APPENDIX B

to SNM-124, Chapter 7, Revision 2

April 28, 1989

PLUTONIUM FACILITIES

DECOMMISSIONING PROJECT PLAN

CONDITION ADDENDUM

Nuclear Fuel Services, Inc.
Erwin, Tennessee

April 28, 1989

CONDITION ADDENDUM
PLUTONIUM FACILITIES DECOMMISSIONING PROJECT PLAN

1.0 INTRODUCTION AND BACKGROUND

Nuclear Fuel Services, Inc., (NFS) initially submitted a conceptual plan for the decontamination and decommissioning of the plutonium facilities located in Erwin, Tennessee to the NRC on October 9, 1978, (reference 1). The conceptual plan was approved by the NRC on March 16, 1979, (reference 2).

Amendment No. 5 to Special Nuclear Material License No. SNM-124 License was issued by the NRC on April 30, 1980, (reference 5). That amendment modified license condition 51 and added license conditions 52 through 60. Upon completion of decontamination and decommissioning of the uranium-233 process facilities, further implementation of decommissioning activities were suspended because of non-acceptance of transuranic (TRU) bearing wastes at commercial radioactive waste burial sites.

Upon completion of a contractual agreement with the U.S. Department of Energy (DOE) relating to the acceptance of TRU wastes, NFS reactivated its plutonium decommissioning efforts by updating and adding detail to the 1978 conceptual plan in the form of a plutonium decommissioning project plan which was submitted to the NRC for demonstration purposes on October 28, 1988.

After NRC review of this updated plan and NFS discussions with the NRC staff, this document is submitted as containing the NFS commitments and specific conditions required for the NRC to approve the overall plan and thereby permitting NFS to proceed with its plutonium decommissioning effort. This document is intended to contain commitments which will allow the NRC to withdraw Conditions 51 through 60 of the current SNM License No. SNM-124 under which NFS conducts its operations. The withdrawal of Conditions 51 through 60 is necessary as they are outdated and obsolete.

This document, although it contains references to specific sections of SNM License No. SNM-124, is intended as a "stand-alone" submittal which, upon completion of the plutonium decommissioning activities and final release by the NRC, will not encumber the current SNM License or the renewal license when it is issued.

It is intended that the commitments made in this submittal are in conformity with all of the conditions of the present license except where a specific change is requested. In the event of conflict between this submittal and the existing license, except where it contains a specific request for change, the existing license will prevail. Similarly, should a conflict exist between this submittal and any subsequently issued renewal license, the conditions of the renewal license will prevail.

2.0 BACKGROUND AND OBJECTIVES

The objectives of the Decontamination and Decommissioning (D&D) Project are:

1) To restore the existing facilities and site to levels of contamination which will permit "unrestricted" use, including possible use for future NFS requirements;

2) To accomplish the work in a safe and environmentally acceptable manner in accordance with all applicable federal and state laws and regulations;

3) To maintain exposures As Low As [is] Reasonably Achievable (ALARA).

2.1 Facilities Description

Figure 2-1 shows the NFS plutonium facilities to be decommissioned in relation to the Erwin plant site. Table 2-1 provides a description of those facilities.

2.2 General Scope of Work

In order to accomplish the decommissioning project, facilities, equipment, and real estate will be decontaminated to acceptable contamination levels. Where decontamination is not practical or economical, contaminated materials will be disposed of at approved disposal sites.

2.3 Waste Disposal

Prior to shipment from NFS, shipping containers will be inspected, radioactive materials will be segregated according to waste classification, and materials will be properly packaged for shipment to either a licensed commercial solid waste volume reduction facility (e.g.; Scientific Ecology Group, Inc. (SEG), Oak Ridge, Tennessee,) for volume reduction; the Southeast Compact burial site at Barnwell, South Carolina operated by Chem-Nuclear Systems, Inc. (CNSI), for waste burial; or a DOE facility for waste storage. All shipments will be made in conformance with Title 10, Code of Federal Regulations (CFR), Part 71.

2.3.1 Segregation of Materials

Materials will be segregated into three distinct waste categories. Categories will be determined by radioactive non-destructive assay (NDA) measurements in conjunction with weights of components or component parts, in order to provide appropriate packaging prior to transporting for volume reduction, storage, or burial. These categories are defined as Class A ($\leq$10 nCi/gm), Class C (>10 - $\leq$ 100 nCi/gm), and TRU (> 100 nCi/gm).

2.3.2 Packaging for Shipment to SEG (or Alternate) for Volume Reduction

2.3.2.1 Materials containing:

≤10 nCi/gm concentration of radioactivity will be packaged in an appropriate Type A package. The package will be shipped as low specific activity (LSA) material and meet the specifications of a Type A package.

>10 - ≤100 nCi/gm concentration of radioactivity will be packaged in an appropriate Type A package. The package will be shipped as LSA material and meet the specifications of a Type A package.

>100 nCi/gm concentration of radioactivity will be packaged in an appropriate Type B package. The package will be shipped as TRU material to a DOE facility and meet the specificatons of a Type B package.

2.3.2.2 Packaging for Shipment to CNSI, Barnwell, S.C.

Materials containing:
10 nCi/gm concentrations of radioactivity will be placed in appropriate Type A containers.

>10 - ≤100 nCi/gm concentrations of radioactivity will be placed in appropriate Type A containers, compacted, and then placed in specially made containers that can be lined top, bottom, and sides with 2.5 inches of stabilization material around the radioactive contents to meet the Barnwell criteria for Class C waste.

2.3.2.3 Packaging for Shipment to DOE Facility

Materials containing:
>100 nCi/gm concentrations of radioactivity will be packaged in containers which meet the criteria specified by DOE-INEL. These containers are designed to provide safety, integrity, improved space usage, and waste handling.

2.3.3 Decontamination and Smear Surveys of Containers

Upon completion of the packaging and closure processes, all packages will be decontaminated; a smear survey will be performed on top, bottom, and sides of each package and a determination made that each smear sample is below the release criteria of 1000 dpm/100 cm^2 beta-gamma and 20 dpm/100 cm^2 alpha.

2.3.4 Radiation Survey

A radiation dose rate survey will be performed on each completed package. Total radiation readings, including neutrons, of each package will not exceed 1000 mRem/hr at any point on the external surface of the package. Packages exceeding 200 mRem/hr will be shipped using the special requirements of 10 CFR 71.47.

FIGURE 2-1
• Plutonium Facilities

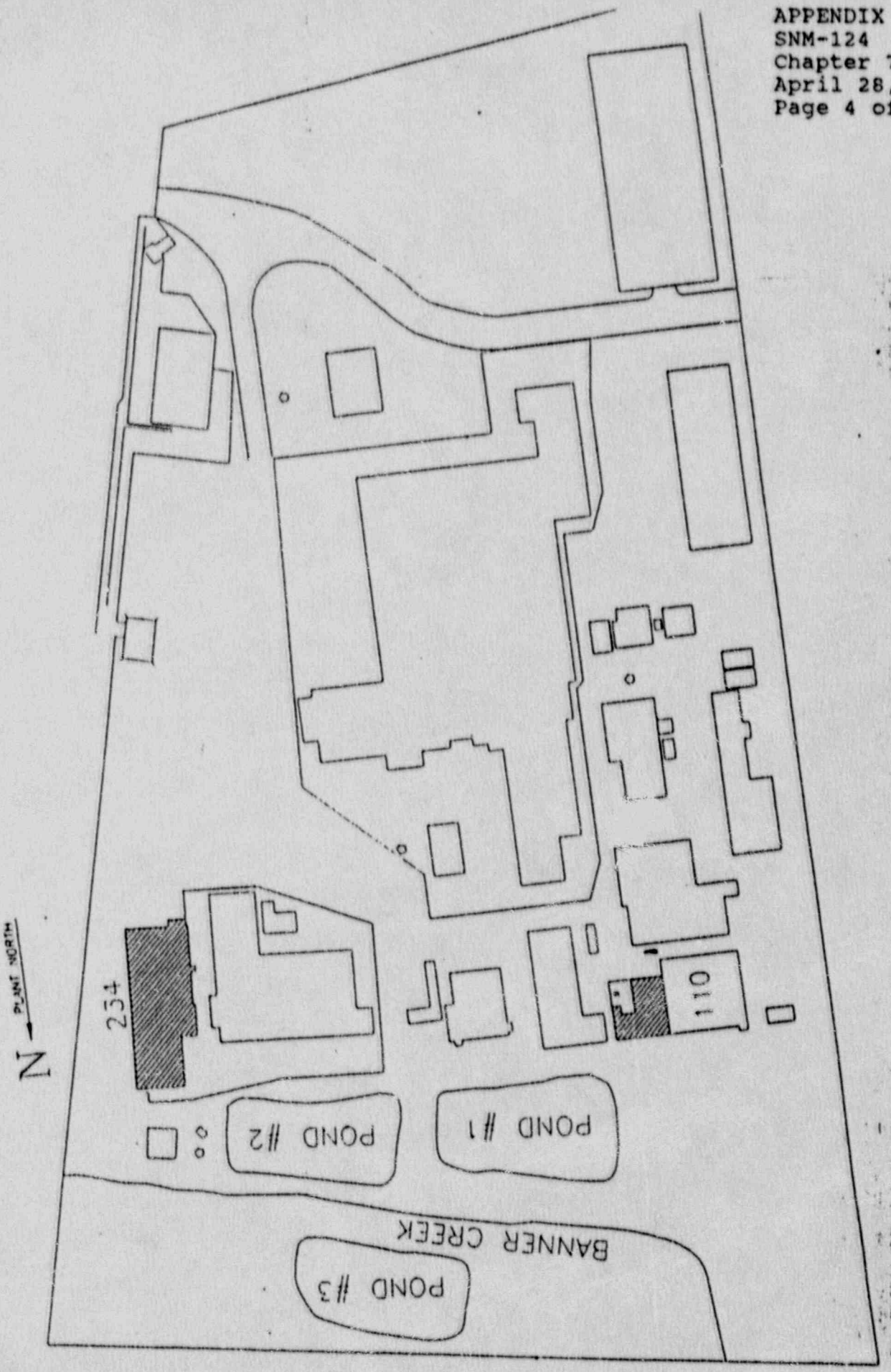


Table 2-1

Description of Plutonium Facilities

234 BLDG.	PROCESSING FUNCTION	SQUARE FEET
Area C	Pelleting	3,000
Area A	Batch Weigh	108
Area B	Former ^{233}U Process	994
Area D	Fabrication	1,550
Area E	Lab	228
Area F	Office	135
Area G	Clean Change	246
Area H	Process Change	249
Area I	Material Unloading	288
Area M	Airlock	360
Area 67	Condensate Station	168
Area 68	Condensate Station	66
Wet Cell	Cell	630
	TOTAL	8,022

110 BLDG.	PROCESSING FUNCTION	SQUARE FEET
Area C	Wet Lab Chemistry*	1,800
Area D	Spectrographic Lab	617
	TOTAL	2,417

*Includes underground tank and associated piping.

2.4 Safety and Safeguards Review (SSR) Council

Decommissioning Work Procedures (DWP) and special health and safety procedures will be prepared and, when approved by the NFS SSR Council, implemented for the performance of this work. Additional responsibilities include: Review and approval of all facility modifications in regard to criticality safety, radiation safety and protection; changes to the facility or facility operation which affect material control and accountability or physical security and safety; review of license required inspection and audit reports; and review of any unusual event or regulatory violations having safety significance.

3.0 ORGANIZATION

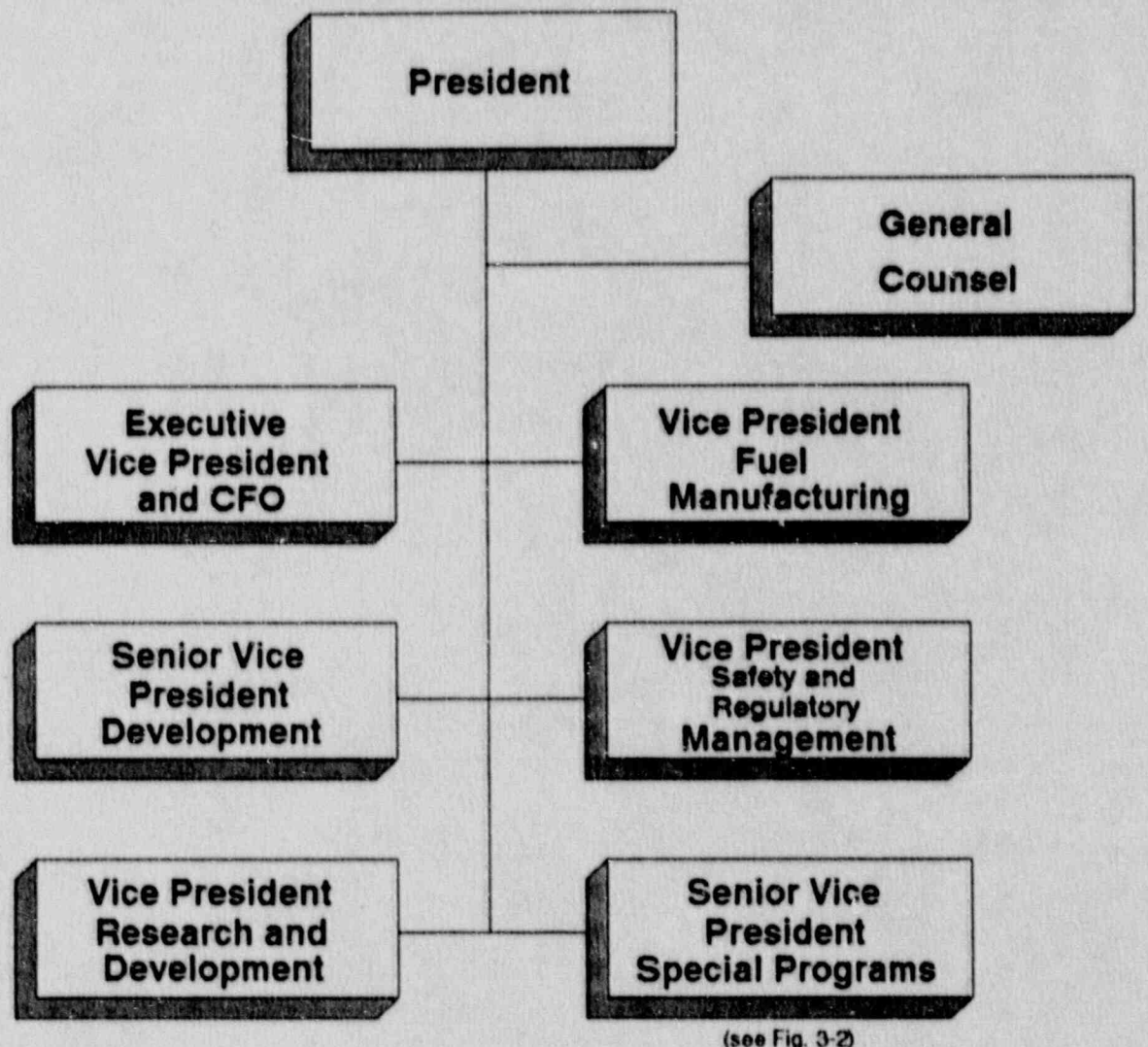
3.1 Structure

The sole responsibility for decontamination and decommissioning of the plutonium facilities lies with NFS. Figure 3-1 depicts the current NFS plant-wide organization. The line responsibility within NFS resides with the Senior Vice President, Special Programs and, more specifically, with the Decommissioning Project Director - Plutonium Project (see Figures 3-2 and 3-3).

A wholly owned NFS subsidiary, EcoTek, Inc., will assist NFS with decommissioning activities at the Erwin site. Figure 3-4 depicts EcoTek's organizational structure. The EcoTek line responsibility for plutonium decommissioning lies with the Project Manager - Plutonium (see Figure 3-5). Upon commencement of the decommissioning effort, a dedicated project team will be established to plan, develop and provide safe methodologies and approaches for the conduct of decommissioning activities through the completion of the project (see Figure 3-6).

Figure 3-1

Nuclear Fuel Services, Inc.
Plantwide Organizational Chart



(see Fig. 3-2)

Figure 3-2

Nuclear Fuel Services, Inc
Special Programs

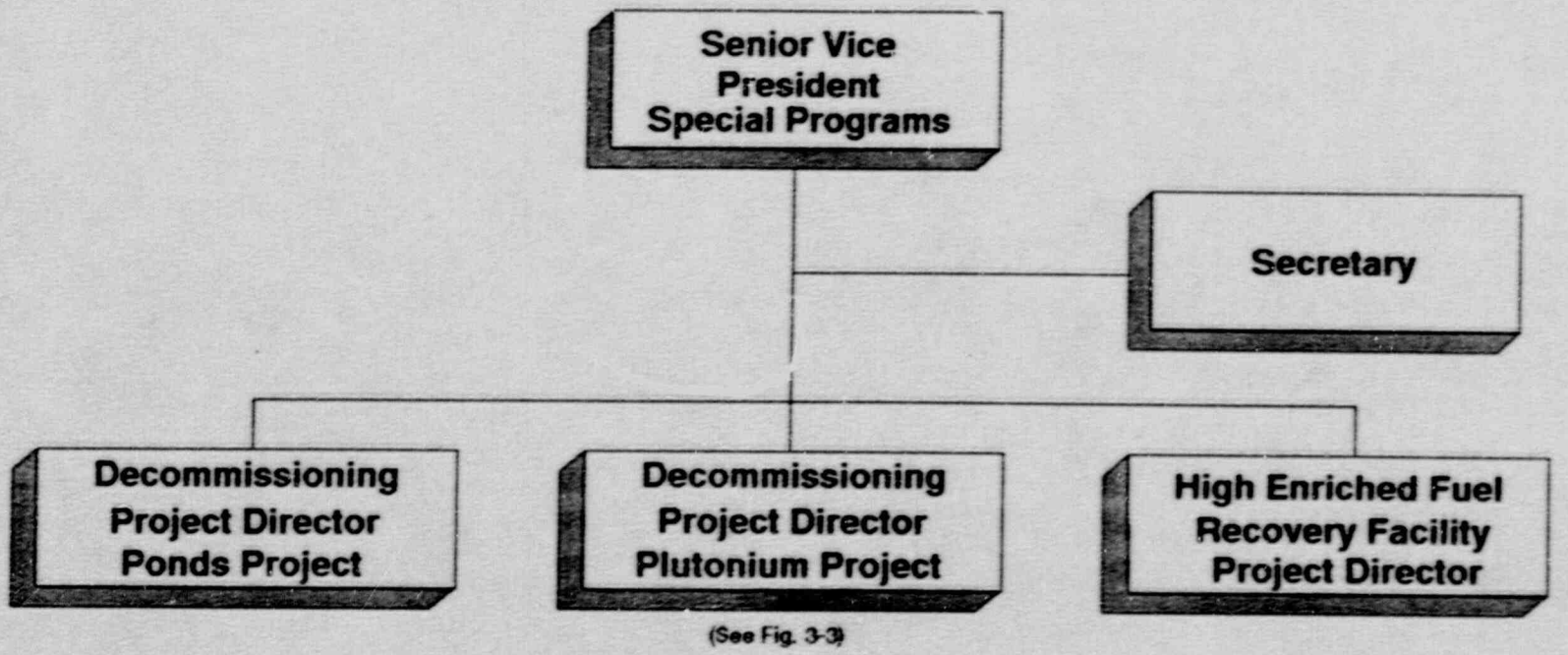


Figure 3-3

Nuclear Fuel Services, Inc.
Plutonium Decommissioning Organization

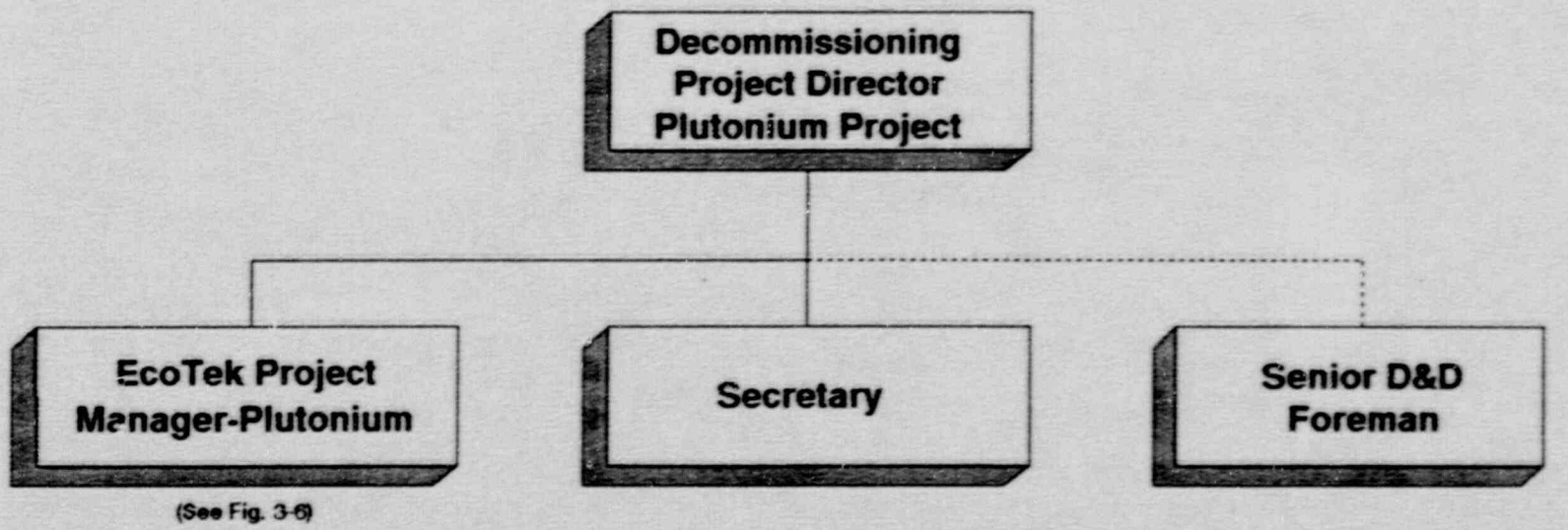


Figure 3-4

EcoTek Organizational Chart

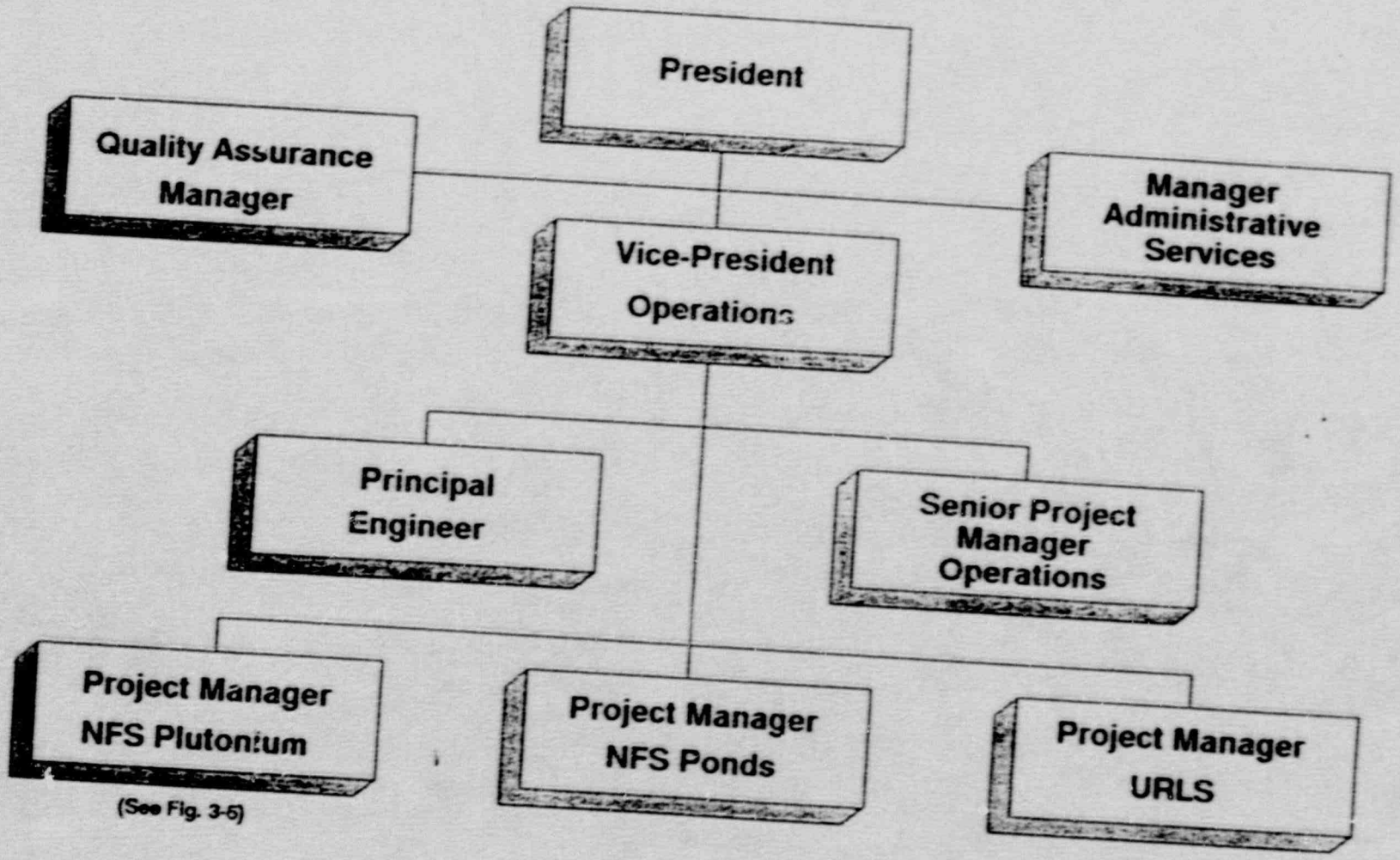


Figure 3-5

EcoTek Plutonium Project Management Organizational Chart

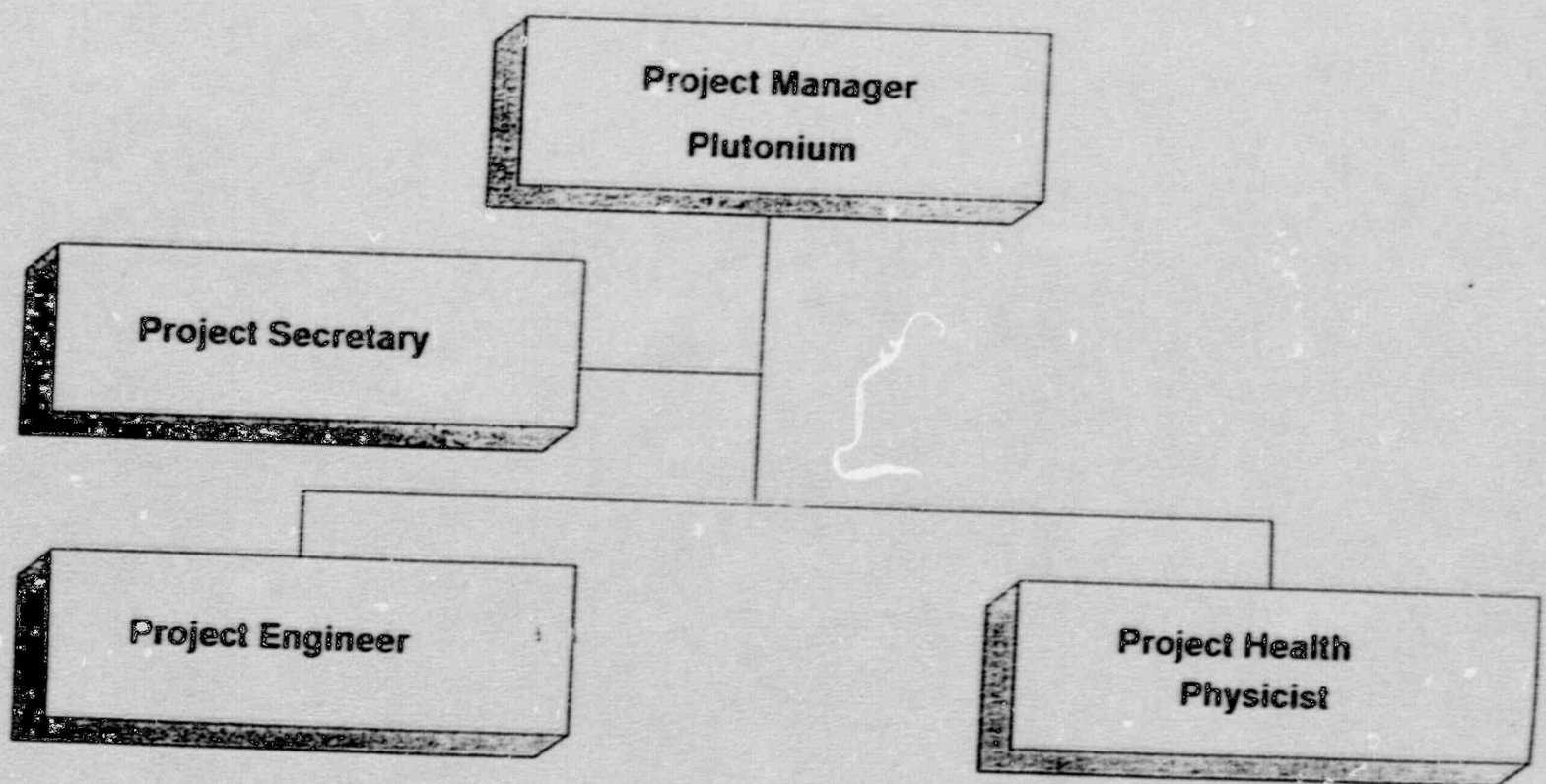
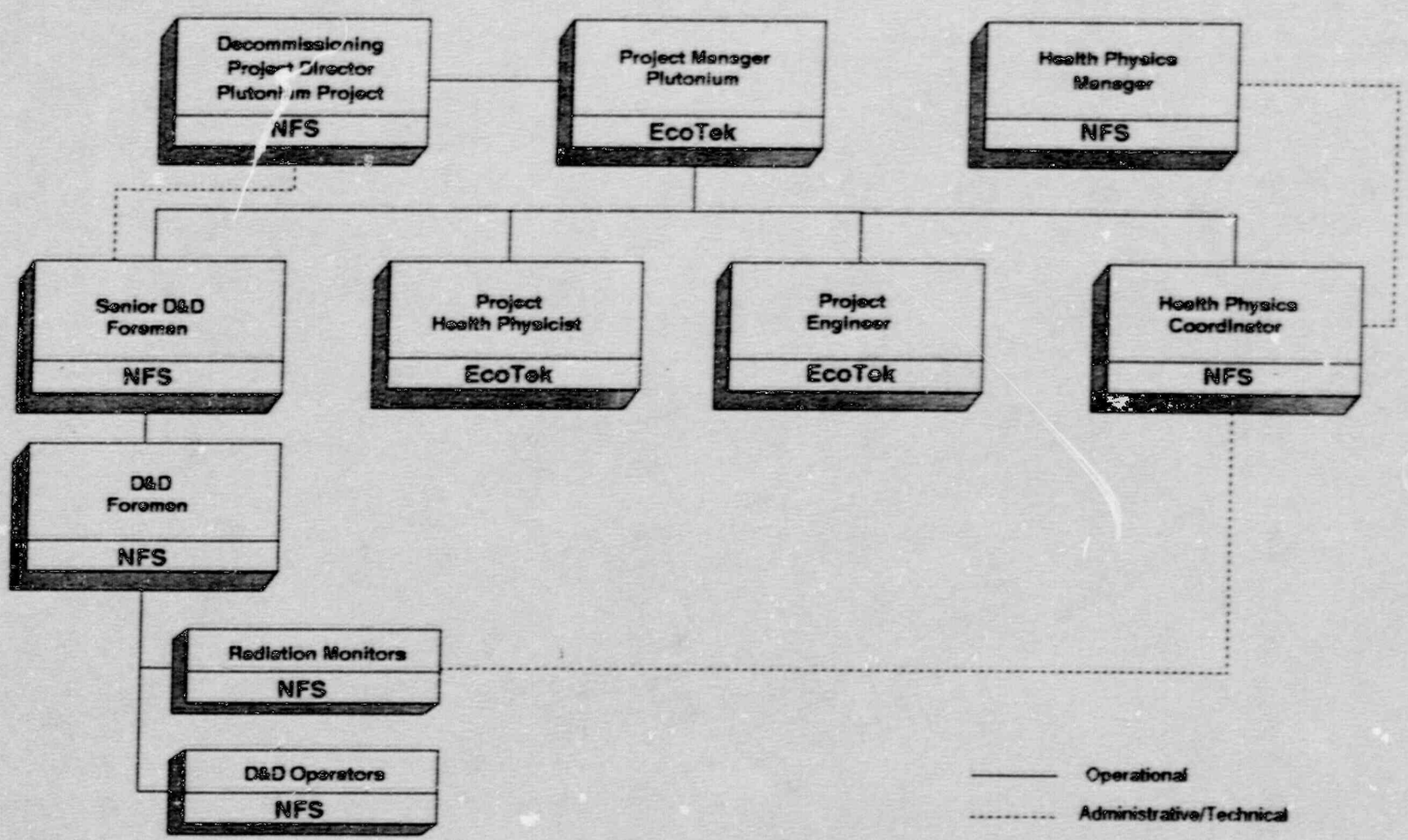


Figure 3-6

Plutonium Decommissioning Project Team



3.2 Responsibilities & Qualifications

As a minimum, all personnel assigned to perform NFS decommissioning work, will have successfully completed NFS' radiation, nuclear and industrial safety orientation and refresher training. Personnel assigned to the project will have a minimum of two years experience with radiation and radioactive materials handling and processing.

3.2.1 NFS Decommissioning Project Director - Plutonium Project

The NFS Decommissioning Project Director - Plutonium Project is responsible for NFS decommissioning activities associated with the plutonium project. He has overall responsibility for assuring that the project is managed by experienced and qualified personnel and that projects are implemented in accordance with written direction. He is responsible for overseeing scheduling, coordinating with NFS support and services departments and overseeing the EcoTek Project Manager - Plutonium, to ensure the project is performed in an efficient and safe manner (see Figures 3-3 and 3-6). In matters of safety and regulatory compliance, the position is subordinate to the Director of Safety, who may independently determine safety and license compliance requirements. The position's responsibilities with regard to material control accountability and physical protection are defined in NFS' Fundamental Nuclear Material Control (FNMC) and Physical Safeguards Plans respectively. The position requires a Baccalaureate degree in engineering or physical science with at least three years experience in D&D of nuclear facilities. Equivalent experience may be substituted for educational requirements when approved by the NRC.

3.2.2 EcoTek Project Manager - Plutonium

The EcoTek Project Manager - Plutonium is responsible for developing the decommissioning project plan and detailed work procedures for the safe and effective D&D of the plutonium facility. The position will develop a schedule for the overall project, a conceptual design for the Decontamination and Volume Reduction Facility (DVRF), and specifications for D&D equipment. This position is responsible for conducting the initial survey and clean-up of the plutonium facilities prior to the start of decommissioning, and for providing technical support of all activities associated with the actual decommissioning effort through the final survey and unrestricted release of the facilities. The position is subordinate to the NFS Decommissioning Project Director - Plutonium Project in all matters related to D&D of the NFS plutonium facilities. The position requires a Baccalaureate degree in engineering or physical science with at least five years experience in D&D of nuclear facilities. Equivalent experience may be substituted for educational requirements when approved by the NRC.

3.2.3 Health Physics Coordinator

The Health Physics Coordinator organizationally reports directly to the NFS Safety Department and is at liberty to use that line of communication to request assistance and support. The position is responsible for radiation monitoring, the safety aspects of procedural compliance and general safety observation and oversight of the decommissioning operations. Through frequent audits and inspections of work activities, the position provides "on-the-floor" health physics expertise to first line supervision and workers. This position has authority to immediately stop any operation which is believed to be unsafe. This position requires a Baccalaureate degree in science or engineering with specialized training in health physics. In addition, he must have at least five years of applied health physics experience in a nuclear facility.

3.2.4 EcoTek Project Health Physicist

The responsibility of the EcoTek Project Health Physicist is to provide daily radiological evaluations and develop protection guidelines and to aid in the safe conduct of decommissioning activities. The position is responsible for developing and providing project specific safety training. This position requires a Baccalaureate degree in science or engineering with specialized training in health physics. In addition, he must have at least two years of applied health physics experience in a nuclear facility.

4.0 GENERAL HEALTH AND SAFETY

4.1 Procedures

The documents described below are those specific to the decommissioning activity. Other documents required to carry out the work (e.g. RWPs, maintenance work orders, etc.) will be handled in the same manner as required by current NFS procedures. RWPs will be approved by the NFS Health Physics Coordinator. Any changes to approved plans, instructions, and procedures will be subject to the same level of control used for the original. NFS will operate in accordance with the written procedures described within this section.

4.1.1 Decommissioning Work Procedures

The Decommissioning Work Procedure (DWP) is a description of decommissioning activity including the operation of equipment used in the activity. It includes limits and instructions for criticality, radiation, and environmental safety. It also includes instructions for disposition of radioactive wastes, and specifies the ranges within which activities may be varied at the discretion of the Decommissioning Project Director - Plutonium Project. The DWP is general in that it applies to any job order requiring the given process.

The DWPs are developed by the EcoTek Plutonium Project Staff and are reviewed by, at least, all members of the SSR Council, the NFS Decommissioning Project Director - Plutonium Project, the NFS Health Physics Coordinator and the EcoTek Project Manager - Plutonium. Other personnel may review a specific DWP if specific expertise is desirable as determined by the Decommissioning Project Manager. Independently, each reviewer examines the DWP for overall safety, with particular emphasis on the function represented.

The following will review and approve all DWPs:

- SSR Council
- NFS Decommissioning Project Director - Plutonium Project
- NFS Health Physics Coordinator
- EcoTek Project Manager - Plutonium

4.1.2 Specific Work Instructions

The Specific Work Instruction (SWI) is intended to provide greater and more specific detail to implement a DWP. SWI's identify step-by-step actions or requirements, including sketches or drawings, data documentation and reporting, to control and guide the actual work.

SWI's must be approved by the originator, the NFS Decommissioning Project Director - Plutonium Project, the EcoTek Project Manager - Plutonium, and the NFS Health Physics Coordinator or other authorized member of the NFS Safety function. Each reviewer examines the SWI for overall safety and consistency with the guidance provided in the applicable DWP.

4.1.3 Procedure Availability

Current revisions of the above described procedures which provide instruction for the work in progress will be available to the persons performing decommissioning work at the immediate site of the work activity.

4.2 Fire Protection

Fire protection will be accordance with existing NFS procedures. Fire detection, control capability, and apparatus will meet the minimum specifications in this part.

4.2.1 Fire Extinguisher - Portable

Fire extinguishers will meet National Fire Protection Association (NFPA) ratings for CO_2 or dry chemicals. Class 10B extinguishers (minimum 50 feet travel distance) or Class 5B extinguishers

(minimum 30 feet travel distance), with piercing nozzles, shall be provided in accordance with NFPA 10. Class A rating and distribution fire extinguishers will also be provided in the area.

4.2.2 Fire Hydrants

Fire hydrants are installed and equipped according to NFPA guidelines and located within 250 feet of each facility.

4.2.3 Automatic Detection Systems

At a minimum, automatic detection systems will be provided in certain areas used for storage or D&D of equipment and materials. The system will consist of sensing devices appropriately distributed and spaced in the building in accordance with NFPA 72E and will actuate automatic alarms locally and at another constantly supervised location.

4.2.4 Cutting and Welding

Any job requiring use of equipment which might constitute a fire hazard (i.e., source of ignition) will have a fire, welding and cutting permit approved prior to proceeding with the work per NFS procedures which must comply with National Fire Protection Association (NFPA) codes and/or American National Standard Institute (ANSI) standards .

4.2.5 Decontamination Reagents - Nitric Acid

Nitric acid, because of its pyrophorcity in the presence of cellulose and other organic materials, will be used on a limited basis and will require a Radiation Work Permit (RWP) or a fire, welding, and cutting permit prior to its use. The RWP usage at NFS has been expanded to include fire protection and control in compliance with NFPA guidelines.

4.3 Criticality Safety

Notwithstanding the possible issuance of a renewal license prior to the completion of the plutonium decommissioning activities, all decommissioning operations will be demonstrated to be safe either by means which have been defined in the current SNM License renewal application dated August 30, 1976 (including amendments), or by specific authorization of the NRC through the acquisition of a license amendment. The NFS nuclear criticality safety function will provide authoritative and expert advise and counsel on matters of criticality prevention and will review and approve all DWPs and process and equipment changes through the SSR Council.

Additionally, during the early phases of the project, until the more significant quantities of plutonium which may be held up in old process equipment are removed and safely packaged, frequent and regular criticality safety audits will be conducted.

Additional control for the DVRF, will consist of passive neutron monitoring with detection sensitivities of 0.2 grams of plutonium. Local alarming capabilities will exist. Set points for alarm will be adjusted according to safe mass limits. The passive system will be used to continuously monitor plutonium concentrations in the recirculation system of the decontamination unit.

4.3.1 Criticality Monitoring and Evacuation Alarm System

A plant-wide criticality alarm system is provided that conforms to the requirements of 10 CFR 70.24 and is described in Section 400 of the renewal application for the current SNM license dated August 30, 1976.

Emergency response in the event of a c ical excursion are in place in NFS' current emergency plans and procedures.

4.4 Possession Limits and Chemical/Physical Form

Other than counting and calibration standards as described below, the maximum quantity of plutonium which will be possessed on-site at any time will be as contamination and process holdup as described in the Facility Characterization Report transmitted to the NRC on October 17, 1988. Calibration sources and counting standards for incidental use with counting room and/or laboratory instrumentation with total activity up to 10 millicuries may be possessed.

The isotopic content is greater than 60 percent plutonium-239 and includes other isotopes of plutonium in the relative percentages produced in and discharged from nuclear reactors. The chemical and physical form may be any form but is expected to be solid forms of nitrates and/or oxides of plutonium. All plutonium in possession, except for calibration and counting standards, will be residual contamination and holdup from past operations.

5.0 TRAINING

Employees, prior to performing work on the plutonium decommissioning project, shall have received, at a minimum, documented training and qualification in the disciplines cited below:

- Basic radiation worker training
- Personnel dosimetry
- Respirator training and respirator fit test

- Contamination control, protective clothing, and personnel monitoring requirements
- Criticality safety controls
- Potential hazards, e.g., flammable solutions and combustibles, electrical hazards, eye injuries, inhalation of dust and fumes
- Emergency procedures, i.e, emergency evacuation, commercial power failure, fire control
- Personnel ingress and egress
- Injuries and injury reporting
- Pertinent Decommissioning Work Procedures
- Chelation treatment
- Special bag-out techniques
- QA/QC requirements
- MC & A requirements
- Decontamination and dismantling techniques
- ALARA

The initial training will include approximately 32 hours of formal classroom instruction and approximately 48 hours of supervised "on-the-job-training" associated with use of specialized D&D procedures, equipment, and materials. The training will also include a written test to determine proficiency. A minimum qualification of 80% is required. All personnel directly involved in the decontamination, volume reduction, and dismantlement of the plutonium facilities with the exception of security, material control personnel and support supervisory personnel reporting directly to the NFS Decommissioning Project Director - Plutonium Project or his designated representative shall have supervised on-the-job training in work with plutonium.

5.1 Retraining Requirements

All D&D personnel will be retrained:

1) upon revision of an operating procedure; or

2) if the person(s) have not worked in the plutonium facilities for a consecutive twelve week period.

3) at a minimum frequency of annually (not to exceed 14 months).

Although retraining will not be as intensive as initial training, the topics will be covered in sufficient depth so that successful completion will be a grade of 80 (percent) on written re-examinations.

6.0 DOCUMENTATION

Documentation records will be retained in accordance with 10 CFR parts 19, 20, 70, 71 and 74 and "General Requirements for Decommissioning Nuclear Facilities"-Final Rule, June 27, 1988. The documentation effort consists of the recording, traceability, and certification of the performance of certain tasks and events in the D&D programs. The Quality Assurance, and the Health, Safety and Environmental records for the program duration will be maintained for traceability.

7.0 RADIATION PROTECTION

The radiation safety program is intended to provide for the protection of employees, the public, and the environment from unwarranted or unacceptable radiation exposures. The program is designed to maintain exposures ALARA.

7.1 Internal Dose Assessment

In addition to NFS' current bioassay programs, the routine bioassay program will also include incremental urinalysis and/or fecal analysis. Bioassay frequencies, at a minimum, will be quarterly for urine/fecal samples and annually for invivo lung counting. Baseline urine, fecal and in vivo analyses shall be performed on all participating personnel. Termination analyses will also be performed when practicable. Diagnostic bioassays will be performed in the event that an employee may have been exposed to greater than 40 MPC-hours. When bioassay procedures do not have the sensitivity required for detecting a particular control level of interest, then other measurement systems (e.g. breathing zone air [BZA]) will be utilized to estimate intake of internal radiation doses to workers.

7.1.1 Actions and Limits

An investigation will be conducted for bioassay measurements that indicates an intake of greater than 40 MPC-hours. This investigation will include, at a minimum, reasons for exposure and actions to prevent recurrence. If a bioassay measurement indicates an intake of greater than 200 MPC-hours the personnel will be restricted from radioactive material areas until an

investigation can be performed and intake verified. If the investigation reveals a confirmed intake greater than 500 MPC-hours a report will be made to the NRC in accordance with 10 CFR 20.403.

7.2 External Dose Assessment

All project personnel entering the plutonium facilities will wear an external dosimetry device capable of measuring gamma and neutron radiation.

7.2.1 Thermoluminescence Dosimeter (TLD)

TLD's will be used for personnel monitoring and will be routinely evaluated on a monthly basis. TLD's will be supplied by a commercial badge source meeting National Voluntary Laboratory Accreditation Program (NVLAP) approval criteria.

7.2.1.1 Actions and Limits

If a TLD indicates an unexpected whole body dose equivalent which exceeds 100 mRem/month, an investigation will be performed to determine cause and actions to be taken to prevent recurrence. If a TLD indicates an exposure which exceeds 500 mRem/month whole body dose equivalent, the worker will be restricted from the plutonium facilities until an investigation can be completed and the exposure verified. If a TLD indicates an exposure greater than 1,250 mRem per calender quarter (whole body dose equivalent), then a report will be made to the NRC in accordance with 10 CFR 20.403.

7.2.2 Pocket Ionization Chambers

Self-reading pocket ionization chambers will be utilized if exposure rate surveys indicate that an employee is likely to constantly receive external exposure which would qualify an area as a radiation area as defined in Title 10, Code of Federal Regulations, Part 20 (10 CFR 20).

7.2.2.1 Actions and Limits

If any pocket ionization chamber indicates a daily reading of greater than 50 mRem, actions will be taken to verify the exposure and, if confirmed, to reduce exposures to ALARA levels.

7.2.3 Extremity Dosimeters

Extremity (hands, fingers, wrists, forearms, feet and ankles) dosimetry shall be utilized if exposure rate surveys indicate that an employee is likely to constantly receive, on a daily basis, external exposure in excess of 300 mRem or two percent of the quarterly limit prescribed in 10 CFR 20.

7.2.3.1 Actions and Limits

If an extremity dosimeter indicates an unexpected exposure which exceeds 1,500 mRem, an investigation shall be performed to determine cause and actions to be taken to prevent recurrence. If an extremity dosimeter indicates an exposure which exceeds 7,500 mRem, the worker shall be restricted from the plutonium facilities until an investigation can be completed and the exposure verified. If an extremity dosimeter indicates an exposure greater 18,750 mRem in a calender quarter, then a report shall be made to the NRC in accordance with 10 CFR 20.403.

7.3 Wound Monitoring

A thin crystal NaI detector with a multi-channel analyzer shall be used for wound monitoring.

7.4 Work Place Air Monitoring

Work place air monitoring shall consist of stationary air sampling, Continuous Air Monitors (CAM), portable air sampling and breathing zone air sampling [BZA].

7.4.1 Stationary Air Samplers

For purposes of routine surveillance of the work areas and evaluating the effectiveness of engineered control measures, continuous air sampling for airborne radioactivity will be performed. At a minimum, stationary air samples in active process areas will be collected each shift for counting. Stationary air samples in non-active process areas may be collected less frequently.

7.4.2 Continuous Air Monitors (CAM)

CAMs shall be positioned in active work areas to identify airborne problems as they occur. They will alarm locally (visible and audible) when the time integrated concentration equals 2 times MPC (16 MPC-hours). CAM filters shall be collected each shift to be counted. If a CAM alarms or fails in the monitoring area, employees shall immediately evacuate the area until alarm is confirmed and/or other protective measures are implemented.

7.4.3 Portable Air Samplers

Portable air samplers shall be used in those active work areas where special work (i.e., cutting, welding, RWP, etc.) is being performed if stationary or CAM samplers are not available. Portable samplers may also be used for evaluation of upset conditions for protective action recommendations.

7.4.4 Actions and Limits

If the work area air monitoring (stationary air samplers) indicates airborne concentrations greater than 50 percent of MPC, as averaged over a 40-hour work week, an investigation will be performed to determine cause and recommend corrective action. If work area air monitoring indicates airborne radioactivity concentrations greater than 100 percent of MPC, as averaged over a 40-hour work week, diagnostic bioassay samples will be required for any personnel identified to have been in the area.

7.5 Personal (Lapel-Type) Air Monitoring

In order to assure that significant internal airborne radioactivity exposures are detected, properly evaluated, and recorded, BZAs will be used to monitor personnel intake, i. e.; MPC-hours of exposure. Filter media from BZA samplers used will be analyzed (counted) after each shift. Intake may be adjusted based on respiratory protection factors where applicable. Other measurement systems; i. e., urinalysis, fecal analysis, invivo lung counting, nasal smears, etc.; may supercede the BZA measurement of intake providing they possess the necessary sensitivity.

7.5.1 Actions and Limits

If the BZA concentration indicates an intake greater than 8 MPC-hours in one shift, after decay and respiratory protection factor correction, an investigation will be conducted. If the BZA concentration, adjusted as above, indicates an intake greater than 40 MPC-hours in one shift, then diagnostic bioassay shall also be required.

7.6 Contamination Surveys

Contamination surveys will consist of transferrable and non-transferrable contamination surveys for alpha and/or beta/gamma radiations.

7.6.1 Surface Contamination Surveys

Surface contamination surveys will be performed in accordance with the frequencies specified in Table 7-1. Surface contamination smear tests will be counted either with a hand held portable survey meter or in a laboratory type counter depending on the measurement sensitivity required.

Table 7-1

Contamination Survey Frequency And Action Points

Survey Type	Frequency	Action Point
Controlled Areas		
Transferrable	Each Operating Shift	1,000 dpm/100 cm^2
Total Alpha	Monthly	5,000 dpm/100 cm^2
Non-Controlled Areas		
Transferrable	Weekly	20 dpm/100 cm^2
Total Alpha	Semi-Annually	100 dpm/100 cm^2

7.6.2 Personnel Contamination Surveys

Contamination surveys will be performed by a Radiation Monitor on all personnel exiting the controlled areas. Other self-performed personnel contamination surveys will be performed within the controlled areas on a more frequent basis after the performance of activities in which the potential for personnel contamination exists.

7.6.3 Actions and Limits

The action points for clean up of surface contamination found outside of enclosures or containment are shown in Table 7-1. The action points for personnel decontamination are shown in Table 7-2.

Table 7-2

Action Guidelines for Personnel Contamination Surveys

Monitoring Measurement	Contamination(d/m)	Level to Immediately Notify Physician[a] (d/m/probe)
First Nasal Smear[b]	≥50[c] (total both nostrils)	≥1,000
Facial	Any Detectable Activity[e]	≥25,000
Break in Skin (Any skinbreak while handling a-emitters)		≥2,000
Inside Respirator	Detectable Activity Inside Mask After Use[e]	----
Head, Neck	Any Detectable Activity[e]	----
Clothing[d]	Any Detectable Activity[e]	____
Hands, Forearms	Any Detectable Activity[e]	____

(a) The NFS Physician will first be notified at this level or greater, followed immediately by notification of the Environmental Safety Manager to consider use of DTPA chelating agent.

(b) The level of 50 d/m/probe area also applies to mouth smears.

(c) Action taken will include the performance of bioassay.

(d) Levels apply to potential exposure without wearing a respirator such as on the inner coveralls while undressing.

(e) Per probe area above background.

7.7 Respiratory Protection

Respiratory Protection shall be provided in accordance with NFS' current procedures. All respirators shall be surveyed and decontaminated, if required, prior to transferring to the Respiratory Protection Facility.

7.8 Laundry

Contaminated laundry shall be handled as follows:

1) All contaminated protective clothing and disposable protective clothing will be disposed of as radioactive material;

2) Protective clothing with no detectable contamination above background may be processed through the NFS laundry;

3) Special color-coded shoe covers, when contaminated, or disposable shoe covers will be disposed of as radioactive waste prior to exit from the facility.

4) Instrumentation for detecting contamination on items to be laundered will be sufficiently sensitive to measure 200 dpm/100 cm^2.

5) Water from the laundered protective clothing may be discharged to the on-site Waste Water Treatment Facility.

7.9 Ventilation Systems and Facility Inspection

Operation of ventilation systems for process glovebox lines and room air exhausts shall be maintained and operated continuously in plutonium facilities during decommissioning. Pressure differentials on ventilation systems will be observed daily. Operational criteria such as pressure differentials, face air velocities and directional air flows are described in Chapter 3, Section 3.2.2.2 the current license renewal application dated August. Abnormalities such as leaks, spills, fires, deteriorated equipment, gloves, etc., shall be investigated and corrective action initiated promptly.

Process room air exhausted to the atmosphere will continue to be filtered through a final two-stage High Efficiency Particulate Air (HEPA) filter until all plutonium facility D&D activities are completed. Quantities of uncontained materials permitted in open faced hoods or boxes will be less than one millicurie of plutonium. Processing or handling of plutonium in quantities greater than that amount will be conducted in a glove box. The capacity of the process exhaust system will maintain a minimum air flow, through an open glove port or the largest open access port, of 125 linear feet/minute (LFPM). The minimum acceptable efficiency of the filter system for removal of particles of 0.7 microns AMAD[1] will be 99.95 percent as certified by the manufacturer. HEPA filters will be fire resistant and capable of continuous operation at 105 degrees Fahrenheit and withstanding the Underwriters Laboratories (UL) spot test or fire-proof and capable of operation above 150 degrees Fahrenheit.

The building air outside of the Decontamination and Volume Reduction Facility containment in Area D of Building 234 may be recirculated provided that the average concentration of radioactive material in Area D as averaged over a period of any 7 consecutive days does not result in any individual's weekly intake being equal to or exceeding 10 MPC-hours, based on the concentrations specified in 10 CFR Part 20, Appendix B, Table I*,

*Activity Mean Aerodynamic Diameter

Column 1, and that the surface contamination in Area D does not exceed the transferable action point for "non-controlled areas" in Table 7.1

8.0 ENVIRONMENTAL PROTECTION

The environmental protection program consists of control of liquid and gaseous effluents and environmental surveillance and monitoring.

8.1 Liquid Effluents

The only liquid stream exiting the facility is from the showers and toilets. During decommissioning activities, this stream will be sampled and analyzed daily via a continuous proportional sewer sampler located between Building 234 and NFS' main sewer discharge sampler. The sample will be analyzed for gross alpha radioactivity. If the gross alpha radioactivity analytical results exceed the limit for soluble plutonium contained in Appendix B, 10 CFR 20, as averaged over seven days, specific isotopic analysis will be performed to evaluate the regulatory compliance status.

Composites of the daily samples will be made quarterly and analyzed for isotopic uranium and plutonium. Action limits based on these analyses will be in accordance with NFS' current procedures and license conditions.

8.2 Gaseous Effluents

All gaseous discharge points or stacks will be continuously sampled and collected on a daily basis during decommissioning operations. The filter media thus collected will be analyzed for gross alpha radioactivity. In addition, a replicate sampler will be operated for seven consecutive days at each gaseous discharge point to be analyzed for gross alpha radioactivity.. Any daily sample which indicates stack concentrations of greater than 50 percent of the insoluble plutonium limit specified in Appendix B, 10 CFR 20 will require an investigation as to cause and corrective action where appropriate. Any 7-day stack sample which indicates an average concentration of greater than 100 percent of the insoluble plutonium limit specified in Appendix B, 10 CFR 20 will require an immediate shut-down of decommissioning operations, an investigation as to cause, and appropriate corrective action.

8.3 Environmental Surveillance and Monitoring Program

Environmental surveillance and monitoring consists of sampling of the air, soil, water, and vegetation in the near-plant environs. The program will be conducted in accordance with NFS' current procedures and license conditions.

9.0 SAFETY HAZARDS ANALYSIS

A Safety Hazards Analysis (SHA) will be conducted and documented for all new equipment; e. g., shear/baler, ultra high-pressure jetting system, etc. The principle criteria applicable to the evaluation shall include, but not necessarily be limited to, fire protection, radiological safety, industrial safety, containment, confinement, criticality prevention and loss of utilities. There will be no installation or operation of decommissioning equipment until the SHA has been approved by the NFS SSR Council.

The limits and controls established by the SHA shall be incorporated into the DWP and the SWI. The training of operators in the SWI and DWP requirements must be completed prior to the initiation of operations involving the equipment.

10.0 MEASUREMENT FOR FINAL RELEASE

Prior to release of the premises for unrestricted use, NFS will make a comprehensive survey establishing that the levels of contamination are within the limits specified in "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material", USNRC, August, 1987. Residual uranium-233 contamination limits in plutonium areas will be the same as those used for plutonium.

10.1 Scope of Work

The general methodology necessary to perform the post-decommissioning radiological survey is as follows:

1) Perform a detailed radiological survey of the decontaminated areas including Building 234, Building 110, the Building 110 laboratory tank site, and associated piping;

2) Establish a grid system that will define all surfaces which are to be released on a key grid system. Each grid shall be uniquely identified and will be 1 square meter, except where the cell or floor space does not divide evenly into 1-meter by 1-meter grids. Thus, the last rank and/or file will be smaller than 1 square meter;

3) Perform a 100 percent surface survey using both alpha and beta/gamma portable detection instruments to test for total (transferrable and fixed) contamination;

4) Perform smear tests in each grid area, typically at the location of greatest activity detected during the surface survey, to determine the level of contamination;

5) Obtain samples of surface media (i.e., paint, tile, concrete, soil) to determine concentrations of residual sub-surface migration of radioactivity;

6) Obtain core samples at locations where significant migration may have occurred (i.e., under/around holding tank, under buried pipe runs, area of sump, floor) to determine concentrations of radioactivity .

10.2 Final Report

The final report shall, at a minimum, include the results of the final survey, a narrative on "lessons learned" during decommissioning, and other pertinent information required by "General Requirements for Decommissioning Nuclear Facilities"-Final Rule, USNRC, Federal Register, June 27, 1988.

11.0 REFERENCES

1. Letter, W. C. Manser, Jr., to L. C. Rouse, dated 10/9/78

2. Letter, W. T. Crow to W. C. Manser, Jr., dated 3/16/79

3. Letter, R. G. Page to C. J. Michel, dated 4/30/80

ATTACHMENT 6
To Letter Dated October 15, 1990
D. Paine to C. J. Haughney
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Table	5.4A
Table	5.4B
Table	5.6.1A 5.6.2A
Table	5.10A
Table	5.11A
Table	5.16A
Table	5.18A
Table	5.19A

TABLE 5.4A

SUMMARY OF ENVIRONMENTAL AIR SAMPLING
AVERAGE GROSS ALPHA RADIOACTIVITY (uCi/ml E-14)

LOCATION/SAMPLE TYPE	1989
PERIMETER - NE* (2 SAMPLE AVG) #173,217	0.26
PERIMETER - E (2 SAMPLE AVG) #174,218	0.42
PERIMETER - S #172	0.46
PERIMETER - W #171	0.36
PERIMETER - NW #170	0.24
PERIMETER - ENE #555	0.42
OFF-SITE - LITTLE MTN. (APPROX. 800 M NE)#322	0.24
OFF-SITE - CAROLINA AVE (APPROX. 300M ESE)#323	0.23
OFFSITE - ASHEVILLE HWY. (APPROX. 8 km SW) #324	0.2
OFFSITE - EMERG. HOUSE (280 m S) #372	0.27
OFFSITE - CAROLINA AVE. STALLING LANE (215 m SE)#381	0.27
OFFSITE - STALLING LANE (315 M SE) #382	0.25
OFFSITE - HIGHLAND AVE. FIRST STREET (405 m S) #383	0.26
OFFSITE - MEADOWBROOK LANE (540 m ENE) #384	0.2
OFFSITE - SECURITY FENCE (210 m SSW) #385	0.29
OFFSITE - SEWER MOUND (APPROX. 300 m N) #553	0.33

* DOWNWIND OF PREVAILING WIND

MOST RESTRICTIVE UNRESTRICTED AREA MPC FOR URANIUM (INSOLUBLE): 400 E-14
MOST RESTRICTIVE UNRESTRICTED AREA MPC FOR PLUTONIUM (SOLUBLE): 6 E-14 uCi/ml

TABLE 5.4B

LUBILITY AND PARTICLE SIZE SUMMARY
FROM SAMPLES COLLECTED
AT THE PARKING LOT ENTRANCE

PERIOD	AMAD (MICRO METERS)	%CLASS D	%CLASS W	%CLASS Y
1st Qtr 1988	1.5	47	0	53
2nd Qtr 1988	1.2	53	0	47
3rd Qtr 1988	1.3	62	0	38
4th Qtr 1988	1.1	43	0	58
1st Qtr 1989	1	26	0	74
2nd Qtr 1989	0.7	29	0	71
3rd Qtr 1989	0.7	38	0	62
4th Qtr 1989	1.5	*	*	*

*DATA NOT YET RECEIVED FROM CONTRACTOR LABORATORY.

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TABLE 5.6.1A

SUMMARY OF STACK EFFLUENT CONCENTRATIONS
(ALL units in uCi/ml E-12)

PROCESS MATERIAL		STACK NO.	BLDG. NO.	DESCRIPTION	1984 MAX	1984 AVG	1985 MAX	1985 AVG	1986 MAX	1986 AVG
PLUTONIUM		27	234A	PROD. GLOVE BOX LINE	1.80	0.06	2.25	0.06	0.65	0.05
		28	234A	ROOM AIR CELL	0.78	0.04	2.69	0.05	4.77	0.12
		29	234A	WET CELL SCURBBER	0.69	0.06	0.66	0.04	0.41	0.06
		224	234A	DISSOLUTION GLOVE BOXES	0.51	0.02	0.46	0.02	1.59	0.07
	(1)	554	110	ROOM AIR FROM CWB LAB	---	---	---	---	---	---
	(7)	583	234	PU LAB EXHAUST	---	---	---	---	---	---
		103	110	DRY BOXES	1.56	0.06	0.78	0.04	0.68	0.04
		104	110	DRY BOXES	0.41	0.03	0.62	0.04	0.32	0.04
H. E. URANIUM	(2)	185	131	PROD. DRY BOXES	3.74	0.12	1.06	0.10	---	---
		332	120	MAINTENANCE WELDING HOOD	0.76	0.06	7.18	0.11	1.91	0.14
		333	110	SPEC LAB ARC STAND	0.82	0.10	2.70	0.07	0.71	0.07
		416		MAIN PROCESS VENTILATION	450.8	7.66	107.07	3.02	54.08	5.55
	(3)	376	301	VENTILATION	---	---	23.53	1.17	9.82	1.22
	(4)	573	302 303	FINISHING OFFGASES	---	---	---	---	---	---
		421	100	LAUNDRY EXHAUSTS	.038	0.18	0.61	0.17	0.53	0.22
	(5)	547	100	LAUNDRY EXHAUSTS	---	---	---	---	---	---
	(6)	278	111	CALCINER FURNACE	48.93	3.61	70.74	2.43	58.81	9.44
	(6)	287	111	MAIN VENT SCRUBBER	130.23	9.08	136.46	8.17	79.78	3.62
		320	130	CYLINDER WASH OPERATION	145.84	5.01	113.25	5.95	22.77	3.19
		354	110	TRASH COMPACTOR	6.10	1.80	1.80	0.10	3.01	0.12

(1) STACK NO. 554 BEGAN OPERATION DURING THE SECOND HALF OF 1988
(2) STACK NO 185 WAS NOT IN OPERATION IN 1986 AND 1987
(3) STACK NO. 376 BEGAN OPERATION DURING THE FIRST HALF OF 1985
(4) STACK NO. 573 BEGAN OPERATION DURING THE SECOND HALF OF 1988
(5) NEW SAMPLER BEGAN OPERATION DURING THE FIRST HALF
(6) BUILDING 111 WAS SHUT DOWN DURING 1987 AND 1988
(7) EXHAUST NO. 583 WAS STARTED SECOND HALF OF 1989

TABLE 5.6.2A

SUMMARY OF STACK EFFLUENT CONCENTRATIONS
(ALL units in uCi/ml E-12)

PROCESS MATERIAL		STACK NO.	BLDG. NO.	DESCRIPTION	1987 MAI	1987 AVG	1988 MAI	1988 AVG	1989 MAI	1989 AVG
PLUTONIUM		27	234A	PROD. GLOVE BOX LINE	2.14	0.06	0.17	0.02	0.24	0.04
		28	234A	ROOM AIR CELL	0.28	0.05	1.04	0.06	0.18	0.03
		29	234A	WET CELL SCRUBBER	2.90	0.13	0.21	0.03	0.39	0.03
		224	234A	DISSOLUTION GLOVE BOXES	0.90	0.04	0.15	0.02	0.18	0.04
	(1)	554	110	ROOM AIR FROM CWB LAB	---	---	0.06	0.01	0.20	0.09
	(7)	583	234	PU LAB EXHAUST	---	---	---	---	0.10	0.04
		103	110	DRY BOXES	0.70	0.15	0.24	0.04	0.72	0.05
		104	110	DRY BOXES	0.19	0.05	0.40	0.04	1.46	0.12
H. E. URANIUM	(2)	185	131	PROD. DRY BOXES	---	---	5.13	0.06	5.13	0.35
		332	120	MAINTENANCE WELDING HOOD	0.82	0.09	0.17	0.05	0.07	0.07
		333	110	SPEC LAB ARC STAND	0.22	0.02	0.10	0.02	0.07	0.05
		416		MAIN PROCESS VENTILATION	153.70	3.22	36.88	1.94	230.0	2.80
	(3)	376	301	VENTILATION	14.83	0.56	5.19	0.34	3.74	0.24
	(4)	573	302 303	FINISHING OFFGASES	---	---	95.87	3.86	3260.00	82.33
		421	100	LAUNDRY EXHAUSTS	0.24	0.08	0.14	0.04	0.07	0.04
	(5)	547	100	LAUNDRY EXHAUSTS	---	---	0.28	0.04	0.50	0.06
	(6)	278	111	CALCINER FURNACE	---	---	---	---	---	---
	(6)	287	111	MAIN VENT SCRUBBER	---	---	---	---	---	---
		320	130	CYLINDER WASH OPERATION	31.67	3.70	171.19	4.30	0.30	0.09
		354	110	TRASH COMPACTOR	0.26	0.04	0.14	0.02	0.22	0.31

(1) STACK NO. 554 BEGAN OPERATION DURING THE SECOND HALF OF 1988
(2) STACK NO 185 WAS NOT IN OPERATION IN 1986 AND 1987
(3) STACK NO. 376 BEGAN OPERATION DURING THE FIRST HALF OF 1985
(4) STACK NO. 573 BEGAN OPERATION DURING THE SECOND HALF OF 1988
(5) NEW SAMPLER BEGAN OPERATION DURING THE FIRST HALF
(6) BUILDING 111 WAS SHUT DOWN DURING 1987 AND 1988
(7) EXHAUST NO. 583 WAS STARTED SECOND HALF OF 1989

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TABLE 5.10A

ANNUAL AVERAGE SURFACE WATER BETA RADIOACTIVITY
(uCi/ml X E-06)

LOCATION	1984	1985	1986	1987	1988	1989
BANNER SPRING BRANCH (UPSTREAM)	0	0	7.5	8.7	10.2	7.1
BANNER SPRING BRANCH (DOWNSTREAM)	0	0.02	13.5	10.8	11.3	10.6
MARTIN CREEK AT CAROLINA AVE (UPSTREAM)	0	0	4.2	13.6	9.2	7.6
MARTIN CREEK AT BANNER SPRING MOUTH (UPSTREAM)	---	---	---	7.35	9.7	5.5
MARTIN CREEK (DOWNSTREAM)	0	0.01	13.7	9.15	11.4	8.5
NOLICHUCKY RIVER (UPSTREAM)	0	0	-.5	13.4	9.5	6.7
NOLICHUCKY RIVER (DOWNSTREAM)	0	0	2.2	14.5	10.2	7.7

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TABLE 5.11A

SUMMARY OF ISOTOPIC RADIOACTIVITY
IN
SURFACE WATER SAMPLES (DOWNSTREAM)
(uCi/ml X E-07)

BANNER SPRING BRANCH	U-234	U-235	U-238	TOTAL PU	TOTAL TH
1984	0.58	0.05	0.06	0.01	0.01
1985	0.352	0.042	0.035	0.068	0.007
1986	0.353	0.015	0.036	0.403	0.052
1987	0.283	0.016	0.064	0.006	0.009
1988	0.232	0.021	0.029	0.003	0.024
1989	0.433	0.040	0.056	0.002	0.067
MARTIN CREEK					
1984	0.13	0.01	0.02	0	0
1985	0.261	0.019	0.026	0.005	0.01
1986	0.493	0.02	0.028	0.009	0.011
1987	0.283	0.016	0.064	0.006	0.009
1988	0.141	0.009	0.014	0.002	0.015
1989	0.158	0.014	0.014	0.002	0.043
NOLICHUCKY RIVER					
1984	0.013	0.001	0.001	0.012	0.005
1985	0.016	0.001	0.001	0.018	0.006
1986	0	0	0	0	0.012
1987	0.008	0.002	0.005	0.004	0.015
1988	0.013	0.003	0.005	0.001	0.04
1989	0.016	0.003	0.003	0.001	0.023

NOTE: "0" INDICATES <5E-10 uCi/ml

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TABLE 5.16A

SUMMARY OF COOLING WATER DISCHARGE RADIOACTIVITY
BUILDING 233
(uCi/ml X E-08)

	MEASURED VALUE	
YEAR	ALPHA	BETA
1984	4.75	0.53
1985	5.75	1.75
1986	0.84	0.67
1987	0.07	0.27
1988	3.03	5.62
1989	3.59	5.82

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TABLE 5.15A

SUMMARY OF 1989 STREAM SILT, SOIL & VEGETATION RADIOACTIVITY

LOCATION/SAMPLE TYPE	ALPHA (pCi/G)	BETA (pCi/G)
BANNER SPRING BRANCH (UPSTREAM/SILT)	0.23	0.25
BANNER SPRING BRANCH (DOWNSTREAM/SILT)	15.16	6.3
MARTIN CREEK (UPSTREAM/SILT CAROLINA AVE)	0.5	0.36
MARTIN CREEK (DOWNSTREAM/SILT)	3.4	1.71
NOLICHUCKY RIVER (UPSTREAM/SILT)	0.16	0.23
NOLICHUCKY RIVER (DOWNSTREAM/SILT)	0.15	0.21
LITTLE MTN.(APPROX. 0.6 m N) SOIL	0.53	0.41
CAROLINA AVE. (APPROX. 150 m E) SOIL	0.8	0.23
ASHEVILLE HWY. (APPROX. 8 Km S) SOIL	0.28	0.3
NFS MOUND (APPROX. 300m N)	4.2	2.16
LITTLE MTN. (APPROX. 0.6 m N) VEGETATION	0.15	0.13
CAROLINA AVE. (APPROX. 150 m E) VEGETATION	0.08	0.15
ASHEVILLE HWY. (APPROX. 8 Km S) VEGETATION	0.1	0.13
NFS MOUND (APPROX. 300m N) VEGETATION	0.9	0.15

NOTE: NO SOIL DATA AVAILABLE FOR DECEMBER 1989 DUE TO SNOW.

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TABLE 5.19A

TLD SUMMARY
ANNUAL DOSE
(MILLIREM)

LOCATION	1984	1985	1986	1987	1988	1989
CAROLINA AVENUE	125	35	65	35	65	45 +
LITTLE MOUNTAIN	115	35	65	35	65	25 +
ASHEVILLE HIGHWAY	125	35	65	35	65	25 +
NE CORNER SECURITY FENCE	155	35	65	35	75	25 +
FENCE N OF PLANT NEAR MARTIN CREEK	155	35	65	30 +	65	65
NW CORNER SECURITY FENCE	185	35	65	35	65	65
SW CORNER SECURITY FENCE	195	35	65	35	45 +	45 +
TELEPHONE POLE S OF PLANT	155	35	55	35	65	25 +
S PERIMETER SAMPLE STATION	295	35	85	55	55 +	75
E PERIMETER SAMPLE STATION	115	35	75	35	65 +	65
N PERIMETER SAMPLE STATION	125	35	85	35	165 +	75
FENCE HIGH VOLTAGE TRANSFORMER	135	35	75	85	125	495 +
W PERIMETER STATION	155	35	95	35	75	65

+ : BASED ON LESS THAN 4 QUARTERS OF DATA

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