A.4.0 PRINCIPAL DESIGN CRITERIA

This chapter identifies and discusses the principal engineering design criteria and design bases for the WVDP structures, systems, and components (SSCs).

The Western New York Nuclear Service Center (WNYNSC) was originally located at West Valley because the area is suitable in several ways for nuclear materials handling and disposal. Section A.4.3 discusses the approach used in the design safety evaluation of the original WNYNSC facilities.

As stated in WVDP-028, *West Valley Demonstration Project (WVDP) Plan*, "the overall approach to the project was to make the maximum use of existing technology, facilities, and equipment while minimizing new development and new construction. The objective of the WVDP is to develop a system that will vitrify the High-Level Waste (HLW) in a safe, environmentally sound, and cost-effective manner."

As noted in Section A.1.0, due to the nature of the Project, a number of the Project facilities, such as the main plant complex and the HLW tank farm, predate the Project and the DOE's presence at the site. These facilities were constructed during 1963 through 1966 by the previous operator on the site, NFS, according to AEC license CSF-1 and the various criteria in effect at that time. In as much as records handed down by NFS do not always provide complete criteria information, these facilities were initially inspected and are continually monitored to determine their adequacy to meet Project needs. In cases where pre-existing facilities may not meet current design criteria, but the facilities are judged adequate to meet the current Project objectives (based on its temporary nature), it has often been determined that it would not be cost-effective to replace or refurbish the facilities.

The West Valley Nuclear Services Company (WVNS) used the U.S. Department of Energy (DOE) Draft Order 6430.1, *General Design Criteria* (USDOE December 12, 1983), DOE-Idaho (ID), *Architectural Engineering Standards* (USDOE-ID October 1986), DOE Order 5481.1B, *Safety Analysis and Review System* (USDOE May 19, 1987), and ID-12044, *Operational Safety Design Criteria Manual* (USDOE April 1985), as general guidelines to develop the WVDP principal design criteria.

The DOE Idaho Field Office (DOE-ID), DOE-West Valley Area Office (DOE-WV), and WVNS agreed (Bixby July 17, 1989) that DOE Order 6430.1A would not apply to existing facilities but would apply to new facilities and major modifications to existing

facilities then in design or to be designed. The DOE Ohio Field Office (DOE-OH) subsequently concurred with the design basis (Hamric June 15, 1995).

WVNS was designing to the guidance of ID-12044 when DOE Order 6430.1A, dated April 6, 1989, was received for evaluation and implementation. The WVDP site status at that time was as follows: 1) the existing plant and the Integrated Radwaste Treatment System (IRTS) were operating; and 2) the basic designs and interfaces for the Vitrification System, Sludge Mobilization System (SMS) and Cold Chemical System (CCS) were complete.

The High-Level Waste Interim Storage (HLWIS) uses an existing building and heating, ventilation, and air conditioning (HVAC) system that predate DOE Order 6430.1A, and hence the HLWIS is considered an "existing facility." The existing plant and operations and the facilities that comprise the IRTS are discussed in other DOE approved WVDP safety documentation. The Vitrification Load-In Facility has been designed to comply with the applicable requirements of DOE Order 6430.1A.

WVNS evaluated the principal design criteria documents listed above against DOE Order 6430.1A using a three phased approach: 1) a review of DOE Order 6430.1A to determine what paragraphs were applicable to the WVDP site; 2) a complete review of DOE Order 6430.1A of the codes and standards to determine which were applicable to the WVDP; and 3) a review of every paragraph that contained the words environment, environmental, fire, health, safe, and/or safety.

The completion of these reviews established that the Vitrification System, SMS, CCS, and HLWIS designs meet DOE Order 6430.1A, Section 7, *Policy and Objectives*, paragraph (4), "All Department facilities are to be designed and constructed to be reasonable and adequate for their intended purpose and consistent with health, safety, security, and environmental protection requirements."

A.4.1 Purpose of the Facility

West Valley is the site of a former nuclear fuel reprocessing plant which has been modified to house a HLW vitrification system and ancillary waste treatment and storage systems. Modifications included removing the reprocessing equipment and decontaminating a number of process cells so that workers could enter the cells for extended periods without respiratory protection. After cleaning the former reprocessing cells, equipment was installed to process gaseous and liquid waste streams. Risers were remotely installed in the HLW tanks, and equipment and pumps

were installed for processing HLW supernatant and washing HLW sludge. Processing of HLW supernatant and sludge wash solution occurs in the Supernatant Treatment System (STS) portion of the Integrated Radwaste Treatment System (IRTS). After washing the HLW sludge and converting the sludge wash water into a stabilized, LLW form in the IRTS, the HLW sludge remaining in the tank will be transferred to the Vitrification Facility, where it will be converted into glass. The stainless steel canisters containing the HLW glass will be transferred to the HLWIS (former Chemical Process Cell (CPC)) for interim storage. Auxiliary support systems, such as utility and ventilation systems, will continue to operate through the HLW solidification and the postsolidification period, as required. Fuel assemblies are being temporarily stored in the Fuel Storage Pool until they can be shipped off-site for permanent storage/disposal. Facilities for temporary storage of mixed waste, LLW, and TRU waste are being provided on-site.

A.4.1.1 Plant Feeds

The feeds for the vitrification and ancillary waste treatment systems are briefly discussed in Section A.1.3, Description of WVDP Activities. Further details along with the associated safety analyses are in WVNS-SAR-002, *Low-Level Waste Processing and Support Activities* (WVNS), and WVNS-SAR-003, *Vitrification System Operations and High Level Waste Interim Storage* (WVNS).

A.4.1.2 Plant Products and By-Products

The products and by-products of the vitrification and waste treatment facilities are briefly discussed in Section A.1.3, Description of WVDP Activities. Further details along with the associated safety analyses are in WVNS-SAR-002, *Low-Level Waste Processing and Support Activities* (WVNS), and WVNS-SAR-003, *Vitrification System Operations and High Level Waste Interim Storage* (WVNS).

A.4.1.3 Facility Functions

Functions of the various Project facilities were determined early in the design process and described in facility-specific Functional and Operational Requirements and/or Design Criteria for each component, system, or facility. These requirements and criteria are discussed in other WVDP safety documentation. Section A.1.3, Description of WVDP Activities, provides an abbreviated overview of various facility functions.

A.4.2 Structural and Mechanical Safety Criteria

The loads used for structural design and analysis include the following:

- Dead load (D)
- Live load (L)
- Thermal load (T_o)
- Internal pressure (P_o)
- Differential settlement (Δ)
- Soil pressure load (H_{static}, $H_{hydrostatic}$, $H_{dynamic}$)
- Snow load (S)
- Wind load (W)
- Tornado load (W_t)
- Seismic load (E_{DBE})

The basis for selecting specific values of these loads for design and analysis are discussed in subsequent sections.

At the time of the NFS plant construction (1963 through 1966), no specific standards had been established for nuclear fuel reprocessing facilities. The mechanical and structural aspects of the facility were designed by Bechtel using typical commercial hazardous chemical plant design criteria. The design criteria and design codes used in the original 1964 construction are discussed in other WVDP safety documentation (WVNS-SAR-002), the 1973 NFS SAR (NFS, 1973) and in various NRC evaluations under Docket No. 50-201. The plant was designed and constructed for active reprocessing operations and is now in a shutdown and decommissioned condition relative to fuel reprocessing. Much of the reprocessing equipment has been removed and portions of

the NFS plant have been decontaminated for reuse by the WVDP. There is little risk to the health and safety of the public from the plant in its current condition, and with its current use, as demonstrated by the safety analyses in WVNS-SAR-002 and -003.

For new construction, the design criteria and design basis loads have been selected based on the WVDP graded approach to the classification of structures, systems and components (SSCs). As discussed in Section A.4.4, facility SSCs are classified (WVNS, WVDP-204) into WVDP safety classes. WVDP-204 discusses the process used in the selection of design criteria and the relationship between design standards and the WVDP safety class. Based on the WVDP safety class, WVDP-204 specifies the corresponding design codes and standards to be used in the design of SSCs.

As discussed in Subsection A.4.0, the design of the new construction predated the current DOE guidance of UCRL-15910 (Kennedy et al. 1990) which also uses a graded approach based on probabilistic considerations for Natural Phenomena Hazards (NPH). No redesign was performed, rather as outlined in the following subsections, the WVDP design basis loads are shown to meet or exceed DOE Order 6430.1A and UCRL-15910 guidance for NPH.

A.4.2.1 Wind Loadings

The design basis wind (DBW) has a fastest mile wind speed (or basic wind speed) of 145 kph (90 mph) and with gust factor included is 185 kph (115 mph). The design basis wind load on structures is calculated using the methods of ANSI A58.1 with exposure condition C and importance factor I=1.

The extreme winds are non-rotating such as those found in thunderstorm gust fronts and are often termed "straight" winds to distinguish them from tornado and hurricane winds. The straight wind speed of 145 kph (90 mph) corresponds to a return period of 1,000 years based on a Fisher-Tippett Type I extreme wind analysis (Simiu 1979; Fujita 1981; McDonald 1981) using historical data from the National Oceanic and Atmospheric Administration (NOAA) weather station at Buffalo, New York which is 35 miles NW of the site.

The 1,000 year return period is in accordance with present DOE guidance (i.e. UCRL-15910) which sets the annual probability of exceedance for the Design Basis Wind at 1 x 10^{-3} /year for a Moderate Hazard facility.

Facility specific design wind loadings can be found in the appropriate design criteria documents. The appropriate wind to use with the severe environment load combination is the 100 year return period wind which has a fastest mile wind speed of 130 kph (80 mph) which with gust factor included is 160 kph (97 mph). The wind load on structures is calculated using the methods of ANSI A58.1 with exposure condition C and importance factor I=1.07.

Facilities judged to present lesser hazards are designed using lower wind speeds. For example, the design fastest mile wind speed used for the office trailers is 119 kph (73 mph) which corresponds to the value specified by the NY State Building Code and by UBC. Facility specific design wind loads can be found in the appropriate design criteria documents.

A.4.2.2 Tornado Loadings

The design basis tornado (DBT) has the following characteristics:

maximum windspeed	260 kph (160 mph)
rotational speed	180 kph (110 mph)
translational speed	80 kph (50 mph)
radius of maximum rotational wind	46 m (150 ft)
peak pressure differential	2.4 kPa (0.35 psi)
rate of pressure drop	1.0 kPa/sec (0.15 psi/sec)

The design basis tornado for the WVDP is established in Nicholas and Eagan (1983) and was selected based on an assessment of the probability of occurrence using the work of Dames & Moore (July 27, 1972), Fujita (1981), McDonald (1981), and Murray (1981).

The maximum wind speed is taken as the sum of the translational and rotational components. The 260 kph (160 mph) maximum wind speed tornado corresponds to a 1 million year return period event. The 1,000,000 year return period value is more conservative than the probability of exceedance required (i.e. 2×10^{-5} /year) by UCRL-15910. The 2×10^{-5}/year tornado would correspond to a maximum wind speed of only 80 kph (50 mph) which would be insufficient to generate any missiles.

Facility specific design basis tornado wind loadings can be found in the appropriate design criteria documents. The tornado load is a combination of wind pressure and atmospheric pressure drop. The tornado wind load on structures is calculated using the methods of ANSI A58.1 with exposure condition C and importance factor I=1.

Maximum windspeeds may be reduced to fastest mile windspeeds before they are used in the ANSI A58.1 equations.

A.4.2.3 Flood Design

The site is situated at an elevation which will not be affected by flooding of either Buttermilk Creek or Cattaraugus Creek (see Section A.3.4, Surface Hydrology); thus no special considerations are required to design against flood. Site grading practices are employed to protect Project facilities from local flooding during heavy rains or snow melt and spring run-off.

A.4.2.4 Tornado Missile Protection

The design basis tornado generated missiles are summarized as follows:

Missile	Weight	Cross Sectional Area	Horizontal Velocity*	Maximum Height Above Ground
Timber Plank 10 cm x 30 cm x 3.7 m long	63 kg (139 lb)	269 cm^2 (.29 ft^2)	136 kph (85 mph)	61 m (200 ft)
Steel Pipe 8 cm diameter x 3.1 m long	34.4 kg (76 lb)	14.4 cm^2** (.0155 ft^2)	80 kph (50 mph)	30 m (100 ft)

* Vertical velocities are taken as two-thirds the horizontal missile velocity. Horizontal and vertical velocities should not be combined vectorially.

** Value represents metal area.

McDonald (1981) forms the technical basis for the selection of the WVDP site design basis tornado missiles. After reviewing lists of potential missiles, McDonald provided tornado generated missile parameters for wind speeds of 320, 400, 480 and 560 kph (200, 250, 300 and 350 mph). The four most likely missiles considered by McDonald were a 63 kg (139 lb) timber plank, a 34.4 kg (76 lb) steel pipe, a 676 kg (1,490 lb) utility pole and a 1814 kg (4,000 lb) automobile. The utility pole and the automobile would not be picked up or sustained by tornado wind speeds less than 320 kph (200 mph).

Murray (1981) reviewed the McDonald report and recommended a Design Basis Tornado wind speed of 260 kph (160 mph) based on an assessment of the probability of occurrence. Murray then recommended design basis missiles consistent with this

maximum wind speed (which is lower than the range of values provided by McDonald). McDonald reviewed and concurred with these recommended design missile values.

The WVDP tornado missiles exceed the current DOE guidance design tornado missiles which are the following: (i) a 6.8 kg (15 lb) timber plank at 161 kph (100 mph) and (ii) a 34.0 kg (75 lb) steel pipe at 80 kph (50 mph).

Tornado missile barrier protection is incorporated into structures determined to require such protection. The barriers are considered to be in the direct path of a tornado borne missile and are designed against penetration and crushing effects. Facility specific design basis tornado generated missiles can be found in the appropriate design criteria documents.

A.4.2.5 Seismic Load

The design basis earthquake (DBE) has a peak horizontal ground acceleration of 0.1 g, with design response spectra and associated damping values in accordance with U.S. NRC Regulatory Guides 1.60 (US/NRC, 1973) and 1.61 (US/NRC, 1973), respectively. The vertical component of peak ground acceleration was taken as 0.067 g, using the horizontal design spectra specified in NRC Regulatory Guide 1.60 scaled by two-thirds over the entire range of frequencies.

The 0.1 g DBE was established and accepted by DOE (Letter Hannum to Mairson, October 20, 1983) in accordance with DOE guidance in effect at the time and was based on well documented and reviewed seismic hazard studies completed for WVDP (Dames & Moore, 1983). More recent seismic hazard re-evaluations (WVNS, December 23, 1992; Dames & Moore, 1995) have confirmed the 0.1 g peak horizontal ground acceleration DBE. Further discussion of the background and history of the many seismic hazard evaluations conducted since the original NFS plant design in the early 1960's are provided in Section A.3.6.2 and in TSD A.3.6-E.

Dames & Moore (1995) shows that for the important oscillator periods between 0.1 and 1.0 second, the annual probabilities of exceedance for the WVDP DBE are lower than 5×10^{-4}. This is more conservative than present DOE guidance (i.e. UCRL-15910) which sets the annual probability of exceedance for the Design Basis Earthquake at 1×10^{-3} /year for a Moderate Hazard facility.

Structures designed for the design basis earthquake are analyzed using dynamic analysis procedures and have been independently reviewed.

At the time of the NFS plant construction (1963 through 1966), no specific seismic standards had been established for nuclear fuel reprocessing facilities. In lieu of these standards, the facility was designed to meet the requirements of the 1961 Uniform Building Code (UBC) Seismic Zone 3 specifications.

The NY State Building Code with seismic loads determined using the UBC was used for the structural design of non-confinement structures. Facility specific design seismic loads can be found in the appropriate design criteria documents.

A.4.2.6 Snow Load

Snow loads specified by modern standards for structural design are calculated as the product of a ground snow load and a snow load coefficient that transforms the ground load to a roof load. The ground snow load is dependent on the building site, and is determined from basic meteorological data.

The design ground snow load (ASCE,1990) is based on an analysis (Ellingwood, 1983) of data for 184 National Weather Service (NWS) "first-order" stations at which ground snow loads are measured. This data was supplemented by data at over 9000 other locations at which only snow depths were measured and snowpack densities estimated. Statistical analysis of the data shows that the maximum snow load can be represented by a log normal distribution. Using this distribution, the maximum snow loads for various probabilities of exceedance (or their inverse, return period) can be estimated.

Wilks & McKay (1994) report snowpack density relationships for 30 northeastern United States NWS first-order stations and provide maximum snow water equivalent contour maps for various return periods. An appropriate probability distribution (Wilks & McKay, 1994) was used to extrapolate the data beyond the current observational record to various return periods.

Forty one years of direct snow load measurements are available for the NWS Buffalo station. The maximum snow water equivalent depths, interpolated from the maps and converted to loads, are in close agreement to the Ellingwood (1983) analysis.

The 2% probability of exceedance per year value is used as a basis for design by most building codes (e.g. ASCE,1990; NY State Building Code; Uniform Building Code). This corresponds to a site ground snow load of 1.91 kPa (40 lb/ft^2). University of California Research Laboratory (UCRL)-15910 does not provide guidance on snow load.

Facility specific design snow loadings can be found in the appropriate design criteria documents. Design criteria WVNS-DC-022 (VF) and WVNS-DC-046 (HLWTS) specify 1.91 kPa (40 lb/ft^2) for the site snow load.

A.4.2.7 Process- and Equipment-Derived Loads

Process and equipment derived loads are divided into dead loads and live loads. Dead loads include the weight of structures, systems, and components (SSCs). Live loads include floor and roof area loads, crane loads, lay down loads due to temporary placement of moveable equipment or SSCs, impact loads and other processing loads.

Parameters used for the design of process and equipment derived loads for the original facility are not fully specified in the historical record.

Facility specific design process and equipment derived loads can be found in the appropriate design criteria documents.

A.4.2.8 Combined Load Criteria

Parameters used to establish the combined load design for the original facility are not fully specified in the historical record.

Three groups of load combinations were used in the design:

a. Normal Operating Load Conditions - these are loads which are encountered during normal plant operations and shutdown and include dead, live, thermal, internal pressure and soil pressure loads.

b. Severe Environmental Load Conditions - these are loads that could infrequently be encountered during the plant life and include wind and snow.

c. Extreme Environmental Load Conditions - these are loads which are credible but are highly improbable and include tornado and earthquake.

Facility specific design load combinations can be found in the appropriate design criteria documents.

A.4.2.9 Subsurface Hydrostatic Loadings

Parameters used for the design of subsurface hydrostatic loading for the original facility are not fully specified in the historical record.

For new facilities, subsurface loadings due to soil and groundwater are developed using accepted engineering practices including rational analysis in accordance with established principles of soil mechanics. As indicated in sections A.3.5.1.3 and A.3.5.1.4, for design conservatism, the hydrostatic surface is assumed to be at ground level. This results in a maximum lateral and vertical (buoyant) loading. Specific design details of WVDP constructed structures are included in individual facility SAR modules.

A.4.2.10 Temperature Design Loadings

Parameters used for the design of temperature loading for the original facility are not fully specified in the historical record.

New structures, systems and components are designed to withstand thermal loads due to expansion and/or contraction and thermal gradients due to severe environment temperatures. Specific design details of WVDP constructed structures are included in individual facility SAR modules.

A.4.3 Safety Protection Systems

A.4.3.1 General

The WNYNSC was sited at West Valley because the area is suitable in several ways for nuclear materials handling and disposal. The population density around the site is low, yet access to the site via road and rail is good. The rolling terrain and high elevation provide good atmospheric dispersion, and the geology and hydrology were considered, at the time the site was selected, to be compatible with near surface disposal of low-level wastes. In particular, the relatively impermeable silty till underlying the site affords excellent protection of the groundwater from downward vertical migration of contaminated leachate. This constitutes a `passive` safety feature. Special care must be exercised in design and operation of waste disposal systems to ensure that the integrity of this barrier is maintained.

All the newer facilities, designed since the Project began, have been built in accordance with specifications approved by the DOE. However, the DOE criteria continue to evolve. As such, on the occasion of subsequent reviews (Final Safety Analysis Reports (FSARs), periodic updates, significant modifications, etc.), these facilities are evaluated against the updated criteria. New facilities and major modifications and additions to existing facilities will comply, as appropriate, with DOE orders and other applicable regulations at the time of design approval.

A.4.3.2 Protection by Multiple Confinement Barriers and Systems

Design criteria for new facilities that are part of the WVDP will, at a minimum, reflect the requirements of DOE Order 6430.1A, the WVNS Radiation Control Manual, and other established nuclear industry codes and standards. In addition, for hazardous materials, design and operating requirements of RCRA and SARA Title III will be met. Facility-specific confinement barriers and systems are fully described in other WVDP safety documentation.

A.4.3.3 Protection by Equipment and Instrument Selection

Safety aspects of and protection provided by system equipment and instrument selection are presented in individual SAR modules. Equipment and instrument selection is in accordance with requirements specified in DOE Order 6430.1A. In general, a fundamental concern is that the structural and/or operational features of the equipment provide confinement of radioactive and hazardous materials if required. Beyond this first-order objective, ALARA principles apply. Where appropriate, in circumstances important to safety, the effects of design-basis accidents such as fires, explosions, impacts involving natural phenomena are factored into design or selection. Equipment is selected for reliability, and where protection in depth is required, redundant systems are provided using different motive forces to avoid system loss due to a single-mode failure.

A.4.3.4 Nuclear Criticality Safety

Nuclear criticality safety has been established at the WVDP through implementation of WVDP-162, *Nuclear Criticality Safety Program Plan* (WVNS), and WV-923, *Nuclear Criticality Safety* (WVNS). These documents have been written to implement the requirements of DOE Order 420.1, *Facility Safety,* and referenced ANSI/ANS nuclear criticality safety standards.

The WVDP criticality safety program has been developed to control fissionable materials and potential criticality hazards in a way that assures that workers, members of the general public, government and personal property, and essential operations are protected from the effects of potential accidents. Fissionable materials at the WVDP are processed, stored, transported and handled in a manner which assures that the potential for an accidental criticality is acceptably low. A discussion of the WVDP criticality program is given in Section A.8.8.

A.4.3.5 Radiological Protection

Administrative and design controls provide radiological protection. Administrative controls are discussed in Section A.8; design controls (e.g., confinement, ventilation, remote handling, equipment layout, and shielding) for new facilities shall meet the requirements of DOE 6430.1A as appropriate and are presented in individual facility SAR modules.

A.4.3.6 Fire and Explosion Protection

A.4.3.6.1 Fire Hazards

Fire Hazard Analyses (FHAs) have been conducted to comprehensively and qualitatively assess the fire risk within individual fire areas comprising the facilities on-site. A complete discussion of the FHA process and its requirements is given in WVDP-177, *WVDP Fire Protection Manual* (WVNS). In addition, WVDP-178, *Pre-Fire Plan* (WVNS), which describes the fire hazards and protection system(s) specific to each facility on the WVDP site, has been prepared. As with WVDP-177, the Pre-Fire Plan seeks to ensure that a safe environment is maintained to protect the health and safety of plant personnel, the general public, and the environment, and to limit the extent of property damage caused by fire at the WVDP.

A.4.3.6.2 Fire Protection Program and Organization

A comprehensive fire protection program based on the requirements of DOE Order 420.1, *Facility Safety* (USDOE October 13, 1995) and NFPA-101, *Life Safety Code* (National Fire Protection Association), has been developed for the WVDP. The philosophy and requirements of this program are presented in WVDP-177, *WVDP Fire Protection Manual*. This manual establishes a formalized fire protection program governing the conduct of all activities at the WVDP to ensure that employees, the public, and the environment are protected from the effects of a fire. The WVDP Fire Protection Program

establishes minimum requirements for ensuring compliance with the improved risk criteria as outlined in DOE Order 420.1.

The WVDP Fire Protection Program has the following objectives:

- Minimize the potential for the occurrence of a fire.
- Ensure that fire does not cause an unacceptable on-site or off-site release of hazardous or radioactive material that will threaten the worker or public health and safety, or the environment.
- Establish requirements that will provide an acceptable degree of life safety from fire for WVDP personnel and the public.
- Ensure that process control and safety systems are not damaged by fire or related perils.
- Ensure that vital DOE Programs will not suffer unacceptable delays as a result of fire and its effects.
- Ensure that property damage from fire and related perils does not exceed an acceptable level.

The WVDP Fire Protection Program, which goes beyond the minimum requirements established by the National Fire Protection Association (NFPA), encompasses the defense-in-depth concept to ensure that a high level of fire protection is provided. The defense-in-depth concept incorporates the following attributes:

A. Fire Resistive/Non-Combustible Construction

B. Physical Compartmentalization and Separation

C. Automatic Fire Suppression

D. Automatic/Manual Fire Detection

E. Manual Fire Fighting

F. Fire Protection System Surveillance

G. Fire Prevention Activities

H. Administrative Controls

I. Fire Protection Inspections

J. Fire Protection Appraisals

K. Training for Fire Awareness and Response

Various inspections, appraisals, and assessments are incorporated into the WVDP Fire Protection Program. These activities, which identify potential fire and explosive hazards and ensure that new and existing facilities and activities maintain the level of fire protection required by DOE Orders, include the following:

- The Industrial Hygiene & Safety Department (IH&S) conducts fire protection appraisals of facilities, structures, and equipment in accordance with the scope and frequency established by DOE Order 420.1. The guidelines for conducting these appraisals are listed in WVDP-177 and documented in WVDP-319, *Facility Fire Assessments* (WVNS).

- As part of the WVDP Conduct of Operations program as implemented through WVDP-106, *Westinghouse Conduct of Operations Manual (WVNS)*, routine facility inspections are carried out by line managers, supervisors, or cognizant engineers. These "walk your spaces" inspections include control and handling of flammables and combustibles, control and handling of ignition sources, identification of potential fire and explosive hazards, and general housekeeping practices.

- To ensure that activities (e.g., modifications or work practices) do not reduce the level of provided fire protection required per the DOE Orders, activities are reviewed for potential fire protection impact by Plant Engineering per WV-111, *Work Order Control System (WVNS)*. Fire protection reviews are also conducted by Plant Engineering on all new facilities and modifications to facilities as appropriate, per WVDP-114, *Engineering Procedures (WVNS)*. A documented design review program has been developed to ensure that designs, specifications, modifications, fire system acceptance test procedures, fire equipment procurement, and fire system testing/inspection/maintenance procedures, are reviewed and/or approved by

Plant Engineering per WVDP-114. This program includes a formal tracking system for comment resolution.

Ultimate responsibility for the WVDP Fire Protection Program rests with the Management and Operating (M&O) contractor, West Valley Nuclear Services Company. Management is responsible for executing the procedures in the program and for adhering to the requirements of the fire protection program for the facilities and/or operations under their jurisdiction. Responsibilities of the WVNS management and line organizations regarding the WVDP Fire Protection Program are listed in WVDP-177.

Specific design criteria for fire and explosion protection are presented in individual facility SAR modules. Additional information on fire fighting capabilities and fire fighting readiness assurance is presented in Section A.10.5.

A.4.3.6.3 Combustible Loading Control

Combustible loading at the WVDP is controlled through procedures and requirements contained in WVDP-177. In compliance with applicable DOE Orders and NFPA codes, combustible materials are stored such that their accumulation does not present an increased risk to facilities or personnel or create a fire hazard. WVDP-177 contains guidance for minimizing and controlling the use of combustible materials and provides the design and operation requirements and responsibilities for hazardous material storage.

Facility inspections, which include control and handling of flammables and combustibles, are conducted by the Industrial Hygiene and Safety Department on a schedule consistent with facility use. These inspections, whose findings are documented and reviewed, give facility managers a consistent method of documenting in-house fire safety inspections and corrective actions taken to resolve findings.

A.4.3.7 Fuel and Radioactive Waste Handling and Storage

Safety design criteria for radioactive waste storage are described as applicable in the individual facility SAR modules.

A.4.3.8 Industrial and Chemical Safety

A discussion of industrial and chemical safety is presented in Section A.8.7, Hazardous Material Protection.

A.4.4 Classification of Structures, Systems, and Components

The safety class and quality level of structures, systems, and components (SSCs) are listed in WVDP-204, *WVDP Quality List (Q-List)* (WVNS). The definitions of safety class and quality level that are contained in WVDP-204 were developed by WVNS personnel and were chosen for reasons stated in WVDP-204. The WVDP-204 definition of safety class (and SSCs that have been designated as safety class in WVDP-204) is to be completely disassociated with safety class SSCs as defined in DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports* (USDOE July 1994). Safety class SSCs per DOE-STD-3009-94 generally have Technical Safety Requirements (TSRs) associated with them.

DOE-STD-3009-94 defines safety class SSCs as follows: "Systems, structures, or components including primary environmental monitors and portions of process systems, whose failure could adversely affect the environment, or safety and health of the public as identified by safety analyses. For the purposes of implementing this Standard, the phrase "adversely affect" means Evaluation Guidelines are exceeded. Safety class SSCs are systems, structures, or components whose preventive or mitigative function is necessary to keep hazardous material exposure to the public below the off-site Evaluation Guidelines. This definition would typically exclude items such as primary environmental monitors and most process equipment." The individual SAR modules classify SSCs based upon the accident analyses.

A.4.5 Decommissioning

As explained in Section A.1.0, the objective of the WVDP is to solidify the remaining liquid HLW and ship it off-site for disposal or provide interim storage while awaiting disposal. After this is completed, the facilities that were used by DOE to conduct the Project are to be decontaminated and decommissioned prior to being returned to the custody of New York State. Therefore, the topic of Decontamination and Decommissioning (D&D) is ingrained in the Project culture. Because of this, and the lessons learned from the Project's earlier D&D efforts (many of the Project's functional components are housed in the former reprocessing plant, in cells that required decontamination prior to use for Project activities), the design of new facilities and components is undertaken with the need for future D&D as a major consideration. Since this approach is consistent with ALARA and the need for day-to-day contamination control, with frequent application of remote handling methods, and with requirements for in-service maintenance, design objectives for future D&D are generally consistent with the requirements for current waste processing. Information

regarding how these objectives are addressed for new and modified WVDP facilities is presented in the individual SAR modules.

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A.7.0 WASTE CONFINEMENT AND MANAGEMENT

This chapter addresses the policies and guidelines for the generation, handling, treatment, storage, and disposal of radiological and hazardous wastes at the West Valley Demonstration Project (WVDP). These wastes occur in a gaseous, liquid, or solid form. Detailed information regarding "quantities, chemical forms and characteristics, physical characteristics, and radiological or toxic/radiological composition", as required by DOE Order 5480.23, *Nuclear Safety Analysis Reports* (USDOE), is provided in the applicable Safety Analysis Report (SAR) for each nuclear facility or activity at the WVDP.

DOE Order 5480.23 also states the following: "The SAR should include estimates of the quantity and form of radioactive wastes generated incidental to the mission of each DOE nuclear facility, as well as equipment, provisions, and plans for the management of these wastes. Note that if the management of radioactive wastes is among the missions of the facility, such waste management should be addressed under subparagraph (d) (Facility description and operation, etc.)." The "management of radioactive wastes" is the primary mission of the WVDP. Hence, it is important to make a distinction between the processing of liquid high-level wastes contained in the waste tank farm through the Vitrification Facility and Integrated Radwaste Treatment System (IRTS), and the treatment of secondary or byproduct radioactive waste streams that are generated during operation of high-level waste facilities. Byproduct waste streams are treated at, or stored in, facilities such as the Low-Level Waste Treatment System (LLWTS) or lag storage facilities, or shipped off-site for disposal or for treatment (compaction or incineration). Alternatives for final disposition of Project waste will be described in a Final Environmental Impact Statement (USDOE) which is currently being prepared. A draft EIS was issued in January, 1996 (DOE/EIS-0226-D).

A.7.1 Waste Management Criteria

Fundamental waste management objectives are considered prior to the design and operation of all WVDP facilities or systems for handling, treatment, storage, and disposal of waste. These objectives include:

- Protection of the worker, public health, and the environment;
- Conformance to applicable federal and state laws, rules and regulations, and DOE orders;

- Application of the ALARA philosophy;

- Waste minimization, including volume reduction, segregation, preferential use of less toxic materials; and

- Provision of flexibility in facility design to accommodate future needs.

In addition to the secondary radioactive waste streams, certain hazardous and mixed waste streams generated at the WVDP also are treated, packaged, and stored on-site. (Mixed waste contains both radioactive and hazardous constituents as defined by the Resource Conservation and Recovery Act [RCRA]). Other effluent streams are treated and subsequently released to the environment. Waste handling and processing facilities at the WVDP are designed to ensure that discharges to the environment are maintained well within the requirements of applicable regulations and the guidelines given in DOE Order 5400.5, *Radiation Protection of the Public and the Environment* (USDOE). Release limits which ensure compliance with 5400.5 are specified in WVDP-010, *WVDP Radiological Controls Manual*, (WVNS). Hazardous waste is disposed of off-site in licensed hazardous waste treatment and disposal facilities. Nonradioactive and nonhazardous waste is disposed of off-site in licensed commercial facilities.

The management (e.g., handling, packaging, storage, etc.) of radioactive, hazardous, non-hazardous, industrial, and radioactive mixed wastes is conducted at the WVDP according to approved policies and procedures. Consistent with the waste minimization stipulations contained in DOE Order 435.1 and the implementation guidance for DOE Order 5400.1, a waste minimization plan for the WVDP, WVDP-087, *Waste Minimization/Pollution Prevention Awareness Plan* (WVDP), has been prepared. Waste minimization and pollution prevention activities are conducted according to this plan and standard operating procedures.

A.7.2 Radiological and Mixed Wastes

Radiological and mixed waste generation at the WVDP is discussed in WVNS-SAR-002 and WVNS-SAR-003. WVNS-SAR-002 describes low-level waste processing and support activities which include the storage of boxed vessels and other equipment removed from the Chemical Process Cell. WVNS-SAR-003 addresses the Vitrification Facility, including High Level Waste Interim Storage (HLWIS).

The WVDP is currently using the NRC waste classification system prescribed in 10 CFR 61 (USNRC) for Class A, B, and C wastes. Based on this classification system, most

of the radioactive waste generated at the WVDP is Class A waste. Much of this waste is compactable material consisting of anticontamination clothing, bags, paper products, rags, analytical sample bottles and other miscellaneous items. Other low-level wastes include spent ventilation air filters, drums containing dewatered resin from LLWTS operations, contaminated soil and wood products, small diameter piping and sheet metal, and failed processing components which have been removed from radioactive service and overpacked before disposal.

At the WVDP, transuranic (TRU) waste as defined by DOE was generated during plant decontamination efforts during the 1980's. At present, there are no major on-going decontamination projects and, therefore, no significant quantities of TRU waste are being generated. TRU material also is present in areas of the former reprocessing plant which have not yet been decontaminated. Ultimate disposal plans for this material have not been developed, but DOE policy prohibits disposal at West Valley.

In addition to the TRU waste, there also exists at the WVDP a large volume (approximately 20,000 270-liter square drums) of cement-solidified waste from HLW supernatant and sludge wash processing. About one-half of the drums stored in the drum cell contain between 10 and 100 nanocuries per gram of long-lived alpha activity. This low-level waste was a product of the primary mission of the West Valley Demonstration Project as noted in the introduction to Section A.7.0.

Management and processing of the high-level and mixed waste that is stored in the waste tank farm is described in WVNS-SAR-003. This waste is a process feed to the Vitrification Facility. High-level waste is defined in DOE Order 435.1 as "the highly radioactive waste material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and other highly radioactive material that is determined, consistent with existing law, to require permanent isolation." This definition includes the vitrified waste containing the Tank 8D-2 residue and the cesium- and plutonium-loaded zeolite from Tank 8D-1. High-level waste does not include other wastes resulting from reprocessing plant operations and does not include wastes generated incidental to the management or treatment of high-level waste. The PUREX (in Tank 8D-2) and THOREX (formerly in Tank 8D-4 but later transferred to Tank 8D-2) high-level waste is classified as a mixed waste by virtue of its toxicity characteristic (related primarily to the content of heavy metals). Therefore, this waste also is managed in accordance with applicable hazardous waste regulations.

Low-level mixed wastes are packaged for storage according to applicable federal and state environmental regulations and applicable DOE Orders. The primary forms, based on the volume of low-level radioactive waste at the WVDP, are mercury- and lead-contaminated debris, PCB-contaminated debris, and spent filter media. These materials are currently stored in the Lag Storage Building, IWSF, and Lag Storage Areas. Small quantities of radioactive mixed wastes are generated during analyses in the WVDP Analytical and Process Chemistry Laboratory. Radioactive mixed waste may be stored at the IWSF, Lag Storage Building, Lag Storage Area (LSA) 3 or 4, in the CPC-WSA, or on the FRS Hardstand prior to final disposition.

The WVDP mixed waste management operations are also conducted in accordance with the Federal Facility Compliance Act (FFC Act). Pursuant to this legislation, the WVDP developed a mixed waste "Site Treatment Plan" that provides plans and schedules for treatment of mixed waste either on or off-site, to meet Land Disposal Restriction standards.

A.7.3 Nonradiological Wastes

Nonradiological wastes generated at the WVDP include RCRA hazardous, non-hazardous industrial, non-hazardous solid waste, recyclables, and environmental media.

The amount of hazardous waste generated at the WVDP, primarily as a result of maintenance, analytical, and printing activities, is relatively small. Hazardous wastes generated on-site from defined waste streams may be accumulated in Satellite Accumulation Areas before transfer, or may go directly to the Hazardous Waste Storage Facility (HWSF). Hazardous waste is shipped off-site for treatment and disposal by licensed and approved transporters to permitted commercial treatment, storage, and disposal facilities.

Nonhazardous, nonradioactive industrial wastes are disposed of off-site in commercial facilities.

Project effluents are regulated by the New York State Department of Environmental Conservation (NYSDEC). The combined liquid effluents from the LLWTS and wastewater (sanitary sewage) treatment facility, as discussed in WVNS-SAR-002, are monitored to assure compliance with discharge limits identified in the State Pollutant Discharge Elimination System (SPDES) permit.

A.7.4 Off-Gas Treatment and Ventilation

Gaseous waste streams associated with WVDP facilities and activities are processed through various types of treatment equipment so that releases to the environment are below applicable DOE, EPA, and NYSDEC limits. Off-gas treatment and ventilation systems at the WVDP are described and discussed in WVNS-SAR-002 and WVNS-SAR-003. Any new or major modifications to existing off-gas treatment and ventilation systems will be addressed in approved safety related documents and NESHAP permit applications. High Efficiency Particulate Air (HEPA) filters are used extensively at the WVDP to remove particulate radioactivity from gaseous streams. Upon removal from service, HEPA filters are placed in shielded containers if required and transferred to lag storage for subsequent disposition. Certain equipment at the WVDP, such as the Submerged Bed Scrubber used in the Vitrification Facility, is becoming contaminated while processing off-gases. The disposition of such heavily contaminated components and equipment that are used in the filtering/processing of off-gases will be described in future WVDP safety and environmental documentation.

There are two primary locations at the WVDP where radioactive airborne emissions are released to the atmosphere. These are the Main Plant stack and the stack for Vitrification Building Heating, Ventilation, and Air Conditioning (HVAC) system effluent. The monitoring program for these stacks is described in other DOE-approved WVDP reports including the Annual Site Environmental Reports, the annual NESHAP reports, and Monthly Trend Analysis Reports, and WVDP-098, *Environmental Monitoring Program Plan* (WVDP).

A.7.5 Liquid Waste Treatment and Retention

During operations at the WVDP, waste water is generated that contains traces of various activation and fission product radionuclides. The purpose of the Low-Level Waste Treatment System (LLWTS) with its associated retention system of lagoons is to intercept radioactive waste water, remove and confine the contained radioactivity to the greatest extent practicable, and discharge the treated water at controlled rates to the environs.

The LLWTS decontaminates site low-level liquid waste and is operated in a manner which ensures that effluent concentrations of radionuclides from the facility do not exceed the derived concentration guides for those nuclides as specified in DOE Order

5400.5. Effluents from Lagoon 3 are also monitored for nonradiological parameters to ensure compliance with limits set forth in the SPDES permit issued by the NYSDEC.

Low-level liquid wastes are collected batchwise in one of the two interceptors. The third (old) interceptor is used for collecting radioactive water that may exceed nonradiological parameters of concern. From there, the water is metered into one of the new interceptors for sampling before being transferred to Lagoon 2. Following radiological analysis, batches with a gross alpha plus gross beta concentration below 5×10^{-3} µCi/mL are transferred to Lagoon 2. Interceptor contents having an activity concentration in excess of 5×10^{-3} µCi/mL (gross alpha plus gross beta) are diluted with water until an acceptable concentration is obtained. The LLWTS is currently configured to process 165,000 L/day (43,200 gpd) and preferentially removes strontium and cesium. The LLWTS process equipment previously was housed in the 02 Building, but in 1998 this structure and the treatment equipment it sheltered were replaced by the Low-Level Waste Treatment Replacement Facility (LLW2) containing two skid-mounted equipment trains. Ion exchange resins used to remove radioactivity at the LLW2 are sluiced out of their columns and into B-25 overpack boxes before being transferred to the Lag Storage facility for holding until disposal. Batches of the treated liquid are collected in Lagoon 4 or 5 where they are sampled and analyzed. If the treated liquid batch meets the discharge specifications, it is transferred to Lagoon 3 for controlled discharge to the environment; otherwise, the liquid batch is transferred to Lagoon 2 for recycle through the LLW2. Typically, on the order of 10 to 12 million gallons of water are released from Lagoon 3 in a year. The LLWTS is discussed and depicted in WVNS-SAR-002.

Radioactive wastes produced by operation of the Vitrification Facility are processed through existing systems at the WVDP. Liquid radioactive wastes are either returned to the high-level waste tank farm for subsequent processing though the Vitrification Facility or IRTS, or processed through the LLWTS with subsequent release to the environment.

A.7.6 Liquid Waste Solidification

Solidification of secondary or byproduct low-level liquid waste generated during operation of high-level waste treatment facilities is not performed at the WVDP. As noted above, this waste is returned to the tank farm or treated by the LLWTS.

A.7.7 Solid Wastes

The WVDP does not dispose of radiological waste on-site. The Programmatic EIS Record of Decision for Low-Level Waste provided the policy decision that West Valley low-level waste will be disposed of at NTS, Hanford, commercial sites, or a combination thereof. The high-level waste and TRU waste will likewise be disposed of at an off-site location.

Radioactive wastes generated at the WVDP include Class A, B, and C wastes, mixed waste, and TRU waste. Temporary storage for these wastes is provided by Lag Storage Facility buildings and hardstand areas. These facilities provide interim storage for wastes generated at the WVDP prior to final disposal. See WVNS-SAR-002 for additional information about these facilities and equipment.

Waste volume reduction is performed at the Waste Reduction and Packaging Area compactor, and the Contact Size Reduction Facility. Wastes are segregated in the Container Sorting and Packaging Facility located in LSA 4. Following completion of an Environmental Assessment and issuance of a Finding of No Significant Impact by DOE on November 29, 1995, a limited quantity of Class A and mixed LLW is being shipped to off-site commercial facilities for treatment and volume reduction. Residues are disposed of at commercial, licensed LLW disposal facilities. Waste storage facilities at the WVDP have been designed for the safe storage of wastes packaged to meet the requirements of 10 CFR 61.

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A.8.0 HAZARDS PROTECTION

Sections A.8.1 through A.8.6 below discuss radiation protection. Section A.8.7 discusses hazardous material protection and Section A.8.8 discusses prevention of inadvertent criticality.

A.8.1 Assuring that Occupational Radiation Exposures are As Low As Reasonably Achievable

A.8.1.1 Policy Considerations

A formally documented program directed toward maintaining personnel radiation doses as low as reasonably achievable (ALARA) is in place for the WVDP. Requirements contained in 10 CFR 835, *Occupational Radiation Protection* (USDOE), along with guidance provided in DOE Guide G-441.1-2, *Occupational ALARA Program Guide* (USDOE March 1999), and DOE Publication PNL-6577, *Health Physics Manual of Good Practices for Reducing Radiation Exposure Levels that are As Low As Reasonably Achievable* (USDOE June 10, 1988), have been implemented in the ALARA program. This program is required by management policy as set forth in WV-984, *ALARA Program* (WVNS), coordinated by the Radiation Protection Manager and Environmental, Safety, Quality Assurance, and Laboratory Operations Manager, and implemented by line management. WVDP-163, *WVDP ALARA Program Manual* (WVNS), is the implementing document for both the occupational and environmental ALARA programs. In essence, the program includes formal plans and measures for applying the ALARA process to occupational and environmental exposures from radiation and radioactive materials, and establishes annual radiological performance goals, work conduct and design requirements, ALARA training, etc. The annual radiological performance goals include dose, contamination, and waste reduction objectives. The WVDP maintains the radiation protection program in compliance with 10 CFR 835, DOE Order 5400.5, and DOE-STD-1098-99, *DOE Radiological Control Standard* (USDOE July 1999). Progress toward meeting the goals is reported to management quarterly with an annual summary report presenting the accomplishments from the previous year and establishing goals and corresponding activities for the following year. The formal ALARA program and its implementation is the subject of quarterly Radiation and Safety Committee reviews, per WV-906, *Radiation and Safety Committee* (WVNS), and WVDP-010, *WVDP Radiological Controls Manual* (WVNS).

Process Safety Requirements (PSRs), which are administrative controls used at the WVDP, are imposed upon Project facilities and operations in the interest of health

and safety of on-site personnel and facility operators. PSRs are developed for systems and/or components that are under the direct control of the operator and that meet criteria which have been approved by the West Valley Area Office. These criteria, which involve radiological, nonradiological, or worker risk-reduction considerations, may be found in WV-365, *Preparation of WVDP Safety Documents* (WVNS). PSRs are identified in implementing procedures and other documentation. Each PSR provides limiting conditions for operation, actions, surveillance requirements, and background information. All PSRs require the approval of the WVNS Radiation and Safety Committee and select PSRs (based on written criteria) require the additional approval of the DOE-OH/WVDP.

A.8.1.2 Design Considerations

Design requirements contained in 10 CFR 835 and DOE-STD-1098-99 have been implemented at the WVDP. Design reviews are conducted with ALARA principles (discussed below) incorporated into design documents, i.e., design bases and drawings, where applicable. Requirements for ALARA design reviews are provided in WVDP-010, *WVDP Radiological Controls Manual* (WVNS), WV-984, *ALARA Program* (WVNS), and in WVDP-163, *WVDP ALARA Program Manual* (WVNS).

A.8.1.2.1 General Design Considerations for Maintaining Exposures ALARA

General design considerations and methods employed to maintain radiation doses ALARA, as required by WVDP-010, WV-984, and WVDP-163, are as follows:

- Measures are taken to maintain radiation exposure in controlled areas as low as reasonably achievable through physical design features and administrative controls. The primary methods used are physical design features (e.g., confinement, ventilation, remote handling, and shielding). Administrative controls are employed only as supplemental methods to control radiation exposure;

- For specific activities where use of physical design features are demonstrated to be impractical, administrative controls are used to maintain radiation exposures ALARA;

- Radiation and airborne radioactivity levels are minimized in routinely occupied areas of the solidification and support

facilities and in the vicinity of equipment expected to require the attention of individuals;

- Whole body radiation doses of personnel are maintained below 500 mrem per year per individual and ALARA; and

- Exposure rates to radiological workers are maintained less than 0.25 mrem per hour in full-time occupied areas (2000 hours per year) and ALARA and, where occupancy differs from the above, the exposure rates to workers are maintained less than 500 mrem per year per individual and ALARA.

Both equipment and facility designs are considered in maintaining doses ALARA during operation, including normal operation, maintenance and repairs, in-service inspection, and calibrations.

A.8.1.2.2 Equipment Design Considerations for ALARA

Equipment design considerations to minimize the necessity for personnel to spend time in radiation areas and the amount of time spent there include:

- Incorporating design features and constructing equipment, components, and materials to reduce the need for repair or preventive maintenance;

- Providing maintenance and repair convenience (including easy disassembly and the use of modular components) so that repairs can be made in areas with lower radiation levels;

- Remotely or mechanically operating, repairing, servicing, monitoring, and inspecting equipment where practicable;

- Providing redundant equipment or components to reduce the need for immediate repair or maintenance where radiation or airborne radioactivity levels may be high;

- Providing override features on remote handling equipment in radiation areas; and

- Selecting materials that facilitate operations, maintenance, decontamination, and decommissioning.

A.8.1.2.3 Facility Layout Design Considerations for ALARA

Optimization methods are used to assure that occupational exposure is maintained ALARA in developing and justifying facility design and physical controls in accordance with 10 CFR 835, *Occupational Radiation Protection*. Facility design considerations to minimize the amount of time personnel spend in radiation areas, as required by WVDP-010, WVDP-984, and WVDP-163, include:

- Locating equipment and instruments that require routine maintenance, calibration, operation, or inspection in easily accessible areas in order to minimize the amount of time needed to perform those operations;

- Separating radioactive or potentially radioactive equipment from nonradioactive equipment;

- Providing for the transportation of equipment components requiring service to areas with lower radiation levels;

- Separating radiation sources from occupied areas (e.g., designing so that pipes and ducts containing potentially radioactive fluids do not pass through normally occupied areas);

- Providing adequate shielding between radiation sources and access and service areas;

- Providing central control panels to permit remote operation of all essential instrumentation and controls from the lowest radiation zone practicable;

- Providing means for controlling contamination and airborne radioactivity by proper design of the ventilation system (i.e., designing air flow rate, velocity, and flow patterns for maximum confinement efficiency); and

- Designing surfaces subject to possible contamination so that they are free of crevices and sharp edges and coating them to facilitate decontamination.

A.8.1.3 Operational Considerations

In accordance with the operating contractor's policy contained in WV-984 and consistent with the requirements of 10 CFR 835, recommendations of DOE Guide G-441.1-2, and DOE/PNL-6577, the radiation exposure to plant personnel is kept ALARA by the facility design, continued review of operations and training, and the functioning of the radiation protection organization. In addition to planning, training, and monitoring all activities related to radiation exposure of personnel, some of the ALARA techniques used to reduce exposures are listed below.

- Work is performed outside radiation areas to the extent practicable.

- Entry and exit points are located in areas where dose rates are as low as practicable.

- Shielding is used whenever possible. Temporary shielding is also used for operations near radiation sources.

- Work is preplanned when it involves whole-body exposure to high levels of radiation or contamination. This ensures expeditious performance in a safe manner and with minimum personnel.

- When required, protective clothing and respiratory equipment are worn for radiological protection and selected to minimize the discomfort of workers so that efficiency is maintained and less time is spent in radiation areas.

- Workers entering radiation areas where significant doses could be received wear self-reading dosimeters so that they can determine their accumulated exposure at any time while on the job.

- Areas with potential for significant loose contamination of airborne radioactivity are isolated by air locks and/or airflow control to minimize inhalation exposure and the potential for the spread of contamination.

A.8.2 Radiation Sources

The radiation sources will vary from system to system and will be addressed in individual SAR modules. During the former operation of the spent nuclear fuel reprocessing facility, reprocessing wastes and contamination were generated, resulting in High-level, Transuranic, and Low-level wastes in various buildings, nearby land and structural storage areas, and systems. While many of the shorter-lived radionuclides from the spent nuclear fuel have decayed, the radiation sources present in various operating systems and facilities that are addressed in individual SAR modules stem from the longer-lived radionuclides from reprocessed spent nuclear fuel.

A.8.3 Radiation Protection Design Features

Specific radiation protection design features are described and discussed in the individual SAR modules. Because the WVDP has made the maximum feasible use of the former nuclear reprocessing facilities, many radiation protection design features in the main reprocessing building and systems and other existing facilities are based on original facility structural and process designs. Additions and modifications to and/or enhanced design features to these buildings and/or systems were used when necessary. The radiation protection design features that will be addressed in individual SAR modules stem from either original, modified, or added design features.

A.8.4 Occupational Dose Assessment

The on-site (occupational) dose assessment for a given system or operation will be presented in individual SAR modules. In the actual operation of each system, the radiological performance goal of collective occupational dose is predetermined for annual exposures resulting from routine operation and maintenance of that system. The collective occupational dose performance goal is based upon WVNS administrative control levels and is monitored quarterly to assure that excessive exposures are not being accrued. In the event that the collective occupational dose performance goal is being exceeded, the operation is flagged for additional management attention and/or evaluation.

A.8.5 Health Physics Program

A.8.5.1 Organization

Implementation of the health physics program is an operating line management responsibility and is set forth in WV-905, *Radiological Protection* (WVNS), and is promulgated in WVDP-010. Development of the health physics program is the responsibility of the Radiation Protection Manager. The Radiation and Safety Committee is responsible for the development of policies and procedures relative to the independent safety review program. This independent review program, established by WV-906, *Radiation and Safety Committee* (WVNS), requires the formation of ad hoc committees to conduct objective reviews of significant modifications to programs or facilities. The organizational structure and duties of the staff that provides health physics program management are described below.

A.8.5.1.1 Radiological Protection Operations

WVDP management has provided a staff of radiological protection professionals to administer those health physics policies which are related to specific organizational duties. In general terms, the health physics-related responsibilities of the Radiation Protection organization are to:

- Establish, interpret, and implement the health physics program and policy requirements;
- Adopt and interpret applicable codes, standards, and guides;
- Provide health physics services for employees;
- Provide training support and support an emergency response capability;
- Support line organizations with regard to health physics matters;
- Collect, evaluate, and disseminate health physics-related information; and

- Support hazard and risk assessment and systems safety programs.

In addition to those staff members directly committed to the WVDP, support is available, if necessary, from other operating divisions of Westinghouse Government Environmental Services Company.

Figure A.8.5-1 depicts the radiological protection management organization at WVDP. The functions and responsibilities of the health physics-related organizations are discussed in the following paragraphs.

Manager, Radiation Protection

The Radiation Protection Manager, is responsible for all activities concerning radiological protection of employees and on-site visitors in accordance with WV-905. The Radiation Protection Manager maintains department responsibilities, charters, goals, and qualifications in WVDP-337, *Radiation Protection Improvement Plan* (WVNS). The Radiation Protection Manager is responsible for developing training programs to instruct workers in performing their jobs safely. The Radiation Protection Manager reports to the President of WVNS and has the full authority to cease operations in the event that operating conditions are not in compliance with operational radiological safety controls or approved operating procedures.

The Radiation Protection Manager is responsible for maintaining radiological safety of the plant by regularly evaluating and assessing surface contamination, radiation levels, and airborne radioactivity concentrations in work areas with respect to approved limits in accordance with WV-905. A major responsibility of this organization is to assist operating management in developing programs and plans to maintain radiation exposures ALARA. Cost effectiveness or optimization of these programs is considered in the development and justification of design and physical controls. The Radiation Protection Manager, is responsible for:

- Ensuring that a personnel dosimetry program is in place to determine radiation exposures of employees and visitors who are authorized to receive occupational radiation exposure and that records of such exposures are properly maintained and reported;

- Ensuring proper calibration and maintenance of the radiological control instrumentation used in normal or emergency operations;

- Analyzing and radioassay of samples collected by the Radiation Protection Operations staff;

- Ensuring that radiological surveys and monitoring are performed in the workplace and that internal and external exposure controls are adequate in protecting individuals within exposure limits and ALARA;

- Conducting radiological training courses and briefings that ensure that site personnel and visitors have the necessary skills and training to conduct radiological work activities;

- Removing from the list of employees authorized to receive occupational radiation exposure those who have exceeded the established facility administrative control levels, or have not demonstrated their continuing understanding of the Project's radiological safety-related operating procedures or the need for compliance with them; and

- Reviewing facility and process design, operating procedures, design and process changes, and providing engineering support to operational groups which prepare those procedures.

The Radiation Protection Manager and staff have the authority and responsibility to cease operations in the event that they are not proceeding in accordance with established operating procedures and safety controls or involve an unreviewed operation which presents a safety risk. The Radiation Protection Manager maintains WVDP-010, *WVDP Radiological Controls Manual*, which implements the policies contained in WV-905. Radiological control procedures are contained in WVDP-131, *Radiological Control Procedures* (WVNS), and provide details to the Radiation Protection Department in implementing radiation protection program requirements. Program manuals and technical basis documents are developed by the Radiation Protection staff to describe a specific program's requirements and also to provide a rationale or background for calculations, measurement frequencies, etc., for such programs.

Reporting to the Radiation Protection Manager are the Radiation Protection Operations Manager, Dosimetry Manager, Radiation Protection Technical Support Manager, and the Radiological Engineering Manager. Under the Radiation Protection Operations Manager are the Radiological Control Operations Supervisors, Radiation Protection Labs Supervisor, and the Radiological Control Technicians, who provide routine monitoring and surveillance functions, and calibration technicians and laboratory counting

technicians. The Radiological Engineering staff, which includes Health Physicists and Radiological Control Engineers, provide engineering support to the Radiological Controls Operations groups, if needed. The Radiological Engineering Manager is assisted by the staff in establishing, developing, and maintaining the radiation protection program in compliance with DOE and management requirements, including those requirements in WVDP-010. The Dosimetry staff runs the Dosimetry Laboratory. The Radiation Protection Technical Support staff maintain the training programs and radiological control procedures.

The Safety Analysis and Integration (SA&I) Manager is responsible for reviewing facility operations that involve fissile material storage, processing, handling and shipping, and for developing and implementing a control and monitoring program to prevent accumulating unsafe quantities of fissile materials. The SA&I Manager is responsible for ensuring that nuclear criticality alarm instrumentation, nuclear accident dosimeters, and an effective and well-documented analysis program and review system are in place if and when conditions require such monitoring. In compliance with WVNS policy, these systems will meet or exceed the DOE requirements for nuclear criticality safety of nonreactor nuclear facilities described in DOE Order 420.1, *Facility Safety* (USDOE September 1995), and DOE-mandated American National Standards. The program is implemented at the WVDP through WV-923 and WVDP-162. The SA&I Manager reports to the Environmental, Safety, Quality Assurance, and Laboratory Operations (ESQA&LO) Manager, who reports directly to the WVNS President.

A.8.5.1.2 Facility Operations

The Radiation Protection organization provides support to Operations, Maintenance, and other technical support groups in the area of radiation safety training and radiological emergencies (i.e., the radiological control team). The Radiation Protection Technical Support staff develops and conducts radiation safety training programs, qualification standards and questionnaires for use in general employee and radiological worker training, use of containment devices, nuclear criticality safety training, and radiation safety orientation for on-site visitors and general employees. These programs are presented by the Radiation Protection Technical Support staff. Training records are maintained in a central file by the Records Management Department. Specific training policies and requirements are discussed under Section A.10.3.

The Radiation Protection Manager is responsible for providing radiological control support to the Emergency Management Department in implementing the requirements of

DOE Order 151.1 (USDOE September 25, 1995). The Radiation Protection staff also performs duties for the DOE Radiological Assistance Program (RAP), which is coordinated by Brookhaven National Laboratory for Region I and includes the eleven Northeastern states. This program is described and implemented in WVDP-246, *Radiological Assistance Program Plan* (WVNS).

A.8.5.1.3 Radiation and Safety Committee

WV-906, *Radiation and Safety Committee*, establishes the Radiation and Safety Committee (R&SC), a group of individuals appointed by the President to provide objective and independent review of safety-related operations, systems, and activities. The R&SC, which functions in an advisory capacity to the line organization and the President, provides an independent review of significant modifications to programs and facilities to assure that:

- Health physics matters are comprehensively addressed in formal documents and reports submitted for review;
- Risks have been identified and are acceptably low with respect to the benefits gained; and
- Management authorization of operations is documented.

The Radiation and Safety Committee is staffed by standing and ad hoc members who are independent of the organization being reviewed. The R&SC Chairman and the standing and ad hoc committee members are appointed by the President. The Radiation and Safety Committee reports directly to the WVNS President.

A.8.5.2 Radiation Detection Equipment, Instrumentation, and Support Facilities

The instrumentation used by the radiological control personnel can be divided into four categories:

- Fixed radiation counting instruments;
- Portable radiation detection instruments;
- Area radiation monitoring instruments; and
- Airborne radioactivity sampling and monitoring instruments.

Instruments are consistent throughout the WVDP facilities. Requirements for radiation protection instrumentation found in 10 CFR 835 and DOE-STD-1098-99 are implemented in WVDP-010, *WVDP Radiological Controls Manual* (WVNS). ANSI N323A-1997 calibration requirements are implemented in WVDP-318, *WVDP Radiological Instrumentation Calibration and Maintenance Program Manual* (WVNS), and in individual radiological control procedures contained in WVDP-131, *WVDP Radiological Control Procedures* (WVNS). Instruments are repaired and calibrated by instrument maintenance and calibration personnel in the Radiation Protection Labs within Radiation Protection Operations. In some cases, specialized instruments may be returned to the manufacturers for repair and calibration.

A.8.5.2.1 Radiation Counting Instruments

Fixed radiation counting instruments are used primarily for analyzing air, water, soil, and smear samples taken in and around the WVDP facilities. The instruments selected for use by the Radiation Protection Department and in the laboratories possess sensitivities to detect levels required by the operating technical specifications and good operating practices.

These instruments are periodically calibrated in accordance with WVDP-318 and with standard sources traceable to the National Institute of Standards and Technology (NIST) or other recognized standards laboratories. The standards are counted using the various geometries that are normally used to count actual samples. Instrument background and response to calibration and/or check sources is determined each operating day to verify that the instrument background and calibration have not changed.

The type of fixed radiation-counting instruments used by the Radiation Protection Department are: a low background, gas flow proportional counter that consists of an anticoincidence guard detector with lead shield, automatic sample changer, and electronics to permit simultaneous counting of alpha and beta radiations; and a High Purity Germanium Spectroscopy System for the measurement of gamma-ray emission rates of radionuclides. The counters are used for low-level alpha and beta determinations of air, smear, soil, and water samples.

The laboratory instrumentation is located in the Radiation Protection Laboratory, which is located adjacent to the warehouse and operated by the Radiation Protection Counting Laboratory technicians.

Samples are prepared by Radiation Protection Counting laboratory personnel for counting in the laboratory. A quality assurance plan has been developed for the Radiation Protection Laboratory in WVDP-317, *WVNS Radiation Protection Laboratory Quality Assurance Plan* (WVNS). Laboratory procedures are implemented in WVDP-131.

A.8.5.2.2 Portable Radiation Detection Instruments

Portable radiation detection instruments are used by the Radiation Protection Department to perform radiation and contamination surveys in the field. Portable instruments include those capable of detecting alpha, beta, gamma, and neutron radiation. Instruments are selected based on ruggedness, accuracy, reliability, and ease of service. These instruments cover the entire spectrum of radiation measurements expected to be required during normal operations and accident conditions.

Portable instruments are normally calibrated semiannually using appropriate NIST-traceable radiation sources per ANSI N323A-1997, *Radiation Protection Instrumentation Test and Calibration, Portable Survey Instruments.* Requirements for calibration have been established in WVDP-318 and are incorporated into radiological control procedures contained in WVDP-131. Calibration may be performed on-site or off-site.

A.8.5.2.2.1 Alpha Detection Instruments

Portable alpha detection instruments used at WVDP are scintillation type detectors. These detectors have efficiencies that range between 15 and 20 percent for Pu-239 and are intended for field use in making surface and personnel contamination surveys. The geometry of the detectors makes them suitable for use in both removable and total contamination surveys. In addition to the detectors, a portable ratemeter and/or scaler is provided for scanning and/or fixed-point measurements. Scanning rates and counting times are established so that the minimum detectable activity of these instruments is less than the contamination limits specified in 10 CFR 835, DOE Order 5400.5, and DOE-STD-1098-99. WVDP-234, *WVDP Workplace Radiological Surface Measurements Program and Technical Basis Document* (WVNS), provides the rationale and calculational methods used in performing and analyzing surface radioactivity measurements for alpha-emitting radionuclides.

A.8.5.2.2.2 Beta Detection Instruments

Beta detectors and suitable ratemeters are widely used for both surface and personnel contamination control at WVDP. The primary detectors used in these applications are thin-window G-M tubes. The thin-window G-M tubes have efficiencies ranging between 16 and 21 percent for Sr-90/Y-90. Scanning rates and counting times are established so that the minimum detectable activity of these instruments is less than the contamination limits specified in 10 CFR 835, DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, and DOE-STD-1098-99, *DOE Radiological Control Standard*. WVDP-234 provides the rationale and calculational methods used in performing and analyzing surface radioactivity measurements for beta-emitting radionuclides.

A.8.5.2.2.3 Gamma Detection Instruments

Scintillation detectors and ionization chambers are used for gamma radiation surveys. Ionization chambers with movable beta shields that cover the active area of the detector allow discrimination between penetrating and nonpenetrating radiation (i.e., deep and shallow dose). Both directional and nondirectional detectors are provided. These detectors are used for both field contamination and direct radiation surveys. Low-, medium-, and high-range instruments are available as follows:

- Low-range instruments are normally used for background monitoring outside of areas where radioactive materials are handled. They use either scintillation or high-pressure ionization chambers as detectors. The range of detection is 0.1 milli-Roentgen per hour (mR/hr) to 5 Roentgen per hour (R/hr).

- Medium-range instruments are hand-held survey instruments used for general area radiation surveys. They have a range of 0.1 mR/hr to 50 R/hr and use either ionization chambers or scintillation detectors.

- High-range instruments fitted with telescoping probes are available for monitoring high-level radiation sources. In general, they have probes that can be extended over 10 feet to reduce exposure to the technician making the measurement. These instruments are either G-M tubes or solid state detectors not subject to saturation at high fluxes and have ranges from 0.1 mR/hr to 1000 R/hr.

A.8.5.2.2.4 Neutron Detection Instruments

Neutron detection instruments are portable instruments available for neutron surveys incorporating tissue-equivalent, polyethylene-cadmium shielded, BF_3-type detectors. These instruments are calibrated to read directly in mrem per hour and have a range of 0.1 mrem/hr to 2000 mrem/hour.

A.8.5.2.3 Airborne Contamination Sampling and Monitoring Equipment

Sampling for airborne contamination is accomplished using both fixed and portable devices and is discussed in WVDP-216, *WVDP Workplace Radiological Air Sampling and Monitoring Program and Technical Basis Documents* (WVNS). The fixed instrumentation consists of low-volume air samplers mounted on the walls near breathing zone heights throughout the plant. The plant vacuum system draws air through fixed filter papers in these samplers continuously at a flow rate of approximately 28 liters per minute (lpm).

Portable instrumentation used for airborne contamination sampling consists of continuous air monitors (CAMs) and hand-held high-volume air samplers. The CAMs are located near the workers' operational areas and provide representative samples of the concentrations to which personnel are exposed. They continuously collect and measure airborne particulates by pumping air through a fixed filter, at approximately 28 liters per minute, in close proximity to an integral beta-gamma or alpha detector. The flow rate may be adjusted to the desired level, and pulse height discriminators and background subtraction features available on some of the models lessen the sensitivity of the detectors to short-lived radon and thoron daughter interference. Meters, strip chart recorders, audible alarms, and alarm lights provide a clear, permanent record and unambiguous indication of alarm conditions. Ranges are switched automatically. Each monitoring system is capable of measuring one derived air concentration (DAC) when averaged over 8 hours (8 DAC-hours) under laboratory conditions. However, under normal operating conditions, interference from radon and their progeny have caused actuation of CAM alarms; therefore, alpha CAM alarm set points of up to 24 DAC-hours are considered acceptable but are set at the lowest practical level, specific to a location, without causing a significant number of false alarms (i.e., one alarm per month per unit).

Portable high-volume air samplers operate with much higher flow rates than the CAMs or the fixed plant air samplers. They operate on battery power or line voltage. Air

is drawn through a fixed filter paper; interchangeable filter holders of varying sizes are used in conjunction with filters of matching sizes and varying materials depending on the particular application.

Flow rate measuring devices on stationary and portable air samplers are calibrated annually using flow rate calibration equipment. The flow calibrators are calibrated annually by the manufacturer with NIST-traceable calibration standards. CAM detectors are calibrated annually using NIST-traceable calibration standards.

A.8.5.2.4 Personnel Monitoring Instruments and Services

Instruments are used to measure the radiation dose received by personnel and to detect external and internal contamination.

Personnel monitoring at the exit of contaminated areas for external contamination is performed using the survey instruments previously discussed. In addition, personnel contamination monitors (PCMs) or hand-held probes are placed at exits from Radiological Buffer Areas surrounding Contamination Areas and personnel are responsible for conducting a whole body survey each time they leave such an area.

Personnel monitoring for external dose uses thermoluminescent dosimeters (TLDs). TLDs are processed in an automatic TLD reader. The TLD reader is calibrated both electronically and with elements exposed to known doses from NIST-traceable sources prior to processing TLDs. The personnel dosimetry and extremity dosimetry systems are accredited under the Department of Energy Laboratory Accreditation Program (DOELAP) in accordance with 10 CFR 835 and DOE-STD-1098-99, as described DOE Standard DOE-STD-1095-95, *Department of Energy Laboratory Accreditation Program for Personnel Dosimetry Systems* (USDOE December 1995) and DOE Standard DOE-STD-1111-98, *The Department of Energy Laboratory Accreditation Program Administration* (USDOE December 1998).

In addition to the TLD badge, ionization chamber direct-reading pocket dosimeters are issued to all monthly badged workers and a select number of workers on the quarterly badge processing schedule. The direct-reading dosimeters and TLDs are worn continuously by these employees while they are in radiologically controlled areas. In some special cases, digital electronic alarming integrating dosimeters are used in addition to the standard-issue dosimetry.

A whole body counting facility for internal dose assessment is located in the dosimetry office. In-vivo measurements are made using a gamma spectroscopy whole body counter. The in-vivo dosimetry program participates in the conduct of intercomparison studies and uses the "DOE Phantom Library." Urine samples are collected from all monthly badged workers and select quarterly-badged workers and those using respiratory protection in radiologically posted areas. These bioassay samples are shipped to a subcontracted laboratory for radioanalysis. Containers for both urine samples and fecal samples are available at the site and service subcontracts are established for handling both routine and nonroutine bioassay samples.

A.8.5.2.5 Instrument Storage, Calibration, and Maintenance Facilities

Portable radiation detection instruments are stored in the Radiological Control Operations Shift Office. The Project maintains a radiological instrument calibration facility. In addition to other equipment, this facility possesses a Gamma Calibrator with retractable shielded Cs-137 source capable of producing radiation fields greater then 400 R/hr inside a small portion of the shielded calibration cavity; the corresponding external dose rate is 0.1 mR/hr at 1 meter.

Instrument maintenance is also performed in the Calibration Facility. Out-of-service instruments are stored in a specified location in the Calibration Facility while awaiting calibration/service. Information on radiation detection instrumentation for specific areas of the site may be found in the individual SAR modules.

A.8.5.2.6 Health Physics and Radioactive Analysis Facilities

The Radiological Control Operations Shift Office is located in the first floor offices of the Main Plant. The Radiation Protection Laboratory Counting facility is located adjacent to the warehouse. Fixed radiation counting instruments are located in this facility as discussed in Section A.8.5.2.1.

A.8.5.2.7 Radiological Control Equipment and Clothing and Associated Facilities

Personal protective equipment and clothing are supplied on an as-needed basis to protect personnel from contamination. Protective equipment provided includes:

- Body protection - lab coats, anti-contamination coveralls, paper suits, and paper sleeves as appropriate;

- Head protection - cloth and plastic hoods;
- Hand protection - thin disposable gloves, rubber, latex, and vinyl gloves, and cotton glove liners; and
- Foot protection - plastic shoe covers, cloth reusable booties, rubber overshoes, and rubber boots.

Protective clothing is stored at the laundry facility for normal facility entry. Protective clothing is removed when personnel exit a contaminated area; clothing designated for use in contaminated areas is not permitted to be worn elsewhere in the facility. Used protective clothing is stored in plastic hampers at the change point until disposal of nonreusable items (e.g., paper suit, tape, etc.) or transport to the laundry facility of reusable items (e.g., cloth anti-contamination coveralls, hoods, rubber shoe covers, etc.).

Contamination control equipment is used to prevent or limit the spread of radioactive contamination and to assist in its removal. The equipment includes such items as:

- Polyethylene sheeting;
- Disposable absorbent towels;
- Plastic bags of assorted sizes;
- Clothbacked tape;
- Radiation and contamination warning signs;
- Barricade posts with magenta and yellow-colored rope;
- Air locks, containment tents, and enclosures for manned entry/exit and work in highly contaminated areas; and
- Custom glove boxes designed on an as-needed basis, for entry/exit of remotely controlled equipment into/out of highly contaminated areas.

This equipment is stored in cabinets at control points, and in or near other areas where it is usually used.

A.8.5.2.8 Respiratory Protection Equipment

A variety of types of respiratory protection equipment for decontamination and decommissioning activities, waste solidification and management operations, maintenance activities, and emergency use are available at the WVDP. High-efficiency air purifying, and atmosphere-supplied respiratory devices are routinely used. A quantitative respirator fit test is used to measure the fit of a respirator on an individual using ANSI and OSHA fit-testing protocols. The fit-test equipment measures ambient air concentrations inside and outside the mask while the individual performs a variety of exercises. The equipment is sensitive enough to verify fit factors up to 100,000 for individuals.

Only equipment approved for use by the National Institute of Occupational Safety and Health (NIOSH) under 42 CFR 84, Respiratory Protective Devices (USDOL) are used at the WVDP. Emergency respiratory protection facepieces and hoses are cleaned and inspected in the laundry facility after each use and on an annual basis. Emergency respiratory protection equipment, such as self-contained breathing apparatuses and fullface air-purifying, HEPA-filtered masks are staged in various locations throughout the WVDP and are inspected monthly. Respiratory equipment is cleaned, examined, repaired, and leak tested by trained personnel. The respiratory equipment available for use is as follows:

- Air Purifying Respirators. Air in the work area is used and filtered through cartridges or canisters. The types of cartridges/canisters available for use include:

  - Air Particulate Removing. Particulate removing respirators protect individuals against inhalation of airborne particles in the form of aerosols including dusts, sprays, fumes, smoke, and mists. They consist of both positive pressure and negative pressure masks and typically consist of one or two P100 (HEPA) cartridges. While both half- and full-face respirators are available at the WVDP, full-face respirators are used at a minimum for protection against radionuclides.

- Gas and Vapor Removing Respirators. Chemical cartridge respirators typically consist of a single canister or two cartridges containing granular absorbents or catalysts attached to the facepiece. These respirators protect against lower concentrations of vapors and/or gases such as acid gases, ammonia, organic vapors, and solvent vapors.

- Combination Particulate/Gas and Vapor. Cartridges and canisters contain filtering media for both particulates and gases/vapors.

- Supplied-Air Respirators. A source of compressed air supplies respirable air through a small-diameter hose to the wearer of an airline respirator. The fullface airline respirator is used for a wide variety of airborne contaminants, including higher concentrations of particulates, gases, and vapors. The airline hose is connected to an apparatus on the individual that contains a backup cartridge or canister in the event of a loss of supplied air and for use during protective clothing doffing procedures after disconnect from the air source.

- Self-Contained Breathing Apparatus. A Self-Contained Breathing Apparatus (SCBA) is a respirator that employs a supply of air carried by the individual, providing him/her with respirable air. SCBAs offer respiratory protection against unknown or higher concentrations of vapors, gases, particulates, and combinations thereof with an assigned protection factor of 10,000 used. SCBAs are also used in potential or oxygen deficient atmospheres. SCBAs are placed in strategic locations throughout facilities at the WVDP and are inspected on a weekly basis for tank pressure; a thorough inspection is performed monthly.

Additional information on respiratory protection may be found in Section A.8.7.8.

A.8.5.2.9 Equipment and Personnel Decontamination Facilities

If required, contaminated tools and equipment are decontaminated in the Master Slave Manipulator Repair Shop. Any water and detergents used in the decontamination process is routed to the low-level waste treatment facility.

Anticontamination clothing is decontaminated in the WVDP laundry facility. Respirators are decontaminated, sanitized, and refurbished (if necessary) at the laundry. Waste water from the laundry facility is routed through the Low-Level Waste Treatment Facility intercepter. Air effluent from the Laundry Facility is HEPA filtered and discharged to the environment through a dedicated stack. After passing inspection per ANSI Z88.2, *American National Standard for Respiratory Protection* (ANSI) and 29 CFR 1910.134, respirators are bagged and tagged ready for use and stored in the laundry issuance facility.

A personnel decontamination facility is available on-site with an alternate facility located off-site at the Bulk Storage Warehouse. The on-site personnel decontamination facility is located on the second floor of the Main Plant in the Chemical Viewing Aisle. The on-site facility contains a shower and two sinks and is equipped with the appropriate personnel decontamination chemicals and detergents. Drains are directed to the low-level waste treatment facility.

In addition to these exclusive-use facilities, showers and eyewash stations are placed at various locations throughout the Main Plant.

A.8.5.3 Radiological Control Procedures

A.8.5.3.1 Radiation and Contamination Surveys

Radiological Control technicians perform routine radiation and contamination surveys of all accessible areas of the facility. Survey areas and frequencies are determined in accordance with DOE-STD-1098-99 as well as site-specific requirements contained in WVDP-131, *Radiological Control Procedures*, and manuals and are based upon the probability of contamination, changes in radiation level, and personnel occupancy. These surveys consist of radiation measurements and/or total and removable contamination measurements as appropriate for the specific area. The records of the survey results are retained by Radiation Protection and are reviewed periodically so that trends indicating problem areas are identified as early as possible.

Direct radiation surveys are performed using portable instruments in accordance with the following criteria:

- Appropriate radiation surveys are performed periodically to control radiation doses during solidification and decontamination and decommissioning activities.

- Routine gamma surveys are performed at frequencies specified by DOE-STD-1098-99 and the WVDP Radiological Control Manual WVDP-010.

- Gamma surveys are performed in spaces surrounding radiation areas subsequent to movement of radioactive equipment or material. The boundaries are adjusted as necessary.

- Boundaries of radiation areas established for a specific short-term purpose are surveyed each work day that activities are performed during which radiological conditions might change.

Radiation Protection staff establishes and maintains a routine schedule for surface contamination surveys and direct radiation surveys. Requirements and guidelines for the conduct of contamination and radiation surveys are provided in DOE-STD-1098-99 and WVDP-010. The survey schedule defines the area to be surveyed and the frequency of the survey. In general, areas with a higher potential for contamination are surveyed more frequently than areas with a lower contamination potential. In addition, sufficient surveys are taken during work involving radioactive material handling to ensure that contamination control is maintained.

Two types of contamination surveys are made: surveys performed with portable instruments or total contamination measurements and smear surveys or removable contamination measurements using fixed laboratory counting instruments for analyses. For any item to be removed from the radiologically controlled area, portable instruments are used to determine the amount of total (fixed) contamination deposited on the surface. The probe is placed in close proximity to the surface being surveyed, and the total amount of radioactivity detected by the instrument is averaged over the active area of the probe. These probe surveys are followed by removable contamination measurements made by wiping a 100 cm^2 area with wipes and analyzing the wipe in the counting laboratory to determine the amount of gross alpha and beta activity wiped from the potentially contaminated surface.

Results are compared with the maximum allowable surface radioactivity levels permitted outside contaminated areas. Limits for removable contamination for accessible surfaces within clean areas are specified in 10 CFR 835, DOE-STD-1098-99 and DOE Order 5400.5 as well as the WVDP Radiological Controls Manual.

The survey methods discussed above are capable of detecting activities below the applicable surface radioactivity limits. Based on the results of these surveys, areas are posted and controlled in accordance with the criteria discussed in Section A.8.5.3.3.

A.8.5.3.2 Procedures for Ensuring that Occupational Doses are ALARA

The objective of the radiation protection program is to ensure that the exposure of employees to radiation and radioactive materials is within the requirements of 10 CFR 835 and DOE-STD-1098-99 as implemented in WV-984 and WVDP-163 and that such exposures are kept ALARA. These objectives are met by ensuring that:

- Personnel receive a level of radiation protection training appropriate to their assignments;
- Appropriate access control techniques and protective clothing are used to limit the spread of external contamination;
- Engineering and administrative controls are used to control contamination in the workplace, a respiratory protection program is in place, and respiratory protective equipment is used where required;
- Radiation areas are segregated and appropriately posted to limit radiation exposure;
- Instruments and equipment are properly calibrated so that accurate radiation, contamination, and airborne activity surveys can be performed;
- Appropriate personnel dosimetry devices are supplied, and a radiation exposure record system is maintained;
- An internal dose assessment program (whole body counting and/or urinalysis) is in place; and
- All work in radiation areas and surface or airborne contamination areas is preplanned and reviewed from an ALARA standpoint.

A.8.5.3.3 Access Control

Access to portions of the facility is controlled in accordance with 10 CFR 835, DOE-STD-1098-99 and the WVDP Radiological Controls Manual. Personnel entering radiologically posted areas of the plant must know the radiological control procedures, must receive documented training for the specific area or areas as specified in Section A.8.5.3.5, or must be escorted continuously by someone who has received such training. All personnel entering a radiologically posted area will wear appropriate dosimetry (Section A.8.5.2.4). Radiologically posted areas at the WVDP are accessed through an administrative system of radiation work permits (RWPs) and, for High and Very High Radiation Areas, locks are placed on the entrances to prevent inadvertent entry.

The RWP specifies the controls necessary for the planned entry, such as protective clothing, stay times, respiratory protection, and supplemental dosimetry. The necessity for these controls may be based exclusively on radiation level, a combination of surface contamination and radiation level, the concentration of airborne contamination, or the potential for occurrence of any of these conditions.

Access and stay time are rigidly controlled for High and Very High Radiation Areas. If conditions are of a nature that manned entry is not warranted, remote techniques are used. The exposure and contamination controls to be specified depend on the nature of the work performed in the areas. A stay time or maximum allowable dose for each entry is determined by Radiation Protection and noted on the RWP. In addition to TLD badges, entering personnel may be accompanied by a member of Radiation Protection who continuously monitors the dose rate in the work area.

There are thirteen types of radiologically posted areas as defined in the following sections: Radiation Area, High Radiation Area, Very High Radiation Area, Hot Spot, Fixed Contamination Area, Contamination Area, High Contamination Area, Airborne Radioactivity Area, Soil Contamination Area, Underground Radioactive Materials Area, Restricted Access Area, Radioactive Material Area, and Radiological Buffer Area. Posting may include any combination of classifications needed to correctly characterize the area. Personnel who do not enter the above areas are not expected to receive greater than 100 mrem/yr.

Radiation Area

A Radiation Area is an area accessible to personnel where there are radiation fields of such levels that an individual could receive in 1 hour a deep dose equivalent between 5 mrem (0.05 millisievert) and 100 mrem (1.0 millisievert) at a distance of 30 cm from the radiation source or from any surface through which the radiation penetrates.

Each Radiation Area is posted with a sign meeting applicable standards, including the trefoil radiation symbol, and the words CAUTION - RADIATION AREA - PERSONNEL DOSIMETRY REQUIRED FOR ENTRY.

High Radiation Area

A High Radiation Area is an area accessible to personnel such that an individual could receive in one hour a deep dose equivalent greater than 100 millirem (1.0 millisievert) at a distance of 30 cm but less than 500 rads (5 gray) at a distance of 100 cm from the radiation source or from any surface through which the radiation penetrates.

Each High Radiation Area is posted with a sign meeting applicable standards, including the trefoil radiation symbol, and words DANGER - HIGH RADIATION AREA PERSONNEL DOSIMETER, SUPPLEMENTAL DOSIMETER, AND RWP REQUIRED FOR ENTRY.

Very High Radiation Area

A Very High Radiation Area is an area accessible to personnel such that an individual could receive in one hour an absorbed dose greater than 500 rads (5 gray) at a distance of 100 cm from the radiation source or from any surface through which the radiation penetrates.

Each Very High Radiation Area is posted with a sign meeting applicable standards, including the trefoil radiation symbol, and the words GRAVE DANGER - VERY HIGH RADIATION AREA - SPECIAL CONTROLS REQUIRED FOR ENTRY.

Hot Spot

A Hot Spot is an area where the localized exposure rate made by contact readings is greater than or equal to five times the exposure rate in the general work area and greater than 100 mrem/hr.

Each Hot Spot is posted with a sign meeting applicable standards, including the radiation symbol, and the words CAUTION - HOT SPOT. Radiation Protection personnel will provide the exposure rate in the appropriate space on the sign.

Fixed Contamination Area

A Fixed Contamination Area is an area which has total contamination levels (fixed plus removable) greater than 1500 dpm/100 cm^2 alpha maximum (100 cm^2 area), or 500 dpm/100 cm^2 alpha average (1 m^2 area), or 15000 dpm/100 cm^2 beta-gamma maximum (100 cm^2 area), or 5,000 dpm/100 cm^2 beta-gamma average (1 m^2 area), but with removable contamination levels less than or equal to 20 dpm/100 cm^2 alpha and 200 dpm/100 cm^2 beta-gamma.

Each Fixed Contamination Area is posted with a sign meeting applicable standards, including the trefoil radiation symbol, and the words CAUTION - FIXED CONTAMINATION.

Exits from each Fixed Contamination Area do not require a personnel survey unless specified by the Radiation Protection Department; however, when a personnel survey is required, the area must be posted with the words STOP - ALL PERSONNEL -SURVEY REQUIRED UPON EXITING, unless the area is contained within a larger area which has such a sign posted at its exits.

Contamination Area

A Contamination Area is an area with removable contamination levels greater than one times but less than 100 times the following levels: 20 dpm/100 cm^2 alpha and 200 dpm/100 cm^2 beta-gamma.

Each Contamination Area is posted with a sign meeting applicable standards, including the trefoil radiation symbol, and the words CAUTION - CONTAMINATION AREA.

Exits from each Contamination Area must be posted with the words STOP - ALL PERSONNEL - SURVEY REQUIRED UPON EXITING, unless the area is contained within a larger area which has such a sign posted at its exits.

High Contamination Area

A High Contamination Area is an area with removable contamination levels exceeding 2,000 dpm/100 cm^2 alpha or 20,000 dpm/100 cm^2 beta-gamma.

Each High Contamination Area is posted with a sign meeting applicable standards, including the trefoil radiation symbol, and the words DANGER - HIGH CONTAMINATION AREA - RWP REQUIRED FOR ENTRY.

Exits from a High Contamination Area are posted with the words STOP - ALL PERSONNEL - SURVEY REQUIRED UPON EXITING, unless the area is contained within a larger area which has such a sign posted at its exits.

Airborne Radioactivity Area

An Airborne Radioactivity Area is an area accessible to personnel where airborne radioactivity is known to exist or is likely to exist in concentrations greater than the Derived Air Concentrations (DACs) contained in 10 CFR 835.

Each Airborne Radioactivity Area is posted with a sign meeting applicable standards, including the trefoil radiation symbol, and the words CAUTION - AIRBORNE RADIOACTIVITY AREA - RWP REQUIRED FOR ENTRY.

Exits from each Airborne Radioactivity Area are posted with the words STOP - ALL PERSONNEL - SURVEY REQUIRED UPON EXITING, unless the area is contained within a larger area which has such a sign posted at its exits.

Soil Contamination Area

A Soil Contamination Area is an area that has contaminated soil that is not releasable in accordance with DOE Order 5400.5, *Radiation Protection of the Public and the Environment*.

Each Soil Contamination Area is posted with a sign meeting applicable standards, including the trefoil radiation symbol, and the words CAUTION - SOIL CONTAMINATION AREA - CONTACT RADIATION PROTECTION BEFORE ENTERING.

Exits from each Soil Contamination Area are posted with the words STOP - ALL PERSONNEL - SURVEY REQUIRED UPON EXITING, unless the area is contained within a larger area which has such a sign posted at its exits.

Restricted Access Area

A Restricted Access Area is an area which requires special radiological precautions for entry. Entry into a Restricted Access Area shall require the approval of Radiation Protection.

Each Restricted Access Area is designated by a sign with the following words CAUTION - RESTRICTED ACCESS AREA - APPROVAL REQUIRED FOR ENTRY - CONTACT RADIATION PROTECTION.

Radioactive Material Area

A Radioactive Material Area is an area where radioactive materials, as defined by WVDP-010, *WVDP Radiological Controls Manual*, are used, handled, or stored and exceed the values listed in 10 CFR 835, Appendix E. Each Radioactive Material Area not identified with or within other appropriate radiological controls is posted with a sign meeting the applicable standards, including the trefoil radiation symbol, and the words CAUTION - RADIOACTIVE MATERIAL.

Exits from each Radioactive Materials Area do not require a personnel survey unless specified by the Radiation Protection Department; however, when a personnel survey is required, the area must be posted with STOP - ALL PERSONNEL -SURVEY REQUIRED UPON EXITING, unless the area is contained within a larger area which has such a sign posted at its exits.

Underground Radioactive Material Areas

An Underground Radioactive Material Area is an area established to indicate the presence of underground items that contain radioactive materials such as pipelines, radioactive cribs, covered ponds, covered ditches, catch tanks, inactive burial grounds, and site of known, unplanned releases (spills).

Each Underground Radioactive Material Area is posted with a sign meeting the applicable standards, including the trefoil radiation symbol, and the words UNDERGROUND RADIOACTIVE MATERIALS - CONSULT WITH RADIATION PROTECTION BEFORE DIGGING.

Radiological Buffer Area

A Radiological Buffer Area is an area established within the WVDP Controlled Area to provide secondary boundaries to minimize the spread of contamination and to limit doses to general employees who have not been trained as radiological workers.

Each Radiological Buffer Area is posted with a sign meeting the applicable standards, including the trefoil radiation symbol, and the words CAUTION - RADIOLOGICAL BUFFER AREA.

Exits from each Radiological Buffer Area do not require a personnel survey unless specified by the Radiation Protection Department; however, when a personnel survey is required, the area must be posted with STOP - ALL PERSONNEL - SURVEY REQUIRED UPON EXITING.

A.8.5.3.4 Sealed Source and Radioisotope Control

No sealed sources may be purchased without the approval of Radiation Protection and an approved purchase specification. A Radioactive Source Control Program is established and implemented in WVDP-291, *WVDP Radioactive Source Control Program* (WVNS). The control program for the purchase of radioisotopes (e.g., gas, liquid, or solid calibration standards, etc.) is essentially the same as that for sealed sources. The sealed source program meets the requirements of 10 CFR 835 and DOE-STD-1098-99.

Upon receipt, sealed sources will be leak-tested and placed on the sealed source inventory list. Leaking sources will not be accepted and arrangements will be made for their safe return to the manufacturer. In addition to the receipt leak test, accountable sealed sources, as defined in 10 CFR 835, are leak-tested semiannually. Source disposal is controlled as to disposition and requires removal from the source inventory list. The source inventory list also indicates transfer of sources between organizations. When not in actual use, accountable sealed sources are maintained in secured storage. Accountable sealed sources are inventoried semiannually.

Facilities that use high-radiation source range equipment or radiography equipment shall meet the requirements of ANSI N43.3, *General Radiation Safety for Installations Using Nonmedical X-Ray and Sealed Gamma-Ray Sources, Energies up to 10 MeV* (ANSI) and the requirements of WVDP-292, *WVDP Radiation-Generating Device and Radiography Work Operations Program Manual* (WVNS). WVDP-292 requires that as-built engineering drawings of the facility be maintained current, user training and certification are maintained current, and an operational survey program be developed for the system or facility. Records of site operations and of equipment maintenance and calibration are maintained in an auditable manner.

A.8.5.3.5 Radiation Safety Training

Radiation Safety training is conducted at WVDP to ensure that each worker understands: the general and specific radiological aspects of their assignment, their responsibility to co-workers and the public for safe handling of radioactive materials, and their responsibility for minimizing their own dose. As a general statement of policy, WVNS provides a level of training commensurate with an individual's work assignment and responsibilities. All radiation safety training meets the requirements contained in 10 CFR 835, DOE-STD-1098-99, and DOE Handbook DOE-HDBK-1131-98 *General Employee Radiological Training* (USDOE December 1998), DOE Handbook DOE-HDBK-1130-98, *Radiological Worker Training* (USDOE December 1998), and DOE-STD-1122-99 *Radiological Control Technician Training* (USDOE June 1998) series standardized core training materials. All WVDP radiation safety training requirements are set forth in WVDP-010 and WVDP-290, *WVDP Radiation Safety Training Program Manual* (WVNS).

In addition to completion of routine employee training programs, Radiological Control Technicians are required to demonstrate their proficiency in performing to a minimum standard in qualification examinations. The training standards for Radiological Control Technicians are maintained as separate qualification standards. Personnel who have not demonstrated acceptable performance to a documented standard for a given operation are not permitted to perform that operation except under the direct, continuous control of a qualified employee. Employees who have qualified but whose actions on the job may indicate a lack of knowledge in operational health physics are immediately disqualified and retrained.

The general process of radiation safety training is discussed in the following paragraphs. Additional information on training may be found in Section A.10.3.

All-Employee - Indoctrination

All new employees are required to attend General Employee Training per DOE Order 5480.20A. Even employees not directly involved in radioactive work are required to receive basic radiological training, repeated every two years with refresher training provided in the alternate years, to ensure that personnel understand the posting of radiologically posted areas and the identification of radioactive materials. The instruction also explains the impact of WVDP on the radiation environment of personnel employed outside radiation areas and outside the WVDP facility. Additional instruction is provided on the recognition of emergency signals and the response of employees who have no formally designated responsibility during an emergency. Training for both general employees and visitors complies with DOE-HDBK-1131-98 and DOE standardized core training requirements.

Radiological Workers

Before being authorized to work with radioactive materials (or to enter any radiologically posted area unescorted), a worker is required to complete a formal course in radiological worker training and pass a written and practical examination. Consideration of radiation exposure and contamination control are prominent in this training. The principal areas covered in training on radiation exposure control are:

- Limits for whole body penetrating radiation and units of radiation dose;
- Use of "stay times";
- The seriousness of violations;
- Procedures and methods of minimizing exposure, such as working at the maximum practicable distance from a source, limiting time in a radiation area, use of shielding, and source radiation;
- Potential sources of radiation associated with work performed by an individual's trade;
- Use of dosimetry equipment and personnel monitoring devices;

- Posting and labelling;
- Exposure records;
- Biological risks of radiation exposures;
- Procedures and methods for control of contamination;
- Methods of personnel survey; and
- Use of protective clothing and "step-off" procedures.

In addition to passing the written examination, completion of the training course requires satisfactory performance during basic types of simulated work operations in radiologically posted areas. To supplement this training, selected incident/accident reports are also discussed to familiarize the worker with how things can go wrong while on the job.

The radiological worker training program is divided into two areas: Radiological Worker I (RWI) and Radiological Worker II (RWII). RWI training focuses on radiation exposure control and RWII covers both radiation exposure control and contamination control. After the initial qualification training is complete, retraining is completed every two years. In the alternate years, refresher training is conducted to include changes in requirements and updates of lessons learned. Employees must follow the training information during all work activities. On-the-job training is also conducted in the specific job skills for radiological work within each trade. For complex jobs, this is followed by special training for specific operations as required using mock-ups outside radiation areas.

Criticality Safety Training

A criticality safety training program has been developed at the WVDP in accordance with the requirements of DOE Order 5480.20A, *Personnel Selection, Qualification, and Training Requirements at DOE Nuclear Facilities* (USDOE November 15, 1994), DOE Order 420.1, and DOE-mandated ANSI/ANS 8.20. Criticality safety training is given to individuals who operate, maintain, and/or supervise activities in areas where significant quantities of fissionable materials are stored or handled. Elements of the training program require that each individual receive instruction in nuclear criticality safety, including a summary of criticality accident history and nuclear

criticality theory, normal procedures, radiation control practices, configuration control, criticality control zones, procedural compliance, and individual responsibility. Criticality safety training requirements are established in WVDP-162, *WVDP Nuclear Criticality Safety Program Manual*, (WVNS).

Radiological Control Technicians

Radiological Control Technicians are required to complete an extensive course in radiological controls, to demonstrate their practical abilities, and to pass comprehensive written, practical, and oral examinations in accordance with the requirements of 10 CFR 835 and DOE-STD-1098-99. The first-line Radiological Control Operations Supervisor is required to have sufficient training to allow him or her to evaluate initial symptoms of unusual radiological control situations, state immediate corrective action required, state what additional measurements are required, perform a final analysis of the measurements to identify the specific problem, and the ability to implement the required actions. At least every 2 years, radiological control personnel requalify through written and oral examinations similar to those used for their initial qualification. Continuing training is provided monthly to radiological control technicians.

There are six levels of qualification for radiological control technicians at the WVDP. The first three lower levels comprise the requirements under the DOE standardized core training program. The fourth through the sixth levels of qualification go beyond the DOE radiological controls technician training program through the National Registry of Radiation Protection Technology (NRRPT) certification at level six. The requalification program is based upon meeting the DOE core training requirements. The continuing training program provides for changes in requirements and updates of lessons learned.

Dosimetry Technicians

Dosimetry technicians have a five level qualification standard program. The qualification standards require a combination of experience and practical and theoretical knowledge. As the technicians progress in their qualifications they perform increasingly complex tasks.

Respiratory Protection Training

In addition to radiological worker training, all personnel who may be required to wear respiratory protection devices are required to attend a training program on their use during normal and emergency operations. They are fitted for the devices that are required to be worn and are given a health assessment to ensure that they are capable of wearing the devices. Respiratory protection training meets or exceeds the requirements of 29 CFR 1910, *Occupational Safety and Health Standards* (USDOL), 29 CFR 1926, *Safety and Health Regulations for Construction* (USDOL), and ANSI Z88.2, *Respiratory Protection* (ANSI). Requirements for the respiratory protection program are described in WVDP-179, *WVDP Respiratory Protection Program Manual* (WVNS).

A.8.5.3.6 Personnel Monitoring Program

Personnel at WVDP are monitored for both internal and external dose. The monitoring equipment used is discussed in Section A.8.5.2.4.

Monitoring External Radiation Dose

The external dosimetry monitoring program at the WVDP complies with requirements contained in 10 CFR 835 and DOE-STD-1098-99. The requirements are described in WVDP-010 and WVDP-071, *WVDP External Dosimetry Program Manual, Quality Assurance Plan, and Technical Basis Document* (WVNS). A routine external dose monitoring program at WVDP measures the radiation dose received by personnel. The basic monitoring device is the thermoluminescent dosimeter (TLD).

Each dosimeter card contains four TLD elements. The four TLD elements are contained within badge cases that provide various levels of shielding using various materials. Penetrating and non-penetrating radiation can be discriminated. Dosimetry badges are permanently issued only to those employees who have been trained to enter areas that require permanent dosimetry to be worn. These employees are called radiological workers.

WVDP badges both Radiological Workers I and II, who have their dosimeter badge exchanged monthly or quarterly. Employees with a greater potential for exposure are placed on the monthly or quarterly-direct (i.e., issued direct-reading dosimeters) TLD processing schedule. Quarterly-direct workers are issued a direct-reading pocket ionization chamber dosimeter to be worn in conjunction with the TLD badge.

Personnel dosimetry is issued only to radiological workers who meet the following criteria:

- Whole body count and/or bioassay baseline completed;
- Inclusion on the periodic whole body count and/or bioassay roster;
- Satisfactory completion of radiological worker training course (i.e., RWI or RWII);
- Completion of facility indoctrination (i.e., general employee training);
- No precluding radiological restrictions; and
- Radiation dose history on file with or requested by Radiation Protection.

TLD badges may be issued to visitors and members of the public who have a valid need to enter radiologically posted areas requiring a permanent dosimeter. A visitor is defined as any WVDP employee who is not qualified as a radiological worker or any employee not permanently assigned to the WVDP facility who is not qualified as a radiological worker. Visitors and members of the public are escorted by a qualified radiological worker at all times and are issued a visitor's dosimeter for a period not exceeding one week. A visitor is not permitted to exceed 5000 mrem per year, while members of the public are not permitted to exceed 100 mrem per year.

Persons not permanently assigned to the WVDP facility may be qualified as radiological workers, in which case the visitor requirements are no longer applicable.

Radiological workers at WVDP are monitored for external dose in accordance with 10 CFR 835 and DOE-STD-1098-99. The program is accredited by the Department of Energy Laboratory Accreditation Program (DOELAP), described in DOE-STD-1095-95 and DOE-STD-1111-98. In cases where a limited portion of the body (e.g., head, arms) is exposed to the source of radiation, supplemental dosimeters are placed at the point of the highest anticipated dose rate to monitor the localized exposure.

Internal Dose Assessment

The internal dosimetry monitoring program at the WVDP complies with requirements contained in 10 CFR 835 and DOE-STD-1098-99. The requirements are described in WVDP-010 and WVDP-070, *WVDP Internal Dosimetry Program Manual and Technical Basis Document* (WVNS). Internal doses are assessed by personnel in vivo counting and in vitro radioanalysis techniques. The in vitro program is supported by a subcontract laboratory with provisions for routine, nonroutine, and emergency assessments of urine and/or fecal samples. The monitoring program is capable of detecting internal depositions of transuranic elements, fission products, and activation products. DOE-STD-1121-98, *Internal Dosimetry,* (USDOE December 1999) provides detailed guidance on internal dosimetry in fulfilling the requirements of 10 CFR 835 and provisions of DOE-STD-1098-99 and is used by the WVDP Internal Dosimetry Program.

In vivo counters are used to measure the gamma rays from radionuclides present inside the body. This whole body counter is sensitive to the relatively high-energy gamma rays emitted by fission products and in general can detect an internal deposition of gamma-emitting radionuclides at a level much less than 10 nanoCuries and less than one percent of the Annual Limit of Intake (ALI) as defined in 10 CFR 835 .

Bioassay analysis is used to monitor for strontium-90, tritium, uranium isotopes, and plutonium isotopes. Urinalysis is the normal method used in the bioassay program. Urine samples are collected to obtain the equivalent of a 24-hour sample.

The routine internal exposure monitoring program is designed to detect deposition of both actinide and fission products. Employees on the monthly and quarterly-direct TLD-processing schedule and those required to wear respiratory protection in radiologically posted areas are required to submit a urine sample annually. All radiological workers permanently assigned to WVDP are required to undergo a whole body count annually. Radiological workers not permanently assigned to WVNS are required to have whole body counts at the start and termination of the work, and may also be required to submit urine samples initially and upon termination if WVDP determines the need.

Additional internal dose assessment may be required if personnel are exposed during an event in which radioactive contamination is released and:

- Detectable radioactivity is deposited in a person's nostrils or mouth or on the skin of the face;

- The concentration of airborne radioactivity in an area is determined to exceed the derived air concentration without, or with inadequate, respiratory protection equipment;

- A worker has a potentially contaminated wound; or

- Intakes of radioactive material are indicated that could result in an individual receiving a committed effective dose equivalent greater than 100 mrem.

The extent of post-event dose evaluations is determined in each case by the Radiation Protection Manager and may include urine sampling, fecal analysis, blood sample analysis, analysis of nose swipes, and lung or whole body counting.

DOE-STD-1112, *DOE Laboratory Accreditation Program for Radiobioassay,* (December 1998) describes the technical requirements and processes specific to the DOELAP Radiobioassay Accreditation Program as required by 10 CFR 835. Accreditation as mandated by 10 CFR 835 prior to January 1, 2002.

Dosimetry Records

Dosimetry processing at WVDP is performed by the Radiation Protection Dosimetry Office; however, the DOE Idaho Engineering & Environmental Laboratory (INEEL) is the official records repository for WVDP dosimetry records. The record includes:

- Any preemployment occupational exposure history;

- External and internal exposure occupationally received, including that received at other installations, during employment at WVDP;

- Special dose evaluations; and

- Reports of unusual exposure (i.e., overexposure or incidents with the potential for internal deposition) and the results of any follow-up investigations.

Duplicate records are also maintained by WVDP, but the INEEL is the legal repository for all WVDP dosimetry records.

A statement of exposure records is provided to employees:

- At least annually;
- Ninety days following termination, when requested;
- Upon request by the individual; and
- Upon submittal of an Occurrence Report or report from a Planned Special Exposure to the DOE as a result of exceeding a DOE dose limit or facility Administrative Control Level.

In addition to the above records, the readings from ionization chambers are retained by Radiation Protection to allow the reconstruction or verification of exposures and for use in comparing pocket dosimeter/TLD data.

The dosimetry program record system is maintained in accordance with 10 CFR 835 and DOE-STD-1098-99 and is established and implemented in WVDP-293, *Radiological Protection Record-keeping and Reporting Program Manual* (WVNS), as well as WVDP-070 and WVDP-071.

A.8.5.3.7 Airborne Radioactivity Monitoring Program

The function of the airborne radioactivity occupational monitoring program is to comply with 10 CFR 835 and DOE-STD-1098-99 and to verify that the survey program described in Section A.8.5.3.1 is detecting contamination control problem areas. The equipment used for air sampling and monitoring is described in Section A.8.5.2.3. Requirements for the WVDP workplace airborne radioactivity monitoring program and the technical basis are presented in WVDP-216.

Fixed filters from the low-volume air samplers located throughout the Main Plant are collected and analyzed weekly for gross alpha and gross beta activity. If the amount of radioactivity on the filter paper indicates that the work area DAC has been exceeded during the sampling period, the sample may be tested to determine the isotopic content (tests may include alpha, beta, and/or gamma spectroscopy and/or radiochemical analysis techniques). These data are used in performing follow-up assessments of internal dose.

Fixed filters on the CAM units are changed twice per week or more frequently if required by dust loading. These filters are analyzed with the same methods used for low-volume air sample filters.

High-volume air samplers are available for rapid measurement of airborne activity. The short-term samples are taken:

- If the installed CAM in a work area is inoperative and radioactive work is being performed;
- When opening a radioactive system to the atmosphere for maintenance;
- Before entering tanks or voids containing potentially radioactive piping; or
- Where a proposed operation could potentially release airborne radioactivity.

A.8.6 Off-Site Dose Assessment

In order to assess effects of site activities on the public and the environment, air emissions are monitored and/or sampled, liquid effluents are sampled, ambient air, surface water, groundwater, soils, sediments, and biological media are sampled, and direct radiation is measured. Data from environmental monitoring samples, together with data from the site meteorological system, are used to estimate dose to the public and the environment.

A.8.6.1 Environmental Monitoring Program

Prior to the Department of Energy (DOE) assuming responsibility for the West Valley Demonstration Project (WVDP), Nuclear Fuel Services Company, Inc. (NFS) had monitored the environment in conformance with Nuclear Regulatory Commission (NRC) requirements. When West Valley Nuclear Services Company (WVNS) assumed operational control of the site, an evaluation of the existing environmental monitoring program determined that a more intensive program would be necessary to support high level waste (HLW) processing.

The expanded program was designed to consider: potential effluent streams from HLW processing; routes that contaminants could follow into the environment; site geological, hydrological, and meteorological conditions; quality assurance standards for sampling and analysis; and contaminant limits and standards as set by federal and state agencies.

The major pathways for potential movement of radionuclides away from the site are by airborne transport and surface water drainage. In addition to the major pathways, a potentially significant pathway to man is through consumption of farm animals and produce from the WVDP area and ingestion of game animals and fish. Thus, samples of beef, milk, hay, fruits, and vegetables, as well as venison and fish, from off-site locations are collected and analyzed. Direct environmental radiation is also monitored through the placement of thermoluminescent dosimeters (TLDs) at on-site and off-site locations.

The environmental monitoring program for the WVDP began in February 1982 and has been updated as facilities were added or taken out of service and as processes were changed. The program has also been modified as necessary to address updates to regulatory requirements, DOE Orders, and guidance standards. The current program, as summarized in WVDP-098, *Environmental Monitoring Program Plan,* has been designed to comply with the requirements of DOE Orders 5400.1, 5400.5, and 435.1 (formerly 5820.2A). A separate plan, WVDP-239, *Groundwater Monitoring Plan,* focuses specifically on groundwater sampling and analysis.

WVDP-098 and WVDP-239 describe the rationale and requirements for sampling, the location on-site and off-site sampling points, types of sample (or direct environmental measurement), sampling matrices and frequencies, analytical parameters, quality assurance requirements, records maintenance, and reporting requirements. Methods for conducting dose assessments are described in WVDP-098, Section 9.0.

Data from the monitoring program are subjected to multiple levels of review, including bench top supervisory review, automated screening for anomalous data upon entry to the database, a formal data validation process, and a final formal peer review of data reports. Environmental data are evaluated monthly and reported in Monthly Trend Analysis Reports. Groundwater data are evaluated and reported quarterly in Groundwater Trend Analysis Reports. Data and evaluations from both environmental and groundwater sampling programs are presented in annual Site Environmental Reports (SERs), as are annual estimates of dose from WVDP activities to the public and the environment. Separate reporting of doses from airborne releases

is also made on an annual basis to the EPA a in conformance with Clean Air Act regulations.

A.8.6.1.1 Radiological Monitoring

Air and water sampling are the primary emphases of the monitoring program for radiological parameters because the two major pathways for potential movement of radionuclides from the site are by airborne transport and by surface water drainage. Samples are collected on-site at locations from which radioactivity is normally released or might be released, from perimeter locations to determine if contaminants might be migrating off-site, and from background locations to serve as a baseline for comparison with on-site and near-site results.

A.8.6.1.1.1 Radioactivity in Air

Sources of treated airborne emissions having the potential to result in a dose to the maximally-exposed off-site individual (MEOSI) exceeding 0.1 mrem (0.001 mSv) effective dose equivalent (EDE) in a year are required by the DOE and the Environmental Protection Agency (EPA) to be permitted as specified under National Emissions Standards for Hazardous Air Pollutants (NESHAP), 40 CFR 61 Subpart H. Currently, all point sources that could exceed the 0.1 mrem threshold for radioactive emissions on-site are continuously monitored and/or sampled. The site also continuously monitors all emission sources with the potential to release <0.1 mrem but >0.01 mrem EDE to the MEOSI. Per agreement with the EPA, sources that could release radioactivity resulting in <0.01 mrem EDE will be periodically monitored or the release will be estimated using process knowledge. Diffuse sources are evaluated to meet the requirements of DOE/EH-0173T. On-site air monitoring locations are shown on Figure A.8.6-1. Off-site air is monitored at ten locations in all, including six perimeter locations (Figure A.8.6-2), two communities near the site, and two background locations. On-site ambient air is monitored at three waste storage areas with the potential to be diffuse sources of air emissions: the lag storage area; the NRC-licensed disposal area (NDA); and the state-licensed disposal area (SDA). At all ambient air locations the sampler head is set at 1.7 meters above the ground, the height of the average human breathing zone.

Depending upon the parameters of interest at an air sampling location, the air may be passed through three types of sampling media. 1) Glass-fiber filters are used to collect particulates; these filters are then analyzed for gross alpha and gross beta radioactivity and specific alpha-, beta-, and gamma-emitting radionuclides. 2)

Desiccant columns are used to collect water vapor which is analyzed for tritium. 3) Charcoal cartridges are used to collect gaseous iodine-129. Detail regarding sampler design may be found in WVDP-098, Section 3.3.

The ventilation stack from the main plant is the most significant airborne emission point on the site. Other monitored ventilation points include the supernatant treatment system, the 01-14 building, the contact size-reduction facility, the container sorting and packaging facility, the vitrification heating, ventilation, and air conditioning (HVAC) system, the seismic sampler (vitrification backup), the outdoor ventilated enclosures/portable ventilation units, the low-level waste treatment facility, and the laundry change room.

WVDP-098, Section 3.0 (Effluent Monitoring - Airborne Emissions), describes the rationale for monitoring air emissions at each location, the regulatory requirements for monitoring, the locations within each facility where air is monitored, the activities contributing to emissions at each point, the type of monitoring at each point, and the analytical parameters measured at each location.

A.8.6.1.1.2 Radioactivity in Surface Water, Groundwater, Sediment, Soil, and Global Fallout

Surface Water

Surface water samples are collected on-site from ponds, swamps, seeps, and from drainage channels that flow through the Western New York Nuclear Service Center (WNYNSC) and off-site into Cattaraugus Creek.

On-site and off-site surface water monitoring locations are shown in Figures A.8.6-3 and A.8.6-4, respectively. The most recent monitoring program information and results on these locations are provided in the SER for CY1999. Historical surface water monitoring program information and sample analysis results are provided in previous SERs.

Surface water samples are collected manually by grab sampling or automatically by using fixed sampling equipment. Automatic samplers are used to collect surface water at select points along drainage channels within the WNYNSC that are most likely to show radioactivity released from the site and at one background station upstream of the site. The samplers draw water through a tube extending to an intake below the stream surface. An electronically controlled pump first blows air through the sample

line to clear it of any debris. The pump then reverses the flow to collect a sample, reverses once more to clear the line again, and resets itself. Pumps and sample containers are housed in insulated, heated sheds to allow sampling throughout the year.

At the location on Cattaraugus Creek at Felton Bridge, just downstream of the confluence with Buttermilk Creek, a chart recorder registers stream depth during the sampling period so that a flow-weighted weekly sample can be proportioned to a monthly composite based on relative stream discharge. At the two monitoring stations on Buttermilk Creek, and at the station on Frank's Creek where site drainage leaves the security area, the samplers collect aliquots every half hour. Samples are retrieved weekly and composited both monthly and quarterly.

The two largest sources of radioactivity released to surface waters from the project are: 1) the discharge from the low-level waste treatment system (LLWTS) through the Lagoon 3 weir into Erdman Brook, a tributary of Frank's Creek and 2) the drainage from the north plateau via monitoring location WNSWAMP which also reaches Frank's Creek. The LLWTF is comprised of four active lagoons (lagoons 2, 3, 4, and 5), and inactive Lagoon 1, which has been filled in to grade level. The active lagoons are used to collect low-level liquid radioactive waste and store treated water before discharge. Lagoons 4 (908,000 liters capacity) and 5 (700,000 liter capacity) are effluent hold basins. The feed lagoon (Lagoon 2) and final effluent lagoon (Lagoon 3) each hold about 10 million liters. A valved pipe from Lagoon 3 is used to discharge the effluent into Erdman Brook. (See Figure A.8.6-3.)

See WVDP-098, Section 2.0 for a detailed discussion of the liquid effluent monitoring program. Nonradiological releases to surface waters by the site are regulated by New York State Department of Environmental Conservation (NYSDEC) under the site's State Pollutant Discharge Elimination System (SPDES) permit. (See section A.8.6.1.2, *Nonradiological Monitoring*.) Radiological releases in liquid effluents are compared to derived concentration guides (DCGs) as specified in DOE 5400.5.

Off-site surface waters are collected from Buttermilk and Cattaraugus Creeks both upstream and downstream of the site in order to assess effects of the site drainage into the creeks. Standing surface waters are also sampled at points near the site. See Figure A.8.6-4 for off-site surface water locations. See WVDP-098, section 5.1 for a description of the program for monitoring off-site surface water.

Groundwater

The WVDP groundwater monitoring program is designed to support DOE Order 5400.1 requirements and those of the RCRA 3008(h) Administrative Order on Consent that involves NYSDEC, the EPA, the New York State Energy Research and Development Authority (NYSERDA), and the DOE. The program also focuses on long-term monitoring requirements as delineated in the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) reports.

The groundwater monitoring program at the WVDP provides data to characterize existing groundwater contamination, to monitor present conditions, and to support potential mitigative and long-term monitoring requirements. On-site groundwater and near off-site groundwater monitoring well locations are shown in Figures A.8.6-5 and A.8.6-6, respectively. Detailed monitoring results for CY1999 and program information are presented in the SER for CY1999. Historical groundwater monitoring program information and sample analyses results can be found in previous SERs. The groundwater monitoring program is described in WVDP-239.

Sediment

On-site sediments are collected from three locations (SNSW74A, SNSWAMP, and SNSP006) with the potential to receive deposition of radiological contamination from surface water drainage, and which may, depending on drainage conditions, be partially composed of soil (Figure A.8.6-3). Off-site stream sediments, as with surface water, are sampled both upstream and downstream of the WVDP. See Figure A.8.6-4 for a map of off-site locations and WVDP-098, Section 5.5, for a discussion of sediment sampling.

Soil

Long-term deposition of airborne radioactive particulates is measured by annual sampling of soil at the off-site air monitoring locations (Figure A.8.6-2). Detailed monitoring results and soil monitoring program information are presented in the SER for CY1999. Soil sampling results from these locations for past years can be found in previous SERs. Details on soil sampling may be found in WVDP-098, section 5.5.

Global Fallout

Short-term deposition of airborne radioactive particulates in precipitation is measured by monthly sampling of fallout pots located at the four near off-site air monitoring locations (see Figure A.8.6-2). In 1991, a fifth fallout pot was added, on-site, at the former meteorological tower behind the Environmental Laboratory (see Figure A.8.6-1). Information on the fallout pots monitoring program and detailed monitoring results are presented in the SER for CY1999. Historical results of the monthly samples collected at the fallout pots are provided in previous SERs. Additional details on sampling fallout may be found in WVDP-098, Section 5.2.4.

A.8.6.1.1.3 Radioactivity in the Food Chain

The biological monitoring program consists of sampling and analysis of milk and beef from cattle at near-site and remote locations, forage and produce such as hay, corn, apples, and beans from near-site and background locations, and fish and deer from near-site and background locations during periods when they would normally be taken by sportsmen for consumption. Near-site biological sampling locations are shown on Figure A.8.6-7. Information on the biological monitoring program and detailed sample analyses results are presented in the SER for CY1999. Biological sample results and program information for previous years are provided in past SERs. The monitoring program for foodstuffs is described in WVDP-098, section 5.4.

A.8.6.1.1.4 Direct Environmental Radiation

To further assist in determining total radiation exposures to on-site and off-site populations from site and background radiation, an array of thermoluminescent dosimeters (TLDs) is placed on-site near waste-management units, at locations along the site security fence, around the site perimeter, in communities near the site, and at off-site background locations. On-site TLD locations are shown in Figure A.8.6-8 and site boundary and most off-site TLD locations are shown in Figure A.8.6-9. The perimeter TLDs (1 through 16, 20, 24, and 26-34) are located around the WNYNSC boundary in the sixteen compass sectors and at locations along the security fence, while TLDs 17, 21 to 23, 37, and 41 monitor community and background locations.

Information on the TLD monitoring program and exposure results are provided in the SER for CY1999. Historical results from these monitoring locations are provided in previous SERs. See WVDP-098, section 5.3 for the description of methods for monitoring environmental radiation.

A.8.6.1.2 Nonradiological Monitoring

Air Monitoring

Nonradiological air emissions are permitted under New York State and EPA regulations. Individual air permits held by the WVDP are identified and described in WVDP-098, Table B-3.

The primary permitted minor sources are particulates, nitric acid mist, oxides of nitrogen (NO_x), ammonia, volatile organic compounds, and sulfur dioxide. However, because of their insignificant concentrations and low emission rates, monitoring of these substances is currently not required. Process monitoring of NO_x emissions from the Main Plant stack is used to demonstrate compliance with capping requirements (federally enforceable permit conditions limiting facility-wide NO_x and SO_2 emissions to below 100 tons per year) under Title V of the 1990 Clean Air Act. The only other non-radiological parameter currently periodically monitored for is opacity, releases of which are currently limited to an average of 20% over a 6 minute period.

Surface Water Monitoring

Nonradiological parameters in liquid effluents are regulated by NYSDEC and are monitored as a requirement of the site SPDES permit. The WVDP SPDES permit identifies the outfalls where liquid effluents are released to Erdman Brook, specifies the sampling and analytical requirements for each outfall (or combination of outfalls), and sets limits on concentrations of constituents being released from each. Nonradiological constituents for which liquid effluents are monitored are listed in WVDP-098, Appendix A. The site SPDES permit was renewed effective February 1, 1999 and expires in 2004.

Four outfalls are identified in the permit: outfall 001, discharge from the low-level waste treatment system (LLWTS); outfall 007, discharge of sanitary and utility water from the waste water treatment plant; outfall 008, groundwater effluent from the perimeter of the low-level waste treatment facility storage lagoons, and psuedo-outfall 116 used as a compliance point for TDS monitoring.

Drinking Water Monitoring

The site's drinking water is monitored for various nonradiological parameters to verify compliance with EPA and New York State Department of Health regulations. Special monitoring is conducted under the direction of the Cattaraugus County Health Department. Analytical parameters are listed in WVDP-098, Appendix A. Off-site drinking water is monitored at locations shown in Figure A.8.6-6.

Groundwater Monitoring

Nonradiological parameters routinely monitored in site groundwater are listed, by monitoring point, in WVDP-239. Modifications to the monitoring program must be approved by NYSDEC.

A.8.6.2 Analysis of Multiple Contributions

This section is not applicable to the WVDP because there are no nearby nuclear facilities either operating or planned during the duration of the Project. (The adjacent New York State-licensed commercial LLW burial ground is maintained in a shut-down status by NYSERDA. Per the cooperative agreement between DOE and NYSERDA, effluents from this facility had been treated and discharged by the Project.) Since closure of the SDA lagoon in 1991, NYSERDA has maintained sole responsibility for all effluents and waste generated as a result of management and maintenance of the closed low-level waste disposal facility. Data from monitoring of points on or near the SDA are reported in the SER.

The WVDP measures the concentrations of radioactivity in the air and liquid effluents from permitted discharge points and reports the total calculated off-site doses in the SERs.

A.8.6.3 Estimated Exposures

A.8.6.3.1 Source Term Estimation

Source inventories and terms for each system or facility are developed through the application of analytical methods, extrapolation of relevant measurement data, and to the extent necessary, from engineering judgment. A complete description of the source term resulting from a given accident scenario or operational activity is presented in the individual SAR modules.

Except for criticality accidents which would generate new fission products, the radioactive material that is available at the WVDP site and that could contribute to the source inventory for a given scenario is fairly well characterized (Rykken 1986; WVNS-SAR-002 [WVNS]; WVNS-SAR-003 [WVNS]). Radionuclides of interest are those remaining in storage tank 8D-2, the spent zeolite in tank 8D-1, and the contaminated portions of the existing facility.

In order to perform an efficient radiological assessment, each radionuclide is screened for its contribution to the total impact. Each radionuclide is ranked by the product of the quantity of radioactivity (Ci) at the time of intake or exposure and the effective dose equivalent factor (rem/Ci) appropriate to the intake pathway. For dose assessment calculations, only radionuclides that contribute greater than 0.1% of the total effective dose equivalent are reported.

There are several important parameters to be considered in estimating radiological source terms (activity released) from source inventories (total activity available). These calculations require quantification of parameters including Material at Risk (MAR), Damage Ratio (DR), Airborne Release Fraction (ARF) or Airborne Release Rate (ARR), Leak Path Factor (LPF), and Respirable Fraction (RF). Estimates of source terms used in accident calculations are derived using these parameters and guidance provided in DOE-HDBK-3010-94, *Airborne Release Fractions/Rates and Respirable Fractions for Non-Reactor Nuclear Facilities* (USDOE December, 1994).

A.8.6.3.2 Environmental Pathways

The pathways by which radioactive effluents may be dispersed into the off-site environment and eventually expose members of the general public to radiation may be broadly categorized as airborne or liquid. Both of these major pathways may lead to direct external exposure since gamma and energetic beta emitters will usually be among those radionuclides released. External exposure can result from immersion in an airborne cloud of radioactive particulates or from immersion in contaminated waters, or from proximity to radioactivity deposited on land, vegetation, sediments, and stream banks.

The more significant exposures from both the air and water pathways are likely to result from internally deposited radionuclides. Inhalation of airborne radioactive particulates is an important cause of lung irradiation and irradiation of other tissues and organs when particles move from the lung. Ingestion of radionuclides also results in internal radiation exposure. Some ingestion pathways are quite

direct, such as drinking contaminated water. Others are more complex, such as the transfer of radioiodine deposited from air or irrigation water on forage to cows, to milk, and to humans. The pathways to be analyzed for routine releases from the WVDP (by the CAP88-PC and LADTAP-II codes, discussed in Section A.8.6.3.4) are illustrated in Figure A.8.6-10.

For short-term accidental releases to the atmosphere, only inhalation and direct radiation from cloud immersion are of significance and therefore need be considered when estimating the dose to the maximally exposed individual. This is done by using the models and codes described in Section A.8.6.3.4. Even accidental releases to the hydrosphere of short duration will result in dispersion over an extended time and will be modeled in most cases as a chronic release, also using the LADTAP-II code. If an accident scenario is identified which leads to a credible release of short duration directly to surface water, an analysis of the pathways is done using the LADTAP-II computer code or by using hand calculations.

A.8.6.3.3 Radiological Parameters

Calculations of dose to the public from exposures resulting from both routine and unplanned activities or accidents are performed using standard EPA, DOE, or NRC analytical models and dose conversion factors prescribed in regulations applicable to WVDP operations. Analytical models and radiological parameters used for dose evaluations are appropriate for characteristics of emissions (e.g., gas, liquid, or particle; depositing or non-depositing); mode of release (e.g., stack or vent; surface or subsurface water; continuous or intermittent); environmental transport medium (e.g., air or water); and exposure pathway (e.g., inhalation; ingestion of food, water, or milk; direct radiation). Information on dispersion in the environment, demography, land use, food supplies, and exposure pathways used in the dose calculations is provided in Section A.3.0. Dose evaluation models that are coded, approved, or accepted by regulatory or other authorities will be used where appropriate, such as the CAP88-PC code for demonstrating compliance with 40 CFR 61 Subpart H, *National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities* (USEPA).

The dose conversion factors used to make dose evaluations under normal operations and during accidents are those provided in three EPA and DOE documents: EPA-520/1-88-020 (USEPA 1988); DOE/EH-0070 (USDOE 1988a); and DOE/EH-0071 (USDOE 1988b). The internal dose conversion factors presented in EPA-520/1-88-020 and in DOE/EH-0071 are based upon the ICRP reference man model (ICRP 1974). Because radionuclides taken into the

body by ingestion or inhalation will continue to irradiate the body as long as they exist and are retained by the body, these internal dose conversion factors represent the committed dose, which is the dose integrated over an interval of 50 years. The doses from exposure to external radiation from radionuclide concentration in air and in water that result from submersion or from exposure to contaminated plane surfaces are estimated using the external dose conversion factors presented in DOE/EH-0070.

The parameter of primary interest is the "dose" to the maximally exposed on-site and off-site individual. In the context of Project safety analysis, "dose" is understood to mean the 50-year committed dose equivalent expressed in units of rem or millirem (mrem). Effective dose equivalent commitments are calculated using standard EPA and DOE dose conversion factors. No attempt is made to estimate dose as a function of the age or sex of the maximally exposed individual.

The maximally exposed on-site individual is assumed to be at the On-Site Evaluation Point (OEP) located 640 m from the center of the accident and for off-site individuals located at the nearest site boundary (1,050 m), or at the distance that produces the maximum exposure using site-specific 95% meteorology. Radionuclide specific unit dose factors are calculated using dose conversion factors from DOE/EH-0070 and DOE/EH-0071 and χ/Q values calculated for three meteorological conditions: stability class "D", wind speed 4.5 m/s; stability class "F", wind speed 1 m/s; and site-specific 95% meteorology.

A.8.6.3.4 Analytical Tools

This section briefly describes the computer codes to be used for the analysis of radiological impacts from the WVDP during both normal and abnormal events. The principal environmental pathways considered include:

- atmospheric dispersion,
- surface water transport, and
- subsurface or groundwater transport.

A.8.6.3.4.1 Atmospheric Dispersion Codes

Meteorological analysis and dispersion from chronic or accidental releases of radioactive material are calculated using the straight-line Gaussian dispersion model and meteorological conditions collected at the on-site meteorological tower.

The computer code used to predict individual doses for the maximally exposed off-site individual (MEOSI) or at site boundaries and the collective dose within 80 km of the WVDP from continuous releases of radioactivity is CAP88-PC (USEPA, 1992). This code uses a modified version of the straight-line Gaussian plume dispersion equation and site-specific meteorological conditions to compute radionuclide concentrations in air, rates of deposition on ground surfaces, concentrations in foods, and human intake rates resulting from inhalation and ingestion of contaminated air and food products. Estimates of the radionuclide concentrations in produce, milk, and meat are made by the CAP88-PC code using pathway parameters defined by *NRC Regulatory Guide 1.109* (USNRC October 1977), for the terrestrial food chain. The PAVAN computer code (PNL, 1982) was used to calculate χ/Q values for accidental (short-term) releases of airborne radioactive material. The χ/Q values generated by the PAVAN computer code are presented in WVDP-065, *Radiological Parameters for Assessment of West Valley Demonstration Project Activities.*

A.8.6.3.4.2 Liquid Pathway Codes

The radiological impact of liquid effluents released to surface water is estimated using the LADTAP-II code (ORNL May, 1980), which implements the radiological exposure models of NRC Regulatory Guide 1.109. Radiological impacts from potable water, aquatic foods, shoreline deposits, swimming, boating, and irrigation are calculated in terms of dose to the maximally exposed individual and to the general population. Dose conversion factors, based on ICRP Publication 30, have been incorporated into the WVDP version of the LADTAP-II code.

The LADTAP-II computer code was selected to predict the radiological impacts resulting from accidental releases of radionuclides to wells, streams, and lakes. The code is designed to calculate radiation dose to the maximally exposed individual as well as to the regional population. The exposure modes considered are drinking water, aquatic food, and recreational activities such as swimming and boating. One of the important features of the code is that radiation dose as a function of time can be estimated for either direct releases to surface water or indirect releases from another water body. Accidents such as spills or underground leaks followed by eventual releases to surface water can be analyzed appropriately.

To analyze radiological impact from surface or subsurface contamination, the methodology employed in the RESRAD (Gilbert et al. 1989) and PRESTO-II codes is used. RESRAD is a computer code for implementing DOE guidelines for residual radioactive material. The RESRAD code establishes soil cleanup criteria on the basis of

prediction of radiation doses received by an individual from radionuclides contained in the soil and transported in the environment. The code considers six long-term environmental transport pathways: external radiation from contaminated soil materials; internal radiation from ingestion of contaminated dust particles; internal radiation from ingestion of plant foods grown on contaminated areas and irrigated with water drawn from a nearby well or pond; internal radiation from ingestion of milk from livestock fed with fodder grown on a contaminated area and water drawn from a nearby well or pond; internal radiation from drinking water from a nearby well or pond; and internal radiation from ingestion of aquatic food from a nearby pond. PRESTO-II is a computer code developed to evaluate possible health effects from shallow land burial of low-level radioactive wastes. The model is intended to assess radionuclide transport and health impact to local population for up to 1,000 years following the end of burial operations. Pathways and processes of transport from the trench to an individual or population include: vertical subsurface flow, groundwater transport, chemical exchange, overland flow, erosion, surface water dilution, resuspension, inhalation, and ingestion of contaminated beef, milk, crops, and water. Off-site population and individual doses may be calculated as well as doses to the on-site individual.

A.8.7 Hazardous Material Protection

In accordance with DOE P 450.4 and DEAR 48 CFR 970.5204-2, WVNS has established an Integrated Safety Management System to ensure a safe workplace for the worker, the public, and the environment. WVDP-310, *Safety Management System (SMS) Description,* provides an overview of the programs, policies, and procedures used by WVNS to ensure that safety is integrated into work performed by WVNS for the DOE.

Occupational hazards of concern may be grouped into four general categories: chemical, physical, biological, and ergonomics. To control and minimize exposure to these hazards, the WVDP Industrial Hygiene Program addresses the following: identification of health hazards, hazard evaluation, control measures, periodic monitoring, employee education, and medical monitoring. Section A.8.7 will primarily focus on these activities as they relate to, and provide for, hazardous material protection.

A.8.7.1 Hazardous Material Protection Program

The WVDP has established a comprehensive industrial hygiene and safety program dedicated to the anticipation, recognition, evaluation, and control of occupational

hazards and/or stresses that may cause sickness or impair health. This program is implemented through WVDP-011, *WVDP Industrial Hygiene and Safety Manual* (WVNS), which incorporates the guidance of DOE Order 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees* (USDOE March 27, 1998) and DOE-adopted Occupational Safety and Health Administration (OSHA) standards 29 CFR 1910, *Occupational Safety and Health Standards* and 29 CFR 1926, *Safety and Health Regulations for Construction* (U.S. Department of Labor).

Several organizations, including the Industrial Hygiene and Safety (IH&S) Department, WVNS Engineering groups, Operations Support, Training and Development, and Employee Health Services, are responsible for implementing aspects of the hazardous material protection program. Responsibilities and interfaces between these and other organizations are presented in WVDP-011. To ensure the priority of issues relating to hazardous material protection and worker safety, the IH&S manager reports directly to the Manager of Environmental, Safety, Quality Assurance, and Laboratory Operations, who in turn reports directly to the WVNS President.

A.8.7.2 ALARA Policy and Program

It is the policy of WVNS to keep safety and health risks as low as reasonably achievable (ALARA). Hazardous materials are identified, controlled, monitored, handled, and stored in a manner consistent with the ALARA philosophy. The major components of hazardous material exposure control are Hazard Prevention and Hazard Control. Hazard Prevention is that part of the safety program dedicated to the elimination of hazards through design and planning. The review of new facility and process designs, and the purchase of less toxic materials are two examples. Hazard Controls, which are the means applied to existing hazards to ensure worker safety, include:

- Substitution - e.g. using non-toxic or lower hazard products or equipment
- Engineering Controls - e.g. laboratory fume hoods
- Administrative Controls - e.g. worker schedules to reduce exposure
- Personal Protective Equipment - e.g. respirators, gloves

These and other aspects of hazardous material control used to ensure consistency with the ALARA philosophy are discussed in greater detail in the following sections.

A.8.7.3 Hazardous Material Training

All picture-badged employees at the WVDP receive General Employee Training (GET), which includes OSHA Hazard Communication training per 29 CFR 1910.1200. GET requalification is required on a biennial basis. OSHA Hazardous Waste Operations (HAZWOPER) training, per 29 CFR 1910.120 and 29 CFR 1926.65, is required for those individuals, including subcontractors, entering into a predetermined hazardous waste operations exclusion zone or who will be performing hazardous waste operations activity. An annual refresher is required for maintenance of hazardous waste qualifications. Additional training is required for individuals involved with the transportation of hazardous materials.

Operators working in specific areas who are routinely involved with hazardous chemicals are required to meet qualification standards which address specific training requirements for handling chemicals in these job functions.

Additional information on training may be found in section A.10.3.

A.8.7.4 Hazardous Material Exposure Control

Measures for the control of hazardous materials are required at many levels at the WVDP. Controls begin during the design phase by including IH&S review and approval whenever the potential for hazardous materials exposure is present or wherever industrial hazards may occur. Controls continue through process operation and closeout via the review process and appropriate industrial hygiene programs and procedures. IH&S reviews site-wide procedures whenever industrial hygiene or industrial safety hazards are expected to be encountered, thus ensuring that proper controls are identified.

An additional managerial control is the industrial work permit (IWP) system. The IWP is a permit system which reviews and controls unique and/or high-risk jobs. Jobs subject to review include but are not limited to those involving hazardous material handling. For certain tasks, the IH&S Department reviews the IWP to evaluate the hazards, specify necessary personal protective equipment, and issue any appropriate precautionary remarks. WV-911, *Industrial Work Permits* (WVNS), details the policy and administrative control in place for use of the IWP.

To reduce occupational exposure to the lowest practical levels, the planning and design aspects of all work are required to include consideration of safety hazards and risks to health. This is done during the design stage by using engineering controls such as ventilation, containment, isolation, and/or substitution. Remote handling, automatic feed, and exhaust or off-gas scrubbing are examples of system planning intended to separate workers from process hazards. Per WVDP-011, IH&S is required to review and approve all equipment designs and purchases intended for implementing engineering control of health hazards.

Because airborne hazards pose the most immediate threat to personnel health, a major consideration in design controls includes ventilation of related process hazards. Ventilation systems, which include both dilution and removal systems, play a vital role at the WVDP in reducing or eliminating toxic substance exposure. All new systems are designed in accordance with the following:

- Industrial Ventilation - Manual of Recommended Practice (American Conference of Governmental Industrial Hygienists [ACGIH]);
- 29 CFR 1910 - Occupational Safety and Health Standards;
- DOE Order 420.1 - Facility Safety;
- ASHRAE 62-1989 - Ventilation for Acceptable Indoor Air Quality (American Society of Heating, Refrigeration, and Air Conditioning Engineers).

Modifications or other changes to existing ventilation systems are also required to comply with these standards. All new or significantly modified ventilation systems used for personal protection (i.e., lab hoods, etc.) are performance tested by IH&S before being placed in, or returned to, service.

Several programs have been implemented at the WVDP with the goal of minimizing health hazards from specific hazardous materials. Formal approved site procedures provide for the controlled handling of certain hazardous materials, including asbestos, lead, carcinogens, mercury, and polychlorinated biphenyls (PCBs). Other procedures control those operations that involve hazardous materials, such as laboratory activities, painting, and hazardous waste operations.

Because it is a WVNS objective, per WVDP-011, to minimize the use of highly toxic and/or dangerous substances where technically feasible, substitution of less toxic/dangerous materials is a highly recommended health and safety practice. Formal approved procedures require that purchase requisitions for all chemical and hazardous material purchases be reviewed by IH&S for identification of potential health hazards. Depending on the nature of the hazardous material, the requisitioner may be directed to substitute a less hazardous material or initiate procurement of necessary controls or specific personal protective equipment.

Certain hazardous materials are either prohibited or under restricted usage at the WVDP. Prohibited materials, which include confirmed human carcinogens, lead-based and chromate-containing paints, asbestos-containing material, and picric acid, may not be purchased or used unless written approval is granted by the Radiation and Safety Committee (R&SC). Restricted use materials, which include suspected carcinogens, isocyanates, mercury, particulate polycyclic organic matter, perchloric acids and their salts, peroxidizable compounds, and grinding coolants or cutting oils containing inorganic oxidants require written approval by the IH&S Department prior to purchase and/or use.

Additional information on hazardous material control and protection design features may be found in the individual SAR modules.

A.8.7.5 Hazardous Material Identification Program

Before acquiring any chemical or hazardous material at the WVDP, the user must identify any potential risk associated with that chemical, and, as appropriate, plan and identify resources for:

- Safe and proper transportation;
- Adequate facility design;
- Proper facility equipment and process design;
- Required protective equipment;
- Safe storage;
- Use and process procedures;

- Review of proposals and procedures;
- Employee training; and
- Ultimate safe disposal.

Recognition of hazards associated with chemicals is aided through the use of Material Safety Data Sheets (MSDS), which are required for every chemical received on site and which must be read prior to working with any chemical. MSDSs are available for evaluation and assessment of the above items and are retained in a location accessible to the workplace. It is the responsibility of supervision to know what chemicals are present, what hazards are associated with them, what precautions are required, to inform all personnel in the work area of these hazards, and to enforce the necessary precautions. The IH&S Department or the responsible safety organization is consulted if there are any questions concerning the hazards of any material, the proper procedures, or protective equipment.

A formal approved procedure provides for the identification, evaluation, and control of health hazards at the WVDP. Elements of this procedure provide for the following aspects of health hazard control and hazardous material control:

- Identification of Health Hazards - Health hazards are identified through knowledge and assessment of existing operations, periodic walk-through surveys, review of proposed projects, facilities, engineering plans, and specifications, chemical inventories, injury/illness reports, complaints, and purchase requisitions. An inventory of health hazards is maintained by the IH&S Department.
- Health Hazard Evaluations - Potential health hazards are evaluated by qualified personnel using professional judgement, application of established standards or guidelines, and such evaluation techniques as air sampling and bioassay.
- Control Measures - Control measures are required whenever it is determined that a potential health hazard exists that is capable of causing injury or illness. Engineering controls, process changes, or material substitution are among the primary options in controlling hazardous materials. Administrative controls are implemented when

engineering controls cannot be used; personal protective equipment is used when engineering and administrative controls are not feasible.

- Periodic Reviews - Periodic reviews are conducted to ensure continued control of hazardous materials. Walk-through surveys of facilities are conducted and reports are provided to the appropriate supervisor. Periodic area monitoring and personal sampling are conducted as appropriate to ensure that existing control measures are adequate.

Hazardous material identification and assessment is also implemented as part of the site emergency management program. WVDP-193, *Emergency Action Derivation and Guidance Manual for the West Valley Demonstration Project* (WVNS), identifies and evaluates on-site hazardous materials and characterizes their associated hazards. Additional information on emergency planning is given in Section A.10.5.

A.8.7.6 Administrative Limits

The exposure limits used in hazard evaluation may not exceed those in the mandatory industrial hygiene standards of OSHA or the DOE. OSHA Permissible Exposure Limits (PELs) and American Conference of Governmental Industrial Hygienists Threshold Limit Values (ACGIH TLVs) are used by the IH&S Department. The more stringent OSHA PEL or ACGIH TLV is used for any hazardous material. If a potential health hazard is identified that has no assigned PEL or TLV, a guideline on evaluation and control is developed based on the best available toxicological information.

An administrative control limit of ten percent of the PEL or TLV for a chemical hazard is used as the WVDP standard for determining the necessity of further sampling, monitoring, evaluation, or control.

A.8.7.7 Occupational Medical Programs

The policies, objectives, and functions of the WVNS Employees Health Services (EHS) program are presented in WVDP-026, *WVNS Occupational Health Manual* (WVNS). WVDP-026 serves as a tool for implementation of the DOE Order 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees* (USDOE March 27, 1998) and other OSHA and DOE regulations. The primary objective of the EHS Occupational Health Program is the prevention, early detection, and mitigation of occupationally-related injury or disease.

Employee health assessments are given to provide initial and continuing assessment of the employee. Guidelines for the frequency, content, and documentation of these examinations are provided in WVDP-026. Medical records are maintained, updated, and stored in accordance with WVDP-026.

Standards and requirements for special health assessments and health monitoring of employees whose responsibilities involve specific hazardous materials are conducted in accordance with applicable OSHA/DOE standards. Specific medical qualifications exist for employees whose job tasks may involve working with certain hazardous materials, e.g., asbestos, lead, and hazardous waste.

To enhance hazardous material process knowledge, EHS personnel make regular visits to worksites and facilities. These visits, which are coordinated with IH&S personnel, include reviews of materials, processes, and procedures. Information obtained from these visits is used as the basis for recommendations to WVNS management for corrective action or preventive measures.

A.8.7.8 Respiratory Protection

At the WVDP, respiratory protection is required for both radiological and toxicological hazards. A comprehensive program, built around ANSI Z88.2, *American National Standard for Respiratory Protection* (ANSI), and OSHA standards, and in full compliance with applicable DOE requirements, is detailed in WVDP-179, *Respiratory Protection Program Manual* (WVNS). Further program requirements for radiological and toxicological hazard applications are set forth in WVDP-010, *WVDP Radiological Controls Manual* (WVNS), and WVDP-011, *WVDP Industrial Hygiene and Safety Manual*, respectively. The WVDP Respiratory Protection program comprises NIOSH-approved equipment, extensive employee training, quantitative fit testing, worker medical and bioassay monitoring, independent examination and maintenance of all reusable respirator components, and maintenance of records of all such activities. To ensure worker protection, all use of respiratory protection is strictly controlled by specification in either an RWP or IWP as prepared by the Radiation Protection Department or Industrial Hygiene and Safety Department, respectively and issuance in accordance with standard operating procedures. Air-line respirators and full- and half-face air-purifying respirators are routinely used for worker protection while self-contained breathing apparatuses are dedicated for emergency and unknown conditions. Additional information about respirators is given in Section A.8.5.2.8.

A.8.7.9 Hazardous Material Monitoring

As discussed in WVDP-215, *Industrial Hygiene and Safety Exposure Assessment and Monitoring Plan* (WVNS), monitoring at the WVDP is grouped into the following three categories:

- Baseline Monitoring - This type of monitoring is performed to evaluate the range or distribution of exposures among specified homogenous exposure groups. The baseline is the primary database used by the IH&S Department and EHS for determining the acceptability of exposures and the need for diagnostic sampling and additional controls.

- Diagnostic Monitoring - This type of monitoring is performed on special case evaluations to identify the predominant source(s) and tasks that are causing exposures. Results of these activities are used to devise control strategies for the identified high exposures. If the source is stationary, area monitoring maybe used. If the source moves with the employee or is dependent on individual work practices (e.g., asbestos removal), personal monitoring is used.

- Compliance Monitoring - This type of monitoring is performed to make formal comparisons with organizational guidelines and governmental standards for acceptable exposures. Examples include monitoring to ensure compliance with OSHA regulations for asbestos, lead, and cadmium.

WVDP-215 contains guidance for selecting the type of sampling, duration of sampling, number of samples to be taken, reporting of results, and data interpretation. Other formal procedures provide guidance for sampling plant breathing air, performing personal sampling, and routine sampling for various air contaminants.

Periodic monitoring ensures compliance with applicable code limits. The industrial hygiene staff determines the type and frequency of periodic monitoring and reports to line management regarding the continuing adequacy of controls, the need for additional controls, or recommendations for maintenance or re-emphasis of administrative controls.

A discussion of nonradiological monitoring of site emissions, effluents, and discharges is provided in Section A.8.6.1.2. A discussion of the WVDP on-site

meteorological program may be found in Section A.3.3.3. Additional information on monitoring in facilities where there is the potential for release of hazardous materials can be found in the individual SAR modules.

A.8.7.10 Hazardous Materials Protection Instrumentation

Formal approved procedures contained in WVDP-121, *Fire, Health, and Safety Procedures Manual* (WVNS) provide guidance for the operation and regular calibration of industrial hygiene field sampling instruments. WVDP-121 also contains information on selection, sensitivity, range, and types of hazardous material protection instrumentation. All personal and area sampling equipment used by the IH&S Department for monitoring employee exposure to toxic substances in the workplace which requires regular calibration per manufacturer specifications is tracked by the instrument calibration tracking system.

The design review process described in Section A.8.7.4 ensures that appropriate detection and monitoring instrumentation is incorporated into the design requirements for facilities involved with hazardous materials. Additional information on hazardous materials protection instrumentation is found in the individual SAR modules.

A.8.7.11 Hazardous Material Protection Record Keeping

Records pertaining to hazardous material protection are prepared, maintained, and transferred to Records Management for storage in accordance with WVDP-262, *WVNS Manual for Records Management and Storage* (WVNS). Industrial hygiene hazard inventories, reports, and monitoring data are made available to Employee Health Services in support of the Occupational Health Program. Records access is provided to employees or designated representatives of employees in accordance with OSHA regulations. All records relating to occupational health are retained in accordance with current OSHA and DOE Orders.

A.8.7.12 Hazard Communication Program

The WVDP Hazard Communication Program is implemented through WV-988, *Employee 'Right-to-Know' Program - Hazard Communication* (WVNS). WV-988 implements an integrated program to provide site personnel, including subcontractors, maximum protection and awareness of job hazards in compliance with the New York State "Right-To-Know" Law, the Federal OSHA Standard on "Hazard Communication", and applicable DOE Orders. WV-

988 provides guidance on hazard evaluation, material safety data sheets (MSDS), chemical inventories, labeling, directions for non-routine tasks and subcontractors, and training on these subjects.

A.8.7.13 Occupational Chemical Exposures

WVDP-215, *Industrial Hygiene and Safety Exposure Assessment and Monitoring Plan* (WVNS), provides the specifications for developing and implementing a risk-based approach to characterize employee exposures to hazardous materials. The plan includes criteria for exposure assessment and defines the interface between the IH&S Department and Employee Health Services. WVDP-215 is based on criteria set forth in DOE Order 440.1A, DOE Guide 440.1-3, *Occupational Exposure Assessment* (USDOE July 1997), and the American Industrial Hygiene Association publication, *Strategy and Occupational Exposure Assessment* (AIHA). Information on employee exposure to hazardous chemicals from specific facilities can be found in the individual SAR modules.

A.8.8 Prevention of Inadvertent Criticality

A.8.8.1 Introduction

The criticality safety program at the WVDP has been developed to control fissionable materials and potential nuclear criticality hazards in a way that assures that workers, members of the general public, government and personal property, and essential operations are protected from the effects of an inadvertent criticality accident. Fissionable materials at the WVDP are processed, stored, transported, transferred, and handled in a manner that assures that the potential for an inadvertant criticality is acceptably low.

The criticality safety program assures that environmental protection, safety, and health protection matters associated with all fissile and fissionable materials operations at the WVDP are comprehensively addressed and receive an objective review with all identifiable risks reduced to acceptably low levels, and that management authorization of all operations is documented. Consideration is given to all potential criticality hazards associated with fissionable material operations.

A.8.8.2 Requirements

Criticality safety at the WVDP is maintained through adherence to the requirements set forth in WV-923, *Nuclear Criticality Safety* (WVNS), and implemented via WVDP-162, *WVDP Nuclear Criticality Safety Program Manual* (WVNS).

This plan implements the requirements of DOE Order 420.1, *Facility Safety* (USDOE September 1995), and incorporates the elements of the following mandatory American Nuclear Society ANSI/ANS nuclear criticality safety standards:

- ANSI/ANS 8.1-1983, R88, *Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors*, except paragraphs 4.2.2 and 4.2.3 (as required by DOE Order 420.1);
- ANSI/ANS 8.3-1986, *Criticality Accident Alarm System*, except paragraphs 4.2 and 4.2.2 (as required by DOE Order 420.1);
- ANSI/ANS 8.5-1986, *Use of Borosilicate-Glass Raschig Rings as a Neutron Absorber in Solutions of Fissile Material;*
- ANSI/ANS 8.6-1983, R88, *Safety in Conducting Subcritical Neutron-Multiplication Measurements in Situ;*
- ANSI/ANS 8.7-1975, R87, *Guide for Nuclear Criticality Safety in the Storage of Fissile Materials;*
- ANSI/ANS 8.9-1987, *Nuclear Criticality Safety Criteria for Steel-Pipe Intersections Containing Aqueous Solutions of Fissile Materials;*
- ANSI/ANS 8.10-1983, R88, *Criteria for Nuclear Criticality Safety Controls in Operations with Shielding and Confinement;*
- ANSI/ANS 8.12-1987, R93, *Nuclear Criticality Control and Safety of Plutonium-Uranium Fuel Mixtures Outside Reactors;*
- ANSI/ANS 8.15-1981, R87, *Nuclear Criticality Control of Special Actinide Elements*, and

- ANSI/ANS 8.17-1984, R89, *Criticality Safety Criteria for the Handling, Storage, and Transportation of LWR Fuel Outside Reactors;*

- ANSI/ANS 8.19-1984, R89, *Administrative Practices for Nuclear Criticality Safety;* and

- ANSI/ANS 8.21-1995, *Use of Fixed Neutron Absorbers in Nuclear Facilities Outside Reactors.*

Notification, investigation, and reporting requirements are in accordance with DOE Order O 232.1, *Occurrence Reporting and Processing of Operations Information* (USDOE September 25, 1995), and DOE Order O 231.1, *Environment, Safety and Health Reporting Requirements* (USDOE September 30, 1995).

A.8.8.3 Criticality Concerns

Evaluations have shown that there currently is no credible potential for an inadvertent criticality during Vitrification operations (see WVNS-SAR-003); during operations to be conducted in former Integrated Radwaste Treatment System (IRTS) facilities (see WVNS-SAR-002); or, during spent fuel storage operations in the Fuel Receiving and Storage (FRS) facility (see WVNS-SAR-012).

The General Purpose Cell (GPC) currently contains a significant accumulation of contaminated hardware and other material, including fuel hulls, which remain from NFS reprocessing activities. Based on analyses by Westinghouse Hanford Company (WHC), it was determined that under certain conditions of fuel inventory, enrichment, configuration and moderation, a criticality in the cell could be possible; however, in the current configuration the material is safe, even under conditions of full moderation. Analyses contained in Section B.8.7 of WVNS-SAR-002 indicate that the maximum occupational dose resulting from an inadvertent criticality in the GPC would be 98 mrem, while the dose to the maximally exposed off-site individual from this accident would be 1 mrem.

A.8.8.4 Criticality Controls

Criticality controls at the WVDP are developed through guidelines given in WVDP-162 and the references contained therein. Administrative controls are the primary means for criticality control at the WVDP.

A.8.8.4.1 Engineering Controls

The Fuel Receiving and Storage facility utilizes engineered racks and fuel storage canisters to maintain a subcritical array in the Fuel Storage Pool and Cask Unloading Pool. This equipment is fully described in WVNS-SAR-012.

A.8.8.4.2 Administrative Controls

Administrative controls developed through the guidelines and requirements given in WVDP-162 are the primary means for criticality control in the IRTS/Main Plant and associated support facilities. These controls ensure that activities that require storage, processing or handling of fissionable materials are performed in a manner that provides an acceptable margin of safety for the prevention of an inadvertent criticality. WVNS-SAR-003 has demonstrated that the concentration of fissionable material in Vitrification Facility feed and process streams is sufficiently low so as to be critically safe by a wide margin. WVNS-SAR-003 has also demonstrated that no credible mechanism for fissionable material concentration exists in any Vitrification Facility system.

Accessible areas of WVDP facilities for which administrative controls must be maintained to preclude an inadvertent criticality due to the form, quantity or concentration of fissionable material are designated as criticality control zones. Criticality control zones are posted to indicate a definite boundary and provide a means of accounting for and controlling fissionable material inventory in the designated location. Administrative controls placed on activities conducted in these areas ensure that amounts of moderating material are minimized, that procedures for work involving fissionable material are reviewed by a criticality safety engineer and that fissionable material in an unmoderated criticality zone is maintained as such.

A.8.8.4.3 Application of Double Contingency

Requirements given in WVDP-162 ensure that the double contingency principle requirements set forth in DOE Order 420.1 are incorporated into all criticality control elements for activities conducted at the WVDP. Specific contingencies for criticality control are given in individual facility SARs.

A.8.8.5 Criticality Protection Program

Criticality safety at the WVDP is achieved through the requirements of WV-923, *Nuclear Criticality Safety*, which are implemented via WVDP-162, *WVDP Nuclear*

Criticality Safety Program Manual. Subsections of this section provide general information regarding the WVDP criticality safety program.

A.8.8.5.1 Criticality Safety Organization

Responsibility for the conduct of the nuclear criticality safety program at the WVDP is with the Manager of Environmental, Safety, Quality Assurance, and Laboratory Operations (ESQA&LO). The Manager of ESQA&LO ensures that nuclear criticality safety principles are considered for on-going and proposed operations, for site personnel, and for members of the general public. The Manager of ESQA&LO ensures that members of line management have the necessary data and predictions to assess nuclear criticality safety for WVDP operations. The Manager of ESQA&LO is assisted in the conduct of the nuclear criticality safety program by the Safety Analysis & Integration (SA&I) Manager.

The SA&I Manager is responsible for developing programs in accordance with the requirements of WV-923 and WVDP-162 to: ensure that adequate packaging for fissionable material is provided to protect worker health and safety; ensure that accumulations of fissionable materials are controlled during production, storage, transport and handling to reduce the risk of accidental criticality; and provide programs for personnel and nuclear accident dosimetry, when required. The SA&I Manager is also responsible for developing and maintaining the criticality safety program manual and for concurring with the establishment and abolishment of criticality control zones and for criticality control zone management.

The SA&I Manager is responsible for performing nuclear criticality safety analyses for activities conducted at the WVDP. The SA&I Manager provides programmatic evaluations to ensure that adequate nuclear criticality analyses are performed in controlling accumulations of fissionable material during production, storage, transport and handling to reduce the risk of accidental criticality. Personnel qualifications for performing criticality safety evaluations are a minimum of a B.S. in nuclear engineering or science, or equivalent, and three years' experience in directly performing evaluations. Additional relevant education may be substituted for the required experience.

The Criticality Safety Engineer (CSE) reports to the SA&I Manager and is responsible for establishing and abolishing criticality control zones and their operating limits. The CSE is also responsible for reviewing work control documents to ensure that proposed work activities that potentially involve fissionable material are performed in compliance with the requirements of WVDP-162.

A.8.8.5.2 Criticality Safety Plans and Procedures

Operations at the WVDP where nuclear criticality safety is a consideration are governed by written plans and procedures for initial planned operations and for subsequent modifications that may affect reactivity. Documented plans and procedures are provided for storing, processing and handling of fissionable materials. Modifications to these plans and procedures are subject to an Unreviewed Safety Question Determination to ensure that changes to the program remain within the approved authorization basis.

Accessible areas of facilities that contain significant quantities of fissionable material or that provide for storage, processing or handling of fissionable materials that require administrative controls to preclude an inadvertent criticality are designated as a Criticality Control Zone. These zones are prominently identified with criticality control zone signs posted at all anticipated avenues of approach with clearly marked boundaries and a current log indicating the criticality hazard.

A.8.8.5.3 Criticality Safety Training

Criticality safety training is discussed in Section A.8.5.3.5.

A.8.8.5.4 Determination of Operational Nuclear Criticality Limits

Operational nuclear criticality limits at the WVDP are developed based upon considerations of approved criticality analyses. At the WVDP these analyses are primarily performed using the KENO-V code and various cross section data provided by the Radiation Shielding Information Center at Oak Ridge National Laboratory. Prior to use at the WVDP, the KENO-V code is verified on each computing platform on which it will be used following standard site computer code verification procedures. The KENO-V code has been extensively validated for use in low-enriched uranium systems and reports for these validation calculations are referenced in Appendix F of the KENO program manual. No additional validation calculations are performed at the WVDP.

The calculational bias for each analytically-determined effective neutron multiplication factor (k_{eff}) is determined by correlating the results of the analysis with the results from critical experiments of similar systems. In systems in which the calculational method underestimates the effective neutron multiplication factor, the positive bias value is added to the calculated k_{eff}. Safety margins, therefore,

are established such that the calculated effective neutron multiplication factor, including all computational biases and uncertainties for a unit, array of units, or systems containing fissionable material does not exceed 0.95, with a 95 percent probability and a 95 percent confidence level (i.e., $k_{eff} + 2\sigma \leq 0.95$, where σ is the uncertainty associated with the method of calculation).

All criticality safety analyses or evaluations are reviewed by the WVDP Radiation and Safety Committee and DOE in accordance with WV-906 and WV-923. Furthermore these analyses are independently reviewed by qualified individuals whose education and experience meet or exceed the requirements of a criticality safety engineer.

A.8.8.5.5 Criticality Safety Inspection/Audits

The WVNS SA&I Manager is responsible for establishing and conducting independent appraisals that review and evaluate nuclear criticality safety against DOE orders, federal and management requirements, Technical Safety Appraisal criteria listed in DOE/EH-0135 *Performance Objectives and Criteria for Technical Safety Appraisals at Department of Energy Facilities and Sites* (USDOE June 1990), as well as best management practices.

A.8.8.5.6 Criticality Infraction Reporting and Follow-Up

Occurrence reporting requirements dictated by DOE Order O 232.1 are implemented at the WVDP through WVNS Policy and Procedure WV-987, *Occurrence Investigation and Reporting* (WVNS) and WVDP-242, *Event Investigation and Reporting Manual* (WVNS). This procedure establishes a system for determining, evaluating, reporting, and correcting criticality infractions.

The position of Facility Manager is defined in WVDP-242. As prescribed in WVDP-242, the Facility Manager is responsible for evaluating and categorizing occurrences, including criticality infractions, and completes oral notification per DOE requirements when determined applicable. Furthermore, the Facility Manager is responsible for ensuring that the corrective actions proposed and implemented as a result of an occurrence are adequate, and approves the closeout of identified corrective action items resulting from occurrences in areas for which they are responsible.

A.8.8.6 Criticality Instrumentation

There are no criticality alarm systems installed at the WVDP. Evaluations have been performed based on the fission gas source given in U.S. Nuclear Regulatory Guide 3.33, *Assumptions Used for Evaluating the Potential Radiological Consequences of Accidental Nuclear Criticality in a Fuel Reprocessing Plant* (USNRC April 1977), which demonstrate the suitability of the Main Plant stack monitors as a criticality detection system for the General Purpose Cell located in the Main Plant building (Prowse March 1, 1994).

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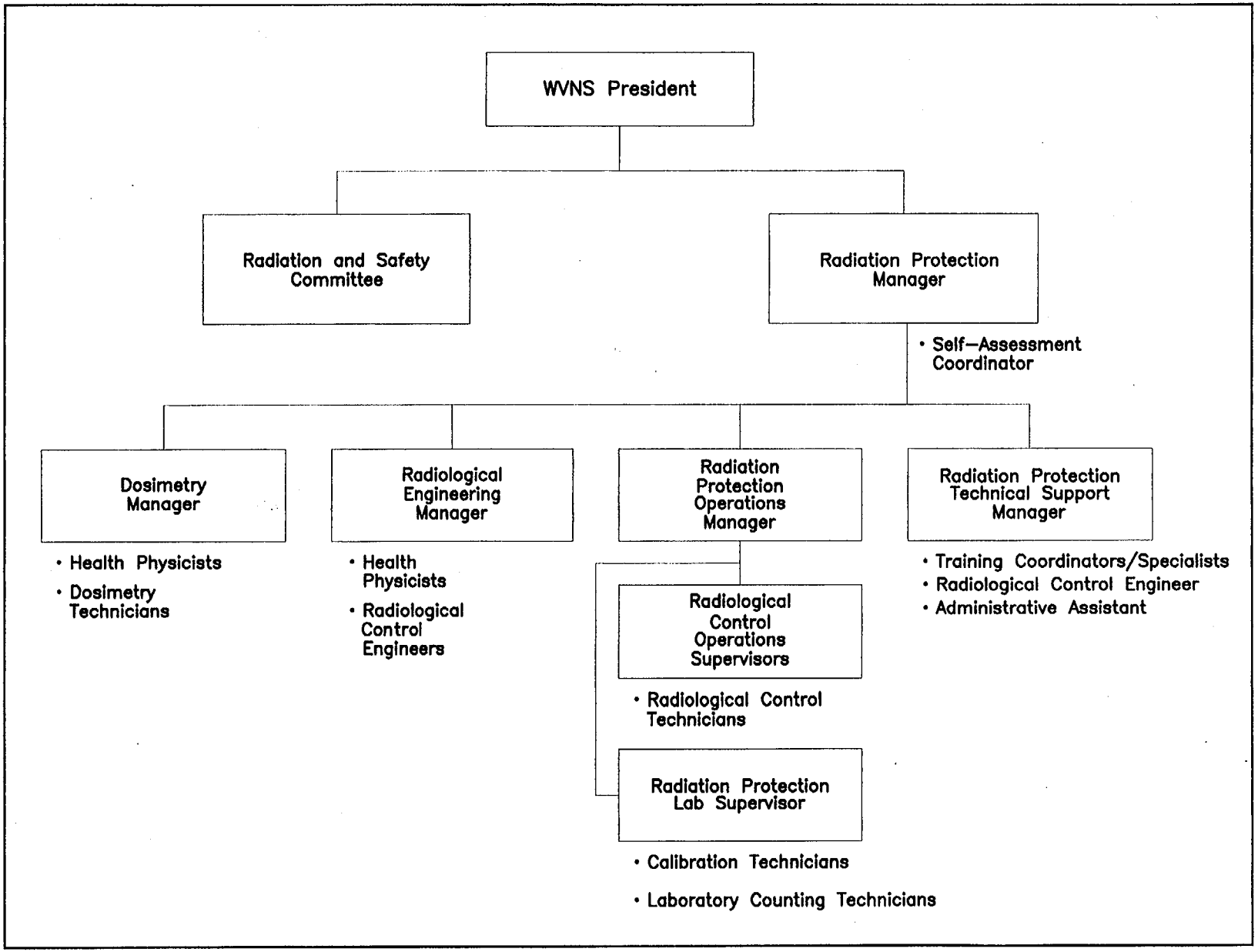

Figure A.8.5-1 Radiological Protection Organization

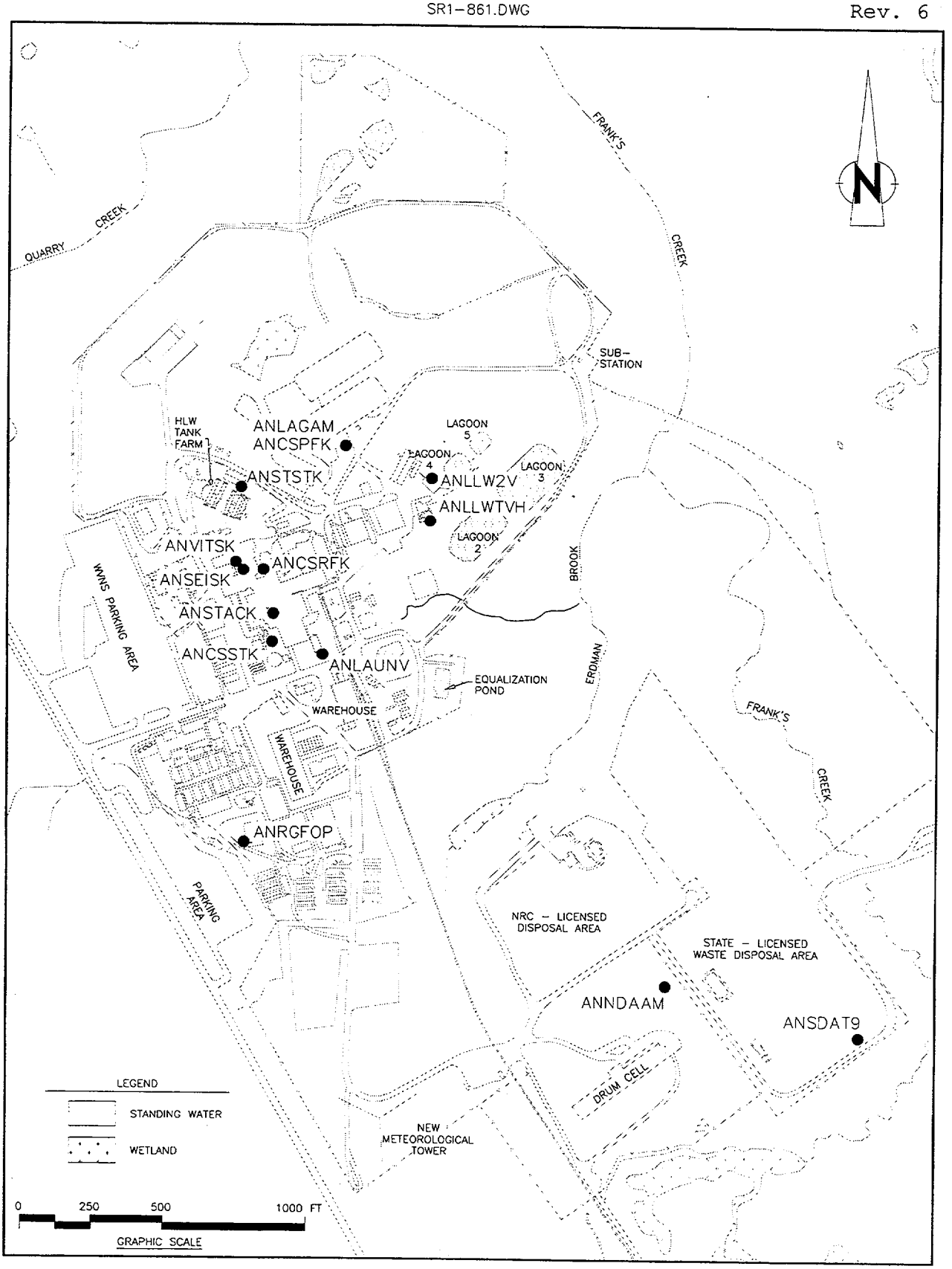

Figure A.8.6-1 Location of On-site Air Monitoring Points

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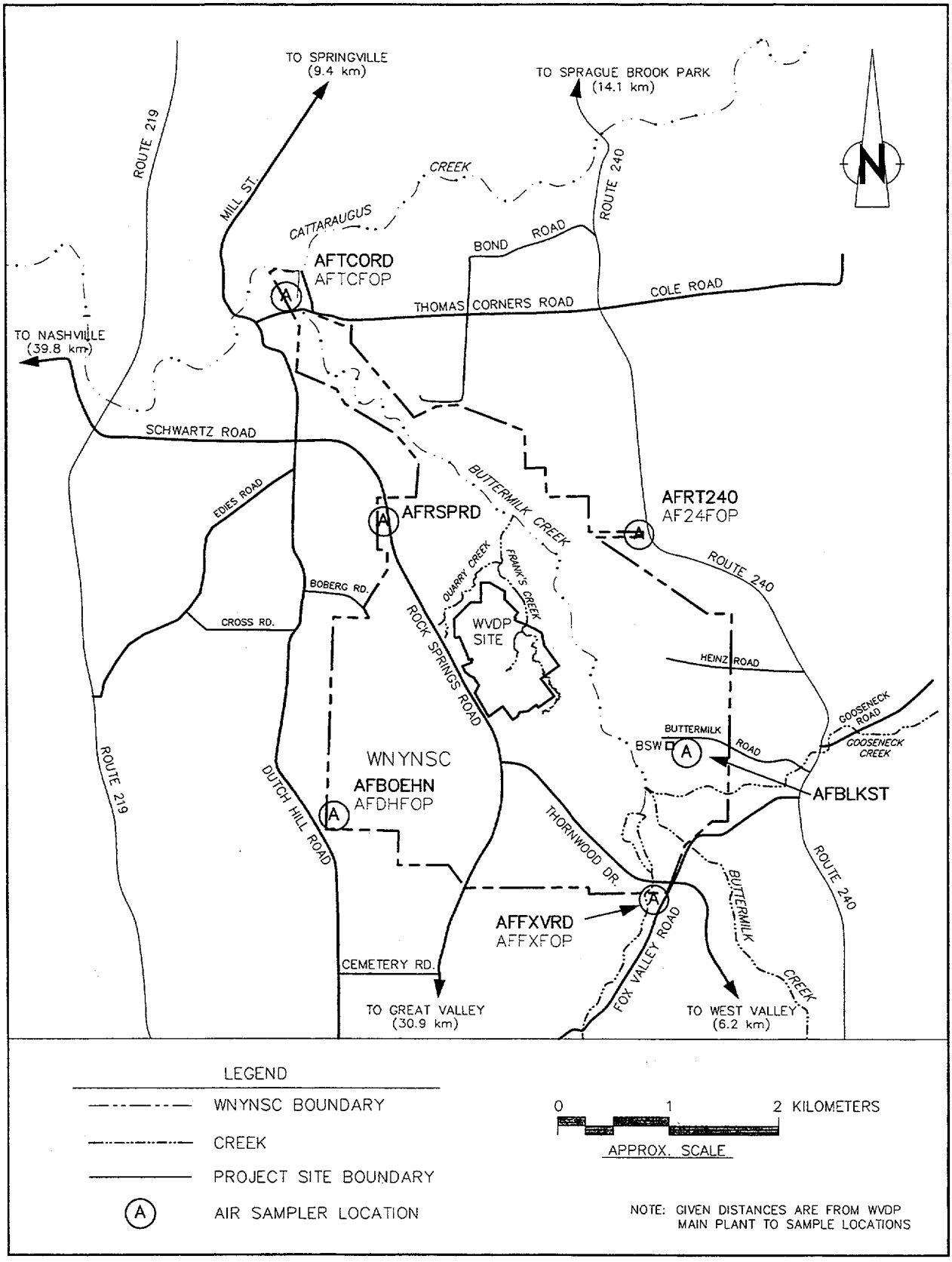

Figure A.8.6-2 Location of Perimeter Air Monitors

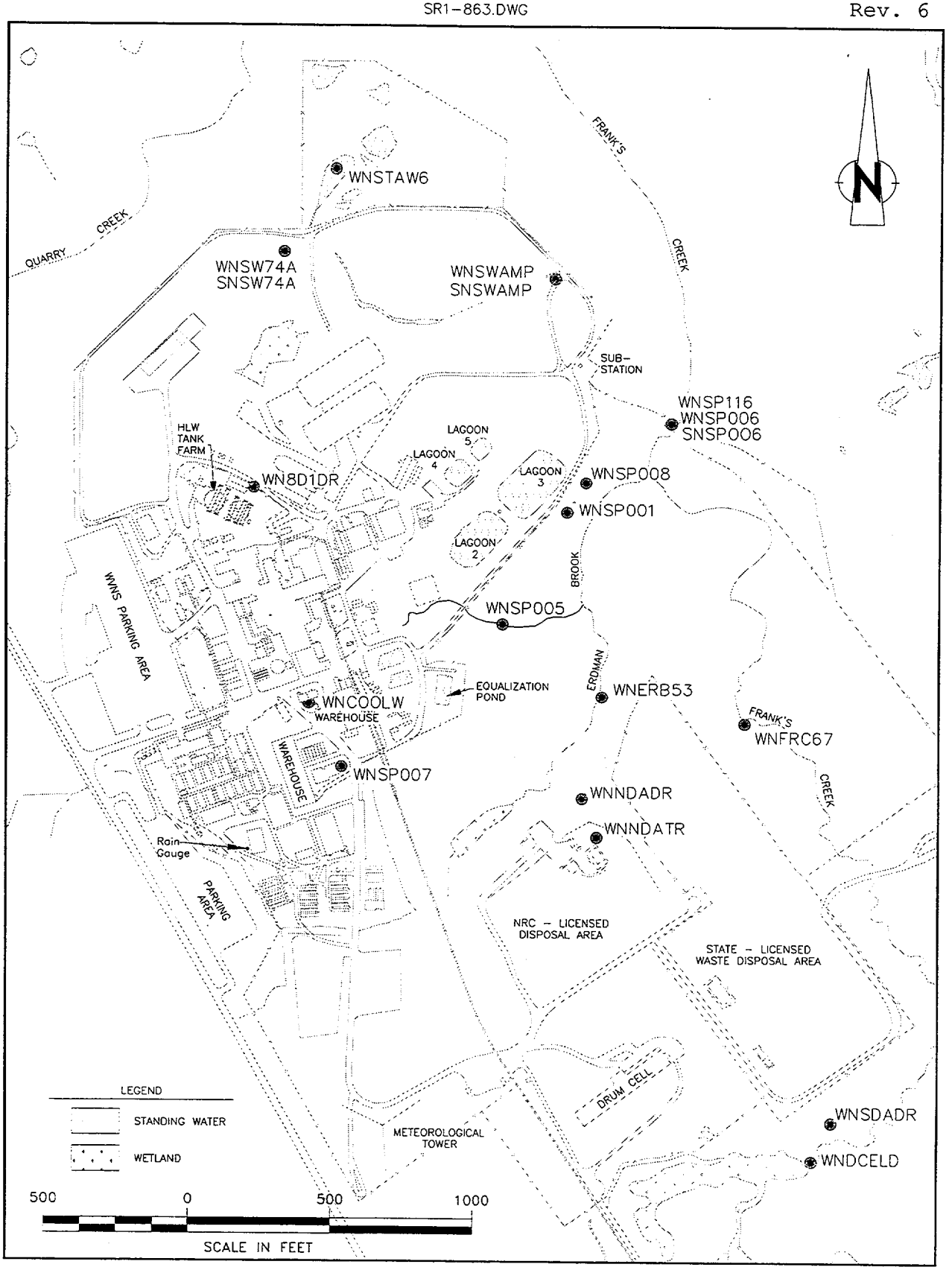

Figure A.8.6-3 Monitoring Locations for On-site Surface Water

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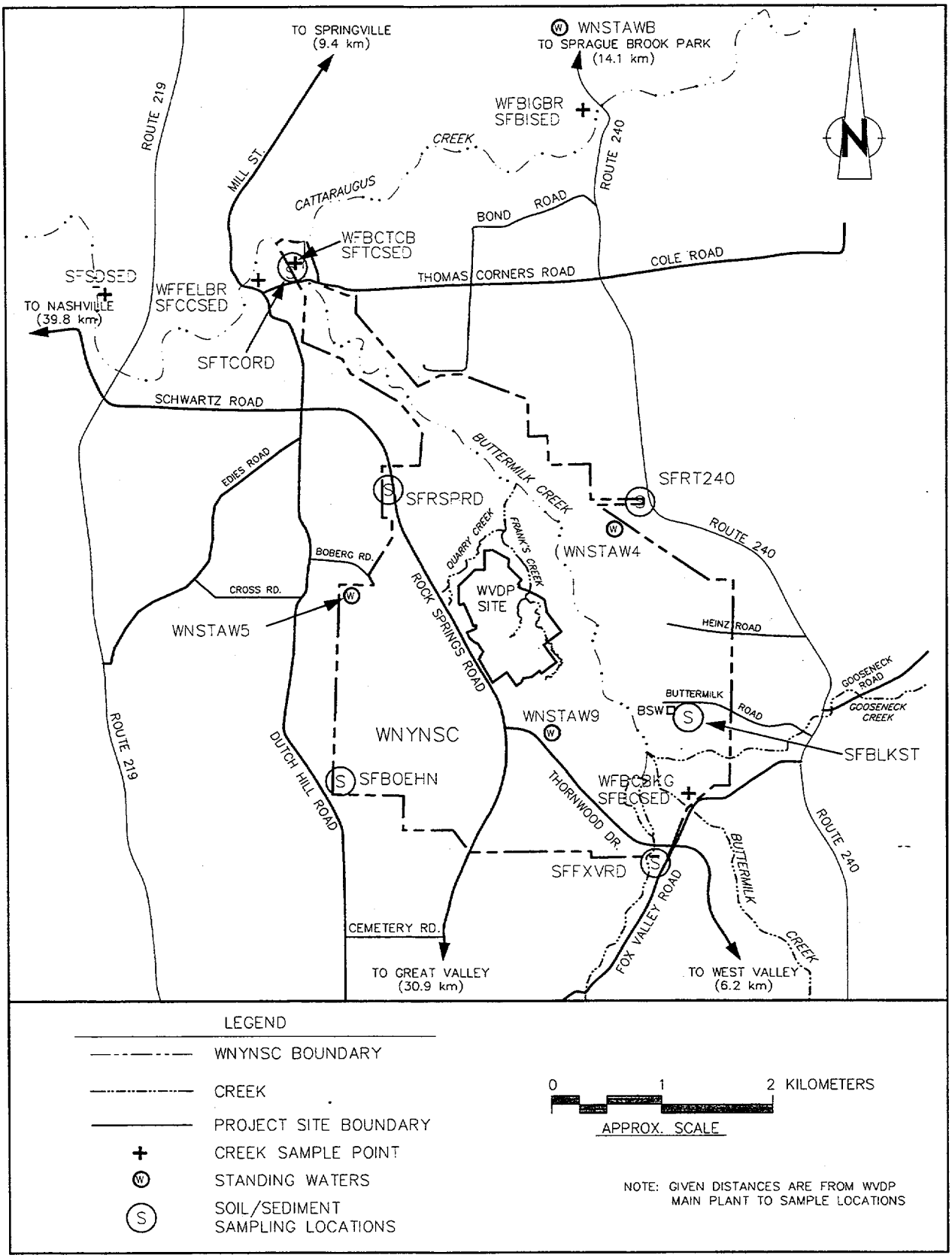

Figure A.8.6-4 Location of Off-site Surface Water Monitors and Sediment Collection

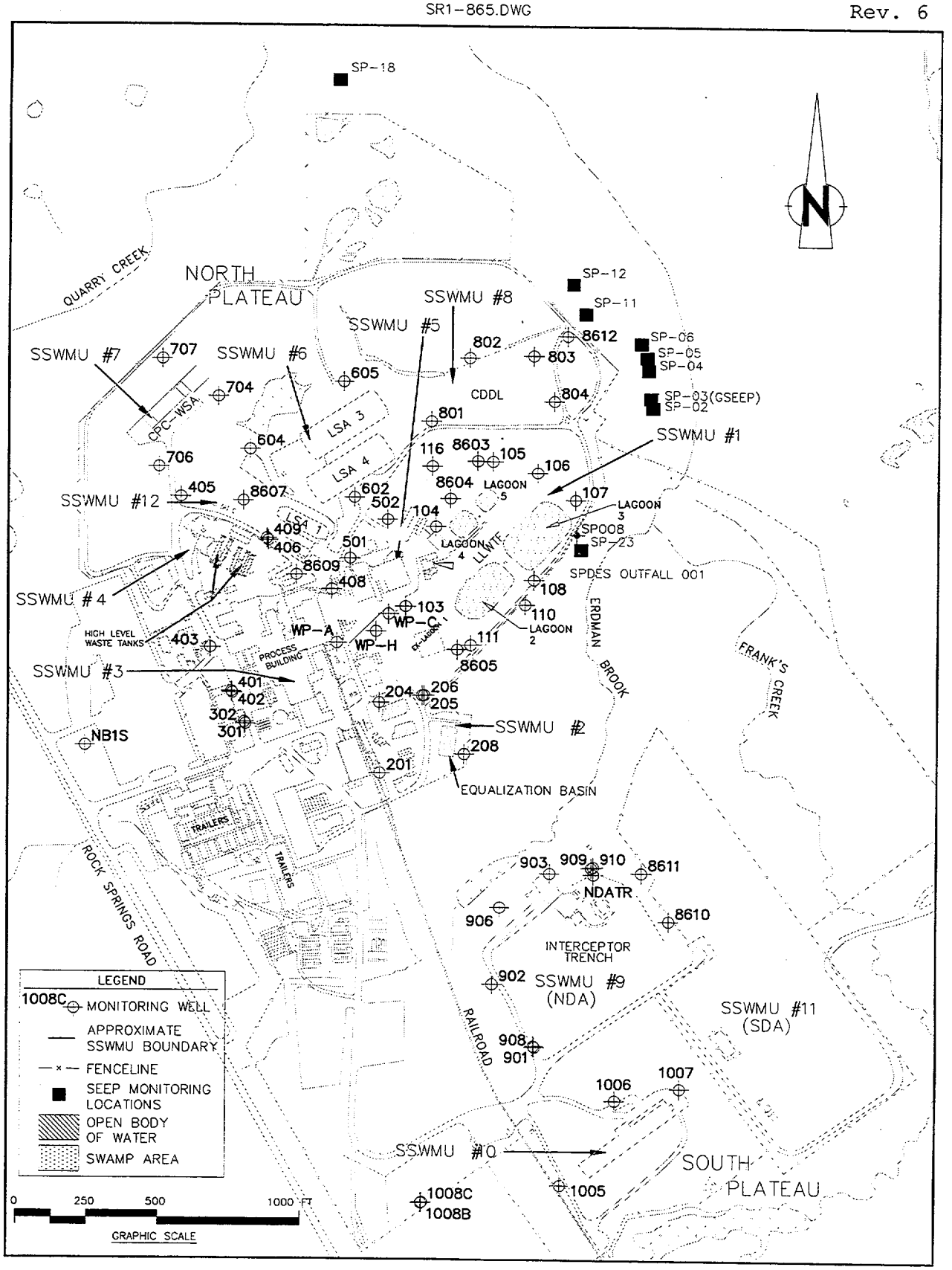

Figure A.8.6–5 Location of On–site Groundwater Monitoring Wells

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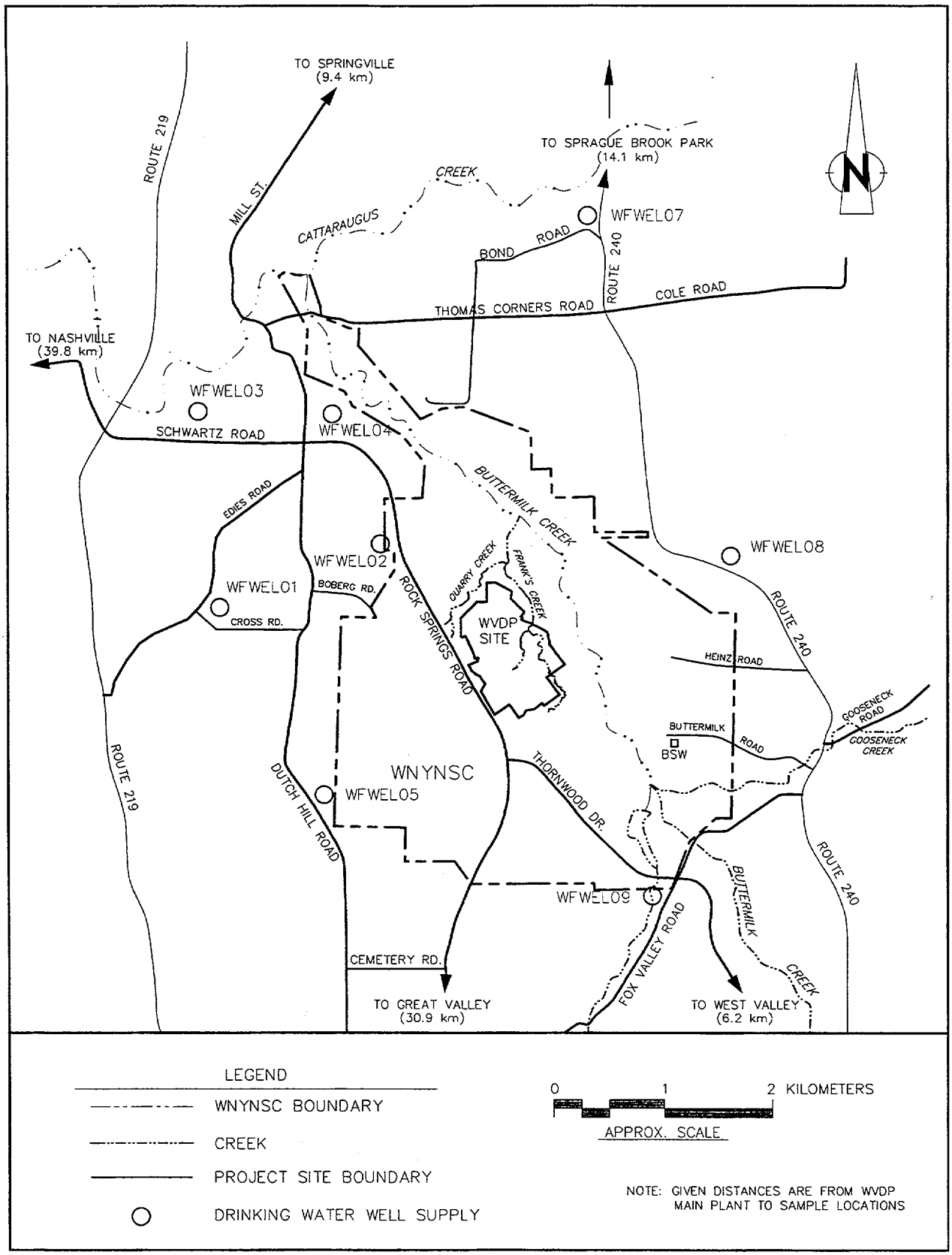

Figure A.8.6-6 Location of Off-site Drinking Water Monitoring Wells

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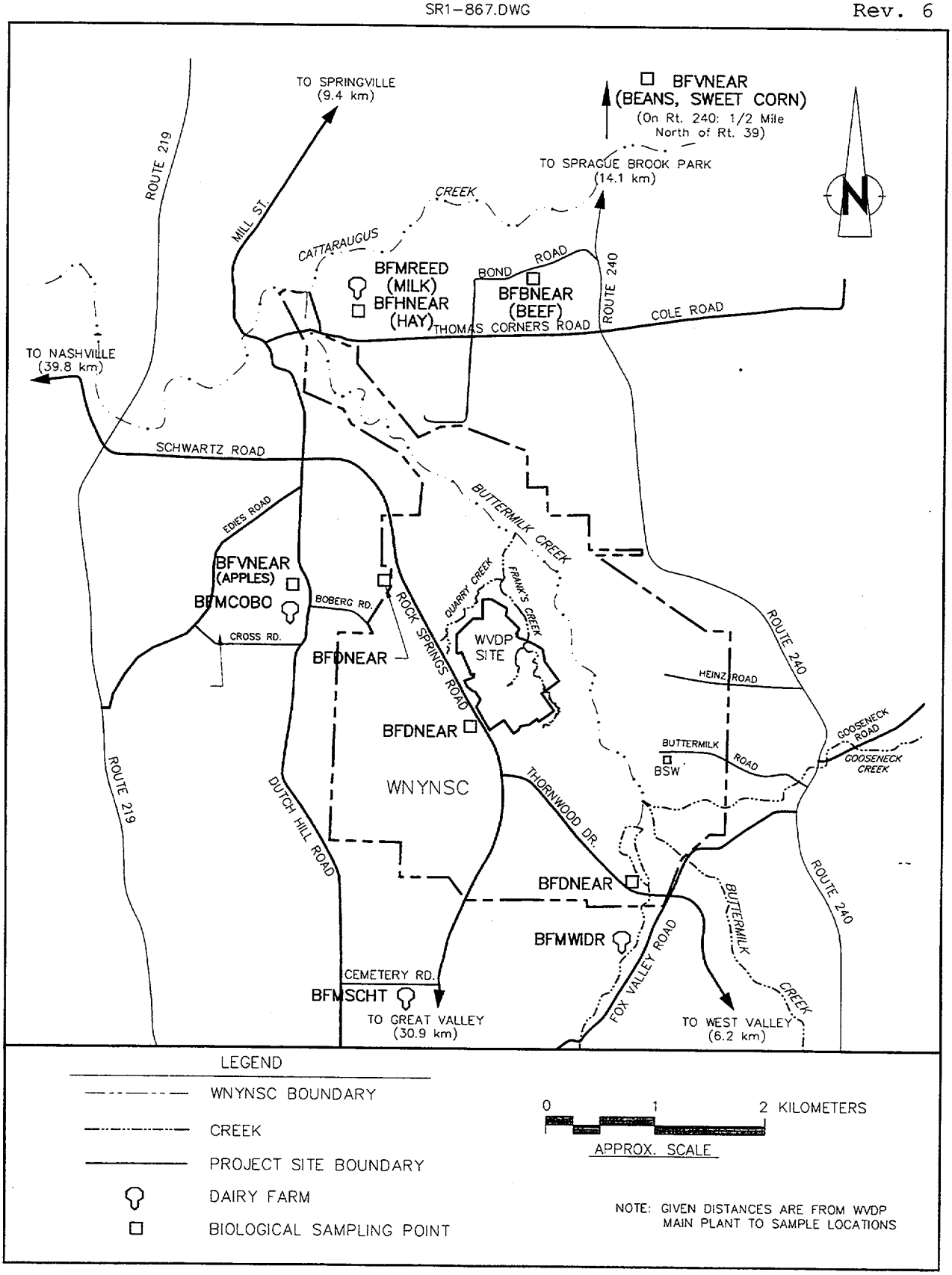

Figure A.8.6-7 Near-site Biological Sampling Points

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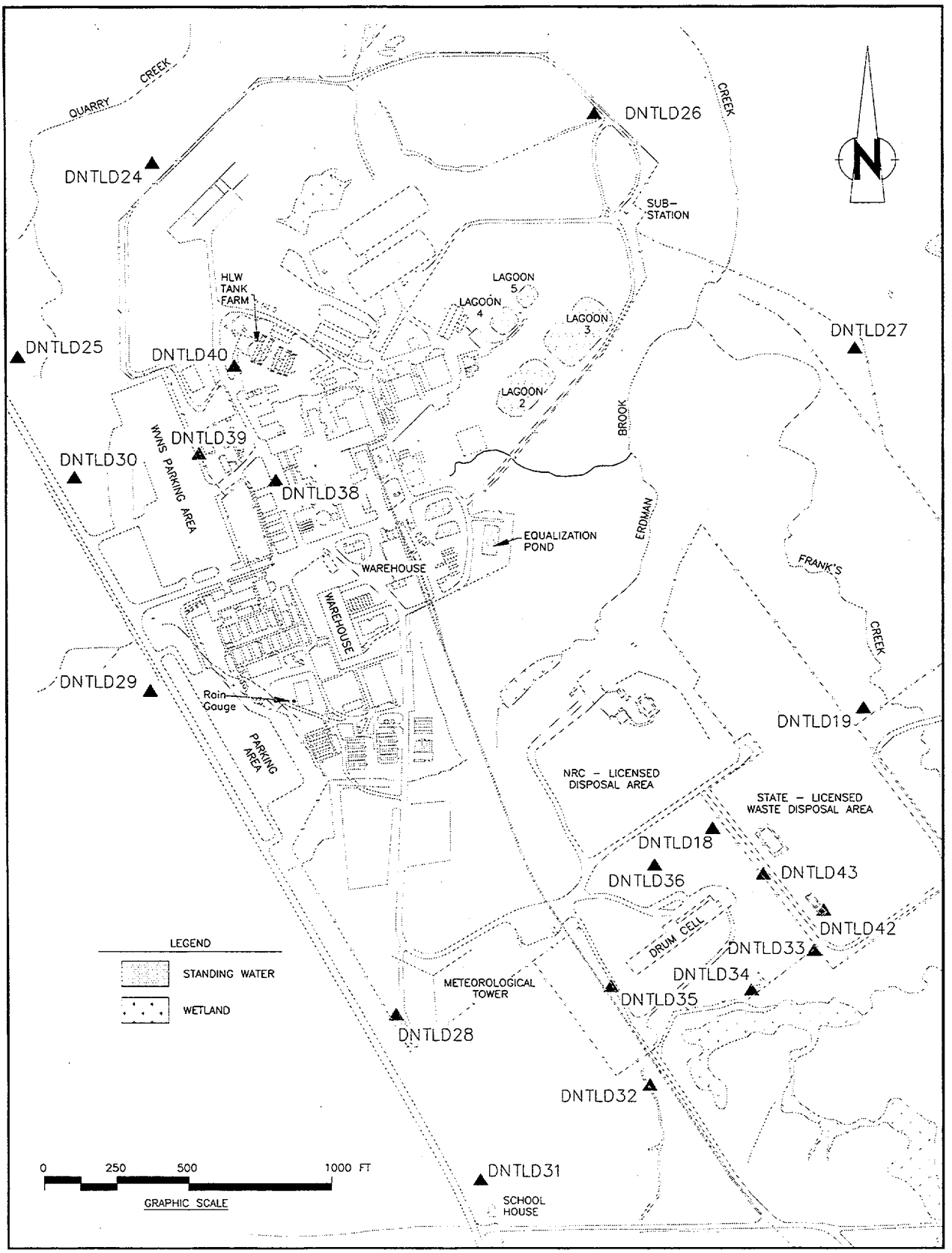

Figure A.8.6-8 Location of On-site Thermoluminescent Dosimetry (TLD) Monitors

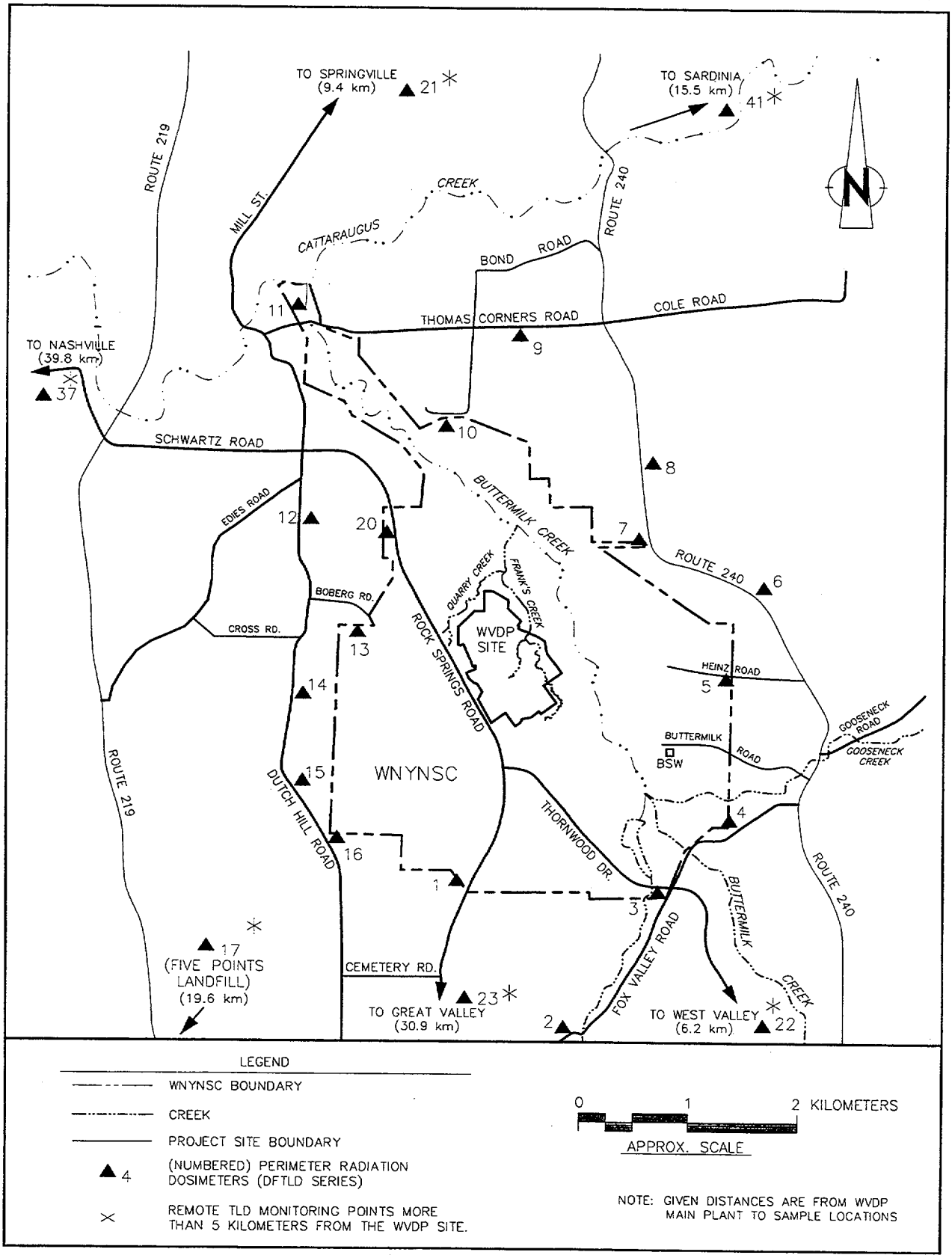

Figure A.8.6–9 Location of Boundary and Off–Site Remote Thermoluminscent Dosimetry (TLD) Monitors

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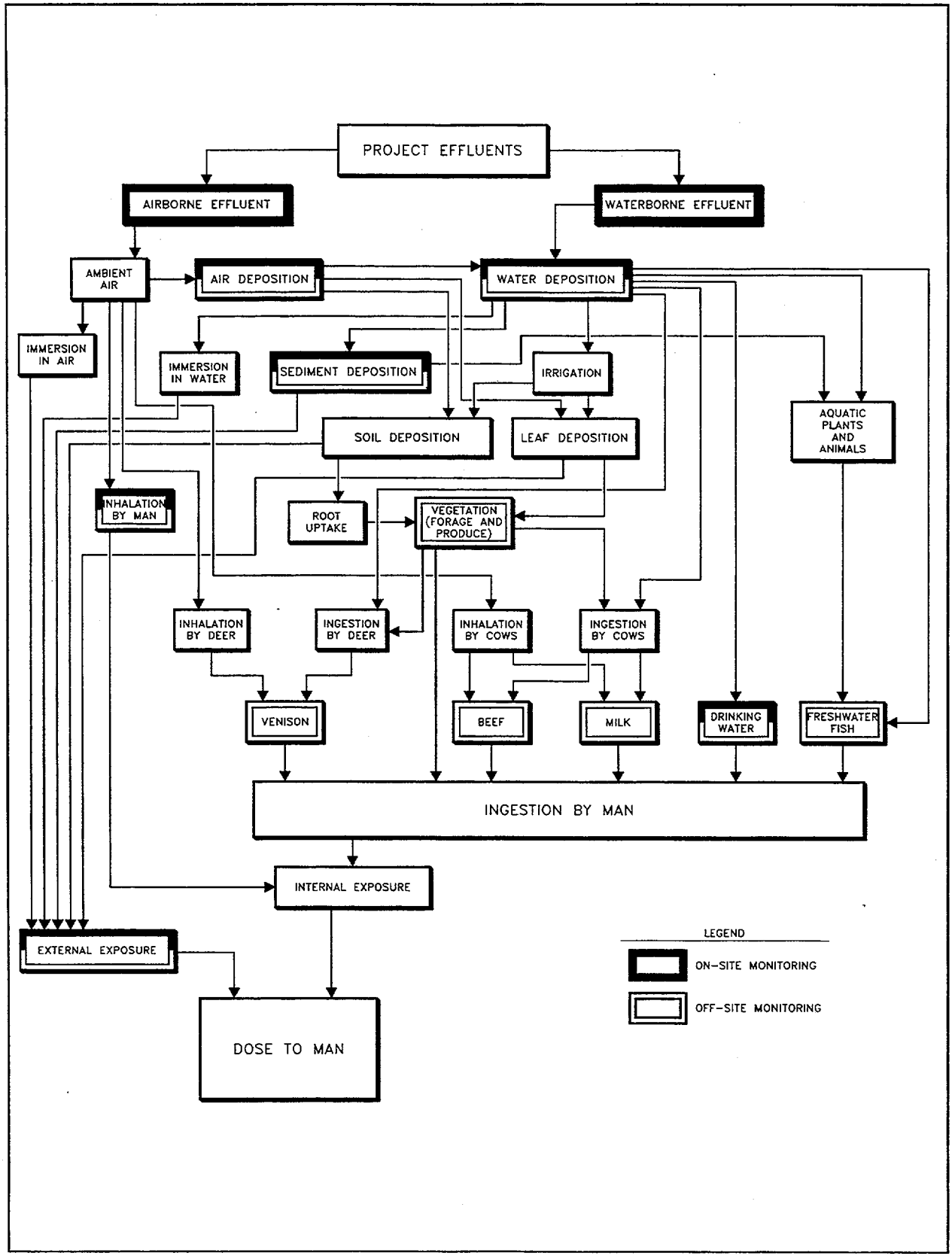

Figure A.8.6–10 Schematic of Pathways Considered for Dose Assessments

A.10.0 CONDUCT OF OPERATIONS

Conduct of Operations at the West Valley Nuclear Services Company (WVNS) is a philosophy for achieving excellence. To enhance safe operations and deliver a high quality product, WVNS follows WVDP-106, *Westinghouse Conduct of Operations Manual* (WVNS), which implements and augments DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*, Change 1 (USDOE May 18, 1992). The manual, which is based on the eighteen chapters of DOE Order 5480.19 in sequence, provides guidance for uniform and consistent compliance with the Order. The principles and philosophy of the manual apply to all WVDP activities and are implemented on-site in a graded fashion. The goal of the manual is to promote greater accountability of each individual for their cognizant site activities.

A.10.1 Organizational Structure

The West Valley Demonstration Project (WVDP) Act, Public Law 96-368 (U.S. Congress October 1, 1980), initiated a high-level radioactive waste management project at the Western New York Nuclear Service Center (WNYNSC). Authority to implement the Act was given to the DOE, whose on-site office, DOE-OH/WVDP, reports to the DOE Ohio Field Office (OH).

A cooperative agreement was signed between DOE and the State of New York, which is the owner of the site. The state is represented in this relationship by the New York State Energy Research and Development Authority (NYSERDA). The WVDP is managed by West Valley Nuclear Services Company (WVNS), under contract to the DOE. WVNS is a part of the Westinghouse Government Services Group (WGSG), which was formed following acquisition of Westinghouse in March 1999 by a joint venture of Washington Group International, Inc., and BNFL Inc. (a U.S. subsidiary of British Nuclear Fuels). WVNS responsibilities include WVDP management, conceptual design and engineering management, construction management, decontamination and decommissioning of the facilities, and site/facility operation. WVNS subcontracts portions of the work to URS (Dames & Moore), which provides environmental and safety services, and Burns International Security Services, which provides security.

DOE-WVDP has overall responsibility for compliance with federal, state, and local government requirements. WVNS has the responsibility, authority, and accountability for operation and management of the WVDP, including the performance of operational reviews, audits, and self-assessments. Third-party review and regulatory oversight is provided by the New York State Department of Environmental Conservation (NYSDEC), the New York State Department of Health (NYSDOH), the New York State Department of

Transportation (NYSDOT), the Nuclear Regulatory Commission (NRC), and the U.S. Environmental Protection Agency (EPA). Technical support has been provided on an as-needed basis by Argonne National Laboratory (ANL), Alfred University (AU), Brookhaven National Laboratory (BNL), Catholic University of America (CUA), Idaho National Engineering and Environmental Laboratory (INEEL), Los Alamos National Laboratory (LANL), Materials Characterization Center (MCC), Oak Ridge National Laboratory (ORNL), Pacific Northwest National Laboratory (PNNL), Sandia National Laboratory (SNL), Waste Isolation Pilot Plant (WIPP), and Westinghouse Savannah River Company (WSRC). The major project organizational interfaces are presented in Figure A.1.4-1.

A.10.1.1 Westinghouse Government Services Group Organization

WVNS is part of the Westinghouse Government Services Group, which is owned by a joint venture of Morrison Knudsen Company and British Nuclear Fuels Limited (through BNFL Nuclear Services Inc.).

Westinghouse Government Services assistance is provided on an as-needed basis when specialized expertise and services are required. Projects requiring significant time and assistance are contracted to other Westinghouse entities or other contractors.

A.10.1.2 WVNS Organization

WVNS is structured to ensure safe and successful completion of project goals. Numerous control systems have been developed to assist in WVDP management. These systems are documented in WVDP-075, *DOE WVDP Project Management Plan* (WVNS), and WVDP-117, *WVNS Policies and Procedures Manual* (WVNS), and WVDP-002, *Quality Management Manual* (WVNS). Specific WVNS policies and procedures developed to ensure safe operation, quality assurance, testing, emergency operation, and related activities, including specific procedures and guidance regarding radiological safety and operations, are kept on file and routinely updated by WVNS Records Management.

Minimum staffing requirements for safe operation of Hazard Category 2 or 3 facilities are contained in WVDP-218, *Process Safety Requirements* (WVNS). In addition, safe operation is assured through compliance with local, state, and federal rules and regulations and via safety programs established, monitored and controlled by the Environmental Safety, Health, & QA Department and the Quality Assurance Department.

The Radiation and Safety Committee (R&SC), whose scope, function, and responsibilities are defined in WV-906, *Radiation and Safety Committee* (WVNS), is a group of individuals appointed by the WVNS President to: provide objective and

independent review of safety-related operations, systems, and activities; serve in an advisory capacity to the line organizations; and respond to questions and concerns about safety. The management functions of the R&SC members (including the R&SC Chairman) are independent of facility design and operations (i.e., are not related to day-to-day operations and activities) to the maximum extent practicable. Line management has the direct responsibility for conducting activities in a safe manner, in compliance with DOE Policy 450.4, *Safety Management System Policy* (USDOE October 15, 1996), as implemented through WV-100, *Integrated Safety Management and Control of Documents* (WVNS); WV-110, *Conduct of Operations* (WVNS); and WVDP-106, *Westinghouse Conduct of Operations Manual* (WVNS).

The WVDP organizational hierarchy is provided in Figure A.10.1-1. Figure A.10.1-2 is a WVNS organization chart indicating the major staff groups. Figures A.10.1-3a through A.10.1-3e show additional WVNS organization structures. Following is a brief functional description of groups in the WVNS organization:

Construction and Project Administration - manages construction projects, and provides project management systems, records management, technical procedures and publications, and community relations services.

Environmental, Safety, Quality Assurance, and Laboratory Operations - responsible for industrial hygiene and safety, environmental affairs, criticality, safety analysis and integration, analytical chemistry, emergency management, and quality assurance.

Human Resources - coordinates labor relations activities, implements compensation programs, employee communications programs, training and development, provides essential security services and oversees the medical services department.

Internal Audits & Employee Concerns - performs internal financial and performance audits and investigates employee concerns.

Legal Counsel - assists in the administration of the prime contract and conducts independent reviews of WVNS activities.

Quality Assurance - provides quality engineering and inspection services and coordinates project appraisal functions, including self assessments. The QA manager is at the same or higher organization level as the highest line manager directly responsible for performing activities affecting quality and is sufficiently independent from cost and schedule considerations to assure impartiality. The QA

manager has the authority to ensure resolution of any quality issue, elevating the matter to the President of WVNS, if necessary.

Radiation and Safety Committee - provides objective and independent review of safety-related operations, systems, and activities and functions in an advisory capacity to the line organization and the WVNS President.

Radiation Protection - responsible for radiological protection operations, radiological instrumentation maintenance, dosimetry, respiratory protection, and radiological training programs.

Site Operations & Facility Closure Projects - manages Plant operations, provides support to the operations group and technical/engineering support, manages site and equipment maintenance and operations, and manages facility closure projects.

Waste, Fuel, & Environmental Projects - responsible for providing design, systems engineering, and project management for environmental programs, remote handled waste facility, and spent nuclear fuel shipping. It also provides for the safety characterization, treatment, storage, packaging and shipment of radioactive, hazardous, mixed, and industrial wastes.

Vice President & Controller - provides financial and computer services.

High-Level Waste Projects - schedules, prepares work documents, and executes the integrated operations to assure that the vitrification system operation continues safely. This organization also operates the Waste Tank Farm, Vitrification Off-Gas Treatment, and the Integrated Radwaste Treatment Systems Facilities in a safe and effective manner to complete the immobilization of the high-level waste (HLW). Preparations for facility deactivation and closure of HLW facilities per regulatory guidance will follow completion of facility operation.

An approved site procedure provides the flow of responsibility in the event of an emergency.

A.10.1.3 Personnel Qualification Requirements

A minimum requirement for any person to be hired in any WVNS position is a high school diploma or equivalent, ensuring basic competence and ability in reading, mathematics, and science. Positions requiring advanced abilities may require further academic preparation, demonstrated to management during actual job performance.

Individuals in operational positions must also meet qualification requirements specified in job descriptions and applicable standards. The determination of appropriate and necessary training for employees is based on specific job requirements and is management-approved. In addition, basic training and refresher training are available in the areas of mathematics and science to all operations personnel, as necessary, based on the appropriateness of such training to job functions and duties.

The guidelines for training established in DOE 5480.20A, *Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities* (USDOE November 15, 1994), are implemented by WVNS. Specified training courses must be successfully completed before any individual can begin working at the site. Subcontractors are also required to successfully complete applicable WVDP training before beginning work on-site. In addition, a four-month probationary period is established for hourly non-exempt employees and a six-month probationary period for salaried exempt and non-exempt employees.

All training and qualification programs are in compliance with DOE Order 5480.20A. Qualification standards, which include specific course content necessary for safe operation of the facility, are available in the Training Records Management Department. Additional information on training is presented in Section A.10.3.

Technical personnel at the WVDP have expertise in mechanics, electronics, instrumentation and control, chemistry, radiation protection, training, safety, and/or quality assurance. The education requirement is a baccalaureate degree in engineering or related science or equivalent, and the experience requirement is two years of job-related experience and one year of nuclear experience or equivalent. Position requirements are defined in individual position descriptions.

Technical requirements are intended to apply to supervisory positions or positions with authority to review and concur, not to entry level positions. Training is provided to entry-level technical support personnel in the following facility-specific subject areas, as appropriate to the position:

- Facility organization;
- Facility fundamentals;
  - Heat transfer, fluid flow, and thermodynamics
  - Electrical science

  - Chemistry/chemistry controls
  - Process controls

- Facility systems, components, and operations;
- Environmental, safety, and health orders;
- Codes and standards overview;
- Facility document system;
- Safety Analysis Reports and Process Safety Requirements;
- Nuclear Criticality;
- Material, maintenance, and modification;
- ALARA and radwaste reduction; and
- Quality Assurance/Quality Control (QA/QC).

Technical personnel and technical support personnel are given initial General Employee Training. Each department manager is required to develop an indoctrination checklist which further defines the necessary training for a given position. Any additional training is provided as determined by the manager.

In addition to the training noted above, analytical and process chemistry (A&PC) laboratory technicians, RadCon technicians, maintenance personnel, operators, shift supervisors, shift engineers, and QA inspectors have approved qualification programs which provide training as required for their individual job functions.

All key personnel are qualified individuals in terms of technical aptitude, experience, and training. Minimum qualification requirements for senior operations management positions such as the Waste, Fuel, and Environmental Projects Manager, High-Level Waste Projects Manager, and the Vice President of Environmental, Safety, QA, and Laboratory Operations Manager are a B.S. degree in engineering or science or equivalent, 10 years experience in the nuclear field, and five years technical and/or plant management experience or equivalent. Minimum qualification requirements for operations management positions are a B.S. degree in engineering or equivalent, five years professional experience or equivalent, including five years in nuclear waste

management and/or systems operations or equivalent, and a minimum of three years of management experience or equivalent.

Resumes and associated documentation for WVNS personnel are kept on file in the WVNS Human Resources Department. All training and qualification is conducted and documented in accordance with WVNS performance-based training procedures.

A.10.1.4 Liaison with Outside Organizations

The various organizations associated with the WVDP and their interrelationships are illustrated in Figure A.10.1-1. All government agencies deal directly with DOE-OH/WVDP in a manner controlled by cooperative agreements or Memoranda of Understanding (MOU). All subcontractors interface through the WVNS Purchasing Department and a WVNS technical liaison. To resolve specialized questions on technical subcontracts, the Purchasing Department coordinates contacts within the appropriate departments at WVNS. WVDP-117, *WVNS Policies and Procedures Manual* (WVNS), provides specific direction for interfacing with subcontractors and suppliers in accordance with DOE directives and federal acquisition regulations.

A.10.2 Preoperational Testing

A.10.2.1 Administrative Procedures for Conducting the Test Program

The Startup and Testing phase for structures, systems, or components starts with construction turnover and continues until the facility or system has been turned over to the Operations Department. An Engineering Procedure (EP) contained in WVDP-114, *WVNS Engineering Procedures* (WVNS), provides instructions on how to identify and control the startup and testing of structures, systems, or components used at the WVDP to verify performance to the specified design and performance requirements. As described in the procedure, Design Criteria, System Descriptions, Construction Specifications, Equipment Specifications, the WVDP Quality List, Test Plans (TPLs), and the WVDP HLW Items and Activities List are documents used to identify and control the testing. The EP also provides the responsibilities of the organizations which ensure that testing is developed, approved, and performed in compliance with all elements of the test program.

Test programs for new structures, systems, or components are addressed in the individual facility SAR module for the system being tested. For example, testing of vitrification systems is addressed in WVNS-SAR-003, *Safety Analysis Report for Vitrification System Operations and High-Level Waste Interim Storage* (WVNS).

Other Engineering Procedures describe actions and controls required for any experimental or developmental test activity at the WVDP, including support of WVDP high-level waste form qualification. Inspection and test control, as they relate to Quality Assurance, are discussed in Chapter A.12.

WV-368, *Operational Readiness Determination for Startup/Restart* (WVNS), defines the processes necessary for compliance with startup and restart requirements as they pertain to unreviewed safety questions (USQs), new processes and/or facilities, and pertinent restart actions. This procedure identifies necessary approvals, authorizations, and requirements for performing readiness activities, developing related readiness documentation, and conducting required reviews, verifications, and reporting in accordance with DOE Order 425.1, *Startup and Restart of Nuclear Facilities* (USDOE October 26, 1995). WV-368 is supplemented by WVDP-342, *Operational Readiness Determination Manual for Startup and Restart of WVDP Facilities* (WVDP).

All procedures and instructions for conducting the test program and evaluating, documenting, and approving the results are prepared, reviewed, and approved in accordance with WVDP-114, *WVNS Engineering Procedures* (WVNS), and WVDP-117, *WVNS Policies and Procedures Manual* (WVNS). Operating records, including procedures, data sheets, and logbooks are maintained for the life of the Project in accordance with WVDP-262, *WVNS Manual for Records Management and Storage* (WVNS).

A.10.3 Training Programs

A.10.3.1 Program Description

The overall objective of the qualification program is to provide qualified personnel to operate the WVNS facilities safely in such areas as equipment operation, process flows, control instrumentation, radiological/industrial safety, and emergency response in accordance with DOE Order 5480.20A, *Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities* (USDOE November 15, 1994). Operator candidates who meet the prerequisites for the qualification programs are trained and tested to provide qualified operations personnel. The operator training program for facility operators fulfills the specific needs determined for personnel to operate the facility and process in a safe and efficient manner. At the completion of the training/qualification program, the operator is able to:

- Explain the theory and function of the system process, equipment, and controls for generation of an acceptable product;

- Perform the normal modes of operation per Standard Operating Procedures;
- Detect abnormal or emergency conditions using the instrumentation available and visual monitoring of the components;
- Mitigate emergency situations using appropriate procedures and bring the system to a safe shut-down mode; and
- Operate the facility safely in accordance with approved procedures.

The guiding philosophy underlying the West Valley Nuclear Services training program is the DOE-recognized performance-based training (PBT) model. It is the industry standard for the administration of efficient and cost-effective training. The objective of this program, implemented in WVDP-126, *Performance-Based Training Program Manual* (WVNS), is to ensure program excellence which will result in well-trained and qualified personnel.

A.10.3.1.1 Development of Training Programs

The cognizant line manager has the responsibility for overall coordination and documentation of the qualification program. Each department provides on-the-job training (OJT) and classroom instruction on the basic theory, concepts, subsystems, components, and procedures relevant to each facility. This training is supplemented by the use of vendor-prepared materials related to basic functions of valves, pumps, instruments, process controllers and other vendor material specific to the facility. Cognizant department personnel develop qualification standards and training aids. The cognizant department also provides instruction, tutorial activities and operator qualification guidance. Departmental trainers provide support in the production of training and qualification materials and the documentation of the programs.

Performance-Based Training (PBT) is defined as training based on knowledge and skills directly related to on-the-job performance requirements. PBT consists of five distinct phases: Analysis, Design, Development, Implementation, and Evaluation. The first three of these phases comprise the process by which the technical content of training programs is developed, verified, and validated. These three phases are discussed below:

- ANALYSIS - This phase is used to determine the training requirements. The needs analysis ensures that training is required and identifies the requirements that serve as the basis for the design and development of

the training. This phase is supported by approved performance-based-training procedures. The requirements identified in the analysis phase are used to create the framework to accomplish the training goals.

- DESIGN - Activities of the design phase include the creation of objectives, standards, tests, and training plans. The major products of this phase are the learning objectives and the knowledge/skill examinations. This phase is supported by approved departmental procedures.

- DEVELOPMENT - The development phase determines the best methodology to teach the objectives created during the design activities. The major outputs of the development phase are the lesson plans and training aids.

Qualification Standards include both knowledge and skill objectives. Supervisors, qualified as on-the-job instructors, oversee the on-the-job training program. This program requires demonstration of proficiencies set forth in the qualification standards. As required in DOE Order 5480.20A, on-the-job training will continue to provide personnel with familiarity in all aspects of the position. Such training includes standard operating procedures, emergency actions, radiation control practices, configuration control procedures, and other requirements. Continuous training on new material is included in both the qualification program and the required requalification program. Included are the required reading programs and the ongoing job training which is specific to maintain proficiency of job skills.

Not all technical support personnel have qualification standards. Those who do not require them are required to complete an indoctrination checklist in accordance with Policy and Procedure WV-538, *Employee Indoctrination and Training* (WVNS).

Manager and supervisor training encompasses similar subjects as the personnel they supervise. The system supervisors complete the senior operations specialist qualification. Managers also receive training in leadership skills, fiscal management, and integrated facility and interdepartmental operations.

Initial training on process safety requirements and other requirements is given to entry level operators ("C" operators). The training includes the criteria for development of Process Safety Requirements (PSRs), safety limits, limiting conditions for operation (LCOs), and limiting control settings. Surveillance requirements and reporting requirements are also covered.

Training and proficiency requirements for other activities, including emergency preparedness, maintenance, criticality safety, fuel handling, hazardous material protection, and quality assurance are each discussed in the appropriate sections of this SAR. Qualification and proficiency requirements for personnel performing facility-specific activities are presented in the SAR module for that facility.

A.10.3.1.2 Maintenance of Training Programs

The fourth phase of the Performance-Based training program is Implementation and it takes the materials from the development phase into the learning setting. Implementation is supported by approved sitewide procedures that provide for:

- Conduct of On-the-Job Training;
- Operations Team Building and Training;
- Proficiency Demonstration;
- Qualification of Operations Personnel; and
- Instructor Training and Qualification.

In addition, training walkdowns are conducted prior to procedure release and distribution. The Cognizant Operations Manager is responsible for verifying that such walkdowns have been conducted prior to procedure use. Changes are reflected in required readings, briefings, courses (lesson plans), and on-the-job training sessions. A formal approved procedure ensures that facility changes and operating experience are incorporated into those training programs leading to certification or qualification of operations, maintenance, and technical support personnel.

A.10.3.1.3 Modification of Training Materials

WVDP training programs are evaluated by Training and Development personnel, trainees, supervisors, management, auditing groups, and DOE personnel. Scheduled evaluations are conducted to ensure that the training program(s) are achieving the WVDP objectives, to identify corrective actions, and to improve the quality of the training programs. Specific review and evaluation criteria are contained in WVDP-126.

Changes to the training program are initiated for various reasons. Programs are kept current and reflect applicable experience and changes to facility design, Safety Analysis Reports, Process Safety Requirements, procedures, and regulations. Programs are maintained current using a process that reviews facility and procedure changes for effect on knowledge and skill of qualified facility personnel in accordance with WVDP-126.

The need for changes to training materials or courses may also be identified by the trainer, the user organization, facility operators, or others. When the need for a change has been identified for a qualification standard, a Qualification Change Notice (QCN) is initiated to define the scope of the change. Changes to Qualification Standards are controlled by WVDP-126.

A.10.3.1.4 General Training

All new WVNS and subcontractor employees and unescorted visitors are required to attend general employee training (GET). The GET program consists of orientation on the scope and purpose of the project; radiation safety; safety and environmental training; QA orientation; conduct of operations training; security; emergency evacuation response instruction; and an introduction to project organizational responsibilities and management. WVDP personnel receive refresher training in these topics every two years, as applicable.

All new engineering personnel receive an indoctrination to the engineering procedures which govern their work at the project. This indoctrination is conducted and documented in accordance with WVNS procedures.

Personnel are not allowed to handle radioactive materials without proper mandatory training. Additionally, they are not permitted to enter any radiologically-controlled area without training and qualification.

A.10.3.1.5 Radiation Worker Training

Before being authorized to work with or handle radioactive materials (or enter any radiologically controlled area unescorted), personnel at the WVDP are required to complete formal Radiation Worker Training courses. The courses consist of formal classroom training and practical training. A comprehensive written examination is required with a grade of at least 80% following the classroom portion. Candidates are tested in these areas:

- Fundamental atomic theory;
- Biological effects of radiation exposure;
- Radiation exposure control of the unborn child;
- Decontamination and waste minimization;
- External radiation exposure control;
- Internal radiation exposure control;
- Radiation signs and postings; and
- Employer/employee responsibilities.

Requalification is required for all radiation workers every two years. Additional information on the training of radiation and nuclear safety personnel is presented in Section A.8.5.3.5.

A.10.3.1.6 Operations Training

Operations areas and the scope of training for each are revised as the scope of operations changes. All training and qualification is performed in accordance with DOE Order 5480.20A. Supervisors receive similar operational training as the plant operators and can operate system controls in an emergency. In addition, supervisors receive training in emergency response/management, enhanced training on the basis for Process Safety Requirements (PSRs), occurrence reporting training, and management/leadership training.

To operate in one or more of the above areas, an operator must be trained and qualified. Qualification in any one of the areas may require the following:

- Review by upper management of the candidate's performance and assignment to a specific training program;
- Completion of all of the checklist items of the applicable qualification standard;
- A recommendation for examination by the appropriate supervisors;

- Completion of a comprehensive written examination with a grade of at least 80% for each process or operation in the area or areas for which the operator is to be qualified;

- Completion of a plant walk-through examination, including hands-on testing demonstration and discussion of the operator's responsibilities in existing plant operations;

- Oral examination before a committee consisting of senior members of Operations, Training and Development, Radiation Protection, and Industrial Hygiene & Safety; and

- Concurrence of qualifications by the appropriate operations manager.

Team training and evaluation of shift performance during emergencies is conducted through drills and exercises. All site drills are documented and areas requiring improvement are clearly noted. In addition, operational personnel develop and rehearse various scenarios of system emergencies. These scenarios are performed on-shift and allow the supervisor to evaluate and coach their personnel to react and function appropriately during actual site emergencies.

A.10.3.1.7 Safety Training

Employees receive ongoing safety awareness training and instruction to develop the knowledge and skills they need to understand workplace hazards and protect themselves. Training programs are developed and conducted whenever new hazards are identified as requiring specific safety training. Only individuals who have received proper training and demonstrated the ability (by written test or otherwise) to recognize and control job-related hazards are allowed to do so. Additional information on safety training is presented in Section A.8.3.3.

A.10.3.2 Continuing Training Programs

All occupational workers receive bi-annual refresher training on the general employee training program covering the scope and purpose of the project, general safety, radiation safety, and environmental training, QA, orientation, security and emergency alarm response, and an introduction to project organizational responsibilities and management.

All radiation workers are required to requalify annually through the radiation worker training program by satisfactorily demonstrating their knowledge of the program in a written examination with a score of 80% or higher.

As part of their requalification, all operators are required to participate in a continuing training program which may consist of required reading (procedures and unusual occurrence reports), proficiency demonstrations, classroom and on-the-job training, and satisfactory completion of a comprehensive written requalification exam(s).

Verification of training for all positions is provided by senior cognizant managers.

A.10.3.2.1 Requalification

The requalification program serves in maintaining knowledge and skills of the applicable operators. The program, which is structured commensurate with specific position requirements and administered on a cycle not exceeding two years, includes, but is not limited, to:

- Equipment and Plant Modifications;
- PSRs and other requirements;
- Operating Procedures;
- Occurrence Reports, accidents, or near-misses which occur locally or elsewhere if appropriate;
- Changing sources of radioactivity, criticality potentials, or other potential environmental hazards;
- New outlooks or methods regarding the ALARA concepts; and
- Safety (fire, personnel injury, etc.).

Drills on abnormal or emergency procedures are incorporated into the continuing training program and are used to assess the operators' knowledge of the procedures to follow in emergency or abnormal operating conditions. The drills are as realistic as possible without endangering property or personal welfare.

A.10.3.3 Administration and Records

Training materials are reviewed for technical accuracy and approved by the cognizant functional manager. Before training materials are released for use, the Training and Development Department reviews them to assure that they satisfy established training criteria in terms of complying with WVDP-126, *Performance-Based Training Manual* (WVNS).

The Records Management department is responsible for maintenance of the training records management system for the program, and for individual training records in an auditable manner. Training records are maintained in accordance with NQA-1-1989, Supplement 17S-1 (ASME) requirements as lifetime quality assurance records. Training records are stored in one hour fire-rated file cabinets. Records Management is also responsible for maintenance of the training records management system (TRMS) database, which contains the information for completion of initial and requalification training of WVDP personnel. Training record activities are conducted in accordance with WVDP-126, *Performance-Based Training Program Manual* (WVNS) and WVDP-262, *WVNS Manual for Records Management and Storage* (WVNS).

A.10.4 Normal Operations

A.10.4.1 Procedures

A.10.4.1.1 Development of Procedures

WVDP procedures ensure safe operations under routine, abnormal, or emergency conditions. Different types of procedures used for the various site activities are contained in appropriate site and Department Procedures Manuals. Facility operating procedures provide detailed step-by-step instructions for performing operations and routines for testing, maintenance, decontamination, and other special activities, including operation under abnormal or emergency conditions. Facility operating procedures are of two basic types: Standard Operating Procedures (SOPs), used to conduct normal operations, and Special Instruction Procedures (SIPs), usually used for one-time operations such as startup/testing of new systems. The Emergency Management Plan and Procedures provide the basis for a timely and effective response to potential or actual emergency events at the WVDP. Work Orders are used primarily for non-routine maintenance activities. Work Requests are used for specific jobs that are relatively routine in nature.

SOPs, SIPs, and emergency management procedures are controlled distribution documents, that is, they specify quality requirements or prescribe activities affecting quality, and as such are developed and distributed under the general guidance set forth in WVDP-257, *WVNS Manual for the Preparation, Review, Approval, Distribution, and Revision of Controlled Documents* (WVNS). EP-5-002 contains specific guidance for the development of SOPs and SIPs consistent with the guidance presented in DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities* (USDOE May 18, 1992). Work Orders are considered controlled documents and are tracked in accordance with WV-111, *Work Order Control System* (WVNS). (Work Orders are developed in accordance with guidance contained in EP-5-002, *Work Instruction Preparation* (WVNS)). Work Requests are also controlled documents and are developed in accordance with guidance presented in EP-5-002.

Selection of procedures and other controlled documents for development, revision, or cancellation is determined by the cognizant manager. Typical reasons for procedure development include lack of an existing program or document that satisfies new or existing requirements; the need to define controls and mechanisms for consistently accomplishing a specific task; activities specified within a document have been determined to be unsafe; or changes to existing requirements require changes to existing documentation.

As described in WVDP-257, procedures and other controlled documents are ranked within a document hierarchy. Reviews of these documents are determined by the relative level of the document within the hierarchy. Designated reviewers, who are individuals responsible for the management and/or operation of areas affected by the procedure, review the procedure; their comments must be either resolved or incorporated into the document. Procedures and changes to procedures used to control radiological work activities require review and approval by the Radiation Protection Department. Procedures and changes to procedures that impact worker safety require review and approval by the Industrial Hygiene & Safety Department. Procedures and changes to procedures that implement Integrated Safety Management (ISM) principles and core functions require SA&I review.

New and revised SOPs and SIPs are validated by walk-throughs, which simulate procedure use to determine if the procedure can be used safely and accurately to perform the tasks described therein. Any significant changes recommended as a result of the walk-through are incorporated into the document. The Cognizant Manager is responsible for verifying that any required training has been conducted prior to procedure use.

Routine facility walkdowns are conducted per the guidance in WVDP-106, *Westinghouse Conduct of Operations Manual*. During these walkdowns, differences among facility conditions, procedures, and personnel training are identified and appropriate corrective action is determined, assigned, and tracked.

A.10.4.1.2 Distribution and Maintenance of Procedures

The Records Management Department assures conformance with distribution and control requirements of all site-wide and department level procedures and controlled documents. Records Management uses the General Office Automated Logging System (GOALS) to issue controlled copy transmittal/receipt acknowledgments, track receipt of controlled distribution documents, generate and track the Delinquent Notice Report, and generate and track Periodic Review Notifications for controlled distribution documents. Current electronic versions of controlled documents are tracked using the DOCSOpen (Personal Computer Document Organization and Control Software) package.

Additional information on procedure maintenance is presented in Section A.10.4.2.2.

A.10.4.1.3 Safety and Authorization Basis Review

Of special concern in the development and use of facility work documents (including work instructions and operating procedures) is the safety of workers, the general public, and the environment. To ensure that operations (especially those involving hazardous and/or radioactive material, as well as those performed in a hazardous and/or radiologically contaminated environment) include the appropriate safety considerations, precautions, and controls, WVNS has implemented a Safety Review Program. This program establishes the Radiation and Safety Committee (R&SC) to review various proposed activities with potential safety impacts. WV-906, *Radiation and Safety Committee* (WVNS) defines the R&SC's scope, function, and responsibilities. The cognizant manager of a proposed activity (e.g., a facility, program, process, operation, or change thereto) determines whether it involves a level of risk that merits R&SC review.

In addition, adherence to WV-914, *Unreviewed Safety Question Determination* (USQD) (WVNS), ensures (1) that proposed activities that would be outside of the approved WVDP authorization basis are identified and that appropriate actions are taken; and (2) that discoveries that represent conditions that are outside the approved WVDP authorization basis are identified and that the appropriate actions are taken to remedy the situation. The Safety Review Program complies with and implements the

requirements contained in DOE Order 5480.21, *Unreviewed Safety Questions* (USDOE December 24, 1991) and also implements former requirements contained in the canceled DOE Order 5481.1B, *Safety Analysis and Review System* (USDOE May 19, 1987).

A.10.4.1.4 Project Records

The WVNS Records Management System is outlined in WVDP-262, *WVNS Manual for Records Management and Storage* (WVNS). This document describes the actions and activities for controlling the generation, inventory, identification, transmittal, receipt, maintenance, processing, preservation, storage, retrieval, and destruction of WVDP records. The Records Management System has been developed to comply with the requirements of DOE Order 200.1, *Information Management Program* (USDOE September 30, 1996), and 36 CFR Chapter XII Subchapter B, Records Management, and ASME NQA-1 *Quality Assurance Program Requirements for Nuclear Facilities* (ASME 1989).

A.10.4.1.5 Y2K Compliance

All WVNS mission-critical systems were compliant, implemented, and validated on December 14, 1998. On March 3, 1999, the DOE Ohio Field Office Independent Validation and Verification (IV&V) Team determined that the WVNS Mission Critical systems are Y2K compliant per DOE guidance. Y2K issues that are not critical to the WVDP mission are 94 percent complete as of May 1999.

A.10.4.2 Safety Management Policies and Programs

A.10.4.2.1 Safety Performance Assessment

Safety performance appraisal of those organizations involved in the management of safety is carried out as part of the general WVDP Assessment Program. This program, implemented by WV-121, *Self-Assessment Program* (WVNS), covers all disciplines related to safety and includes such functional areas of inquiry as nuclear safety, emergency management, fire protection, occupational safety and health, radiological protection, and environmental protection. Disciplines are assessed at multiple levels, including line-organization self-assessments, management assessments, independent internal assessments, assessments conducted by external agencies, and performance monitoring, feedback, and issues management systems.

The WVDP Self-Assessment program complies with applicable DOE Directives governing assessment at DOE facilities, including DOE P 450.5, *Line Environment, Safety, and Health Oversight* (USDOE October 15, 1996), and DOE Order 5480.19, *Conduct of*

Operations Requirements for DOE Facilities (USDOE May 18, 1992). Individual departments provide safety performance review through Line Organization Self-Assessment, and department managers review safety as part of their Management Assessments. Cognizant Program assessments are performed by those departments that have cognizance of a particular safety discipline. The Safety Analysis and Integration department provides independent assessment of environment, safety, and health programs through its Performance Analysis program and its administration of the Safety Management System. The Quality Assurance department also provides independent assessment of ES&H programs through its audit and surveillance program.

WVDP-242, *Event Investigation and Reporting Manual* (WVNS), contains procedures which provide for root cause analysis and trending of site ES&H performance. Other formal programs such as the Conduct of Operations Surveillance Program, implemented by WVDP-106, *Westinghouse Conduct of Operations Manual* (WVNS), and the Operational Readiness Review (ORR) Program, implemented by WV-368, *Operational Readiness Determination For Startup/Restart* (WVNS), complement the formal self assessment process described in WV-121.

A.10.4.2.2 Configuration and Document Control

The WVNS configuration and document control program is composed of five major elements:

- Program Management;
- Design Requirements;
- Document Control;
- Change Control; and
- Assessment/Review.

Combined, these elements establish and maintain consistency in design requirements, physical configuration, modifications to the facility or its operation, and facility documentation. The WVDP design basis is established and maintained through design control elements contained in WVDP-002, *Quality Management Manual* (WVNS). The WVDP safety basis is broader in concept than the design basis and includes managerial, institutional, programmatic, and human factors dimensions as discussed throughout Chapters A.8.0, A.10.0, and A.12.0 of this SAR.

Program management identifies objectives and activities such as the project mission/charter, management approach, and cost and schedule control. To implement these goals, various WVDP Project Plans have been issued, including WVDP-075, *DOE WVDP Project Management Plan* (WVNS), and WVDP-095, *WVDP Major Systems Acquisition Project Plan* (WVNS).

Design requirements are implemented through control of approved engineering procedures and design documents such as design criteria, drawings, specifications, and functional and operational requirements.

Document control and change control are combined into one program that has been developed in accordance with the requirements of ASME NQA-1. The program describes how to prepare, review, approve, issue, use, and revise documents that either prescribe quality-affecting activities, specify requirements, or establish design. Controlled instructions and procedures are distributed to, and used by, the person performing the activity. Site-wide procedures that define the document control and change control system provide:

- Integrated Safety Management and Control of Documents;
- Document Control;
- Preparation, Review, Approval, Distribution, and Revision of Controlled Documents;
- Controlled Distribution and Maintenance of Operations Documents;
- Preparing, Issuing, Field Changing, and Revising Developmental Operating Procedures, Standard Operating Procedures, and Special Instruction Procedures;
- Engineering Change Notices;
- Engineering Release of Documents;
- Engineering Document Control; and
- Field Change Notice.

A.10.4.2.3 Event Reporting

Abnormal events at the WVDP are investigated and reported in accordance with WV-987, *Occurrence Investigation and Reporting* (WVNS), and WVDP-242, *Event Investigation and Reporting Manual* (WVNS). WVDP-242 implements the requirements of DOE Order 232.1A, *Occurrence Reporting and Processing of Operations Information* (USDOE July 21, 1997), DOE Manual 232.1-1A, *Occurrence Reporting and Processing of Operations Information* (USDOE July 21, 1997), and DOE Order 5480.19, Change 1, *Conduct of Operations Requirements for DOE Facilities* (USDOE May 18, 1992). This policy establishes the requirement for WVNS to develop and implement a process for determining, evaluating, reporting, and correcting events and conditions at the WVDP, including those occurrences involving WVNS subcontractors. The types of events covered by this process include, but are not limited to, events related to safety, health, security, operations, property, quality assurance or the environment.

A.10.4.2.4 Safety Culture

WVNS has implemented a comprehensive program for worker protection, based on a safety policy that states: "Exceed customer expectations without injury or illness." WVNS has formatted its safety program to be an integrated safety management system which is implemented by the guiding principles of the OSHA Safety and Health Management Guidelines. These guidelines are the precursor to DOE Policy 450.4, *Integrated Safety Management,* (USDOE October 15, 1996) and DOE Order 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees.* (USDOE, March 27, 1998). Documents that implement the WVDP integrated safety management system are identified in WVDP-310, *WVDP Safety Management System Description (WVNS).*

WVNS has instituted the Safety Success Team, an employee-driven safety committee given the authority to implement safety program initiatives. This team has an active role in establishing safety goals, measuring performance, providing feedback to the workforce, and developing activities intended to motivate and reward worker safety. Some of its sub-teams include the Safety Observer Committee, the Accident Prevention Team, and the Off-the-Job Safety Committee.

There are several avenues available for employees who have safety concerns. The use of the Chain-of-Command, the Safety Department, the Safety Improvement Report, and the Safety Committees are encouraged as primary methods for reporting concerns. The Employee Concerns Program described in WV-990, *Employee Concerns Program* (WVNS), was established to provide an opportunity to formally report any condition that was

considered to be an environmental, health, safety, fraud, abuse, or quality concern. Workers are trained and encouraged to report concerns without fear of any reprisal.

WVNS promotes a strong Conduct of Operations work ethic and a "Stop Work" policy. Simply stated: any worker who believes that work they have been asked to do is unsafe has the right and responsibility to refuse. The issue must be resolved to the worker's satisfaction before the job can proceed.

WVNS systematically integrates safety into management and work practices at all levels so that missions are accomplished while protecting the public, the worker, and the environment. This integration is accomplished by implementing an Integrated Safety Management System (ISMS). The DOE has developed seven guiding principles to provide the focus for implementing an ISMS. These principles are:

1) Line Management Responsibility for Safety
2) Clear Roles and Responsibilities
3) Competence Commensurate with Responsibilities
4) Balanced Priorities
5) Identification of Safety Standards and Requirements
6) Hazards Control
7) Operations Authorization

While these principles guide the implementation of an ISMS, five core functions define its make-up. These functions comprise a cycle of activities which, although different in detail, are the same for activities on a program or site level and a facility and work task level. The core functions are:

1) **Define the Scope of Work** - This function includes identifying all tasks associated with the activity and identifying resources needed to perform the activity.
2) **Analyze the Hazards** - On a work task level, this function includes identifying the physical and environmental hazards involved in an activity (radiation level, heat, potential for release of contaminants.) On a facility or program level, this includes developing and maintaining safety analysis documentation.
3) **Develop Hazards Controls** - This function includes administrative and engineering controls, design controls, and training. As examples, the controls can take the form of personnel protective equipment or technical safety requirements.

4) **Perform Work Within Controls** - This function provides the means to ensure that once the controls are developed, the work is performed within the controls.

5) **Provide Feedback and Continuous Improvement** - This function closes the loop for the work activity. Lessons-learned from one activity are identified so that they may be incorporated into subsequent activities. This feedback includes both things that went right as well as things that went wrong.

A.10.4.3 Maintenance and In-Service Surveillance Program

The WVDP has developed a maintenance and surveillance program consistent with the requirements of DOE Order 4330.4B, *Maintenance Management Program* (USDOE February 10, 1994), which has been superseded by DOE Order 430.1, *Life Cycle Assessment Management* (USDOE August 24, 1995). The maintenance program, which is administered through guidelines set forth in WVDP-170, *West Valley Nuclear Services Maintenance Manual* (WVNS), provides the policy to ensure that maintenance activities are conducted to preserve or restore the availability, operability, and reliability of plant structures, systems, and components important to the safe operation of the facilities. All maintenance activities, policies, programs, and procedures incorporate the DOE Conduct of Maintenance philosophy as adopted by WVNS in WVDP-158, *Westinghouse Conduct of Maintenance Manual* (WVNS). A complete description of the WVDP maintenance program is given in WVDP-170.

An instrumentation surveillance program, which includes an instrument calibration recall (ICR) system, is implemented through WV-109, *Instrument Data and Recall Tracking System* (WVNS). This procedure satisfies the recall requirements of WVDP-002, *Quality Management Manual* (WVNS) and DOE Order 4330.4B. A preventive maintenance (PM) tracking system is implemented by WV-108, *Preventive Maintenance Recall Tracking System and Component Information Input* (WVNS). These systems use computerized databases to document and forecast ICR and PM activity.

Management of the maintenance organization is through the Maintenance Manager, who reports to the Site Operations and Facility Closure Projects Manager. As indicated in WVDP-170, interfaces have been established between the Maintenance organization and several other WVDP organizations, including Quality Assurance, Training and Development, Radiation Protection, Industrial Hygiene and Safety, and Operations.

Training and qualification programs are provided for all maintenance personnel and maintenance supervisors. This training includes general employee training, radiation safety and industrial hygiene (OSHA) training, and training specific to skilled trades. The training qualification standards specify knowledge and performance requirements and designate documentation of the major areas of training with which the maintenance personnel will be involved. Training and proficiency requirements for maintenance personnel are contained in formal Maintenance Qualification Standards.

Specific facilities are designated for nonradiological maintenance activities and for the contact maintenance of contaminated equipment, including master-slave manipulators, pumps, etc. Maintenance equipment is stored in a site tool crib.

Routine maintenance activities are conducted per approved procedures. These procedures are identified, developed, documented and maintained in the same manner as all other site operating procedures, as described in Section A.10.4.1. Non-routine maintenance activities potentially involving radiological or industrial hazards are performed in accordance with detailed instructions provided in approved work orders. Non-routine maintenance activities that do not require special hazards protection requirements, such as simple fabrication or common repair tasks, are performed per instructions in work requests.

Post-maintenance testing is performed after corrective maintenance and after some preventive maintenance activities. The site work control system is used for the control, documentation, and review of post-maintenance testing. Specific requirements for post-maintenance testing are incorporated into the work documentation and are reviewed and verified during the approval process. Test results are documented and verified by the QA Department. No safety-related equipment is declared operable until post-maintenance testing is complete.

The program for control and calibration of measuring and test equipment (M&TE) used by the Maintenance Department confirms the accurate performance of facility instrumentation and equipment for testing, calibration, and repairs. Each piece of M&TE is assigned a unique identification number, allowing M&TE data to be recorded and tracked in accordance with WV-109. Only calibration standards that are traceable to the National Institute of Standards and Technology (NIST) are used for calibration of maintenance M&TE. Access to maintenance M&TE is traceable and under the control of the Maintenance Instrumentation and Calibration Group.

A maintenance history and trending program, implemented by both WV-108 and WV-109, is maintained to document data, provide historical information for maintenance planning, and support maintenance and performance trending of facility systems and components. To identify needed corrections or changes to the M&TE program, trending evaluation of M&TE performance is done each time a unit is inspected and calibrated. Maintenance history is traceable through electronic database by the unique equipment identification number.

A.10.4.4 Conduct of Operations

The WVDP has developed a formal conduct of operations program which is consistent with the requirements of DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*. Policy elements of this program, given in WVDP-106, *Westinghouse Conduct of Operations Manual*, set forth the DOE philosophy for safe facility operations and specific requirements to be included in facility and site procedures. A matrix for implementing elements of the conduct of operations program is contained in WV-110, *Conduct of Operations* (WVNS). Details on the WVDP operating organization may be found in the individual SAR modules and in organizational updates issued by the Human Resources Manager. Specific areas to which conduct of operations apply include the following:

- Shift Routines and Operating Practices

Practices for the safe operation of WVDP facilities consistent with the guidance given in WVDP-106 have been developed and implemented through approved facility procedures. These practices include daily and weekly planning meetings to brief operations personnel on near-term activities affecting the facility, routine surveillance requirements to ensure regular and systematic appraisals of facility conditions, and equipment status boards to indicate the operating status of major equipment.

- Control Room Activities

Control room access in site facilities is maintained through WVDP security restrictions. Control areas are clearly indicated and personnel access to these areas may be restricted beyond security controls if deemed necessary by the facility operations supervisor. Control rooms are manned as facility operations warrant.

Additional information on specific control room activities can be found in the individual SAR modules.

- Communications

The WVDP communications system includes a public address system, emergency all-page system, and radio and telephone communication system. These systems are tested frequently to ensure continuous operability for routine and emergency conditions throughout the site. These communication systems are discussed in Section A.10.5.1.5.

- Control of On-Shift Training

All facility operations personnel receive on-the-job training as a supplement to formal classroom training. On-the-job training provides trainees direct supervision by qualified trainers/instructors as they perform their actual job function. This training has been factored into the formal operations training programs described in Section A.10.3.

- Control of Equipment and Systems Status

Formal approved procedures, consistent with the guidance given in WVDP-106, have been developed for indication and control of the status of facility equipment and systems. Routinely-updated status boards located in each facility's shift office indicate the status of major equipment.

- Lockouts and Tagouts

Formal approved procedures, consistent with the guidance in WVDP-106, implement a site lock and tag program. This program ensures that systems and equipment are locked and tagged to the degree necessary to assure the protection of personnel during construction, maintenance, repair, decommissioning, and any other operation.

- Independent Verification Practice

Guidance for performing independent verification of facility equipment is provided in WVDP-106. Procedures governing critical equipment are evaluated against independent verification criteria.

- Log Keeping

Operating logs are maintained, used, reviewed, and stored in a manner consistent with WVDP-106. Logbooks are maintained for the life of the facility in accordance with WV-730, *Records Management and Storage* (WVNS).

- Operations Turnover

The WVDP has developed a procedure, consistent with the operations turnover protocol given in WVDP-106, that provides instructions for conducting an orderly and accurate transfer of information regarding a facility's overall status at shift turnover. The information necessary for operations turnover is in the form of a standard checklist and discussion between off-going and on-coming operators. Significant events such as changes in equipment operational status and shift activities are recorded in formal logbooks which are maintained in operations facilities.

- Operations Aspects of Facility Chemistry and Unique Processes

Activities consistent with WVDP-106 are implemented for those aspects of operations involved in chemistry and unique processes. Specific guidance for these operations can be found in the individual SAR modules.

- Required Reading

A required reading program has been implemented in a manner consistent with the guidance given in WVDP-106. Additional guidance for required reading is given in WV-552, *Required Reading for WVNS Personnel* (WVNS).

- Timely Orders to Operators

Timely orders to operators are issued, reviewed, and maintained in a manner consistent with WVDP-106 guidance.

- Operator Aid Postings

Operators aids are developed, reviewed, posted, and logged in a manner consistent with WVDP-106 guidance.

- Equipment and Piping Labeling

A formal approved procedure, consistent with WVDP-106, has been developed for system and component labeling. This procedure ensures consistent, readable, and permanent identification of plant areas, valves, pipes, instruments, breakers, switches, electrical and control panels, and electrical components inside panels.

A.10.5 Emergency Preparedness Program

A.10.5.1 Introduction

The West Valley Demonstration Project (WVDP) site emergency plan is provided in WVDP-022, *WVDP Emergency Plan* (WVNS). The site hazards assessment is presented in WVDP-193, *WVDP Hazards Assessment* (WVNS), and the site hazards survey is presented in WVDP-273, *WVDP Hazards Survey* (WVNS). WVDP-022 is implemented via a series of implementing and administrative procedures contained in WVDP-139, Vol. I, *Emergency Management Implementing Procedures* (EMIPs) and WVDP-139 (WVNS), Vol. II, *Emergency Management Administrative Procedures* (WVNS). WVDP-171, *WVDP Emergency Readiness Assurance Plan* (WVNS), contains summaries of current year activities and the five-year plan for emergency management.

A.10.5.1.1 Purpose

WVDP-022 describes the WVDP emergency planning, preparedness and response program which is designed to respond to and mitigate the potential consequences of an emergency. The emergency plan provides an organized plan of action, identifies authorities and responsibilities of emergency response personnel and organizations, and identifies the manpower and equipment available during operational emergencies at the WVDP.

WVDP-022 has been prepared to meet the requirements of the Department of Energy (DOE) Order 151.1, *Comprehensive Emergency Management System* and related DOE Emergency Management Guides, the Resource Conservation and Recovery Act (RCRA) contingency plan requirements of 40 CFR 265 Subpart D, *Contingency Plan and Emergency Procedures* (USEPA) and the requirements of 6 NYCRR Part 373-3.4, *Contingency Plan and Emergency Procedures* (New York Code of Rules and Regulations).

The primary purpose of WVDP-022 is to provide the direction and approach used to minimize the impact of any emergency upon the safety and health of site personnel,

the general public, and the environment. Protection of facility property is a secondary objective. The goals of the emergency plan are to:

- Maximize the safety of on-site personnel;
- Minimize the potential exposure to the general public;
- Minimize environmental impacts; and
- Limit loss or damage to the facility and plant equipment.

The WVDP has the required personnel and resources to adequately assess the actual or potential on-site or off-site consequences of an emergency condition, including:

- Timely initial assessment of actual or potential consequences;
- Integration of the initial consequence assessment process with the implementation of emergency classification;
- Monitoring and evaluation of specific indicators necessary for continual assessment; and
- Coordination with off-site response organizations.

Provisions for protective actions during an emergency are in place to protect the public and on-site personnel. The WVDP uses Environmental Protection Agency (EPA) Protective Action Guidelines (PAGs), the American Industrial Hygiene Association (AIHA), and the Emergency Response Planning Guidelines (ERPGs) in determining or reevaluating protective action recommendations. Chapter 7 of WVDP-022 discusses the use of protective actions during on-site emergencies.

A.10.5.1.2 Scope

The emergency plan and emergency management procedures provide an organized program of action to cope with emergencies at the WVDP, identifies emergency response organizations, personnel, and responsibilities, and lists manpower, facilities, and equipment resources available for such situations. The Radiological Assistance Plan (RAP) for DOE Region 1, which includes the New England states, New York, New Jersey,

Pennsylvania, Delaware, Maryland, and the District of Columbia, has been incorporated into WVDP-246, *WVDP Radiological Assistance Plan (WVNS)*.

A.10.5.1.3 Emergency Response Organizations

This section identifies emergency response organizations (EROs) for the WVDP and their functions and responsibilities. Staffing of the EROs is presented in Table A.10.5-1 and their functions and responsibilities are shown in Table A.10.5-2.

A.10.5.1.3.1 U.S. Department of Energy

The DOE response organization includes the manager of the DOE Field Office and the OH/WVDP Project Director (DOE-PD). The manager of the DOE Field Office, through the DOE-PD, is responsible for overall executive direction of emergency planning, preparedness, response, and readiness at the WVDP.

A.10.5.1.3.2 WVDP ERO

The WVDP ERO consists of functional groups:

- Emergency Operations Center (EOC)
- On-Scene Command (including emergency response teams)
- Technical Support Center (TSC)

The members of these groups and their duties are outlined below and in Volume I of WVDP-139.

EOC Staff

The Emergency Director (ED) has the ultimate responsibility for all WVDP emergency activities per WVDP-139. During an emergency, the WVDP Site Contractor President acts as the ED. The ED interacts with the DOE-PD and off-site response agencies, but maintains executive control of all emergency situations affecting WVDP operations. In addition, the ED shall:

- Activate the EOC and WVDP emergency response personnel, as needed.

- Make an "812" All Page announcement when the EOC is operational.
- Provide for regular briefings by and to the EOC/TSC/Operation Support Center (OSC) staff.
- Classify and/or re-classify events per WVDP-139.
- Approve all news releases in conjunction with the DOE-PD prior to release.
- Approve all protective actions, including evacuations, relocations, and sheltering orders.
- Authorize requests by WVDP personnel for emergency assistance from off-site organizations or agencies.
- Authorize notification in consultation with the DOE-PD of off-site local, county, and state officials as appropriate.
- Initiate recovery planning where appropriate; review and approve recovery plan(s) in conjunction with the DOE-PD.
- Authorize termination of emergency response and deactivation of the EOC when termination and recovery criteria are met per WVDP-139.

The Assistant Emergency Director (AED) is responsible for assisting the ED in managing the activities and personnel during EOC activation per WVDP-139. The AED obtains all emergency-related technical, radiological, hazardous materials, and operational information from managers within the EOC and advises the ED on actions to mitigate the consequences of the emergency. The AED begins recovery planning and submits the Recovery Planning Outline to the ED and DOE-PD for review and approval.

The DOE Project Director (DOE-PD) is responsible for providing DOE oversight of the WVDP emergency response actions as outlined in WVDP-139. The DOE-PD interacts with the ED to assist, review, or concur in the decision making process, including classification of the emergency, offsite notifications, news releases, termination and recovery.

The DOE Facility Representative, dispatched at the discretion of the DOE-PD, provides a DOE presence at the scene of the emergency to act as a liaison between the field and the DOE-PD for emergency situations and response activities including: protective actions assessment, plant operations status and trends, on-scene conditions, activities, and personnel.

The New York State Energy Research and Development Authority (NYSERDA) Representative is responsible for notifying the NYSERDA Program Director in Albany, New York, of the emergency and for keeping the NYSERDA Program Director informed and updated on events during the emergency per WVDP-139.

The Notification Officer is responsible for notification of off-site authorities in accordance with the requirements given in WVDP-139. Authorization to initiate the notification process is required from the DOE-PD and from the ED.

The Operational Assessment Manager (OAM) is responsible for providing the AED with evaluations and data analysis of plant emergency. The OAM conducts activities per WVDP-139. The OAM is responsible for initiating contact with the Operations Manager of the affected system, whose presence will be required either in the field or in the EOC, as determined and assigned by the OAM. Plant emergency control actions based on plant status and trends will be provided by the OAM to the IC and/or the Operations Manager of the affected system.

The Vitrification Liaison (VL) is responsible for providing evaluation and data analysis of vitrification-related emergencies, per WVDP-139. The VL consults with the OAM and recommends actions or responses to mitigate the effects of the emergency on vitrification and/or High Level Waste Operations systems and equipment.

The Radiological and Environmental Assessment Manager (REAM) is responsible for the evaluation of the radiological, environmental and safety related aspects of the emergency and directing the rescue and/or care of involved personnel. Per WVDP-139, the REAM evaluates information provided by the SEAM and the RPM. The REAM initiates and maintains communications with the RPM, who serves in the field.

The Safety and Environmental Assessment Manager (SEAM) is responsible for evaluating calculated radiological and/or chemical hazard impacts to the public and the environment and providing results to the REAM. The Project Manager for Environmental and Safety Services serves as the SEAM.

The Security Manager (SM) is responsible for maintaining WVDP and Ashford Office Complex (AOC) security during the emergency and directing the security force in supporting response teams in accordance with WVDP-139. The SM coordinates egress and ingress of emergency personnel and vehicles, provides notifications to emergency responders as directed by the IC, coordinates personnel accountability activities during an offsite evacuation or on-site relocation, and provides liaison with the county and state law enforcement officials.

The Human Resources (HR) Manager is responsible for coordinating actions with the ED, SM, PID, and any other EOC member needing assistance with personnel related issues. The HR Manager identifies WVDP casualities and where they are being treated, makes notifications to family members of injured employees, and monitors the status of injured personnel. The HR Manager also monitors the conditions of employees to ensure the comfort and safety of on-site personnel.

The Public Information Director (PID) directs and coordinates emergency public information within the EOC, including emergency public information development, obtaining approval for press releases from the ED and the DOE-PD, and relaying the approved emergency public information to the EPI Coordinator.

The DOE Communicator is responsible for establishing telephone communication with the DOE-OH Duty Officer and the DOE Headquarters Emergency Operations Center (DOE-HQ-EOC) in accordance with WVDP-139. A OH/WVDP Staff Representative serves as the DOE Communicator.

The Technical Support Center (TSC) Manager is responsible for assuring that the TSC is staffed with the necessary personnel representing areas of expertise appropriate for the emergency situation. Per WVDP-139, the TSC Manager coordinates and supervises technical activities and personnel in the TSC and provides interface between TSC staff and the AED.

The EOC Facilitator establishes communications with the ED and the OSC Facilitor and provides logistic and administrative support to the EOC.

The OSC Facilitator establishes communications with the EOC Facilitator and provides logistic and administrative support to the EOC.

The Data Recorders record pertinent information about the emergency on the computerized data management system as it becomes available. Computer Data Display

System (CDDS) recorders represent the Operations, Radiological, and Computer Systems groups.

The Secretary provides clerical and communications support to the EOC staff.

Incident Command Staff

The Incident Commander (IC) is responsible for the activation and overall supervision of on-scene personnel performing emergency response actions. The Main Plant Operations Shift Supervisor (MPOSS) serves as the IC. The IC keeps the EOC informed of all on-scene response actions, directs equipment shutdown or other actions that are required to mitigate emergency situations, and serves as the chief of the WVDP Operations Response Team (Fire Brigade) until the arrival of the West Valley Volunteer Hose Company, Inc. (WVVHC). The WVVHC, which is contacted at the determination of the IC, then becomes part of the WVDP Emergency Response Organization (ERO) under the control of the IC. Details of the interface, notification, and activation responsibilities of the IC are stated in WVDP-139.

The Radiation Protection (RP) Manager is responsible for evaluating the radiological aspects of the emergency and the need for rescue and/or care of involved personnel per WVDP-139. During activation of the EOC, the RP Manager receives notification from the REAM to evaluate emergency-related issues concerning radiological health and safety, personnel monitoring, and support of the Emergency Medical Response Team (EMRT) during treatment of contaminated-injured personnel. For incidents that do not require EOC activation, the Radiological Protection Operations (RPO) Supervisor shall notify the RPM of emergency events per Radiation Protection (RP) Department established protocols and procedures, as detailed in WVDP-010, *WVDP Radiological Controls Manual* (WVNS).

Operations Manager (OM). Depending upon which areas of the site are affected, the OM may be either the High Level Waste (HLW) Tank Farm Operations Manager, the Waste Management Operations (WMO) Manager, the Vitrification Operations Manager, or the Main Plant Operations (MPO) Manager. Notification of the emergency condition is provided to the OM by the Site Operations Manager. If multiple systems are involved, the OAM or the ED shall designate a primary OM. The OM has the primary responsibility for the shutdown or continued operation of plant equipment, as appropriate, to mitigate the consequences of an emergency. In the event that a system stops operation in response to a fire, explosion, or release, the OM ensures that monitoring is performed for leaks, pressure buildup, gas generation or ruptures

in valves, pipes or other equipment. The OM is responsible for providing the OAM with an accurate appraisal of plant equipment status.

Radiation Control Technicians (RCTs) are responsible for evaluating the radiological health aspects of the emergency and advising the IC of precautionary measures and actions to be taken. The RCTs provide immediate notification to the Radiological Protection Operations (RPO) Supervisor during potential or actual emergency conditions.

Qualified Operators assist the IC, Operations Supervisor(s), and/or the Operations Manager of the affected system with the initial assessment and mitigation of the emergency situation.

The Security Supervisor reports immediately to the IC and acts as an on-scene security director. The security supervisor assists emergency response teams in access and egress to areas and provides off-site notifications to emergency responders, as directed by the IC or EOC. Personnel control and accountability are the responsibility of security and members of the security force who report any missing individuals to the IC. During any emergency in a controlled access area, such as the Fuel Receiving and Storage (FRS) area or the Waste Tank Farm (WTF), etc., the SSS is responsible for maintaining security overview and control of the affected area. This responsibility exceeds all others.

Other members of the Incident Command Staff are identified in Section A.10.5.1.3.3.

Technical Support Center Staff

The TSC is the third element of the WVDP ERO. The TSC is supervised by the TSC Managers who use the expertise of the following personnel:

- Engineering Staff - Provide engineering support on system design characteristics and remedial actions to mitigate problems. TSC staff are available from the following disciplines: electrical engineering, chemical engineering, instrumentation and control (I&C), mechanical engineering, nuclear engineering, vitrification systems and processes, industrial hygiene, toxicology, chemistry, drafting, maintenance, document control, and Operations Technical Support (OTS).

- Consultants - Provide advice on all technical and design characteristics of systems and services that may be affected by the emergency.

A.10.5.1.3.3 WVDP Emergency Response Groups

Emergency Response Teams are composed of trained and qualified operators, technicians, and security officers who are organized to respond to an emergency situation at the request of the WVDP ED or IC. The teams, which are part of the Incident Command Staff, are identified below.

Security personnel take action consistent with the *Site Security Plan,* Part 1 for WVDP (WVNS). Security personnel are immediately activated upon becoming aware of any potential or actual emergency conditions through discovery or through telephone, face to face communications, radio, or any paging system.

The Operations Response Team is composed of the following three groups:

- Fire Brigade (FB). The roles and responsibilities of the FB are delineated in WVDP-139. The FB is activated by the IC. Fire fighting readiness assurance is maintained through initial and annual training. The FB fights only incipient stage fires.

- The Confined Space Rescue Team (CSRT) is composed of operators trained and qualified in confined space rescue per OSHA requirements. The CSRT is activated only if rescue operation is required during confined space entry. Responsibilities of the CSRT are defined in WVDP-139.

- The Search and Reentry (SRE) Team is activated when the IC selects team members from available HAZMAT Team and Radiological Controls personnel per WVDP-139. All activities are conducted under the direction of the IC. Duties of this response team include: reentry into the plant during an emergency situation for the purpose of rescuing injured personnel and/or shutting down equipment which is causing the emergency condition; and obtaining information necessary for accident assessment.

- First Responders (FRs) deliver appropriate emergency equipment to the scene of all medical emergencies. They respond to medical emergencies, provide initial first aid, and assist with continuing patient care as necessary.

The Emergency Medical Response Team (EMRT) is composed of trained individuals with the responsibility to provide initial first aid to injured personnel until relieved by off-site emergency medical responders. Duties, lines of authority, and interface for this response team are defined in WVDP-139 and WVDP-253, *Emergency Medical Response Team Manual* (WVNS). During back shifts, the IC, MPO operators, radiological technicians, and members of security are responsible for providing initial medical response until off-site medical responders arrive. In the event an individual is contaminated and injured, the EMRT is in charge of patient care and receives decontamination support from RP personnel.

The HAZMAT Team is responsible for initial containment and mitigation of releases of hazardous substances or wastes. This team is activated by the IC via the "812" All Page, announcement, or through an off-hour emergency call list. The HAZMAT Team responds to releases of hazardous substances or wastes in accordance with WVDP-139.

The Radiological Controls Team is composed of the Radiological Protection Operations Supervisor (RPOS) and RCTs. The RPOS is responsible for assigning qualified technicians and providing necessary support/equipment per WVDP-139. The Radiological Controls Team is activated by the IC through any "812" All Page announcement, and automatically upon activation of the EOC. Assembly takes place in the RPO Shift Office or as otherwise directed by the IC or RPOS. Responsibilities of this team include on-scene radiological monitoring and support of the SRE or HAZMAT Team. Personnel monitoring is performed by the Radiological Controls Team and includes personnel surveys and decontamination of individuals as directed by the RCOS. In the event an individual is contaminated and injured, the Radiological Controls Team provides decontamination support to the EMRT which is in charge of patient care.

The Environmental Monitoring Team (EMT) is composed of several units, each with a Team Leader and one or more team members. The reports of the team leader are forwarded to the Environmental Laboratory (E-Lab) Manager and then to the Safety and Environmental Assessment Manager (SEAM). The team leader is the designated environmental scientist responsible for providing direction and supervision for the collection of radiological and/or nonradiological data and all team members are knowledgeable in the use of all E-Lab instrumentation, in sample collection techniques, mapping, and communications. Upon activation, the EMT assembles in the E-Lab. Support equipment for this team is stored in either the Mobile Lab or in the E-Lab. The EMT is activated by the SEAM if the EOC is activated or via the "812" All Page system. In addition to the field team(s), designated team support members remain in the E-Lab to handle meteorological and field data, communications, team

dispatch, and release trajectory and dose estimates and/or concentration calculations.

A.10.5.1.3.4 Medical Facilities

Employee Health Services (EHS) is located in Trailer F across from the Main Plant Process Building. The facility consists of a nurse's station, a first aid station, and a doctor's office. Minor and routine first aid services are performed on-site. A Letter of Agreement (LOA) to provide fire protection and ambulance services for ill or injured patients, including those possibly contaminated with radiological or hazardous materials, exists with the West Valley Volunteer Hose Company (WVVHC). In addition, air ambulance transport support for ill, injured, and/or contaminated personnel is provided by Mercy Flight through a letter of agreement (LOA).

A.10.5.1.3.5 Off-Site County and State Agencies

During emergency situations WVNS maintains close liaison with appropriate local, county and state officials.

New York State (NYS) Emergency Management Organization:

NYS Emergency Management Office is the state agency authorized to mobilize the state emergency response agencies, if required, per the NYS Emergency Plan.

NYS Department of Health (NYSDOH) is the state agency responsible for the assessment and evaluation of the emergency condition and for recommending the appropriate protective actions for off-site areas.

NYS Warning Point is the State Agency authorized to receive initial notification from the WVDP. The NYS Warning Point is part of the NYS Police.

NYS Office of Disaster Preparedness is the state agency responsible for the coordination of all state and local activities throughout the emergency.

NYS Department of Environmental Conservation is responsible for administration of the Hazardous Waste regulatory program in New York State.

County Response Organization:

Cattaraugus County and Erie County Offices of Emergency Management. The Emergency Response Directors in Cattaraugus and Erie Counties receive initial notification from the WVDP for an Alert and a Site Area Emergency (SAE). They have the responsibility for initiating any necessary off-site protective actions, based upon available information from the WVDP Emergency Director (ED) and the NYSDOH. In addition to overall responsibility, they have the responsibility for direction and control of county emergency resources. The WVDP has established Memoranda of Understanding (MOUs), documented in Appendix C to WVDP-022, with the Cattaraugus County Office of Emergency Services.

Other Local Agencies. The DOE-PD or ED requests support, as necessary, from the following agencies:

- Cattaraugus County Office of Disaster Preparedness
- Erie County Sheriffs Department
- Cattaraugus County Sheriffs Department
- Cattaraugus County Highway Department
- Cattaraugus County Department of Health.

The WVVHC, by agreement with West Valley Nuclear Services Co., provides fire protection, ambulance service, and traffic control when requested. In addition, the WVDP has an LOA with the Town of Ashford to operate the Alternate Emergency Operations Center (AEOC) on the second floor of the Ashford Community Center (ACC) and with Bertrand-Chaffee Hospital (BCH) for treatment of contaminated-injured patients. Erie County Medical Center is the secondary treatment facility to the BCH for contaminated/injured patients. WVNS also has a LOA with Mercy Flight, which provides air ambulance services if requested. These agreements are documented in Appendix C to WVDP-022.

A.10.5.1.4 Emergency Control Facilities

A.10.5.1.4.1 Emergency Support Facilities

The Emergency Operations Center (EOC) provides senior management overview and strategic advice to the on-scene command group for resolution of immediate problems at the scene. Interface with outside agencies, public information, extended response planning, and longer range recovery plans are the responsibility of the EOC. The ED is in charge of all operations in the EOC.

Trailer 44 in the Administrative Trailer Complex has been designated as the location of the EOC. This room is furnished with telephones, tables, chairs, status boards, computers, maps (WVDP site, surrounding counties, and state), wall-mounted site page speakers, supply cabinet, scanner, cellular telephones, and power-fail telephones. There is also a microphone unit which is to be used by the ED during EOC activation to perform updates to ERO members within the EOC/TSC and OSC.

The Technical Support Center (TSC) provides technical support and information regarding engineering design and/or as-built construction details to the EOC. The TSC manager is in charge of all operations in the TSC. The TSC is adjacent to the EOC. This room is furnished with conference tables, chairs, telephones, cellular phone, computers, scanner and an emergency resource material center.

The News Media Center (NMC) is a facility provided to allow the news media access to information from the EOC. The NMC is located in the AOC library.

Emergency Public Information (EPI) facilities are located in Trailer 49 in the Administration Complex. Functions covered in the EPI facilities include the Telephone Team, the Media Monitoring Team, and Administrative Support. The Telephone Team answers incoming telephone calls from the public and the media and responds to telephone inquiries with approved information. The Media Monitoring Team tracks information being released about the site over television, radio, and print media and relates information back to the EOC. Administrative Support personnel maintain chronological files of press releases/notices and distribute approved information as directed. All of the functions covered within the EPI facilities in Trailer 49 may be relocated to the Ashford Office Complex in West Valley, NY, or the Joint Information Center (JIC) in Little Valley, NY.

The Alternate Emergency Operations Center (AEOC) is located on the second floor of the Ashford Community Center (ACC), which is located on Route 240 in West Valley, NY. It is used for emergency management in the event the EOC is not habitable.

The Main Gatehouse, houses the Alarm Monitoring Station (AMS). During an emergency condition, WVDP Security is responsible for controlling appropriate movement, ingress, and egress of personnel and vehicles throughout the WVDP; communicating with and assisting local and state law enforcement agencies; providing necessary security to the EOC and the NMC; supporting response teams as necessary; and assisting in personnel evacuation and personnel accountability activities.

A.10.5.1.4.2 Environmental and Dosimetry Laboratories

Environmental Laboratory (E-Lab). The E-Lab assesses the impact of any release of radioactivity or hazardous material or hazardous waste to the environment and the impact to personnel and property both on and off-site.

Additional E-Lab emergency-related activities include:

- Environmental sample analysis and coordination of analyses by other laboratories.
- Use of data from the WVDP meteorology system to plot trajectories of airborne releases.
- Operation of the WVDP Environmental Mobile Laboratory and providing a record of its movements (i.e., release, return, and location).
- Reporting the results of analyses and data to the Environmental, Safety, Quality Assurance, and Laboratory Operations (ESQA&LO) Manager.

The E-Lab is located in the Administrative Trailer Complex. The facility contains instrumentation necessary for processing and analysis of environmental samples, source term identification, and determination of meteorological trajectories.

Environmental Mobile Laboratory. The Environmental Mobile Laboratory is available for response to on-site and off-site emergencies. This self-contained unit is capable of functioning as a health physics and radio-analytical field laboratory. It can be used to perform airborne sampling for ammonia (NH_3) and nitrogen oxides (No_x).

WVDP Meteorological System. The meteorological system is designed to provide atmospheric dispersion data specific to the topography of the site. The system consists of two towers and a digital data acquisition and display system.

The two towers are life-of-project installations. The regional installation is a 10-meter tower located on an unobstructed hilltop near the site. This tower is used to measure wind speed and wind direction which has not been influenced by local terrain. These data are telemetered to the on-site digital acquisition system. The other tower is located on-site. The on-site tower is 60 meters high and is used to measure wind speed, temperature, and wind direction at 10 meters and 60 meters. These data are recorded by the data acquisition system. The data recorded by the on-site and regional towers are used to calculate stability class, and in combination with source term data, to calculate dose and concentration isopleths for real or hypothetical accident releases. The data collected by the data acquisition system can be accessed in the E-Lab, the remote terminal located in the EOC, and the Main Plant Operations (MPO) Shift Office.

Dosimetry Laboratory. The Dosimetry Laboratory is located in the Administration Trailer Complex. The facility contains instrumentation necessary for performing whole body counts and processing personnel dosimetry. Emergency-related activities include:

- Supplying and processing emergency response personnel dosimeters and reporting their results.

- Determination of body burdens through whole body counting and analysis of bioassay samples.

A.10.5.1.5 Communications

During emergencies and recovery operations, communications are maintained (as appropriate to the conditions of the emergency) between emergency response personnel, the TSC, the NMC, the EOC, DOE-Headquarters, OH/WVNS, other federal agencies, and related emergency services (i.e., fire, security, and medical).

A.10.5.1.5.1 WVDP Communications Equipment

When the EOC is activated, communications with the WVDP Emergency Response Teams are accomplished in the most expedient manner available. Portable radios are the primary

equipment, and shall be used to the extent that emergency response groups can maintain clear contact. Other equipment available for communication purposes includes:

- VF GAI-Tronics Communications system
- 812 All-Page system
- 222 Plant Page system
- Plant Telephone system
- Power Fail Telephone system
- Cellular Mobile Telephone system
- Hand held 2-way Communications Radios

WVDP Network

The WVDP Portable Radio Network is composed of ten frequencies. Approximately 15 different departments use these frequencies, including Operations, Construction, EOC, et al. Because portable radios are used by more groups (15) than there are FCC-approved frequencies (10), users share frequencies with the primary operating department assigned to each frequency. Supporting agencies must be given permission by the primary operating department manager before being given access to a particular frequency. The hierarchy of departments using each frequency is shown in Table A.10.5-3.

Sheriff's Radio

WVNS has a mutual aid agreement with the Cattaraugus County Sheriffs Department. Two security patrol vehicles and the Main Gatehouse security personnel have communications capability with the Sheriffs Department. This radio link can be used to request assistance, or as a source of emergency information.

A.10.5.1.6 Detection and Warning Systems

Fire, off-site evacuation, on-site relocation, and sheltering warning signals throughout the WVDP site ensure that trained personnel provide the appropriate response when those alarms/signals are activated.

A.10.5.1.6.1 Fire

The operating areas are equipped with smoke detectors, fire pull stations, and/or sprinkler alarm systems to signal fire emergencies. In addition to these alarms, WVDP personnel utilize the "812" All Page system to announce the location of fires.

A.10.5.1.6.2 Radiation/Contamination

Continuous Air Monitors (CAMs)

CAMs, which have audible and visual alarms, are placed strategically around the plant. RP is responsible for determining monitoring points and for the calibration and maintenance of these instruments.

Area Radiation Monitors (ARMs)

ARMs are located throughout the facility in occupied areas where high exposure rates to personnel are expected. Like CAMs, these monitors have audible and visual alarms. RP is also responsible for the maintenance, calibration, and periodic testing of these instruments.

Process Radiation Monitors (PRMs)

PRMs are used to detect high levels of radiation at key locations in process stream(s). The monitors that have a role in identifying operational emergencies at the WVDP are discussed in WVDP-193 and WVDP-139. RP is responsible for the maintenance, calibration, and periodic testing of these instruments.

Monitors

Environmental Affairs is responsible for the maintenance, sample collection and analysis, calibration, and periodic testing of these instruments. They are located as follows:

- Stack Monitoring. Airborne effluents are monitored at several facilities at the WVDP with continuous isokinetic stack monitors. These instruments monitor gross alpha and beta-gamma activity. Specific details regarding these monitors are contained in the *Site Environmental Report for Calendar Year 1999* (WVNS, 2000).

- Personnel Contamination Monitors (PCMs). There are several PCMs located throughout the site at the exits of radiologically controlled areas.

- Portal Monitors. The WVDP has one Portal Monitor, whose use is optional, in the Main Gatehouse entrance. This monitor has local audible and visual alarms. RP is responsible for the maintenance, calibration, and periodic testing of this equipment.

A.10.5.1.6.3 On-Site Relocation

On-site relocation is achieved either via the "812" All Page announcement or through local alarms.

Site personnel are to listen to the "812" All Page for all instructions. When directed to relocate, personnel are to go immediately to the designated assembly area, unless directed to do otherwise by the IC or the ED. If the IC or ED determines that another designated assembly area will be used, the designated assembly area will be announced on the "812" All Page.

The "812" All Page is tested weekly.

A.10.5.1.6.4 Off-Site Evacuation Alarm

All individuals at the WVDP fall into one of four established response categories for off-site evacuation: Dismissable Eligible, Off-Site Assembly Required, ERO, or Essential Support Personnel. Each category is defined in WVDP-139.

The Off-Site Evacuation Alarm is a three-minute oscillating tone. When the off-site evacuation siren alarms, site personnel who have not been designated as ERO or Essential Support Personnel are to evacuate from the site immediately.

The off-site evacuation alarm is tested weekly.

A.10.5.1.6.5 Sheltering Signal

A sheltering signal alerts all personnel to take immediate sheltering action to limit exposure of personnel to releases of hazardous and/or radiological materials. The Sheltering Signal tone lasts thirty seconds. All personnel are instructed to perform the following actions upon hearing the signal:

1) If outside, seek the nearest indoor shelter immediately.

2) If indoors, remain indoors.

3) Shut down heating, air conditioning, or other sources of air intake in accordance with sheltering/ventilation stickers.

4) Close all windows and doors.

5) Remain inside and listen to the "812" All Page for follow-up instructions.

The Sheltering Signal is tested weekly.

A.10.5.1.7 Evacuation Routes and Roadblocks

Site personnel are provided with basic information on the proper evacuation route. The IC or ED selects the most favorable evacuation route, based on conditions at the time of the emergency. MOUs with the NYS Police, the Cattaraugus County Sheriffs Department, and the Erie County Sheriffs Department provide for law enforcement response when requested.

A.10.5.1.8 Training, Tests, and Exercises

A.10.5.1.8.1 Personnel Training

General Emergency Response Training

Responsibilities. WVNS must ensure that its employees are adequately trained in emergency preparedness principles and practices. Each new employee permanently assigned to work at the WVDP shall be given initial orientation training in the contents of WVDP-022 and WVDP-139. For employees not assigned specific responsibility or authority under the emergency management procedures, such training shall, at a minimum, provide information describing the action to be taken by an individual discovering an emergency condition, the location of the assembly areas, the identification of emergency alarms, evacuation, and the action to be taken on hearing such alarms.

Objectives. The primary objectives of emergency response training are as follows:

- Familiarize appropriate individuals with the WVDP Emergency Plan through related WVDP Emergency Management Implementing Procedures (EMIPs).
- Instruct individuals in their specific duties to ensure effective and expeditious action during an emergency.
- Periodically present significant changes in the scope or content of the emergency management procedures.
- Provide refresher training to ensure that personnel are familiar with their duties and responsibilities.
- Provide the various emergency organization groups with the required training to ensure an integrated and prompt response to an emergency situation.

Training of On-Site Emergency Organization Personnel. The Training and Development Manager and the Emergency Management (EM) Manager share the responsibility of providing personnel training and documentation of initial training and annual retraining programs for on-site WVDP Emergency Response Organization (ERO) personnel. The EM Manager is responsible for the content and accuracy of WVDP-022 and WVDP-139. Training programs have been established for personnel working at the plant site. The programs, which include initial indoctrination and subsequent retraining, are outlined in WVDP-139.

The training programs for members of the on-site ERO include annual exercises in which each individual demonstrates an ability to perform their assigned emergency functions.

Training of Off-Site Emergency Response Personnel. Off-site agencies that may be called upon to provide assistance in the event of an emergency are offered orientation training annually. This training covers basic concepts of radiation and hazardous materials protection, plant operations and security, location of hazards, and response. The following groups are offered these sessions:

- Fire and Rescue
- Air Ambulance Service (Mercy Flight Helicopter)

- Medical Support
- News Media
- Law Enforcement

A.10.5.1.8.2 Equipment Testing

WVNS must assure reliability under emergency conditions of all emergency equipment and instruments used for the detection and evaluation of emergencies, systems used for warning and directing personnel, and communication systems by providing routine maintenance and tests as required by technical specifications or operational safety requirements.

Equipment and instruments used for the detection and evaluation of emergencies, systems used for warning and directing personnel, and communication systems are routinely maintained and tested, as required by technical specifications or by EMAPs, to assure their reliability under emergency conditions. Results of these tests are documented and needed repairs are implemented as soon as possible. Portable instruments are checked periodically for operability and are recalibrated as required by the instrument manufacturer.

A.10.5.1.8.3 Exercises and Drills

Definitions

Exercise. An evaluated demonstration of the integrated capabilities of emergency response resources (personnel, procedures, facilities, and equipment) conducted for the purpose of validating elements of an emergency management program.

Drill. A supervised, hands-on instruction period for individuals of teams intended to develop and/or maintain specific emergency response skills or operational capabilities. Its purpose is training. Drills may be used to prepare for exercises as well as to resolve deficiencies or develop improvements in specific functional areas identified in previous exercise. A drill is often a component of an exercise.

Purpose and Responsibilities

Periodic exercises and drills are conducted in order to test the state of emergency preparedness of participating personnel, organizations, and agencies. Exercises or drills are conducted to:

- Ensure that participants are familiar with their respective duties and responsibilities.
- Verify the adequacy of WVDP-022 and WVDP-139.
- Test the operability of the communication network and system.
- Check the availability of emergency supplies and equipment.
- Verify the operability of emergency equipment.

The results of the exercises/drills form the basis for prescribing actions to eliminate identified deficiencies.

WVNS is required to perform an emergency at least once every three years. The EM Manager is responsible for developing realistic accident scenarios. The scope and depth of the exercises or drills should be commensurate with potential emergencies at the facility. Realistic scenarios should test the adequacy of personnel, equipment, plans, and procedures to cope with emergency situations.

Emergency-oriented personnel, such as Security, Fire Department, medical, radiological assistance, and HAZMAT, etc., are integrated into exercises consistent with the programmatic demands and the objectives of the exercise.

Drills and exercises include (but are not limited to) the following considerations: sheltering, evacuation, relocation, personnel accountability, activation of emergency response facilities, emergency management damage assessment actions, SRE, recovery efforts, notification of OH/WVDP and contractor management, utilization of communication equipment, facility and equipment shutdown, and public information releases.

Exercises are terminated or suspended at the first indication of danger to life or property and include an appropriate number of evaluators, a debrief immediately

following the exercise, and a critique for issues of events that require the level of investigation outlined in WVDP-242, *Event Investigation and Reporting Manual* (WVNS). Strengths and weaknesses are noted and discussed during the post-drill/exercise evaluation. The evaluation is based on the ability of participants to follow WVDP-022 and WVDP-139, the adequacy of the plan and procedures, and the adequacy of emergency equipment and supplies. The EM Manager is responsible for any necessary changes in the EMIPs and for recommending changes in the Emergency Plan.

A report of the exercise/drill, noting errors, deficiencies, recommendations and assigned corrective actions is submitted to the responsible staff managers, participants, and the DOE-PD. A summary of corrective actions taken or planned is submitted to the EM Manager by the date specified in the report. Actions are entered into the Open Item Tracking System (OITS) and a report summarizing corrective actions taken or planned by responsible staff managers is issued bi-monthy.

General Employee Training (GET) annual mandatory briefings are conducted for site personnel. The review and explanation of WVDP-022 and WVDP-139, inform each employee of any changes in procedures, as well as refresh their familiarity with the overall plan.

A.10.5.1.9 Emergency Response Levels

The manner of response and degree of involvement in an emergency depend upon the level of severity of real or potential emergencies. Incidents and emergencies at the WVDP that are classified as Operational Emergencies must be reported to OH/WVDP, DOE-Headquarters (DOE-HQ), and federal, state, and local agencies, based on the following categories. Once the emergency has been categorized by the IC, timely notification DOE-HQ-EOC must be achieved within 15 minutes.

A.10.5.1.9.1 Alert

An ALERT is the classification used to designate the least significant classifiable Operational Emergency at an OEHMP facility. The criteria for classification of nonradiological or radiological releases as an Alert Emergency are given in WVDP-193. The purpose of the Alert level is to assure that on-site and off-site emergency response personnel are promptly advised and available for activation if the situation becomes more serious, to initiate and perform confirmatory monitoring as required, and to assure appropriate notification of emergency conditions to the responsible organizations within WVDP and DOE. WVDP actions in response to this category are:

- Assess and respond as directed by the ED (or IC during back shifts, weekends, and holidays, until relieved by higher authorities).

- Augment resources by activating the EOC, TSC, and/or emergency response teams according to the conditions of the emergency.

- Report the Alert to off-site authorities in accordance with procedures.

- Dispatch monitoring teams.

- Provide periodic status updates in accordance with procedures.

- Provide periodic meteorological assessments in accordance with procedures if releases are anticipated or occurring. If releases are occurring, provide dose estimates for actual releases.

- Perform off-site notifications within 15 minutes of declaration, reclassification, and termination of classified Operational Emergency.

A.10.5.1.9.2 Site Area Emergency (SAE)

An SAE is an event in progress or having occurred that involves actual or probable major failures of facility functions that are needed for the protection of on-site personnel, public health and safety, and the environment. The event also involves the actual or potential release off-site of radioactive or toxic material not exceeding PAGs. The criteria for classification of nonradiological or radiological release as an SAE is given in WVDP-193. The purpose of the SAE level is to assure that EOC is manned, appropriate monitoring teams are dispatched, personnel required for determining on-site protective measures are available, predetermined protective measures for on-site personnel are initiated, and current information to OH/WVDP and consultation with off-site officials and organizations is provided. WVDP actions in response to this category are:

- Assess and respond as directed by the ED (or IC during backshift, weekends, and holidays, until relieved by higher authorities).

- Augment resources as necessary by activating the EOC and the TSC.

- Report the SAE to DOE and off-site authorities in accordance with procedures.

- Dispatch monitoring teams.
- Provide plant status updates in accordance with procedures.
- Provide periodic meteorological assessments in accordance with procedures.
- Provide release and dose projections based on available plant meteorological information and foreseeable contingencies.
- Terminate or reclassify the emergency class when appropriate.
- Perform off-site notifications within 15 minutes of declaration, reclassification, and termination of a classified Operational Emergency.

A.10.5.1.10 Notification

A.10.5.1.10.1 West Valley Demonstration Project

WVNS reports any emergency impacting its operations promptly to the DOE-PD and Washington Group International, Inc., Risk Management Staff. The notifications include the severity (emergency response level), magnitude, type, cause of emergency (if known), extent of damage (including injuries), assistance needed (if any), and areas or personnel affected. This information is read from the Notification Form (found in EMIP-103). The DOE-HQ-EOC and the OH Duty Officer are notified in the most expeditious manner by the DOE Communicator and a preferred means of communication is established.

A.10.5.1.10.2 Notification of Off-Site Agencies and Authorities

The ED has the responsibility to authorize off-site local, county, and state officials of WVDP emergency situations. Notifications are made as soon as crucial information is available to warrant such action. WVDP-139 contains the telephone numbers of agencies to be notified.

Notification to the DOE-HQ-EOC is made concerning an Operational Emergency within 15 minutes after discovery of a hazardous material (radiological or nonradiological) spill or release to the environment.

A.10.5.1.10.3 Notification of DOE Headquarters

Notification to the DOE-HQ-EOC is made as soon as crucial information is available, or within 15 minutes after declaration of an Alert or SAE for any Operational Emergency (i.e., radiological, hazardous substances/wastes, fire, explosion). Written notification to DOE Headquarters is made as soon as practical, but in any event, within twenty-four hours of categorization of the emergency.

A.10.5.1.10.4 Notification of New York State

The New York State Emergency Plan for major radiological accidents involving WVDP facilities requires that events resulting in Alert or SAE Classifications shall be reported to the State Warning Point. The State Warning Point notifies the appropriate state and county health departments. State Department of Health and in Cattaraugus and Erie counties. The State Warning Point initiates notification of other state agencies. Pursuant to the state plan, these agencies begin to mobilize their resources to react in preventing or minimizing radiological or other hazardous materials impacts to the public.

Whenever there is an imminent or actual emergency situation involving hazardous substances, WVDP notifies the State of New York as required in WVDP-139 and WV-915, *Spill/Release Notification and Reporting* (WVNS). The notifications are to the 24-hour oil and hazardous substances spill notification number and the National Response Center. The report includes:

- The name and telephone number of the reporter;
- The name and address of the WVDP facility;
- The time and type of incident (e.g., release, fire);
- The name and quantity of materials involved, to the extent known;
- The extent of injuries, if any; and
- The possible hazards to human health or the environment outside the facility.

If a hazardous substance/waste release, fire, or explosion that could threaten human health or the environment occurs outside the facility, the Notification Officer shall

immediately notify the EPA National Response Center. Notification of NYSERDA headquarters in Albany, New York, is made directly by the on-site NYSERDA Representative to the NYSERDA Program Director, per WVDP-139.

A.10.5.1.10.5 Special Notification

In the event of an emergency affecting the railway or utility service, the Notification Officer, at the direction of the ED, notifies the following local utilities and railroad whose lines are on-site:

- Railroad - Buffalo and Pittsburgh.
- Natural Gas - National Fuel Gas Corporation.
- Electric Utility - Niagara Mohawk Power Corporation.

A.10.5.1.11 Public Information

A.10.5.1.11.1 Policy

Information regarding WVDP emergencies is released to the news media as quickly as possible after sufficient details are known to provide a clear and accurate account of the situation. However, depending on the circumstances, to reassure the public and prevent rumors, fear, or panic, it may be necessary to release information before all facts are known. All news releases during activation of the EOC are approved by the ED and the DOE-PD.

A.10.5.1.11.2 Emergency Operations and Response Concepts

Emergency public affairs functions are an integral part of emergency response operations. In the event of an emergency, the ED advises the Public Information Director (PID) of the emergency and the general situation as soon as possible so that a proper response to the media and public can be presented.

A.10.5.1.11.3 Exercises

WVDP-022 and WVDP-139 are used as key elements in field organization exercises.

A.10.5.1.12 Emergency Resources

A.10.5.1.12.1 Emergency Equipment and Resources

Emergency response equipment is maintained at strategic locations throughout the WVDP site for use in all types of potential threats, including fires and releases of radioactive material, hazardous substances, or hazardous waste. This section contains general descriptions of the types of supplies that are maintained on-site. Surveillance and maintenance requirements are detailed in WVDP-139.

Emergency Equipment and Supplies

Emergency Rescue Packs. Rescue Packs contain enough equipment for a three-man team to enter and retrieve an injured worker. The Main Plant Operations (MPO) Department is responsible for inventorying the contents of the rescue packs and for their maintenance and monthly inspection.

Self-Contained Breathing Apparatus. Self-contained breathing apparatus (SCBA) for use only during an emergency is maintained throughout the plant. The maintenance and periodic inspection of the SCBAs is the responsibility of the IH&S Department.

Medical and Surgical Supplies. The Advanced Life Support (ALS) Unit is maintained in the Main Gatehouse. Upon announcement of a medical emergency, the ALS Unit is delivered to the scene of the medical emergency by Security. This item can only be used by qualified personnel per established procedures.

Emergency Medical Technician (EMT) kits and first aid kits are located throughout the site. The Employee Health Services (EHS) Administrator is responsible for determining adequate inventory levels and storage locations and providing maintenance and periodic inspection of medical supplies.

A Public Access Defibrillation (PAD) Team has been established at the Ashford Office Complex (AOC). These personnel are trained and certified in CPR, first aid, defibrillator use for response to medical emergencies at the AOC.

Anti-Contamination Clothing and Respirators. Clean protective clothing and respirators are stored in the personnel equipment room (north section of Laundry Building). Waste Management Operations is responsible for the laundering, maintenance, and inspection of anti-contamination clothing and respirators.

Emergency Operations Center Supplies. EOC supplies are stored in a room in the EOC. Maintenance and periodic inspection of these supplies is the responsibility of the Emergency Management Department.

Radiological Control Equipment. Instrumentation necessary for the support of the Radiological Control Team, is the responsibility of the RP Department, which is also responsible for the maintenance and biannual inspection of this instrumentation. Instrumentation necessary for the support of the EMT is the responsibility of the Environmental Laboratory. The Environmental Laboratory is responsible for the maintenance and inspection of this instrumentation.

Nonradiological Control Equipment

Instrumentation and equipment necessary for the support of the EMT and HaZmat Team is maintained by the E-Lab Department and IH&S, respectively. The Environmental Laboratory houses portable monitors for airborne sampling of nitrogen oxides (NO_x) and ammonia (NH_3) vapors and a pH field meter. HaZmat Team equipment, which is stored in the Test & Storage Building (TSB) and HaZmat Equipment Response Trailer, is comprised of Personal Protective Equipment (PPE), portable monitors, and spill kits for different types of spills or releases.

Emergency Food Supply Locker. The MPO Manager is responsible for rotating the food supply annually and determining adequate inventory levels. The MPO Department is responsible for maintaining adequate inventory levels.

Firefighting Systems. A reserve of 300,000 gallons of water is available at all times for firefighting purposes. This reserve is piped to fire stations throughout the plant and hydrants around the perimeter of the plant. Maintenance and periodic inspection of these systems is the responsibility of the MPO Department. Additional information concerning fire equipment located on-site can be found in WVDP-177, *WVDP Fire Protection Plan,* and WVDP-178, *Pre-Fire Plan* (WVNS).

Media Center Supplies. Maintenance and periodic inspection of this material is the responsibility of the Public and Employee Communications Department.

A.10.5.1.12.2 DOE-Wide Resources

A great variety of emergency resources (manpower and equipment) is available from the OH/WVDP and other DOE sources, as well as from other federal agencies. The resources

of DOE and other federal agencies may be called upon to cope with on-site or off-site DOE emergencies. Resources are obtained from the nearest location.

A.10.5.1.13 Recovery and Reentry

The authority and responsibility for restoring the WVDP facilities or systems to pre-emergency conditions rests with the ED and DOE-PD, as specified in WVDP-139. The Recovery organization consists of personnel from departments responsible for site operations and emergency response.

The Site Contractor President is the ED at this point and formally assigns and announces the AED as the Recovery Manager. A written recovery plan must be approved by the ED and the DOE-PD before any recovery action can be taken. The DOE-PD coordinates implementation of the plan with OH/WVDP and other federal, state and local off-site agencies for on-site and off-site recovery.

Reentry during the recovery phase can only occur after approval from the ED and emergency response has been terminated, all potential hazards have been eliminated, and a comprehensive checklist of recovery and reentry criteria is met. The reentry is performed by the Search and Reentry Team as supervised by the IC. Per WVDP-139, the team establishes preplanned objectives and actions to limit exposure and control access to affected areas. Additional guidelines from WVDP-139 include the use of protective clothing and personnel monitoring.

The WVDP Emergency Plan describes the provisions for reentries involving an immediate "search" and those associated with a post-emergency "recovery." Reentry and Recovery differs from SRE in that it entails actions taken after safe shutdown following an operational emergency rather than urgent activities taken during an emergency.

A.10.5.1.14 Emergency Plan Review

WVDP-022 is reviewed at least annually and revised if necessary. The annual review includes the following items:

- Organizational changes that may affect emergency response.
- Equipment and facility changes.
- Agreements for assistance by off-site organizations.

- Corrective actions from drills and exercises.

- Changes in laws, regulations, DOE Orders, or guidance documents.

WVDP-139 is revised accordingly to incorporate changes in the approved Emergency Plan. Revisions to WVDP-139 do not require approval by the same persons that approve revisions to the WVDP-022.

Document holders (e.g., WVNS, DOE, state, local, and federal agencies) receive revisions to WVDP-022 as they are issued. During annual review of WVDP-022, LOA and MOUs are reviewed to determine if they need to be updated.

If a need arises to revise WVDP-022 before the scheduled annual revision date, it is revised by inclusion of page changes, which are incorporated in the appropriate section of WVDP-022 at the following revision. Reasons to revise the Plan between the scheduled annual revisions include:

- Revision(s) of laws or regulations which materially affect the plan.

- Failure of the plan during an emergency.

- Changes in the facility's design, construction, operation, maintenance, or other circumstances in a way that materially increases the potential for fires, explosions, or releases of hazardous waste or hazardous waste constituents, or that changes the response necessary in any emergency.

- Significant changes in the Emergency Response Organization.

A.10.6 Decommissioning

A.10.6.1 Decommissioning Program

Planning for decommissioning of Project facilities is in progress and will include decontamination of existing and new facilities, including the tanks in which the HLW was stored prior to vitrification, the facilities used in the solidification of the liquid waste, and any material and hardware used in connection with the Project. Once the environmental review process has been completed (the *Draft Environmental Impact Statement for Completion of the WVDP and Closure or Long-Term Management of Facilities at the WNYNSC* (USDOE January 1996) has been issued, and a supplement is

currently in preparation) and the conceptual approach to decommissioning has been determined, the details of implementation will be developed.

A.10.6.2 Decontamination

To the extent feasible, all new and modified facilities have been designed to facilitate decontamination following the completion of vitrification and other Project activities. Specific design features are described in individual facility SAR modules.

A.10.6.3 Agreements with Outside Organizations

The DOE, as dictated in the WVDP Act, Public Law 96-368 (U.S. Congress October 1, 1980), entered into agreements, which include the decontamination and decommissioning (D&D) program, with the Nuclear Regulatory Commission (NRC) and New York State. The agreement between the DOE and the NRC is in the form of a Memorandum of Understanding (MOU) (Memorandum of Understanding, November 19, 1981) which defines the relationships between these two organizations. The MOU indicated that the DOE will D&D the Project facilities at the end of the Project according to criteria approved by the NRC. Negotiations are currently underway between the NRC and the DOE/NYSERDA to establish these criteria.

DOE also entered into a cooperative agreement with the New York State Energy Research and Development Authority (NYSERDA). The Cooperative Agreement and the WVDP Act establish a 90%/10% cost-sharing arrangement between the federal and New York State governments for cost directly related to the Project scope as defined by the Act. All D&D costs associated with non-Project facilities are the responsibility of New York State. Negotiations are currently underway between DOE and NYSERDA regarding cost-sharing for decontamination and decommissioning of the WNYNSC.

In addition, to facilitate compliance with federal Resource Conservation and Recovery Act (RCRA) provisions, DOE and NYSERDA entered into a Federal and State Facilities Compliance Agreement (FSFCA) with the U.S. Environmental Protection Agency (EPA) and New York State Department of Environmental Conservation (NYSDEC). This agreement establishes the framework for agency interaction with regard to rules and regulations governing hazardous wastes and mixed wastes.

A.10.6.4 Arrangements for Funding

Decontamination of Project facilities is a requirement of the WVDP Act, the MOU, and the Cooperative Agreement. The total scope of D&D cannot be determined until after the Record of Decision for the final EIS on Project completion. The total cost also cannot be estimated until final D&D criteria are approved by the NRC. However, the cost of the WVDP, including the D&D of the Project premises only, will be shared by the federal and New York State governments.

After completion of the WVDP, operational control of the Project premises will revert back to the State of New York for institutional control, including continued monitoring and maintenance, if required.

A.10.7 Site Security Plan

A.10.7.1 Site and Facility Description

A.10.7.1.1 General Layout

The WNYNSC is located on a 3,345-acre site in Cattaraugus County, N.Y., about 35 miles south of Buffalo, N.Y. The WVDP is located on 220 acres at the center of the WNYNSC.

A live fire range (LFR), used for training local law enforcement agencies is located within the WNYNSC but outside the chain-link fence area which encloses the 220-acre Project area. A Firearms Safety Analysis has been developed for the LFR (WVNS).

A.10.7.1.2 Protection of Material

A formal site security plan, *Site Security Plan* (WVNS), provides a facility description and security procedures to ensure compliance with DOE Orders 470.1, *Safeguards and Security Program* (USDOE September 28, 1995), 471.1, *Unclassified Controlled Nuclear Information* (USDOE September 25, 1995), 471.2, *Information Security Program* (USDOE September 26, 1995), 472.1, *Personnel Security Activities (USDOE September 25, 1995), and DOE Manual 5632.1C-1, Manual for Protection and Control of Safeguards and Security Interests*, Change 1 (USDOE April 10, 1996). The objects of the plan are:

- To assure that protection is provided and maintained for DOE security interests; and

- To provide for periodic on-site security and materials control surveys of facilities under the jurisdiction of the DOE-Ohio Field Office (DOE-OH).

The provisions of the plan apply to all WVDP prime contractor and other contractor personnel. The plan is implemented by the WVNS Security Department.

A.10.7.2 Security Areas

A.10.7.2.1 Security Area

The Security Area (also known as the Property Protection Area), shown in Figure A.3.1-4, consists of approximately 220 acres in and around the main plant and ancillary buildings and facilities. The Security Area is surrounded by a 8-ft high chain-link fence. Access into and out of the Security Area is through the main gate or the administration building entrance. Unescorted entry into the Security Area requires a magnetically-encoded picture badge, which must be displayed at all times within the Security Area.

A.10.7.2.2 Radiological and Non-radiological Controlled Areas

Several areas within the Security Area are designated radiological or non-radiological controlled areas for security purposes. These areas are typically surrounded by a high chain-link fence and patrolled by the Security force. Access is controlled by the Security force and either by means of the magnetically-encoded picture badge system or via locks and keys. The radiological controlled areas are:

- The Fuel Receiving and Storage (FRS) Area;
- The High Level Waste (HLW) Area, also known as the Waste Tank Farm;
- The Cement Solidification System (CSS);
- The New York State-licensed Disposal Area (SDA);
- The Supernatant Treatment System (STS);
- The Permanent Ventilation System (PVS); and
- Vitrification Facility (VF).

The non-radiological controlled areas are:

- The Utility Room;
- The Computer Room; and
- Emergency Operations Center.

The above lists are revised as warranted by site activities and operations.

A.10.7.2.3 Post and Patrols

Post and patrols for the Security Area and radiological and non-radiological controlled areas are provided by members of the Security force. The Security force is on duty seven days a week, 24 hours a day.

Security force patrols of designated plant areas, including all radiological and non-radiological controlled areas, are performed at least every 8 hours. Routes and times are varied to preclude predictability. Patrol officers are equipped with portable radios and maintain communications with the alarm monitoring station (AMS) operator. Radio communications may be supplemented with the plant intercom system and telephones. If a patrol is not conducted as scheduled, the Security Shift Supervisor is notified immediately and informed of the reason for the missed patrol so appropriate action can be taken.

A.10.7.3 Access Controls

A.10.7.3.1 Badge System

Magnetically-encoded personnel identification picture badges prepared and issued by the Security Department must be displayed by all personnel at all times inside the Security Area. The badges are used in conjunction with electronic card readers to control access into and out of the Security Area and radiological and non-radiological controlled areas. All such entries and exits are recorded by computer. Card readers that read the magnetically encoded information on the picture badge are placed at the two access-ways into the Security Area and at access-ways to radiological or non-radiological controlled areas. WV-544, *Personnel Access Control* (WVNS), provides guidance for obtaining temporary and permanent access authorization to

radiological and non-radiological controlled areas. No clearance is required for entry into the WVDP.

Subcontractor picture badges are issued as needed. Visitor badges (without pictures) are also issued on a day-to-day basis. The visitor badge indicates the wearer has not received site training and therefore must be escorted at all times while in the Security Area. No escort is required in site administrative areas if the visitor is assigned a limited access badge. Visitors assigned an "Annex Only" badge need not be escorted in the annex complex. Badges remain the property of WVNS and must be returned upon termination of employment, contract, or visit.

A.10.7.3.2 Personnel Escort

Any trained and picture-badged person may serve as escort to a visitor. When a visitor is transferred from one escort to another, it is the responsibility of the first escort to notify the Security force of the change.

A.10.7.3.3 Personnel Access

A.10.7.3.3.1 Controlled Areas

Site deliveries and delivery personnel are authorized to enter the Security Area or required areas only after notification to the warehouse and when accompanied by an escort. Access authorization is terminated when notification is given to the Security office. The Human Resources Manager may authorize access for individuals interviewing for employment within the Security Area. Persons who may authorize access to controlled areas are limited to the managers with cognizance over the area or their designee, the Operations Shift Supervisor, DOE personnel, and, in an emergency, the Security Shift Supervisor.

A.10.7.3.3.2 Personnel Searches

All personnel are subject to search upon entry into and exit from the Security Area. This search may be either a physical hands-on frisk or a search with detectors.

A.10.7.3.3.3 Package Searches

Hand-carried packages, tool boxes, valises, lunch pails, etc., are subject to search upon entry to and exit from the Security Area.

A.10.7.3.4 Vehicle Access

Personal vehicles are not permitted entry to the Security Area unless approved by the Security Manager or designee. Routine vehicle access into the Security Area is through the main gate. Vehicles are randomly searched upon entrance to and exit from the Security Area. Packages or other deliveries by vehicle are checked for proper identification and authorization. Delivery vehicles are escorted at all times within the Security Area according to established procedures. Vehicle control is maintained in accordance with WV-544, *Personnel Access Control* (WVNS).

The employee parking lots are within DOE-controlled property. All vehicles parked in the parking lots are subject to survey. Articles prohibited in the Security Area are also prohibited in the parking lots.

A.10.7.4 Intrusion and Detection Alarms

A.10.7.4.1 Design and Performance Characteristics

Design and performance characteristics for the intrusion and detection alarms are maintained by the Security Manager.

A.10.7.4.2 Location and Type of Security Alarms

All doors and gates that are used for routine entry to and exit from the Security Area and controlled-access areas are alarmed. All alarms signal at the Alarm Monitoring Station (AMS). Auxiliary power for the alarms is supplied from a storage battery pack located in the AMS. The battery pack operates in conjunction with a trickle charger that keeps it fully charged.

The alarm system for access into the administration building is only activated when the entrance is closed and unmanned. Buildings outside the Security Area with intrusion alarms are the School House Building, the Bulk Storage Warehouse, and the Ashford Office Complex.

A.10.7.5 Security Organization and Responsibilities

A.10.7.5.1 Management Organization

Administration of the Security Program at the WVDP is the responsibility of the WVNS Security Department.

A.10.7.5.2 Security Organization

The WVDP Security Program is supervised by the Security Manager. This supervision includes training, intrusion detection system, access control, and routine supervision and direction of the Security force. The Security Manager reports to the Human Resources Manager.

A.10.7.5.3 Security Personnel

A.10.7.5.3.1 Minimum Employment Qualifications

Security Officers (SOs) must be capable of performing duties involving moderate physical exertion. SOs must meet the requirements of 10 CFR 1046, *Physical Fitness Standards* (USDOE). SOs are required to pass a physical examination prior to employment. SOs must have a diploma from a secondary school or equivalent experience which will be subject to examination by WVNS.

A.10.7.5.3.2 Training

Training and qualification of SOs follows DOE Order 473.2, *Protective Force Program*. They receive additional training in the operation of specialized equipment required to perform their duties.

Most SO training is performed in-house. The training program consists of classroom, practical, and on-the-job training. A record of SO training and participation in annual requalification courses is maintained by the Training Records Management System. Training in the area of an SO's legal responsibility is conducted to ensure that each SO possesses an understanding of: 1) the general limits of legal authority of an SO, according to Federal statutes; and 2) the legally permissible use of force in self-defense.

Formal tests are the basis for determining initial SO qualification and are given annually thereafter.

A.10.7.6 Responses to Security Threats and Intrusion Alarms

The criteria used to assess the significance of an alarm or threat to the security of the facility are: the magnitude of the threat relative to the number of people threatened, the presence of arms, and the apparent intent of the threatening person or group involved.

A.10.7.6.1 Suspected Intrusion into the Security Area

When an alarm signals, the security force will inspect the area indicated by the alarm. The alarm monitoring station will maintain radio communications with the responding officer.

A.10.7.6.2 Rupture of Security Area Fence

Upon discovery or notification of a rupture of the Security Area fence, a security officer will be dispatched to the scene to close and secure the rupture. If necessary, higher authority will be notified.

A.10.7.6.3 Bomb Threat

In the event of a bomb (or biochemical) threat, the protective force will alert higher authority and will take such actions as directed.

A.10.7.6.4 Civil Disturbance

In the event of a civil disturbance, higher authority will be notified, the main plant entrance will be closed and secured, and the security force will take such actions as directed including notifying local law enforcement agencies.

A.10.7.6.5 Site Evacuation

In the event that a site evacuation is required the security objectives will not be allowed to compromise health and safety; however, protective force surveillance will be maintained to the greatest extent practicable. Personnel will be directed to the assembly point and instructed to remain there until further instructions are

received. The routine plant evacuation plan requires that a roll call be taken and the AMS account for all personnel and ensure that no one has remained in the evacuation area. The alarm circuits at the AMS will be monitored as long as radiation or hazardous material levels allow, to determine if any intrusion is attempted during the evacuation procedure.

A.10.7.6.6 Fire or Explosion

In the event of a fire or explosion, the Security force will notify higher authority, and will take such actions as directed.

A.10.7.6.7 Outage of Plant Protection Equipment

Should an intrusion alarm fail, the protective force is directed to provide continual visual surveillance in the area served by the alarm, using closed-circuit television (CCTV) in areas that can be surveilled by such means. For areas that cannot be surveilled by CCTV, 1 hour rounds of inspection are initiated. The Security Manager is notified and repairs are initiated.

If the failure is estimated to persist in excess of four hours or past the security shift change, the Security Manager will be notified. The Security Manager evaluates the situation to ensure that plant security provisions are not compromised. Special orders or arrangements for additional officers are made and higher authority notified, if required.

Should other security equipment fail, appropriate measures are taken to maintain effective site security.

A.10.7.6.8 Action Response

Local law enforcement authorities are contacted for assistance when there is a perceived threat that could result in significant harm to the facility, facility personnel, or the public.

The Security Shift Supervisor has authority to contact the local law enforcement agencies and direct the Security force as required in the event of a clear and present threat to the security of the facility. Higher authority will be promptly notified of any actions taken.

A.10.7.7 Alarm Monitoring Station (AMS) and Communications System

A.10.7.7.1 Staffing

The Security Department consists of a Security Manager, staff, and contract personnel.

A.10.7.7.2 Local Communications

The AMS is equipped with a radio transceiver for communication with the Security force. Officers on patrol carry portable transceivers to communicate with the AMS.

A.10.7.7.3 Radio Communications

The AMS is equipped with a radio transceiver linked to the radio network of the Sheriff of Cattaraugus County and a transceiver base station which can communicate with all portable units. The system is continuously monitored.

The radio is supplied with auxiliary power from the battery pack emergency power located at the AMS. The battery pack is sized to maintain operations for 24 hours without other sources of power.

A.10.7.8 Local Law Enforcement Authorities

A.10.7.8.1 Size of Force

The Cattaraugus County Sheriff's Office will respond with maximum ability to any call for assistance from the facility, using regular and special response team officers, if necessary.

Additionally, the Sheriff of Cattaraugus County has given assurance that law enforcement agencies of neighboring counties and towns will offer reinforcement support as required.

A.10.7.8.2 Kind of Assistance

The Cattaraugus County Sheriff's Office will provide normal police power, special response teams, crowd control, and investigation assistance, as needed. County, town, and state agencies will also provide assistance as needed.

A.10.7.8.3 Arrangements

Liaison has been established with the Cattaraugus County Sheriff, the New York State Police, and the Federal Bureau of Investigation. The WVNS Security Department has permission to use the radio frequency assigned to the Cattaraugus County Sheriff's Office.

A.10.7.9 Tests and Inspections

A.10.7.9.1 Physical Barriers

The Security force performs a weekly visual inspection of fences, gates, and doors in the course of routine patrols. The results of these checks are documented.

A.10.7.9.2 Alarms and Annunciators

Special tests are performed as required. In particular, the alarm systems are tested immediately following any required maintenance work to verify that the system is operating properly.

A.10.7.9.3 Communications Equipment

Communications equipment is tested at the beginning of each Security force work shift. The following items are tested for operability: 1) portable radio between officers and the AMS, and 2) radio communications between the AMS and local law enforcement office.

A.10.7.9.4 Other Security-Related Equipment

A.10.7.9.4.1 Illumination

The Security force is instructed to immediately report any defective or inoperative lights or lamps in the security system so that maintenance work can be performed promptly.

A.10.7.9.4.2 Closed-Circuit Television

CCTV monitors and cameras are tested for operability as a part of daily usage. Malfunctions of these units are detected at the AMS so that maintenance and repairs can be instituted promptly.

A.10.7.10 Reports to the DOE

A.10.7.10.1 Incidents

A Security Incident Report is completed for all security-related incidents. In the event of a theft or unlawful diversion of SNM, or an attempt to commit an act of radiological sabotage, the Security Manager determines if an immediate verbal report is made to the DOE-OH/WVDP Office. A detailed report must be submitted within ten days to the DOE-OH/WVDP Office. In all security-related incidents, WVNS management is notified to determine if additional reporting to DOE and/or Westinghouse Government Environmental Services (WGES) is warranted or if any additional action is required. Notification requirements contained in the DOE Orders cited in Section A.10.4.2.3, are followed for all off-normal and unusual occurrences and The Qemergency situations.

Records of Security Department tours, barrier inspections, and communication tests are contained in weekly reports.

A written report is submitted to the Security Manager by the Security Shift Supervisor detailing any incident, alarm, or intrusion other than false alarms. This report is the basis for the submission of any incident reports to the DOE.

A.10.8 Human Factors

The discipline of human factors is directed towards the application of behavioral and social sciences principles to system settings to optimize both human and system performance. There are three overlapping areas within human factors.

- Human factors engineering (HFE) or simply human engineering (sometimes referred to as ergonomics) - HFE is directed primarily toward person-machine interfaces such as equipment design(e.g., displays, controls, and their juxtaposition), workspace layout and accessibility, and habitability (e.g., temperature, light, noise, radiation).

- Personal Subsystems Analysis - this area is concerned primarily with person-person interfaces such as allocation of duties and responsibilities, staffing, qualifications, selection, training, operating procedures, maintenance procedures, technical and administrative management, and organizational controls.

- Human Reliability Analysis (HRA) - this area is concerned with both person-machine and person-person issues pertaining to human performance measurement, whether qualitative or quantitative (including probabilistic analysis).

As discussed in WVDP-011, *WVDP Industrial Hygiene and Safety Manual* (WVNS), the primary focus of HFE (ergonomic analyses) conducted by the IH&S Department is on safety and prevention of injury. Several categories of workplace injury that may be avoidable through the application of ergonomic principles have been identified. Pre-operational testing and Operational Readiness Reviews (ORRs) help ensure that HFE has been adequately incorporated into facility operations.

The area of subsystems analysis is addressed throughout Section A.10 and in the appropriate sections of the other SAR modules. Person-person issues are also examined during ORRs.

Because there are no instances where operator actions are assumed in order to keep the consequences to receptors below Evaluation Guidelines, HRA for Evaluation Basis Accidents evaluated in the SARs are not considered necessary.

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Table A.10.5-1

West Valley Demonstration Project
Emergency Operations Center Staffing

A. Emergency Operations Center Staff

Position Title	Primary Responder
Emergency Director	WVDP Site Contractor President
Assistant Emergency Director	Construction and Project Administration Manager
DOE Project Director	OH/WVNS Project Director
NYSERDA Representative	NYSERDA Program Manager
Operational Assessment Manager	Site Operations Manager
Radiological/Environmental Assessment Manager	Radiological Protection Manager
Security Manager	Security Manager
Notification Officer	Environmental Affairs Manager
DOE Facility Representative	OH/WVDP Staff Representative
DOE Communicator	OH/WVDP Staff Representative
Vitrification Liaison Manager	Vitrification Operations Manager
Public Information Director	Community Relations Manager
Human Resources Manager	Human Resources Manager
Safety and Environmental Assessment Manager	Project Manager for Environmental and Safety Services
Technical Support Center Manager	Engineering Manager
EOC Facilitator	Emergency Management Manager
Data Recorders	Representative from the Designated Group
Secretary	Designated Representative
Timely Notification Officer	VOSS
AEOC Facilitator	EM Representative
Emergency Management Program; Management and Oversight	OH/WVDP-EM Interface

Table A.10.5-1 (Concluded)

West Valley Demonstration Project
Emergency Operations Center Staffing

B. Technical Support Center Essential Support Personnel

The TSC Staff comprises qualified engineers or individuals representing the following disciplines:

Operations Support

Electronics

Chemistry

Instrumentation and Control

Mechanics

Nuclear Engineering

Toxicology

Chemistry

Vitrification Systems and Processes

Industrial Hygiene

Maintenance

Drafting

Document Control

Fire Protection

C. Incident Command Staff

Incident Commander (primary responder is the Main Plant Operations Shift Supervisor)

Operations Manager (primary responder is the Main Plant Operations Manager and/or manager of affected facility)

Radiation Protection Manager

Radiological Protection Supervisors

Qualified Operators

Security Supervisor

Operations Response Team (Fire Brigade, Search and Re-Entry Team, Confined Space Entry Rescue Team, First Responders)

Security Force

Radiological Controls Team

Radiological Controls Technicians

Environmental Monitoring Team

Emergency Medical Response Team

HaZmat Team

Table A.10.5-2

West Valley Nuclear Services Emergency Response Organization Functions and Responsibilities

Function	Responsibility
On-Scene Control and Command	Incident Commander
On-Site Command and Control	Emergency Director
Warning	Emergency Director (assisted by EOC staff) and Incident Commander (during first phase of emergency)
Notifications/Communications	Notification Officer/DOE Communicator/Liaison Manager NYSERDA
Public Information	Public Information Director
Accident Assessment	Emergency Director (assisted by EOC staff)
Fire	Fire Chief (Main Plant Operations Shift Supervisor) - Incident Commander
Search and Re-entry	Incident Commander
Traffic Control (on-site)	Security Team Leader (Security Shift Supervisor)
Emergency Medical Services	Emergency Medical Response Team
Transportation	Security Manager
Protective Radiological Response (on-site)	Radiological Control Team

Table A.10.5-3
Network Frequencies

FREQUENCY (MHz)	DEPARTMENT	DEPARTMENT CHANNEL
164.2250	Security NYSERDA	#1 #2
164.2750	Emergency Frequency Safety Public Information Warehouse Vitrification Emergency Preparation Facility Engineering	#4 #6 #2 #7 #1 #2
164.3500	Security Safety	#2 #6
164.7500	Vitrification A&PC	#1 #6
167.8750	Operations IRTS Waste Operations R/S Maintenance A&PC Safety Security Public Information Environmental Lab Vitrification NYSERDA	#1 #1 #2 #1 #2 #1 #1 #3 #2 #1 #2 #1
167.9250	IRTS R/S Maintenance Geotech A&PC Public Information Safety Security Environmental Lab Vitrification	#2 #2 #1 #1 #2 #3 #2 #4 #2 #3
168.4500	Geotech Safety A&PC Public Information Environmental Lab	#3 #3 #3 #1 #3
173.0000	Waste Operations R/S Public Information A&PC Safety Vitrification	#1 #3 #5 #7 #5 #4
411.2000	Construction	#1
416.3500	Construction	#2

SR1101-1.DWG

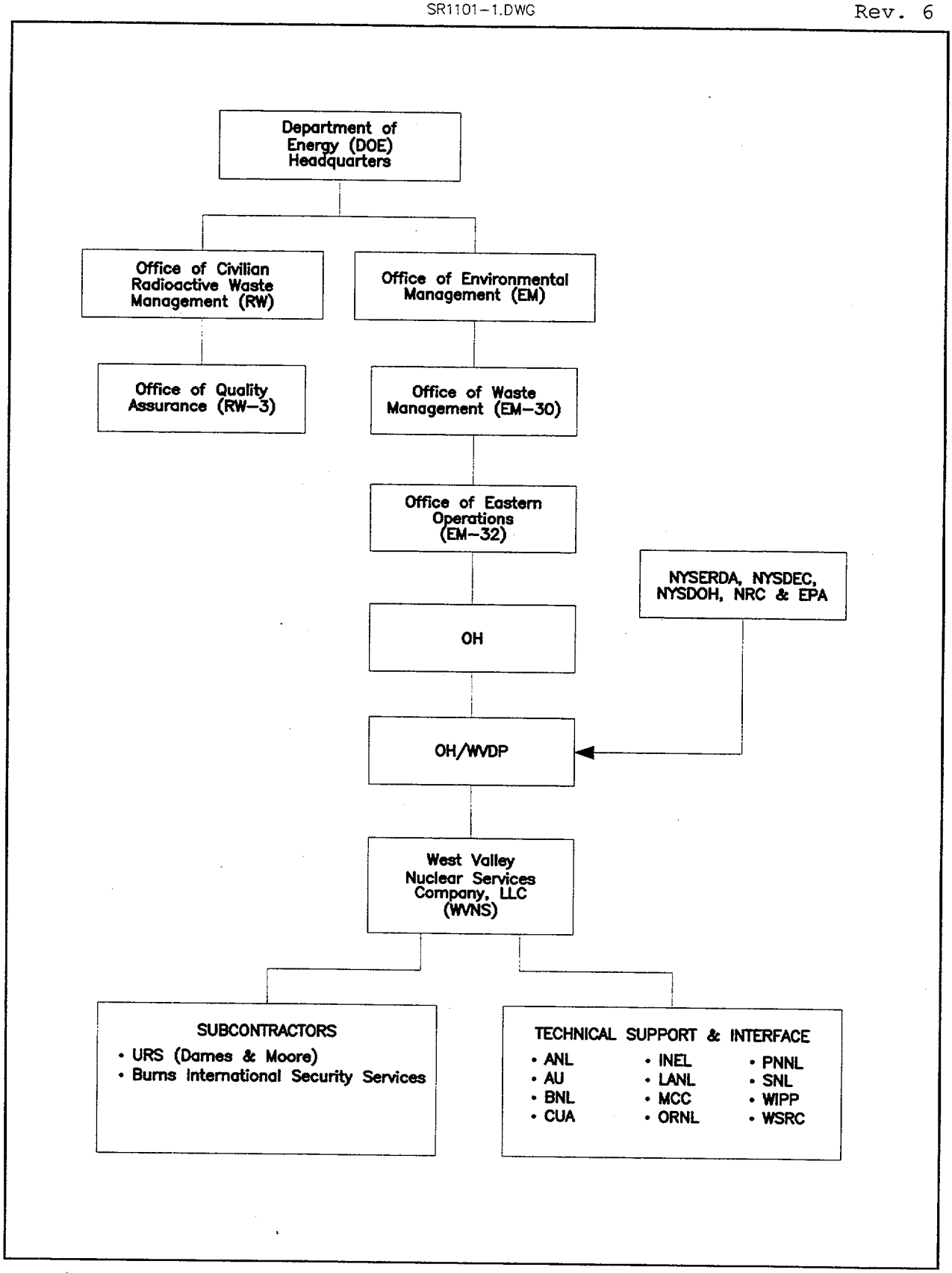
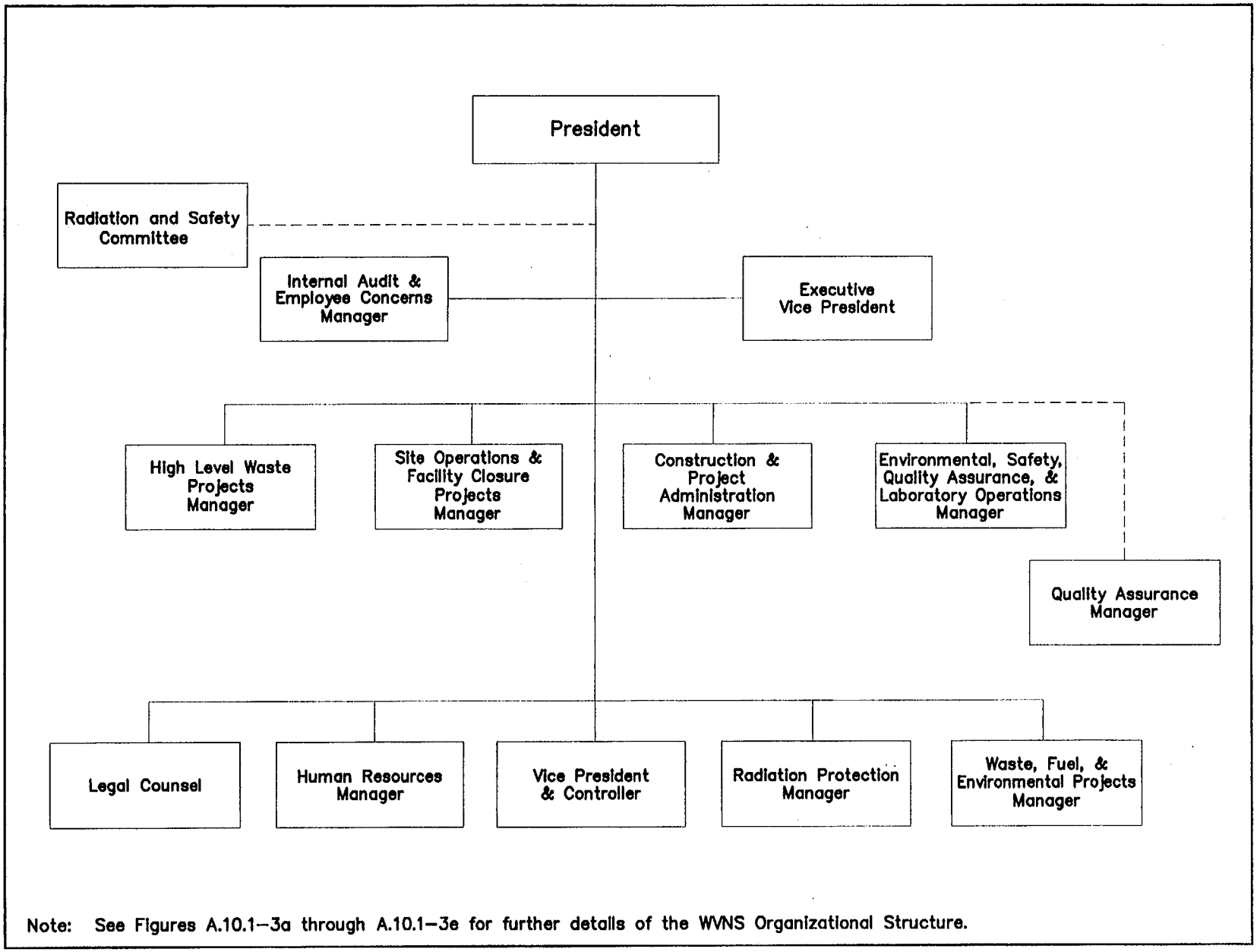


Figure A.10.1-1 WVDP Organizational Hierarchy

SR1101-2.DWG



Note: See Figures A.10.1-3a through A.10.1-3e for further details of the WVNS Organizational Structure.

Figure A.10.1-2 WVNS Organization

SR11013A.DWG

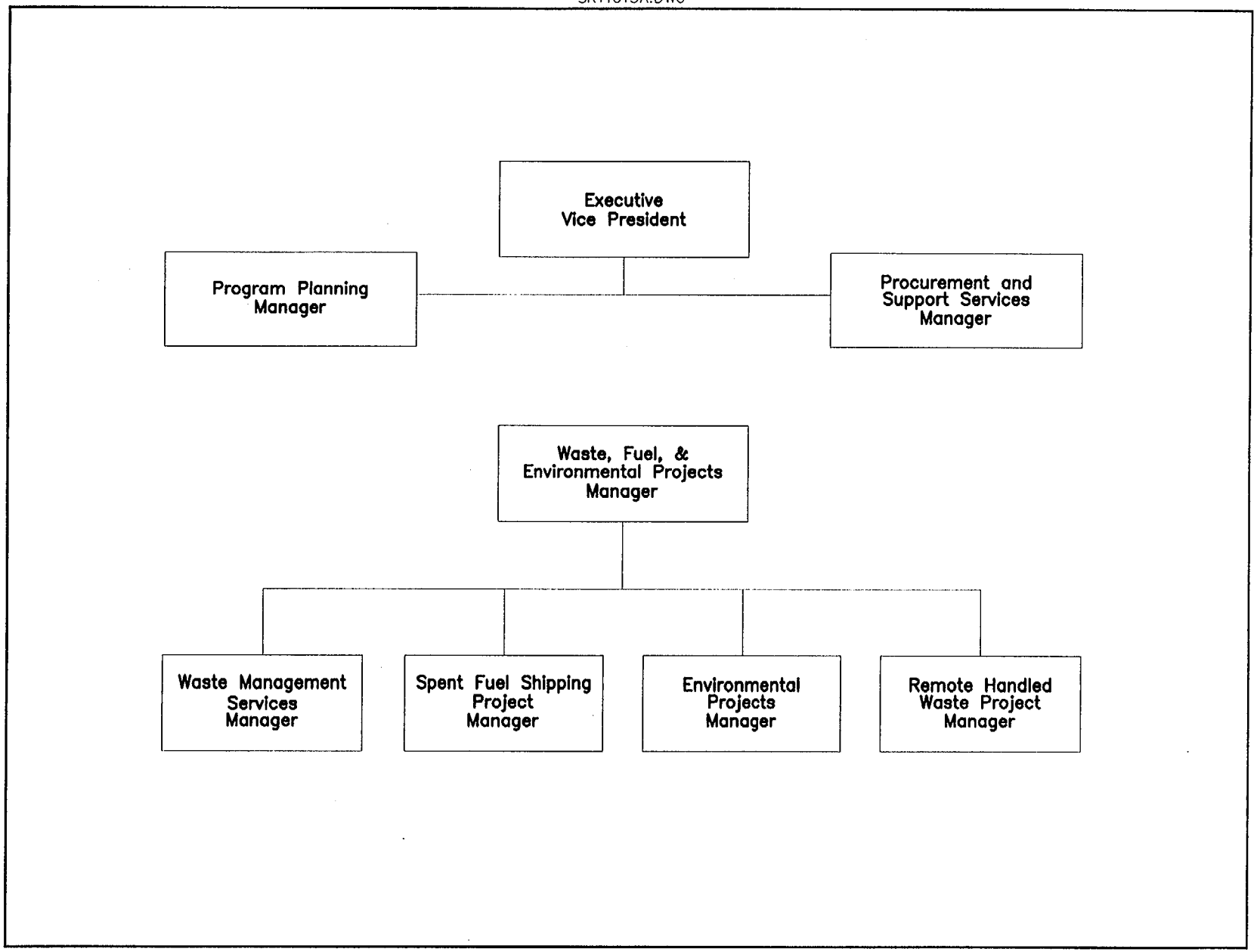


Figure A.10.1–3a WVNS Organizational Structure

SR11013B.DWG

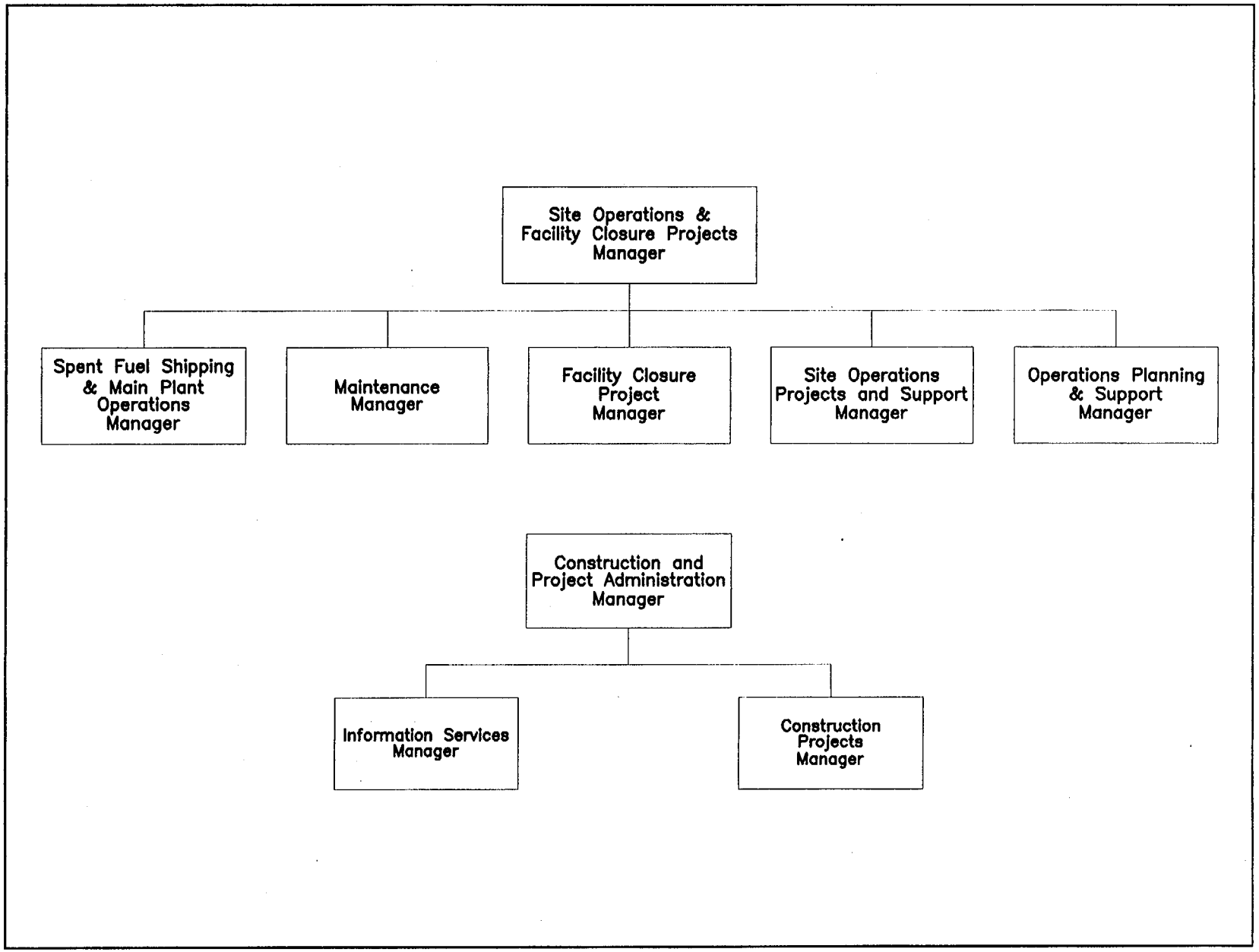


Figure A.10.1–3b WVNS Organizational Structure

SR11013C.DWG

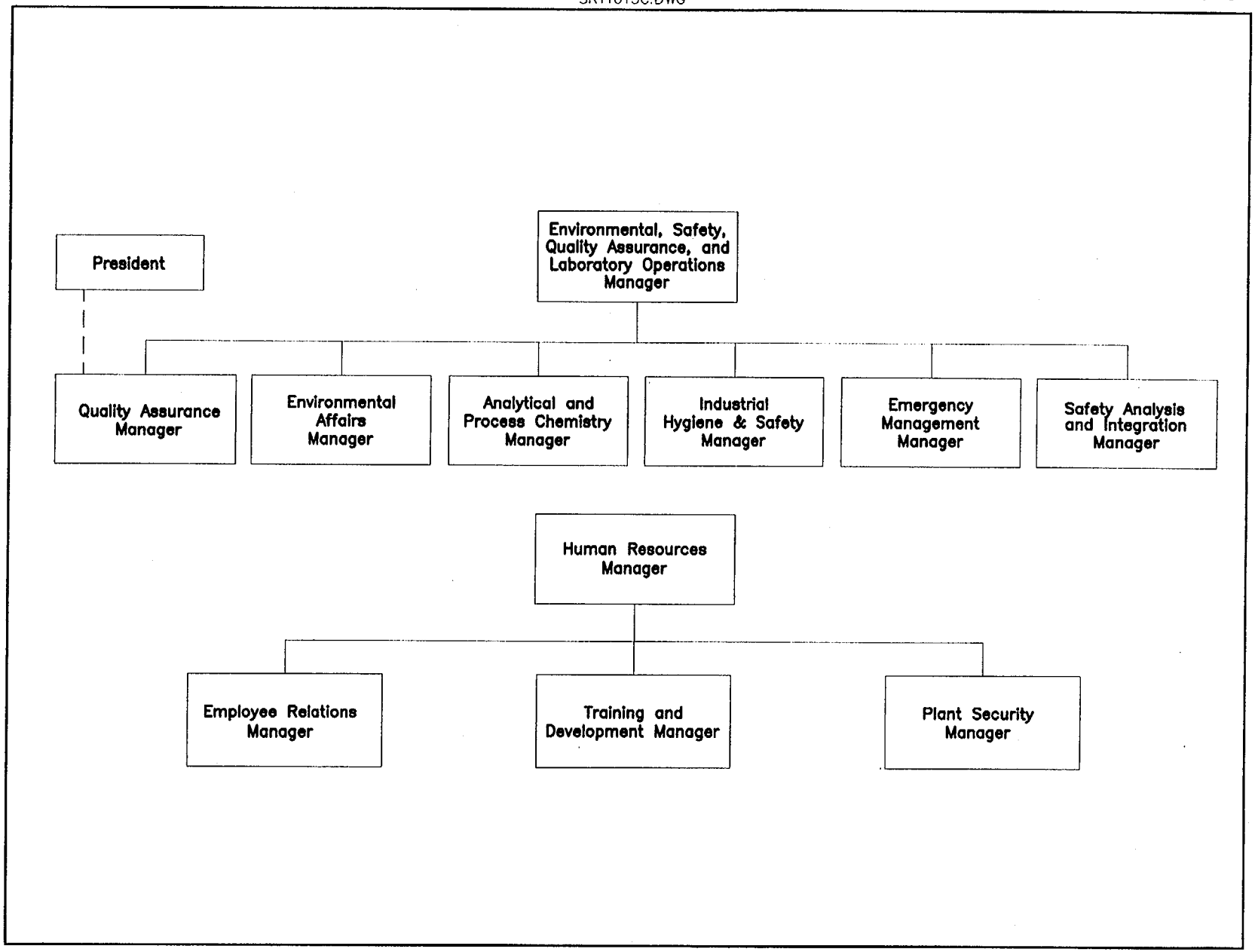


Figure A.10.1–3c WVNS Organizational Structure

SR11013D.DWG

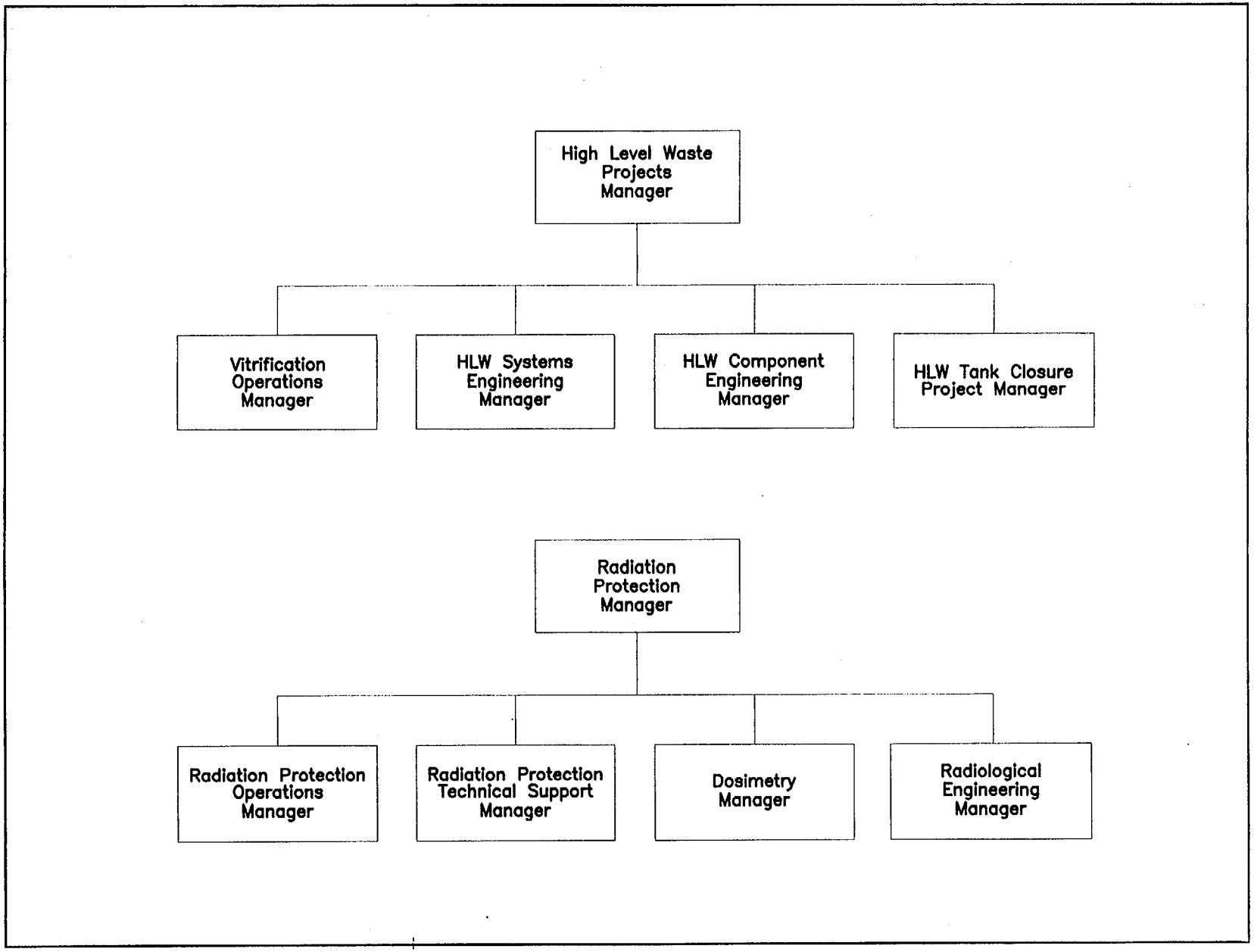


Figure A.10.1–3d WVNS Organizational Structure

SR11013E.DWG

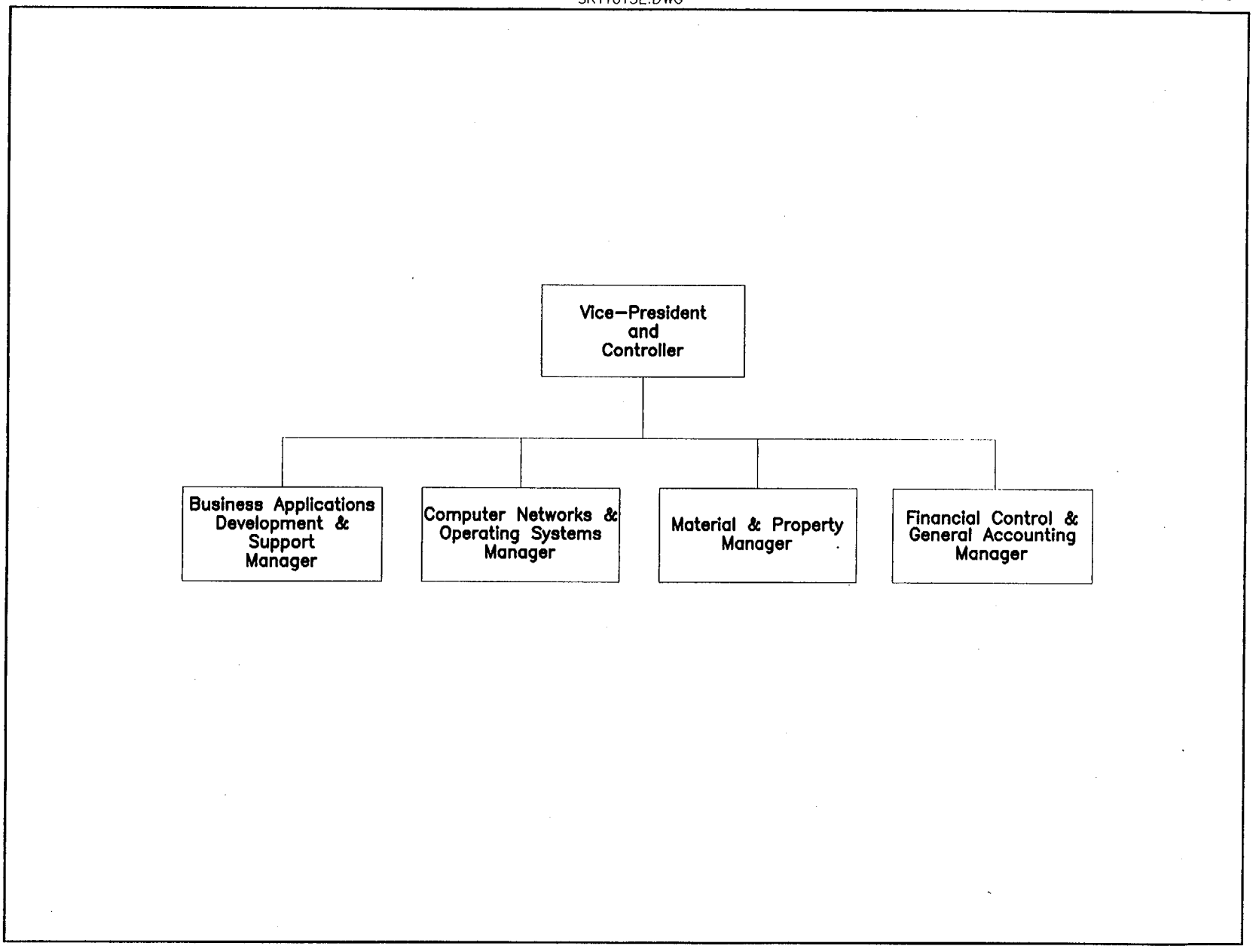


Figure A.10.1–3e WVNS Organizational Structure

A.12.0 QUALITY ASSURANCE

This section describes how the WVNS Quality Assurance (QA) Program is being applied in compliance with 10 CFR 830.120, *Quality Assurance Requirements* (USDOE). The DOE-approved WVNS QA Program (QAP) has been established, approved, and implemented to ensure that site missions are accomplished while minimizing potential hazards to the public, site or facility workers, and the environment. The program is applied to all activities affecting quality at the WVDP site, including both nuclear and non-nuclear areas. In particular, the WVDP scope of work consists of:

- Project management and administrative support activities;
- Design, construction, and modification of facilities;
- Processing, interim storage, and disposal of nuclear wastes (waste characterization, sludge mobilization, supernatant processing, waste vitrification, and high-level waste storage);
- SNF shipout;
- Shutdown and maintenance operations; and
- Decontamination and decommissioning activities (low-level waste treatment and disposal, transuranic waste segregation, storage and shipping, and radwaste volume reduction).

As stated in Section A.1.1, this SAR is an overview. In keeping with this application of a graded approach, not all aspects of the WVNS QAP are described.

As described by the WVNS QAP document WVDP-111, *Quality Assurance Program*, (WVNS) the WVNS QAP incorporates grading through use of Quality Levels established by risk-based evaluation of safety, environmental, and programmatic factors. An important feature of the WVNS grading process approach is that the level of effort or degree of program application is determined by review of items or activities. The assigned Quality Level provides a key basis for determining the degree of application of QA requirements in accordance with factors influencing responsible work process control and work acceptance such as complexity, consequence of failure, and degree of uncertainty. The WVNS graded implementation is consistent with 10 CFR 830.3,

Definition of Graded Approach, and 10 CFR 830.7, *Description of Graded Approach* (USDOE).

The WVNS Quality Assurance Program has been developed using the format and content of ASME NQA-1, *Quality Assurance Program Requirements for Nuclear Facilities* (ASME), DOE/RW-0333P, *Quality Assurance Requirements and Description* (USDOE December 18, 1992), and the appropriate requirements from DOE O 414.1, *Quality Assurance* (USDOE November 24, 1998). The WVNS Quality Assurance Program, as defined by WVDP-111, has been approved by DOE (Lowes, April 20, 2000) and provides for a functioning program for compliance to the QA Rule, 10 CFR 830.120. Requirements identified by WVDP-111 are implemented by policies contained in WVDP-002, *Quality Management Manual* (WVNS), and selected portions in WVDP-117, *WVNS Policies and Procedures Manual* (WVNS).

DOE has provided guidance for preparing QA Rule implementation plans, including guidance for use of the non-mandatory G-830.120, *Implementation Guide for use with 10 CFR Part 830.120 Quality Assurance* (USDOE April 15, 1994) The Implementation Guide provides a specific list of Technical Standards to be used to meet the criteria of 10 CFR 830.120. In order to implement the QA Rule, the WVNS QAP is based on the appropriate criteria specified in the Implementation Guide and DOE 0 414.1, *Quality Assurance*. Other guidance documents provided by the DOE include DOE G 414.1-1, *Implementation Guide for Use With Independent and Management Assessment Requirements of 10 CFR 830.120 and DOE O 414.1 Quality Assurance* (USDOE August 1996); DOE G 414.1-2, *Quality Assurance Management System Guide for Use With 10 CFR 830.120 and DOE O 414.1* (USDOE June 17, 1999); DOE G 450.4-1, *Integrated Safety Management System Guide* (USDOE November 26, 1997); and DOE G 440.1-6, *Implementation Guide for Use With Suspect/Counterfeit Items Requirements of DOE O 440.1A* (USDOE June 30, 1997).

The following technical standards were also used as guidance to implement Quality Assurance Requirements:

- ASME NQA-1-1989, *Quality Assurance Program Requirements for Nuclear Facilities;*
- DOE G 450.4-1, *Integrated Safety Management System* Guide (USDOE November 6, 1997);
- DOE O 414.1, *Quality Assurance;*
- DOE Order 5480.19, *Conduct of Operations* (USDOE May 18, 1992);

- DOE P 450.4, *Safety Management System Policy* (USDOE October 15, 1996); and

- DOE/RW-0333P, *Quality Assurance Requirements and Description*, Rev. 0.

A.12.1 Organization

The WVNS organization is shown in Figures A.10.1-1 and A.10.1-2 and described in associated text in Section A.10. Other participants, including suppliers, consultants, subcontractors, and laboratories are a part of the overall WVNS program by virtue of WVNS-delegated Quality Assurance Program elements. All such delegated Quality Assurance functions are identified by appropriate contractual requirements with accountability for acceptable implementation retained by WVNS. WVNS performs initial approval of the organizational structures and quality assurance programs of all major project participants. WVNS also performs scheduled, periodic overviews of these organizational structures and QA programs via audits, surveillance, or other appropriate methods. The Quality Assurance Organization, which has responsibility for establishing the WVNS QAP, is shown in Figure A.12.1-1.

A.12.1.1 Responsibilities

WVDP-002 and WVDP-117 document the responsibilities and authority of persons and organizations that: 1) perform safety functions, 2) ensure that the Quality Assurance Program is established and implemented, and 3) verify that activities have been correctly performed and documented in accordance with WVNS implementing procedures. These responsibilities are summarized below:

A.12.1.1.1 WVNS Responsibilities

WVNS is responsible for:

- Establishing the Project QAP requirements and responsibilities during the design, procurement, construction, installation, modification, testing, and operation phases of the Project, in accordance with the WVNS QAP, to meet the requirements of 10 CFR 830.120 and D&D;

- Establishing, documenting, and implementing a program for control of Project activities in accordance with the WVNS QAP;

- Developing design criteria and safety analysis reports;

- Monitoring and reviewing the Environmental and Safety Services activities;

- Assuring completion of decontamination and decommissioning (D/D) activities for Project premises; and

- Processing and safe disposal of wastes.

A.12.1.1.2 WVNS President Responsibilities

The WVNS President is responsible for:

- All functions of WVNS, including establishment and implementation of the Quality Assurance Program;

- Reviewing the Quality Assurance Program and for causing corrective action, when necessary, to be taken by the responsible West Valley Nuclear Services Company organizations.

A.12.1.1.3 Manager, Environmental, Safety, QA, & Laboratory Operations

The Manager, Environmental, Safety, QA, & Laboratory Operations is responsible for:

- Radiological engineering, radiological control operations, NEPA compliance, environmental assessment, facility assessment, criticality, safety evaluation, environmental monitoring programs and geotechnical operations, analytical chemistry, environmental and subcontract laboratories.

- Overall quality assurance.

A.12.1.1.4 WVNS Quality Assurance Organization Responsibilities

The WVNS QA Organization is responsible for:

- Establishing the WVNS QAP to meet the requirements of 10 CFR 830.120;
- Providing Project support in quality assurance activities;
- Reviewing test documentation;
- Providing Project support in witnessing and approving construction tests;
- Performing audit and assessment activities of WVNS and subcontractors to determine compliance with the Project requirements;
- Recommending quality assurance hold points in system operability test procedures and coordinating the release of these hold points;
- Identifying deficiencies in the QAPs of the subcontractors and suppliers; and
- Monitoring activities of the subcontractors.

A.12.1.1.5 URS (Dames & Moore) Responsibilities

The Environmental and Safety Services subcontractor, URS (Dames & Moore), is responsible for:

- Conducting work in accordance with the WVNS QAP;
- Collecting environmental samples and processing, validating, evaluating, and interpreting environmental data for the Project as directed by WVNS; and
- Preparing safety analysis reports and auditable safety analyses.
- Preparing PSR criteria and the resulting PSRs.

A.12.1.1.6 Other Departments within WVNS

Other departments within WVNS are responsible for:

- Compliance with the WVNS QAP as documented in WVDP-002, *Quality Management Manual*, and for implementing the portions of the manual applicable to them. The WVNS departments are structured to effectively administer the design, procurement, construction, installation, modification, testing, and operation phases.

A.12.1.1.7 Site Personnel

Site personnel are responsible for:

- Expressing quality allegations up to the President of WVNS, or the Director, DOE-OH/WVDP, without fear of reprisal. A well-publicized policy provides the provisions for reporting such allegations or concerns.

A.12.1.1.8 Pacific Northwest National Laboratories Responsibilities

The Commercial Waste Treatment Program (CWTP) contractor, Pacific Northwest National Laboratories (PNNL), is responsible for:

- Preparing and implementing a QAP during the design and process phase of the Project that is based on the appropriate requirements of DOE/RW-0333P.

Responsibilities of PNNL during earlier phases of Project development included: providing design and support for overall management; providing laboratory studies (e.g., melter runs and glass formulation studies); and providing the design, procurement, fabrication, and shipment of the Component Test Stand (CTS) equipment.

A.12.1.1.9 Review of Quality Assurance Manuals

Subcontractors' QAPs are reviewed and approved by WVNS. Their implementation procedures and instructions are reviewed by WVNS, as appropriate.

A.12.2 Quality Assurance Program Plan

Definition and description of the WVNS QAP is provided by the DOE-approved WVNS document WVDP-111, *Quality Assurance Program*, which is the QAP document required by the QA rule, 10 CFR 830.120, *Quality Assurance Requirements*. WVDP-111 and its implementing procedures provide identification of the applicable requirements of the WVNS QAP to be used in determining compliance to the QA Rule. The *WVNS Implementation Plan for QA Rule 10 CFR 830.120* (WVNS February 15, 1996), which is integrated into the QAP (Appendix C), contains a matrix identifying appropriate and applicable requirements of the WVNS QAP to be used in determining compliance with the QA Rule.

The core documents providing policy and program implementation procedures for the WVNS QAP are WVDP-002, *Quality Management Manual*, and select WVs contained in WVDP-117, *WVNS Policies and Procedures Manual* (WVNS). WVDP-002 details the established policies, requirements, and organizational responsibilities for the WVNS QAP. The Quality Management Manual requirements are implemented by written procedures and instructions, most of which are implemented at the department level with either company or department procedures or manuals. WVDP-002 is approved by the president of WVNS and has been subsequently reviewed for acceptability by DOE. Figure A.12.2-1 presents the hierarchy of QA documents at the WVDP.

The QA Rule, 10 CFR 830.120, identifies ten requirements. These ten requirements are embodied in the WVNS QA program, as defined by WVDP-111. Table 12.2-1 is a matrix showing these ten requirements and the sections in this SAR discussing their implementation at the WVDP.

The WVNS President is the senior manager responsible for ensuring adequacy, implementation, and continuing assessment of the WVNS Quality Assurance Program. The President's staff managers responsible for operational, administrative, technical, engineering, and quality assurance functions provide the top-level of line management responsible for work processes and work performance in compliance with QAP requirements. The requirements of the QAP apply to all WVNS organizations performing activities affecting quality. As appropriate, WVNS QAP requirements are imposed upon subcontractors and other project participants by WVNS contractual delegation. WVDP-002 provides a definition of organizational structure and responsibilities as applied to individual QAP authorities and functions.

The WVDP QAP policies and requirements for the Project are established by WVNS. The QAP for the Project complies with the provisions of 10 CFR 830.120, as applicable to the design, procurement, construction, installation, modification, testing, operation, and D&D. The quality required for the Project scope of work is achieved by work performed and verified in accordance with approved procedures.

Quality requirements are applied to the WVDP and suppliers by including appropriate quality and documentation requirements in contractual provisions and in technical specifications.

The QAP is implemented for quality-related activities. The degree of control and verification of the QAP to the WVDP work scope is consistent with criteria delineated by implementing procedures and work instructions. These criteria were developed using the following considerations:

- Safety Class and Quality Level of equipment;
- Consequence of malfunction, or failure of an item, system, or process;
- Need for special controls and surveillance over processes and equipment;
- Degree to which functional compliance can be demonstrated by inspection or test;
- Quality history and degree of standardization of an item, system, or process; and
- Difficulty of repair or replacement of an item.

A.12.2.1 Design Control

The quality required for Project design control is achieved by ensuring that the design of structures, systems, components, assemblies, test equipment, processes, and facilities is adequately defined, controlled, and verified in accordance with design control procedures. These procedures comply with DOE Order 4700.1, *Project Management System* (USDOE March 6, 1987), and with 10 CFR 830.120.

The extent of independent design verification depends upon the safety aspects of the item, the complexity of the design, the similarity of the design to proven designs,

and the present state of the art. Acceptable verification methods include (but are not limited to) one or a combination of: design reviews, alternate independent calculations, and qualification testing.

Design changes are processed in accordance with design control procedures. These procedures provide for the independent review of designs and for control of the review, approval, and release of drawings and specifications.

A.12.2.2 Procurement Document Control

DOE-OH/WVDP has delegated prime authority for the procurement and the administration of contracts to WVNS. The preparation and processing of procurement documents are performed in accordance with policies and requirements of WVDP-117, *WVNS Policy and Procedures Manual*, and WVDP-002, *Quality Management Manual* (WVNS). These policies ensure that procurement documents contain appropriate technical and quality requirements. To the extent necessary, procurement documents require contractors and suppliers to have quality assurance programs that are adequate to control the quality of the items or services.

The procurement documents specify the scope of work, technical requirements, and application of QA requirements. The appropriate procurement documents with QA requirements specified therein are reviewed and approved by the WVNS QA organization. Procurement documents are controlled by WVNS' standard procurement procedures and practices. Changes to procurement documents are controlled by written WVNS procedures.

To the extent of an item's importance to safety and quality, procurement documents require that suppliers and their subtier suppliers have quality assurance programs consistent with the requirements contained in the purchase documents. The requirements are commensurate with the Quality Level and safety class of the item or activity. Suppliers are surveyed and evaluated to assure that sufficient and appropriate systems, procedures, and personnel are available to meet the programmatic and technical requirements of the purchase order prior to the initiation of work activities covered by the QAP. Records are maintained on all suppliers surveyed to show those quality assurance attributes available within their Quality Assurance Program. The WVNS Purchasing organization obtains approval from Engineering and Quality Assurance of potential suppliers.

Following the preparation and approval of a procurement document and selection of an acceptable supplier, the purchase order is prepared and issued along with the supporting procurement documents. If verification of the quality of supplied items cannot be performed at receiving inspection, work performed by the supplier is verified by WVNS during the course of procurement, ensuring that the purchase order requirements are met. Verification activities conducted by the QA Organization may include auditing, receiving inspection, surveillance, or inspection at mandatory hold points during processing, final inspection, and shipping.

A.12.2.3 Instructions, Procedures, and Drawings

Components, systems, structures, and associated services that are important to the safe and reliable operation of the WVDP are designed, fabricated, erected, inspected, and tested in accordance with approved specifications and drawings. Instructions, procedures, and drawings are issued and controlled for the performance of the work scope in accordance with the considerations specified in appropriate QA programmatic requirements. The documents prepared by the issuing organization are approved by the WVNS QA organization and other interfacing organizations. Where appropriate, the documents contain quantitative and qualitative acceptance criteria that form the basis for verifying that all quality-related activities are satisfactorily accomplished.

A.12.2.3.1 Document Control

The preparation, issuance, and revisions to documents that implement the considerations specified in accordance with appropriate QA programmatic requirements are controlled to assure that correct documents, including the proper revision level, are being used. These documents, including any changes, are reviewed for adequacy and approved for use.

WVNS has established and implemented appropriate measures to control the preparation, review, approval, and issuance of site documents such as standard operating procedures, safety analysis reports, drawings, procedures, specifications, instructions, and changes that prescribe activities affecting quality. Documents are controlled to assure that correct and applicable documents are available at the location where they are to be used. Any change to controlled documents are reviewed and approved by the same organizations that performed the original review and approval unless other organizations are specifically designated.

Additional information on document control may be found in Section A.10.4.2.2.

A.12.2.4 Control and Identification of Purchased Material, Equipment, and Services

Measures have been established and implemented at the WVDP to ensure that purchased materials, equipment, and services conform to the requirements outlined in the procurement documents. Control of purchased materials, equipment, services, and supplier selection is implemented in accordance with the considerations specified in accordance with appropriate QA programmatic requirements. These measures include contract provisions as appropriate for source inspections, receiving inspections, monitoring of site construction activities, equipment installation activities, acceptance testing, and objective evidence of compliance submitted by contractors and suppliers to demonstrate compliance with contract requirements.

Before a purchase order is issued, the selected supplier, if required, is evaluated by WVNS to assess the adequacy of the supplier's quality assurance program, technical abilities, and the facilities and organization necessary to produce an acceptable item or service. Evaluation and selection of sources of supply prior to award of the purchase order are defined by procedure. Qualified personnel survey and evaluate proposed suppliers of quality-related services and items based on the Quality Level of the item being procured. The survey is documented. The QA organization concurs with the proposed accepted supplier list prior to issuing the procurement package for supplier quotations. For specific major or critical procurements, the QA organization participates in the entire supplier selection process, including the proposed bid evaluation.

Surveillance at supplier's facilities is planned and conducted during the life of the contract by the WVNS QA organization or a representative, based on the items' importance to safety and the suppliers quality history. These surveillances are performed to verify compliance with the procurement quality assurance requirements. Surveillances may include independent source inspection and release of items at the supplier prior to shipment.

When required, purchase orders contain the requirements for suppliers to submit documents and revisions thereto (i.e., technical specifications, drawings, processing procedures, inspection and test plans, procedures and quality programs/procedures) for WVNS review and approval.

Mandatory supplier hold points may be identified to facilitate QA determination of the acceptability of the item or service. Instructions issued with the hold point direct the supplier not to proceed beyond the hold point until the work has been released by a WVNS representative. Hold points may be identified at receiving, during processing, and at final inspection and shipping.

A.12.2.4.1 Identification and Control of Items

WVNS has established measures to identify and control materials, parts, and components to ensure only correct and acceptable items are used and installed at the WVDP.

Procedures implement requirements for traceability from receipt to the end-use or installation of items with considerations specified in accordance with appropriate QA programmatic requirements. To maintain traceability throughout the supplier's work scope and shipping cycle, applicable requirements for the identification and traceability of supplier-furnished materials, equipment, and services are included in the purchase order.

Physical identification is used where appropriate to provide for clear and legible identification that does not affect the function or service life of an item. When physical identification is not practical, other administrative controls such as tagging, physical separation, and lot or batch control are employed to maintain traceability.

A.12.2.4.2 Control of Processes

Provisions for the control of processes (i.e., welding, nondestructive examination, installation, construction, and testing phases) are incorporated into the Project. Processes that affect the quality of final items or services in accordance with their Quality Level classifications, as discussed in Section A.12.3, are controlled. Special processes that control or verify quality are performed by qualified personnel using qualified procedures in accordance with applicable requirements.

Requirements for control of supplier processes are included in the procurement documents. The process control provisions included in the technical specifications vary depending on the importance and complexity of the involved process, component, system, or structure. As appropriate, the specified control includes the use of documented procedures and qualification of procedures, personnel, and equipment.

A.12.2.5 Inspection, Surveillance, and Testing

A.12.2.5.1 Inspection

Measures have been established and implemented by WVNS to ensure that inspections required to verify acceptance of an item, test, or service are performed in accordance with documented requirements. Inspection plans include measures to ensure that qualified procedures and personnel are provided to perform the following inspection activities during the procurement, installation, construction, and testing and operation phases of the Project:

- Source surveillance and inspection;
- Receiving inspection;
- Fabrication, assembly, or installation inspection;
- On-site construction inspection;
- Test verification;
- Process hold point surveillance; and
- Operating procedure surveillance.

Personnel performing inspection activities for the purpose of product acceptance are qualified and trained to perform the inspection task and are independent of the group performing the activity being inspected. Inspector training and qualification for the WVNS personnel is formally prescribed, defined, maintained, and documented. These records are maintained by the Training and Development Department. Training and proficiency requirements include activities such as inspections, surveillances, and QA documentation and records. Formal training requirements are also prescribed for QA program auditors and for personnel performing nondestructive examination, inspection, and test activities.

WVNS QA Organization inspection planning is documented, showing each characteristic to be inspected, method to be used, the acceptance criteria, and providing for the recording of objective evidence of inspection results. When sampling is used to

verify acceptability of a group of products, the sampling plan is based on a recognized standard practice and the sampling results are documented.

Final inspection performed for the Project includes a review of all previously performed inspections, reworks, repairs, or recalibrations, and the resolution of nonconformances. Quality records are also examined for acceptance and accuracy prior to final acceptance of the product.

A.12.2.5.2 Test Control

Measures have been established and implemented at WVNS to assure that tests necessary to verify conformance of items or services to requirements are performed in accordance with documented procedures. Tests are performed by trained and qualified personnel. The results are documented and evaluated against approved acceptance criteria. Test programs are established to ensure that components, systems, and structures perform safely, that operational functions are satisfactory when in service, and that the testing is identified and documented in written test procedures that incorporate or reference the requirements and acceptance limits contained in applicable design documents.

Requirements for the performance of tests by WVNS personnel or by Project suppliers are included in the procurement documents. The procurement documents specify, when necessary, those procedures required to be submitted to WVNS for review, approval, or information. Test requirements and acceptance criteria are included in design documents.

A.12.2.5.3 Control of Measuring and Test Equipment

Measures have been established at WVNS to ensure that gauges, instruments, measuring devices, and testing equipment used to determine conformance with specified requirements of drawings and specifications, or for obtaining test data, are of the proper range, type, and accuracy. To ensure accuracy, measuring and test equipment is calibrated at established intervals against certified standards that have a known valid relationship to nationally recognized standards. Purchase orders may be issued for calibration of measuring and test equipment through a qualified supplier. Calibration records include (if appropriate) an Instrument Data Card and a History of Repair Card for each instrument used for acceptance or testing. The calibration system provides for recall of equipment for recalibration. Additional information about control of measuring and test equipment may be found in Section A.10.4.3.

A.12.2.5.4 Handling, Storage, and Shipping

Procedures are established to control the handling, storage, and shipping of items and materials by WVNS to prevent damage or deterioration. Handling, storage, packaging, preservation, and shipping requirements contained in government and industry safety codes and standards apply as required by the contract. In special circumstances, the specific requirements may be cited in the technical specifications for material, parts, components, or equipment involved.

Controls are established to ensure that special handling tools and lifting equipment are inspected and tested at required intervals to show that these items are adequately and safely maintained. Personnel who operate and maintain special handling tools and lifting equipment are trained in the use of the equipment. Purchase orders may be issued for load testing of lifting equipment and special handling tools through a qualified supplier.

Purchase orders include appropriate requirements for qualification of suppliers to ensure that items are protected to prevent damage during handling, shipping, and storage. WVNS QA personnel perform surveillances during handling, storage, and shipping activities for critical items.

A.12.2.5.5 Inspection, Test, and Operating Status

Measures established to determine the status of inspection and test activities are identified in documents traceable to the items. Controls are established to identify nonconforming, inoperative, or malfunctioning components or systems and to prevent items from being processed beyond the required inspections, tests, or installation. Controls also prevent inadvertent use of the items.

Status of items are maintained on the processing documents or test plan. Equipment status is also maintained by use of shop documents or visible indicators. Review of suppliers' QAPs and procedures is conducted by WVNS to verify that the status of inspections and tests is adequately addressed.

WVNS QA personnel perform surveillances and audits of the suppliers for conformance to documented procedures regarding the identification of inspection status of work in process by inspection records, tags, markings, stamps, labels, shop travelers, or other appropriate means. A WVNS procedure has been established to: 1) designate status of items or equipment as "accepted," "hold," or "rejected"; 2) control

application and removal of inspection tags by authorized persons; and 3) prevent bypassing of required inspections, tests, or other critical operations.

A.12.2.6 Nonconforming Materials, Components, and Fabrication and Construction Features

Materials, parts, components, equipment, structures, and systems that deviate from approved specifications, drawings, codes, or other applicable documents are considered nonconforming items and are identified and controlled to prevent inadvertent use or installation. If identification of each nonconforming item is not practical, the container, package, or segregated storage area, as appropriate, is identified. Nonconforming items discovered during manufacture, fabrication, or shop test activities, or operations are controlled and documented in accordance with written procedures. WVDP-357 provides formal procedures for resolving non-conformance issues.

WVNS provides requirements for suppliers' procedures for control and reporting of nonconforming items in procurement documents. Suppliers' and major Project participants' procedures are reviewed by WVNS as part of the overall review of their QAP. These procedures address, as applicable: identification, tagging, and segregation of nonconforming items; documentation of nonconforming items; disposition of the nonconformance; notification of affected organizations; rework or repair requirements; and reinspection and retest requirements.

A.12.2.7 Corrective Action

Measures are established and implemented by WVNS and major Project participants to ensure that adverse conditions such as failures, malfunctions, deficiencies, deviations, or defective material or equipment are promptly identified and corrected. In the case of significant conditions adverse to quality, the measures ensure that the cause is determined and that appropriate corrective action is taken by the responsible organization to prevent repetition or recurrence.

Identification of situations that may require corrective action are accomplished through periodic review of supplier surveillance activities, QA surveillance and monitoring programs, QA audits, and issue reports. Issue reports for significant issues document the identification of all significant conditions adverse to quality, including the cause of the condition, corrective action taken, and cost and/or schedule impact (when applicable). Corrective actions are reported to appropriate

levels of management. Final verification or follow-up is documented by responsible parties.

Performance data, internal and external failures, and other quality-related information are analyzed to identify trends that adversely impact quality and to identify opportunities to improve items and processes. This analysis considers information from external sources and is not limited to one type of work, one facility, or one contractor. The extent of cause analyses for nonconforming items and processes is commensurate with the importance or significance of the problem.

A.12.2.8 Quality Assurance Records

The WVDP QA Records Program includes requirements and responsibilities for identification, filing, transmittal, receipt, storage, retention, maintenance, retrieval, and disposition of QA records. The system addresses the records associated with design, QA, and procurement, including duration for each type of record. Sufficient information is provided to enable traceability to the item or activity to which it is associated.

QA Records are classified as either lifetime or nonpermanent. Criteria for classifying records are contained in WV-730, *Records Management and Storage*, which incorporates guidance contained in ASME NQA-1 and DOE/RW-0333P. Lifetime records are maintained for the life of the particular item.

Nonpermanent records are records that do not meet the criteria for lifetime records but are required as evidence that an activity was performed in accordance with the applicable requirements. Nonpermanent records need not be retained for the life of the item because they do not meet the criteria for lifetime records.

QA records provide sufficient information to permit matching of the record and the item(s) or activity to which it applies. These include the following information as applicable: document title, number, revision, date, reference to appropriate contract, purchase order, work order numbers, references to appropriate drawings, specifications, procedures, and instructions. Records are indexed and maintained to provide for the retrieval of information within a reasonable time. The Project QA records include but are not limited to the following: results of reviews, inspections, tests, audits, monitoring of work performance, personnel qualifications, drawings, specifications, calculations, procurement documents, calibration procedures, nonconformance reports, and corrective action reports.

Inspection and test records identify the data, type of observation, results, acceptability, and the action taken with regard to any deficiencies noted.

A.12.2.9 Audits

A comprehensive program of planned and periodic WVNS audits is conducted under the direction of the QA Organization to verify compliance with the various aspects of the QAP and to determine the effectiveness of the program. The audits include review of indoctrination and training activities, processes, and items, and reviews of documents and records of corrective actions, calibrations, and nonconforming items control. The audits are conducted during design activities and procurement, construction, installation, system acceptance testing, and operation phases of the WVDP Project. The program includes audits of suppliers and major Project participants' activities in support of the Project.

Audits are performed in accordance with written procedures or checklists by appropriately trained and qualified personnel within the QA organization and/or qualified audit representatives from other organizations who do not have direct responsibility for the areas being audited. Audit results are documented and reviewed by management personnel having responsibility for the area being audited. Responsible management personnel ensure timely and appropriate action to correct and prevent recurrence of deficiencies revealed by the audit.

A.12.3 Quality Level Classification of Structures, Systems, and Components

The Quality Assurance Program provides guidance for determining the graded applicability of quality assurance standards to items, systems, or services. Structures, systems, and components that are covered by the Quality Assurance Program are graded and identified by quality level, which is based upon safety, environmental, health, and other programmatic considerations. The assigned list, methodology for classification, and rationale for establishment of quality levels are contained in WVDP-204, *WVDP Quality List (Q-List)*, (WVNS). With activities clearly identified by quality level, existing WVNS procedures and practices provide a mechanism and process for graded quality assurance. The quality level system consists of four quality levels:

Quality Level A

Quality Level A is assigned to activities affecting structures, systems, subsystems, components, or services where predicted consequences of failure, error, or other inadequacies are judged to have major or severe environmental, public health and safety, or programmatic impact.

Quality Level B

Quality Level B is assigned to activities affecting structures, systems, subsystems, components, or services where the predicted consequences of failure, error, or other inadequacies are judged to have significant on-site environmental, health and safety, or programmatic impact.

Quality Level C

Quality Level C is assigned to activities affecting structures, systems, subsystems, components, or services where the predicted consequences of failure, error, or other inadequacies are judged to have limited on-site environmental, health and safety, or programmatic impact, and do not require quality assurance categorizing as Quality Level A or B. This category would also apply to activities having reportable, site-generated environmental or health and safety impact.

Quality Level N

Quality Level N applies to activities affecting structures, systems, subsystems, components, or services where the consequences of predicted failure, error, or other inadequacies are not judged to have significant environmental, health and safety, or programmatic impact. Application of quality assurance program controls is not required but may be applied as determined appropriate and cost-effective by the cognizant performing organization.

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Table A.12.2-1

COVERAGE OF DOE-STD-3009-94 QUALITY ASSURANCE REQUIREMENTS IN WVNS-SAR-001

WVDP-111 Criteria	DOE-STD-3009-94 QA Criteria	Coverage in SAR-001
1	Program and Organization	Sections A.12.0, A.12.1, A.12.2
3	Quality Improvement	Sections A.12.2.6, A.12.2.7
4	Documents and Records	Sections A.12.2.2, A.12.2.3, A.12.2.8
5	Work Processes	Sections A.10.4.3, A.12.2.3, A.12.2.4.2, A.12.2.5.3, A.12.2.5.4
6	Design	Sections A.4.0, A.10.4.2.2, A.12.2.1
7	Procurement	Sections A.12.2.2, A.12.2.4
8	Inspection and Acceptance Testing	Sections A.12.2.3, A.12.2.4, A.12.2.5
10	Independent Assessment	Sections A.12.2.6, A.12.2.7, A.12.2.9

SR1121-1.DWG

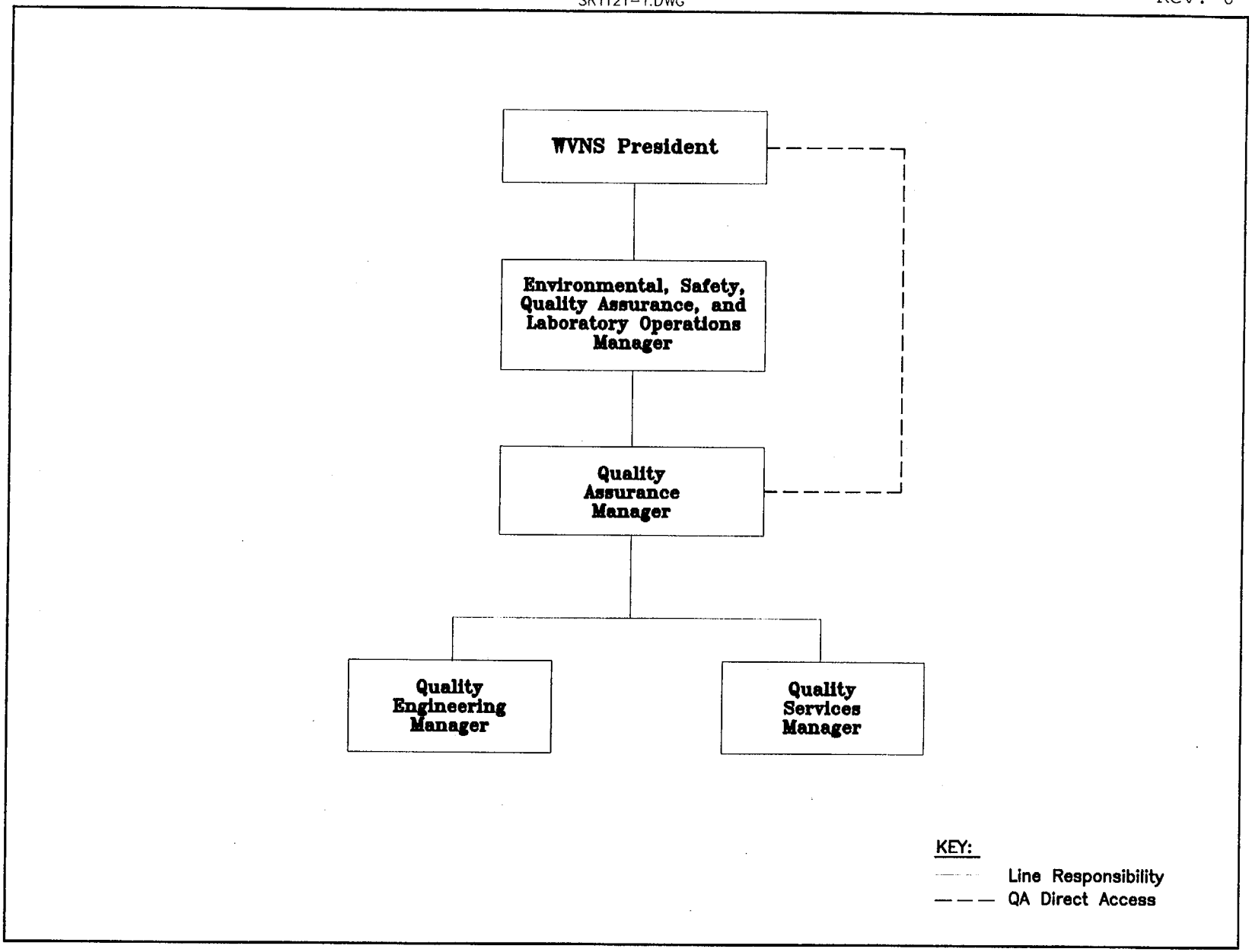

Figure A.12.1-1 Quality Assurance Organization

SR1122-1.DWG

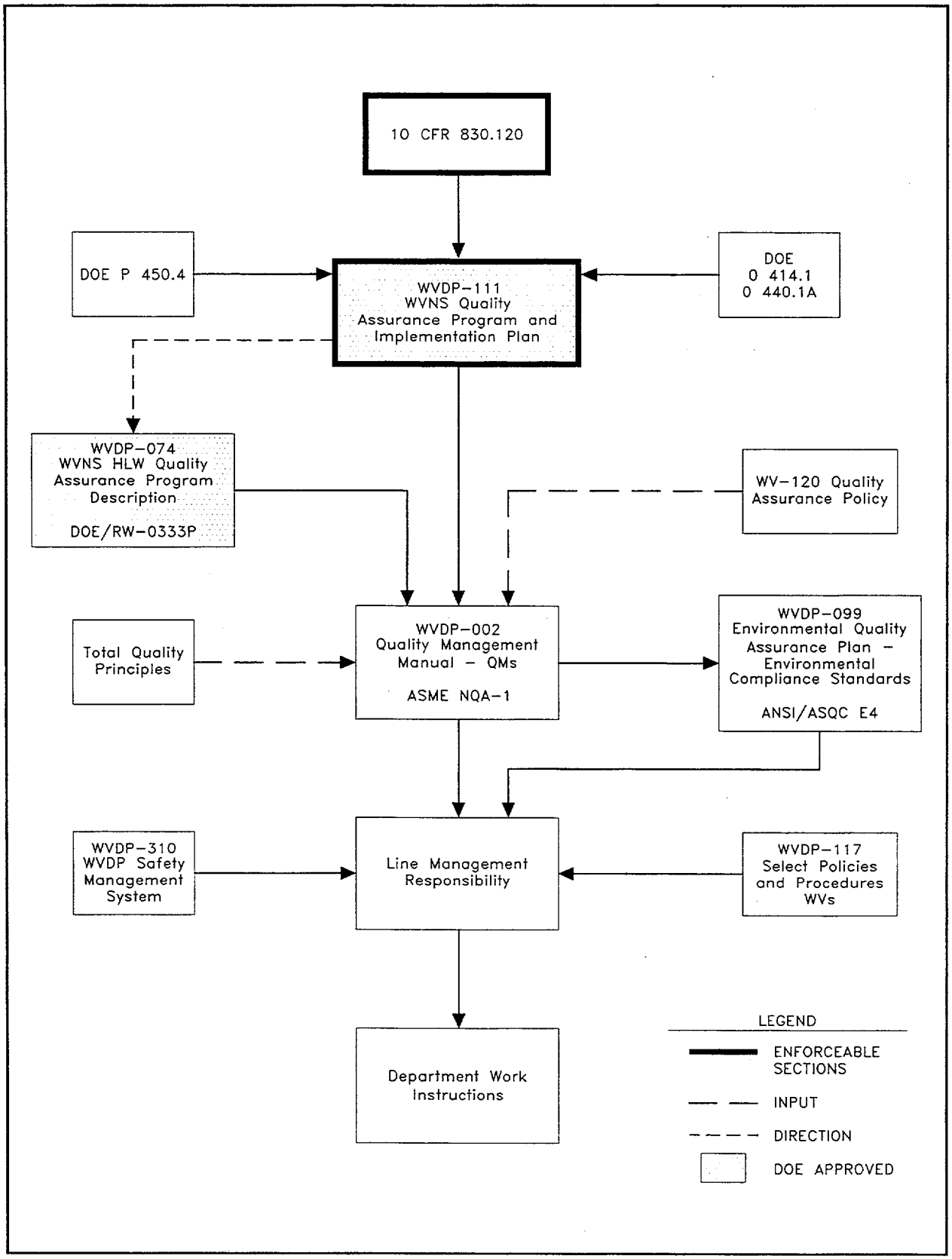

Figure A.12.2-1 Quality Assurance Program Implementation Hierarchy