Decommissioning Plan
For
Plant C
1000 Harvard Avenue
Cleveland, Ohio

Submitted to the
US Nuclear Regulatory Commission
by the
Chevron Chemical Company
San Ramon, California

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1.0 GENERAL INFORMATION

This decommissioning plan is prepared in accordance with the stipulations of the U.S. Nuclear Regulatory Commission Regulatory Guide 3.65, "Standard Format and Content of Decommissioning Plans for Licensees Under 10 CFR Parts 30, 40, and 70" (Reference 1-1).

1.1 Purpose

The purpose of this plan is to detail the services to be provided by a responsible, USNRC licensed contractor (Contractor) to Chevron Chemical Company (Chevron) in support of the decommissioning of Plant C (at times referred to as Building C) located at 1000 Harvard Avenue, Cleveland, Ohio. This plan includes a description of the decommissioning activities, a description of the health and safety measures that will be in place during the decommissioning activities, and a description of the planned Final Radiological Status Survey of the site.

1.2 Licensee Information

The Chevron facility is not governed by a Nuclear Regulatory Commission (NRC) Radioactive Materials License. However, this plan is written to comply with all applicable federal regulations as if the facility contained licensed radioactive material and the purpose of the decommissioning activities was to terminate that license. All decommissioning activities will be performed under a Contractor license issued by the NRC. The Contractor will take possession of all radioactive material at the Plant C site until the material is disposed of as low-level radioactive waste. Chevron will, however, remain as the generator of that radioactive waste throughout the decommissioning and waste disposal processes.

WHEN WILL DISPOSAL TAKE PLACE?

1.3 Facility Description

Plant C is located within a fenced area of approximately 1.6 acres. It is a three-story brick and steel building with a concrete floor and pre-cast concrete roof. The second and third levels of the building have significantly less floor space than the ground level.

The approximate floor areas of Plant C are as follows:

- first floor 45,100 ft^2
- first floor mezzanine 3,700 ft^2
- second floor 14,590 ft^2
- third floor 3,200 ft^2

Plant C is divided into 50,240 ft^2 of operating area and 16,350 ft^2 of standby area.

Plant C was formerly a part of a larger Harshaw Chemical Company (Harshaw) facility. Although Plant C is currently owned by a subsidiary of Chevron, the surrounding buildings and properties that made up the Harshaw facility are now part of an operating

Englehard Chemical Company (Englehard) facility. The Contractor will keep plant personnel informed of all planned Plant C decommissioning activities and will address any concerns raised by plant personnel throughout the completion of these activities.

1.4 References

Reference 1-1 U.S. Nuclear Regulatory Commission Regulatory Guide 3.65, "Standard Format and Content of Decommissioning Plans for Licensees Under 10 CFR Parts 30, 40, and 70," August, 1989.

2.0 DESCRIPTION OF PLANNED DECOMMISSIONING ACTIVITIES

Radiological assessments performed in Plant C and the immediate vicinity by Argonne National Laboratory and Chemical Waste Management have identified the presence of natural uranium and its decay daughters on building surfaces and in soil in excess of radiological release criteria.

This Decommissioning Plan outlines a method for returning the Plant C site to an acceptable condition for future use such that occupants and the environment will not be subjected to unacceptable risks from residual radioactivity. This method will safely remove radioactive and other materials that pose a hazard to human health (such as asbestos) and will prepare the property for subsequent use by removing all above-grade structures and evaluating the need for removing contaminated soils. Upon completion of the decommissioning activities, the site will be suitable for use without radiological restriction.

2.1 Decommissioning Objectives, Tasks, and Schedule

2.1.1 Decommissioning Objectives

There are three primary objectives of the decommissioning of Plant C:

- to reduce residual radioactive contamination of building surfaces to below the current release criteria,
- to raze Plant C once it has been decontaminated, and
- to evaluate and/or reduce residual radioactive soil contamination to levels prescribed in the USNRC Branch Technical Position paper dated October, 1981 (Reference 2-1).

Although an NRC license for Plant C is not involved, this Decommissioning Plan is written as though Plant C were an NRC-licensed facility. The following radiological release criteria reflect this approach:

Residual Radioactive Surface Contamination

The following surface contamination limits were obtained from the NRC white paper entitled "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material" (Reference 2-2), published in April, 1993.

- 5,000 disintegrations per minute (dpm)/100 cm^2 fixed and removable alpha contamination averaged over an area no greater than 1 m^2,
- 15,000 dpm/100 cm^2 fixed and removable alpha contamination at any location, and
- 1,000 dpm/100 cm^2 removable alpha contamination at any location.

Residual Radioactivity in Soil

The evaluation and remediation of soils below the Plant C footprint will be in accordance with the "Disposal or Onsite Storage of Residual Thorium or Uranium from Past Operations" (Reference 2-1), an NRC Branch Technical Position published in October, 1981.

General Area Exposure Rate Levels

The guideline value for general area exposure rate measurements will be 5 microrem (μrem)/hr above background at 1 m from the surface being measured. This guideline is to be applied as an average over a maximum area of 100 m^2, provided no discreet area of residual radioactivity results in levels exceeding 10 μrem/hr above background.

2.1.2 Decommissioning Tasks

Table 2-1 lists the major decommissioning tasks described below.

Prior to mobilizing to the Plant C Site, the Contractor will prepare, review, and approve the following documents: a Site Safety and Health Plan, a Radiological Characterization Survey Plan for the Plant C surfaces, and specific work instructions for performing decontamination tasks. These documents will also be reviewed and approved by Chevron before the Contractor mobilizes to the site.

Upon mobilization, the Contractor will set up mobile office trailers, break/lunch/meeting trailers, change trailers, storage trailers, sanitation facilities, communications provisions, and utilities. After setting up basic facilities and services, the Contractor will conduct site-specific training and orientation.

Radiologically Controlled Areas (RCAs) will be established to facilitate proper access and egress controls before other activities commence within Plant C. A gridding team will follow the cleaning team to mark a one meter by one meter reference grid system on all interior walls and floors.

Teams of Radiological Control Technicians will begin performing a detailed Radiological Characterization Survey as the gridding team progresses. The Radiological Characterization Survey will find all areas of building surfaces and structures that are contaminated with radionuclides in excess of guideline values. The Radiological Characterization Survey will be performed such that the results can be used in the Final Radiological Status Survey for areas in which no contamination is found. Results of the Radiological Characterization Survey will be reported to the NRC upon completion.

The Radiological Characterization Survey Plan will include the data quality objectives for the survey, as well as the quality assurance and quality control measures that will be implemented. Additionally, the Radiological Characterization Survey Plan will include any samples for hazardous materials regulated by RCRA.

Decontamination of building surfaces will begin as soon as enough characterization data are accumulated to support the formulation of an efficient remediation strategy. Building interior surfaces such as concrete floors, cinder block walls, and brick will be decontaminated with pneumatic needle-scalers and floor scabblers. The Contractor will use pneumatic needle-scalers that have integral shrouds for attaching High Efficiency Particulate Air (HEPA) filter equipped vacuum cleaners. The floor scabblers will also have integral shrouds for attaching HEPA filter equipped vacuum cleaners. By using HEPA filter equipped vacuum cleaners with the dust producing decontamination equipment, it should not be necessary to construct containment enclosures for contamination control.

Air Sampling? Respirators?

Building materials and furnishings that cannot be decontaminated by scabbling will be cleaned with treated cloths (maslin), and simple detergents. If cleaning is not feasible, some contaminated items (or portions of contaminated items) may be mechanically removed for disposal using a saw or other hand tools. When disposal of an item as radioactive waste is necessary, consideration will be given to minimizing the volume of material.

Following decontamination and survey, a qualified asbestos abatement contractor will find and remove all materials in Plant C that contain asbestos that might cause an unacceptable spread of asbestos fibers during the building demolition. Asbestos removed during abatement will be monitored prior to disposal to ensure the materials are not in excess of radioactive contamination limits.

Preparation of the Final Radiological Status Survey Plan will commence during the Radiological Characterization Survey. This plan will be prepared using guidance from NUREG/CR 5849, "Manual for Conducting Radiological Surveys in Support of License Termination" (Reference 2-3). The Plan will include the data quality objectives for the survey, as well as the quality assurance and quality control measures that will be implemented. During the decontamination efforts, the Final Radiological Status Survey Plan will be submitted to the NRC. Upon NRC concurrence with the Final Radiological Status Survey Plan, the Final Radiological Status Survey will be performed to demonstrate that all areas of Plant C have been decontaminated such that no radioactive contamination exists in excess of guideline values. A Final Radiological Status Survey Report will be prepared and submitted to the NRC upon completion of the Final Radiological Status Survey.

The NRC may perform a Confirmatory Survey of Plant C after reviewing the Final Radiological Status Survey results. Plant C will be declared acceptable for unrestricted use following successful completion of the Confirmatory Survey. If no Confirmatory Survey is performed, the building may be declared acceptable for unrestricted use after the review of the Final Radiological Status Survey results.

A contractor qualified to perform demolition activities will raze Plant C once it has been declared acceptable for unrestricted use. Radiological Controls Technicians will monitor the activities of the demolition contractor to ensure that no unexpected radioactive contamination is uncovered during the demolition of the building and the removal of the

building rubble. Building rubble that was exposed to potentially contaminated soil will be surveyed for radioactive contamination before being transported from the Plant C site.

During the decontamination and demolition of Plant C, a Radiological Characterization Survey Plan for the soil area will be developed. The Radiological Characterization Survey Plan will include the data quality objectives for the survey, as well as the quality assurance and quality control measures that will be implemented. Additionally, the Radiological Characterization Survey Plan will include any samples for hazardous materials regulated by RCRA.

After all above-grade structures have been removed, including the concrete slab and foundations, the soil underneath the building footprint will undergo a Radiological Characterization Survey. Surface radiation scans will be performed, and surface and subsurface soil samples will be obtained and analyzed. The results will be presented in a Radiological Characterization Survey Report, which will be the basis for a work instruction governing disposition of the residual soil in accordance with the USNRC BTP (Reference 2-1).

what about drains?

When the NRC is satisfied that the entire site has been adequately remediated, any packaged radioactive waste remaining on the site will be disposed of and Contractor personnel and equipment will be demobilized. The Contractor will prepare a Project Final Report after demobilization.

↑ Contain what info?

2.1.3 Decommissioning Procedures

Plant C decommissioning tasks will be performed in accordance with the following documents:

- this Decommissioning Plan,
- a Site Specific Health and Safety Plan,
- Radiological Characterization Plans for the Plant C structures and the soil area below the Plant C footprint,
- Final Radiological Status Survey Plans for the Plant C structures,
- Contractor standard operating procedures and/or other guidance referenced by this plan.

All Contractor plans and procedures will be submitted for review and approval prior to implementation. The Contractor will prepare specific work instructions for project activities not covered by its standard operating procedures.

2.1.4 Decommissioning Schedule

Figure 2-1 contains a generic schedule of the Plant C decommissioning tasks. The duration of each activity is shown in relation to other tasks since estimated durations for individual activities have not yet been determined.

2.2 Decommissioning Organization and Responsibilities

Figure 2-2 provides an organizational chart of personnel who will be involved in the Chevron Plant C Decommissioning Project. The following sections detail the specific responsibilities of all key project personnel. Due to the limited size of the project, the duties of certain key project personnel may be combined (e.g., combine the duties of the Radiological Engineer and Radiological Controls Supervisor).

2.2.1 Chevron Project Manager

The Chevron Project Manager will function as the Chevron representative for the decommissioning project and will provide oversight for all project activities. The Chevron Project Manager will coordinate cost and schedule reporting requirements with the Project Manager.

2.2.2 Project Manager

The Project Manager will maintain overall responsibility for the performance of project operations and will be on site for the duration of the project. The Project Manager will report to the designated Chevron Project Manager for all project related activities and to the Contractor Corporate Office for project oversight, management direction, and resolution of company related issues. The Project Manager will control all on-site professional, technical, and labor forces to ensure the adequate and timely completion of planned project tasks. With the assistance of the assigned on-site and off-site corporate personnel, the Project Manager will ensure the following:

- Maintenance of a single point of contact for Chevron representatives on all project related schedule, cost, safety, and technical matters, including the coordination of any required communications, meetings, or updates;
- Coordination of the project staff to assure that adequate safety and radiological controls plans and procedures are enforced and that project operations are conducted efficiently and in compliance with all appropriate regulatory requirements;
- Provision of sufficient staffing to support the scheduled completion of project tasks;
- Coordination of appropriate procurement and subcontract activities in support of project goals and schedules;
- Continuous monitoring of project status and performance and the initiation of any required corrective actions or reassignment of project personnel;

- Accurate reporting to Chevron representatives of actual and projected project costs and up-to-date schedule status;

- Resolution of any cost or schedule related discrepancies or questions;

- Compliance with all required procedures, operating requirements, permits or restrictions; and

- Maintenance of all appropriate project data, documents, and records and the compilation of a final report that accurately reflects the work performed.

The minimum qualifications for the Project Manager position consist of the following:

- B.S. degree in physical sciences, chemistry, biology, math, or engineering and two years of experience in managing nuclear decontamination and remediation projects; or

- Four years of experience in managing nuclear decontamination and remediation projects.

2.2.3 Radiological Engineer

The Radiological Engineer will participate in project planning and final reporting activities to ensure regulatory compliance, the adequacy of plans and procedures, and the appropriate development of project specific plans and work instructions. The Radiological Engineer will also be responsible for assuring radiological safety in the design of processes and equipment for the decommissioning activities. The Radiological Engineer will be responsible for ensuring that radiation exposure to personnel and the environment are maintained As Low As Reasonably Achievable (ALARA) and are at all times within regulatory and administrative limits. The Radiological Engineer will report administratively to the Project Manager and will perform the following duties:

- Act as the Authorized User and Radiation Safety Officer for this implementation of the Contractor's Radioactive Materials License;

- Manage the radiological information obtained during the Radiological Characterization Surveys and Final Radiological Status Surveys, including performing all calculations to show compliance with project guidelines;

- Prepare Radiological Characterization Survey Reports and Final Radiological Status Survey Reports;

- Oversee the bioassay program to ensure proper monitoring of internal and external exposures, and assisting in the training of individuals in the biological effects of radiation, as needed;

- Prepare and/or review project specific plans, procedures, and work instructions to ensure compliance with applicable guidelines, regulations, and ALARA policies;

- Assist the Radiological Controls Supervisor and Radiological Controls Technicians in the performance of field surveys;

- Provide radiological calculations for dose assessment, ALARA, and safety considerations.

- May perform the duties of the Project Supervisor in addition to the above duties.

The minimum qualifications for the Radiological Engineer consist of the following:

- M.S. degree in radiological health, nuclear physics, or health physics and two years of experience as a health physicist or radiological engineer in nuclear decontamination and remediation projects; or

- M.S. degree in physical sciences, chemistry, biology, math, or engineering and three years of experience as a health physicist or radiological engineer in nuclear decontamination and remediation projects; or

- B.S. degree in radiological health, nuclear physics, or health physics and four years of experience as a health physicist or radiological engineer in nuclear decontamination and remediation projects; or

- B.S. degree in physical sciences, chemistry, biology, math, or engineering and six years of experience as a health physicist or radiological engineer in nuclear decontamination and remediation projects.

2.2.4 Project Supervisor

The Project Supervisor will report directly to the Project Manager and will be responsible for the day-to-day activities on the project. The Project Supervisor will also be responsible for ensuring that personnel are provided the correct health and safety resources as required. The Project Supervisor will also be responsible for the coordination of daily activities with the Radiological Controls Supervisor to ensure proper planning, organizing, directing, and controlling of project activities in a manner that does not conflict with the safety and health of employees performing the work activities. Specifically, the Project Supervisor will ensure the safety and health of employees during all project activities and will allocate the necessary resources to ensure that required safety and health activities are carried out. The Project Supervisor will be responsible for enforcing all applicable, plans, procedures, and instructions affecting safety and health. The Project Supervisor is further responsible for the day-to-day oversight of all subcontractor activities to ensure that those activities are being performed in a manner consistent with all health and safety requirements.

The minimum qualifications for the Project Supervisor position consist of the following:

- B.S. degree in physical sciences, chemistry, biological sciences, math, or engineering and two years of experience supervising personnel on nuclear decontamination and remediation projects; or

- Four years of experience supervising personnel on nuclear decontamination and remediation projects.

2.2.5 Radiological Controls Supervisor

The Radiological Controls Supervisor will report directly to the Project Manager for the day-to-day performance of project radiological activities. The Radiological Controls Supervisor will receive direction from a Certified Health Physicist in the administration of all project radiological controls programs, final release activities, appropriate documentation, and compliance with all appropriate plans, procedures, practices, and regulatory requirements. The Radiological Controls Supervisor will be responsible for the following:

- Performing site characterizations, developing the Site Safety and Health Plan, implementing the specific provisions of that plan, and ensuring that all site employees, subcontractors, and visitors understand the requirements of the plan;

- Functioning as the Site Safety and Health Supervisor with responsibility for implementing the Site Safety and Health Plan;

- Assisting the Project Manager and other project personnel in the preparation of work plans and procedures;

- Conducting appropriate surveys and inspections while ensuring that radiological and industrial safety hazards are appropriately identified and that necessary precautions are in place prior to the initiation of work activities;

- Specifying appropriate safety and radiological controls precautions for work permits and work procedures;

- Directing the day-to-day activities of radiological controls personnel in the performance of project operations and the selection of instrumentation and decontamination techniques appropriate for protecting personnel and reducing exposures;

- Monitoring work in progress to ensure compliance with project plans and procedures, regulatory requirements, and good radiological work practices;

- Preventing the performance of work activities that may jeopardize the safety of personnel, violate approved plans, procedures, or practices, or could result in the release of contamination;

- Reviewing and maintaining all appropriate project personnel and radiological records, including survey data, training documentation, certification and qualification records, release survey records, permits, licenses, and instrumentation records;

- Maintaining radiological supplies and instrument inventories; and

- Inspecting and assisting in the preparation of waste materials for shipment, including appropriate radiological survey and assay activities.

The minimum qualifications for the Radiological Controls Supervisor position consist of the following:

- Two years experience as a Radiological Controls Technician on nuclear decontamination and remediation projects and successful completion of the Contractor's Radiological Controls Supervisor qualification training and examination.

- Certification as an Occupational Health and Safety Technician.

2.3 Training

The Contractor's Training Program meets the following goals:

- To meet or exceed the applicable training requirements specified by the NRC, Occupational Safety and Health Administration (OSHA), and the Environmental Protection Agency;

- To ensure that all personnel are knowledgeable of requirements of their jobs and are competent in the operation of equipment they use, are safe in their work practices, and understand all risks associated with their work environment;

- To ensure that personnel will meet the requirements specified by Chevron to work at the Plant C site;

- To ensure that personnel maintain a high level of competency in all qualified areas; and

- To indoctrinate new employees to ensure that they understand all requirements that they are expected to meet.

For this decommissioning project, all Contractor and subcontractor personnel working on site will be trained in accordance with the applicable requirements of 29 CFR 1910.120 before participating in the survey or decommissioning activities. Twenty-four hours of on-site training will be conducted upon mobilization of project personnel. Table 2-2 lists the specific training requirements for this project that will be covered during this twenty-four hour training session.

The Radiological Controls Supervisor will maintain site-specific training records.

2.4 Contractor Assistance

The removal of asbestos and the razing of Plant C may be accomplished by other contractors. The asbestos removal contractor will meet both State of Ohio and local requirements concerning asbestos abatement. Based on radiological considerations, these assisting contractors will perform their activities under the Contractor USNRC Radioactive Materials License as well as applicable health & safety policies and procedures.

2.5 References

Reference 2-1 "Disposal or Onsite Storage of Residual Thorium or Uranium from Past Operations," NRC Branch Technical Position, October, 1981.

Reference 2-2 "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material," NRC, April, 1993.

Reference 2-3 NUREG/CR 5849, "Manual for Conducting Radiological Surveys in Support of License Termination," June, 1992.

Table 2-1
Major Plant C Decommissioning Tasks

1. Procedure preparation, review, and approval
2. Procurement of equipment/materials
3. Mobilization
4. Site setup and site training/orientation
5. Removal of debris from surfaces to be surveyed
6. Outline of reference grid system on building surfaces to be surveyed
7. Radiological Background Survey
8. Radiological Characterization Survey of Plant C
9. Decontamination of Plant C where residual radioactive contamination exceeds radiological release criteria
10. Removal of asbestos from Plant C
11. Final Radiological Status Survey Plan
12. Final Radiological Status Survey of Plant C surfaces
13. Preparation of Plant C Final Radiological Status Report and submittal to the NRC
14. Confirmatory Survey of Plant C as necessary
15. Razing of above-grade structures
16. Radiological Characterization Survey of soil below Plant C footprint
17. Evaluation of disposal options for soil below Plant C footprint per the USNRC BTP (Reference 2-1)
18. Confirmatory Survey of remediated soil areas as necessary
19. Disposal of remaining waste materials
20. Demobilization
21. Project Final Report

Table 2-2
Training Requirements for Plant C Decommissioning

1. Requirements of this Decommissioning Plan and guidance referenced by the Plan.
2. Requirements of the Site Safety and Health Plan and guidance referenced by that Plan.
3. Hazard communication training required by 29 CFR 1910.1200.
4. Lockout/tagout training required by 29 CFR 1910.134.
5. Noise abatement training required by 29 CFR 1910.95.
6. Respiratory protection program training required by 29 CFR 1910.134.
7. Safety signs and tags training required by 29 CFR 1910.145.
8. Fork lift operations training required by 29 CFR 1910.178.
9. Fire extinguisher training required by 29 CFR 1910.157.
10. Fire emergency training required by 29 CFR 1910.38.
11. Basic radiation worker training required by 29 CFR 1910.96; 10 CFR 19; and 10 CFR 2[illegible].

Figure 2-1
Schedule of Major Plant C Decommissioning Tasks

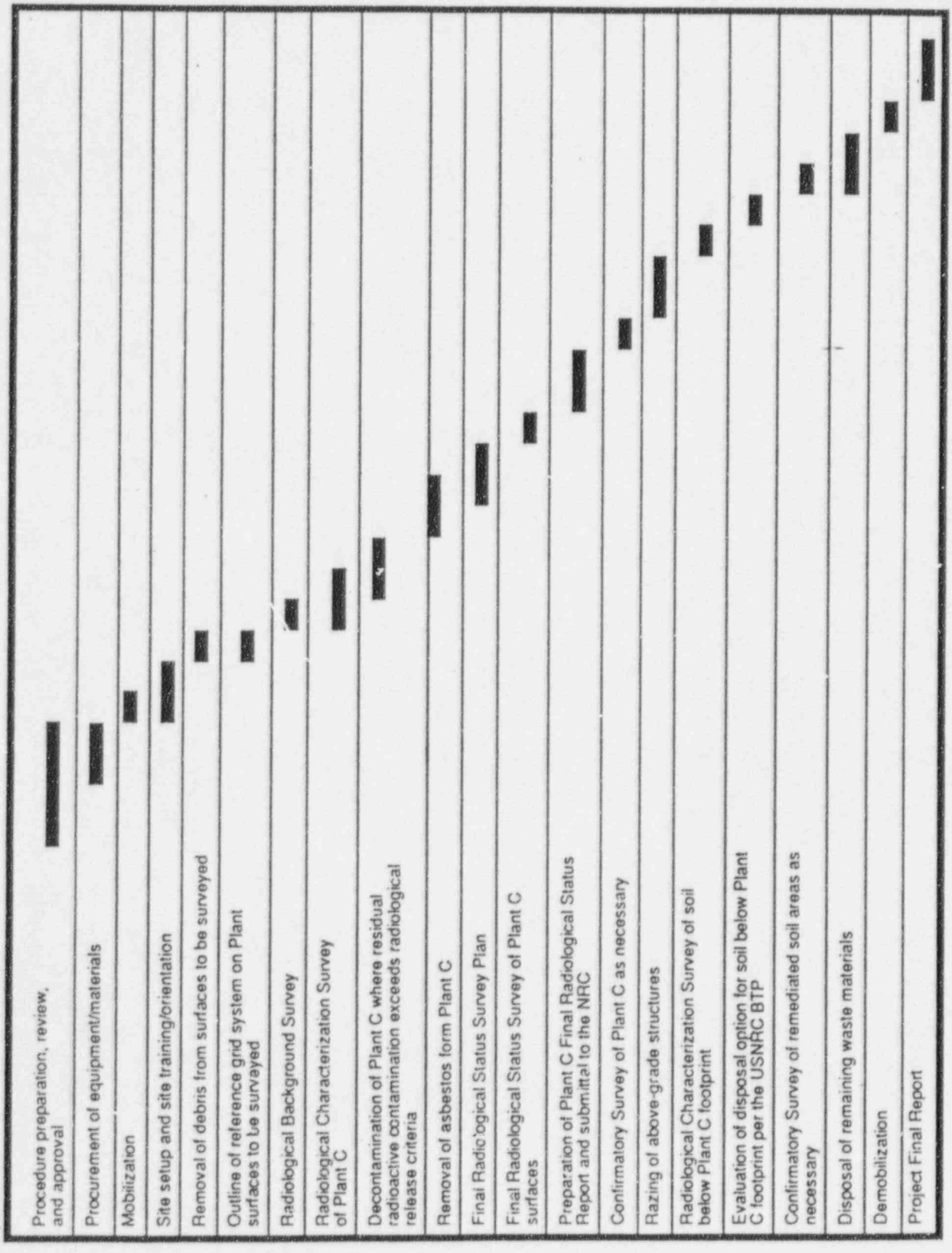
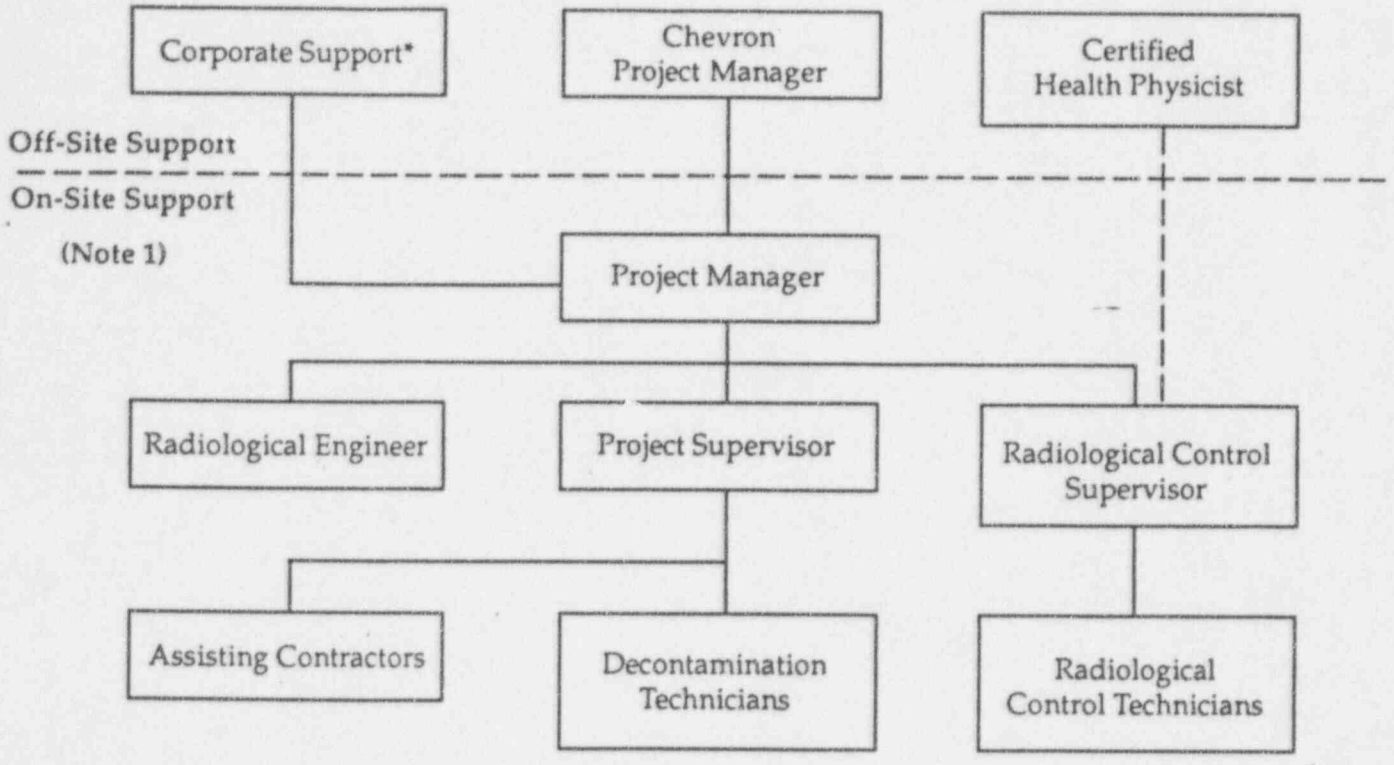


Figure 2-2
Plant C Decommissioning Project Organization



* Corporate Support includes the following:

- Senior Project Management
- Environmental Safety & Health
- Quality Assurance
- Cost/Schedule Control
- Purchasing
- Record Management

Note 1: Due to the limited size of the project, the duties of certain key project personnel may be combined.

3.0 DESCRIPTION OF METHODS USED FOR PROTECTION OF OCCUPATIONAL AND PUBLIC HEALTH AND SAFETY

3.1 Facility Radiological History Information

Two radiological assessments have been performed at the Plant C site. Argonne National Laboratory completed an assessment in 1979, while Chemical Waste Management, Inc. (CWM) completed an additional assessment in 1992.

3.1.1 Argonne National Laboratory Assessment

DOE/EV-0005/48, "Formerly Utilized MED/AEC Sites Remedial Action Program - Radiological Survey of the Harshaw Chemical Company, Cleveland, Ohio" (Reference 3-1) is a report of a radiological assessment of what was then the Harshaw Chemical Company facility. This assessment was performed by Argonne National Laboratory (ANL) in several different campaigns from 1976 through 1979. The radiological condition of the entire facility was assessed during the course of those campaigns.

Reference 3-1 provides the best available historical information about Plant C and the surrounding property. Specific information concerning past use of individual areas of Plant C is not available from Reference 3-1 or any other known documentation.

During the Manhattan Engineering District (MED)/Atomic Energy Commission (AEC) era, Harshaw processed large quantities of natural uranium to produce both oxide and fluoride compounds. Only a few of the many Harshaw Complex buildings were actually involved with the use of radioactive materials. The principle building involved with the uranium processing activities was the refinery building identified as Plant C (Plant C). Essentially all of the equipment used in Plant C operations was government-owned. Plant C was used primarily for the refining of yellowcake into uranium orange oxide, although the plant was capable of reducing orange oxide (UO_3) to brown oxide (UO_2), fluorination of brown oxide to green salt (UF_4), and fluorination of green salt to hexafluoride (UF_6). This work was done under contract to MED and its successor, AEC.

Records indicate that at the time the AEC contract was terminated, the facility was decontaminated by Harshaw and released from AEC control in 1960. However, a search of AEC records indicates that documentation is insufficient to determine whether the decontamination work was adequate by the then-current guidelines. Hence, the ANL radiological assessment of the site was initiated in 1976. The entire grounds and all buildings were surveyed using surface survey instruments to detect surface contamination and radiation exposure rate , to determine general radiation levels.

Approximately 60% of the floor areas inside Plant C were surveyed. The floor of the third level was not surveyed by ANL because a fluorspar drying operation in this area had caused the entire area to be covered with fine powder. About 130 measurements were made on the girders, lighting fixtures, pipes, and walls. A total of 500 smears were collected from throughout the building. Some areas of the first floor had been resurfaced with new concrete over the older concrete floor surface. Elevated levels of radiation were

consistently found at seams and cracks in the new floor surface. Beta-gamma measurements from the surface of the new floor indicated contamination levels of up to 20,000 dpm/100 cm^2 while measurements from the surface of the underlying original floor indicated contamination levels of up to 1,100,000 dpm/100 cm^2.

Alpha contamination measurements from the surface of the first floor indicated contamination levels of 300 to 900 dpm/100 cm^2.

Based on review of the ANL assessment, building contamination levels are above current guidelines for release of the site for unrestricted use.

3.1.2 Chemical Waste Management

"Chevron Chemical Company Plant C, Cleveland, Ohio, Radiological Assessment Report" (Reference 3-2) details an radiological assessment of Plant C was performed by CWM in April of 1992. This radiological assessment was equivalent to a scoping survey as described in NUREG/CR 5849, "Manual for Conducting Radiological Surveys in Support of License Termination" (Reference 3-3). Figures 3-1 through 3-4 show the areas of identified contamination and provide a rough estimate of the total area of building surfaces to be decontaminated. The following conclusions were determined from the CWM assessment:

- No external radiation dose hazard exists from the contamination contained in Plant C;
- The only radioactive contaminant discovered in Plant C was natural uranium and the associated progeny. The source of contamination is the natural uranium processing conducted in the building during the 1940's and 1950's.
- Several locations on the surface of the first floor contain removable contamination above NRC release guidelines. Most of the removable contamination that exceeds release guidelines is from beta/gamma emissions. Only one location with alpha contamination above the unrestricted release limits for natural uranium was detected.
- Fixed contamination exists inside Plant C.
  - Approximately 50% of the floor surfaces are contaminated above the release guidelines. Much of this contamination is detectable through approximately one inch of concrete overlay installed after the natural uranium processing operations had ceased.
  - Many of the wall surfaces in Plant C are contaminated above the release guidelines.
  - Randomly selected 1 m^2 grids on the Plant C ceiling surfaces were surveyed during the assessment. These surveys did not reveal contamination exceeding the release guidelines.

- The original roof surface has been covered by several layers of material (tar and stone) since the time when deposition of contamination would have occurred.

- Areas adjacent to drain lines and ground floor penetrations were discovered to contain uranium concentrations above NRC release guidelines.

The combined information obtained from the ANL assessment and the Contractor assessment is adequate to define the potential contaminants and to define the general extent of residual radioactive contamination.

3.2 Ensuring That Occupational Radiation Exposures Are As Low As Is Reasonably Achievable

Every reasonable effort to maintain radiation exposures As Low As Is Reasonably Achievable (ALARA) will be made during the decommissioning project. The implementation of the Contractor ALARA policy is the responsibility of the Contractor's staff of professional health physicists. These health physicists are required to review procedures, plans, or work instructions involving radiation safety. Designs or design changes for facilities or equipment that may cause radiation exposure are also reviewed by the health physicists prior to fabrication, construction, or procurement. The design must be approved before the facility or equipment is released for use. The health physicists are further responsible for reviewing radiation protection programs developed for implementation at the Plant C site.

3.2.1 Certified Health Physicist

The Certified Health Physicist responsibilities in regard to ALARA include:

- directing an annual appraisal of the radiation protection and exposure control programs applicable to Contractor employees; and

- overseeing and coordinating the development of exposure goals, plans, procedures, and methods for maintaining radiation exposures ALARA for all Contractor employees, subcontractors, and project visitors.

3.2.2 Project Manager

The Project Manager is responsible for ensuring that criteria affecting potential radiation exposure and contamination are considered in the design, operation, and construction of facilities and equipment. Other Project Manager responsibilities in regard to ALARA include:

- ensuring adherence to the radiation protection program by all personnel assigned to the project; and

- ensuring that ALARA reviews are performed for procedures, programs, policies, new equipment, or facility designs and equipment changes.

3.2.3 Radiological Engineer

As a professional health physicist, the Radiological Engineer is responsible for the following:

- participating in design reviews for procedures, facilities, and equipment that can affect potential radiation exposures;
- prescribing goals and objectives to be achieved in the area of radiological protection;
- reviewing data and information obtained from radiological surveys and monitoring activities to determine compliance with ALARA policy;
- developing methods, plans, procedures, and work instructions to keep occupational exposures ALARA;
- reviewing training programs related to work in radiation areas or involving radioactive materials;
- reviewing exposure records to develop methods to reduce exposures; and
- reviewing the supervision, training, and qualifications of the radiological controls staff in all Contractor operations.

3.2.4 Radiological Controls Supervisor

The Radiological Controls Supervisor is responsible for implementation of the radiation protection program for the Plant C decommissioning. The radiation protection program includes all radiological standard operating procedures and those procedures written specifically for the Plant C decommissioning that have radiological requirements. The responsibilities of the Radiological Controls Supervisor in regard to ALARA include:

- ensuring adequate radiation protection coverage for all personnel, including visitors;
- supervising, training, and documenting the training of the radiation protection staff;
- identifying sources or operations having the potential for causing significant exposures to ionizing radiation;
- implementing the radiation protection and exposure control programs;
- reviewing draft procedures and proposed changes in equipment to ensure that provisions are included for maintaining exposures ALARA;
- overseeing the collection, analysis, and evaluation of data and information obtained from radiological surveys or radiological monitoring activities used in determining hazards to occupational or public health; and

- making routine reports to the Certified Health Physicist concerning the status of radiation protection and exposure control programs in effect at the field location to which the Radiological Controls Supervisor is assigned.

3.2.5 Individual Employees

Each individual who performs a work assignment for the Contractor and becomes subject to the ALARA and Health Physics Policies is responsible for complying with the Contractor policy as set forth in administrative and radiological protection procedures.

3.3 Health Physics Program

3.3.1 Administrative Occupational Exposure Limits

Occupational exposures to ionizing radiation for Contractor personnel will be administratively limited to below regulatory limits to control personnel exposures resulting from operations with radioactive materials.

3.3.2 Dosimetry

Dosimetry methods will be applied by the Radiological Controls Supervisor to all project personnel who require access to Radiologically Controlled Areas (RCAs).

Visitors to the Plant C project site will be issued dosimetry as deemed appropriate by the Radiological Controls Supervisor after considering radiation and contamination levels to be encountered by the visitor, the duration of the visit, and the nature of the visit. A visitor may be exempted from the requirements of the dosimetry, bioassay, and training programs at the discretion of the Radiological Controls Supervisor provided that the visit is expected to be a one-time occurrence and the visitor is escorted by an individual who has proper dosimetry, has the required training for access to the site, and is familiar with site operations.

The primary dosimeter to be employed is the thermoluminescent dosimeter (TLD). The Radiological Controls Supervisor may require the use of self-reading pocket dosimeters (SRDs) and additional dosimeters, such as extremity TLDs, when radiological conditions warrant such use. Dosimetry requirements for a given operation or activity will be specified by a Radiation Work Permit. TLDs will be processed monthly. The Radiological Controls Supervisor will maintain records of exposure to ionizing radiation for those individuals wearing dosimetry.

Urine bioassay samples will be collected from all personnel who participate in the project dosimetry program. A baseline sample will be collected from appropriate project personnel upon mobilization, and an exit sample will be collected upon demobilization. Other samples will be collected as deemed necessary by the Certified Health Physicist, the Radiological Engineer, and/or the Radiological Controls Supervisor.

Urine bioassay samples will be analyzed by a Contractor approved laboratory. It is the responsibility of the Radiological Engineer to interpret the bioassay data and perform any dosimetry calculations that may be necessary.

Whole-body counting is not expected to be routinely employed during the Plant C decommissioning for determining personnel uptake of radionuclides. Whole-body counting may be employed as prescribed by the Certified Health Physicist or Radiological Engineer for extenuating circumstances.

3.3.3 Radiation Work Permits

The Radiological Controls Supervisor shall issue a Radiation Work Permit (RWP) for any work in a radiologically controlled area. In cases where no written procedures exist for an operation, an RWP may be issued with sufficient specific instructions to allow the RWP to take the place of written procedures. The RWP is a tool used to control personnel exposures to ionizing radiation and radioactive material by establishing minimum requirements for dosimetry, personnel protective equipment, etc., for work to be performed and by providing specific information about radiological and other hazards in the area to be accessed.

An RWP may be initiated by any individual responsible for a given operation or work to be performed. The Radiological Controls Supervisor reviews RWPs, makes any necessary changes, then approves the RWP for use.

Personnel performing work covered by an RWP participate in a pre-job brief in which the requirements of the RWP are presented by a responsible individual and discussed by the work group. Personnel attending the brief sign the RWP before entering the Radiologically Controlled Area to indicate that they understand the requirements of the RWP.

An RWP is terminated by the Radiological Controls Supervisor when radiological conditions change, the scope of work changes, or a specified period of time has elapsed. Since RWPs are task-specific, it is likely that several RWPs will be in effect at any given time during the course of the Plant C decommissioning.

3.3.4 Controlled Access Area Entry Requirements

Controlled Access Areas are established for the purpose of controlling radiation exposures to site workers, visitors, and the general public, and to control the spread of contamination.

Signs at points of entry into the fenced area surrounding Plant C will instruct visitors and other individuals unfamiliar with decommissioning operations at Plant C to register at the Contractor project office trailer. Upon reporting to Contractor personnel in the office trailer, the individual can be escorted to any area to which he/she may need access. Subcontractors and other personnel who will perform work on the site will be given

orientation and training that will make them aware of areas that they may access and the requirements for entering such areas.

RCAs include Controlled Surface Contamination Areas (CSCAs), Radiation Areas, Airborne Radioactivity Areas, and Radioactive Material Storage Areas. It is anticipated that there will be no High Radiation Areas nor Very High Radiation Areas posted during the course of the Plant C decommissioning. RCAs will be posted with radiation warning signs that will normally be suspended from yellow and magenta colored rope or ribbon or affixed to doors. Some of the requirements for entering an RCA are listed on the posted radiological warning signs applicable to a given area. The remainder of the requirements for entering a given RCA will be contained in the active RWPs.

There will be no eating, drinking, smoking, chewing, or application of cosmetics within RCAs. The need for respiratory protection shall be evaluated and documented for all personnel entering an Airborne Radioactivity Area.

3.3.5 Clean Area Requirements

High traffic areas outside of RCAs, especially paths to and from RCA accesses, restrooms, break/lunch rooms, and field office spaces, will be frequently surveyed for radioactive surface contamination to ensure that these areas are maintained essentially free of radioactive contamination above background levels. The periodicity of these routine surveys will be determined by the Radiological Controls Supervisor in consultation with the Certified Health Physicist and the Radiological Engineer. Clean areas shall be promptly decontaminated or controlled as RCAs if surface contamination levels are found to exceed guideline values.

The potential for an internal uptake of radioactive material remains relatively small based on References 3-1 and 3-2. High Efficiency Particulate Air (HEPA) filtered exhaust ventilation shall be evaluated and used inside all containments in which airborne radionuclides may present a hazard. If air sampling indicates the need for respiratory protection, full-face negative pressure respirators with HEPA filters shall be the first choice. If air samples indicate airborne contamination levels are sufficiently high, air supplied respirators shall be used to work in the affected areas.

Except for sources that are permanently attached to detection instruments, radioactive check sources not in use will be stored in a locked cabinet designated by the Radiological Controls Supervisor. The number of keys to the cabinet and the number of personnel having access to the keys will be kept to a minimum. Radioactive check sources stored on site will be inventoried at a frequency specified by the Radiological Controls Supervisor.

Radioactive waste will be stored in strong, tight containers in designated Radioactive Material Storage Areas after it is removed from an RCA. Radioactively contaminated tools, equipment, and other materials will be marked with yellow and magenta colored tape or equivalent and will be stored in RCAs until they are decontaminated or otherwise disposed of as radioactive waste. Radioactive materials transported through uncontrolled

areas will be wrapped or packaged as necessary to prevent the spread of contamination while transiting these uncontrolled areas.

Packaging, labeling, manifesting, and transportation of radioactive waste will be performed in accordance with all regulatory requirements.

Spread of contamination will be minimized by:

- posting areas with removable contamination in excess of guideline values as CSCA;
- requiring personnel who enter CSCAs to wear anti-contamination clothing specified by the applicable RWP;
- ensuring that personnel remove contaminated clothing properly and place used anti-contamination clothing in designated receptacles upon exiting a CSCA;
- monitoring personnel, materials, and equipment for the presence of radioactive contamination upon exiting or removal from a CSCA, and decontaminating personnel or equipment, or controlling items as radioactive material, as appropriate;
- performing contamination surveys frequently inside CSCAs, along the perimeters of CSCAs, and at the exits of CSCAs; and
- using HEPA-filtered ventilation equipment and HEPA-filtered vacuum cleaners for operations likely to cause significant airborne radioactive contamination or to spread contaminated dusts.

3.3.6 Airborne Monitoring

Airborne particulate monitoring is performed to:

- demonstrate compliance with the intake limits for workers specified in 10 CFR 20;
- meet the posting requirements for Airborne Radioactivity Areas;
- determine whether precautionary measures such as process or engineering controls, increased surveillance, limitation of working times, provision of respiratory protective equipment, or other precautions should be considered; and
- determine whether exposures to radioactive materials are being maintained ALARA.

The system used for monitoring airborne radioactivity shall have a Minimum Detectable Activity (MDA) not greater than 10% of the applicable Derived Air Concentration (DAC). Site specific MDA requirements shall be determined during the project ALARA briefing.

Airborne particulate surveys shall be performed with portable air samplers as follows:

- at least every four hours and when airborne radioactivity is expected to be maximized;
- in RCAs when radiological work is performed;
- during radiological work that has been known to cause or is expected to cause airborne radioactivity;
- before initially entering tanks or voids or opening systems that contain potentially radioactive piping;
- whenever airborne radioactivity levels above the regulatory or administrative limits are suspected; and
- in occupied areas where removable contamination exceeds 10,000 dpm/100 cm^2 alpha or beta gamma.

Portable samples are not required if continuous monitoring is performed. If a continuous air particulate detector is not installed in an exhaust system ventilating an RCA, or the detector is not in operation when radioactive work is being performed in an RCA, portable sampling will be performed every four hours at the ventilation exhaust instead.

Personnel air samplers (lapel samplers) will be employed whenever general area air samples indicate levels greater than 0.1 DAC (or when breathing zone grab samples indicate levels greater than 0.1 DAC) to more accurately measure actual concentrations of airborne radioactivity in the breathing zones.

Portable air particulate sampling equipment will be immediately available during abnormal conditions. Site specific airborne particulate surveys will be performed as identified in the project ALARA briefing.

Continuous air monitors will be employed to sample airborne particulate radioactivity if low volume, portable air sampling is otherwise required but not performed.

3.3.7 Respiratory Protection Program

Respiratory protection requirements will be specified in the applicable RWP. The Radiological Controls Supervisor will specify appropriate respiratory protective equipment based upon measurement of actual airborne radioactive contamination, suspicion/ likelihood of airborne contamination in excess of applicable limits, and consultation with the Certified Health Physicist or Radiologic. ' Engineer.

Prior to using respiratory protective equipment, employees will be physically examined to determine their fitness for using respiratory equipment and will be fit tested to ensure that a proper seal can be obtained between the individual's face and the respirator selected. These physical examinations will be updated annually.

Personnel required to wear respiratory protective equipment will be trained in the proper use and care of the respiratory protective equipment to be employed. This training will contain the following minimum elements:

- when and why respiratory protection is required;
- the operating principles of the selected respiratory protective equipment and its limitations;
- procedures to ensure proper fit of the respirator;
- proper care and maintenance of the selected respirator; and
- emergency actions to be carried out by individuals who experience respirator failure or malfunction, physical or emotional distress, procedural or communication failure, significant deterioration of operating conditions, and any other condition that might require relief.

3.3.8 Personal Protective Clothing Requirements

The Radiological Controls Supervisor will determine the appropriate requirements for personal protective clothing for a given operation or activity and will include these requirements on the applicable RWP.

When working in RCAs with low levels of removable contamination, an ensemble of personal protective clothing consisting of as few items as shoe covers and rubber gloves may be adequate to protect against contamination of personnel. In such cases, precautions should be observed to prevent contaminating personal clothing.

A full set of personal protective clothing will be worn when working in RCAs with high levels of removable contamination, such as >1,000 dpm/100cm^2 alpha or beta/gamma.

A double set of personal protective clothing will be worn when working in RCAs with very high levels of removable contamination, such as >50,000 dpm/100cm^2 beta/gamma or >5,000 dpm/100cm^2 alpha. A double set of anti-contamination clothing decreases the likelihood of radioactive contamination penetrating clothing material during work and helps minimize the possibility of spreading contamination.

It is anticipated that disposable personal protective clothing will be employed during the Plant C decommissioning. Soiled disposable clothing will be packaged into steel drums, or other appropriate containers, so that it can be efficiently volume-reduced.

The use of launderable anti-contamination clothing will also be considered. If selected, launderable anti-contamination clothing will either be laundered on-site or processed regularly by an off-site vendor.

3.3.9 Quality Assurance

During the course of the Plant C decommissioning project, one or more audits of project activities and records will be performed by qualified personnel from the Contractor Quality Assurance Department. Records and activities will be reviewed and compared to the requirements of Contractor procedures. Results of audit findings will be addressed by Contractor corporate management and the Project Manager.

Calibration of all portable radiological instruments will be performed semi-annually, or more frequently if specified by the instrument operating manual, and after repairs or maintenance that could have invalidated the instrument's current calibration. The Certified Health Physicist, the Radiological Engineer, or the Radiological Controls Supervisor will determine whether or not a given instrument requires calibration more frequently than semi-annually. Radiological field survey equipment and laboratory analysis equipment shall be calibrated by qualified personnel using standards traceable to the National Institute of Standards and Technology (NIST).

Portable survey instruments, self-reading pocket dosimeters, counter-scalers, and air sampling equipment will have a current calibration prior to use. The Radiological Controls Supervisor is responsible for ensuring that all such equipment for the Plant C decommissioning maintains a current calibration label and that records of the current calibration are on file. In addition to records of calibration, the Radiological Controls Supervisor will maintain a copy of the operating manual provided by the manufacturer for each type of instrument in use at the project.

3.4 Contractor Personnel and Site Health & Safety Plan

A Site Safety and Health Plan will be prepared before mobilization of the Contractor project team. The purpose of the Site Safety and Health Plan is to establish methods of protecting employees and the public from hazards associated with the decontamination and decommissioning of the Plant C site. The Site Safety and Health Plan will be prepared in accordance with the requirements of 29 CFR 1910.120.

One week after on-site work starts, the Site Safety and Health Plan will be reviewed and revised as necessary to contain provisions for protection against unanticipated project hazards. Other changes to the Site Safety and Health Plan will be made throughout the life of the project as circumstances dictate.

The Site Safety and Health Plan will identify the following elements:

- A safety and health risk or hazard analysis for each operation identified in this Decommissioning Plan;
- Employee training to ensure compliance with 29 CFR 1910.120 and any additional site requirements;
- Personal protective equipment to be used by employees for each operation;

- Medical surveillance requirements;
- Frequency and types of air monitoring, personnel monitoring, environmental sampling techniques, and instrumentation to be employed, including requirements for maintenance and calibration of sampling equipment;
- Site control measures;
- Decontamination procedures;
- Emergency response plan for safe and effective responses to emergencies;
- Confined space entry; and
- Spill containment.

All personnel involved in the decommissioning activities at Plant C will meet the requirements of the project-specific Site Safety and Health Plan, which include applicable requirements from the Contractor ALARA Program, Health Physics Program, Industrial Health and Safety Program, Training Program, and Quality Assurance Program.

3.5 Radioactive Waste Management

Radioactively contaminated building materials and soil will be packaged in steel boxes or in heavy-duty fabric bags. Soiled protective clothing will be packaged in steel drums to facilitate volume reduction.

All radioactive waste from the Plant C decommissioning is expected to be Low Specific Activity (LSA), Class A-Unstable waste. It is not anticipated that any mixed waste will be generated during the course of decommissioning Plant C.

In the event that a quantity of mixed waste is discovered in Plant C, the Site Safety and Health Plan will be revised to include provisions for handling the waste; mixed waste will be segregated from other radioactive waste containers to simplify management of the waste.

Asbestos containing materials may be radiologically contaminated. All radiologically contaminated materials that contain asbestos will be removed and packaged for disposal by a licensed contractor. Asbestos removal will be in accordance with a specific work instruction. Radiological controls for removal of radioactively contaminated asbestos will be provided by the Contractor. Radioactive waste containing asbestos will be segregated from other containers of radioactive waste to facilitate overall waste management activities.

Packaged radioactive waste awaiting disposal will be stored in a segregated area within the security fence surrounding Plant C. If possible, an area inside Plant C will be used to store radioactive waste awaiting disposal since an indoor area will afford some

protection from the weather for the waste containers. The selected area will be below guideline values for radioactive contamination and will be out of the way of planned decontamination activities.

Gamma radiation levels associated with the stored waste should not be more than 5 millirem (mrem)/hr above background. The highest gamma dose rate documented during previous surveys of Plant C is 32 mrem/hr from a contaminated spot on the floor of the ground level. Appropriate dosimetry will be required for access within the radioactive materials storage area.

The selected area for temporary storage of radioactive waste will be designated with yellow and magenta boundary rope and posted with signs warning that the area is a radioactive material storage area. The warning signs will state requirements for entering the posted area. The security fence surrounding Plant C will prevent unauthorized access to the radioactive materials storage area by unauthorized personnel.

Packaging, labeling, manifesting, and transportation of radioactive waste will be performed in accordance with all regulatory requirements. A disposal facility has not yet been selected for receipt of radioactive waste generated from decommissioning Plant C.

3.6 References

Reference 3-1 DOE/EV-005/48, "Formerly Utilized MED/AEC Sites Remedial Action Program - Radiological Survey of the Harshaw Chemical Company, Cleveland, Ohio," April, 1984.

Reference 3-2 "Chevron Chemical Company Plant C, Cleveland, Ohio, Radiological Assessment Report" (CWM), April-June, 1992.

Reference 3-3 NUREG/CR 5849, "Manual for Conducting Radiological Surveys in Support of License Termination," June, 1992.

Figure 3-1
Plant C First Floor

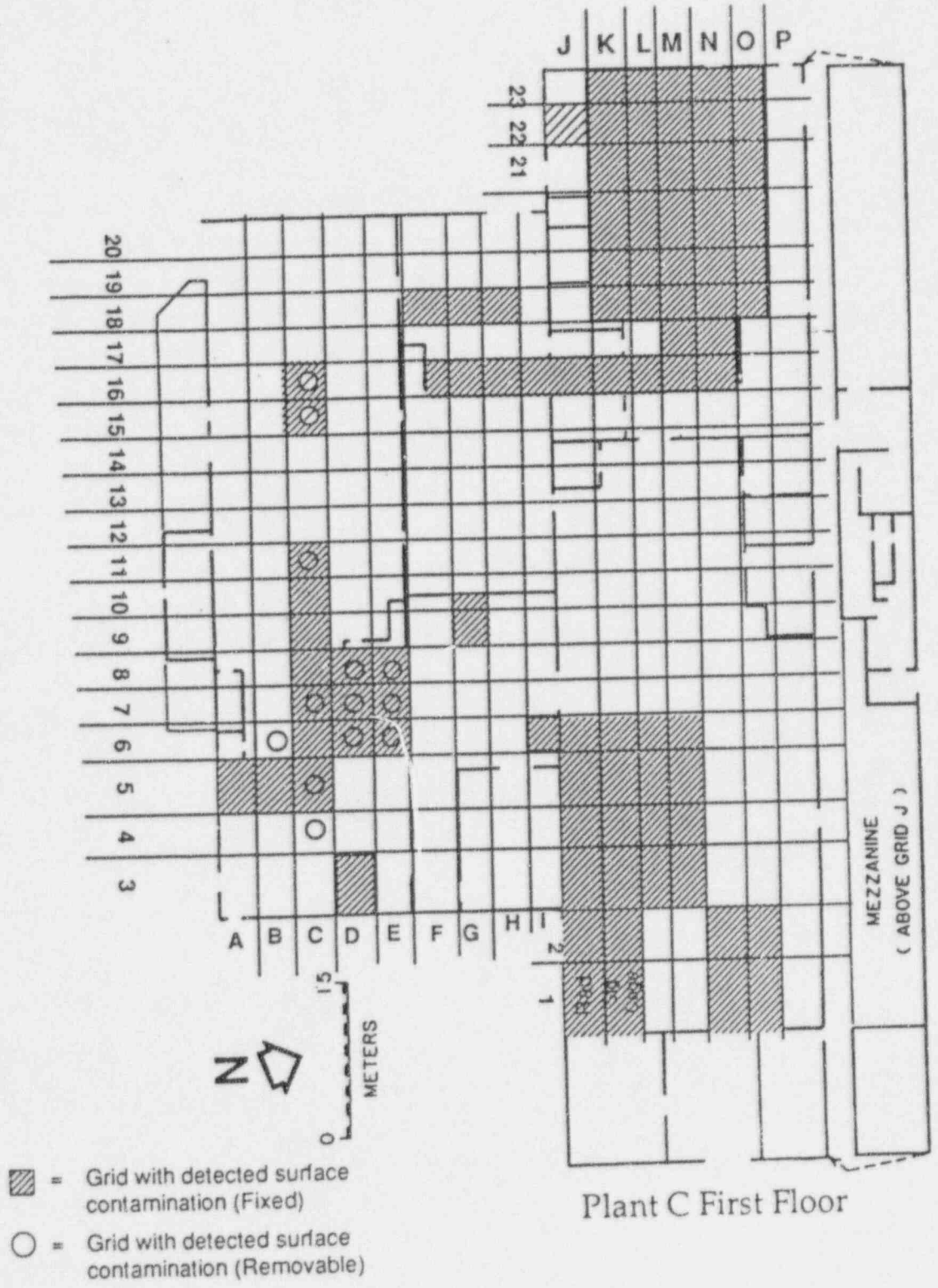
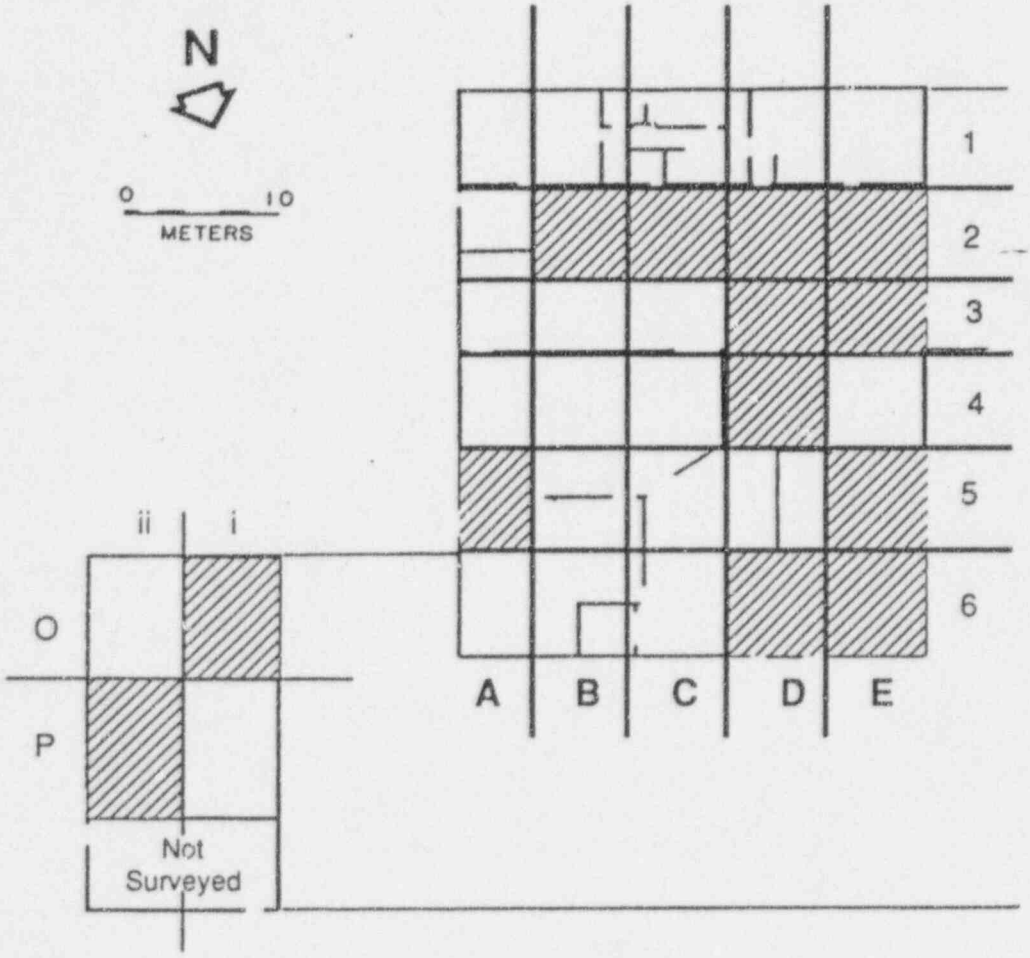


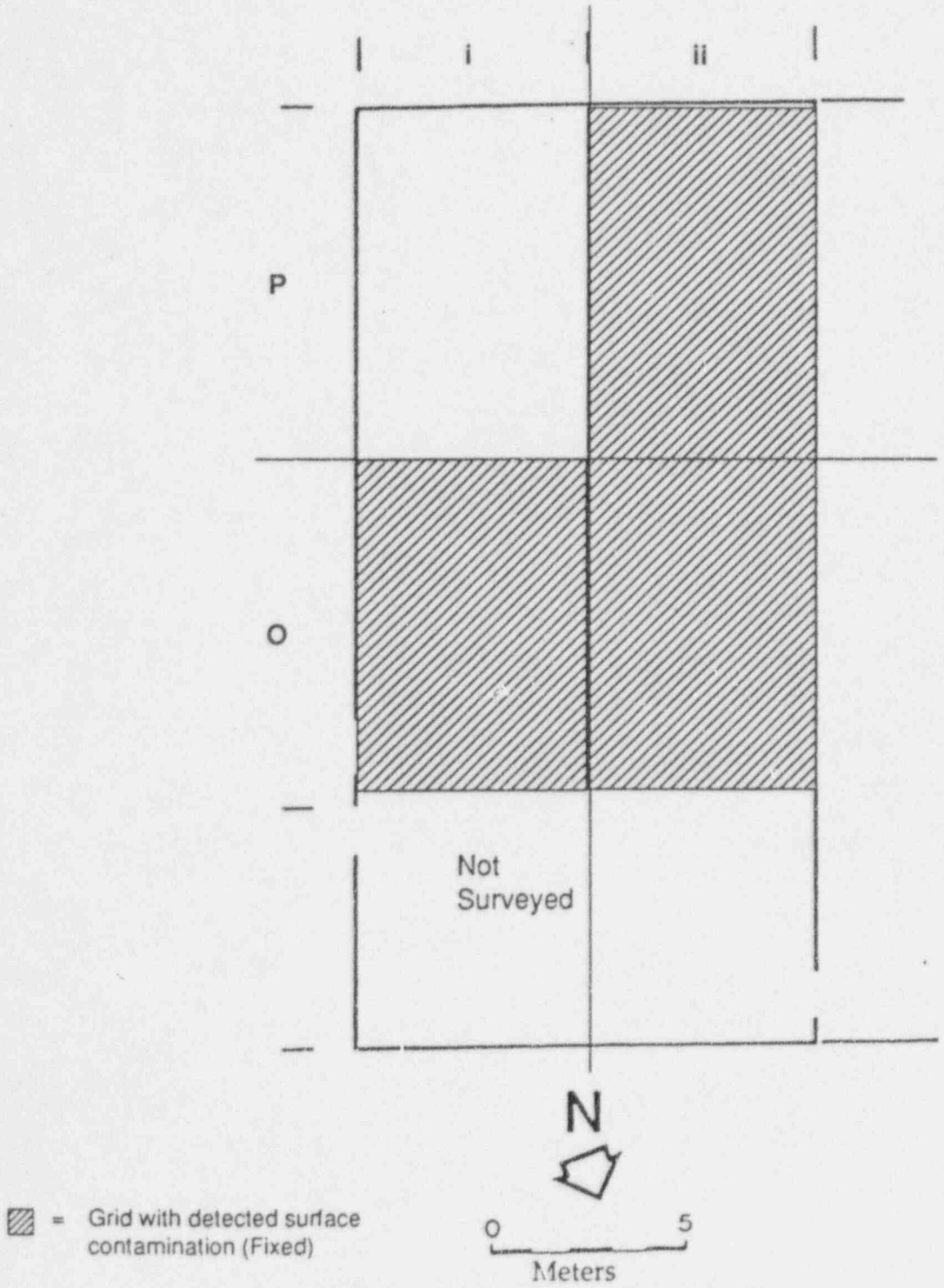
Figure 3-2
Plant C Second Floor



Plant C Second Floor

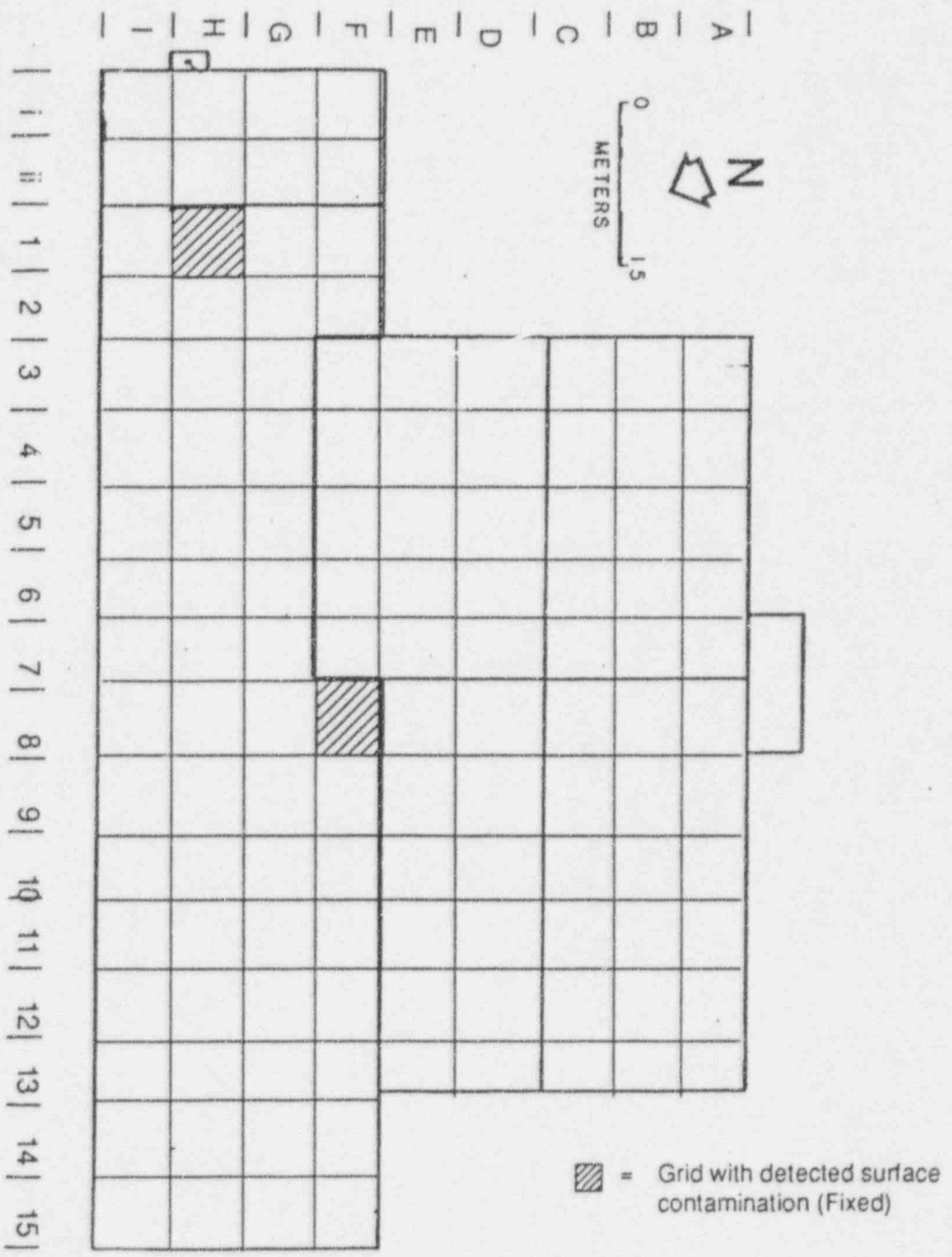
▨ = Grid with detected surface contamination (Fixed)

Figure 3-3
Plant C Third Floor



Plant C Third Floor

Figure 3-4
Plant C Roof



Plant C Roof

4.0 FINAL RADIOLOGICAL STATUS SURVEYS

The purpose of the Final Radiological Status Surveys is to demonstrate that the radiological conditions of Plant C satisfy the guidelines approved for use at the Plant C site (Section 2.1.1 of this Decommissioning Plan), and that the site should, therefore, be released from restrictions for future use without the need for radiological controls. These surveys will be performed with guidance from NUREG/CR 5849, "Manual for Conducting Radiological Surveys in Support of License Termination," (Reference 4-1). The specific objectives of the Final Radiological Status Surveys are to demonstrate the following:

Residual Surface Activity of Building Surfaces and Structures

- Average surface contamination levels for each survey unit are within the authorized guideline values;
- Small areas of residual activity (hot spots) do not exceed the authorized guideline value for maximum residual surface activity;
- Reasonable efforts have been made to clean up removable activity, and remaining removable activity does not exceed the authorized guideline values; and
- Average exposure rates resulting from residual activity are less than 5 μrem/hr above background and no discrete point exceeds 10 μrem/hr above background (exposure levels are measured at 1 m from floor and lower wall surfaces and are averaged over areas not to exceed 10 m^2).

Volume Activity of Soil

- Average concentrations of natural uranium are within the authorized guideline value (soil radionuclide concentrations are averaged over a maximum area of 100 m^2);
- Reasonable efforts have been made to identify and remove areas of elevated soil activity that may exceed the guideline value by greater than a factor of $(100/A)^{1/2}$, where A is the area (in m^2) of the elevated activity; and
- Exposure rates resulting from residual activity are less than 5 μrem/hr above background with maximum exposure rates over any discrete area not to exceed 10 μrem/hr (exposure levels are measured at 1 m from the surface of the soil and are averaged over areas not to exceed 100 m^2).

The radiological conditions described above will be demonstrated at a 95% confidence level for each survey unit as a whole.

The number of samples collected per survey unit will be stratified based upon the potential for residual radioactivity. Contamination potential will be based upon a review of the results of the Radiological Characterization Survey and surveys taken during decontamination operations.

4.1 Background Determinations

Background values for use in comparing actual measurements of Plant C radiological conditions to guideline values will be determined during the Radiological Characterization Survey. Measurements determining background values will be taken in areas unaffected by radiological work at the site.

4.2 Area Classification

For purposes of establishing the sampling and measurement frequency and pattern, the Plant C site will be divided into Affected and Unaffected areas. The bases for these classifications are:

Affected Areas - Areas that have potential radioactive contamination (based on plant operating history) or known radioactive contamination (based on actual radiological surveys).

Unaffected Areas - All areas not classified as Affected Areas. These areas are not expected to contain residual radioactivity based upon survey information. These are areas where characterization and decontamination surveys detected no residual activity in excess of guideline values.

4.3 Reference Grid System

A reference grid system will already have been established during the Radiological Characterization Survey. This grid system will also be used for the Final Radiological Status Survey. Portions of the grid system will have to be re-established as a result of decontamination activities that destroyed grid markings on original surfaces. Using the reference grid system established for the Radiological Characterization Survey saves the time that would be spent marking off a new grid scheme.

The entire Plant C site shall be subdivided into many individual survey units having common contamination potential so that the radiological condition of the property is evaluated section-by-section. A survey unit is a grouping of contiguous surfaces, rooms, or areas with similar use history that have the same classification of contamination potential. In no case shall Affected and Unaffected Areas be included within the same survey unit. When dividing areas into survey units, areas that are naturally distinguishable from other areas, in addition to sharing a common contamination potential, will be grouped into individual survey units. Survey units shall be sized to assure a minimum of thirty measurement locations for floors and lower walls, other vertical surfaces, and other horizontal surfaces.

4.4 Surface Scans

Scanning of surfaces to identify locations of residual surface and near-surface activity will be performed according to the following schedule:

- Affected Area surfaces - 100% of floor and lower wall surfaces (< 2 meters from floor) and other surfaces in Affected Areas found to have residual activity in excess of guideline values during the Radiological Characterization Survey;
- Upper surfaces (> 2 meters from floor) of Affected Areas found to be non-contaminated during the Radiological Characterization Survey - scans in immediate vicinity of direct measurements;
- Unaffected Area surfaces - 10% of floor and lower wall surfaces (< 2 meters from floor).

Not exactly per second paragraph of 5843, p 4-15, 2nd paragraph

Building interior and exterior surface scans will be conducted for beta-gamma radiations. In selected areas, alpha radiation scans will be performed to verify that the beta-gamma radiation scans have identified the contaminated areas. Soil surfaces will be scanned for gamma radiation only.

OK? →

The instruments having the lowest detection sensitivity will be used for the scans wherever physical surface conditions and measurement locations permit. Instruments with audible indicators will be used to identify locations having elevated levels of directly-measured radiation exceeding two times background. Locations of surface activity exceeding twice background shall be marked for further evaluation.

what about 25 & 75% fraction?

4.5 Surface Activity Measurements

4.5.1 Direct Measurements

Direct measurements of alpha, beta-gamma, or gamma surface activity will be performed at selected locations using instrumentation similar to that selected for the same measurements performed during the Radiological Characterization Survey. Unless precluded by surface condition or physical parameters, the most sensitive of the instruments available will be used for direct surface measurements. Measurements will be performed by integrating counts over a sufficiently long period of time to achieve a satisfactorily low MDA. Count times will be determined on site based on background levels and detector efficiency.

Define! →

If scanning methods will be capable of detecting a residual uranium activity of less than 1,000 dpm/100 cm^2, direct surface activity measurements will be systematically performed at two meter intervals on floors and lower walls of Affected Areas and at the same intervals on upper surfaces of Affected Areas. If scanning methods produce an MDA that exceeds 1,000 dpm/100 cm^2, measurements will be performed at one meter intervals.

Compare to 4.4 above vs 5843

On upper surfaces of Affected Areas that are not scanned for the presence of residual activity (areas where the Radiological Characterization Survey detected no residual activity in excess of 5,000 dpm/100 cm^2), measurements will be performed at a minimum of thirty locations on both vertical and horizontal surfaces. These locations will include surfaces where radioactive material would likely settle and sufficient additional locations to provide coverage at a minimum of one location per 20 m^2 of surface area.

4.5.2 Removable Surface Activity Measurements

A smear sample for removable contamination will be collected from each location where a direct surface activity measurement is made. These samples will be analyzed for alpha and beta-gamma contamination.

4.6 Exposure Rate Measurements

Gamma exposure rates will be measured at a distance of one meter perpendicular to building surfaces, using a gamma scintillation instrument detector calibrated for low enrichment uranium radiation energies. Measurements will be uniformly spaced according to the following pattern:

Building interiors

Affected Areas:	one measurement per 4 m^2
Unaffected Areas:	one measurement per 50 m^2

Grounds (except areas of soil)

Affected Areas:	one measurement per 20 1m^2 gridblocks
Unaffected Areas:	one measurement per 50 1m^2 gridblocks

Soil areas

Affected Areas:	four measurements per 100 m^2 gridblock
Unaffected Areas:	one measurement per 100 m^2 gridblock

4.7 Soil Sampling

4.7.1 Sampling of Surface Soil

Samples of surface soil will be systematically collected from the four points midway between the center and each gridblock corner for each 100 m^2 gridblock in Affected Areas. In Unaffected Areas, one sample will be collected from each 100 m^2 gridblock. At each surface sampling location, contact gamma radiation levels before and after sampling will be measured to determine whether subsurface contamination is present. Soil samples will be analyzed to determine radioactivity concentrations.

4.7.2 Sampling of Subsurface Soil

Locations of potential subsurface radiological contamination will be sampled in 2-foot increments until the depth of contamination is bounded. These locations will be chosen based on the contact gamma radiation readings described in Section 4.7.1. Soil samples will be analyzed to determine radioactivity concentrations.

Underground hazards such as energy sources or obstructions will already have been identified during the Radiological Characterization Survey. Markings established prior to the Radiological Characterization Survey that show the locations of any underground hazards will be verified prior to beginning the Final Radiological Status Survey subsurface soil sampling.

4.8 Other Measurements and Samples

4.8.1 Building Interiors

Exterior of piping and ventilation ducting in Affected Areas will be surveyed by beta-gamma scans to determine locations which exceed background (typically two times background). At these locations, and at available access points to pipe and ducting interiors, direct alpha measurements and smear samples for removable contaminants will be taken.

Remaining ducts, electrical boxes, conduits, or other interior surfaces in Affected Areas that may contain residual contamination, will be accessed at random, and measurements of direct and removable activity will be performed.

4.8.2 Building Exteriors

Measurements of direct and removable activity will be performed on exterior and interior surfaces of air exhaust equipment and at roof drains. Samples of roofing material will be obtained where direct measurements indicate contamination is present.

Exterior walls will be surveyed as if they were Unaffected Area interior walls. The exterior surface of the roof will be scanned for gamma radiation as if it were an Affected Area interior floor.

4.9 Sample Analyses

Smears and swabs for removable contamination will be counted for gross alpha and gross beta-gamma activity. Soil will be analyzed for natural uranium concentration by gamma spectrometry. Chain-of-custody procedures will be observed for all sample analyses.

4.10 Data Interpretation

Radiological measurement data will be converted to units of dpm/100cm^2 (surface activity), µrem/hr (exposure rates), and pCi/g (soil radionuclide concentrations) for comparison to guideline values. Values will be adjusted for contributions from natural background. Individual measurements and soil concentrations will be compared to guideline values for maximum activity locations. Average values for survey unit radiological parameters will be determined and compared to guideline values for average activity. Data collected during the Final Radiological Status Survey for each survey unit will be tested against the confidence level objective of 95% using guidance and procedures described in Reference 4-1.

Additional remediation and/or further sampling and measurements will be performed where guidelines are not met or cannot be demonstrated to the 95% confidence level. Computations and comparisons will be repeated as necessary.

4.11 Final Radiological Status Survey Report

The Contractor will prepare a Final Radiological Status Survey Report that will provide a complete record of the radiological status of each survey unit at the Plant C site. This report will conform to the guidance presented in Reference 4-1.

4.12 References

Reference 4-1 NUREG/CR 5849, "Manual for Conducting Radiological Surveys in Support of License Termination," June, 1992.

5.0 FUNDING

An Environmental Reserve Fund has been set aside to address all activities required to complete the proposed work plan for Plant C. Through the duration of the project, projected cost and actual cost will be compared against this reserve to assure that sufficient funding exists to execute the work plan. If a short fall of funding develops, the reserve fund will be supplemented.

6.0 PHYSICAL SECURITY PLAN AND MATERIAL CONTROL AND ACCOUNTING PLAN PROVISIONS IN PLACE DURING DECOMMISSIONING

The two previous radiological assessments of the Plant C site have not identified any source material or special nuclear material at the site. Therefore, a Physical Security and Material Control Plan will not be developed or implemented during the decontamination and decommissioning. Plant C is located within an area with controlled access.

7.0 RECORDS/REPORTS/NOTIFICATIONS

7.1 Records, Reports, and Notifications

All records that are generated through the performance of the Plant C decommissioning activities will be maintained in accordance with Contractor USNRC Radioactive Materials License requirements.