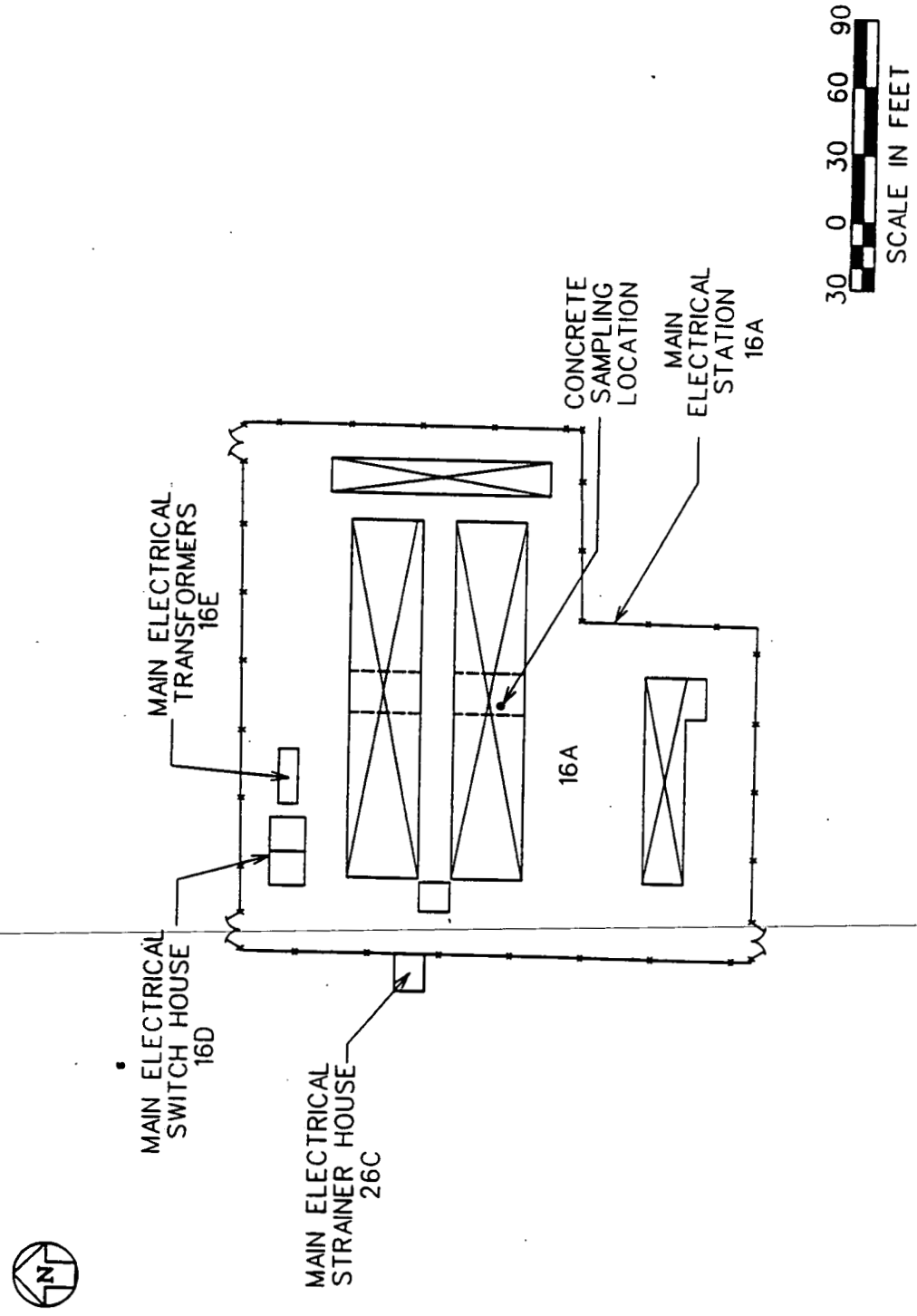

FIGURE 16E-1 Location of Component 16E

TABLE 16E-1 Sample Types and Quantities for Component 16E

Sample Type	Electrical Distribution	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	NA
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.9.11 Component 16F — Trailer Substation 1

Component Description

Component 16F (Trailer Substation 1) is a concrete pad, 4 × 20 ft, with a small fiberglass enclosure for a transformer, main circuit breaker, fuse disconnect, and electrical meters. It is located north of Trailer 11 (Component T-11), as shown on the Grid 7 map in Appendix C.

Process Area Description

Component 16F is a power distribution point that receives 480 V from the Electrical Substation (Component 16B) and transforms it 208 V to power the local office trailers shown on the Grid 7 map. The only anticipated contaminant for the component, listed in Table A.3, are PCBs because of the presence of a transformer.

Major Media Types per Process Area

The only major medium for Component 16F is the concrete pad.

Summary of Available Radiological Data

Radiological surveys have not been conducted on or around Component 16F because of the belief that no local radiological sources exist. Data will be taken and assessed before sampling to determine the location of the radiological hot spot or to verify nondetectable levels.

Summary of Sampling for Component 16F

Because of the relative size of the area, an air sample has been determined to be unnecessary. Nonintrusive measurements, including exposure rate measurements, PCB field test kit measurements, and swipe samples, will be performed and assessed in the field to further detail a final intrusive sampling location. The only medium within the component is concrete. Because Component 16F contains a transformer and therefore may have released PCBs, a concrete chip will be taken from the pad. Visual inspection of the component identified no supplemental samples and no obvious PCB contamination locations. Table 16F-1 summarizes the planned sampling program for Component 16F.

TABLE 16F-1 Sample Types and Quantities for Component 16F

Sample Type	Electrical Distribution	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	NA
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.9.12 Component 16G — Trailer Substation 2

Component Description

Component 16G (Trailer Substation 2) is a 4 × 20 ft concrete pad with a small fiberglass enclosure for a transformer, main circuit breaker, fuse disconnect, and electrical meters. It is located north of Trailer 14 (Component T-14), as shown on the Grid 7 map in Appendix C.

Process Area Description

Component 16G is a power distribution point that receives 480 V from the Electrical Substation (Component 16B) and transforms it to 208 V to power the local office trailers shown on the Grid 7 map. The only anticipated contaminants for the component, listed in Table A.3, are PCBs because of the presence of a transformer.

Major Media Types per Process Area

The only major medium for Component 16G is a concrete pad.

Summary of Available Radiological Data

Radiological surveys have not been conducted on or around Component 16G because of the belief that no local radiological sources exist. Data will be taken and assessed before sampling to determine the location of the radiological hot spot or to verify nondetectable levels.

Summary of Sampling for Component 16G

Because of the relative size of the area, an air sample has been determined to be unnecessary. Nonintrusive measurements, including exposure rate measurements, PCB field test kit measurements, and swipe samples, will be performed and assessed in the field to further detail a final intrusive sampling location. The only medium within the component is concrete. Because Component 16G contains a transformer and therefore may have released PCBs, a concrete chip will be taken from the pad. Visual inspection of the component identified no supplemental samples and no obvious PCB contamination locations. Table 16G-1 summarizes the planned sampling program for Component 16G.

TABLE 16G-1 Sample Types and Quantities for Component 16G

Sample Type	Electrical Distribution	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	NA
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.9.13 Component 20C — Cooling Towers

Component Description

Component 20C (Cooling Towers) measures approximately 31 x 96 ft and 42 ft high and is shown on Figure 20C-1, and the Grid 11 map. Component 20C consists of a wooden structure and a poured concrete base.

Process Area Description

Component 20C provides air cooling of site process water in mechanical draft-type towers. This component comprises four cooling towers; however, originally there were only three. The anticipated contaminants for Component 20C are summarized in Table A.3.

Major Media Types per Process Area

The major medium for Component 20C is concrete.

Summary of Available Radiological Data

Component 20C has been surveyed for removable alpha contamination; however, total beta-gamma contamination measurements have not been performed. During 1992, 20 removable alpha contamination survey measurements were performed for Component 20C. All 20 removable alpha measurements fell below the 42.1 dpm MDA. Total beta-gamma contamination measurements have not yet been performed for Component 20C. Additional data will be gathered before sampling and reassessed to determine the location of the radiological hot spot or to verify nondetectable contamination levels.

Summary of Sampling for Component 20C

One airborne particulate sample will be taken and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive sampling for the concrete medium will be performed at the location identified as the radiological hot spot. Because Component 20C is considered a wet process, a concrete core will be taken from the concrete base. Because of the extensive use of wood in the component, an intrusive sample of wood will also be collected and analyzed as a supplemental sample. Swipe samples will be collected on the basis of Protocols 1 and 3. Visual inspection did not identify any other supplemental samples. Table 20C-1 summarizes the planned sampling program for Component 20C.

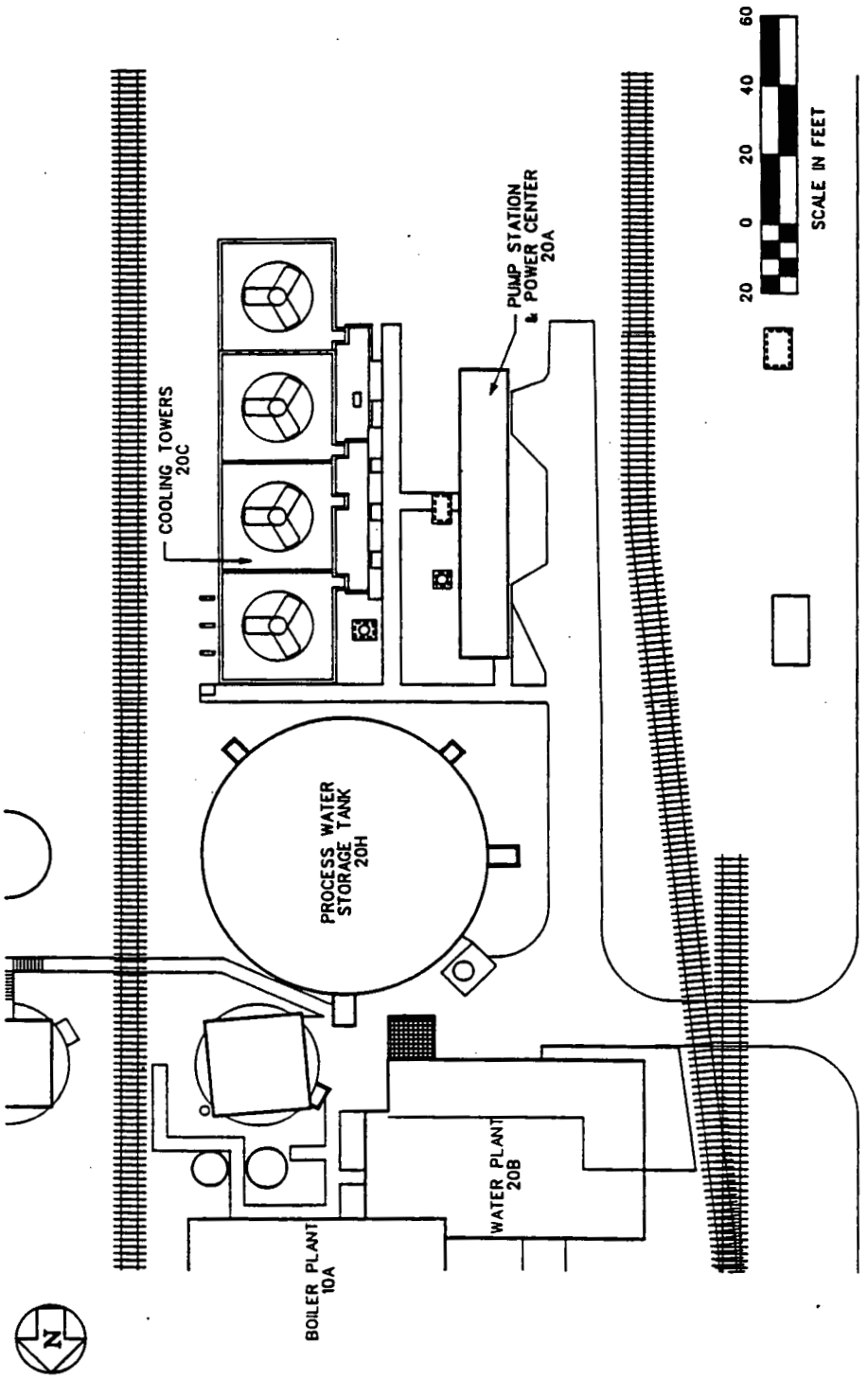

FIGURE 20C-1 Layout of Component 20C

TABLE 20C-1 Sample Types and Quantities for Cooling Towers

Sample Type	Cooling Towers	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA
Wood	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.9.14 Component 23 — Meteorological Tower

Component Description

Component 23 (Meteorological Tower) is a steel tower located outside the production area boundaries. This component is located west of the Storm-Water Retention Basin (Component 18E), as shown on the Grid 30 map in Appendix C.

Process Area Description

The tower is located outside the administration area and houses weather instruments to provide site-specific weather information.

Summary of Sampling for Component 23

This component does not require sampling because it is located outside of radiologically controlled areas and is insignificant in size. The contaminants expected for the component are of low toxicity, and the component exhibits little or no evidence of contamination.

D.9.9.15 Component 38B — Cylinder Filling Station

Component Description

Component 38B (Cylinder Filling Station) is a single-level, pre-engineered shed consisting of a structural steel frame on a reinforced poured concrete base that is approximately 6 × 10 ft and 8 ft high. The shed contains equipment necessary for filling propane cylinders. This component is located east of the Propane Storage (Component 38A), as shown on the Grid 10 map in Appendix C.

Process Area Description

This component fills cylinders of propane for use with on-site vehicles.

Summary of Sampling for Component 38B

This component does not require sampling because it is insignificant in size and exhibits little or no evidence of contamination. The contaminants expected for the component are of low toxicity.

D.9.9.16 Component 39D — Sewage Treatment Plant Incinerator

Component Description

Component 39D (Sewage Treatment Plant Incinerator) is aboveground equipment measuring approximately 16 × 20 ft and sitting on a concrete pad shown on the Grid 32 map in Appendix C. Component 39D consists of a poured concrete base and a structural steel frame. The floor plan for Component 39D is shown in Figure 39D-1.

Process Area Description

The Sewage Treatment Plant Incinerator was operational from 1954 through 1979. Its primary purpose was to incinerate a variety of site process wastes. Anticipated contaminants for Component 39D are summarized in Table A.3.

Major Media Types per Process Area

The major media for Component 39D are the steel of the equipment and the concrete pad.

Summary of Available Radiological Data

Component 39D has been surveyed for removable alpha and total beta-gamma contamination. Results from the most recent surveys are summarized in Tables A.4.0 and A.4.1 and provide the basis for identifying radiological hot spots. As indicated, 14 total beta-gamma survey measurements were performed in Component 39D from 1989 through 1992. On the basis of the data, the hot spot for the concrete medium is identified on Figure 39D-1. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys. The highest measured concentration of total beta-gamma contamination is 800,000 dpm.

Summary of Sampling for Component 39D

One airborne particulate sample will be taken and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive sampling for the concrete medium will be performed at the radiological hot spot shown in Figure 39D-1. Because the process in Component 39D was dry, the concrete sample will be a chip sample. Structural steel scrapings and swipe samples will be collected (where applicable) on the basis of Protocols 1 and 3. Additional supplemental sampling activities

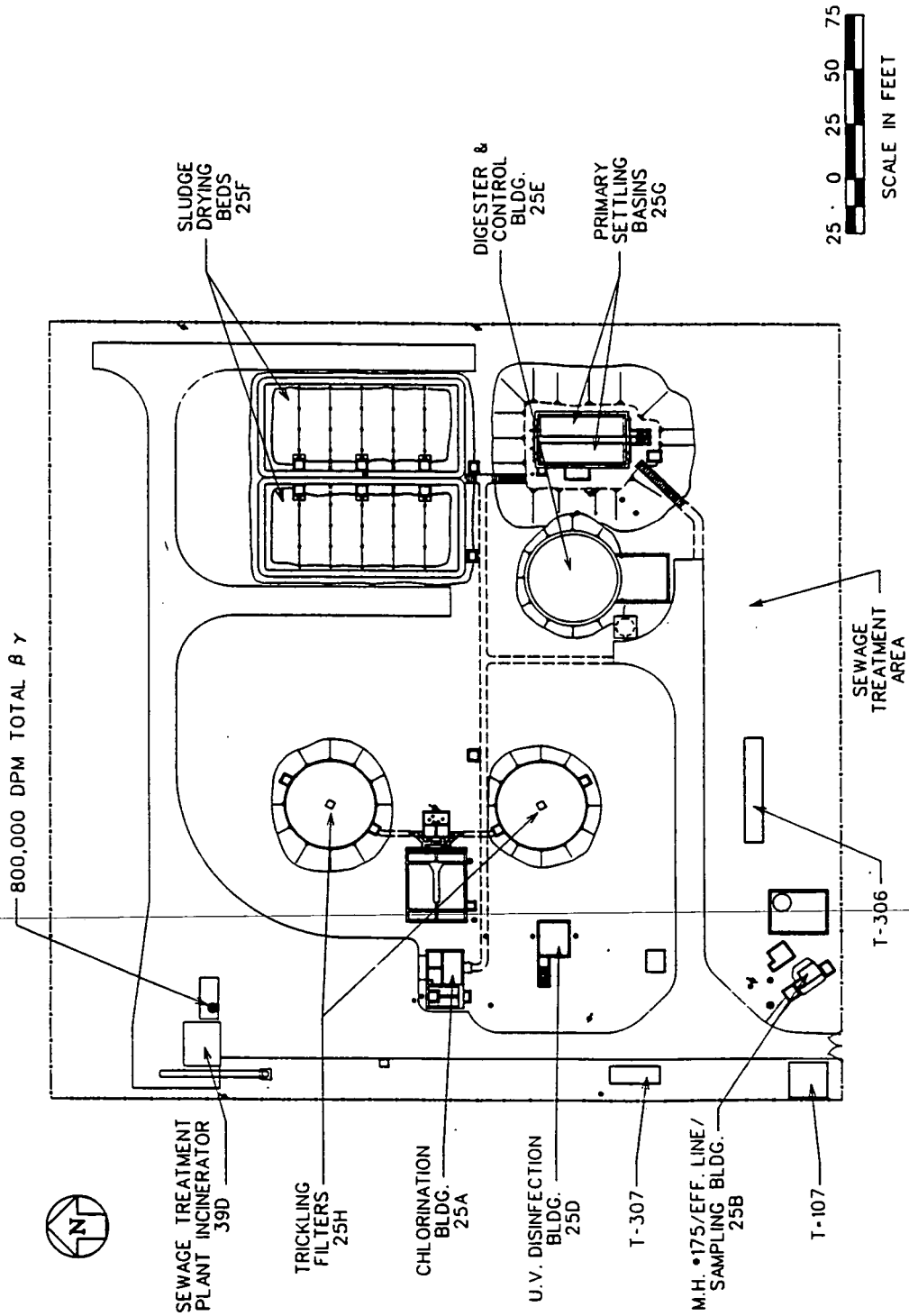

FIGURE 39D-1 Layout of Component 39D

will be identified by field crews at the time of the sampling for residues not identified in the visual inspection of the component. Table 39D-1 summarizes the planned sampling program for Component 39D.

TABLE 39D-1 Sample Types and Quantities for Component 39D

Sample Type	Incinerator	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.9.17 Component G-008 — Pipe Bridges

Component Description

Component G-008 (Pipe Bridges) comprises approximately 1 mi of structural steel members used to support aboveground plant piping. This component is located throughout the production area and some of the administrative areas.

Process Area Description

This component comprises nearly 1 mi of structural steel supports located throughout the production area for utility lines, steam lines, and process piping.

Summary of Sampling for Component G-008

This component does not require sampling because it exhibits little or no evidence of contamination. The contaminants expected for the component are of low toxicity.

D.9.10 PIPING, UTILITIES, AND EQUIPMENT — BELOWGROUND

D.9.10.1 Component 2H — Conveyor Tunnel from Plant 1

Component Description

Component 2H (Conveyor Tunnel from Plant 1) houses a subgrade conveyor. The pproximate dimensions of the conveyor trench are 15 × 190 ft, and 5 ft deep. Component 2H extends from the Plant 1 Ore Silos (Component 1C) to the Ore Refinery Plant (Component 2A), as shown on the Grid 19 and 27 maps in Appendix C and Figure 2H-1. Component 2H was intended to transport milled uranium ores to the Ore Refinery Plant; this operation was aborted in 1955.

Process Area Description

Component 2H contained one dry process area, the Ore Conveyor. The anticipated contaminants from this process are summarized in Table A.3. Component 2H housed the Ore Conveyor process, which was intended to transport milled uranium ores underground from the Plant 1 Ore Silos to the Ore Refinery Plant. The conveyor system had a problem with accountability of uranium and was aborted.

Major Media Types per Process Area

The major media for Component 2H are concrete and steel. The trench, which housed the conveyor, was constructed of concrete. The trench was covered with a steel plate.

Summary of Available Radiological Data

Component 2H is routinely sampled for removable alpha contamination. However, no recent data exist from total beta-gamma survey measurements for the component. Results for the removable alpha surveys, performed in 1989 through 1992, are summarized in Tables A.4.0 and A.4.1 and are the basis for identifying hot spots. Six removable alpha survey measurements were collected for the concrete medium in the trench. Also, 10 removable alpha data points were taken for the heavy steel plate covering the trench. All removable alpha data for both media were below the MDA. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys.

Summary of Sampling for Component 2H

One air sample will be taken in the component and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other non-intrusive measurements, including exposure rate measurements, XRF surveys, radiological surveys, and swipes, will be performed and assessed in the field to further detail final

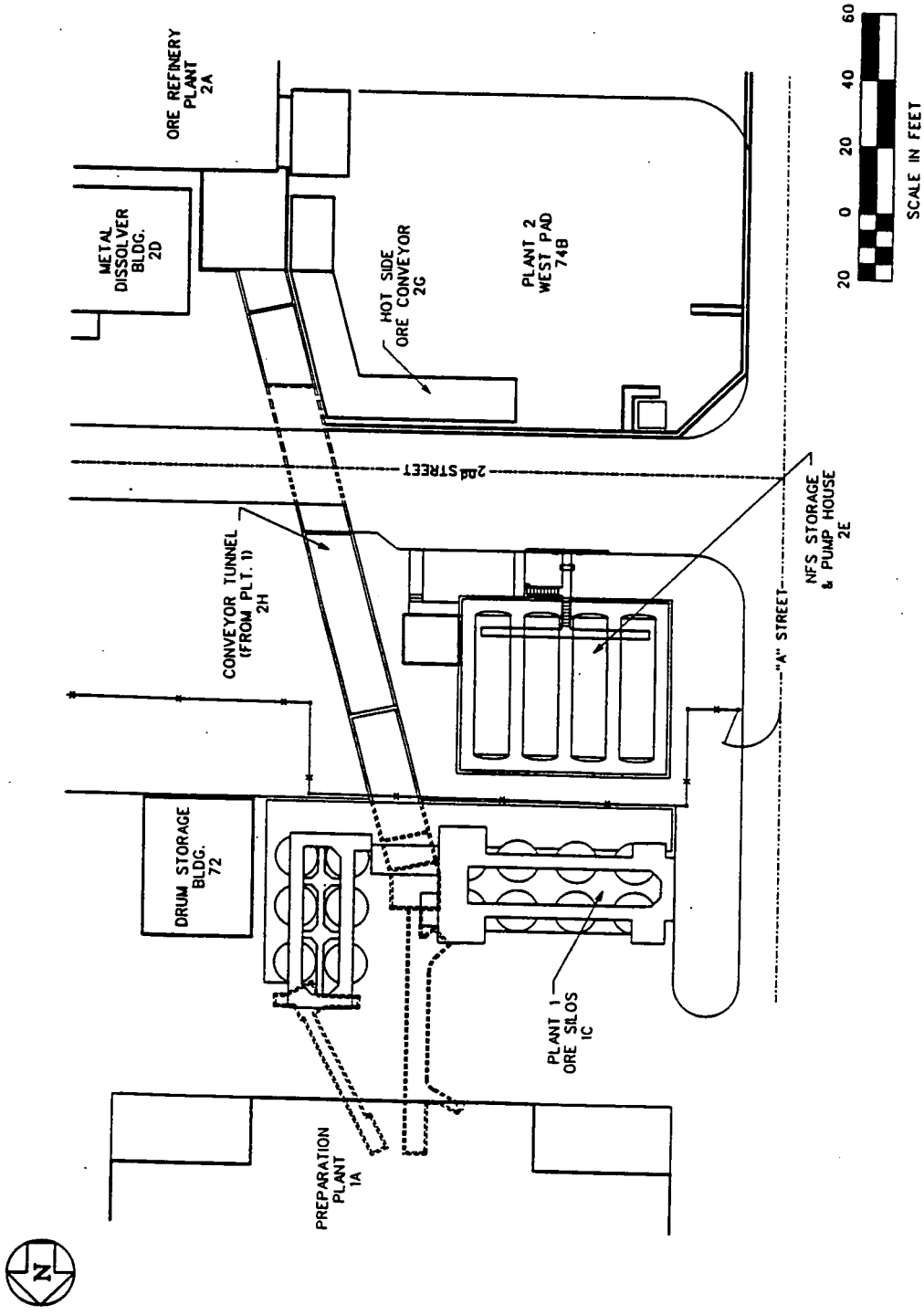

FIGURE 2H-1 Layout of Component 2H

intrusive sampling locations. One concrete chip will be taken from the concrete trench encasing the Ore Conveyor, which is considered a dry process area. Steel scrapings and swipe samples will be collected from the steel plate covering the conveyor based on Protocols 1 and 3. No supplemental samples were identified during the component inspection. Table 2H-1 summarizes the planned sampling program for Component 2H.

TABLE 2H-1 Sample Types and Quantities for Component 2H

Sample Type	Ore Conveyor	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	1	1
Supplemental		
Liquid sample	NA	NA
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.10.2 Component 3K — Old Cooling Water Tower

Component Description

Component 3K (Old Cooling Water Tower) formerly was a one-story, redwood structure, 30 × 50 ft, similar to the Cooling Towers (Component 20C). It was located at the intersection of A Street and 101st Street, as shown on the Grid 19 map in Appendix C. The wooden tower has been removed, leaving a grade and below-grade structure consisting of a concrete basin and a diked pad. Figure 3K-1 shows the layout of the basin and pad, as well as the former location of the cooling tower.

Process Area Description

Component 3K consists of a single, wet process referred to as process water cooling. A redwood cooling tower provided process water to cool four of the towers of the Harshaw System (Component 3F). This system was replaced by the Refrigeration Building (Component 3G) in the mid-1960s. The original wooden equipment has been removed, but the concrete basin and diked pad remain.

Major Media Types per Process Area

Component 3K has a concrete basin topped with gravel and a diked pad housing six thin, steel manhole covers. The concrete is considered the major medium.

Summary of Available Radiological Data

The highest removable alpha contamination reading for the remaining structure is 125 dpm, located on the northern side of the concrete berm. No recent total beta-gamma data for Component 3K are available, so the radiological hot spot for the concrete within this process area is considered to be the location corresponding to the 125 dpm removable alpha measurement. As data are acquired from ongoing radiological surveys, the identified hot spot will be reassessed before sampling begins.

Summary of Sampling for Component 3K

One airborne particulate sample will be taken on the concrete berm and analyzed for airborne radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, radiological surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. A concrete core and swipe samples will

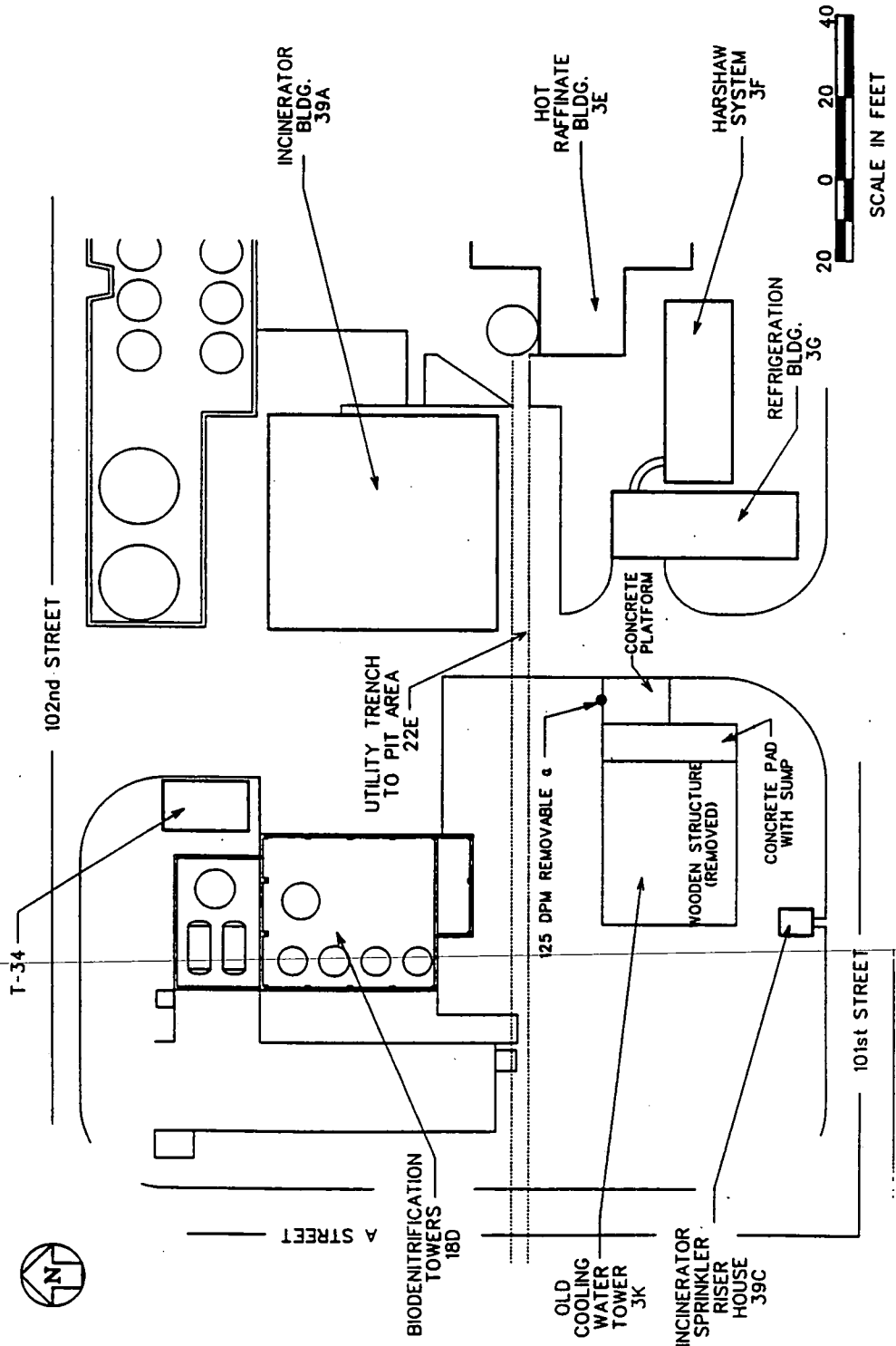

FIGURE 3K-1 Layout of Component 3K

be collected from the concrete. Also, on the basis of the visual field inspection, a composite liquid supplemental sample will be taken from the standing liquid beneath the pad. Table 3K-1 summarizes the planned sampling program for Component 3K.

TABLE 3K-1 Sample Types and Quantities for Component 3K

Sample Type	Process Water Cooling	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	1	1
Loose media	NA	NA

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.10.3 Component 22E — Utility Trench to K-65 Area

Component Description

Component 22E is a subgrade concrete trench and steel piping system; it is shown on the Grid 19, 25, and 31 maps in Appendix C. The component is approximately 1,500 ft long and 3 ft wide.

Process Area Description

Component 22E is considered one process area and was used in the pumping of high-radium raffinate slurry from the Hot Raffinate Building (Component 3E) to K-65 Silos 1 and 2. Also, decant from the K-65 Silos was returned through the trench and collected in the tank located on the northwestern corner of Component 3E before being transferred for treatment. Component 22E also contained pneumatic lines running to Silo 3 and liquid lines used to connect water treatment processes and sources in the Pit Area to process area systems. Anticipated contaminants are summarized in Table A.3.

Major Media Types per Process Area

Concrete is the only major medium identified for Component 22E.

Summary of Available Radiological Data

Component 22E has not been routinely surveyed for removable alpha and total beta-gamma contamination. No recent data are available, but the radiological hot spot will be determined from field measurements before sampling occurs. Also, any data developed from ongoing radiological surveys taken for health physics needs will be factored into the determination of sampling locations.

Summary of Sampling for Component 22E

Nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. The only major medium within the trench is concrete. Because Component 22E is considered a wet process area, a concrete core will be taken from the trench. Because the trench internals were inaccessible to the engineering inspection team, it is unknown whether supplemental samples can be collected. Because of the length/size of the component, a loose media sample will be assumed. Table 22E-1 summarizes the planned sampling program for Component 22E.

TABLE 22E-1 Sample Types and Quantities for Component 22E

Sample Type	Material Handling	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	NA
Swipes	2	2
Lab composite swipes	NA	1
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	NA	NA
Loose media	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.10.4 Component 88 — Clearwell Line

Component Description

Component 88 (Clearwell Line) is a pressurized transfer line (pipe) that runs from the Clearwell Area near the Operable Unit 1 Waste Pits to the Biodenitrification Lagoon (Component 18A) as shown on the Grid 31 map in Appendix C. It has a diameter of 6 in. and is approximately 2,000 ft long.

Process Area Description

The Clearwell Line is considered one process area and is used as a transfer system for rainwater collected at the clearwell area of the waste pits. Water entering the Clearwell Area is collected and transferred via the 6-in. line to the Biodenitrification Lagoon (Component 18A). Anticipated contaminants for Component 88 are summarized in Table A.3.

Major Media Types per Process Area

No major media are associated with Component 88.

Summary of Available Radiological Data

Component 88 has not been routinely surveyed for removable alpha and total beta-gamma contamination. No recent data are available, and a radiological hot spot will not be determined.

Summary of Sampling for Component 88

Nonintrusive measurements are not anticipated to be of value for assessing the component. Because the Clearwell Line was inaccessible to the engineering inspection team, it is unknown whether supplemental samples can be collected; however, because of the length/size of the component, loose media and liquid samples will be assumed. Table 88-1 summarizes the planned sampling program for the Clearwell Line.

TABLE 88-1 Sample Types and Quantities for Component 88

Sample Type	Water Handling	Component Totals
Nonintrusive[a]		
Radiological surveys	NA[b]	NA
Chemical surveys	NA	NA
Air particulates	NA	NA
Swipes	NA	NA
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	1	1
Loose media	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] Not applicable.

D.9.10.5 Component G-003 — Storm Sewer System

Component Description

Component G-003 (Storm Sewer System) is a subgrade piping and pumping system for handling storm-water runoff. It consists of drainage lines located throughout much of the FEMP property, two lift station pumps, and a diverter valve.

Process Area Description

Component G-003 is considered one process area and is used for handling storm-water runoff from much of the developed FEMP property. It is a network of piping, pumps, and associated equipment located throughout the site. The flow is continuously monitored and can be diverted or held in the storm-water retention basins on the basis of the levels of contamination encountered. Anticipated contaminants for Component G-003 are summarized in Table A.3.

Major Media Types per Process Area

The Storm Sewer System is made of metal; however, because the metal is not considered structural, no major media are identified.

Summary of Available Radiological Data

The Storm Sewer System has not been routinely surveyed for removable alpha and total beta-gamma contamination. No recent data are available; because of the nature of the component, radiological hot spots will not be determined.

Summary of Sampling for Component G-003

Nonintrusive measurements are not anticipated to provide a significant resource for characterizing this component. Supplemental sampling will be performed at locations to be determined in the field. Because of the length/size of the component, a loose media sample will be assumed available and will be taken. Also, because the Storm Sewer System is a wet process area, a supplemental liquid sample will be taken. Table G-003-1 summarizes the planned sampling program for Component G-003.

TABLE G-003-1 Sample Types and Quantities for Component G-003

Sample Type	Storm Sewers	Component Totals
Nonintrusive[a]		
Radiological surveys	NA[b]	NA
Chemical surveys	NA	NA
Air particulates	NA	NA
Swipes	NA	NA
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	1	1
Loose media	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] Not applicable.

D.9.10.6 Component G-004 — Utility Lines

Component Description

Component G-004 (Utility Lines) comprises all site underground and aboveground utilities, totaling many miles of piping, conduit, and wiring.

Process Area Description

The general category of utilities includes all electrical, piping, water, sewer, gas, and conduit lines on-site. The soils associated with underground lines are within the scope of Operable Unit 5 and will not be sampled as part of this effort.

Summary of Sampling for Component G-004

The utilities lines do not require sampling. The contaminants expected for the component are of low toxicity, and the component exhibits little or no evidence of contamination.

D.9.11 PONDS AND BASINS

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D.9.11.1 Component 18A — Biodenitrification Surge Lagoon

Component Description

Component 18A (Biodenitrification [Bio-D] Surge Lagoon) is an 8.6-million-gal lagoon shown on the Grid 31 map in Appendix C. It measures approximately 400 × 400 ft, or about 3.3 acres (Figure 18A-1). The Bio-D Surge Lagoon is roughly 15 ft above grade and has an average depth of 12 ft with a 6-ft differential over the sloping bottom. The Bio-D Surge Lagoon is lined with 40-mil-thick, carbon-filled, high-density polyethylene (HDPE) underlain by an 18-in.-thick soil/bentonite layer.

Process Area Description

Wastewater effluent from the General Sump (Component 18B) and the Clearwell Line (Component 88) enters the northwestern corner of the Bio-D Surge Lagoon. Effluent leaves the lagoon from its southeastern corner and is pumped to the Biodenitrification Towers (Component 18D) for nitrate removal. The Bio-D Surge Lagoon has been declared a RCRA HWMU. The lagoon is considered one process area. The anticipated contaminants for the Bio-D Surge Lagoon are summarized in Table A.3.

Major Media Types per Process Area

No major media are associated with the Bio-D Surge Lagoon.

Summary of Available Radiological Data

Component 18A has not been routinely surveyed for removable alpha and total beta-gamma contamination. Data will be gathered before sampling and will include any data gathered from ongoing radiological surveys.

Summary of Sampling for Component 18A

One airborne particulate sample will be taken and analyzed for airborne radiological and inorganic contaminants on the basis of Protocol 1. Depending on the condition of the component at the time of sampling, other nonintrusive measurements, including exposure rate measurements, will be performed. Visual inspection of the lagoon identified the need for a supplemental liquid sample and a sediment sample from the lagoon bottom. Table 18A-1 summarizes the planned sampling program for Component 18A.

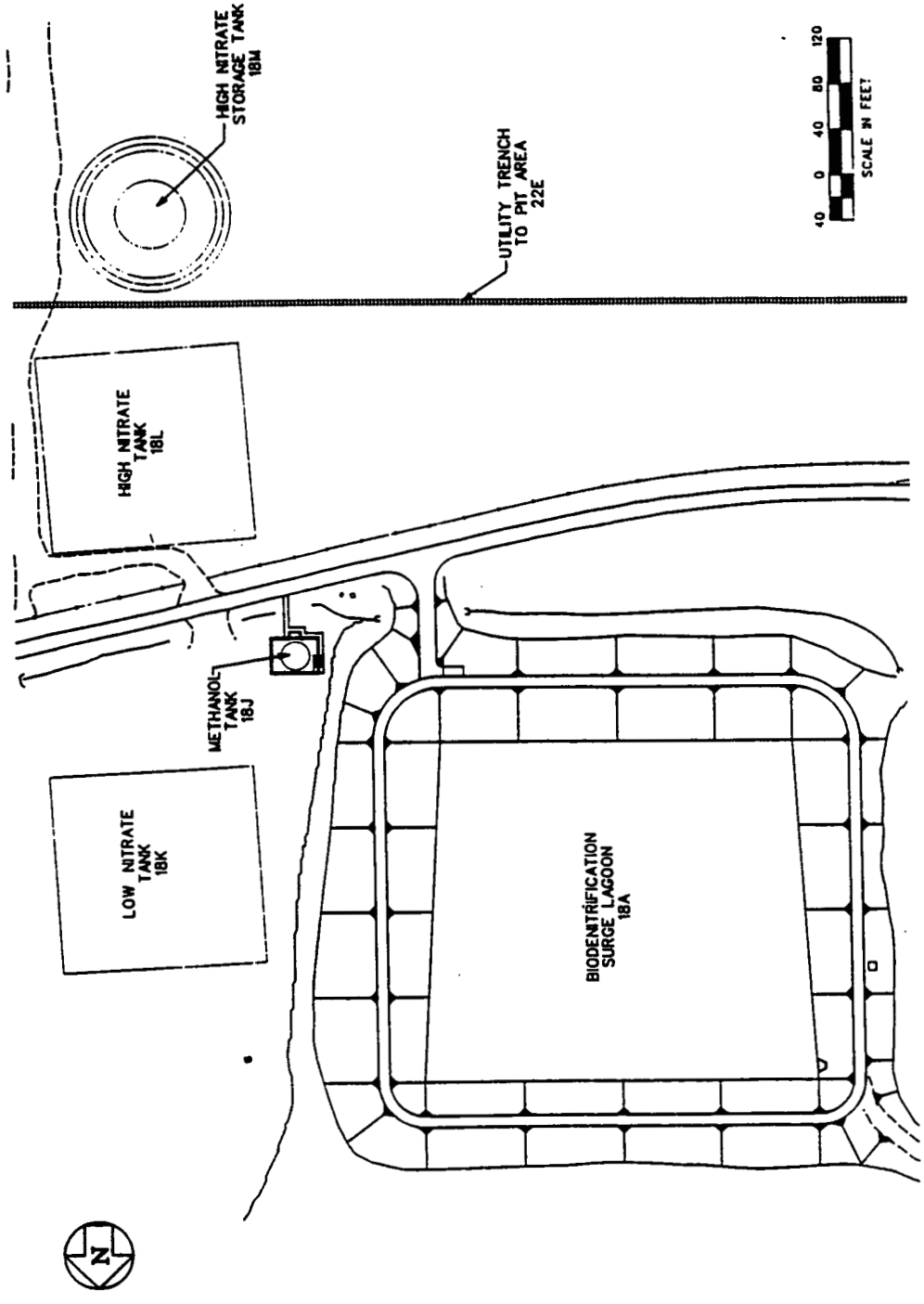

FIGURE 18A-1 Layout of Component 18A

TABLE 18A-1 Sample Types and Quantities for Component 18A

Sample Type	Wastewater Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	NA	NA
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	1	1
Loose media	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.11.2 Component 18C — Coal Pile Runoff Basin

Component Description

Component 18C (Coal Pile Runoff Basin) is a 25,000-gal basin shown on the Grid 11 map in Appendix C. The basin lies adjacent to the east side of the Cooling Towers (Component 20C) and measures approximately 150 × 300 ft, 6 ft above grade and 12 ft deep (Figure 18C-1).

Process Area Description

Component 18C collects storm-water runoff from the Coal Pile (Component P-005) and receives continuous blowdown from boiler operations. Component 18C has been declared a RCRA HWMU. The component has been identified as a single process area. The anticipated contaminants for the basin are summarized in Table A.3.

Major Media Types per Process Area

No major media are associated with the Coal Pile Runoff Basin.

Summary of Available Radiological Data

Component 18C has not been routinely surveyed for removable alpha and total beta-gamma contamination. Data will be gathered before sampling and will include any data gathered from ongoing radiological surveys.

Summary of Sampling for Component 18C

One airborne particulate sample will be taken and analyzed for airborne radiological and inorganic contaminants, on the basis of Protocol 1. Depending on the condition of the component at the time of sampling, other nonintrusive measurements, including exposure rate measurements, will be performed and assessed in the field to determine the need and location of supplemental samples. Visual inspection of the basin identified the need for a supplemental liquid sample and a sediment sample from the basin bottom. Table 18C-1 summarizes the planned sampling program for Component 18C.

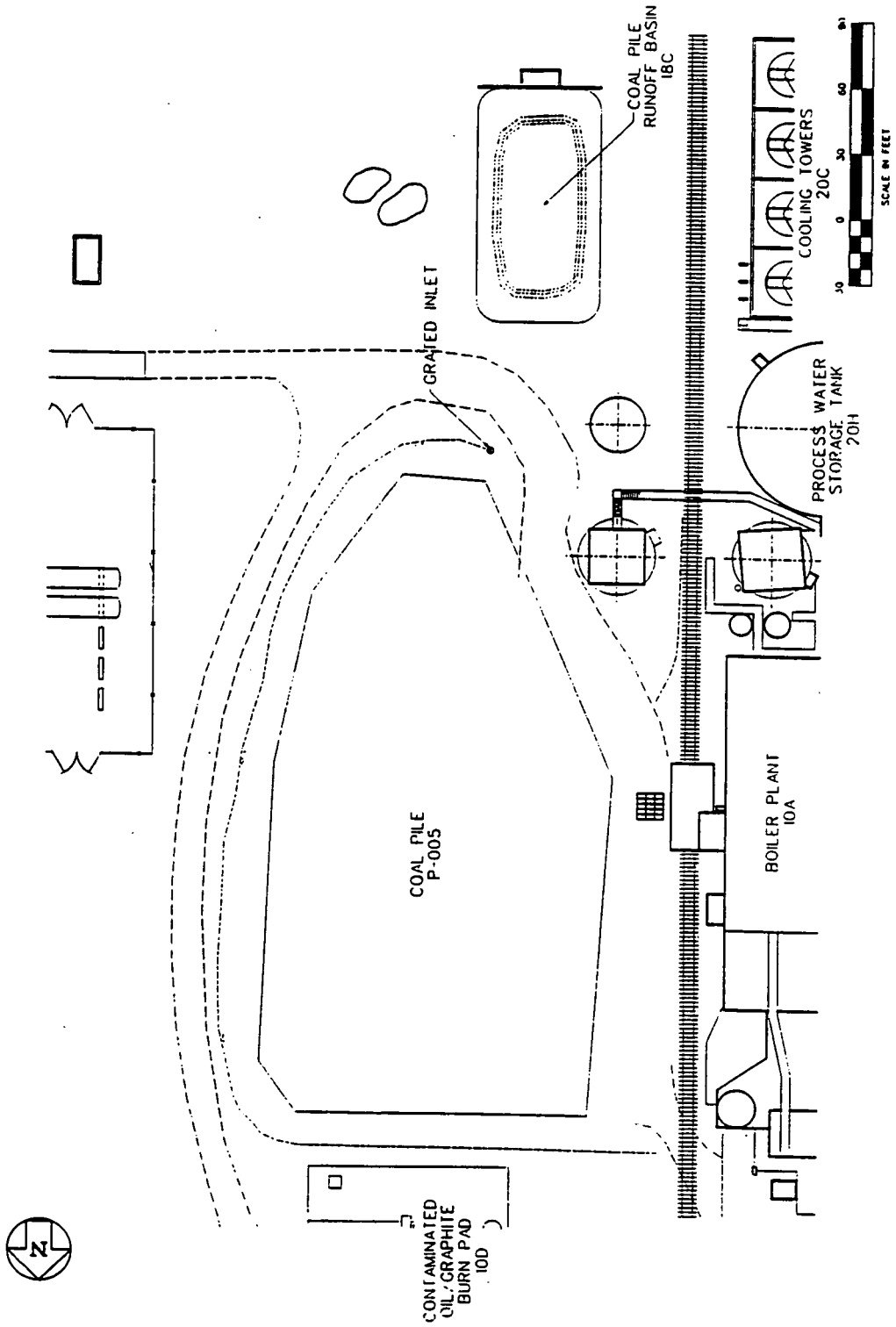

FIGURE 18C-1 Layout of Component 18C

TABLE 18C-1 Sample Types and Quantities for Component 18C

Sample Type	Runoff Collection	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	NA	NA
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	1	1
Loose media	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.11.3 Component 18E — Storm-Water Retention Basin

Component Description

Component 18E (Storm-Water Retention Basin) consists of two adjacently lined collection basins shown on the Grid 30 map in Appendix C. They measure approximately 300 × 300 ft and 200 × 550 ft, and together hold approximately 10.6 million gal of rainwater. The basins are belowgrade and have an average depth of 20 ft. The west (old) basin is lined with a 40-mil-thick, carbon-filled HDPE liner; the east (new) basin is lined with an XR5 liner. They are both underlain by an 18-in.-thick soil/bentonite layer.

Process Area Description

The two basins have the capacity to store approximately 10 million gal of rainwater flow from the site. The retention time of the basins allows uranium-bearing solids to settle. After the solids have settled, the decanted liquids are pumped and sampled in the Manhole-175/Effluent Line/Sampling Building (Component 25B) before release from the site. The anticipated contaminants for the Storm-Water Retention Basin are summarized in Table A.3.

Major Media Types per Process Area

No major media are associated with the Storm-Water Retention Basin.

Summary of Available Radiological Data

Component 18E has not been routinely surveyed for removable alpha and total beta-gamma contamination. Data will be gathered before sampling and will include any data collected from ongoing radiological surveys.

Summary of Sampling for Component 18E

One airborne particulate sample will be taken and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to determine whether supplemental samples are necessary. Visual inspection of the basins identified the need for supplemental liquid samples and sediment samples from each basin bottom. Table 18E-1 summarizes the planned sampling program for Component 18E.

TABLE 18E-1 Sample Types and Quantities for Component 18E

Sample Type	Storm-water Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	NA	NA
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	2	2
Loose media	2	2

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.11.4 Component 18K — Low Nitrate Tank

Component Description

Component 18K (Low Nitrate Tank) is a 1-million-gal temporary open storage tank shown on the Grid 31 map, measuring approximately 180 × 180 ft (Figure 18K-1). The Low Nitrate Tank is lined with 40-mil, carbon-filled HDPE and underlain by an 18.-in-thick soil/bentonite layer.

Process Area Description

Component 18K is a temporary tank used during the reconstruction of the Biodenitrification Surge Lagoon (Component 18A) to hold low-nitrate wastewaters. Control of nitrate levels to the biodenitrification process was accomplished through blending the high- and low-nitrate tank flows. One process area has been identified for the component. The anticipated contaminants for Component 18K are summarized in Table A.3.

Major Media Types per Process Area

No major media are associated with Component 18K.

Summary of Available Radiological Data

Component 18K has not been routinely surveyed for removable alpha and total beta-gamma contamination. Data will be gathered before sampling and will include any data gathered from ongoing radiological surveys.

Summary of Sampling for Component 18K

One airborne particulate sample will be taken and analyzed for airborne radiological and inorganic contaminants, on the basis of Protocol 1. Depending on the condition of the component at the time of sampling, other nonintrusive measurements, including exposure rate measurements, will be performed and assessed in the field to determine the need and location of supplemental samples. Visual inspection of Component 18K identified the need for a supplemental liquid sample and a sediment sample from the tank bottom. Table 18K-1 summarizes the planned sampling program for Component 18K.

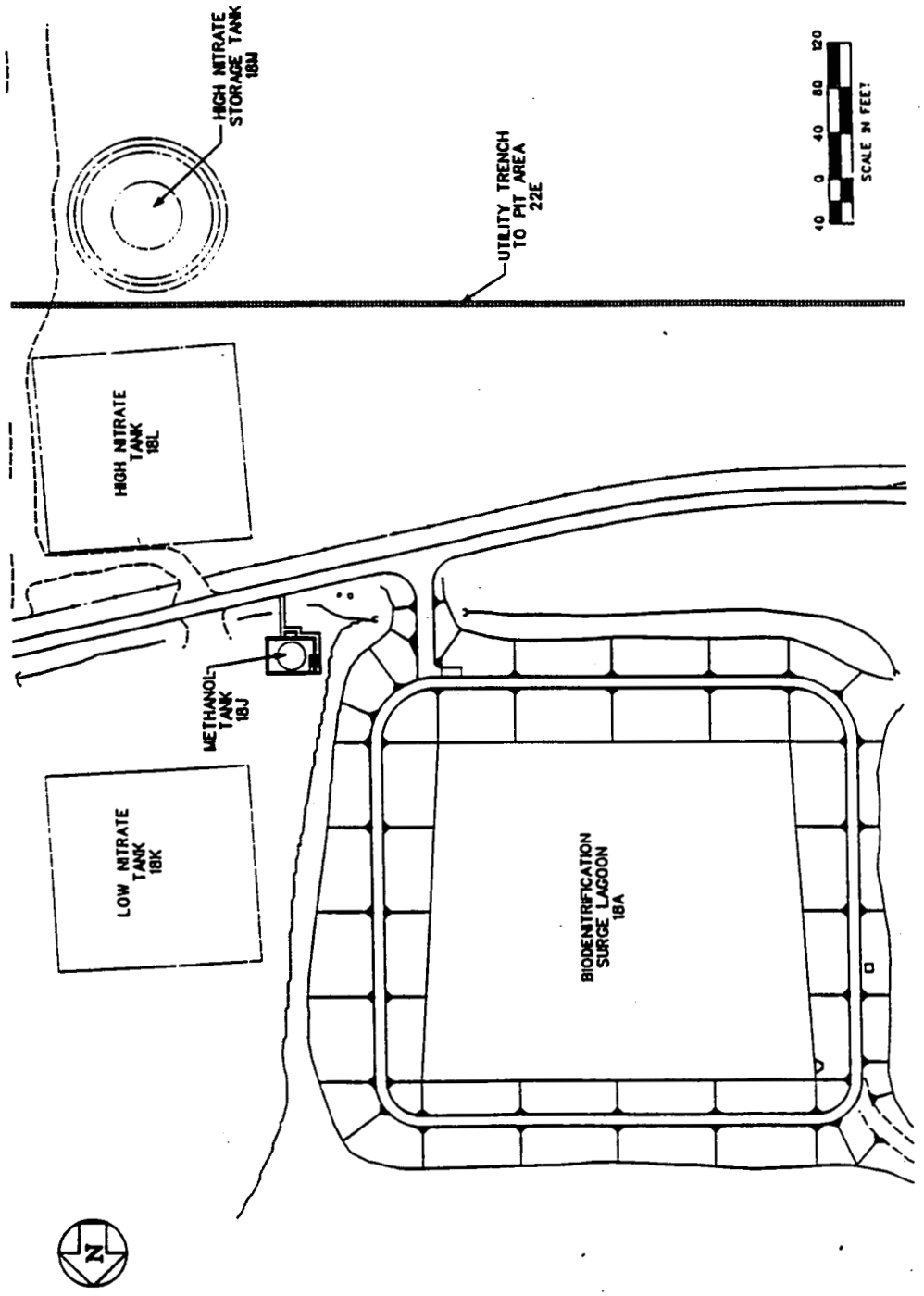

FIGURE 18K-1 Location of Component 18K

TABLE 18K-1 Sample Types and Quantities for Component 18K

Sample Type	Wastewater Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	NA	NA
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	1	1
Loose media	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.11.5 Component 18L — High Nitrate Tank

Component Description

Component 18L (High Nitrate Tank) is a 1-million-gal temporary open storage tank shown on the Grid 31 map, measuring approximately 180 × 180 ft (Figure 18L-1). The High Nitrate Tank is lined with 40-mil, carbon-filled HDPE and underlain by an 18-in.-thick soil/bentonite layer.

Process Area Description

Component 18L is a temporary tank used during the reconstruction of the Biodenitrification Surge Lagoon (Component 18A) to hold high-nitrate wastewaters. Control of nitrate levels to the biodenitrification process was accomplished through blending the high- and low-nitrate tank flows. One process area was identified for the component. The anticipated contaminants for Component 18L are summarized in Table A.3.

Major Media Types per Process Area

No major media are associated with Component 18L.

Summary of Available Radiological Data

Component 18L has not been routinely surveyed for removable alpha and total beta-gamma contamination. Data will be gathered before sampling and will include any data gathered from ongoing radiological surveys.

Summary of Sampling for Component 18L

One airborne particulate sample will be taken and analyzed for airborne radiological and inorganic contaminants, on the basis of Protocol 1. Depending on the condition of the component at the time of sampling, other nonintrusive measurements, including exposure rate measurements, will be performed and assessed in the field to determine the need and location of supplemental samples. Visual inspection of Component 18L identified the need for a supplemental liquid sample and a sediment sample from the tank bottom. Table 18L-1 summarizes the planned sampling program for Component 18L.

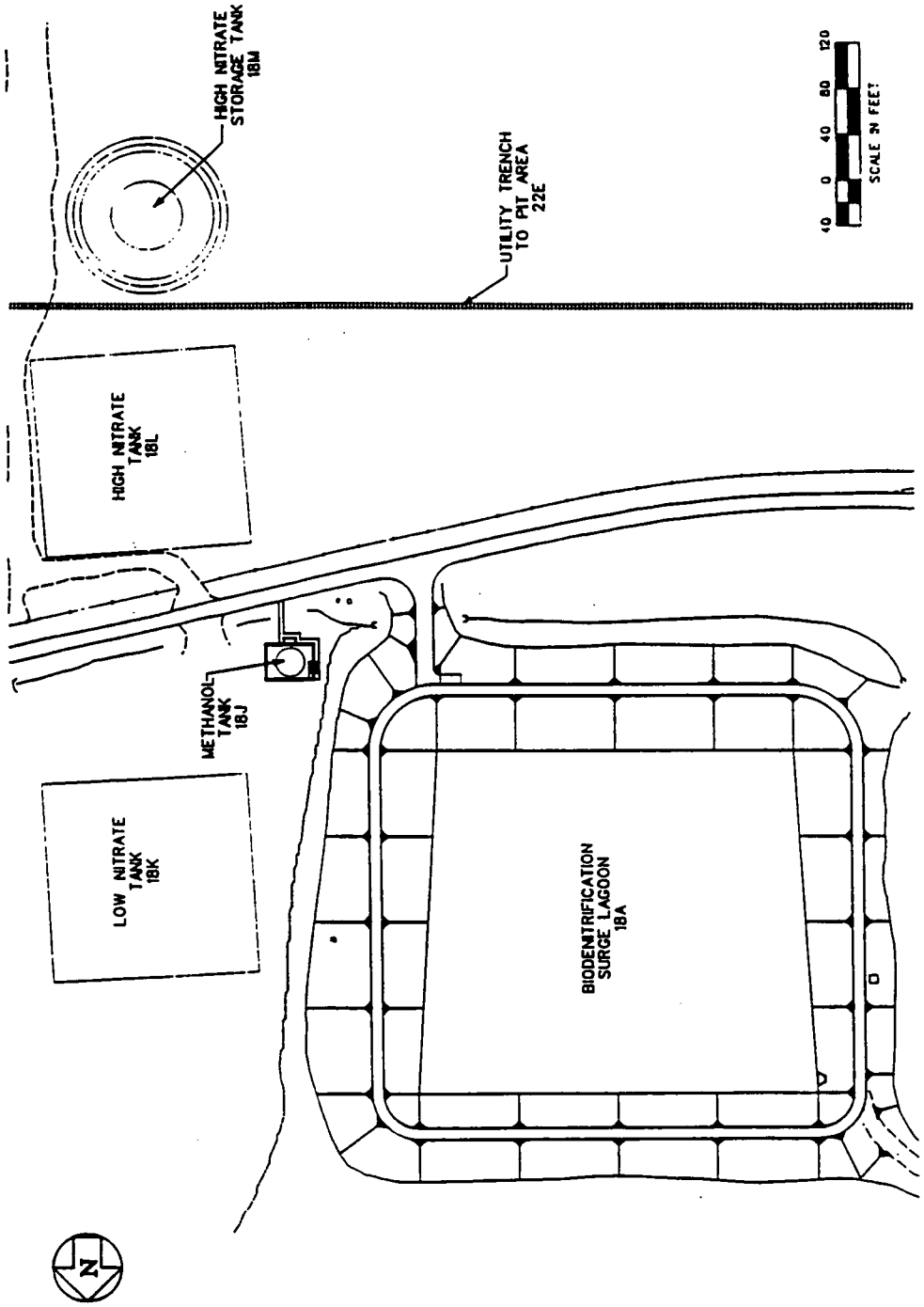

FIGURE 18L-1 Location of Component 18L

TABLE 18L-1 Sample Types and Quantities for Component 18L

Sample Type	Wastewater Storage	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	NA	NA
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	1	1
Loose media	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.11.6 Component 25F — Sludge Drying Beds

Component Description

Component 25F (Sludge Drying Beds) is shown on the Grid 32 map in Appendix C and contains two below-grade concrete tanks, each measuring approximately 30 × 80 ft. The floor plan for the component is shown in Figure 25F-1.

Process Area Description

Site sewage wastes are settled in one of two concrete basins. The sludge is then pumped to the anaerobic digester in the Digester and Control Building (Component 25E), and liquids are pumped to the Trickling Filters (Component 25H). The anticipated contaminants for Component 25F are summarized in Table A.3.

Major Media Types per Process Area

The major medium for Component 25F is the concrete forming the walls of the unit.

Summary of Available Radiological Data

Component 25F is routinely surveyed for total beta-gamma contamination. Results from the most recent surveys are summarized in Tables A.4.0 and A.4.1 and provide the basis for identifying radiological hot spots. Six total beta-gamma survey measurements were performed in Component 25F from 1989 through 1992. On the basis of the data, the hot spot (26,000 dpm total beta-gamma) is identified on Figure 25F-1. Data will be reassessed before sampling to include data gathered from ongoing radiological surveys.

Summary of Sampling for Component 25F

One airborne particulate sample will be taken and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive sampling for the concrete medium will be performed at the radiological hot spot. Because the process is wet, the concrete sample will be a core sample. On the basis of visual inspection, a composite liquid supplemental sample and a sediment/sludge sample will be taken from the settling basins. Table 25F-1 summarizes the planned sampling program for Component 25F.

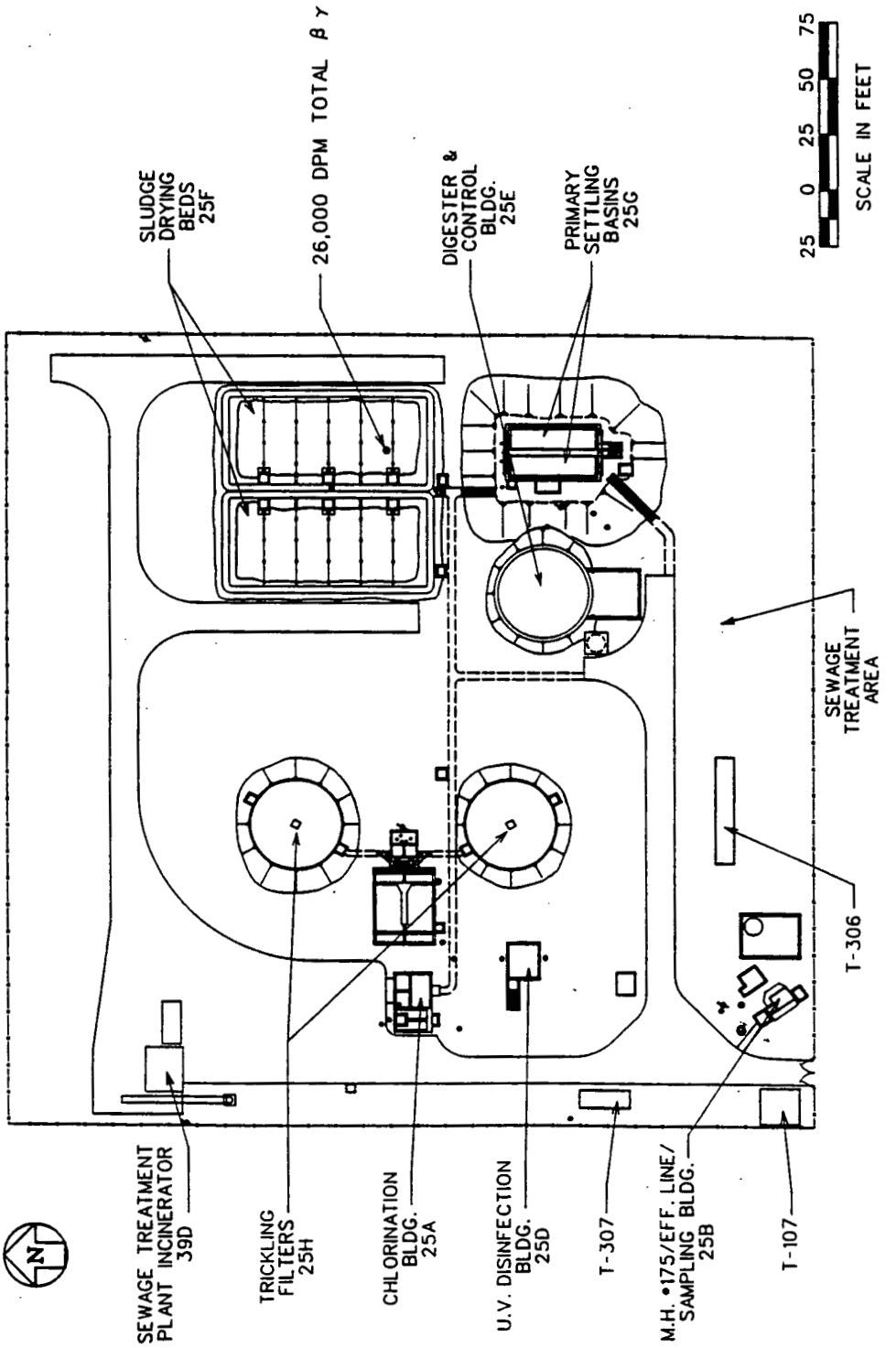

FIGURE 25F-1 Layout of Component 25F

TABLE 25F-1 Sample Types and Quantities for Component 25F-1

Sample Type	Sludge Settling	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	1	1
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	1	1
Loose media	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.11.7 Component 25G — Primary Settling Basins

Component Description

Component 25G (Primary Settling Basins), shown on the Grid 32 map in Appendix C, contains two concrete basins each measuring approximately 12 x 30 ft. The floor plan for the component is shown in Figure 25G-1.

Process Area Description

Component 25G comprises two concrete tanks used as sludge filters for the anaerobic digester in the Digester and Control Building (Component 25E). Anticipated contaminants for the component are summarized in Table A.3.

Major Media Types per Process Area

The major medium for Component 25G is the concrete of the tank walls.

Summary of Available Radiological Data

Component 25G has not been routinely surveyed for removable alpha and total beta-gamma contamination. Data will be gathered before sampling and will include any data gathered from ongoing radiological surveys.

Summary of Sampling for Component 25G

One airborne particulate sample will be taken and analyzed for radiological and inorganic contaminants, as well as asbestos, on the basis of Protocol 1. Other nonintrusive measurements, including exposure rate measurements, XRF surveys, and swipe samples, will be performed and assessed in the field to further detail final intrusive sampling locations. Intrusive sampling for the concrete medium will be performed at the radiological hot spot shown in Figure 25G-1. Because the process is wet, a concrete core sample will be taken. On the basis of visual inspection, a composite liquid supplemental sample and a sludge/sediment sample will be taken from the settling basins. Table 25G-1 summarizes the planned sampling program for Component 25G.

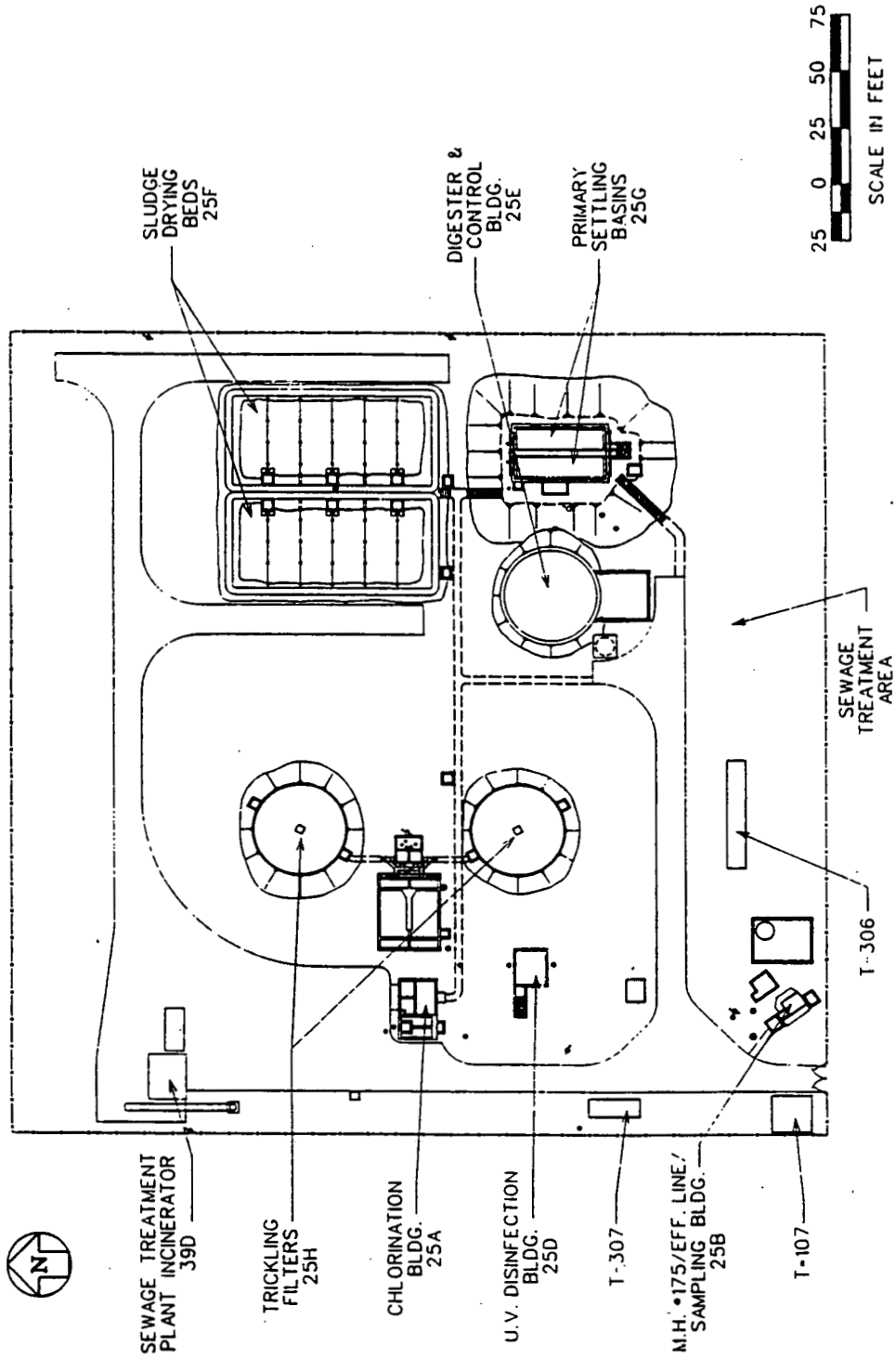

FIGURE 25G-1 Layout of Component 25G

TABLE 25G-1 Sample Types and Quantities for Component 25G

Sample Type	Settling	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	1	1
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	1	1
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	1	1
Loose media	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

D.9.11.8 Component 73B — Fire Training Pond

Component Description

The Fire Training Pond (Component 73B) is a 45-ft diameter pond and drain pit used as a fire brigade training area. It is located on the northern boundary of the site along B Street (Figure 73B-1).

Process Area Description

Component 73B is considered one process area and was used for training fire brigade members in fighting combustible liquid fires. A small horizontal elevated tank in the center of the pond was used to simulate a combustible liquid tank (never filled). Excess water was drained from the area to the drain pit so that combustible liquids would not overflow the pond. Anticipated contaminants are summarized in Table A.3.

Major Media Types per Process Area

Component 73B is an open pond and does not consist of any major media.

Summary of Available Radiological Data

Component 73B has not been routinely surveyed for removable alpha and total beta-gamma contamination. No recent data are available, but the radiological hot spot will be determined from field measurements before sampling occurs.

Summary of Sampling for Component 73B

One airborne particulate sample will be taken on the pond and analyzed for radiological and inorganic contaminants, on the basis of Protocol 1. Nonintrusive measurements, including exposure rate measurements, will be performed and assessed in the field to further detail final sampling locations. No major media are within the pond. Liquid and loose media supplemental samples will be necessary according to a visual inspection of the pond. Table 73B-1 summarizes the planned sampling program for Component 73B.

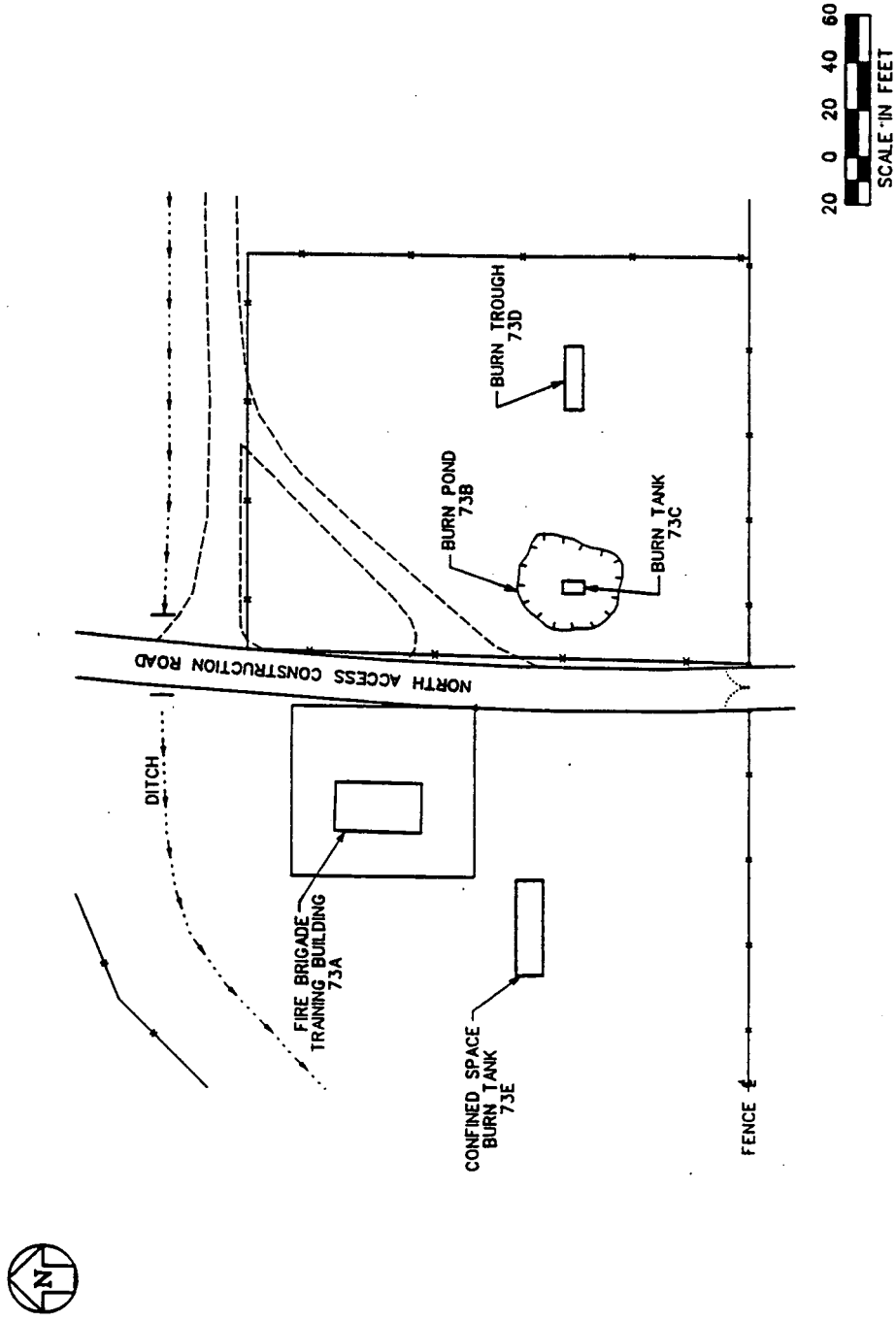

FIGURE 73B-1 Location of Component 73B

TABLE 73B-1 Sample Types and Quantities for Component 73B

Sample Type	Fire Training	Component Totals
Nonintrusive[a]		
Radiological surveys	b	NA[c]
Chemical surveys	b	NA
Air particulates	NA	1
Swipes	NA	NA
Lab composite swipes	NA	NA
Intrusive[a]		
Concrete chips	NA	NA
Concrete cores	NA	NA
Masonry	NA	NA
Steel surface scraping	NA	NA
Supplemental		
Liquid sample	1	1
Loose media	1	1

[a] Nonintrusive samples are governed by Protocol 1 and intrusive samples by Protocols 2 and 3 in Section D.5.

[b] See introduction to Section D.9.

[c] Not applicable.

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ATTACHMENT D.I:

ABSTRACTS OF PROCEDURES FOR THE OPERABLE UNIT 3 FIELD PROGRAM

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NOTATION

Abbreviations, Acronyms, and Initialisms

ALARA	as low as reasonably achievable
ASL	analytic support level(s)
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOE	Department of Energy
DOS	Disk Operating System
DOT	Department of Transportation
ECD	electron capture detector/detection
EPA	U.S. Environment Protection Agency
FEMP	Fernald Environmental Management Project
HECD	Hall electrolytic conductivity detector
HVAC	heating, ventilating, or air conditioning
IRS&T	Industrial Radiological Safety and Training
LCD	liquid crystal display
MCA	Multi-Channel Analyzer
MS	mass spectrometry
MSO	Miscellaneous Shipping Order
NIOSH	National Institute of Occupational Safety and Health
OOC	out of calibration
OOS	out of service
OU	Operable Unit
PC	personal computer
PERALS	Photon/Electron-Rejecting Alpha Liquid Scintillation
PID	photoionization detector
PQL	practical quantitation limit
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
RST	radiological safety technician
SAP	Sampling and Analysis Plan
SCQ	Site-Wide CERCLA Quality Assurance Project Plan
SEFA	self-exciting fluorescent analyzer
STIL	Safety and Training Instrumentation Laboratory
SWAR/CR	Site-Wide Analysis Request/Custody Record
TC	total carbon
TCLP	toxic characteristic leaching procedure
TEM	transmission electron microscopy
TIC	total inorganic carbon
TOC	total organic carbon
UV	ultraviolet
WEMCO	Westinghouse Environmental Management Company of Ohio
XRF	X-ray fluorescence

Chemical Symbols and Abbreviations

Ac	actinium
Am	americium
Ba	barium
Bi	bismuth
C	carbon
Ca	calcium
Cd	cadmium
CO_2	carbon dioxide
Cs	cesium
Cu	curium
EDTA	ethylenedinitriloacetate
Fe	iron
Ge	germanium
HCl	hydrochloric acid
HF	hydrofluoric acid
HNO_3	nitric acid
H_2S	hydrogen sulfide
I	iodine
K	potassium
LN_2	liquid nitrogen
Mg	magnesium
N	nitrogen
Nd	neodymium
Ni	nickel
Np	neptunium
PAO	phenylarsine oxide
Pb	lead
$PbSO_4$	lead sulfate
PCB	polychlorinated biphenyl
Pm	promethium
Po	polonium
Pu	plutonium
PVC	polyvinyl chloride
Ra	radium
Rn	radon
Ru	ruthenium
S	sulfur
Sr	strontium
Tc	technetium
Th	thorium
TIOA	tri-iso-octylamine
U	uranium
Y	yttrium

Units of Measure

°C	degrees Celsius
cc	cubic centimeter
cpm	counts per minute
d	day
dpm	disintegrations per minute
eV	electronvolt
g	gram
h	hour
in.	inch
L	liter
m	meter
M	molarity: moles of solute per liter of solution
min	minute
ncpm	net counts per minute
pCi/L	picocuries per liter
ppm	parts per million
s	second
µg/L	micrograms per liter
µR	microroentgen
V	volt
WL	working levels

ATTACHMENT D.I:

ABSTRACTS OF PROCEDURES FOR THE OPERABLE UNIT 3 FIELD PROGRAM

Attachment D.I to the Sampling and Analysis Plan (SAP) contains abstracts of the 69 procedures (methods) that have been developed to support the plan. The other 127 procedures that will be used for the Remedial Investigation/Feasibility Study (RI/FS) activities are contained in the SCQ (Site-Wide CERCLA [Comprehensive Environmental Response, Compensation, and Liability Act] Quality Assurance Project Plan).

Attachment D.I is subdivided into three abstract sections:

D.I.1 Field Procedures, Instrumental
- Radiological
- Chemical
- Physical

D.I.2 Field Procedures, Sampling

D.I.3 Laboratory Analytical Procedures
- Organic Compounds
- Inorganic Compounds
- Conventional Parameters
- Radiometric

Each abstract provides selected general information about the method including the method or procedure number, associated title, scope and application statement, and a method summary description.

The actual procedures/methods contained in this submittal are scheduled to be forwarded to the U.S Environmental Protection Agency (EPA) for review and approval. Following agency approval, sampling and analysis will proceed on schedule. Also prior to commencement of field activities, methods validation of the radiometric laboratory analytical procedures will be occurring.

D.I.1 FIELD PROCEDURES, INSTRUMENTAL

D.I.1.1 Flame-Ionization Detector Operations (EMON/OU3-012)

1 Scope and Application

This method describes taking field measurements through the calibration and use of a flame-ionization detector for taking field measurements.

2 Method Summary

2.1 The following equipment is needed:

A. Flame-ionization detector
B. Field measurement logbook
C. Indelible black ink pen.

2.2 The work packet is reviewed and the screening locations are determined.

2.3 The flame-ionization detector is calibrated and verified.

2.4 The measurements are performed using the flame-ionization detector.

2.5 The measurements are recorded in the Field Measurement Logbook.

D.I.1.2 Quality Control of Radioactivity Counting Systems (Procedure 016)

1 Scope and Application

To assign responsibilities and establish requirements for the quality control of low background radioactivity detection and measurement equipment.

2 Method Summary

This procedure applies to all radioactivity counting systems (excluding portable instrumentation) in the Radiological Safety Section.

2.1 Daily operational checks and equipment verification are performed prior to the operation of any radioactivity counting system. Daily verification includes review of the posted quality control charts (including calibration information) for current information. Daily checks are valid for 24 hours (h).

2.2 Records of the daily operational checks and equipment verification are maintained in a file (or equivalent) physically located near the counting system.

2.2.1 Daily operational checks are logged with the following information:

- Date
- Instrument serial number
- Background count rate
- Instrument model
- Operator name
- Source count rates

2.2.2 Monthly calibrations are logged with the following information:

- Date
- Instrument serial number
- Background count rates
- Source serial number
- Corrected source assay
- Crosstalk (beta-alpha)
- Alpha and beta efficiency
- Instrument model
- Operator name
- Radionuclide by source used
- Original source assay value and date
- Chi-square test results
- Standard deviation (20 counts)
- Expected counts for daily checks

2.2.3 Replacement of components or any unusual conditions are logged.

2.3 Quality control charts are posted and located near the counting system. Quality control charts provide data for at least one month except during the first month of equipment operation.

2.4 Radioactivity counting systems are calibrated monthly. Calibration is required when operating voltage is adjusted or when system components are changed. For example, calibration is required when detectors or electronic hardware are changed.

2.5 The most current efficiency, detector background, and minimum detectable gross counts are posted near the counting system.

2.6 When gas bottles are changed, system voltage plateau is performed in accordance with equipment technical manual.

2.7 This procedure applies to low background alpha/beta proportional counting systems and alpha scintillation counters. Because two widely divergent counting systems are covered by this procedure, only those steps applicable to each system are performed. For example, beta source checks are ignored for alpha scintillation counters.

D.I.1.3 Performance Testing of Portable Radiation Survey Instruments (Procedure 018)

1 Scope and Application

To assign responsibilities and establish requirements for the inspection and performance testing of portable radiation survey instruments in accordance with Fernald Environmental Management Project (FEMP) and Department of Energy (DOE) guidelines.

2 Method Summary

This procedure identifies and describes the periodic inspection and performance testing criteria for "active-use" portable instrumentation of the Radiological Safety Section.

2.1 At the beginning of each calendar month, the Safety and Training Instrumentation Laboratory (STIL) identifies the instruments due for calibration.

2.2 Instruments that are out of calibration (OOC) or out of service (OOS) are labeled with an Instrument Service Request Tag. OOC or OOS instruments are returned to the portable instrumentation inventory station for calibration or repair.

2.3 All instrumentation submitted to STIL for repair or calibration are monitored for removable contamination prior to their return to the instrumentation inventory station. Surface contamination limits are described in Surface Radioactivity Guides, DOE Order 5480.11.

2.4 Replacement or issued instrumentation is procured from the instrumentation inventory station. The Instrumentation Signout form (Attachment D) is completed for each instrument obtained.

2.5 Proper instrument operation and source response are verified daily. Active-use instrumentation is labeled with an Instrument Inspection Label each month.

2.6 Performance testing of instrumentation is performed in a low (<100 counts per minute [cpm]) background area. Performance testing is not conducted in areas with background exceeding 300 cpm.

2.7 Microroentgen (μR) instruments require inspection and performance tests only for the lowest two scales. Only the 0-25 μR/h and 0-50 μR/h scales are calibrated.

2.8 All instrumentation is maintained as free from radioactive contamination as practical. Instrumentation is wrapped in plastic bags when contamination or the possibility of water damage is present.

Note: Probe or instrument windows (mylar) are not wrapped with plastic.

2.9 Neutron survey instruments and Telectectors are considered "special-use" instruments. These instruments are issued directly to the user and returned to STIL after use.

2.9.1 Neutron survey instruments and Telectectors do not require Instrument Inspection Labels.

2.9.2 Neutron survey instruments and Telectectors do not require performance testing.

2.9.3 Neutron survey instruments cannot be source checked at the FEMP. Refer to SP(SAP)-A-01-011.

2.10 Power is secured to any instrumentation that will not be used immediately.

2.11 Instrument sources are decay corrected bi-annually:

$$A_t = A_0 \times e^{[-(0.693/T_{1/2}) \times t]}$$

Where:

- A_t - Activity at present
- A_0 - Initial activity
- $T_{1/2}$ - Isotope half life
- t - Time
- e - The base of the natural log

D.I.1.4 Operation of the Tennelec Automatic Low Background Counting System (LB5100 Series II/III and LB5100/5500) (Procedure 020)

1 Scope and Application

To assign responsibilities and establish requirements for the use and operation of the Tennelec automatic counters and controller communications software in accordance with FEMP and DOE guidelines.

2 Method Summary

This procedure identifies and describes the DOE and FEMP requirements for the Tennelec automatic counters used by Media Sampling Section.

2.1 Calibration and maintenance of automatic counters are performed by the STIL on a routine basis as specified in procedure SP-A-01-011, Safety and Training Instrumentation Laboratory Administrative Requirements.

2.2 Quality control for counting of samples using automatic counters is performed in accordance with EMON-OU3-016, Quality Control of Radioactivity Counting Systems.

2.3 Tennelec automatic counters are designed to operate by terminal or personal computer (PC) linkage. When linked, the PC emulates the controller terminal. Tennelec LB5100/5500 counters normally are connected to an IBM XT or AT computer. Two automatic counters may interface with the same PC or terminal via a separate executable file (DUAL5100.EXE).

2.4 Copies of bootable operating diskettes for the PC are made from the original or master Disk Operating System (DOS) disk and the LB5100 diskettes that belong to each system. Original diskettes are not used for normal operations. Backup operating diskettes are made to replace deteriorated operating diskettes.

2.5 Bootable operating diskettes contain an auto-executable batch file (AUTOEXEC.BAT) that will allow the system to go to the executive level of the LB5100 communications program upon a hard boot (power-up) or soft boot (manual system reset) due to a system crash. These diskettes also contain the LB5100.EXE file, the system configuration file, LB5100.CNF, the beep-signal intercept program, FIXBEEP.COM, and the appropriate operating parameters file with the .IDN extension.

D.I.1.5 Smear Analysis with Field Survey Instrumentation (Procedure 022)

1 Scope and Application

To assign responsibilities and establish requirements for the analysis of radioactive smear samples with field instrumentation in accordance with FEMP and DOE guidelines.

2 Method Summary

This procedure identifies and describes the DOE and FEMP requirements for smear sample analysis. This procedure is applicable to alpha and beta/gamma instrumentation.

2.1 This procedure is not applicable to dose rate instrumentation.

2.2 This procedure is not applicable to direct survey techniques.

2.3 The most commonly used field instruments are count-rate meters. Fluctuations in meter indication makes it difficult to determine indications with low count rates. Extreme care is taken when assessing meter indication during needle oscillations.

2.4 Efficiencies for the instrument being used are recorded on the calibration sticker attached to the instrument prior to use in the field. This record is verified.

Note: The correction factor listed on the instrument converts net counts per minute (ncpm) to disintegrations per minute (dpm) per probe area. This is equivalent to the ncpm divided by the instrument efficiency. Corrections are reported to the nearest whole number.

2.5 All smears in low background areas are counted. The background limit during analysis for beta/gamma contamination is 300 cpm. The background limit during analysis for alpha contamination is 20 cpm. Instrumentation is shielded or moved as needed to maintain background radiation levels as low as practical.

2.6 Beta/gamma smears are counted for at least 5 seconds (s). Count time is extended to a minimum of 15 s when the presence of contamination is indicated.

D.I.1.6 Direct Air Sampling with the MicroTIP Portable Photoionization Detector (Procedure 025)

1 Scope and Application

To assign responsibilities and establish the requirements for conducting gas and vapor measurements in accordance with FEMP and DOE order guidelines.

2 Method Summary

This procedure identifies the FEMP administrative and DOE order requirements and guidelines for conducting gas and vapor measurements with the MicroTIP portable photoionization detector (PID).

2.1 The MicroTIP principle of detection and measurement is based on the production of ions through the bombardment of organic gas/vapor molecules with light photons from an ultraviolet (UV) lamp. Molecules with ionization potentials less than or equal to the photon energy of the lamp are ionized and detected.

Note: The MicroTIP is supplied with a 10.6 eV lamp; 9.5 eV lamps are available for other gases/vapors.

2.2 The MicroTIP measures relative concentrations of gases/vapors and displays them in parts per million (ppm) (numerical or bar graph). When properly calibrated and with only one ionizable gas/vapor present, the MicroTIP can measure specific concentrations.

2.3 The MicroTIP does not distinguish between compounds present in the sample. The data displayed represent the total concentration of all compounds in the sample. Readings taken in atmospheres containing multiple compounds are considered to contain a standard error of ±25%.

2.4 The MicroTIP logs the high, low, and average readings simultaneously, every 15 s. The data are logged in internal memory, which holds up to 12 h of data or 250 events. Measurements are identified by date, time, and event number. Information can be recalled to the MicroTIP screen, a separate computer, or a printer.

2.5 Operation of the MicroTIP is controlled by a 16-button keypad.

2.6 Refer to the user manual for additional details on relative response, data sheets, and functions of the MicroTIP.

2.7 Before any operation, the user verifies battery voltage be pressing the BATT key on the keypad. Battery voltage must be 9-16V for proper operation. Refer to setup 2.4, Battery Charging, if reading is below 9V.

2.8 Measurement Interferences.

2.8.1 Condensation or dirt on the lamp will lower the sensitivity of the MicroTIP. The MicroTIP is not used in areas of high relative humidity; it is cleaned as needed.

2.8.2 Radio frequencies affect the accuracy of the MicroTIP. Radios are not operated when sampling with the MicroTIP.

2.9 The MicroTIP is turned off when not to be used for more than 30 min.

2.10 MicroTIP response to an organic vapor source (such as an indelible marker) is verified prior to each use. The MicroTIP is allowed to purge prior to continuing.

2.11 When samples are screened for organic contaminants, both the maximum reading and the stabilized reading are recorded. A reading not stabilized within 20 s is also recorded. Background readings are subtracted from the total reading.

D.I.1.7 Portable Gas Chromatograph Operations (EMON/OU3-027)

1 Scope and Application

This method describes taking field measurements through the calibration and use of a portable gas chromatograph. Operations may be supported using a computer.

2 Method Summary

2.1 The following equipment is needed:

A. Portable gas chromatograph
B. Field Measurement Logbook
C. Indelible black ink pen.

2.2 The work packet is reviewed, and the screening locations are determined.

2.3 The portable gas chromatograph is calibrated and verified.

2.4 The sample is prepared using the injection syringe.

2.5 The sample is introduced into the portable gas chromatograph using the injection port.

2.6 The measurements are performed using the portable gas chromatograph.

2.7 The measurements are recorded in either the portable gas chromatograph internal memory or the computer and the Field Measurement Logbook.

D.I.1.8 Water Quality Measurements (EMON/OU3-002)

1 Scope and Application

This method describes the field procedure for measuring pH, temperature, specific conductivity, and dissolved oxygen in water samples to be submitted for analysis.

2 Method Summary

2.1 The measuring equipment is calibrated, verified, and prerinsed with deionized water.

2.2 The temperature is measured with a temperature probe (thermometer).

2.3 The pH is measured with a pH probe.

2.4 The specific conductivity is measured using:

- A conductivity cell, conductivity probe, or temperature-compensating conductivity meter.
- Two different known standards, bracketing the expected conductivity of the sample solution to be measured.

2.5 Dissolved oxygen is measured by immersing a membrane electrode in the water.

2.6 All measurements are recorded in the Field Measurement Logbook.

2.7 Measuring probes are decontaminated to the appropriate level.

D.I.1.9 Operation of the HNu-SEFA-P XRF Analyzer (Procedure K.6.4; EMON/OU3-006)

1 Scope and Application

This method describes the operation of the HNu-SEFA-P XRF Analyzer (SEFA). The SEFA is used for field analysis of trace metals and radioactive isotopes.

2 Method Summary

2.1 The following equipment is needed:

- SEFA
- Liquid nitrogen (LN_2)
- Sample cups
- Plastic film
- Wide "O" ring
- Narrow "O" ring
- Laptop or PC with an RS 232-C (25 to 9 pin) cable (optional)

2.2 Procedure EMON-OU3-007 is referred to when moving the SEFA.

2.3 The analysis system is started by setting up the equipment, checking the battery, charging the battery, filling the SEFA Dewar with LN_2, and powering up the equipment. Operations may be supported manually or by PC.

2.4 The sample is prepared for analysis and placed in a sample chamber that holds up to four samples.

2.5 Sample analysis is conducted using one or more sealed radioactive source(s). If more than one source is used, then the sources must be used consecutively. The available radioactive sources are americium-241 (^{241}Am), cadmium-109 (^{109}Cd), and iron-55 (^{55}Fe).

2.6 Samples are exposed (saturated) to the energy (x-ray) emitted by the radioactive source. SEFA performs qualitative and quantitative analyses by measuring X-ray energy and intensity reflected from the sample.

2.7 Data are stored on the microtape or in the optional computer.

2.8 Equipment is turned off and returned to its appropriate location.

D.I.2 FIELD PROCEDURES, SAMPLING

D.I.2.1 Study for Radiological Contamination Surveys (Procedure 017)

1 Scope and Application

To assign responsibilities and establish requirements for performing radiological contamination surveys in accordance with Fernald Environmental Management Project (FEMP) and Department of Energy (DOE) guidelines.

2 Method Summary

This procedure identifies the FEMP administrative and DOE Order methods and guidelines to schedule, perform, and document contamination surveys.

2.1 Protective gloves are worn when taking smears.

2.2 Smears (paper or cloth type) for removable contamination are taken dry, when possible. Moderate pressure is applied with two fingers.

2.3 Smear samples should be taken over a 40 cm (16 in.) long "S" figure or over 100 cm^2 area unless otherwise required by a procedure. For items with less area than 100 cm^2, the area smeared is estimated.

2.4 Radiological Survey Report copies are distributed in accordance with the distribution list at the bottom of the form.

2.5 In fixed-contamination areas, smear surveys are not required when using depleted or natural uranium contamination limits. Direct surface monitoring with beta-gamma instruments is sufficient for determining surface activity in fixed-contamination areas.

D.I.2.2 Measuring Radon and Thoron Daughter Concentrations (Procedure 019)

1 Scope and Application

To assign responsibilities and establish requirements for the method of measuring radon-222 (^{222}Rn) and ^{220}Rn (thoron) progeny working level in accordance with FEMP and DOE guidelines.

2 Method Summary

This procedure identifies and describes the DOE and FEMP requirements for the method of calculating ^{222}Rn and ^{220}Rn working level. This procedure employs the Kusnetz and Rolle methods.

2.1 Working-level measurements are used for information concerning radiological air quality.

2.2 Radon sampling involves the following steps:

2.2.1 The method most consistent with available instrumentation and analysis time is selected.

2.2.2 The Rolle Method is preferred when sampling in the presence of Tn progeny.

2.2.3 If the ability to meet the time constraints required by the Rolle method is questionable, a 5-minute air sample is performed.

2.2.4 A five-minute-sample time enables the RST to choose the Rolle method (if sample analysis can begin shortly after the sample is collected) or the Kusnetz method (if sample analysis will be delayed for at least 40 minutes after sample collection).

D.I.2.3 Radiation Surveys (Procedure 023)

1 Scope and Application

To assign responsibilities and establish the requirements the performance and methods of radiation surveys in accordance with FEMP and DOE guidelines.

2 Method Summary

This procedure identifies and describes the DOE and FEMP requirements for the routine program and frequency by which Radiological Safety Technicians (RST) perform radiation surveys.

2.1 The frequency, scope, and magnitude of surveys are continuously updated to maintain consistency with Operable Unit (OU) requirements.

2.1.1 High Radiation Areas: for As Low as Reasonably Achievable (ALARA) concerns, a survey is performed only as necessary for OU requirements.

2.1.2 Very High Radiation Areas: for ALARA concerns, a survey is performed only as necessary for OU requirements.

2.2 Radiation surveys are performed to characterize radiation levels and whenever sampling operations are performed that may alter existing radiation levels.

2.3 Report any unposted radiation area to RST Supervision or Industrial Radiological Safety and Training (IRS&T).

2.4 Prior to performing any radiation survey, the RST ensures the instrument is calibrated and passes the performance checks required by EMON-OU3-018, Inspection and Performance Testing of Portable Radiation Survey Instruments.

2.5 The radiation survey instrumentation is placed in a clean plastic bag(s) in areas where instrumentation may become contaminated. The beta window on ion chambers is not covered during beta radiation/contamination surveys. Care is taken not to damage the mylar window while performing beta surveys.

2.6 RST Supervision is immediately notified of unusual or unexpected survey results. RST Supervision is immediately notified if personnel exposure limits may be exceeded in a relatively short period of time. ALARA exposure is maintained.

2.7 The RST performs radiation surveys prior to contamination and/or airborne radioactivity surveys to maintain personnel exposure ALARA, unless radiation levels are known.

D.I.2.4 Estimation of Soil Uranium Concentrations (Procedure 024)

1 Scope and Application

To assign responsibilities and establish requirements for the inception and operation of the D. S. Davidson portable Multi-Channel Analyzer (MCA) in accordance with FEMP and DOE guidelines.

2 Method Summary

This procedure identifies and describes the DOE and FEMP requirements for the equipment and method of operation of the D. S. Davidson MCA. The uranium-238 (^{238}U) concentration assessment, with this technique of soil analysis, is accomplished by the detection of the 93 KeV photon emitted from thorium-234 (^{234}Th) progeny.

2.1 All samples are controlled as radioactive material until analysis proves otherwise.

2.2 Throughout this procedure references are made to two different displays. The liquid crystal display (LCD) screen shows parameters and menus. The spectrum display screen shows the acquired spectra.

2.3 The MCA is equipped with a screen saver that automatically turns off the spectrum display screen after it has been on for two minutes. The screen is restored by pressing the "DISPLAY" button. Restoring the screen does not alter any part of the data acquisition.

2.4 If the MCA is to be operated using the internal battery pack, the battery operating life is verified before operation.

2.5 MCA source checks are performed in accordance with the following guidelines:

- Before the initial sample is counted
- After every tenth sample
- When counting location is changed.

D.I.2.5 Field Measurement Logbook (EMON/OU3-024)

1 Scope and Application

This method describes the guidelines and responsibilities for log-keeping activities and the type of data recorded during field measurement (i.e., temperature, pH, specific conductance, dissolved oxygen, photoionization and flame-ionization measurements) activities. This method provides a controlled system for logbook recording activities during field measurement activities.

2 Method Summary

2.1 The following equipment is needed:

A. Field Measurement Logbook

B. Black indelible ink pen.

2.2 A minimum of two pages (one containing information about the measuring round and one or more containing information about the measuring event[s]) are completed in the Field Measurement Logbook for a measuring round.

2.3 During each measuring event, completed items are entered on the appropriate page in the Field Measurement Logbook.

2.4 Measurement round and measurement event entries are reviewed for accuracy and completeness daily.

2.5 Completed Intrusive Sampling Logbooks are forwarded to the OU3 Remedial Investigation/Feasibility Study (RI/FS) Program management staff for retention.

D.I.2.6 Radiological Survey Logbook (EMON/OU3-025)

1 Scope and Application

This method describes the guidelines and responsibilities for log-keeping activities and the type of data recorded for field screening of radiological survey activities. This method provides a controlled system for logbook recording activities during field survey activities.

2 Method Summary

2.1 The following equipment is needed:

A. Radiological Survey Logbook

B. Black indelible ink pen.

2.2 A minimum of two pages (one containing information about the survey round and one or more containing information about the survey event[s]) are completed in the Radiological Survey Logbook for a measuring round.

2.3 During each measuring event, completed items are entered on the appropriate page in the Radiological Survey Logbook.

2.4 Measurement round and measurement event entries are reviewed for accuracy and completeness daily.

2.5 Completed Radiological Survey Logbooks are forwarded to the OU3 RI/FS Program management staff for retention.

D.I.2.7 Field Operations Conduct (Section 5 and Appendix K; EMON/OU3-026)

1 Scope and Application

This method describes the conduct of general field operations for sampling.

2 Method Summary

2.1 No specific equipment is needed.

2.2 The project work packet is reviewed.

2.3 The work zone is established by identifying sample locations and setting up exclusion zones.

2.4 Sampling is conducted per the appropriate procedure.

2.5 The appropriate field logbook (Intrusive Sampling Logbook or Field Measurement Logbook or Radiological Survey Logbook) is completed.

2.6 Waste disposition forms are completed.

D.I.2.8 Analytic Support Levels (ASL) A and B Sampling (Section 5.4 and 8.3; EMON/OU3-028)

1 Scope and Application

This method applies to the collection of nonintrusive samples (swipe samples and field instrument measurements, that is, photoionization detector and radiological screening). The data collected from these samples is used to select final intrusive sampling locations.

2 Method Summary

2.1 The following equipment is needed:

A. Field Logbooks

B. Swipes

C. Field instruments (as required in the Sampling and Analysis Plan [SAP])

D. Indelible black ink pen

E. Disposable latex gloves.

2.2 The work packet is reviewed, the sample location determined, and the work zone established.

2.3 The swipe samples are taken at the specified locations and recorded in the Field Measurement Logbook.

2.4 The field instrument measurements (photoionization detector and radiological screening) are performed and recorded in the Field Measurement Logbook.

D.I.2.9 Field Operations Coordination (Section 5 and Appendix J; EMON/OU3-005)

1 Scope and Application

This method describes the coordination requirements for the preparation and implementation of field sampling activities to support the OU3 Characterization Program.

2 Method Summary

2.1 No special equipment is needed for field operations coordination.

2.2 Necessary permits are obtained and the Field Work Packet is prepared.

2.3 The sampling points are identified and sampling is scheduled.

2.4 An exclusion zone is set up at the sampling location and samples are screened. Screening information is updated in the database.

2.5 Additional sampling needs are determined and additional sampling is conducted, as necessary.

2.6 Sampling equipment is cleaned and decontaminated.

2.7 Waste is packaged and stored according to Resource Conservation and Recovery Act (RCRA) determination.

D.I.2.10 Sampling Surface, Shallow or Standing Liquids (Procedure K.4.3; EMON/OU3-001)

1 Scope and Application

This method describes the extraction and packaging of a representative sample of liquid media from liquids standing on or in roofs, floors, tanks, drums, sumps, ducts, process equipment, wet scrubbers, or impoundments. This method also applies to the collection of samples for organic analysis (with the exception of halogen compounds).

2 Method Summary

2.1 The following equipment is needed:

- Field logbooks
- Stanchions
- Yellow barrier tape
- Nageline® marker
- Disposable latex gloves
- Clean Herculite® sheeting
- Dipper, beaker, ladle, scoop, or bailer (made of Teflon®, stainless steel, or polyvinyl chloride [PVC])
- Millipore filter
- Sample containers
- Synthetic ice and ice chest
- Large and small plastic bags.

2.2 The work packet is reviewed, the sample location determined, the work zone established, and the sampling equipment precleaned and set up at the sample location.

2.3 The sample is extracted using a dipper, beaker, ladle, scoop, or bailer.

2.4 Field measurements (temperature, pH, specific conductance, dissolved oxygen, photoionization detector, and radiological screening) are performed and recorded in the Field Measurement Logbook.

2.5 The samples are containerized, labeled, and logged into the Intrusive Sampling Logbook and Site-Wide Analysis Request/Custody Record (SWAR/CR).

2.6 Sampling equipment is decontaminated to the appropriate level.

2.7 The completed sampling round samples are delivered to the site analytical laboratory.

D.I.2.11 Field Quality Assurance/Quality Control Procedure (Section 4.1; EMON/OU3-014)

1 Scope and Application

This method describes requirements for the preparation and collection of Quality Assurance/Quality Control (QA/QC) samples for analysis. This method also applies to selection of equipment for sample extraction.

2 Method Summary

2.1 The following equipment is needed:

- Field logbooks
- Nageline® marker
- Disposable latex gloves
- Sample containers
- Deionized water.

2.2 The work packet is reviewed, and the QA/QC samples needed are identified.

2.3 QA/QC samples are prepared.

2.4 The samples are containerized, labeled, and logged into the Intrusive Sampling Logbook and SWAR/CR.

2.5 Deviations in sampling equipment must conform with to tables provided in this procedure.

D.I.2.12 Control and Transport of Devices Containing Sealed Sources (EMON/OU3-007)

1 Scope and Application

This method describes the safe accountability, control, and transport of instruments containing sealed sources.

2 Method Summary

2.1 There are no special equipment requirements for this method.

2.2 Instruments containing sealed sources are controlled through proper storage, periodic inventory, and leak testing.

2.3 Sealed sources are accounted for using the Sealed Source Accountability Log.

2.4 Transport accidents and spills are handled by following site emergency procedures.

2.5 For on-site transport of sealed sources, the instrument is surveyed for contamination, logged out on the Sealed Source Accountability Log prior to transporting sealed sources from the storage area, and logged in on the Sealed Source Accountability Log when the instrument is returned to the storage location.

2.6 For off-site transport of sealed sources:

2.6.1 The instrument is surveyed for spreadable contamination and dose rates according to Department of Transportation (DOT) regulations as defined by Westinghouse Environmental Management Company of Ohio (WEMCO) Site Services Department, Traffic Control Section.

2.6.2 A Miscellaneous Shipping Order (MSO) is completed for the instrument.

2.6.3 The instrument is logged out on the Sealed Source Accountability Log prior to transporting sealed sources from the storage area and logged in on the Sealed Source Accountability Log when the instrument is returned to the storage location.

D.I.2.13 Health and Safety Plan (Section 1; EMON/OU3-008)

1 Scope and Application

This method describes day-to-day health and safety activities relevant to hazardous substances.

2 Method Summary

2.1 The following equipment is needed:

- Protective clothing
- Hand-held or hand-and-foot-radiation monitor
- Air monitoring equipment
- Two-way communication equipment.

2.2 Personal protective clothing is used, as necessary, while dealing with hazardous substances.

2.3 Bioassay samples (urine samples and whole body count) are submitted to IRS&T, as required.

2.4 Posted site entry/exit requirements are observed by all.

2.5 For an emergency incident, the Communication Center is notified, and sufficient information is provided:

2.5.1 Fires or explosions are handled according to site emergency requirements.

2.5.2 Chemical or radiological releases (spill, leak, or vapor cloud) are handled according to site emergency requirements.

D.I.2.14 Sampling Deep Liquids (Procedure K.4.4; EMON/OU3-009)

1 Scope and Application

This method describes the extraction and packaging of a representative sample of liquid media from a retention basin, large drum, tank, or vessel. This method also applies to the collection of samples for inorganic, halogen compounds, and radiological analysis.

2 Method Summary

2.1 The following equipment is needed:

- Field logbooks
- Stanchions
- Yellow barrier tape
- Nageline® marker
- Disposable latex gloves
- Clean Herculite® sheeting
- Glass or Teflon® COLIWASA, Liquid Grab Sampler, Teflon® bailer, or weighted bottle
- Sample containers
- Synthetic ice and ice chest
- Large and small plastic bags.

2.2 The work packet is reviewed, the sample location determined, the work zone established, and the sampling equipment precleaned and set up at the sample location.

2.3 The sample is extracted using a liquid grab sampler (AMS® or Wheaton®), glass or Teflon® COLIWASA, Teflon® bailer, or weighted bottle.

2.4 Field measurements (temperature, pH, specific conductance, dissolved oxygen, photoionization detector, and radiological screening) are performed, as applicable. Measurements are recorded in the Field Measurement Logbook.

2.5 The samples are containerized, labeled, and logged into the Intrusive Sampling Logbook and Site-Wide Analysis Request/Custody Record (SWAR/CR).

2.6 Sampling equipment is decontaminated to the appropriate level.

2.7 The completed sampling-round samples are delivered to the site analytical laboratory.

D.I.2.15 Sampling Contained Liquids (Procedure K.4.4; EMON/OU3-010)

1 Scope and Application

This method describes the collection and preparation of liquid samples from tanks, process lines and pipes, and other containers.

2 Method Summary

2.1 The following equipment is needed:

- Field logbooks
- Stanchions
- Yellow barrier tape
- Nageline® marker
- Disposable latex gloves
- Clean Herculite® sheeting
- Stainless steel pail
- Glass or Teflon® COLIWASA
- Sample containers
- Synthetic ice and ice chest
- Large and small plastic bags.

2.2 The work packet is reviewed, the sample location determined, the work zone established, and the sampling equipment precleaned and set up at the sample location.

2.3 The sample is extracted from valves, from disconnects, by penetration, or from lids, caps, and openings.

2.4 Field measurements (temperature, pH, specific conductance, dissolved oxygen, photoionization detector, and radiological screening) are performed, as applicable. Measurements are recorded in the Field Measurement Logbook.

2.5 The samples are containerized, labeled, and logged into the Intrusive Sampling Logbook and SWAR/CR.

2.6 Sampling equipment is decontaminated to the appropriate level.

2.7 The completed sampling-round samples are delivered to the site analytical laboratory.

D.I.2.16 Sampling Sub-Liquid Sediments (Procedure K.4.11; EMON/OU3-011)

1 Scope and Application

This method describes the collection and preparation for laboratory analysis of sediment samples from impoundments, process and waste sumps, tanks, and vessels.

2 Method Summary

2.1 The following equipment is needed:

- Field logbooks
- Stanchions
- Yellow barrier tape
- Nageline® marker
- Disposable latex gloves
- Clean Herculite® sheeting
- Stainless steel dredge sampler
- Stainless steel mixing pan
- Sample containers
- Synthetic ice and ice chest
- Large and small plastic bags.

2.2 The work packet is reviewed, the sample location determined, the work zone established, and the sampling equipment precleaned and set up at the sample location.

2.3 The sample is extracted with a stainless steel dredge sampler.

2.4 Field measurements (photoionization detector and radiological screening) are performed, as applicable. Measurements are recorded in the Field Measurement Logbook.

2.5 The samples are containerized, labeled, and logged into the Intrusive Sampling Logbook and SWAR/CR.

2.6 Sampling equipment is decontaminated to the appropriate level.

2.7 The completed sampling-round samples are delivered to the site analytical laboratory.

D.I.2.17 Sampling Loose Solids (Procedure K.4.16; EMON/OU3-016)

1 Scope and Application

This method describes the collection and preparation for laboratory analysis of samples from process residues, wastes, sludge, or solids, in tanks, drums, vessels, dry sumps, scrubbers, lines, and conduits.

2 Method Summary

2.1 The following equipment is needed:

- Field logbooks
- Stanchions
- Yellow barrier tape
- Nageline® marker
- Clean Herculite® sheeting
- Disposable latex gloves
- Cotton- or leather-palm work gloves
- Stainless steel dipper, scoop, trowel, or shovel
- Stainless steel pan
- Sample containers
- Synthetic ice and ice chest
- Large and small plastic bags.

2.2 The work packet is reviewed, the sample location determined, the work zone established, and the sampling equipment precleaned and set up at the sample location.

2.3 The sample is extracted with a stainless steel dipper, scoop, trowel, or shovel.

2.4 Field measurements (photoionization detector and radiological screening) are performed, as applicable. Measurements are recorded in the Field Measurement Logbook.

2.5 The samples are containerized, labeled, and logged into the Intrusive Sampling Logbook and SWAR/CR.

2.6 Sampling equipment is decontaminated to the appropriate level.

2.7 The completed sampling round-samples are delivered to the site analytical laboratory.

D.I.2.18 Sampling Firm Solids (Procedures K.5 and K.8; EMON/OU3-017)

1 Scope and Application

This method describes the collection and preparation or laboratory analysis of samples from compacted process residues, wastes, sludge, or solids, in tanks, vessels, dry sumps, scrubbers, lines, and conduits.

2 Method Summary

2.1 The following equipment is needed:

- Field logbooks
- Stanchions
- Yellow barrier tape
- Nageline® marker
- Teflon or stainless steel liners
- Clean Herculite® sheeting
- Disposable latex gloves and cotton- or leather-palm work gloves
- Stainless steel auger, stainless steel trier, or coring probe
- Stainless steel pan
- Sample containers
- Synthetic ice and ice chest
- Large and small plastic bags.

2.2 The work packet is reviewed, the sample location determined, the work zone established, and the sampling equipment precleaned and set up at the sample location.

2.3 The sample is extracted with a stainless steel auger, stainless steel trier, or coring probe.

2.4 Field measurements (photoionization detector and radiological screening) are performed, as applicable, and recorded in the Field Measurement Logbook.

2.5 The samples are containerized, labeled, and logged into the Intrusive Sampling Logbook and SWAR/CR.

2.6 Sampling equipment is decontaminated to the appropriate level.

2.7 The completed sampling-round samples are delivered to the site analytical laboratory.

D.I.2.19 Sampling Surface and Sub-Surface Soil (Procedure K.5; EMON/OU3-018)

1 Scope and Application

This method describes the collection and preparation for laboratory analysis and geophysical profile of surface and subsurface soil samples from dirt storage piles and impoundment beaches.

2 Method Summary

2.1 The following equipment is needed:

- Field logbooks
- Stanchions
- Yellow barrier tape
- Nageline® marker
- Bentonite
- Potable water
- Yellow barrier tape
- Clean Herculite® sheeting
- Disposable latex gloves and cotton- or leather-palm work gloves
- Stainless steel auger, stainless steel trier, split spoon corer, or coring probe
- Teflon® or stainless steel liners
- Stainless steel pan
- Sample containers
- Synthetic ice and ice chest
- Large and small plastic bags.

2.2 The work packet is reviewed, the sample location determined, the work zone established, and the sampling equipment precleaned and set up at the sample location.

2.3 The sample is extracted with a coring probe, stainless steel scoop, stainless steel auger, or split spoon sampler.

2.4 Field measurements (photoionization detector and radiological screening) are performed, as applicable. Measurements are recorded in the Field Measurement Logbook.

2.5 The samples are containerized, labeled, and logged into the Intrusive Sampling Logbook and SWAR/CR.

2.6 Sampling equipment is decontaminated to the appropriate level.

2.7 The completed sampling-round samples are delivered to the site analytical laboratory.

D.I.2.20 Sampling Soft Surfaces (Procedure K.8; EMON/OU3-019)

1 Scope and Application

This method describes the collection and preparation for laboratory analysis of wood, drywall, coating, laminate, paint, transite, or tile samples.

2 Method Summary

2.1 The following equipment is needed:

- Field logbooks
- Stanchions
- Yellow barrier tape
- Nageline® marker
- Rubber mallet
- Yellow barrier tape
- Clean Herculite® sheeting
- Disposable latex gloves and cotton- or leather-palm work gloves
- Dust mask or respirator
- Hand-held electric drill with a wood bit or Milwaukee® hammer drill with wood or core bit, paint scraper, or adze
- Nilfisk® vacuum
- Portable generator, if needed
- Stainless steel pan
- Sample containers
- Synthetic ice and ice chest
- Large and small plastic bags.

2.2 The work packet is reviewed, the sample location determined, the work zone established, and the sampling equipment precleaned and set up at the sample location.

2.3 The sample is extracted by a hand-held electric drill with a wood bit or Milwaukee® hammer drill with a wood (or core) bit, paint scraper, or adze.

2.3.1 Wood and dry wall samples are extracted with hand-held electric drill or Milwaukee® hammer drill.

2.3.2 Coating, laminate, paint, or tile samples are extracted a paint scraper and a rubber mallet, as needed.

2.4 Field measurements (photoionization detector and radiological screening) are performed, as applicable. Measurements are recorded in the Field Measurement Logbook.

2.5 The samples are containerized, labeled, and logged into the Intrusive Sampling Logbook and SWAR/CR.

2.6 Sampling equipment is decontaminated to the appropriate level.

2.7 The completed sampling-round samples are delivered to the site analytical laboratory.

D.I.2.21 Sampling Hard-Surfaced Media (Procedure K.8; EMON/OU3-020)

1 Scope and Application

This method describes the collection and preparation for laboratory analysis of concrete, asphalt, and masonry samples.

2 Method Summary

2.1 Equipment needed is the following:

- Field logbooks
- Stanchions
- Yellow barrier tape
- Nageline® marker
- Clean Herculite® sheeting
- Disposable latex gloves and cotton- or leather-palm work gloves
- Potable water
- Bentonite
- Stainless steel scoop, hammer and chisel, or Milwaukee® hammer drill with a tungsten carbide-tipped coring bit
- Nilfisk® vacuum
- Portable generator, if needed
- Sample containers
- Synthetic ice and ice chest
- Large and small plastic bags.

2.2 The work packet is reviewed, the sample location determined, the work zone established, and the sampling equipment precleaned and set up at the sample location.

2.3 The sample is extracted by a stainless steel scoop, hammer and chisel, or Milwaukee® hammer drill with a tungsten carbide-tipped coring bit. If they will not damage or weaken a weight-bearing structure, a stainless steel scoop or hammer and chisel may be used in place of the Milwaukee® hammer drill.

2.4 Field measurements (photoionization detector and radiological screening) are performed, as applicable. Measurements are recorded in the Field Measurement Logbook.

2.5 The samples are containerized, labeled, and logged into the Intrusive Sampling Logbook and SWAR/CR.

2.6 Sampling equipment is decontaminated to the appropriate level.

2.7 The completed sampling-round samples are delivered to the site analytical laboratory.

D.I.2.22 Sampling Metallic Surfaces (Procedure K.8; EMON/OU3-021)

1 Scope and Application

This method describes the collection and preparation for laboratory analysis of metallic samples, from structural steel, tanks, equipment, or scrap.

2 Method Summary

2.1 The following equipment is needed:

- Field logbooks
- Stanchions
- Yellow barrier tape
- Nageline® marker
- Clean Herculite® sheeting
- Disposable latex gloves and cotton- or leather-palm work gloves
- Power drill (with a rasp bit, grinding bit, or an altered coring bit) or an Innovative Sampling Systems cutting device for tubes (diamond wire)
- Hardened-alloy steel mortar and pestle
- Stainless steel pan
- Sample containers
- Synthetic ice and ice chest
- Large and small plastic bags.

2.2 The work packet is reviewed, the sample location determined, the work zone established, and the sampling equipment precleaned and set up at the sample location.

2.3 Metal slices are obtained from the sample location by using the diamond wire. Representative samples are extracted from the metal slices by using the power drill with a rasp bit or grinding bit and the power drill with an altered coring bit (V-shaped, chip-breaking grooves made in the cutting edge of the coring bit at right angles to the cutting edge).

2.4 Field measurements (photoionization detector and radiological screening) are performed, as applicable. Measurements are recorded in the Field Measurement Logbook.

2.5 The samples are containerized, labeled, and logged into the Intrusive Sampling Logbook and SWAR/CR.

2.6 Sampling equipment is decontaminated to the appropriate level.

2.7 The completed sampling-round samples are delivered to the site analytical laboratory.

D.I.2.23 Sampling Shreddable Solids (Procedure K.8; EMON/OU3-022)

1 Scope and Application

This method describes the collection and preparation for laboratory analysis of fabric and sheet metal samples from heating, ventilating, or air conditioning (HVAC) filters, ducts, and siding.

2 Method Summary

2.1 The following equipment is needed:

- Field logbooks
- Stanchions
- Yellow barrier tape
- Nageline® marker
- Clean Herculite® sheeting
- Disposable latex gloves and cotton- or leather-palm work gloves
- Stainless steel shears
- Stainless steel pan
- Synthetic ice and ice chest
- Sample containers
- Large and small plastic bags.

2.2 The work packet is reviewed, the sample location determined, the work zone established, and the sampling equipment precleaned and set up at the sample location.

2.3 The samples are extracted from the sample location and shredded by using the stainless steel shears.

2.4 Field measurements (photoionization detector and radiological screening) are performed, as applicable. Measurements are recorded in the Field Measurement Logbook.

2.5 The samples are containerized, labeled, and logged into the Intrusive Sampling Logbook and SWAR/CR.

2.6 Sampling equipment is decontaminated to the appropriate level.

2.7 The completed sampling-round samples are delivered to the site analytical laboratory.

D.I.2.24 Sampling Solids in Lines (Procedure K.5 and K.8; EMON/OU3-023)

1 Scope and Application

This method describes the collection and preparation for laboratory analysis of solid media samples from pipes, conduits, and lines.

2 Method Summary

2.1 The following equipment is needed:

- Field logbooks
- Stanchions
- Yellow barrier tape
- Nageline® marker
- Clean Herculite® sheeting
- Disposable latex gloves and cotton- or leather-palm work gloves
- Stainless steel collection pan
- Bottle brush, steel brush, wooden dowel, or stainless steel rod
- Stainless steel scoop
- Innovative Sampling Systems cutting device for tubes (diamond wire)
- Hammer
- Sample containers
- Synthetic ice and ice chest
- Large and small plastic bags.

2.2 The work packet is reviewed, the sample location determined, the work zone established, and the sampling equipment precleaned and set up at the sample location.

2.3 If the media is loose enough on the sample location, the hammer is used to dislodge the sample. If a sample cannot be extracted by using a hammer, the diamond wire is used to cut the media.

2.4 Field measurements (photoionization detector and radiological screening) are performed, as applicable. Measurements are recorded in the Field Measurement Logbook.

2.5 The samples are containerized, labeled, and logged into the Intrusive Sampling Logbook and SWAR/CR.

2.6 Sampling equipment is decontaminated to the appropriate level.

2.7 The completed sampling-round samples are delivered to the site analytical laboratory.

D.I.2.25 Intrusive Sampling Logbook (Procedure K.9; EMON/OU3-003)

1 Scope and Application

This method describes the guidelines and responsibilities for log-keeping activities and the type of data recorded during intrusive sample collection activities. This method provides a controlled system for logbook recording activities during intrusive sampling events.

2 Method Summary

2.1 The following equipment is needed:

- Intrusive Sampling Logbook
- Black indelible ink pen.

2.2 A minimum of two pages (one containing information about the sampling round and one or more containing information about the sampling event[s]) are completed in the Intrusive Sampling Logbook for a sampling round.

2.3 During each sampling event, completed items are entered on the appropriate page in the Intrusive Sampling Logbook.

2.4 Sampling-round and sampling-event entries are reviewed daily for accuracy and completeness.

2.5 Completed Intrusive Sampling Logbooks are forwarded to the OU3 RI/FS Program management staff for retention.

D.I.2.26 Equipment Decontamination (Procedure K.11; EMON/OU3-004)

1 Scope and Application

This method describes the three levels of decontamination and the equipment and methods used for the decontamination of sampling equipment.

1.1 Level I decontamination is for equipment, tools, and other items that *do not* come in contact with the sampled media.

1.2 Level II decontamination is for equipment, tools, and other items that *do* come in contact with the sampled media. Contamination *is not* visible or detectable (where readings are equal to or less than background) by screening with field instruments.

1.3 Level III decontamination is for equipment, tools, and other items that come in contact with the sampled media. Contamination *is* visible or detectable (where readings are greater than background) by screening with field instruments.

2 Method Summary

2.1 Level I Decontamination

2.1.1 The following equipment is needed for Level I decontamination:

- Stainless steel bucket
- Disposable latex gloves and nitrile gloves
- Portable pressure sprayer filled with potable water or steam cleaner
- Bung-type drum
- Transferring funnel
- Lint-free wipes.

2.1.2 For Level I decontamination, the sampling equipment is steam cleaned or washed down using high-pressure potable water.

2.2 Level II Decontamination

2.2.1 The following equipment is needed for Level II decontamination:

- Three stainless steel buckets
- Clean Herculite® sheeting
- Three polyethylene brushes (one brush per bucket)
- Two portable pressure sprayers filled with de-ionized water
- Disposable latex gloves and three pairs of nitrile gloves (one pair per bucket)
- Bung-type drum
- Transferring funnel
- Lint-free wipes
- Three clean plastic bags (to cover the stainless steel buckets)
- One large clean plastic bag (to hold all three buckets)
- Roll of 1-in. yellow tape
- Safety goggles.

2.2.2 Level II decontamination is conducted as follows:

- The equipment is rinsed with potable water.
- The equipment is washed with a phosphate-free, laboratory detergent and potable water solution, steam-cleaned, or washed with high-pressure, potable water.
- The equipment is rinsed again with potable water.
- The equipment is rinsed twice with certified, deionized, organic-free (ASTM Type II) water.
- The equipment is air dried and immediately covered with plastic or aluminum foil.
- The equipment should remain covered from the time decontamination is complete until use.

- Only aluminum foil may be used to cover equipment used to sample organic parameters. If aluminum foil is used, the equipment should be wrapped with the shiny side out. Aluminum foil should not be used if aluminum contamination may be a problem.

2.3 Level III Decontamination

2.3.1 The following equipment is needed for Level III decontamination:

- Four stainless steel buckets
- One plastic container, intermediate stage (organic contamination)
- Three clean plastic sheets
- Five portable pressure sprayers filled with deionized water
- Disposable latex gloves
- Five pairs of nitrile gloves (one pair per bucket)
- Four polyethylene brushes (one brush per bucket)
- One bung-type drum
- Transferring funnel
- Lint-free wipes
- Large and small plastic bags
- Roll of 1-in. yellow tape
- Five clean plastic bags (to cover the stainless steel buckets)
- Face shield
- One large clean plastic bag (to hold all three buckets).

2.3.2 Level III decontamination is conducted as follows:

- The equipment is rinsed with potable water.
- The equipment is washed with a phosphate-free, laboratory detergent and potable water solution, steam-cleaned, or washed with high-pressure, potable water.
- The equipment is rinsed with potable water.

- The equipment is rinsed with acid solution. 1
- The equipment is rinsed again with potable water. 2
- The equipment is rinsed with approved solvent (methanol). 3
- The equipment is triple-rinsed with certified, deionized, organic-free (ASTM Type II) water. 4 5
- The equipment is air dried in a relatively dust-free environment, if time permits. Otherwise, it is covered with plastic or aluminum foil. 6 7

D.I.2.27 Integrated Radon in Air by Activated Carbon Canister (Procedure FM-RAD-0182)

Working Linear Range:	**0.5 picocuries/liter (pCi/L) - <0.001 pCi/L (function of exposure time)**
Reporting Limit:	**4 pCi/L**
Reporting Units:	**pCi/L**
Matrix:	**Air**

1 Scope and Application

1.1 This method is suitable for screening enclosed areas for the presence of radon-222 (^{222}Rn) in excess of the U.S. Environmental Protection Agency (EPA) guidelines for dwellings.

1.2 The sample collected by this procdure represents the concentrations of Rn progeny only at the time of sampling. The sample does not reflect changes that may occur over time.

2 Method Summary

2.1 A canister, equipped with a diffusion barrier, is filled with activated charcoal. The canister is placed in the environment to be screened for two to seven days, as recommended by the manufacturer. Ambient Rn passes through the diffusion barrier and is adsorbed by the activated charcoal.

2.2 After the exposure is completed, the canister is sealed and stored for at least four hours. The canister is counted by gamma spectroscopy within ten days after exposure.

2.3 The airborne concentration of Rn is calculated based on the presence of the radioactive isotopes of the decay daughters in the charcoal, including lead-214 (^{214}Pb) and bismuth-214 (^{214}Bi). It is assumed that the decay daughters are in equilibrium with ^{222}Rn per liter of air (pCi/L). It is assumed that the concentration of ^{222}Rn is calculated at the time that the canister was sealed.

D.I.2.28 Integrated Radon in Air by Passive Alpha Track Detector (Procedure FM-RAD-184)

Working Linear Range: **0.2 pCi/Liter - < 0.001 pCi/L (function of exposure time)**
Reporting Limit: **4 pCi/L**
Reporting Units: **pCi/L of air**
Matrix: **Air**

1 Scope and Application

1.1 This method is suitable for indoor and outdoor determinations of average ^{222}Rn concentrations over extended periods of time. Sample media may be used over a period of several months and as long as one year. Follow the recommendations provided by the manufacturer concerning the maximum duration of exposure.

1.2 This procedure applies to the field sampling activities. The sample must be analyzed by a commercially available system; this procedure does not describe the detailed requirements for analysis.

2 Method Summary

2.1 Radon gas diffuses into a chamber through a filter designed to exclude alpha emitting aerosols and thoron gas. The chamber contains a sample of CR-39 film or related material that sustains alpha track damage proportional to the average Rn concentration multiplied by the exposure time.

2.2 After exposure, the alpha track film is submitted to a commercial vendor for analysis. The film is etched and the enlarged alpha tracks are examined microscopically and counted.

2.3 The airborne concentration of Rn is calculated according to the measured alpha tracks and the exposure time. The data are converted to units of picocuries of ^{222}Rn per liter of air (pCi/L).

D.I.2.29 Radon Progeny in Air by Modified Kusnetz Method (Procedure FM-RAD-0185)

Working Linear Range:	**< 0.05 working levels (WL), function of air volume sampled**
Reporting Limit:	**0.1 WL**
Reporting Units:	**WL**
Matrix:	**Air**

1 Scope and Application

1.1 This method is applicable for indoor and outdoor determinations of average ^{222}Rn concentrations over extended periods of time.

1.2 The sample collected by this procedure represents the concentrations of Rn progeny only at the time of sampling. The sample does not reflect changes that may occur over time.

2 Method Summary

2.1 Samples of ambient air are filtered through an open face glass fiber membrane filter using a calibrated air flow sampling pump. The filter is counted for the presence of total alpha radiations using an alpha scintillation system or calibrated gas flow proportional counter. The radiation measurements are performed at specified times after the sampling process is completed.

2.2 The count rate is converted to WLs of Rn progeny by adjusting the rate using the instrument efficiency and by applying the time dependant Kusnetz factor. WL is calculated by a formula that involves the sample count rate, the detector efficiency, the sample volume and a factor which approximates the ratio of Rn daughters in the sample.

2.3 The sample must be counted at least 40 min after sampling but less than 90 min after sampling is complete.

D.I.3 LABORATORY ANALYTICAL PROCEDURES

D.I.3.1 Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (Procedure FM-ORG-0010)

Working Linear Range:	**Analyte- and matrix-dependent**
Reporting Limit:	**Analyte- and matrix-dependent**
Reporting Units:	**Water, µg/L; Soil, µg/kg**
Matrices:	**Water, sediment, soil, sludge, bulk samples, and waste**

1 Scope and Application

This analytical method is designed to analyze water, sediment, soil, and waste.

2 Method Summary

2.1 Water Samples

2.1.1 A sample aliquot is diluted with water (except for low-level samples). An inert gas is bubbled through a 5-mL aliquot of the diluted sample contained in a specifically designed purging chamber at ambient temperature. Purgeables are efficiently transferred from aqueous phase to vapor phase. The vapor is swept through a sorbent column where purgeables are trapped. After purging is completed, the sorbent column is heated and backflushed with inert gas to desorb purgeables onto a gas chromatograph (GC) column. The GC is temperature programmed to separate the purgeables, which are then detected with a mass spectrometer.

2.2 Soil/Sediment Samples

2.2.1 Low Level: An inert gas is bubbled through a mixture of a 5-gram sample and reagent water contained in a specially designed purging chamber at elevated temperatures. Purgeables are efficiently transferred from aqueous phase to vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and backflushed with inert gas to desorb purgeables onto a GC column. The GC is temperature programmed to separate the purgeables, which are then detected with a mass spectrometer.

2.2.2 Medium Level: A measured amount of soil is extracted with methanol, and a portion of the extract is diluted to 5 mL with reagent water. An inert gas is bubbled through the solution in a specifically designed purging chamber at ambient temperature. The purgeables are effectively transferred from aqueous phase to vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and backflushed with inert gas to desorb purgeables onto a GC column. The GC is temperature programmed to separate the purgeables, which are then detected with a mass spectrometer.

D.I.3.2 Chlorinated Pesticides/Polychlorinated Biphenyls by Gas Chromatography (Procedure FM-ORG-0030)

Working Linear Range:	**To be determined; analyte- and matrix-dependent**
Reporting Limits:	**Tabulated in complete procedure**
Reporting Units:	**Liquids, µg/L; solids, µg/kg**
Matrices:	**Water, sediment, soil, sludge, waste, and bulk solids**

1 Scope and Application

1.1 This method describes procedures to analyze water, soil, sludges, wastes, and bulk solids for chlorinated pesticides/polychlorinated biphenyls (PCBs). The extraction procedure is appropriate for the sample matrix.

1.2 Target compounds and the corresponding practical quantitation limits (PQLs) for this method are listed in the procedure.

2 Method Summary

A measured amount of sample is extracted with methylene chloride. Appropriate cleanup procedures are employed to remove or minimize interferences from the matrix. The extract is then dried and exchanged to hexane during concentration to a volume of 10 mL or less. The extract is separated by gas chromatography (GC), and the parameters of interest are measured with an electron capture detector (ECD) or Hall electrolytic conductivity detector (HECD). Confirmation of tentatively identified parameters is required. This may be accomplished by using a second confirmation GC column or GC/mass spectrometry (MS) techniques.

D.I.3.3 Volatile Organic Compounds by Gas Chromatography, Purge and Trap (Procedure FM-ORG-0050)

Working Linear Range:	**1 to 200 µg/L**
Reporting Limit:	**Matrix dependent**
Reporting Units:	**µg/L or µg/kg dry weight**
Matrices:	**Water, sediment, soil, sludge, waste and bulk solids**

1 Scope and Application

This method describes procedures to analyze water, soil, and sediment samples for selected volatile organic compounds by using purge-trap-desorb GC techniques.

2 Method Summary

2.1 Water samples are analyzed directly by bubbling an inert gas through a sample contained in a specially designed purging chamber at ambient temperature.

2.2 Soil, sediment, and sludge samples are analyzed by one of two methods depending on the concentration of volatile components in the matrix. For low-level solid samples, the matrix is suspended in water and the suspension purged in a heated sparging chamber. Medium- to high-level solid samples are extracted with methanol. An aliquot of the methanol extract is spiked into reagent water and analyzed according to procedures described for water samples.

2.3 The volatile components from the different matrixes are thus transferred efficiently from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column (analytical trap) where the volatile components are stripped from the purge gas. After purging is completed, the sorbent column is heated and backflushed with an inert gas directed into a GC. The volatile components are transferred to a GC column that is temperature programmed to separate the compounds. The GC is equipped with a photoionization detector (PID) connected in series with an HECD. The PID can detect aromatic compounds, and the HECD can detect halogenated compounds.

D.I.3.4 Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (Procedure FM-ORG-0060)

Working Linear Range:	**Detection limit to 200 ppb**
Reporting Limit:	**Analyte- and matrix-dependent**
Reporting Units:	**µg/L or µg/kg**
Matrices:	**Water, sediment, soil, sludge, waste, and bulk solids**

1 Scope and Application

1.1 The method uses GC/MS techniques to identify and quantitate organic compounds in a sample. The components are separated in a GC column and identified and quantified by an MS detector.

1.2 Identification is based on the ionization of a compound into charged fragments using an electron beam. The fragmentation (called mass spectrum) pattern is unique to each compound. Since MS cannot usually distinguish between isomers with the same mass spectra, the GC retention times provide a means for determining the identity of isomers.

1.3 Quantification is accomplished by comparing the area integration of a particular mass ion (called characteristic ion) in a compound's mass spectrum to that of a standard of known concentration.

2 Method Summary

2.1 The method is used for the determination of semivolatile organic compounds in waters, soils, sediments, and wastes.

2.2 The method covers the determination of organic compounds that may be partitioned into methylene chloride and are amenable to GC/MS. Such compounds include polynuclear aromatic hydrocarbons, chlorinated hydrocarbons, pesticides, phthalate esters, organophosphate esters, nitrosamines, haloethers, aldehydes, ethers, ketones, anilines, pyridines, quinolines, aromatic nitro compounds, and phenols including nitrophenols.

2.3 Problems have been associated with some compounds covered by the method. Dichlorobenzidine and 4-chloroaniline are subject to oxidative losses during solvent concentration, and chromatography is poor. Hexachlorocyclopentadiene is subject to thermal decomposition in the inlet of the GC, chemical reaction in acetone solution, and photochemical decomposition. N-nitrosodimethylamine is difficult to separate from the solvent under the chromatographic conditions described. N-nitrosodiphenylamine decomposes in the GC inlet forming diphenylamine and consequently cannot be separated from diphenylamine native to the sample. Pentachlorophenol, 2,4-dinitrophenol, 4-nitrophenol, 4,6-dinitro-2-methylphenol, 4-chloro-3-methylphenol, benzoic acid, 2-nitroaniline, 3-nitroaniline, and benzyl alcohol are subject to erratic chromatographic behavior, especially if the GC system is contaminated with high boiling material.

2.4 Pesticides and PCBs are analyzed by GC procedures provided for the specific pesticide class.

2.5 The method may be used for confirmation of chlorinated pesticides and PCBs identified by GC and ECD if concentrations permit.

D.I.3.5 Metals by Graphite Furnace Atomic Absorption (Procedure FM-INO-0010)

Working Linear Range:	**Metal-dependent; see specific metal**
Reporting Limits:	**Metal-dependent; see specific metal**
Reporting Units:	**µg/L for water; mg/kg for solids**
Matrices:	**Water, soil, sediment, sludge, waste, and bulk solids**

1 Scope and Application

1.1 Metals in solution may be readily determined by several techniques, including atomic absorption spectroscopy. The graphite furnace technique often offers the advantage of lower detection limits than the conventional flame and the inductively coupled plasma techniques. Another advantage of the technique is that it requires only a small volume for analysis. It is, however, subject to more interferences than the flame technique and requires longer analysis time.

1.2 The graphite furnace technique is applicable to the analysis of metals in aqueous and nonaqueous samples following digestion. It is recommended for determinations that require detection limits achievable by other methods. Detection limits are dependent on the spectrometer and the sample matrix.

2 Method Summary

The sample is subjected to an acid digestion procedure to ensure that the metals are in solution (the digestion procedure may be done using microwave energy). The digestate is then analyzed by graphite furnace atomic absorption spectroscopy and the concentration determined by using a calibration curve. Most metals may require the addition of matrix modifiers to sample during the sample injection process.

D.I.3.6 Metals by Atomic Absorption Spectrometry, Flame Technique (Procedure FM-INO-0020)

Working Linear Range:	**Metal-dependent; see specific metal**
Reporting Limit:	**Metal-dependent; see specific metal**
Reporting Units:	**Water, µg/L; solids, mg/kg**
Matrices:	**Water, soil, sediment, sludge, waste, and bulk solids**

1 Scope and Application

1.1 Scope and Application: The method is applicable to a large number of metals in drinking, surface, and saline waters and domestic and industrial wastes. Drinking water free of particulate matter may be analyzed directly, but groundwater, other aqueous samples, TCLP extracts, industrial wastes, soils, sludges, sediments, and other solid wastes require digestion before analysis.

1.2 Detection limits, sensitivity, and optimum ranges for analysis will vary with sample matrix and the model of atomic absorption system used (and method of background correction). Table 1 lists typical detection limits for clean samples. Detection limits may be improved by sample concentration or by solvent extraction techniques.

1.3 Where the flame technique does not offer detection low enough to meet the required reporting limits, other techniques must be used.

2 Method Summary

An aliquot of sample is acid-digested by a steam bath, hot plate, or microwave oven. The volume of the digestate is adjusted. The digestate is then aspirated into the flame and the absorbance measured at a characteristic wavelength. The concentration of the sample is determined with a calibration curve.

D.I.3.7 Nitrite/Nitrate by Flow Injection Analysis (Procedure FM-CON-0040)

Working Linear Range:	**0.1 to 20 mg N/L as NO_3^- or NO_2^-**
Reporting Limit:	**Water, 0.1 mg N/L; to be determined for solid matrices**
Reporting Units:	**mg N/L or mg N/kg**
Matrices:	**Surface, saline, and ground waters; also solid matrices**

1 Scope and Application

1.1 The method covers the measurement of nitrate/nitrite in surface, saline, and ground waters by flow injection analysis.

1.2 Solid matrices including asphalt, concrete, transite, wood, drywall, soil, sediment, sand, gravel, sludge, masonry, inorganic residues, dust, and heterogeneous waste can be analyzed if a neutral extraction is performed before analysis.

2 Method Summary

2.1 Nitrate is quantitatively reduced to nitrite by treatment of the sample with the copperized cadmium (Cd) metal column.

2.2 Nitrite (reduced nitrate plus original nitrite) is then determined by diazotizing with sulfanilamide, followed by coupling with N-(1-naphthyl)ethylenediamine dihydrochloride. The resulting water-soluble dye is magenta-colored and its absorption is measured at 520 nm. Nitrite alone can be determined by removing the Cd reduction column.

D.I.3.8 Analysis of Total Organic Carbon (Procedure FM-CON-0080)

Working Linear Range:	**Instrument dependent**
Reporting Limit:	**Water, 1 mg/L; solids, varies by matrix**
Reporting Units:	**Water, mg/L; solids, mg/kg**
Matrices:	**Water, wastewater, concrete, transite, wood, dry wall, soil, sediment, sand, gravel, sludge, salts, powders, masonry, steel, metals, glass, Inorganic residues, dust, heterogeneous waste**

1 Scope and Application

This method is applicable for aqueous and non-aqueous matrix samples in conjunction with procedures described in a Total Organic Carbon (TOC) Analyzer Systems manual such as Dohrmann Xertex DC-80 or Rosemount Dohrmann DC-180. Solid samples are analyzed using the auxiliary high-temperature combustion furnace.

2 Method Summary

2.1 Total Carbon (TC) is defined as all the carbon present in a sample and comprises total organic and inorganic carbon.

2.1.1 Total Inorganic Carbon (TIC) refers to carbon that is converted to carbon dioxide (CO_2) after acidification of a sample. TIC includes all dissolved CO_2, bicarbonate, and carbonate species and is reported in terms of total mass of carbon (C) per unit of sample (e.g., mg C/L).

2.1.2 TOC refers to all C atoms bonded in organic molecules that are converted to CO_2 by oxidation after inorganic C has been removed or subtracted.

2.2 Organic C is measured using a carbonaceous analyzer. Organic C in the sample is converted to CO_2 by ultraviolet (UV)-promoted persulfate oxidation. The CO_2 formed is measured by non-dispersive infrared detection. The amount of CO_2 detected in a sample is directly proportional to the concentration of carbonaceous material in the sample.

D.I.3.9 Analysis of Extractable and Soluble Sulfide in Sludge, Solids, and Multiphasic Matrices (Procedure FM-CON-0132)

Working Linear Range:	**Solids, 1 to 50 mg/kg; liquids, 1 to 50 mg/kg**
Reporting Limits:	**Solids, 1 mg/kg; liquids, 1 mg/L**
Reporting Units:	**Solids, mg/kg; liquids, mg/L**
Matrices:	**Water,* aqueous liquids, organic liquid, asphalt, organic residues, concrete, wood, dry wall, soil, sediment, sand, gravel, sludge, salts, powders, masonry, metals, glass, inorganic residues, dust, heterogeneous waste**

1 Scope and Application

1.1 The extraction procedure in this method is designed for pre-distillation preparation of oil, solid or multiphasic materials (asphalt, oil, and heterogeneous waste).

1.2 The distillation procedure is designed for the determination of sulfides in aqueous or solid waste materials, extracted fluids, and effluents.

2 Method Summary

2.1 The multiphasic or oil samples are filtered and the solids extracted with water at a pH between 9 and 11. The extract is then combined with the filtrate.

2.2 If the sample is not preserved with zinc acetate, the analysis must start immediately.

2.3 All samples (including extracts) are analyzed after the distillation procedure. Separation of sulfide occurs with the addition of sulfuric acid to the sample. The sample is heated to 70° C and the hydrogen sulfide (H_2S) gas that is formed is distilled under acidic conditions in a closed scrubber system. The H_2S is precipitated as zinc sulfide in a zinc acetate scrubbing solution.

2.4 The sulfide in the zinc sulfide precipitate is oxidized to sulfur (S) with a known amount of excess iodine (I). Then the excess I is determined by titration with a standard solution of phenylarsine oxide (PAO) or sodium thiosulfate until the blue I starch complex disappears. Note: The use of standard sulfide solutions is not possible because of their instability to oxidative degradation. Therefore, quantitation is based on the PAO or sodium thiosulfate.

*Note: Most water samples can be run using FM-CON-0130.

D.I.3.10 Oil and Grease - Infrared and Gravimetric (Procedure FM-CON-0180)

Working Range:	**1.0 to 1,000 mg/L (higher with dilution)**
Reporting Limit:	**Varies by matrix; water, 1.0 mg/L**
Reporting Unit:	**Water, mg/L; solids, mg/kg**
Matrix:	**Water, soil, sediment, sludge and waste**

1 Scope and Application

1.1 The method addresses the measurement of 1,1,2-trichloro-1,2,2-trifluoroethane (fluorocarbon-113) extractable matter from surface and saline waters, industrial and domestic aqueous wastes, soil, sediment and sludge. It is applicable to the determination of hydrocarbons, vegetable oils, animal fats, waxes, soaps, greases, and related matter.

1.2 The gravimetric method is not applicable to measurement of light hydrocarbons that volatilize at temperatures below 70°C. Petroleum fuels from gasoline through No. 2 fuel oils are completely or partially lost in the solvent removal operation.

1.3 Some crude oils and heavy fuel oils contain a significant percentage of residue-type materials that are not soluble in fluorocarbon-113. Accordingly, recoveries of these materials will be low.

2 Method Summary

2.1 Aqueous samples are acidified and serially extracted with fluorocarbon-113 in a separatory funnel.

2.2 Solid samples are reduced to a small particle size, blended with magnesium sulfate, and sonicated or Soxhlet extracted with fluorocarbon-113.

2.3 Infrared or gravimetric analysis of the fluorocarbon-113 extract is performed by direct comparison with standards.

D.I.3.11 Total Petroleum Hydrocarbons (TPH) - Infrared (Procedure FM-CON-0200)

Working Linear Range:	**Water, 0.2 to 1000 mg/L (to 100% with dilution); solids, varies by matrix**
Reporting Limit:	**Water, 0.2 mg/L; solids, varies by matrix**
Reporting Units:	**Water, mg/L and solids, mg/kg**
Matrices:	**Water, wastewater, concrete, transite, wood, dry wall, soil, sediment, sand, gravel, sludge, salts, powders, masonry, steel, metals, glass, inorganic residues, dust, heterogeneous waste**

1 Scope and Application

1.1 This method is applicable for analysis of surface, saline, and ground waters for total recoverable hydrocarbons extracted by 1,1,2-trichloro,1,2,2-trifluoroethane (fluorocarbon-113, Freon) and analyzed by infrared spectrometry.

1.2 This method is also applicable to the analysis of non-aqueous matrix samples in conjunction with Soxhlet or sonication extraction procedures.

1.3 Volatile hydrocarbons such as gasoline are not readily determined by this method, particularly in solid samples.

2 Method Summary

2.1 Aqueous samples are acidified and serially extracted with fluorocarbon-113 in a separatory funnel.

2.2 Solid samples are reduced to a small particle size, blended with magnesium sulfate monohydrate, then sonicated or Soxhlet extracted with fluorocarbon-113.

2.3 Interferences are removed with silica gel adsorbent.

2.4 Infrared analysis of the extract is performed by direct comparison with standards.

D.I.3.12 Asbestos Particulate in Air Samples (Procedure FM-CON-0440)

Working Linear Range:	**100 to 1300 fibers/mm^2 filter area**
Reporting Limit:	**7 fibers/mm^2 filter area**
Reporting Units:	**Fibers/mm^2 or fibers/cc**
Matrix:	**Air**

1 Scope and Application

1.1 The phase contrast microscopy method (National Institute of Occupational Safety and Health [NIOSH]-7400) is applicable to a range of 0.02 fibers/cc of air (1920-liter [L] air sample) to 1.25 fibers/cc (400-L air sample). This method does not differentiate between asbestos, tremolite, anthophyllite, actinolite, or other fibers such as fibrous glass. Asbestos, tremolite, anthophylite, and actinolite fibers less than 0.25 µm diameter will not be detected by this method. Any airborne fiber may interfere since all particles meeting the counting criteria are counted.

1.2 The transmission electron microscopy method (FM-CON-440A) is applicable to a range of 0.04 to 0.5 fibers/cc for a 1000-L air sample. This method is used to determine asbestos fibers in the optically visible range.

2 Method Summary

Air sample filters are prepared for phase contrast microscopy analysis using the acetone/triacetin method with an equivalent index of refraction and similar clarity. Fiber counts are made by only counting fibers equal to or longer than 5 µm and have a length-to-width ratio (aspect ratio) of 3:1 or greater. Each set of samples taken will include 10% blanks or a minimum of two blanks. The blank results shall be averaged and subtracted from the analytical results before reporting.

D.I.3.13 Analysis of Asbestos Particulate by Transmission Electron Microscopy (Procedure FM-CON-0441)

Working Linear Range:	**100 to 1300 fibers/mm^2 filter area**
Reporting Limit:	**7 fibers/mm^2 filter area**
Reporting Units:	**Fibers/mm^2 or fibers/cc**
Matrix:	**Filter**

1 Scope and Application

1.1 This method is applicable to samples of airborne fibers where it is necessary to positively identify the presence of asbestos, tremolite, anthophyllite and actinolite filters.

1.2 The transmission electron microscopy (TEM) method is applicable to a range of 0.04 to 0.5 fibers/cc for a 1000-L air sample. This method is used to determine asbestos fibers in the optically visible range and is intended to complement the results obtained by phase contrast microscopy. High concentrations of background dust interfere with fiber identification.

2 Method Summary

Air sample filters are prepared for TEM analysis using acetone method, the "hot block" clearing technique, or the DMF clearing technique. Fiber counts are made using the guideline of phase contrast microscopy. However, higher magnification is used to determine fiber dimensions and countability under the acceptable criteria. A minimum of 10% of the fibers, and at least 3 asbestos fibers are analyzed by energy-dispersive X-ray and selected area electron diffraction to confirm the presence of asbestos. Two field blanks per sample set shall be counted to document possible contamination of samples.

D.I.3.14 Asbestos in Heterogeneous Waste (Procedure FM-CON-0442)

Working Linear Range:	**1% to 100% asbestos**
Reporting Limit:	**≤1% of asbestos content of projected sample area**
Reporting Units:	**Percentage**
Matrix:	**Solid waste material**

1 Scope and Application

The polarized light microscopy method is applicable to a range of 1 to 100% asbestos perceived by the analyst in comparison to standard area projections. This method is not applicable to samples containing large amounts of fine fibers below the resolutions of the light microscope. Fibers with optical properties similar to asbestos minerals may give positive interferences. Asbestos fibers may not be detected if fibers are coated, fibers are finer than 0.3 µm, or the index of refraction of asbestos is altered by the heat acid treatment.

2 Method Summary

Collected waste samples are prepared for polarized light microscopy by placing a few drops of refractive index liquids on a small portion of a sample in a slide. The slide is scanned to identify the presence of fibers suspected to be asbestos.

.1D.I.3.15 Isotopic Plutonium in Water, Inorganic and Organic Solids, Soil, Sediment, and Air Filters by Alpha Spectrometry (Procedure FM-RAD-0010)

Working Linear Range:	**Infinite with dilution**
Reporting Limit:	**To be determined**
Reporting Units:	**Liquids, pCi/L; solids, pCi/g; air filters, pCi/filter**
Matrices:	**Water, inorganic and organic solids, soil, sediment, and air filters**

1 Scope and Application

1.1 This procedure covers the determination of plutonium (Pu) isotopes $^{239/240}Pu$ and ^{238}Pu by means of chemical separations and alpha spectrometry. The test method applies to soluble Pu and to particulate matter containing Pu in water, inorganic solids, organic solids, soil, sediment, and air filters. Samples are prepared for separation chemistry by the appropriate matrix.

1.2 This analytical method applies to Analytical Support Levels C and D.

2 Method Summary

This procedure provides for the separation of Pu alpha-emitting radionuclides from chemical and radiochemical interferences by elution from anion exchange resin columns. Samples are prepared for separation chemistry by the appropriate matrix. Water samples may be run by an iron precipitation or a phosphoric acid precipitation. Separation is based on the differences in adsorption and chemical properties of Pu and its interferences. The final mounting technique is also optioned for precipitation of neodymium fluoride or electrodeposition.

D.I.3.16 Determination of Plutonium-241 in Water, Inorganic Solids, Organic Solids, and Air Filters by Liquid Scintillation Counting (Procedure FM-RAD-0020)

Working Linear Range:	**Infinite with dilution**
Reporting Limit:	**To be determined**
Reporting Units:	**pCi/L, pCi/g, pCi/filter**
Matrices:	**Water, inorganic solids, organic solids, and air filters**

1 Scope and Application

This method is applicable to the determination of ^{241}Pu following isotopic Pu determination by Method FM-RAD-0010 in water, inorganic solid, organic solid and air filters.

2 Method Summary

The determination is based on dissolving the filter (for neodymium [Nd] precipitate) or splitting the sample in half (for electrodeposition) and measuring the ^{241}Pu beta by use of a liquid scintillation counting technique.

D.I.3.17 Americium-241 in Water, Milk, Soil/Sediment, Air Filters, and Miscellaneous Solids by Alpha Spectrometry (Procedure FM-RAD-0030)

Working Linear Range:	**Infinite with dilution**
Reporting Limit:	**To be determined**
Reporting Units:	**Water, milk, pCi/L; soil, miscellaneous solids, pCi/g; air filters, pCi/filter**
Matrices:	**Water, milk, soil, miscellaneous solids, air filters**

1 Scope and Application

1.1 This procedure applies to the determination of americium-241 (^{241}Am) in water, milk, soil/sediment, and miscellaneous solids by alpha spectrometry. The minimum detectable concentration for this method depends on sample size, counting system characteristics, background, and counting time.

1.2 This analytical method applies to Analytical Support Levels C and D.

2 Method Summary

^{243}Am or curium-244 (^{244}Cu) is added to the sample as a tracer. A water sample is evaporated, a milk sample is oven dried and ashed, an air filter sample or a miscellaneous solid sample is dissolved, and a soil sample is decomposed by nitric-acid (HNO_3)-hydrofluoric-(HCl)-acid digestion. The sample residue is dissolved in HNO_3 and loaded on a disposable anion exchange column. Neptunium (Np), thorium (Th), and Pu are adsorbed on the resin and discarded. The effluent is collected and dried. The collected effluent is further purified to remove the possible contaminants of promethium (Pm), iron (Fe), calcium (Ca), and magnesium (Mg) through a cation exchange column. Am and Cu are eluted with 6.5 M hydrochloric acid (HCl). The nuclide under investigation is co-precipitated with a neodymium (Nd) carrier, filtered, and counted on a solid state detector (e.g., silicon surface barrier) to determine the activity of ^{244}Am by alpha spectrometry.

D.I.3.18 Radium-228 in Milk, Vegetation, Inorganic and Organic Solids and Liquids, Water, and Air Filters, Soil/Sediment by Beta Counting (Procedure FM-RAD-0040)

Working Linear Range:	**> 1 pCi/L, infinite with dilution**
Reporting Limit:	**~1 pCi/L water; to be determined in other matrices**
Reporting Units:	**Liquids, pCi/L; solids, pCi/g; air filters, pCi/filter**
Matrices:	**Milk, vegetation, water, inorganic (solid or liquid), organic (solid or liquid), air filters, soil/sediment**

1 Scope and Application

This method covers the determination of radium (^{228}Ra) in water and air filters. The nominal sensitivity of the procedure may vary with each analysis but is approximately 1 pCi/L for water. The nominal sensitivity that may be obtained by this exact method for air filters requires additional performance data.

2 Method Summary

2.1 The Ra in the sample is co-precipitated as radium-barium sulfate. The precipitate is dissolved in a disodium ethylenedinitriloacetate dihydrate (EDTA) solution.

2.2 ^{228}Ra, a weak beta emitter, decays to actinium-228 (^{228}Ac), which is allowed to ingrow for at least 36 h. The ^{228}Ac is carried with yttrium (Y), purified, and precipitated as yttrium oxalate.

2.3 The ^{228}Ac is beta counted in a low background proportional counter, and its measured activity is used to calculate the ^{228}Ra concentration of the original sample.

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D.I.3.19 Radium-226 in Water, Milk, Soil/Sediment and Air Filters by Emanation/Scintillation Counting (Procedure FM-RAD-0050)

Working Linear Range:	**Infinite with dilution**
Reporting Limit:	**0.1 pCi/L milk and water; 0.04 pCi/g solids; to be determined air filters**
Reporting Units:	**Milk, water, pCi/L; solids, pCi/g; air filters, pCi/filter**
Matrices:	**Milk, water, solids, soil/sediment, air filters**

1 Scope and Application

1.1 The method is used for the determination of low-level ^{226}Ra in milk, soil/sediment, solids, water, and air filters. The technique may be applied to almost any material that can be converted to a homogeneous solution. The nominal sensitivity of the procedure may vary with each analysis but is approximately 0.04 pCi/g for soil/sediment and 0.1 pCi/L for liquids such as milk and water. The nominal sensitivity that may be obtained by this method for air filters needs performance data.

1.2 This analytical method applies to Analytical Support Levels C and D.

2 Method Summary

2.1 The method is based on the emanation and scintillation counting of the radon-222 (^{222}Rn) progeny of ^{226}Ra. It is made specific for ^{226}Ra by allowing the shorter-lived Rn progeny of other Ra isotopes to decay before counting.

2.2 After sample pretreatment, most interferences are removed by successive fuming nitric acid separations. Ra is then coprecipitated with barium sulfate and the resulting barium-radium sulfate is decomposed with phosphoric acid. The glassy melt product is dissolved to form soluble barium (Ba)-radium salts. The salts are dissolved and the solution stored to allow the ^{222}Rn to ingrow. After the ingrowth period, the Rn gas is purged from the solution, collected in a counting cell, and counted after a 4 h wait. The ^{226}Ra yield is determined by using a ^{133}Ba tracer.

2.3 The method differs for the sample matrices only in the sample preparation steps.

D.I.3.20 Lead-210 by Beta Counting (Procedure FM-RAD-0070)

Working Linear Range:	**To be determined**
Reporting Limit:	**To be determined**
Reporting Units:	**Water and milk, pCi/L; solids, pCi/g; filters, pCi/filter,pCi/ml, pCi/L, pCi/cc**
Matrices:	**Water, milk, inorganic solids, organic solids, filter(s)**

1 Scope and Application

1.1 This test method covers two methods (A and B) for the determination of isotopic lead-210 (^{210}Pb) in water, inorganic solids, organic solids, and filters by means of chemical separation and beta counting. The nominal sensitivity of the procedure may vary with each analysis and will be determined for each matrix.

1.2 The method applies to Analytical Support Levels C and D.

2 Method Summary

2.1 Procedure A

2.1.1 To determine the amount of ^{210}Pb present in the sample, bismuth-210 (^{210}Bi) is counted.

2.1.2 Pb carrier is added to a sample. The Pb is separated as a lead bromide complex by solvent extraction with methyltricaprylammonium chloride in toluene. Bismuth carrier is added, and the sample preparation is stored to allow the ingrowth of ^{210}Bi. The ^{210}Bi progeny is separated from the ^{210}Pb parent by precipitation as bismuth oxychloride and is measured using a low background beta counter. Chemical yields are determined by atomic absorption for Pb and gravimetrically for Bi. A calibration standard and reagent blank are processed concurrently with the samples.

2.2 Procedure B

2.2.1 This procedure provides for the separation of ^{210}Pb beta emitting nuclides by elution from anion exchange resin columns. Separation is based on the differences in absorption and chemical properties of ^{210}Pb and contaminants.

2.2.2 An appropriate aliquot of sample is taken for analysis. Stable Pb carrier is added to the sample.

2.2.2.1 Aqueous: Through addition of an Fe carrier and ammonium hydroxide, Pb is coprecipitated from aqueous samples containing iron hydroxide. The sample is brought up in dilute HCl and introduced to a pre-conditioned anion-exchange column. The Fe remains on the column while the Pb passes through. The ^{210}Pb is separated by passing the Pb fraction through a weak HCl anion-exchange column. The Pb is eluted from the column and precipitated as a sulfate, mounted, and the ^{210}Bi daughter is beta counted after an appropriate ingrowth time.

2.2.2.2 Solid: An appropriate weight of solid sample is aliquoted for analysis. As appropriate, the sample is dried and/or muffled to ash in a furnace. The exact muffling sequence and amount of sample must be determined on an individual matrix basis. Stable Pb carrier is added to the sample. The aliquot is dissolved with a series of additions of HNO_3 and HF and evaporated to dryness. The sample is microwaved with HNO_3 and HF. The sample is converted to a chloride form prior to loading onto ion exchange columns. The Pb solution is evaporated to dryness and dissolved in water. Pb sulfate (Pb SO_4) is precipitated and transferred to a preweighed planchet. The precipitate is dried to constant weight to determine chemical recovery, and ^{210}Bi is allowed to ingrow for 21 d.

2.2.2.3 Filter: One or more air particulate filter(s) are selected for analysis. Stable, standardized Pb carrier is added to the sample. The sample is placed in a beaker and muffled in a programmable furnace. If glass fiber filters were used, the residue is dissolved in HF and evaporated to dryness several times. The residue is dissolved in a series of HNO_3 additions. This solution is converted to the chloride form prior to loading on the ion exchange columns. The Pb solution is evaporated to dryness and dissolved in water. $PbSO_4$ is precipitated and transferred to a preweighed planchet. The precipitate is dried to constant weight to determine chemical recovery, and ^{210}Bi is allowed to ingrow for 21 d.

2.2.3 The ingrown $^{210}Bi/PbSO_4$ is counted by gas proportional counter to determine the ^{210}Bi and thus the ^{210}Pb activity.

D.I.3.21 Isotopic Thorium in Milk, Vegetation, Soil/Sediment, Inorganic and Organic Solids, Water, and Air Filters by Alpha Spectrometry (Procedure FM-RAD-0080)

Working Linear Range:	**Infinite with dilution**
Reporting Limit:	**To be determined**
Reporting Units:	**Milk, water, pCi/L; solids, pCi/g; air filters, pCi/filter**
Matrices:	**Milk, vegetation, water, soil/sediment, air filters, and organic and inorganic solids**

1 Scope and Application

1.1 The method covers the measurement of ^{228}Th, ^{230}Th, and ^{232}Th in milk, vegetation, organic and inorganic solids, soil/sediment, water, and air filters. The mass of these three isotopes can be calculated from the measured activities using the specific activity factors for each isotope. The nominal sensitivity that may be obtained by this exact method for the media requires performance data. Note that the beta emitting ^{234}Th isotope is not covered by the method.

1.2 This analytical method applies to Analytical Support Levels C and D.

2 Method Summary

The sample is dissolved in acid or ashed, and the residue is dissolved in acid. Th is separated from uranium (U) by organic extraction and purified by adsorption on anion exchange resin from HNO_3. It is stripped from the resin with HCl and electrodeposited onto a stainless steel disk. The disk is counted on a solid state detector (e.g., a silicon surface barrier) to determine the Th isotopes by alpha spectrometry. The recovery of the Th isotopes is measured using a ^{229}Th tracer.

D.I.3.22 Neptunium-237 in Water, Milk, Soil/Sediment, Air Filters, and Miscellaneous Solids by Alpha Spectrometry (Procedure FM-RAD-0090)

Working Linear Range:	**Infinite with dilution**
Reporting Limit:	**To be determined**
Reporting Units:	**Water, milk, pCi/L; Soil, miscellaneous solids, pCi/g; air filters, pCi/filter**
Matrices:	**Water, milk, soil, miscellaneous solids, air filters**

1 Scope and Application

1.1 This procedure applies to the determination of ^{237}Np in water, milk, soil/sediment, and miscellaneous solids by alpha spectrometry. The minimum detectable concentration for this method depends on sample size, counting system characteristics, background, and counting time.

1.2 This analytical method applies to Analytical Support Levels C and D.

2 Method Summary

^{243}Am tracer is added to the sample. A water sample is evaporated, a milk sample is oven dried and ashed, an air filter sample or a miscellaneous solid sample is dissolved, and a soil sample is decomposed by HNO_3-HF digestion. The sample residue is dissolved in HNO_3 and loaded on a disposable anion exchange column. The ^{243}Am tracer and many other actinide elements such as U, Cm, promethium (Pm), and strontium (Sr), are eluted with 8 M HNO_3 and discarded. ^{237}Np along with ^{239}Np (daughter of ^{243}Am) are eluted with 6.5 M HCI-0.04 M HF solution. The nuclide under investigation is co-precipitated with Nd carrier, filtered, and counted on a solid state dectector (e.g., silicon surface barrier) to determine the activity of ^{237}Np by alpha spectrometry. The tracer yield is determined by beta counting ^{239}Np.

D.I.3.23 Isotopic Uranium in Vegetation, Milk, Water, Soil, Inorganic Solids and Air Filters by Alpha Spectrometry (Procedure FM-RAD--0100)

Working Linear Range:	**Greater than 1 pCi/L, infinite with dilution**
Reporting Limit:	**~1 pCi/L (water); to be determined for other materials**
Reporting Units:	**Milk, water, pCi/L; solids, pCi/g; air filters, pCi/filter**
Matrices:	**Milk, vegetation, water, air filters, soil, inorganic solids**

1 Scope and Application

1.1 This procedure applies to determination of isotopic U in milk, water, vegetation, soil/sediment, inorganic solids and air filters. Total U activity is determined by adding the results for the individual isotopes ($^{233/234}U$, $^{235/236}U$, ^{238}U). Total U mass may be determined with the specific activity factors for each isotope. The nominal sensitivity may vary with each analysis but is approximately 0.06 pCi/L ($^{235,238}U$), 1 pCi/L (^{234}U) for water. The nominal sensitivity that may be obtained by this exact method for the other media requires additional performance data.

1.2 This analytical method applies to Analytical Support Levels C and D.

2 Method Summary

A U tracer (^{232}U) is added to the sample. A milk or vegetation sample is oven dried and ashed, a water sample is evaporated, and an air filter is dissolved. The sample residue is dissolved in strong HCl. U is extracted into tri-iso-octylamine (TIOA) and then stripped from the TIOA with dilute HNO_3. Polonium (Po) is removed by adsorption onto nickel (Ni) foil. The U is passed through an anion exchange column and then either electrodeposited onto a stainless steel disk or precipitated with Nd. The sample is counted on a solid state detector (e.g., silicon surface barrier) to determine the U isotopes by alpha spectrometry.

D.I.3.24 Alpha-Emitting Radioisotopes in Aqueous or Organic Liquids by Liquid Scintillation Counting (Procedure FM-RAD-0112)

Working Linear Range:	**Infinite with dilution**
Reporting Limit:	**0.5 pCi/L by liquid scintillation counting and 0.05 pCi/L for liquids using Photon/Electron-Rejecting Alpha Liquid Scintallation (PERALS) spectrometry**
Reporting Units:	**pCi/L**
Matrices:	**Aqueous and organic liquids**

1 Scope and Application

1.1 The method is used for the determination of low-level alpha emitting radioisotopes in aqueous and/or organic liquid samples. The technique may be applied to most clear, homogeneous liquids. The nominal sensitivity of the procedure may vary with each sample but is approximately 0.5 pCi/L for most liquids by normal liquid scintillation counting and 0.05 pCi/L for liquids using PERALS spectrometry.

1.2 This analytical methods applies to Analytical Support Levels C and D.

2 Method Summary

2.1 The method is based on the mixing of sample with liquid scintillation cocktail and direct detection of alpha radiation by liqiud scintillation counting. It is made more specific for alpha emitters through the use of extractive liquid scintillation cocktails especially when coupled with PERALS spectrometry.

2.2 Normal liquid scintillation counting and normal cocktails can be used for samples that are expected to have little or no beta or gamma activity and have sufficient alpha activity to be counted above natural background. Clear samples are mixed with cocktail and counted. Energy channels are selected to allow measurement of the background and total (background and alpha activity) independent and to allow the calculation of the alpha activity with simultaneous equations. The efficiency of the system is evaluated by using standards of well-known activities in similar matrices.

2.3 Further improvements in alpha selectivity and efficiency can be made with the use of PERALS spectrometry, which uses pulse shape analysis to discriminate alpha scintillation pulses from beta, gamma and X-ray scintillation pulses.

D.I.3.25 Gross Alpha and Gross Beta Radioactivity in Water and Air Filters by Proportional Counting (Procedure FM-RAD-0130)

Working Linear Range:	**Infinite with dilution; 0.1 to 100,000 pCi/filter**
Reporting Limit:	**To be determined**
Reporting Units:	**Water, pCi/L; air filter, pCi/filter; pCi/m^3 (air), pCi/mg (particulate)**
Matrices:	**Water, air filters**

1 Scope and Application

1.1 The method establishes a procedure for monitoring water for gross alpha and gross beta activity and air filters for gross beta activity. It also encompasses a method for gross alpha and gross beta in particulate material in air. The method can measure alpha particles with energies above 3.9 million electronvolts (MeV) and beta particles with maximum energies above 0.1 MeV.

1.2 The minimum detectable concentration for the method depends on sample size, counting system characteristics, background, and counting time. For water with extremely high solids content (>500 mg/L), U.S. Environmental Protection Agency (EPA) Method 900.1 is recommended.

1.3 This analytical method applies to Analytical Support Levels C and D.

2 Method Summary

2.1 An aliquot of a dissolved air filter or water sample is evaporated to a small volume and transferred quantitatively to a tared stainless steel counting planchet. The sample residue is dried to constant weight and counted for alpha and/or beta radioactivity.

2.2 The section for particulate in air is designed for 47-mm filters. Corrections will need to be made if other filters are used. The sampling protocol will contain information on each filter if activity per volume of air drawn through the filter is to be reported. If activity per mg of particulate is to be reported, the filter must be weighed after dehydration in a desiccator prior to deployment and re-weighed after dehydration after deployment. The filter is mounted on a planchet and counted on a thin-window proportional counting system. Detection efficiencies are determined by alpha-calibration sources configured in the same geometry as the filter.

2.3 Counting efficiencies for both alpha-and beta-particle activities are selected from graphs (or best fit equations) of counting efficiency versus sample weight. Alpha and beta events are distinguished by pulse-shape discriminator circuitry and accumulated in separate registers in the counting device.

2.4 The radioactive constituents of the sample are not separated from the solids of the sample; therefore, the solids concentration is a limiting factor in the sensitivity of the method for any given (water) sample. For samples with very low radioactivity, it is essential to analyze as large a sample aliquot as possible to give reasonable counting times in meeting the required sensitivity (minimum detectable concentration).

2.5 The largest sample aliquot to be counted for gross alpha activity is the volume that gives a solids density thickness of 5 mg/cm^2 in the counting planchet. For a 2-in.-diameter counting planchet (20 cm^2), an aliquot containing 100 mg of solids is the maximum sample size to be evaporated and counted for gross alpha activity.

2.6 Sample density thickness on the planchet shall not be more than 5 mg/cm^2 for gross alpha and not more than 10 mg/cm^2 for gross beta.

2.7 The concentration of total dissolved solids is not as limiting for determining gross beta activity because beta particles are not stopped in solids as easily as alpha particles. Very often, a single sample aliquot is evaporated and counted for both gross alpha and gross beta activity. In that case, the sample aliquot size would be dictated by the solids limitation for alpha particles. For beta counting only, the solids on the planchet shall be limited to 200 mg (for 2 in. planchet).

2.8 Radionuclides that are volatile under the sample preparation conditions of the method will not be measured. The sample is evaporated after HNO_3 is added, and the nitrated solids that form will not remain at a constant weight after being dried and if exposed to high atmospheric humidity. Therefore, the samples need to be heated to a dull red glow for a few minutes to convert the nitrate salts to oxides. Sample weights are then usually stable enough to give consistent counting rates, and a correct counting efficiency can then be determined.

D.I.3.26 Radioanalysis of Homogeneous and Heterogeneous Matrices by Gamma Spectrometry (Procedure FM-RAD-0140)

Working Linear Range:	**Infinite with dilution**
Reporting Limit:	**To be determined**
Reporting Units:	**Milk, water, pCi/L; solids, pCi/g; air filters, pCi/filter; heterogeneous materials, pCi/sample or pCi/g**
Matrices:	**Water, soil/sediment, air filters, milk, and heterogeneous materials**

1 Scope and Application

1.1 The method applies to determination of gamma ray emitting radionuclides in homogenous samples of soil/sediment, air filters, milk, water, and aqueous solutions (air filter solutions) and heterogeneous samples of concrete, masonry, asphalt, wood, and sludge. Radionuclides typically covered by the method include* $^{137}Cs/^{137}Ba$, $^{106}Ru/^{106}Rh$, ^{40}K, ^{238}U, ^{235}U, ^{226}Ra and ^{228}Ra. Other gamma emitting radionuclides may be analyzed if requested. The minimum detectable concentration for this method depends on sample size and characteristics, counting system characteristics, background, and counting time.

1.2 This analytical method applies to Analytical Support Levels C and D.

2 Method Summary

2.1 For a homogeneous sample, the entire sample or a homogeneous aliquot of the liquid or solid sample is put into a standard geometry for gamma counting. For a heterogeneous sample, the entire sample or a representative aliquot of each matrix is put into a standard geometry for gamma counting. The counting efficiency for the geometry must have been determined with standards of known radionuclide activity. Sample aliquots are counted long enough to meet the required sensitivity. The gamma spectrum is printed out or stored in an appropriate computer-compatible device for data processing (calculation of sample radionuclide concentrations).

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*Cs cesium
Ru ruthenium
K potassium

2.2 Gamma ray spectra are typically measured with a modular equipment system consisting of a detector, analyzer, memory, printer, and permanent data storage device. Germanium (Ge) detectors are used because of their excellent energy resolution.

D.I.3.27 Determination of Technetium-99 by Liquid Scintillation Counting (Procedure FM-RAD-0150)

Working Linear Range:	**10 pCi/L to 10000 pCi/L**
Reporting Limit:	**30 pCi/L, 15 pCi/g**
Reporting Units:	**pCi/L, pCi/g**
Matricies:	**Water, inorganic and organic solids**

1 Scope and Application

This method is applicable to the determination of technetium-99 (^{99}Tc) in aqueous solutions and may be used with sample preparation procedures that act to dissolve the ^{99}Tc into an aqueous solution.

2 Method Summary

2.1 Samples are treated with HNO_3 and heat. Tc is oxidized to Tc(VII) as the pertecnetate ion, TcO_4, which is stable in the absence of reducing agents. The volume of the liquid is reduced to approximately 200 mL, and the solids are separated from the liquid.

2.2 Fe, Ca, and Ba carriers are added. The sample is made alkaline and the actinides, lanthanides, alkaline earths, many transition metals, Pb, and several anions are precipitated as hydroxides and carbonates away from TcO_4.

2.3 The supernate containing the TcO_4 is adjusted with HNO_3 to approximately pH 1 and the sample is loaded onto a 1-X4 resin, ion exchange column.The Tc is further purified by washing the column with 0.1 M nitric acid then eluted with 5M nitric acid.

2.4 The eluate is evaporated to approximately 1 mL and transferred to a vial for liquid scintillation counting.

D.I.3.28 Strontium-90 in Aqueous Media, Inorganic Solids and Organic Solids by Beta Counting (Procedure FM-RAD-0160)

Working Linear Range:	**To be determined**
Reporting Limit:	**To be determined**
Reporting Units:	**Liquids, pCi/L; solids, pCi/g**
Matrices:	**Water, inorganic solids, organic solids**

1 Scope and Application

1.1 This method is applicable to the determination of ^{90}Sr in aqueous liquids and inorganic or organic solids. Total strontium as is determined ^{90}Sr with no ^{89}Sr assumed present.

1.2 This analytical method applies to Analytical Support Levels C and D.

2 Method Summary

2.1 This procedure provides for the separation of the ^{90}Sr beta-emitting radionuclide from chemical and radiochemical interferences by a series of precipitation and separation steps.

2.2 An appropriate amount of the sample is aliquoted for analysis. Stable Sr and Ba carriers are added to the sample.

2.3 For aqueous samples, the Sr is precipitated as an insoluble carbonate. The precipitate is dissolved in HNO_3.

2.4 For solid samples, the sample is dried and/or muffled to ash in a furnace. The exact muffling sequence and amount of solid sample must be determined on an individual matrix basis to prevent fires and/or explosions. The extent of removal of organic material will directly affect the recovery of Sr in the separation procedure. The aliquot is dissolved with a series of additions of HNO_3 and HF and evaporated to dryness. The sample is converted to a nitrate form prior to further separation.

2.5 The Sr is precipitated as the nitrate from a fuming HNO_3 solution. The strontium nitrate from the liquid or solid preparation is dissolved in water, and the Ba and Ra are removed as chromates.

2.6 The Sr is precipitated as the sulfate and filtered onto a preweighed filter. The precipitate is dried to constant weight to determine chemical recovery.

2.7 The filter is counted by gas flow proportional counter to determine the ^{90}Sr beta activity, and a correction is made for yttrium-90 (^{90}Y) ingrowth.

D.I.3.29 Polonium-210 by Alpha Spectrometry (Procedure FM-RAD-0170)

Working Linear Range:	**With dilution, 0.5 pCi/L to 100,000 pCi/L; to be determined**
Reporting Limit:	**To be determined**
Reporting Units:	**pCi/L, pCi/g, pCi/filter, pCi/mL, or pCi/cc**
Matrices:	**Water, aqueous liquid, inorganic solids, organic solids, and filter(s)**

1 Scope and Application

This method is applicable to the determination of ^{210}Po in aqueous liquid, groundwater, surface water, inorganic solids, organic solids, and filters by chemical separation and alpha spectrometry.

2 Method Summary

2.1 ^{210}Po is determined by alpha spectrometry by counting a plated source. Po is plated from a HCl solution by a galvanic deposition technique on a Ni disk. The yield and efficiency are determined by use of a Po tracer. Matrix effects will be determined on a case by case basis.

2.2 Samples are prepared for separation by the appropriate matrix. For liquids and water, an appropriate volume of sample is used, typically 1,000 mL, and acidified with 50 mL of concentrated HCl. Po tracer is added. To organic or inorganic solids, Pb carrier and Po tracer is added, and the sample is acid leached with a series of HNO_3 and F additions. Insoluble sulfates are removed by heating with concentrated sulfuric acid. Filters are placed in a beaker with 150 mL of HNO_3 and HF and Po tracer is added. The filter solution is heated for 6 h, decanted, and rinsed twice with 50 mL of the acid mixture. For all matrices, the solution is concentrated to approximately 20 mL over low heat. The solution is not boiled. 100 mg of ascorbic acid ($C_6H_8O_6$) is added; Po is plated onto specially-cleaned and polished Ni disks. Plating time should be a minimum of 3 h. Po is determined by alpha spectrometry.

D.I.3.30 Radon-222 in Air by Scintillation Counting (Procedure FM-RAD-0180)

Working Linear Range:	**< 0.5 pCi/L to > 100,000 pCi/L**
Reporting Limit:	**4 pCi/L**
Reporting Units:	**picocuries of ^{222}Rn per liter of air (pCi/L)**
Matrix:	**Air**

1 Scope and Application

1.1 This method is applicable to the direct determination of ^{222}Rn in air or other nonreactive gases. The sample may be an instantaneous grab sample or an aliquot from an integrated sample collected over time in a Tedlar bag or other suitable container.

1.2 The sample collected by this procedure only represents the concentrations of Rn progeny at the time of sampling. The sample does not reflect changes that may occur over time.

2 Method Summary

An alpha scintillation flask (Lucas cell) is evacuated and filled with the air sample. The cell may be flushed with the air sample by flowing through cell, if the cell is equipped with two valves. The cell is stored for at least 3 h in a dark room or chamber. The cell is counted directly on a suitable light shielded photomultiplier tube connected to a scaler. The limit of detection is a function of the size and design of the scintillation flask. The cell volume may vary from 0.1 to 1 L.

D.I.3.31 Gross Beta in Smear Samples (Procedure FM-RAD-0210)

Working Linear Range: **1 smear**
Reporting Limit: **1 pCi/smear**
Reporting Units: **pCi/smear, pCi/cm^2**
Matrices: **Smear**

1 Scope and Application

This method is applicable to the determination of gross beta on one smear. The method is limited to direct counts with no correction for self-absorption.

2 Method Summary

This procedure provides for the determination of gross beta by counting the smear on a gas flow proportional counter to determine the number of beta counts.