START

0025076

DON'T SAY IT --- *Write It!*

DATE: October 23, 1991

TO: Dan Duncan - EPA
Cathy Massimino - EPA

FROM: Cliff Clark
Telephone: (509) 376-9333

cc: R. Holt - RL

SUBJECT: CHANGES TO THE WASTE WATER PILOT PLANT RD&D PERMIT APPLICATION

Enclosed are three copies of replacement pages for the Waste Water Pilot Plant RD&D permit application. The changes were made as a result of RL review prior to certification.

A certified copy of the permit application should be available in the near future. If you have any questions, please don't hesitate to call.

54-3000-101 (9/59) (EF) GEF014
DSI

THIS PAGE INTENTIONALLY
LEFT BLANK

EXECUTIVE SUMMARY

This permit application has been prepared to obtain a research, development, and demonstration permit to perform pilot-scale treatability testing on various Hanford Facility waste water effluent streams. This permit application provides the management framework and controls all the testing conducted in the waste water pilot plant using dangerous waste. The permit application provides a waste acceptance envelope (upper limits for selected constituents) and details the safety requirements for waste water pilot plant testing, two key aspects required to be addressed for permitting purposes. The permit application describes the overall approach to testing and the various components or requirements that are common to all tests. The permit application has been prepared at a sufficient level of detail to establish permit conditions for all waste water pilot plant tests to be conducted.

Two documents will be used to detail each test conducted in the waste water pilot plant and to report the data obtained from these tests. These two documents are test procedures and test reports. Upon request, copies of the test procedures and test reports will be available for inspection for informational purposes. Additionally, a quality assurance project plan is included and will ensure that testing activities are conducted in a manner that will provide accurate and complete data.

Examples of waste water effluent streams treated at the waste water pilot plant include steam condensates and cooling waters that have not been in contact with dangerous or mixed waste and process condensates that might have been in contact with dangerous or mixed waste. The waste waters that are anticipated to be tested in the waste water pilot plant typically contain trace levels of radionuclides and stable chemicals. Both organic and inorganic constituents can be present as suspended solids or as dissolved solids. While there is a wide variety of contamination in the waste waters, the level of contamination is very low.

Regardless of the level of contamination, pilot-scale treatability testing of a waste water stream that is designated dangerous waste requires approval from the Washington State Department of Ecology and/or the U.S. Environmental Protection Agency. The research, development, and demonstration permit will satisfy this permitting requirement. While testing of synthetic and radioactive waste do not require a research, development, and demonstration permit, synthetic and radioactive waste is described in this permit application to provide a complete discussion of the Hanford Facility waste water pilot plant testing program.

Several waste water treatment systems currently are being designed for the Hanford Facility. Before these treatment systems are constructed, the design of the systems will need to be tested. This testing will demonstrate the technical feasibility and performance capability of innovative technologies or innovative treatment system configurations so that these technologies can be tailored to the needs of the Hanford Facility. This testing also will provide data to support the preparation of the required environmental permits and approvals.

Waste water pilot plant testing within the scope of this permit application will be conducted in the 1706-KE Building. Limited filtration testing using a dangerous waste will be conducted at the Liquid Effluent Retention Facility in support of the design of the 242-A Evaporator/PUREX Process Condensate Facility. U.S. Department of Transportation-approved tanker trucks will be used to transport waste water to and from the 1706-KE Building.

The classes of treatment technologies that will be tested in the waste water pilot plant include the following: pH adjustment, organic removal, inorganic removal, secondary waste concentration, and suspended solids removal. A general description of each of the technologies is presented. Where the information is available, detailed descriptions of the specific treatment technology and equipment are included. In addition, the critical parameters for each technology are discussed along with the associated safety or controlling features. These discussions show that a wide margin of safety has been factored into the design of the waste water pilot plant and tests to ensure the operational safety of personnel and to ensure that no unacceptable releases to the environment will occur.

A proposed operating envelope for the waste water pilot plant is contained in the permit application. This operating envelope is the upper limit for selected constituents to be safely tested in the waste water pilot plant. The operational envelope is based on the following considerations: tanker design limits, capacity of the waste water pilot plant ventilation system, and the waste water pilot plant materials of construction and system thermodynamics. A waste analysis plan is presented that will be used to confirm that waste waters are within the operating envelope.

Because of the nature of this testing effort, flexibility in the choice of treatment technology or equipment must be maintained. This flexibility is needed because, in some cases, the treatment system design has not progressed such that equipment for performing the pilot plant tests can be identified. Also, the results of the testing could indicate that other treatment technologies might be more applicable or provide a higher level of performance.

The substitution of a treatment technology with an equivalent technology will be required for the variety of waste streams to be tested at the waste water pilot plant. The definition of equivalent technology under this permit is equipment that will perform a similar function and have similar critical parameters as those described in this permit application.

This research, development, and demonstration permit also discusses the contingency plan for the 1706-KE Building (location of most waste water pilot plant testing), training and reporting requirements, and requirements for closure of the waste water pilot plant. The goal of closure is clean closure for the waste water pilot plant.

CONTENTS

911014.1517

CONTENTS (cont)

CONTENTS (cont)

APPENDICES

FIGURES

1.0 INTRODUCTION

Waste waters have been generated as result of operations conducted at the Hanford Facility for over 40 years. These waste waters were previously discharged to cribs, ponds, or ditches. Examples of such waste waters include steam condensates and cooling waters that have not been in contact with dangerous or mixed waste and process condensates that may have been in contact with dangerous or mixed waste.

Many measures have been taken to reduce the amount of contamination being discharged in these effluents. However, some of these waste waters still require additional treatment before release to the environment. Systems are being designed and built to treat these waste waters along with any future waste waters resulting from remediation activities on the Hanford Facility.

The waste waters typically contain trace levels of radionuclides and stable chemicals. Both organic and inorganic constituents can be present as either suspended solids or dissolved solids. While there is a wide variety of contamination in the waste waters, the level of contamination is very low. The level of contamination in Hanford Facility waste water streams is described in the stream specific reports (WHC 1990).

Several treatment systems will be built on the Hanford Facility to treat waste waters. Before the treatment systems are constructed, the design of the system will need to be tested to verify that the treatment methods selected are effective. Usually this testing will be performed on a small-scale and is termed 'pilot testing'. A portion of the 1706-KE Building (an existing structure in the 100KE Area) has been selected as the site for most of the testing. Testing usually will be performed in two phases; the first phase will use synthetic waste and the second phase will use actual waste that may be a dangerous or mixed waste. If pilot-scale testing is performed on a dangerous or mixed waste, a permit is required under the *Resource Conservation and Recovery Act* (RCRA) *of 1976* and the Washington State Department of Ecology *Dangerous Waste Regulations* (WAC 173-303). The research, development, and demonstration permit will satisfy this permitting requirement.

One of the first treatment systems to be constructed will treat the process condensate from the 242-A Evaporator. The 242-A Evaporator concentrates various liquid waste generated on the Hanford Facility. The liquid waste is stored in underground double-shell tanks (DSTs). The liquid waste in the DSTs is piped to the 242-A Evaporator, concentrated through evaporation, and returned to the DSTs for storage until final disposal. The condensate derived from this evaporation process, called '242-A Evaporator process condensate', is the waste water that will be tested. Limited testing also will be performed at the Liquid Effluent Retention Facility (LERF) located in the 200 East Area. The 242-A Evaporator process condensate will be stored at the LERF until a treatment unit is operational. This waste water is a dangerous waste as defined by WAC 173-303. The waste is designated dangerous due to the presence of nonhalogenated spent solvents (F003 and F005) and the concentration of ammonia (WT02).

1.1 PURPOSE

This permit application is being written to obtain a research, development, and demonstration (RD&D) permit to perform pilot-scale treatability testing on various Hanford Facility waste water effluent streams. The permit will include testing activities on the waste water streams that are designated dangerous waste. The treatability testing must be completed before construction of full-scale treatment systems. This testing is needed to:

- Demonstrate the technical adequacy, economic feasibility, and performance capability of new and innovative treatment technologies
- Tailor existing treatment technologies to site-specific design needs and operating conditions
- Improve the efficiency of treatment processes and refine performance capabilities
- Demonstrate methods to reduce secondary waste resulting from treatment processes
- Demonstrate that treatment systems produce a treated waste water that is nonhazardous
- Provide data to support the preparation of the required environmental permits, delisting petitions, or other regulator approvals
- Provide the U.S. Department of Energy Field Office, Richland (DOE-RL) with a level of confidence that the treatment system will operate within the limits established by the environmental permits
- Provide data for full-scale plant design.

1.2 REGULATORY BASIS

Subtitle C of the RCRA requires the U.S. Environmental Protection Agency (EPA) to develop regulations for issuing permits for the treatment, storage, and disposal of any hazardous waste that is identified or listed under 40 CFR 261 subpart C or D. The *Hazardous and Solid Waste Amendments of 1984* (HSWA) amended Section 3005 of RCRA to give the EPA authority under Section 3005(g) to issue RD&D permits for innovative and experimental hazardous waste treatment technologies or processes.

All testing included in this permit application will be performed on the Hanford Facility. The Hanford Facility is operated by the DOE-RL. The Hanford Facility manages and produces mixed waste (containing both radioactive and dangerous materials). The radioactive portion of mixed waste is interpreted by the U.S. Department of Energy to be regulated under the *Atomic Energy Act of 1954*; the nonradioactive dangerous portion of mixed waste is interpreted to be regulated under the RCRA and Ecology *Dangerous Waste Regulations*.

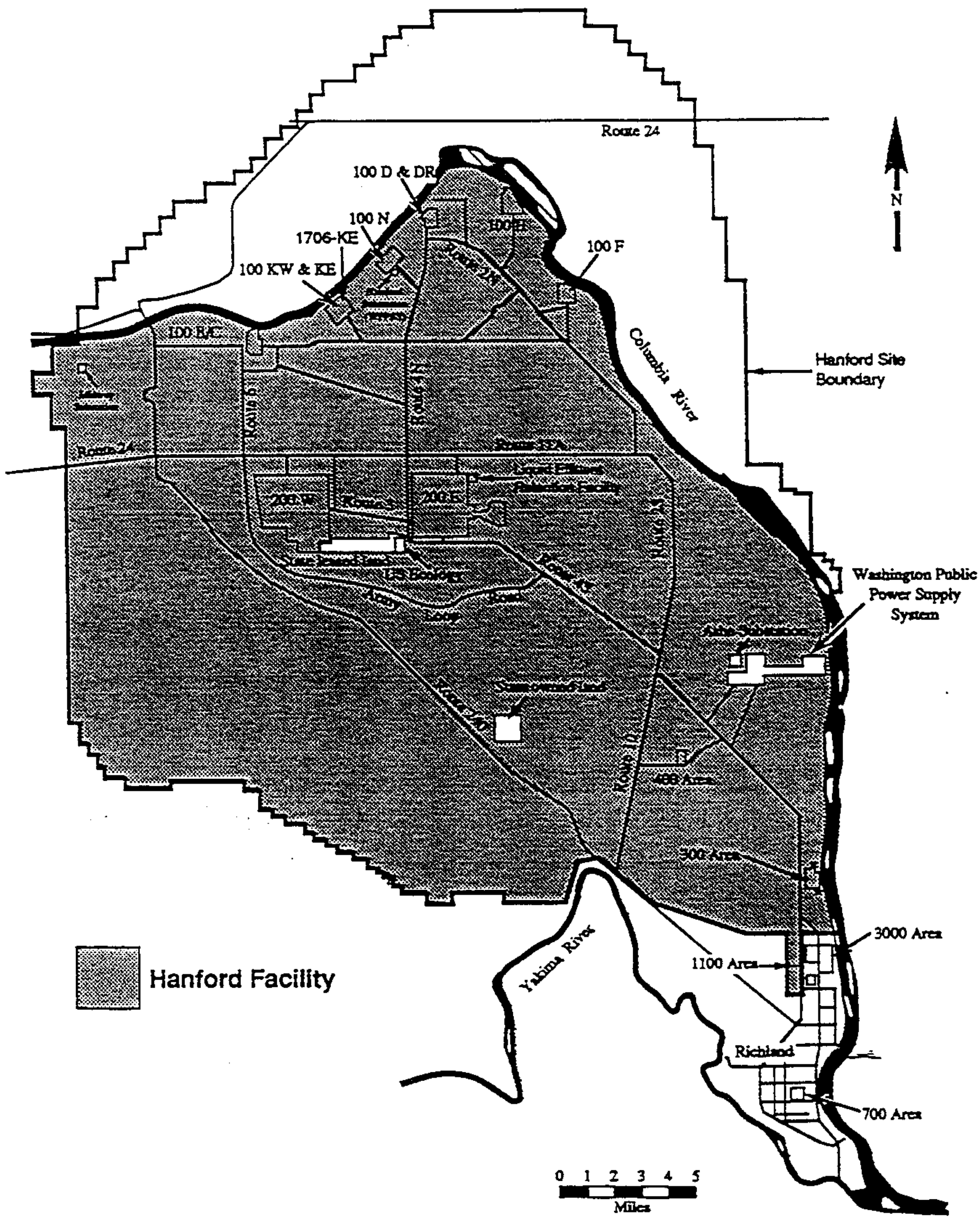


Figure 1-1. Map Showing Relationship Between Hanford Site and Hanford Facility.

THIS PAGE INTENTIONALLY
LEFT BLANK

3.0 WASTE CHARACTERISTICS

This section presents a general description of the types of waste water that could be tested in the waste water pilot plant and the types of contaminants that could be encountered. An operating envelope has been defined to limit the type of waste that will be accepted in the waste water pilot plant. This section also includes a description of the waste analysis plan that will be used to ensure that the composition of the waste to be tested is within the parameters specified in the operating envelope of the waste water pilot plant.

3.1 WASTE WATER PILOT PLANT WASTE STREAMS FOR TESTING

The following sections include a description of the waste water streams received at the waste water pilot plant, a discussion of the waste composition, and an operating envelope for waste accepted at the waste water pilot plant.

3.1.1 Description of Waste Water Streams

The sources and general description of the Hanford Facility waste waters that have the potential for being tested in the waste water pilot plant include the following.

- **Non-contact cooling waters**--Water from the Columbia River is pumped to the Hanford Facility and used in the units as non-contact cooling water. 'Non-contact' means that the water routinely does not come in contact with dangerous or mixed waste. After the water passes through the unit, the water is monitored and released as a waste water. This waste water could contain trace levels of radioactivity from residual contamination in the piping system.

- **Non-contact steam condensates**--Water from the Columbia River is pumped to the Hanford Facility, demineralized, and turned into steam. This steam is used for building and process heating within the buildings. After passing through the heat exchangers, the condensed steam is monitored and released as a waste water. This waste water could contain trace levels of radioactive contamination from the piping system.

- **Process condensates**--The TSD units typically concentrate waste in an evaporator before storage in the DSTs. The process condensate is generated by the condensed overhead vapors from the evaporation of the waste. This category of waste includes the 242-A Evaporator process condensate, which is the only waste water currently determined to be a dangerous waste.

- **Laundry waste waters**--The operation of the Hanford Site requires the use of protective clothing. This protective clothing is washed in an onsite laundry. Waste water resulting from this laundry process typically has high levels of suspended solids and inorganic contaminants. The waste water also contains trace levels of organic and radioactive contamination.

- **Laboratory and chemical sewers**--Most waste water discharges to the laboratory and chemical sewers have been eliminated. The majority of the remaining waste water typically results from heating and ventilation systems and from systems used to ventilate various process vessels. This waste water typically contains trace levels of radioactive contamination from the building piping systems.

- **Groundwater**--The remediation of the Hanford Facility is anticipated to include projects designed to remove contamination from the groundwater beneath the Hanford Facility and to remove contamination from the soils above the groundwater. These remediation efforts could require waste water pilot plant testing.

In general, these waste streams have low concentrations of dangerous constituents. However, some waste streams may have one or more constituents present in quantities sufficient to designate the waste stream as dangerous waste. The waste streams tested at the waste water pilot plant may be dangerous waste due to the following: may contain discarded chemical products; may be from a dangerous waste source; may be a toxic, persistent, or carcinogenic dangerous waste mixture; or may exhibit characteristics of corrosivity or toxicity. None of the waste waters are ignitable or reactive (WHC 1990).

3.1.2 Waste Stream Composition

A variety of constituents are contained in the waste waters discharged from the Hanford Facility TSD units and in the groundwaters beneath the Hanford Facility. Constituents can be classified as suspended solids, organics, and dissolved solids. Suspended solids include colloids, grit, and organic debris (e.g., algae). Organics include compounds such as acetone, butanol, methyl isobutyl ketone, methylene chloride, and carbon tetrachloride. Dissolved solids include inorganics and radionuclides.

For informational purposes, the results of 870 samples collected from the Hanford Facility waste waters described in Section 3.1.1 are summarized in Appendix C. The samples were collected in October 1989 and in May 1990. The appendix shows the range on constituents that may be encountered in the waste streams. It should be emphasized that no one waste water stream contains all of the constituents listed in the table nor does any one waste water contain the maximum concentration of all of these constituents on a regular basis.

3.1.3 Operating Envelope

The operating envelope for the waste water pilot plant is presented in Table 3-1. This operating envelope is the upper limit for selected constituents to be safely tested in the waste water pilot plant. The operating envelope is based on the following considerations: tanker design limits, capacity of the waste water pilot plant ventilation system, and the waste water pilot plant materials of construction. Tanker design, and plant materials of construction are discussed in Section 4.0.

In Table 3-1, the volatile organic constituent limit is expressed as 33 pounds. The 33 pounds is the capacity of the 1706-KE Building ventilation system carbon filters. Before entering the waste water pilot plant, the waste will be tested for volatile organic content. A cumulative total of volatile organic amounts entering the waste water pilot plant will be kept in the waste water pilot plant log book. The carbon filter will be changed out before the 33 pound limit is exceeded. A discussion of the derivation of the 33 pound limit is provided in Section 4.1.

3.2 SECONDARY WASTE

After testing at the waste water pilot plant, the liquid portion of the waste will be returned to the waste source or transferred to the appropriate storage or disposal unit. For example, the 242-A Evaporator process condensate will be returned to LERF after waste water pilot plant testing.

Additional types of secondary waste will be generated in relatively small quantities at the waste water pilot plant. This waste will include items such as rags, gloves, failed equipment, used filters, and recovered solids (e.g., ammonium sulfate). The mixed waste (rags and other solids) will be transferred to the Hanford Central Waste Complex for storage and disposal according to applicable regulations and DOE Orders. Nonradioactive dangerous waste will be transferred to the 616 Nonradioactive Dangerous Waste Storage Facility for storage and eventual offsite disposal at permitted TSD facilities in accordance with applicable federal and state regulations.

3.3 WASTE ANALYSIS PLAN

The waste analysis plan must provide data to establish that the waste to be tested is within the operating envelope of the waste water pilot plant and that the waste water pilot plant equipment is compatible with the waste. Waste analysis requirements, in addition to the operating envelope, will be described in individual test procedures.

The waste analysis plan for the waste water pilot plant contains two sections. The first section addresses waste analysis requirements for all feeds to the waste water pilot plant. The second section addresses specific waste analysis requirements for the 242-A Evaporator process condensate waste stream to the waste water pilot plant.

3.3.1 General Waste Analysis Requirements

Samples of the waste water will be collected during filling of the tanker before transfer into the waste water pilot plant. Samples will be collected in accordance with the appropriate SW-846 procedures and in accordance with requirements specified in the QAPP (Appendix B) discussed in Section 2.0. The type of sample containers and sample preservation methods to be used at the waste water pilot plant are given in Appendix B. The samples will be analyzed for volatile organic content, ammonia, and selected radionuclides to verify that the waste composition is within the operating envelope of the waste water pilot plant. The analytical parameters are listed in Table 3-2. These tests will be performed within the Hanford Site laboratories in accordance with the quality assurance project plan. These samples will be analyzed and the data reported before transferring the waste into the waste water pilot plant.

The limited waste analysis program is justified for the following reasons.

- The toxicity of the waste is low.
- After pilot plant testing, the waste will be transferred to the unit that normally stores or disposes of the waste. In this way, the waste is not uncontrollably released to the environment.
- The possible release of volatile organics to the atmosphere will be controlled at the 1706-KE Building by use of the carbon filters. The waste analysis plan supports the administrative controls to prevent fully loading the filters.

Additional samples will be collected as a result of the testing conducted within the waste water pilot plant or as required by test procedures. For example, it is anticipated that each test will require, at a minimum, an analysis of the feed to the treatment system along with an analysis of the treated effluent and any secondary waste. The specific sampling requirements for these samples along with the analytical requirements will be discussed in the applicable test procedures and will be performed in accordance with requirements of the QAPP. Appendix C contains a list of chemical constituents identified in Hanford Facility waste waters and the analysis methods for those constituents.

3.3.2 242-A Evaporator and Liquid Effluent Retention Facility Waste Analysis Requirements

The *242-A Evaporator Dangerous Waste Permit Application* (DOE-RL 1991b) contains a waste analysis plan for the 242-A Evaporator process condensate that will be transferred and stored in the LERF. Additionally, the LERF dangerous waste permit application (DOE-RL 1991a) contains a waste analysis plan for the process condensate stored in the LERF.

The primary objective of these two waste analysis plans is to characterize the evaporator process condensate and to verify that the process condensate is compatible with the LERF liner system. As stated in their respective dangerous waste permit applications, the 242-A Evaporator process condensate is not an ignitable, reactive, or incompatible waste, nor does the LERF store an ignitable, reactive, or incompatible waste. Therefore, no further discussion of waste-to-waste compatibility is necessary.

The 242-A Evaporator waste analysis will result in the collection of composite samples of the process condensate using a flow proportional sampler before discharge to the LERF. Grab samples of the process condensate also will be collected. The analyses to be performed on these samples are listed in Table 3.3. As illustrated, data will be provided for all of the constituents listed in the operating envelope. Details of the sampling and analysis procedures are contained in the *242-A Evaporator Dangerous Waste Permit Application* (DOE-RL 1991b).

The design of the LERF includes the ability to collect samples at eight locations. In the first round of sampling, grab samples will be collected from eight sample risers at three specified depths. The exact number of locations and depths to be sampled in subsequent routine rounds of sampling depends on analysis of the first round of results. The number of locations could be reduced if the process condensate in the LERF is determined to be homogeneous, and the number of depths could be reduced if stratification is determined not to occur.

The LERF basins, which are actively receiving process condensate, will be sampled at one-half capacity and at full capacity, or every 6 months, whichever comes first. The analyses to be performed on these samples are listed in Table 3.3. As illustrated, data will be provided for all of the constituents listed in the operating envelope. Details of the sampling and analysis procedure are contained in the *Liquid Effluent Retention Facility Dangerous Waste Permit Application* (DOE-RL 1991a).

1

This page intentionally left blank.

- The catch pan footprint will be at least 1 foot (0.3 meter) greater in each horizontal dimension than the footprint of the equipment.

- A minimum height of 4 inches (7 centimeters) will be used (height may be greater to increase volume of the containment).

- The volume of the containment for equipment will be adequate to hold a minimum of 110 percent of the retention volume for that piece of equipment.

- Drip pans under pipe fittings will have a minimum capacity of 5 gallons (19 liters). Frequency of inspection and pipe operating pressure also will be considered in sizing of the pans.

- Material of construction will be either aluminum or stainless steel. Stainless steel will be used whenever the possibility of corrosion exists with the material being contained (i.e., acids or caustics).

- Flanged fittings with an operating pressure greater than 100 pounds per square inch gage (689 kilopascals) will be fitted with spray guards.

- The WAC 173-303-640 will be used to determine containment requirements.

- Labels will be affixed to equipment in accordance with WAC 173-303-640.

Examples of this criteria is shown in Table 4-1 for the two types of test equipment that currently are available.

The waste water pilot plant will have two double-shell 3,000-gallon (11,000-liter) interim storage tanks that will be capable of storing the waste water between tests on different treatment technologies or as feed material. These two storage tanks will be placed outside the 1706-KE Building and will be plumbed to provide 6,000 gallons (22,700 liters) of storage. The inner shell of these tanks will be of stainless steel construction with outer shells of carbon steel. Both tanks will be vented to the 1706-KE Building ventilation system. The two 3,000-gallon (11,350-liter) interim storage tanks will be inspected before use as required in WAC 173-303-640. Leak detection inspection will be provided through access ports to the annular space of the storage tanks. The two tanks also will have connecting overflow piping to prevent overflow conditions.

The purpose of the interim storage tanks is to provide operational flexibility during testing. Some testing will not require use of the interim storage tanks at all. The tanks may not be cleaned or flushed in between tests because the waste to be tested is expected to be relatively homogeneous. If flushing of the tanks between tests is deemed necessary, the tanks will be flushed with either demineralized water or potable water, as appropriate. Tank flushing requirements would normally be given in the individual test procedure. A demineralized water line is currently available in the 1706-KE Building.

As an added containment control, the concrete floor of the waste water pilot plant area will have all drains sealed and will be coated with an epoxy resin sealer. The walls of the waste water pilot plant also will be sealed with an epoxy resin sealer. The sealing of the floor and walls will provide a third level of containment in the unlikely event of a breaching of the secondary containment or 'spraying' at a leak developed at a pipe joint. The epoxy products will be compatible with the waste.

4.1.3 Waste Water Pilot Plant Ventilation System

The process area, process equipment, and interim storage tanks will be vented through the existing 1706-KEL Building ventilation system. This system has a rated capacity of 12,250 cubic feet (347 cubic meters) per minute at a static pressure of 4 inches (10 centimeters) of water vacuum. The ventilation system includes activated charcoal on individual branches of the ventilation system, followed by a coarse prefilter to remove large particulates and a high-efficiency particulate air (HEPA) filter before discharge to the atmosphere. A flow diagram for the ventilation system is presented in Figure 4-2. The ventilation system also services a decontamination laboratory for Hanford Facility RCRA activities, where soil sampling equipment is cleaned. This decontamination laboratory is independent of the pilot plant operations.

The waste water pilot plant ventilation system will contain a charcoal adsorption system to control the escape of volatile organic chemicals to the environment. The capacity of the charcoal system will be far in excess of the amount of volatile organic chemicals that can be provided by the waste water. To prevent moisture buildup in the charcoal, ambient air will be bled into the system ahead of the charcoal filter.

Based on an average adsorption coefficient of 0.3 pound (136 grams) of volatile organic chemicals per pound of charcoal, each commercially available, 35-gallon (132.5-liter) charcoal drum will have a capacity of 33 pounds (15 kilograms) of volatile organic chemicals (Cheremisinoff and Ellersbosch 1978). The amount of volatile organic chemicals present in the waste water pilot plant is limited by the design of the waste water pilot plant. The waste water pilot plant will be designed to accommodate 5,000-gallon (19,000-liter) batches at a nominal flow rate of 5 gallons (18.9 liters) per minute. Using the waste characterization data presented in Section 3.0, the range of volatile organic chemicals that can be expected in each 5,000 gallon (18,927 liter) batch is presented in Table 4-2. As shown, the maximum volatile organic chemicals estimated to be in a single 5,000 gallon (18,927 liter) batch is 4.0 pounds (1.8 kilograms). At the nominal flow rate of the waste water pilot plant, this corresponds to a maximum of 0.24 pounds (108.9 grams) per hour of volatile organic chemicals.

Using the conservative assumption that 100 percent of the volatile organic chemicals will be volatilized in a single branch of the ventilation system (i.e., loading only one drum), the charcoal system will have sufficient capacity for 120 batches of the average site waste water or eight batches of the maximum waste water concentration.

As described in Section 3.0, each of the 5,000-gallon (18,927-liter) batches will be analyzed for volatile organic chemicals. When the total amount of volatile organic chemicals shipped to the pilot plant approaches 33 pounds (14.9 kilograms), the charcoal filters will be replaced. This approach provides sufficient excess capacity because not all of the volatile organic chemicals will volatilize; this approach also is based on the capacity of only one of the two charcoal filters.

Release of volatile organics, volatile inorganics (e.g., mercury, ammonia, arsenic), and/or volatile radionuclides to the ventilation system is possible during transfers of the waste water. To minimize the release of these components and to maintain the integrity of the waste water composition to be studied, transfer points will be engineered to minimize volatilization of the waste water. To prevent any volatilization at the filling point, a fill tube extending to the bottom of the tanker will be used. Once the tanker arrives at the 1706-KE Building, any receiving tank will be bottom-filled to control the release of volatile components. The first processing step planned at the 1706-KE Building will, in most cases, adjust the waste water to a pH between 4 and 7. At this pH, most of the ammonia will be converted completely to ammonium ion and will no longer be vulnerable to release. Other potentially volatile inorganics will have a vapor pressure of less than 1 millimeter of mercury at the maximum operating temperatures of the waste water pilot plant. As a result, these potentially volatile inorganics are not considered to be vulnerable for release.

Stack effluent radionuclide content will be monitored with a particulate record sampler. These sampling systems remove a sample from the stack and pass the sample through a 1.9 inch (47 millimeter) filter. The sample volumes are controlled by rotameters that are calibrated routinely. The record sampler filter will be collected monthly and analyzed for total alpha and beta/gamma activity.

4.1.4 Waste Water Pilot Plant Capacity

The maximum through-put of any operation at the waste water pilot plant will be nominally 5 gallons (19 liters) per minute which is the equivalent to 300 gallons (1,100 liters) per hour. The process flowsheet is shown in Figure 4-3. The waste water pilot plant can be operated with a maximum of 5,000 gallons (19,000 liters) per batch. This limit is based on the size of the tank trailer [5,000 gallons 19,000 liters)]. The test program will be structured to accommodate one 5,000 gallon (19,000 liter) batch per week [20,000 gallons (76,000 liters) per month]. Storage capacity at the waste water pilot plant will include two 5,000 gallons (19,000 liter) tank trailers and two 3,000 gallon (11,000 liter) intermediate storage tanks for a total of 16,000 gallons (61,000 liters) of potentially available storage. Filtration equipment at LERF will be sized at 5 gallons (19 liters) per minute [300 gallons (1,100 liters) per hour)] or less. There will be no storage capacity associated with the LERF equipment.

The amounts of waste tested at the waste water pilot plant will exceed limits contained in the guidance document for research, development, and demonstration permits (EPA 1986a). The guidance document specifies limits of 400 kilograms (100 gallons) per hour through-put, 15,000 kilograms (4,000 gallons) per month for treatment, and 15,000 kilograms (4,000 gallons) for storage. The conversion of kilograms to gallons was made using factors of 2.2 pounds per kilogram and 8.34 pounds per gallon of waste.

The guidance limits for through-put must be exceeded because 5 gallons (19 liters) per minute is the smallest ultraviolet oxidation unit that is commercially available. The flowsheet for the waste water pilot plant was developed around this 5 gallon (19 liters) per minute limit. Several unit operations (such as ion exchange, granular activated carbon, and evaporation) will most likely be sized for less than a 5 gallon (19 liters) per minute through-put. The totals given for the amount of waste tested per month and the storage capacities are maximum values; actual operations are likely to be less. Normal operations at the waste water pilot plant will require storage of 5,000 gallons (19,000 liters) of waste.

4.1.5 Technologies to be Tested

The types of technologies that will be tested in the waste water pilot plant include the following:

- pH adjustment
- Organic removal (e.g., ultraviolet light mediated oxidation and granular activated carbon)
- Inorganic removal (e.g., reverse osmosis and ion exchange)
- Secondary waste concentration (e.g., evaporation)
- Suspended solids removal (e.g., filtration).

Each of the technology types are summarized in the following sections. A general description of the technology, a description of the equipment to be used in testing, identification of the critical parameters of each technology, and a description of the safety features of each type of equipment are presented.

A summary of the critical parameters of each technology that will be part of the waste water pilot plant is presented in Table 4-3. Also presented is a more detailed description of the critical parameters and how the parameters affect the operation and safety of the equipment. The instrumentation used to monitor these critical parameters is specified in Table 4-4.

The following discussion has been organized under treatment technologies. Where specific equipment has been identified for that technology, a discussion of that equipment is included. Generally, equipment to be used for testing will be supplied by vendors as off-the-shelf stock items.

Because one of the primary purposes of the testing is process optimization, some flexibility in the choice of technology or equipment must be maintained. In some cases, equipment for performing some tests has not been identified. Also, depending on the results of the testing, other technologies or types of equipment might need to be tested in addition to or in substitution for the technologies or equipment described in the following sections.

Replacing a treatment technology with an equivalent technology will be required for the variety of waste streams being tested at the waste water pilot plant. The definition of equivalent equipment under this permit is equipment performing a similar function and having similar critical parameters. This is best illustrated with filtration testing. There are numerous types of filtration techniques and initial testing will evaluate up to three different filtration units. Replacing one filtration unit with another unit would be evaluating equipment that is considered equivalent in the technology classification.

4.1.5.1 pH Adjustment. A pH adjustment step is required in many waste water treatment systems. This step is usually required to change the waste water chemistry, to enhance the removal or recovery of desired contaminants by downstream process equipment, or to adjust the waste water pH to meet regulatory discharge limits.

The pH adjustment step is straight forward where either an acid or base is metered into the waste water and thoroughly mixed. The pH adjustment equipment consists of instrumentation and hardware to increase or decrease the process stream pH. This is accomplished either in batches in large feed makeup tanks or inline using two or more relatively small tanks that are well agitated.

4.1.5.1.1 Equipment Description. Adjusting the process stream pH requires an automatic system for adding either an acidic or basic reagent in the precise amount required to change the solution pH so the pH falls within a desired range. For example, the pH of the waste water from the LERF will be above 10 and must be lowered to approximately 4 to 7 before the ultraviolet oxidation step. A continuous inline system will be used for adjusting the pH of the waste water stream. The pH adjustment flow diagram is shown in Figure 4-4.

The pH adjustment system will consist of either two or three 50-gallon (189.3-liter) stainless steel tanks, in series. Each tank will be covered, vented to the building ventilation system, have a pH probe, and a mixer to thoroughly mix the acid. The first and second tanks for a two-stage control tank will have control instruments that will automatically adjust the feed rate from an acid or base metering pump. The third tank and pH analyzer will provide an 'average' pH measurement, because under some circumstances, the indicated pH in the control tanks could be fluctuating considerably. The pH of the waste water can be raised by using a base such as caustic (sodium hydroxide) and lowered by using an acid (sulfuric acid).

The acid or base will be metered from a separate tank using a metering pump. The pump and tank will be designed to be compatible with the chemical. The concentration of sulfuric acid to be used for pH adjustment could range from 20 percent to 98 percent. The sodium hydroxide concentration could range from 5 percent to 50 percent. If lower concentrations of the acid or base is used, a larger metered volume of acid or base is required, simplifying the pH control. Usually the more dilute the waste water stream, the less acid or base is required for pH adjustment. A typical flow rate of acid or base could range from 0.68 to 3.4 ounces (20 to 100 milliliters) per minute for the 5 gallons (18.9 liter) per minute waste water pilot plant.

4.1.5.1.2 Critical Parameters and Safety Features. A critical parameter is the correct volume addition of either acid or base to reach the desired pH. Controllers will activate and adjust the metering pumps depending on the pH signal received from the pH control tank. The pH of the waste water at each step of the pH adjustment process will be monitored using online pH instrumentation. The pH also will be verified in the laboratory to ensure that the online instrumentation is working properly.

The pH adjustment step will involve handling strong acids and bases. Another critical parameter is the corrosion of the acid and base chemical feed system. The concentrated acid and base feed tanks, chemical transfer lines, and metering pumps will be constructed of material compatible with the chemical to minimize corrosion (e.g., stainless steel).

The primary safety features of the pH adjustment system are check valves in the chemical feed lines to prevent water from entering the acid feed tank. Chemical addition will use the waste water in the tank as a heat sink for any increase in temperature because of the heat of solution. The tanks used for pH adjustment will be vented to the ventilation system. Secondary containment pans will be used under the pH adjustment tanks, under the acid and the base tanks, and under the metering pumps.

4.1.5.2 Organic Removal. Organic compounds can be destroyed by using ultraviolet oxidation to convert organics to carbon dioxide and water. When an oxidant, such as hydrogen peroxide or ozone, is acted upon by ultraviolet light, a hydroxyl radical is formed that is a very reactive oxidant. This hydroxyl radical is used to oxidize the organics. The degree of organic oxidation depends on the residence time of the waste water in the ultraviolet reactor, the concentration of oxidant, and the intensity of the ultraviolet light source.

The ultraviolet oxidation technology is relatively new and requires further testing before use at the Hanford Facility. The diverse waste streams found on the Hanford Facility, and the complexity of organic contaminants in some of these streams, requires testing of the actual waste stream.

There are several vendors of ultraviolet oxidation equipment, and each vendor adds an element of uniqueness to the oxidation of the organic contaminants. Equipment from other ultraviolet oxidation vendors could be considered in this waste water pilot plant.

Granular activated carbon is used for removal of organic constituents. The equipment, critical parameter, and safety features are similar to ion exchange and are discussed with ion exchange in Section 4.1.5.3.2.

4.1.5.2.1 **Equipment Description.** The ultraviolet oxidation unit is a Perox-pure Model SSB-30 from Peroxidation Systems, Inc. The unit is skid mounted and contains a 316 stainless steel reaction vessel, hydrogen peroxide addition system, chemical resistant feed pump, and electrical power and control panels. The physical dimensions of the oxidation unit are approximately 3½ feet (1.1 meter) wide by 5 feet (1.5 meter) long by 6½ feet (2 meters) high, with a minimum of approximately 8 feet (2.4 meter) wide by 9½ feet (2.9 meter) long by 6½ feet (2 meters) high for maintenance on the electrical and control panels and for changing the ultraviolet lamps.

The ultraviolet oxidation piping and instrumentation diagram is presented in Figure 4-5. Figures 4-6 and 4-7 present elevation and plan views of the ultraviolet oxidation equipment. The oxidation unit has a reactor volume of approximately 30 gallons (114 liters) and is equipped with six ultraviolet lamps rated for 5 kilowatts each. The lamps are mercury vapor lamps, and are considered high intensity. Other vendors use low intensity lamps that are rated from 14 watts to 65 watts. A quartz sheath protects the lamps from the waste water solution. The six lamps have individual switches so any number of lamps can be activated at any one time. The reactor outlet acts as the vessel vent when filling the equipment and any gas generation during operation will be swept out the outlet piping of the unit to a vented storage tank. The equipment can be operated in a once-through mode or in a recycle mode. Hydrogen peroxide will be added to the ultraviolet oxidation reactor using a metering pump and will be injected into three areas of the reactor.

4.1.5.2.2 **Critical Parameters and Safety Features.** There are several safety features on the equipment that monitor critical parameters and cause an alarm, for which a response is required. The response to an alarm could be to shut the system down, either automatically or manually, or to investigate the problem. The alarm condition is shown on the control panel. The critical parameters require the following safety systems.

- The reactor has a pressure limit of 20 pounds per square inch gage because of the use of quartz glass as part of the physical containment of the waste water. If the pressure in the reactor exceeds 20 pounds per square inch gage a graphite rupture disk will split. When the rupture disk splits, a flow switch in the rupture disk line will cause an alarm to annunciate. The line on the rupture disk leads to an overflow tank or 55-gallon (208-liter) drum. A pressure switch located on the pump discharge will deactivate the pump at approximately 15 pounds per square inch gage. This pressure switch reduces the chances for excessive pressure in the reactor and provides redundant pressure control in the reactor.

- There is a positive seal around each end of the quartz sheathes to eliminate leakage past the sheath. If moisture does leak past the seal around the quartz sheath, a moisture sensor causes an alarm to annunciate.

- Flow and pressure sensors are located in the influent waste water line. If the sensors indicate no flow, an alarm annunciates. A pressure sensor is located in the hydrogen peroxide injection line to make sure there is oxidant flowing into the reactor. If this sensor indicates reduced pressure, the alarm annunciates.

- A limit switch on the lamp enclosure door causes the alarm to annunciate when the door is opened while the lamps are powered.

- There are high temperature sensors for the lamp temperature and for the liquid effluent that will cause an alarm to annunciate. The temperature sensor on the lamps will prevent damage to the lamps due to overheating, and the liquid temperature sensor will help preserve the integrity of the reactor due to overheating.

Other safety features in the ultraviolet oxidation unit are as follows.

- A cooling fan provides cooling for the lamp ballasts to prevent overheating.

- The view ports in the reactor are designed to filter the intense ultraviolet light to prevent eye damage to operators.

- The hydrogen peroxide injection system consists of redundant metering pumps with check valves and ball valves on both sides of each pump, and an additional spring loaded ball check valve to act as an antisiphon valve at the chemical injection ports. These hydrogen peroxide safety features will reduce operator contact and possible spillage when changing or maintaining the metering pumps and prevent waste water from entering the hydrogen peroxide lines.

- The ultraviolet oxidation unit has a bottom drain to thoroughly drain the unit.

4.1.5.3 Inorganic Removal. Reverse Osmosis and ion exchange are the two types of inorganic removal discussed in the following sections. Granular activated carbon requires similar equipment to ion exchange and is discussed with ion exchange.

4.1.5.3.1 Inorganic Removal-Reverse Osmosis. One method of inorganic removal that can be used in the waste water testing is reverse osmosis. Reverse osmosis is a technology that employs pressure to effect a separation of a solute (contaminants) and a solvent (water). The pressure applied must be great enough to overcome the natural osmotic pressure of the solution. The solution is passed over the surface of a semi-permeable membrane, with an applied pressure of between 100 to 700 pounds per square inch gage.

The membrane pore size, composition, surface charge, and thickness, permit the water molecules to preferentially diffuse through the membrane while retaining the contaminant molecules (principally inorganics) in a concentrated waste solution. This concentrated waste solution, which does not pass through the membrane, is called the retentate or concentrate stream, and the portion that passes through the membrane is called the permeate stream. The retentate stream can be processed through several membranes in series to recover more of the waste water as permeate. Likewise, the permeate can be processed through several membranes to increase permeate purity.

Reverse osmosis does have a limitation as to how much separation can occur. This limiting factor depends on the solubility of the inorganic contaminants and the flowrate. When the solubility point is reached for a certain inorganic compound, a precipitate will form. If the flowrate is not adequate there will be a decrease in the effectiveness of the reverse osmosis operation by plugging the membrane. In most cases, cleaning mechanisms or chemicals can be used to restore the membrane to the same condition as before fouling.

4.1.5.3.1.1 Equipment Description. The main test apparatus is a 5 gallon (18.9 liter) per minute reverse osmosis unit manufactured by Applied Membranes, Inc. This system uses spiral wound, tangential flow, composite membranes. These membranes are anticipated to offer the highest strength and excellent permeate volume generation when compared to hollow fiber and plate and frame configurations. The unit uses up to 27 FT-30 series polyamide membranes manufactured by Filmtec, Incorporated. The membrane cartridges are 2½ inches (6.35 centimeters) in diameter and 40 inches (101.6 centimeters) long. The reverse osmosis unit dimensions are approximately 16½ feet (5.03 meters) long, 4½ feet (1.37 meters) wide and 6½ feet (1.98 meters) high. The unit has four stages with three pressure vessels in the first stage and two pressure vessels in each of the remaining stages. Each pressure vessel can contain three membranes. Membrane spacers can be used in pressure vessels when less than three membranes are needed. A flow schematic and piping and instrumentation diagram of the system is presented in Figure 4-8.

The retentate from each stage is recycled back to a preceding stage. This recycle increases the velocity over the membranes and minimizes the retentate volume. The system is designed to provide flexibility on how much retentate is recycled and to where it is fed. A portion of the retentate from stages 1, 2, and 3 can be returned to the influent of stage 1. The retentate from stage 4 is returned to the influent of stage 3 along with a portion of stage 3 retentate. Retentate can be discharged from stages 1 and 3 and treated as secondary waste. This concentrated secondary waste will be used for additional evaporation studies to further concentrate the secondary waste. The high velocity resulting from recycling the retentate will help to minimize fouling by sweeping away precipitate or biological material off the membrane surface. This increases the membrane surface area available for pure water to pass through.

The reverse osmosis unit contains all the piping, pumps, monitoring equipment, instrumentation, and chemical feed equipment necessary for operation. All pressure vessels, housings, and piping are stainless steel for chemical resistance. Flow, conductivity, and temperature instruments are stainless steel. The pH probes are polypropylene and provide adequate resistance to all chemicals in these tests. Pressure gages are liquid filled for shock absorbance.

The system instrumentation permits data collection from initial feed and final permeate and retentate points, and also from intermediate points to give online evaluation of the performance of individual stages. All instruments except pressure gages have 4 to 20 milliamperes output so data can be logged automatically. All instruments have continuous readouts located on a central panel board. The control panel is shown in Figure 4-9.

The reverse osmosis unit contains approximately 50 gallons (189 liters). A catch pan will be placed under the entire unit to provide secondary containment in case of any leaks or spills. No gases will be generated during reverse osmosis operation.

4.1.5.3.1.2 Critical Parameters and Safety Features. Pressure is the most critical parameter in the reverse osmosis system. Pressure provides the driving force to concentrate the waste stream by 'pushing' water through the membrane. The operating pressure of reverse osmosis is nominally 200 to 400 pounds per square inch gage. Pressure regulating valves are provided to control the desired operating pressure. The system is specified for operation up to 700 pounds per square inch gage.

Flow rate also is an important operating parameter. Adequate flow over the membranes is important to keep the membranes clean and fully functional. Flow control valves are provided so proper flow rates can be maintained.

Temperature is another important parameter. Temperature affects the flux (permeate generation rate per membrane surface area) and the purity of the permeate stream. The system is designed for an operating temperature of 77 °F (25 $\pm$ 15 °C). This range is sufficient for the waste water pilot plant operation. Should the operating temperature exceed 104 °F (40 °C), the integrity of the membranes could be compromised by reducing the effective membrane life. However, no safety hazards are presented to the operating personnel.

There are two conditions that will shut down the system. The conditions are high and low pressure. When either of these conditions are met, the high pressure reverse osmosis pumps are shut down along with the booster pump. The high pressure shutdown is adjustable with a maximum of 700 pounds per square inch gage. This will prevent equipment damage and leakage. The reverse osmosis stainless steel pressure vessels are over designed to a pressure rating of 1,000 pounds per square inch gage. The low pressure switch is adjustable and will shut down the pump to prevent cavitation damage to the pump.

Several other safety features are designed into the equipment. All pump shafts, motor shafts, and couplings have a protective shield to protect personnel from moving parts. The control panel contains all pump controls and instrumentation for monitoring the condition and state of the equipment.

4.1.5.3.2 Ion Exchange and Granular Activated Carbon. Ion exchange and granular activated carbon will be considered together because the required test equipment and the critical parameters are very similar. The ion exchange and granular activated carbon process acts to concentrate the contaminants on the ion exchange or granular activated carbon media. The ion exchange resin and granular activated carbon can be used for polishing of the waste water. The granular activated carbon also can be used as an initial organic removal step.

The ion exchange process involves removing dissolved solids, including radionuclides, as ionic species from the waste water and binding the ions to a ion exchange media. The resin is usually in the form of small beads. The ion exchange resin is placed in a large vessel and the assemblies are called ion exchange beds. There could be several ion exchange beds placed in parallel or in series depending on the application. A flow distribution system within the ion exchange bed produces uniform waste water flow through the adsorption media. Uniform flow through an ion exchange bed is important to uniformly deplete the ion exchange resin to provide efficient use of the ion exchange resin capacity. The ion exchange bed can be regenerated to return the ion exchange resin to a state where the ion exchange again will remove contaminants. Regeneration of ion exchange resin is performed by using either an acid or base, depending on the resin, and passing the acid or base through the ion exchange resin bed. The concentrated contaminants are removed into the regeneration solution. This regeneration solution is handled as a secondary waste.

The granular activated carbon primarily is used to remove organic contaminants from water. The organic species are adsorbed physically and retained on the granular carbon particle. The method of handling and using the granular activated carbon is very similar to ion exchange resins, except granular activated carbon is regenerated in a different manner.

4.1.5.3.2.1 Equipment Description. The ion exchange and granular activated carbon waste water pilot plant equipment is in the very early stages of conceptual design. The ion exchange and granular activated carbon equipment will be very similar, with the exception being that a regeneration system might be used for the ion exchange resin. No granular activated carbon regeneration testing is planned. Testing involving ion exchange and granular activated carbon will be performed as a side stream operation to reduce the equipment size and duration of testing. Figure 4-10 presents an ion exchange and granular activated carbon schematic drawing.

The ion exchange and granular activated carbon equipment will be sized to process less than 1 gallon (3.8 liter) per minute. The ion exchange or granular activated carbon vessel will be either a chromatography column or stainless steel pipe with fittings at each end. The column will have a mesh screen at each end sized to prevent the adsorption material from escaping the column. The column diameter will vary because of the test objective. Column sizes will be 2 inches (5.1 centimeters) or less in diameter. The influent waste water could be fed to the ion exchange or granular activated carbon column directly from the preceding unit operation using a flow control valve or from a small [less than 10 gallon (37.8 liter)] equalization tank by using a metering pump. Sample ports in the influent and effluent lines will allow sampling for process control and process efficiency. Samples could be collected automatically using a fraction collector that collects constant volume samples. Online process instrumentation, such as pH and conductivity, could be included for process control. Flow rate will be determined by use of a rotameter or other flow monitoring device.

The regeneration of the ion exchange resin could be accomplished by using metering pumps feeding from an acid or base storage tank [less than a 5-gallon (18.9 liter) tank]. An equally sized tank will be used to receive the chemical after regeneration. The ion exchange beds will be rinsed with deionized water to remove the concentrated chemicals. The rinsate will be considered secondary waste and disposed of according to approved operating procedures.

4.1.5.3.2.2 Critical Parameters and Safety Features. The critical parameter for ion exchange and granular activated carbon is the capacity of the adsorbent. The type and capacity of the adsorbent will determine the amount of adsorbent required and the size of the column will set the regeneration or disposal cycle.

The primary safety features that will be designed into the ion exchange and granular activated carbon testing equipment are the secondary containment pan to contain leaks and a plexiglass shield around any columns made of glass construction. This system will not be automated, except for a possible auto-sampling device, and will require constant surveillance. The ion exchange regeneration acid and base lines will have check valves to prevent backward flow of waste water into the concentrated chemical tanks.

4.1.5.4 Secondary Waste Concentration. An evaporator can be used to reduce the volume of liquid waste discharged from a process. In the case of the 242-A Evaporator/PUREX Condensate Treatment Facility, the retentate stream from the reverse osmosis operation will be a waste water with dissolved solids. This retentate stream could be further concentrated by removing the water with an evaporator. The evaporator also could act as a crystallizer to maximize the water removal. The forced circulation evaporator/crystallizer is described as an example of this technology.

In a forced-circulation evaporator/crystallizer, the liquid feed is injected into a heated vessel that is maintained under vacuum. The liquid in the evaporator is recycled to aid in heat transfer. Water vaporizes and is condensed and collected in a separate vessel. When solubility limits are reached, salts precipitate and crystallize. The feed is concentrated in this manner until the maximum solids content is reached or until the ability of the system to handle the salt slurry is reached. Two streams are generated with an evaporator/crystallizer, a condensate stream containing water, volatile organics, and inorganic salts and a concentrated salt slurry.

4.1.5.4.1 Equipment Description. The bench-scale evaporator/crystallizer (BEC) consists of several pieces of equipment, as shown in Figure 4-11, including:

- Feed System--The feed system consists of a 4-gallon (15-liter) plastic feed tank with mechanical stirrer, a positive displacement, variable speed feed pump, and a separate 2-gallon (8-liter) heated tank and centrifugal pump for clearing solids buildup in the feed line and inlet port.

- Forced-Circulation Evaporator--The evaporator body is a steel cylindrical body with an outside diameter of about four inches (10.2 centimeter), and a capacity of approximately 1.8 gallons (7 liters). A recirculation leg is connected to the body to circulate the slurry and aid in heat transfer. A heavy-duty centrifugal pump is connected in-line with the recirculation leg to maintain flow in the recirculation leg. The flow in this leg is regulated by a throttling valve connected downline of the pump. Heat is supplied by a band heater wrapped around the evaporator body, and by the energy from the recirculation pump. Slurry (concentrate) samples can be obtained from a sample port located between the pump and the throttling valve. The evaporator body is connected to a glass deentrainment column of the same diameter.

- Condenser Section--Offgas and water vapor from the evaporator body are cooled and condensed, respectively, in a glass tubular condenser. No offgas is vented during condensation. This condenser has an internal steel cooling coil, and also can be wrapped with plastic tubing for additional cooling capacity. Heat removal is accomplished by a refrigerated recirculator that uses ethylene glycol as the heat transfer fluid. Condensate is removed to a condensate recycle chamber, and is drained to a condensate receiver column. The condensate receiver can be drained periodically with a centrifugal pump.

- Vacuum System--The entire evaporator is maintained at a vacuum of greater than 20 inches (50.8 centimeters) of water with a rotary-vane vacuum pump. A glass column containing absorbent is connected between the condenser and the vacuum pump to remove moisture from the air stream. A vacuum controller maintains the desired vacuum.

- Instrumentation--System temperatures are monitored with thermocouples. Thermocouples are located in the evaporator body, in the deentrainment column, in the condenser section, and on the recirculation pump. The system vacuum is monitored with a vacuum gauge, and controlled with a vacuum controller. The feed flow is monitored and regulated by the pump. There are level controls on the evaporator body and condensate recycle chamber.

- Sampling Capabilities--Feed solution samples can be obtained directly from the open feed tank. Condensate samples can be obtained from the condensate receiver column. Slurry (concentrate) samples can be obtained from the sampler port on the recirculation leg by throttling the recirculation valve down, and redirecting flow through the sampler port.

4.1.5.4.2 Critical Parameters and Safety Features. The important operating parameters include the following.

- Feed Flowrate--The feed flowrate depends on the desired water content of the final concentrate and the maximum heat removal rate of the condenser. The evaporator has been operated at a maximum feed rate of 0.33 gallons (1.25 liter) per hour, but that rate can probably be doubled with some minor modifications to the condenser section.

- Operating Temperature--The operating temperature can be controlled by varying the band heater temperature, the vacuum set point, and the concentration of the slurry in the evaporator body. Boiling point rise of the solution during concentration is especially important to characterize. The bench-scale evaporator/crystallizer normally operates under 185 °F (85 °C). Higher temperatures can cause the recirculation pump to overheat.

- Operating Vacuum--The system normally operates between 20 and 25 inches (50.8 and 63.5 centimeters) of water vacuum. Operation under a vacuum acts to lower the waste water boiling temperature. Operating within the specified vacuum range will maintain the evaporator body temperature below 185 °F (85 °C).

- Final Concentrate Density and Solids Content--The bench-scale evaporator/crystallizer can handle a slurry with a maximum density of about 14.2 pounds per gallon (1.70 grams per milliliter) and a solids content of approximately 30 volume percent.

The bench-scale evaporator/crystallizer requires constant monitoring by personnel. The operation of the safety features built into the system include the following.

- A main power switch is mounted on the front of the system to shut off power in case of an emergency condition.

- The entire system is contained in a spill pan to prevent releases to the environment.

- A high-level liquid alarm (both audio and visual) is located in the evaporator body to alert personnel to an overfill condition.

- A level sensor is located in the condensate recycle chamber to prevent overfilling the condensate receiver.

- Thermocouples are located at critical points to monitor temperatures and alert personnel to temperature excursions.

- A vacuum gage is mounted on the system to alert personnel to vacuum deviations.

- A water tank and separate pump are connected to the feed line to rapidly cool the evaporator body in the event of an emergency condition.

- A product dump valve is located at the bottom of the evaporator body to rapidly remove the contents of the evaporator body.

4.1.5.5 Suspended Solids Removal. The waste water pilot plant filtration testing will be performed at the 1706-KE Building and at the LERF. Tests at the LERF are specific for the 242-A Evaporator process condensate treatment testing.

The purpose of testing filtration is to identify a filter or filters that can successfully remove the suspended solids (grit, colloids, biological growth, etc.) from waste water. The removal of these solids is essential for the protection of the downstream treatment systems and for the removal of other contaminants (e.g., organics, inorganics). A successful filter will be identified as one that is capable of maintaining a design flow rate with a minimum generation of secondary waste and fouling. The filtration technology investigated will consist of cartridge, microfiltration, and ultrafiltration. These technologies are very similar with the only difference being the particle size removed.

The filtration operation can be enhanced through use of a pretreatment step. The pretreatment can include pH adjustment or coagulation and flocculation. The pH adjustment was discussed in Section 4.1.6.1. The coagulation and flocculation steps can be used with pH adjustment. Coagulation and flocculation involves the addition of an iron, alumina, or magnesium compound that will form a precipitate at a pH usually greater than 8. This precipitate enhances removal of heavy metals. The precipitate can be removed by using a filter with a precoat, or a clarifier. The precipitate can be dewatered using a filter press.

The following discussion is specific for filtration test equipment at the LERF using the 242-A Evaporator process condensate. Filtration testing using different equipment than used at the LERF is anticipated when other waste water streams are evaluated. Equipment that is considered equivalent could be used for other waste water streams.

4.1.5.5.1 Equipment Description. The three filter systems currently planned for testing include tubular polymeric ultrafiltration with sponge ball wash out, polymeric backwashable ultrafiltration, and centrifugal ultrafiltration. Centrifugal ultrafiltration will be used as a backup if the other two technologies do not perform satisfactorily. The systems are in the conceptual state. Therefore, details are not available at this time.

The filtration waste water pilot plant equipment will be skid mounted and set next to the LERF. Figure 4-12 illustrates the proposed location of the equipment. The waste contained in the LERF will be pumped to the pilot plant equipment through a LERF sample port using a submersible pump. After passing through the filtration equipment, the waste will be returned to the LERF via a second sample port. The locations of the selected sample ports are shown in Figure 4-12.

The conceptual tubular polymeric ultrafiltration system, as shown in Figure 4-13, consists of 6 tubes each containing a polymeric membrane that allows water to pass through the membrane while concentrating the particulates. This system is operated at a high velocity within each tube that acts to clean the polymeric membrane. The waste water is fed to a staging tank (the exact size is not yet defined); from there the waste water is pumped to the tubular filters at a recycle flow rate of 450 gallons (1,703.4 liters) per minute. Specially designed sponge balls could be added periodically to clean the polymeric membrane.

The conceptual polymeric backwashable ultrafiltration system, as shown in Figure 4-14, consists of a filter housing containing a polypropylene filter. The filter is backwashed on a timed cycle as follows:

1) The automatic opening of a bottom drain valve on a pressurized vessel containing air and/or filtered water

2) This pressure forces the liquid backwards through the filter dislodging any particulate material from the filter media

3) The pressure vessel drain valve automatically closes, stopping the backwashing process.

The pressure vessel is filled with filtrate again and pressurized with air or water to be ready for the next backwash cycle. The particulate material can be discharged through a port at the base of the filter housing. The pressure required to backwash the filter is about 5 to 25 pounds per square inch gage greater than the inlet pressure to the filter. The pressure is measured in the inlet and outlet side of the filter. If the difference between these two pressures exceeds a preset value, the pump will shut down. The differential pressure value that will shut down the pump depends on the particular filter and filter material.

4.1.5.5.2 Critical Parameters and Safety Features. The critical parameters for filtration are pressure and temperature. The filtration equipment will be operated at a maximum 150 pounds per square inch gage and will be fully pressure tested before processing waste water. The temperature can affect the performance of the polymeric filter assemblies or membranes. The one polymer identified so far is polypropylene, which has a maximum operating temperature of about 176 °F (80 °C).

The following are safety features that will be built into the filtration systems. The detailed safety features are only conceptual at this time. Pressure switches are installed to avoid equipment failure and damage at low pressure and high pressure. Pressure relief valves will be used as a backup safety feature for the high pressure switch. Thermocouples will monitor the system pressure so that the operational temperature of the filter material is not exceeded. High- and low-level switches on all staging tanks alarm to prevent tank overfilling and as a backup to the low pressure switch to prevent running a pump dry.

The waste water pilot plant filtration equipment will be designed to meet the secondary containment requirements of WAC 173-303-640. The waste water pilot plant filtration equipment will have welded pipe joints, where possible, catch pans, and pump interlocks. Piping will be pressure tested before processing waste water. The systems are still in the conceptual stage so details are not available at this time.

4.2 WASTE WATER PILOT PLANT TESTING AT OTHER LOCATIONS

Waste water pilot plant testing could be conducted at locations other than the 1706-KE Building. The following discusses waste water testing that will be performed at the LERF. Also included are the methods for adding to the permit application waste water testing at other locations.

4.2.1 Waste Water Pilot Plant Testing at the Liquid Effluent Retention Facility

Pilot plant testing of several filtration systems will be carried out at the LERF as described in Section 4.1.5.6. The testing will be conducted at the site to minimize sample transport and the impact on the particulate characteristics.

4.2.2 Waste Water Pilot Plant Testing at Other Hanford Facility Locations

Under the terms of the research, development, and demonstration permit, waste water pilot plant testing can take place at other locations on the Hanford Facility if the permit is modified to include information on the additional locations. The information added will be similar in detail to the information in this permit application.

4.3 WASTE TRANSFER OPERATIONS

This section discusses the transfer of the waste from a waste source (usually a processing unit or treatment, storage and disposal unit) to the waste water pilot plant and from the waste water pilot plant back to the waste source. The types of waste that could be tested and could require transport are included in Section 3.0. Most testing will require a number of shipments of waste back and forth between the waste source and the waste water pilot plant. This section discusses the tank trailer and the loading and unloading of the tank trailer. The waste water that will be tested initially will be the 242-A Evaporator process condensate stored in the LERF. The details of this transfer are presented in the following sections.

4.3.1 Transfer Process Description

Transfers will be accomplished using two 5,000 gallon (18,927 liter) truck tankers. These tanker trucks will have detachable trailers pulled by tractors operated by certified drivers. These single-walled tankers are built to U.S. Department of Transportation Specification MC-312-SS (Appendix D), and modified to meet waste water pilot plant requirements. The modifications are discussed in Section 4.3.2.2. The tankers are certified for the transport of hazardous liquids over U.S. public highways (copy of certificate is provided in Appendix D).

An example of waste requiring transport to the waste water pilot plant is the 242-A Evaporator process condensate. The 242-A Evaporator process condensate will be stored at the LERF until the 242-A Evaporator/PUREX Condensate Treatment Facility is operational. This is a dilute aqueous liquid containing low levels of suspended solids, dissolved solids, and organics. A fraction of the suspended and dissolved solids are radioactive. Some of the condensate additionally contains up to 1 weight percent of dissolved ammonia/ammonium hydroxide. The waste has a radioactive waste classification of low specific activity (LSA) per 49 CFR 173.403(n).

At the LERF, the waste will be loaded into the tanker trucks using the existing LERF emergency pumps in the basin valving containment pit. This loading will use single-encased aboveground lines. There will be continuous operator surveillance of the loading lines and the tank liquid level during filling. Unloading at the 1706-KE Building will be accomplished using a sealless pump permanently mounted on the tanker. This pump also will be used for unloading of the treated waste returned to the LERF. Loading of the tanker truck at the 1706-KE Building will be accomplished using internal 1706-KE Building process pumps. These process pumps will be interlocked to the liquid level instrumentation of the tanker truck to prevent overfill.

Onsite waste transfer sheets will be used to document the transfer-out and transfer-in of the waste at the LERF basins.

4.3.2 Equipment Description

The equipment required for transporting the waste to and from the LERF consists of the tank trailers, and the loading and unloading equipment at the LERF and 1706-KE Building.

4.3.2.1 Tank Trailer. The tank trailer consists of a nominal 5,000 gallon (18,927 liter) horizontal cylinder 37 feet (11.3 meters) in length and 57.17 inches (145.2 centimeters) internal diameter, with 8-gage wall [0.1644 inch (0.418 centimeter) nominal thickness]. The dished heads have minimum wall thickness of 0.1255 inch (0.318 centimeter). Material of construction is 316 stainless steel (Figure 4-15). The tanker is U.S. Department of Transportation certified to carry corrosives, acids, and caustics. The waste water processed in the pilot plant will not approach the operating limits of the tank trailer.

The trailer, as modified, has no bottom unloading capability per 49 CFR 173.425(c)(2)(ii). The only tank penetrations are located on the top centerline of the tank. These penetrations are enclosed by small catch basins (Figure 4-16). The penetrations are for the following equipment:

- 2-inch (5.08-centimeter) diameter load-in riser with dip tube terminating near the bottom of the tank; ball valve and valved quick-disconnect, located near the rear of the tank

- 2-inch (5.08-centimeter) flanged riser with a 1/2-inch (1.3-centimeter) dip tube with ball valve and valved quick disconnect for liquid level instrumentation and a 3/4-inch (1.91-centimeter) pipe teed to a pressure gage and a vacuum relief device set to open at 0.5 to 5 inches (1.3 to 12.7 centimeter) of mercury, located in the rear third of the tank

- 20-inch (50.8-centimeter) diameter manhole secured with wing nuts and security wiring, located in the rear third of the tank

- 2-inch (5.08-centimeter) diameter vent riser with ball valve and valved quick-disconnect located near the center of the tank

- 4-inch (10.2-centimeter) diameter loadout riser with dip tube extending down into an 8.25-inch (20.9-centimeter) diameter sump in the tank bottom; ball valve and valved quick-disconnect, located in the center of the tank

- 2-inch (5.08-centimeter) diameter riser for American Society of Mechanical Engineers (ASME 1989) high pressure rupture disk [52 pounds per square inch (358 kilopascals)], located near center of the tank.

4.3.2.2 Additional Tank Trailer Modifications. Modifications to the tank trailers are required to equip the trailers for waste water pilot plant service. Additional trailer mounted equipment to be added is as follows:

- A 3-horsepower (approximate) magnetically coupled (sealless) unloading pump (electric drive) rated at 50 gallons (189 liters) per minute (minimum) at 50 feet (15 meters) hydraulic head (minimum); stainless steel. A second smaller discharge line allows for the reduction of the pumpout rate to the 1706-KE Building to 5 gallons (19 liters) per minute. The lines will be drainable.

- A ventilation assembly with HEPA filter and carbon adsorber. The HEPA filter will be testable and have bag-in/bag-out filter changeout. The ventilation system is rated at a minimum of 100 cubic feet (2.8 cubic meters) per minute at a maximum of 2.25 inches (5.7 centimeters) of water gage initial pressure drop. The HEPA filter/carbon adsorber is valved to the tank to provide removal of particulates and organics during loading and unloading. The filter canisters and piping will be electrically heat traced to prevent problems in cold weather.

- Weight factor dip tube instrumentation, including valves, flowmeter, differential pressure gage, high level alarm, and nitrogen gas bottle. This will provide liquid level indication and alarm capability during loading and unloading. The unit will be electrically heat traced.

Schematic diagrams of the tank trailer loading and unloading configurations are shown in Figure 4-17. A schematic diagram showing the trailer mounted pumping and liquid level unit is shown in Figure 4-18.

4.3.2.3 Tanker Loading and Unloading at the Waste Source. Waste will be loaded into the tanker truck at a waste storage location (such as the LERF). The processed waste will be returned to the waste source or suitable storage or disposal unit after testing. The following sections describe tanker truck loading and unloading at the waste source.

4.3.2.3.1 Waste Loading. The waste storage unit typically will provide pumps and power to load the waste in the tanker truck with waste lines draining back to the waste source. For example, at the LERF, the existing LERF emergency pumps (used to evacuate one basin into another) will be used to load the tank trailers. These pumps are rated at 175 gallons (662.4 liters) per minute at 50 feet (15.2 meters) of hydraulic head. The pumps are located in the containment pit, with any leakage draining back into the LERF.

A motor operated valve is located on the pump discharge line for use in the immediate stopping of flow should this become necessary. Additionally, the pump would be shut down.

The pump discharge manifold (Figure 4-19) will be connected to the trailer fill riser via a 2-inch (5.08 centimeter) neoprene hose with woven stainless steel covering. Connections will be made using quick disconnect fittings.

Trailer electric power requirements (pump, heat tracing, continuous air monitor) will be supplied via a power distribution panel located at the waste source.

Radiation protection for personnel and the environment will be provided. The trailer catch basin drains will be plugged and absorbent material placed in the basins. Plastic ground covers will be placed over the area where the truck is spotted, and the area roped off. Health physics technicians will monitor the trailer and fill piping during the loading process. Following the loading process, the radiation containment materials will be removed, and the area decontaminated back to its original clean status, if necessary.

An operator assigned to the waste source unit and health physics technicians will provide continuous surveillance during the loading process. The actual filling process will take less than 2 hours.

At the LERF, some ammonia is anticipated to be released through the tank vent during filling. This will be mitigated by the fill line dip tube, which will have a submerged outlet. Discharge concentrations are not anticipated to present a health hazard or significant nuisance to the operating and surveillance personnel. Sampling for ammonia in the vent air discharge will be performed during filling. Full-face respirators with ammonia absorption cartridges will be available at the fill site as a precaution.

4.3.2.3.2 **Waste Unloading.** After testing, the waste is transported back to the waste source or to a suitable storage or disposal unit. Unloading of the tank trailer will be accomplished using the sealless pump installed on the trailer. The same 2-inch (5.08 centimeter) neoprene hose jumper with quick disconnects will be used. Electric power will be supplied from the waste source or other convenient electrical distribution panel. Surveillance by operations and radiation protection personnel, and any needed decontamination personnel, will be provided in the same manner that was provided for loading (Section 4.3.2.3.1).

4.3.2.4 Tanker Unloading and Loading at the 1706-KE Building.

Both the unloading of the waste before and the loading of the waste after testing will occur at the 1706-KE Building.

4.3.2.4.1 **1706-KE Building Unloading.** Unloading at the 1706-KE Building will use the pump, liquid level instrumentation, HEPA filtered vent, continuous air monitor, motor operated valve, and heat tracing permanently mounted on the trailer. Electrical power will be supplied from a power distribution panel located at the 1706-KE Building. The pumpout to the 1706-KE Building will be intermittent, depending on the laboratory schedule for the demonstration runs. Also, the rate will be relatively low, i.e., approximately 5 gallons (19 liters) per minute. This will require use of the smaller discharge line option installed on the trailer. A small diameter neoprene hose jumper with woven stainless steel cover and quick-disconnect fittings will be used to connect up to the laboratory inlet piping.

The intermittent nature of the unloading at the 1706-KE Building will essentially establish the trailer as a short-term storage tank, periodically located outside the 1706-KE Building proper. Because the tanker is single walled, provisions will be made for the secondary containment and leak detection required by 40 CFR 265.193.

A permanent or portable (inflatable) berm will be used to contain the trailer and all discharge and fill line quick-disconnect fittings during the loading and unloading processes. The berm will use a leak detector with alarm. The leak detector element will be located in the berm sump. Should a leak occur, the leaked liquid could be pumped out and the open sump dried using absorbent material. The berm will be capable of holding at least 110 percent of the trailer volume.

4.3.2.4.2 **1706-KE Building Loading.** After testing, the waste will be sent back to the waste source. Loading of the trailer with treated waste from the 1706-KE Building will be accomplished using the 1706-KE Building process pumps. These pumps will be interlocked to the trailer liquid level instrumentation to prevent overfill. The trailer mounted HEPA filtered vent, continuous air monitor, and heat tracing will be used.

4.3.2.4.3 Surveillance. The unloading and loading processes at the 1706-KE Building will not be under continuous manned surveillance. However, all this equipment will be inspected daily. Leak detection and liquid-level interlocks will provide the primary means of leak detection and control.

4.3.2.5 Critical Parameters and Safety Features. Certain waste transfer system design features and operating procedural requirements are critical to operator safety and protection of the environment. These are provided in the following sections:

4.3.2.5.1 Design Features. Waste transfer design features are as follows:

- Trailer tank ASME pressure relief rupture disk - rated at 52 ± 5 pounds per square inch, factory installed
- Trailer tank vacuum relief device - rated at 0.5 to 5 inches (1.3 to 12.7 centimeter) of mercury, Hanford Facility installed
- Trailer tank grounding - an integral part of the electrical power hookup
- Trailer tank ventilation continuous air monitor alarm interlocked to 1706-KE Building loading pumps. Calibrated monthly by health physics personnel
- 1706-KE Building trailer loading pumps and motor-operated valves interlocked to the berm leak detector, and to the trailer liquid level instrumentation
- Tank truck pump and discharge line motor-operated valves interlocked to the berm leak detector; this equipment also is interlocked to the 1706-KE Building receiving tank liquid level instrumentation
- All alarm switches activate visible and audible alarms, as well as the appropriate interlocks.

4.3.2.5.2 Operating Parameters. Waste transfer operating parameters are as follows:

- Ventilation line valve open during loading and unloading. Heat tracing functional when ambient temperatures below 40 °F (4.4 °C)
- Pumpout line valve alignment sequence verified correct before initiation of pumping
- Tank truck and liquid level instrumentation under continuous manned surveillance during loading and unloading at the LERF
- Reviewed and approved operating procedures used for loading and unloading

- Protection of the area where the truck is spotted with waterproof ground cover during the loading and unloading processes

- The quick disconnect couplings on the loading/unloading jumpers must be sealed with plastic wrap during loading and unloading at the LERF.

4.4 EQUIPMENT DECONTAMINATION

On completion of testing of a specific waste water, the equipment will be decontaminated to prevent cross-contamination of waste. This decontamination will consist of triple-rinsing equipment that has been contacted by a dangerous waste. A guideline decontamination procedure has been developed that meets the triple-rinsing criteria for vessels that have previously held hazardous waste. The waste water pilot plant equipment could also be decontaminated using this triple-rinsing procedure at any time during a testing program. The triple-rinsing procedure is included in Appendix E.

1

This page intentionally left blank.

7.0 PERSONNEL TRAINING

This section outlines the training program developed and implemented for the waste water pilot plant employees. The training program for the waste water pilot plant personnel is designed to ensure that the waste water pilot plant is operated and maintained in accordance with requirements of the EPA, Ecology, Occupational Safety and Health Administration, and the DOE.

7.1 OUTLINE OF THE TRAINING PROGRAM

The training program for waste water pilot plant personnel is designed to prepare employees to operate and maintain the waste water pilot plant in a safe, effective, efficient, and environmentally sound manner. In addition to preparing employees to operate and maintain the waste water pilot plant under normal conditions, the program ensures that employees are prepared to respond in a prompt and effective manner, should abnormal or emergency conditions occur. Emergency response training is consistent with emergency responses outlined in the contingency plan (Section 6.0 and Appendix E).

This section identifies the organizations which are responsible for the development and administration of the comprehensive training program for employees assigned to or involved with the waste water pilot plant.

7.1.1 Job Titles and Descriptions

Each employee is assigned a job title (from the salaried nonexempt or bargaining unit classifications) or position (from the exempt classification). The waste water pilot plant will be staffed with personnel from the chemical engineering laboratory organization and the 1706-KE Building. Job titles and positions for employees that are associated with the chemical engineering laboratory organization and the 1706-KE Building at the waste water pilot plant are categorized into one of five worker categories. The five worker categories and the supporting organizations involved with training waste water pilot plant employees are described below.

7.1.1.1 All Employees. All personnel assigned to or involved with operations at the waste water pilot plant are included in this group.

7.1.1.2 General Workers. This group includes all those who perform laboratory or sampling activities, such as engineers, operators, managers, and technicians. Also included in this category are personnel from other Hanford Facility and subcontractor employees included in waste water pilot plant testing activities. Personnel such as secretaries and clerks are not included in this worker classification.

7.1.1.3 General Waste Shipper. This category includes the worker or workers who certify shipments of dangerous waste off-site. This includes making sure waste meets applicable regulations for transport, treatment or disposal. For example, if the waste is sent to a landfill, the shipper must certify that the land disposal restrictions are met. The shipper also completes and files all required documents including manifests and required reports.

7.1.1.4 **Managers.** Includes those who supervise workers at the waste water pilot plant. The managers' duties include ensuring that operations are carried out in an efficient, safe, and environmentally sound manner. Managers are responsible for directing the activities of the staff, recommending changes in operational modes, personnel staffing, purchasing equipment, developing expense and capital budgets, approving purchases made by subordinates, approving hiring and firing of subordinates and their workforce, setting operational policies and procedures, and setting disciplinary actions for subordinates and their workforce.

7.1.1.5 **Visitor Training.** All visitors who have the potential for exposure to dangerous waste while at the waste water pilot plant will be trained to levels commensurate with their anticipated level of risk.

7.1.1.5.1 **Pre-job Safety Briefing.** Before a visitor can enter a dangerous waste area, a pre-job safety briefing may be conducted. This briefing could include a discussion of the hazards of the work site, mitigation of those hazards, work procedures for that site, and emergency procedures.

7.1.1.5.2 **Waste Water Pilot Plant Management Responsibilities.** Pre-job planning, training, and medical surveillance requirements must be identified and verified for all visitors requesting access to areas where there is a potential for exposure to dangerous waste. The waste water pilot plant management has the responsibility to ensure that before the visitors are allowed access to the work sites, that the visitors have met all the requirements.

7.1.2 Training Content, Frequency, and Techniques

This section describes the training provided to personnel in the worker classifications discussed in Section 7.1.1. In addition to normal operating conditions, personnel are instructed on communications and alarm systems and the proper response to abnormal conditions and emergencies such as fire, radiological incidents, dangerous waste incidents, and shutdown of operations.

7.1.2.1 **Training Courses for Waste Water Pilot Plant Personnel.** All waste water pilot plant personnel receive applicable facility-general, plant-specific, and job-specific training. To satisfy the requirements of 29 CFR 1910.120, general worker training includes a 40-hour training program for workers dealing with unknown hazards or a 24-hour training program for workers dealing with known hazards. The courses are given in classroom settings, on-the-job training, self-study units, and computer-based training. The dangerous waste related training courses provided to waste water pilot plant personnel are based on worker classifications and are shown in Table 7-1. Worker classifications are discussed in Section 7.1.1.

7.1.2.2 Training Frequency. The frequency of training for a waste water pilot plant employee depends upon the employee's worker classification and corresponding training course requirements. Some introductory courses must be completed one time only (often referred to as orientation). Other introductory courses are the first course in a program of continuing courses. These type of training courses must be repeated according to a specified frequency. The frequency of training requirements related to dangerous waste for the waste water pilot plant personnel are provided in Tables 7-2.

7.1.2.3 Training Course Descriptions. Table 7-3 contains brief descriptions of selected courses, including course descriptions, the target audience, instructional delivery, evaluation method, length of course, and frequency of retraining.

7.1.3 Training Director

Training at the waste water pilot plant is a shared responsibility among Hanford Site contractor training, support, and the waste water pilot plant management organizations. Their responsibility is to ensure that the development and implementation of the dangerous waste training program to comply with WAC 173-303. The waste water pilot plant manager has the ultimate responsibility for ensuring that the required training for all workers has been identified and completed.

7.1.4 Relevance of Training to Job Position

Tasks to be performed will be identified and evaluated to determine training requirements. Supplementary training requirements can be identified by the chemical engineering laboratory organization and the 1706-KE Building management. In addition, training needs will be continually assessed in relation to federal and state regulations. These evaluations could result in modifying or adding new material to the training program.

Certification of training is required for waste water pilot plant employees. To become certified, waste water pilot plant employees must successfully complete classroom training and on-the-job training requirements. Classroom instruction is designed to provide employees with fundamental knowledge required to perform work safely within the waste water pilot plant.

On-the-job training requires operations personnel to gain experience with operating procedures.

Work that involves hazardous material and dangerous waste is performed according to approved operating procedures; therefore, an understanding of procedures is crucial to ensure the proper and safe operation of the waste water pilot plant. Understanding is accomplished by having individuals perform, simulate, and/or describe a particular task as specified by the appropriate operating procedure. The individual demonstrating the required skills and knowledge is certified by the appropriate waste water pilot plant manager and/or on-the-job trainer.

The training program for the waste water pilot plant personnel is designed to ensure that the waste water pilot plant is operated and maintained in accordance with requirements of the Environmental Protection Agency, Washington State Department of Ecology, Occupational Safety and Health Administration, and U.S. Department of Energy.

7.1.5 Training to Emergency Response

Effective response to emergencies, and familiarity with emergency equipment and emergency systems, are covered under the classroom and on-the-job training requirements as outlined in Table 7-1, Section 6.0, and Appendix F.

Federal and state regulations require that personnel be able to respond effectively to emergencies and that personnel be familiar with emergency procedures, emergency equipment, and emergency systems. Specific topics addressed include the following:

- Procedures for using, inspecting, repairing, and replacing emergency and monitoring equipment
- Key parameters for automatic waste feed cut-off systems
- Communications or alarm systems
- Response to fires or explosions
- Shutdown of operations.

7.2 IMPLEMENTATION OF TRAINING PROGRAM

Certification of training is required of waste water pilot plant employees before performing specific tasks without supervision. Certification requires successful completion of identified classroom and on-the-job training requirements. Certification also requires managers to successfully complete self-study, classroom, and on-the-job training requirements. Personnel from other Hanford Facility units and subcontractor personnel working at the waste water pilot plant will be required to meet the appropriate certification requirements. Training content is reviewed and updated as appropriate.

The waste water pilot plant operations will be staffed by the chemical engineering laboratory organization. Chemical engineering laboratory organization personnel are required to successfully complete the training course requirements specified in Table 7-1. Therefore, certified chemical engineering laboratory organization employees will require limited additional training to become certified to operate the waste water pilot plant.

Official training record files for waste water pilot plant employees are stored in the Training Records Information System. This database is managed by the Technical Training Records organization. Technical Training Records inputs the completed training records into a computer file. The computer file is accessible on a local area network to allow remote accessing of employee training records via a computer terminal. A tickler file is available from the database to inform the appropriate waste water pilot plant operations manager and surveillance manager when training is within 90 days of expiration. Employee training records are maintained for a period of 3 years for personnel who leave the waste water pilot plant. Specific employee training records are available on a demonstrated need-to-know basis. Copies of these records will be marked Sensitive Information, and expected to be handled in accordance with the *Privacy Act of 1974*.

This page intentionally left blank.

Table 7-1. Training Courses for Waste Water Pilot Plant Personnel.

Course	General worker	General waste site shipper	Manager
Hanford general employee training (HGET)[a]	All employees		
Generator hazards safety training (4 hours)	X	X	X
Hazardous materials/waste job-specific training (length varies for each unit)	X	X	
Radiation worker training (8 hours)	X	X	
Waste site basic (16 hours)	X[b]		X[b]
Scott SKA-PAK training[c] (2 hours)	X[d]	X[d]	X[d]
Cardiopulmonary resuscitation (4 hours)	X[d]	X[d]	X[d]
Waste site advanced (24 hours)	X[d]	X[d]	X[d]
Waste site field experience (24 hours)	X[d]	X[d]	X[d]
Hazardous waste shipment certification (24 hours)		X	
Certification of hazardous material (radioactive) shipments (8 hours)		X	
Hazardous waste site supervisor/manager (8 hours)			X
Compliance category[e]	1,2 or 4	1,3,4	1,5

[a] The courses for Hazardous Communication and Waste Orientation and Fire Extinguisher Training are included in the HGET training.
[b] Course required for 24-hour training (known hazard).
[c] Scott SKA-PAK is a trademark of Figgie International, Incorporated.
[d] Course required for 40-hour training (unknown hazards).
[e] 1 WAC 173-303, 29 CFR 1910.1200 (OSHA 1988)
2 29 CFR 1910.120 (24-hour requirement) (OSHA 1989)
3 49 CFR 173 (DOT 1987)
4 29 CFR 1910.120 (40-hour requirement) (OSHA 1989)
5 29 CFR 1910.120 (additional 8-hour requirement for managers) (OSHA 1989).

Table 7-2. Training Course Requalification Frequency.

Course	General worker	General waste site shipper	Manager
Hanford general employee training (HGET)	All employees		
Generator hazards safety training (4 hours/2 years)	X	X	X
Hazardous materials/waste job-specific training (length varies for each unit)	X	X	
Hazardous waste site retraining (8 hours/1 year)		X	
Hazardous waste shipment certification (24 hours/1 year)		X	
Certification of hazardous material shipments (8 hours/2 years)		X	

Table 7-3. Training Course Descriptions. (sheet 1 of 7)

Hanford General Employee Training (HGET)	
Prerequisites	None
Description	Course covers Hanford Facility regulations pertaining to employer and employee rights and responsibilities, general radiation training, hazardous communications and hazardous waste, fire prevention, personal protective equipment, safety regulations, accident reporting, and avenues for addressing safety concerns.
Target audience	All employees
Technique	Computer-based training/interactive video
Assessment	Computer generated questions
Length	4 to 6 hours
Frequency	12 months

Generator Hazards Safety Training	
Prerequisites	None
Description	Provides the dangerous material/waste worker with the fundamentals for safe use and disposal of dangerous materials.
Target audience	Dangerous material and waste workers including operations, maintenance, safety, engineering and management personnel
Technique	Classroom
Evaluation	Written test
Length	4 hours
Frequency	24 months

Table 7-3. Training Course Descriptions. (sheet 2 of 7)

Hazardous Material/Waste Job-Specific Information	
Prerequisites	Generator hazards safety training.
Description	Provides job-specific dangerous material waste information to the employee. Two checklists may be obtained from Technical Training-Environmental group to guide the employee's management in the completion and documentation of this training. Note: Not a classroom presentation--supervisor conducts this exercise with each employee using the checklists.
Target audience	Employees who have completed the prerequisite course.
Technique	On-the-job training.
Evaluation	On-the-job training checklist.
Length	Average = 2 hours
Frequency	12 months

Radiation Worker Training	
Prerequisites	None
Description	Provides instruction for radiation workers in the fundamentals of radiation protection and proper procedures for monitoring exposure.
Target audience	Radiation area workers
Technique	Classroom
Evaluation	Written examination and practical dress/undress
Length	8 hours
Frequency	24 months

Table 7-3. Training Course Descriptions. (sheet 3 of 7)

Waste Site Basic	
Prerequisites	None
Description	Provides required information for the safe operation of hazardous waste treatment, storage, and disposal facilities regulated under 40 CFR 264 and 265 pursuant to RCRA.
Target audience	Dangerous material and waste workers including operations, maintenance, safety, engineering, and management personnel
Technique	Classroom
Evaluation	Written test
Length	16 hours
Frequency	Not applicable

Scott SKA-PAK Training*	
Prerequisites	Mask fit
Description	Provides instruction to employees in proper use of Scott SKA-PAK for entry, exit, or work in conditions immediately dangerous to life and health.
Target audience	Hazardous site and radiation workers who require respiratory protection of this type
Technique	Classroom and practical
Evaluation	Written test and practical examination
Length	4 hours
Frequency	12 months Note: Retraining is not required as a condition of continued waste site worker certification that was received.

* Scott SKA-PAK is a trademark of Figgie International, Incorporated.

Table 7-3. Training Course Descriptions. (sheet 4 of 7)

Cardiopulmonary Resuscitation	
Prerequisites	None
Description	Provide cardiopulmonary resuscitation training to the American Heart Association standards.
Target audience	All employees
Technique	Classroom and active participation
Evaluation	Written test and practical exam
Length	4 hours
Frequency	24 months Note: Retraining is not required as a condition of continued waste site worker certification that was initially received.

Waste Site - Advanced	
Prerequisites	
Description	Provides required information for the safe initial site investigation and cleanup of CERCLA and RCRA hazardous waste sites pursuant to 29 CFR 1910.120(a)(1)(i)(ii)(iv).
Target audience	Dangerous material and waste workers including operations, maintenance, safety, engineering, and management personnel
Technique	Classroom and on-the-job training
Evaluation	Written test
Length	24 hours
Frequency	Not applicable

Table 7-3. Training Course Descriptions. (sheet 5 of 7)

Waste Site Field Experience	
Prerequisites	Waste Site Advanced (24 hours)
Description	This is documentation of 3 days of field experience under the direct supervision of a trained, experienced supervisor.
Target audience	Dangerous material and waste workers including operations, maintenance, safety, engineering, and management personnel who attended the prerequisite course.
Technique	On-the-job work experience
Evaluation	Checklist documentation of completed experience
Length	24 hours
Frequency	Not applicable

Hazardous Waste Shipment Certification	
Prerequisites	Generator hazards safety training course (required one time only)
Description	Provides an in-depth look at federal, state, and company requirements for nonradioactive hazardous waste management and shipments
Target audience	Nonradioactive dangerous waste shippers
Technique	Classroom
Evaluation	Written examination
Length	24 hours
Frequency	12 months

Table 7-3. Training Course Descriptions. (sheet 6 of 7)

Certification of Hazardous Material Shipment	
Prerequisites	None
Description	Provides instruction in the federal regulations that govern, by law, those who certify hazardous material shipments. Includes properly classifying hazardous material based on 49 CFR, packaging, labeling, and recordkeeping.
Target audience	Mixed or radiological waste shippers
Technique	Classroom
Evaluation	Written test
Length	8 hours
Frequency	12 months

Hazardous Waste Site Supervisor/Manager Safety Management Training	
Prerequisites	Completion of Hazardous Waste Site Operator Training - basic programs or advanced program
Description	Provides an additional 8 hours of training for supervisors and managers covering hazardous waste programs
Target audience	Personnel who manage or have safety overview responsibilities of dangerous material and waste operations
Technique	Classroom
Evaluation	None
Length	8 hours
Frequency	Not applicable

Table 7-3. Training Course Descriptions. (sheet 7 of 7)

Hazardous Waste Site Operator Training	
Prerequisites	
Description	Provides the dangerous waste worker with a refresher in the fundamentals of safety when working with dangerous waste. Note: This course fulfills continuing training requirements of 29 CFR 1910.120 requiring dangerous waste training of workers at all treatment, storage, and/or disposal facilities regulated under RCRA.
Target audience	Dangerous material and waste workers including operations, maintenance, safety, engineering, and management personnel
Technique	Classroom
Evaluation	Written test
Length	8 hours
Frequency	12 months

THIS PAGE INTENTIONALLY
LEFT BLANK

8.0 CLOSURE AND POSTCLOSURE REQUIREMENTS

This section describes the planned activities and performance standards for closing the waste water pilot plant. Closure will apply only to the areas affected by waste water pilot plant testing at the 1706-KE Building located in the 100KE Area and at the LERF located east of the 200 East Area (Section 1.0, Figures 1-3 and 1-4). There are no postclosure activities planned for the waste water pilot plant because the unit will be clean closed, and as such, postclosure activities are not applicable or required. For the waste water pilot plant, clean closure is defined as the decontamination of waste water pilot equipment or removal and disposal of all contaminated waste water pilot plant equipment from the 1706-KE Building and LERF. Clean closure will also include decontamination of the test locations (as necessary) to pre-pilot plant conditions and return of the test areas to service for other purposes. The ultimate closure of the 1706-KE Building and the LERF will be addressed in other closure plans. If other test locations are included in the waste water pilot plant testing, this closure plan will be modified to include the additional units.

Spills or leaks that might occur during operation of the waste water pilot plant will be immediately remediated. The response to spills or leaks is given in the building emergency plan (Appendix F).

8.1 CLOSURE PLAN

Closure of the waste water pilot plant will require the decontamination and removal of all process vessels, equipment, piping, and tanks currently present within the unit. This plan describes the methods of decontamination and equipment disposal for the following portions of the waste water pilot plant ancillary equipment and structures:

- Process and secondary containment equipment and piping
- Waste water pilot plant structures
- The portion of the 1706-KE Building ventilation system that was used for pilot plant testing.

Contaminated equipment and piping removed from the waste water pilot plant will be transported to the 616 Nonradioactive Dangerous Waste Storage Facility or the Central Waste Complex (as appropriate) for final disposition.

The waste water pilot plant will become operational in 1992. Final closure will begin when the waste treatment testing conducted at the waste water pilot plant is completed. The waste water pilot plant will operate a maximum of 3 years from the time the RD&D permit is issued. Activities that are planned to achieve clean closure are presented in the following sections.

8.1.1 Closure Performance Standard

The following sections address closure performance standards, waste removal and decontamination standards, and the method for determining compliance with the closure performance standard.

8.1.1.1 Performance Standard. This plan has been developed to close the waste water pilot plant in a manner that meets the following closure performance standards:

- Minimize the need for future site maintenance at test locations at the waste water pilot plant or the LERF

- Control, minimize, or eliminate to the extent necessary to protect human health and the environment, the postclosure escape of dangerous waste, dangerous constituents, leachate, contaminated run-off, or dangerous waste decomposition products to the ground, surface water, groundwater, or atmosphere

- Return the 1706-KE Building or the LERF to a condition that the test locations can be used for other Hanford Facility operations.

Specific steps to be used during the closure period to ensure there is minimal escape of dangerous waste constituents and minimal exposure of the public to dangerous waste constituents will be controlling access to the waste water pilot plant. During the closure period, access to the waste water pilot plant will be limited to personnel required to support the closure of the treatment unit. Personnel will be trained in accordance with Hanford Facility requirements before being granted access.

8.1.1.2 Removal or Decontamination Standard. Clean closure of the waste water pilot plant will require removal and disposal of all dangerous waste present in the unit and removal of all process equipment and contaminated components. Any materials, equipment, and structures removed from the unit will be designated and disposed of accordingly. The disposition of the removed equipment is discussed in Section 8.1.10.

8.1.1.3 Determination of Compliance with Closure Standard. The pre-pilot plant background levels for the waste water pilot plant will form the basis for determining if the waste water pilot plant has been adequately decontaminated. Determination of background is discussed in Section 8.1.3.

Waste water pilot plant structures and equipment will be decontaminated to a level where the structures and equipment do not exhibit any significant degree of contamination with dangerous materials above appropriate background levels and/or health and environmental based risk levels. The decontamination levels for process equipment will be determined based on the final disposition of the equipment.

Prior to initiation of pilot plant activities, the floor and walls of the waste water pilot plant will be coated with an epoxy coating. Wipe samples will be collected on the floor and walls at closure to demonstrate that the walls and floor are not contaminated significantly above pre-use background values for the waste water pilot plant. Shallow soil samples will be collected in the waste loading and unloading areas, as well as the testing area at LERF, to demonstrate that the values are not significantly higher than the background levels determined before the pilot plant testing was initiated. The samples collected at closure will be analyzed for the constituents listed in Section 3.0, Table 3-3. These constituents are the major dangerous waste constituents of the 242-A Evaporator process condensate.

Any spills or leaks from secondary containment occurring during waste water pilot plant testing will be cleaned up to background and/or health based standards and environmental risk levels. The responses to spills and leaks are detailed in the building emergency plan (Appendix F).

8.1.2 Order of Closure Activities

Dangerous waste testing activities at the waste water pilot plant consists of a single room within the 1706-KEL Building that contains the process equipment, and an area on the perimeter of the LERF. The activities necessary to close the waste water pilot plant and the basis for establishing the order of performing these activities are detailed in the following.

- **Inventory removal**--The dangerous waste inventory will be removed from all equipment, thus, removing the bulk of the dangerous waste constituents. This removal will minimize the possibility for release and allow decontamination of the equipment to proceed.

- **Process and secondary containment equipment and piping decontamination**--Process and secondary containment equipment and piping will be decontaminated as necessary before removal.

- **Process piping removal**--The process piping will be removed before the removal of the process equipment.

- **Process and secondary containment equipment removal**--After decontamination of the equipment and removal of the piping, the process equipment will be removed.

- **Equipment support structure decontamination**--The 1706-KEL room (floor and walls) will be decontaminated as necessary.

- **Ventilation system sampling and decontamination**--If wipe sampling indicates that the ventilation system is contaminated, the system will be isolated to prevent the spread of contamination and closed during the 1706-KE Building closure that will occur subsequent to closure of the waste water pilot plant.

The order of closure activities was selected so that the most contaminated areas will be decontaminated and cleaned before moving to less contaminated areas. This approach minimizes the potential for release of dangerous waste constituents by removing the bulk of these constituents early in the closure process. This order also minimizes waste generation by reducing the possibility that decontaminated areas will be recontaminated by ongoing decontamination and closure efforts.

8.1.3 Background Level Determination

Pre-pilot plant background levels will be determined in the room in the 1706-KE Building (waste water pilot plant room) to be used for waste water pilot plant testing. Local-area background levels will also be determined at the waste loading and unloading areas, and for the testing area at LERF. These test locations are not known to be contaminated. The purpose of the background sampling will be to establish the current levels of waste constituents at these test locations. These background values will serve as the clean up levels for closure or spill remediation for the waste water pilot plant.

Radionuclide contamination will be used as an indicator of the presence of dangerous waste contamination. If levels of radionuclide contamination in the waste water pilot plant room, the waste loading and unloading areas, or the testing area at LERF, are found to be below levels of concern, then the level of dangerous waste contamination will be assumed to be low. The walls and floor of the waste water pilot plant room will then be coated with epoxy. If localized areas of radionuclide contamination are detected, these areas will be addressed, prior to proceeding with the coating. In the remote chance that significant radionuclide contamination is detected, the test areas will be evaluated for further action in keeping with existing Hanford Facility procedures and maintaining worker exposure 'as low as reasonably achievable' (ALARA).

Two types of background samples will be collected. Wipe samples will be collected on filter paper from the floor and walls of the waste water pilot plant room before the floor and walls are coated with epoxy. Shallow soil samples (less than 3 foot in depth) will be collected at the other testing areas. Samples will be analyzed for the nonvolatile constituents listed in Appendix VIII of 40 CFR 261.

Following the collection of background samples and the coating of the waste water pilot plant room with epoxy, pilot plant testing will proceed as planned. The pre-existing contamination level as indicated by the Appendix VIII analyses will be considered as the local-area background for the pilot plant testing room and/or testing areas. This pre-existing contamination will be remediated during closure of the 1706-KE Building and LERF which will occur subsequent to closure of the waste water pilot plant.

8.1.4 Inventory Removal

The maximum waste inventory at the waste water pilot plant at any one time is 5,000 gallons (18,927 liters). The inventory of dangerous waste contained within the waste water pilot plant will be removed using the existing process equipment and pumps. The waste contained in the process equipment and piping will be transferred to the 616 Nonradioactive Dangerous Waste Storage Facility or the Central Waste Complex, as appropriate.

8.1.5 Process and Secondary Containment Equipment and Piping Decontamination

After the waste inventory remaining in process vessels, piping, and tanks has been transferred from the waste water pilot plant, the vessels, piping, and secondary containment equipment (if necessary) will be rinsed using the decontamination procedure described in Appendix D. Decontamination solutions containing water, detergents, and/or citric acid will be used as required to remove any dangerous waste constituents. All decontamination solutions will be designated as described in Section 8.1.10 and returned to an onsite unit for storage and ultimate disposal according to applicable procedures.

8.1.6 Process Piping Removal

Following decontamination, the piping will be removed from the waste water pilot plant and packaged for transport to an appropriate TSD unit for further decontamination and disposal. The final disposition of the process piping will be determined based on the criteria described in Section 8.1.10.

8.1.7 Process and Secondary Containment Equipment Removal

Following decontamination, the process and secondary containment equipment will be removed from both the 1706-KE Building and the LERF. The removal of each piece of equipment will be under the guidance of an appropriate procedure available specifically to address the removal of that piece of equipment. The removed equipment will be dispositioned as described in Section 8.1.10.

8.1.8 Equipment Support Structure Decontamination

The equipment support structures will be decontaminated or removed, if necessary, depending on the proposed future use of the structures. The structures at the 1706-KE Building and the LERF will be handled separately, as described in the following.

If necessary, the equipment enclosure at the 1706-KE Building will be decontaminated by washing the sealed walls and floor with an appropriate decontamination agent. The decontamination fluids will be collected and disposed of in accordance with procedures described in Section 8.1.10.

8.1.9 Ventilation System Sampling and Decontamination

After removal of the contaminated equipment from the 1706-KE Building in the 1706-KE Building, the building ventilation system will be evaluated for the potential of contamination by taking wipe samples of the inside of the ventilation piping near the air intakes.

If the evaluation indicates that contaminants exist at concentrations that potentially could be released to the environment, the ventilation system will be sealed and isolated at the time of closure of the waste water pilot plant. The ventilation system decontamination and removal will be included in the plan to close the entire 1706-KE Building. The 1706-KE Building has other contaminated areas including some ventilation piping.

8.1.10 Closure Waste Disposal

The waste water pilot plant process equipment is assumed to be contaminated or potentially contaminated. The methods that will be used to dispose of the contaminated equipment from the waste water pilot plant listed by order of preference, are as follows:

- Decontamination and recycling and/or reuse
- Burial as dangerous waste
- Storage as mixed waste.

The selection of the method to be used for the disposal will be made individually for each piece of equipment removed from the waste water pilot plant. The decision will be made based on the classification of the piece of equipment (e.g., mixed waste, dangerous waste, or uncontaminated), the level of contamination associated with each piece of equipment, and the estimated quantity of waste that would be generated during decontamination. The final disposal method for each piece of equipment will be determined using the most appropriate techniques available at the time of closure.

All other waste resulting from decontamination operations will be separated and characterized into the following waste categories:

- Liquid waste
  - Nondangerous and nonradioactive
  - Nondangerous and radioactive
  - Dangerous and nonradioactive
  - Dangerous and radioactive
- Solid waste
  - Nondangerous and nonradioactive
  - Nondangerous and radioactive
  - Dangerous and nonradioactive
  - Dangerous and radioactive.

Depending on the classification of the waste, disposal of the waste could include additional decontamination at an onsite treatment unit. The exact identification of the treatment or disposal unit cannot be provided at this time as the treatment or disposal will depend on the type of contamination encountered. Some disposal trenches that might be suitable to receive contaminated equipment are located within the Hanford Facility.

When removed from the waste water pilot plant for disposal, all waste will be properly packaged in accordance with U.S. Department of Transportation regulations.

8.1.11 Closure Equipment Decontamination

The equipment used during the closure activities will be cleaned three times with a steam cleaner. The equipment cleaning will be performed over a solid sheet of durable plastic. The plastic will be of an appropriate thickness. The thickness will depend on the equipment and the amount of abrasion expected from cleaning activities. The sides of the plastic will be elevated to prevent the escape of rinsate. The rinsate from steam cleaning will be collected, pumped into new bung type 17-H U.S. Department of Transportation-55-gallon (208-liter) containers, and sampled. The pump will be flushed three times with water that will be managed as rinsate. The plastic liner will be removed and disposed of in a manner determined by contaminants found in the rinsate.

8.1.12 Closure of Containers

Containers will be used to collect and contain dangerous waste in the event of a spill, unexpected release, or an equipment failure. Any containers used to collect dangerous waste at the waste water pilot plant will be disposed of in the appropriate manner. Containers of dangerous waste will not be left in the waste water pilot plant after closure.

8.1.13 Closure of Tanks

Clean closure will consist of the removal and disposal of all dangerous waste and the decontamination, sampling, removal, and disposal of contaminated equipment, including the intermediate storage tanks. The intermediate storage tanks will be treated in the same manner as all other contaminated process equipment removed from the waste water pilot plant. This treatment is described in Sections 8.1.5 and 8.1.7.

8.1.14 Schedule for Closure

The waste water pilot plant is expected to operate for a period of 1-year. Depending on the progress of the test efforts, up to two additional 1-year operation periods could be requested. Any dangerous waste in the pilot plant will be removed within 90 days following the completion of the test program. All closure activities will be completed within 180 days following the completion of the test program.

8.1.15 Amendments to Closure Plan

Should changes be required to the approved closure plan, an amended plan will be prepared and submitted to EPA and Ecology for approval in accordance with 40 CFR 264.112 and WAC 173-303-610.

8.1.16 Certification of Closure and Survey Plat

Within 60 days of the final closure of the waste water pilot plant, the DOE-RL will submit a certification of closure to EPA and Ecology in accordance with 40 CFR 264.115 and .116 and WAC 173-303-610. This certification will be signed by an authorized representative of the DOE-RL and by an independent professional engineer registered in the state of Washington, and will state that the waste water pilot plant has been closed in accordance with the approved closure plan. The certification will be submitted by registered mail or an equivalent delivery service. The independent registered professional engineer, who will be monitoring closure, will visit the site at least at the commencement and at the end of each activity described in the closure plan (e.g., inventory removal, contaminated equipment removal, 1706-KE Building decontamination). The professional engineer will review all records, notes, analyses, files, manifests, etc., relating to the closure activities. Documentation supporting the closure certification will be retained by the DOE-RL and provided to EPA and Ecology upon request. This documentation will be kept by the DOE-RL contact (or his successor) identified in Section 8.3.

8.1.17 Owner/Operator Closure Certification

The DOE-RL will certify the closure of the waste water pilot plant with the following statement or a statement similar to it:

> "I, (name), an authorized representative of the U.S. Department of Energy Field Office-Richland, located at the Federal Building, 825 Jadwin Avenue, Richland, Washington, hereby state and certify that the waste water pilot plant to the best of my knowledge and belief, has been closed in accordance with the attached approved closure plan, and that the closure was completed on (date). (Signature and date.)"

8.1.18 Professional Engineer Closure Certification

The DOE-RL will engage an independent professional engineer registered in the state of Washington to certify that the waste water pilot plant has been closed in accordance with this approved closure plan. The DOE-RL will require the engineer to sign the following statement or a statement similar to it:

> "I, (name), a registered professional engineer in the state of Washington, hereby certify, to the best of my knowledge and belief, that I have made visual inspection(s) of the waste water pilot plant and that closure of the aforementioned facility has been performed in accordance with the attached approved closure plan. (Signature, date, state

professional engineer license number, business address, and telephone number.)*

8.3 CLOSURE COST ESTIMATE [I-4]

In accordance with 40 CFR 264.140(c) and WAC 173-303-620(1)(c), this estimate is not required for federal facilities. The Hanford Facility is a federally owned facility for which the federal government is the operator and this estimate is therefore not applicable to the waste water pilot plant.

An annual report updating projections of anticipated closure and postclosure costs for the Hanford Facility will be submitted to Ecology in accordance with WAC 173-303-390 by October 30 (beginning in 1992).

8.4 FINANCIAL ASSURANCE MECHANISM FOR CLOSURE [I-5]

In accordance with 40 CFR 264.140(c) and WAC 173-303-620(1)(c), this section is not required for federal facilities. The Hanford Facility is a federally owned facility for which the federal government is an operator and this section is therefore not applicable to the waste water pilot plant.

8.5 LIABILITY REQUIREMENTS [I-8]

In accordance with 40 CFR 264.140(c) and WAC 173-303-620(1)(c), this section is not required for federal facilities. The Hanford Facility is a federally owned facility for which the federal government is an operator and this section is therefore not applicable to the waste water pilot plant.

8.6 CLOSURE CONTACTS

The following offices (or their successors) are the official contacts for the waste water pilot plant:

Environmental Restoration Division
U.S. Department of Energy
Field Office, Richland
P.O. Box 550
Richland, Washington 99352
(509) 376-7277.

THIS PAGE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY
LEFT BLANK

1.0 INTRODUCTION

The 1706KE Emergency Plan has been designed to provide a system of planned responses which will minimize risks to personnel, equipment, buildings, and the environment in the event of an emergency situation. This Plan is applicable to the total facility, employees and visitors, identified in Section 1.1.

Emergency situations considered for this facility and identified as requiring emergency response plans are identified in section 3.0 Potential Emergency Conditions. The six categories of emergencies considered are identified as follows:

- Operational Emergencies, to Include Security Events
- Natural Hazards
- Non-Radioactive Hazardous Material Hazards
- Radioactive Material
- Criticality
- Explosive Materials/Munitions

Planned responses are those activities which are intended to provide direction to control a fire, minimize the immediate effects of an explosion, contain a spill or release, and minimize the effects of a criticality incident. These responses include, for example: notification of personnel, emergency organizations, and the Building Emergency Director. The Plan also provides guidance for notifying personnel to take cover, evacuate, or take other actions, which are determined by the particular circumstances. The planned responses also provide for formal notification and reporting, investigation of the incident, cleanup, and restoration.

The 100K Area is located on the 570 sq mi, U. S. Department of Energy (DOE) Hanford Site in southeastern Washington State. The 1706KE building is located in the western portion of the 100 Area in the Hanford Reach near the northern portion of the Hanford Site.

A discussion of the 1706KE Facility is contained in Section 1.4.

1.1 FACILITY NAME: U.S. Department of Energy Hanford Site 1706KE

1.2 FACILITIES LOCATION: Benton County, Washington
Within the 100K Area

Facilities covered by this plan are: 1706KE, 1706KEL,1706KER

1.3 OWNER/CO-OPERATOR:

U. S. Department of Energy - Field Office, Richland
Federal Building
825 Jadwin Avenue
Richland, Washington

CO-OPERATOR:

Westinghouse Hanford Company
P. O. Box 1970
Richland, Washington

1.4 DESCRIPTION OF THE FACILITY AND OPERATIONS:

Building Description

1706KE Engineering and Environmental Demonstration Laboratory
1706KEL Laboratory
1706KER Laboratory

The 1706KE/KER, Engineering and Environmental Demonstration Laboratory provides out-of-reactor facilities in support of in-reactor test loops and single pass tubes. The 1706KE Building has a full basement with half sub-basement. It provides water treatment facilities and instrumented supply systems for eight KE Reactor tubes used for studies of corrosion and effects of water treatment parameters on effluent activity. The 1706KER Building contains four shielded cells below grade, each housing the water treatment, heat exchange, pumping, and remote instrument equipment for each of the four in-reactor loops. These loops are capable of operation to 385° C at 1600 psig. Loop materials are Zircaloy-2 and carbon steel or Zircaloy-2 and stainless steel with in-reactor portions to 2.7 in ID.

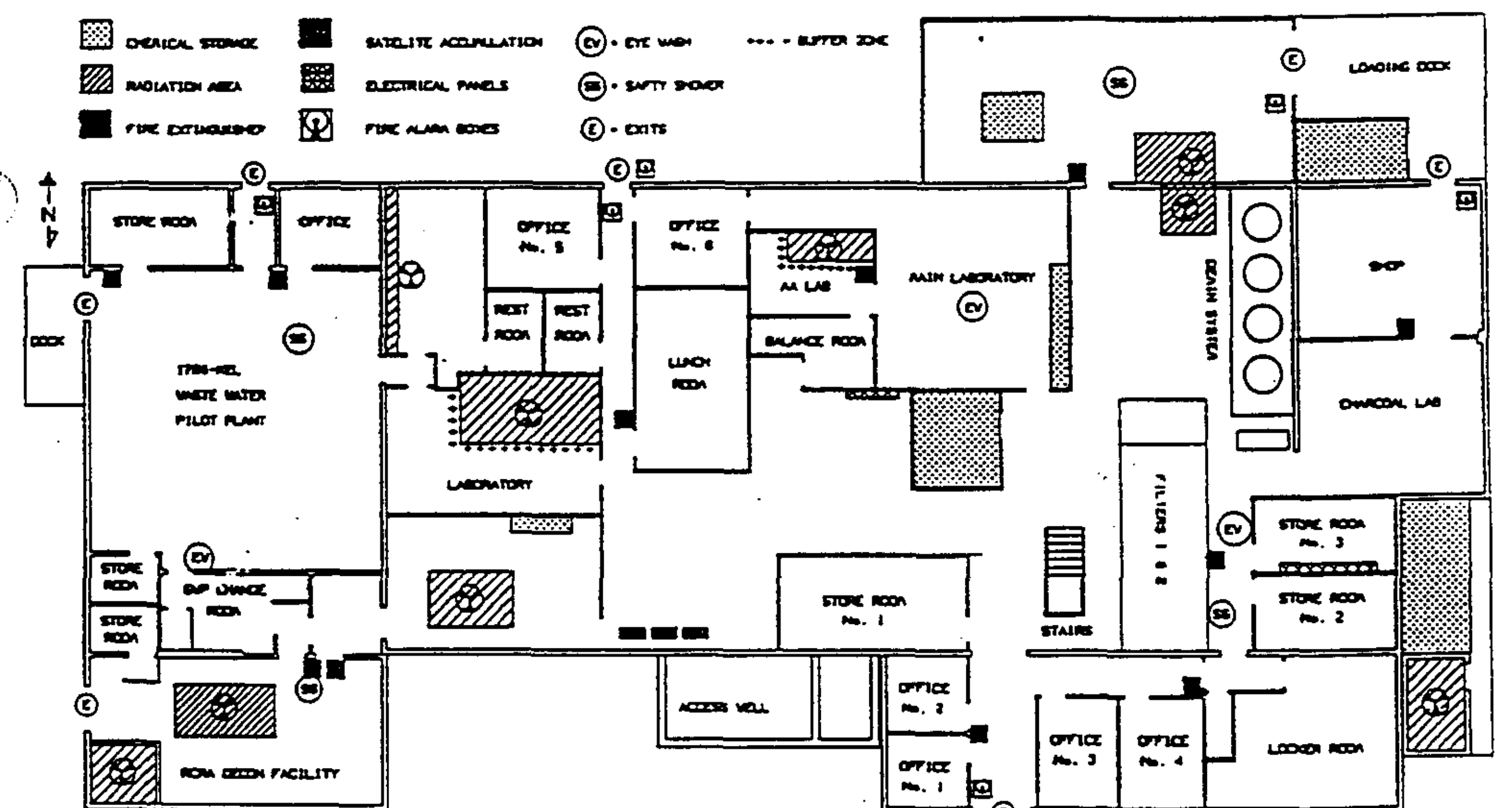
The 1706KEL Laboratory, adjoining the 1706KER building is now being used to provide research and development work. It also provides demineralized water to KE and KW fuel storage basins as needed.

The 1706KER Research and Development Laboratory is constructed of reinforced concrete and is used to house the switchgear rooms, ventilation systems and storage area.

1.5 DESCRIPTION OF THE FACILITY AND GENERAL LOCATION:

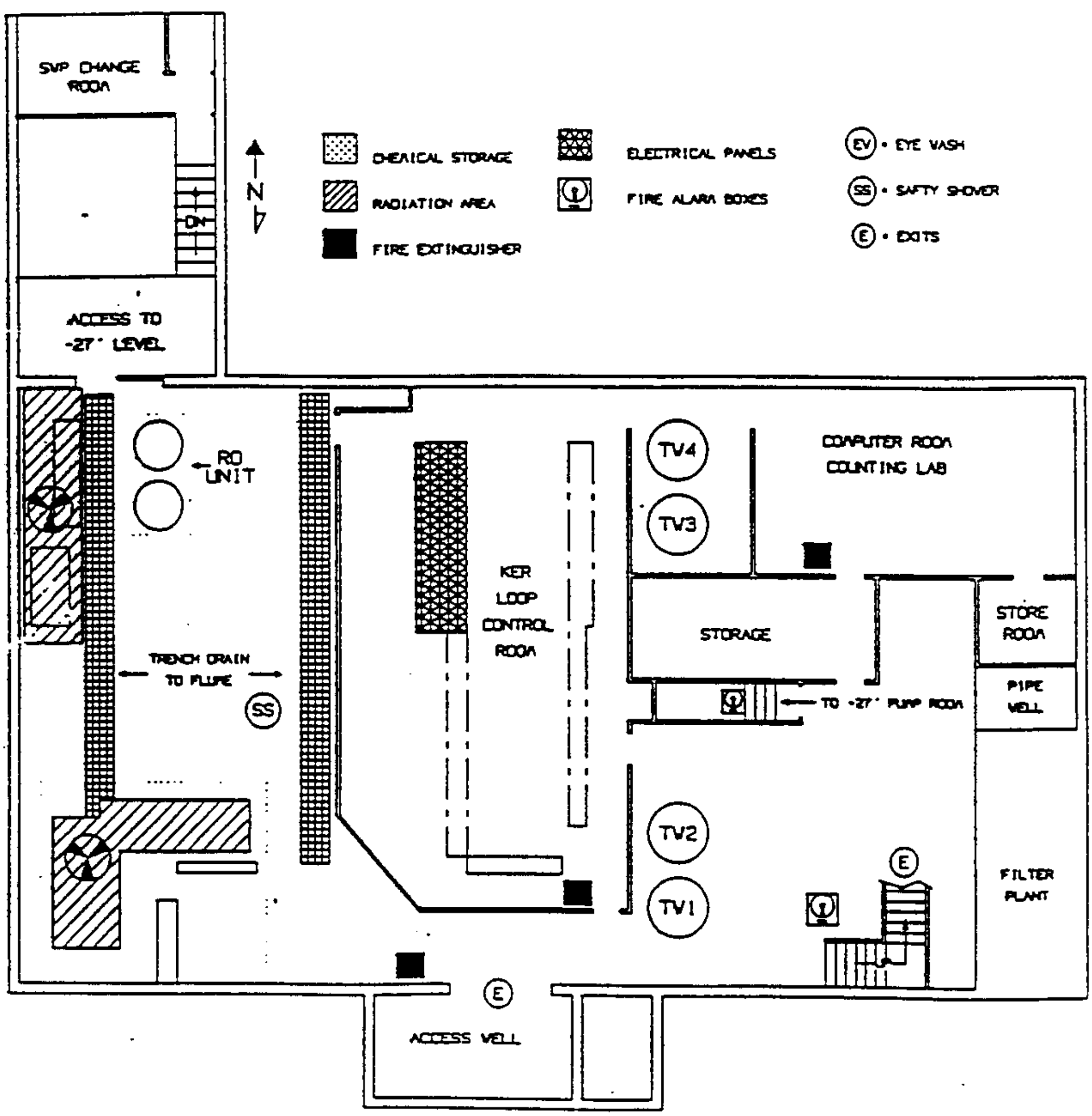
1.5.1 Building Evacuation Routes (Building Layout, and Exits (E))

1706KE Facility - 0' Level



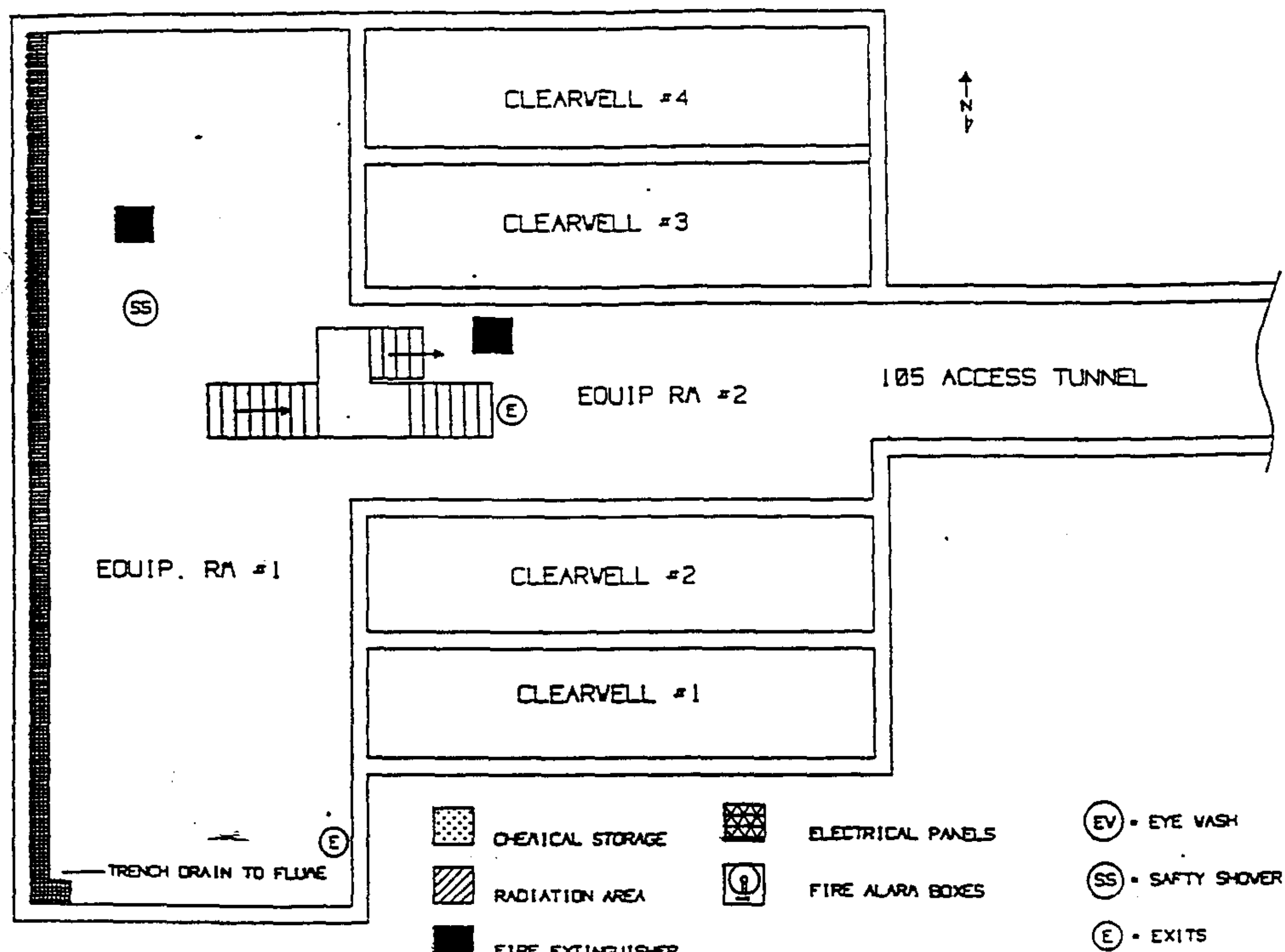
1.5.1 Building Evacuation Routes (Building Layout, and Exits (E)) (con't)

1706KE Facility - 13' Level



1.5.1 Building Evacuation Routes (Building Layout, and Exits (E)) (con't)

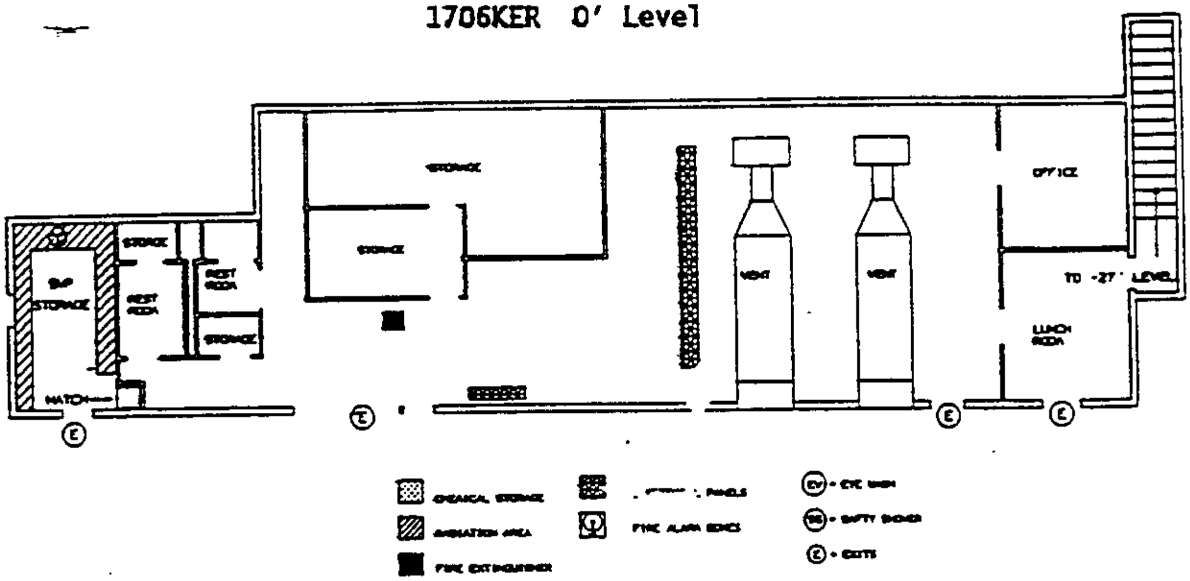
1706KE Facility -27 Level Pump Room



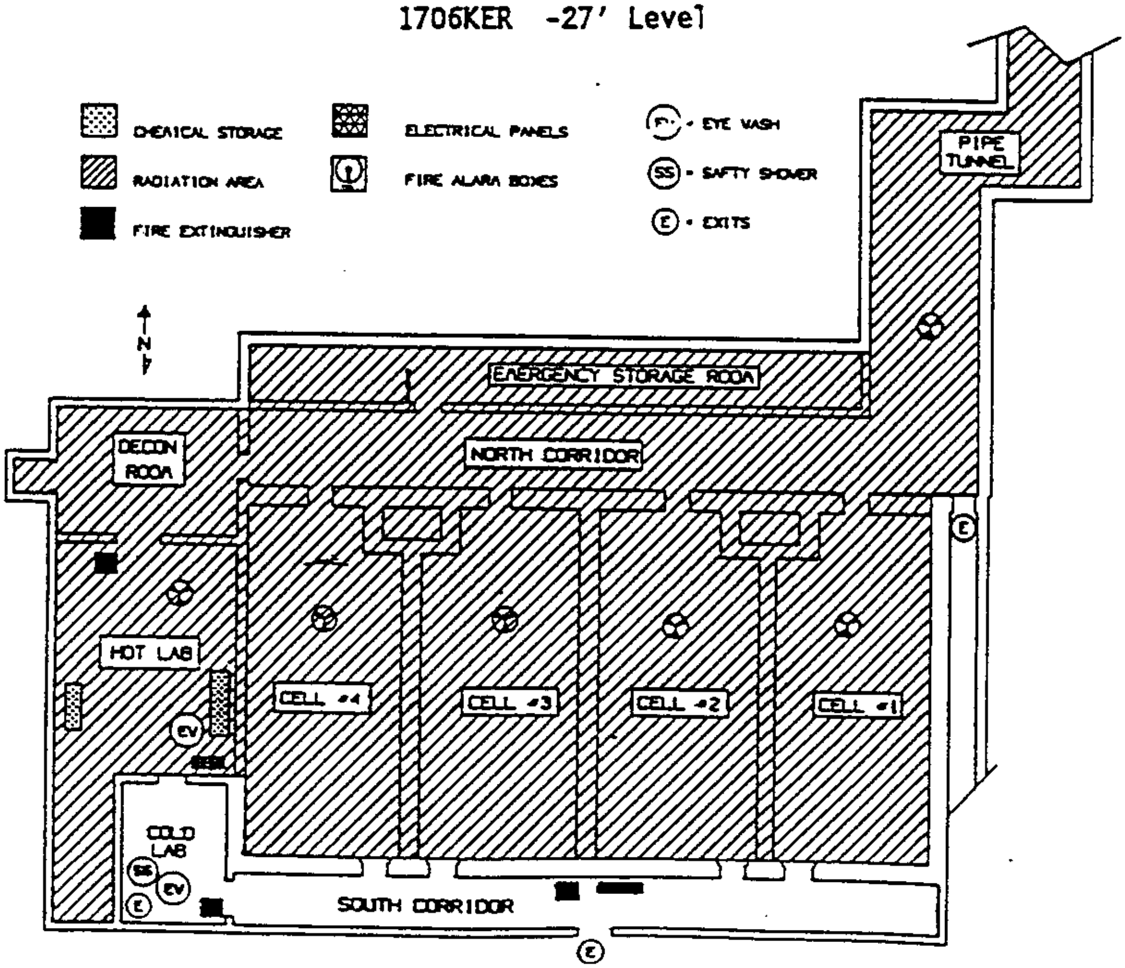
9 1 1 2 9 2 0 5 2

1.5.1 Building Evacuation Routes (Building Layout, and Exits (E) (con't)

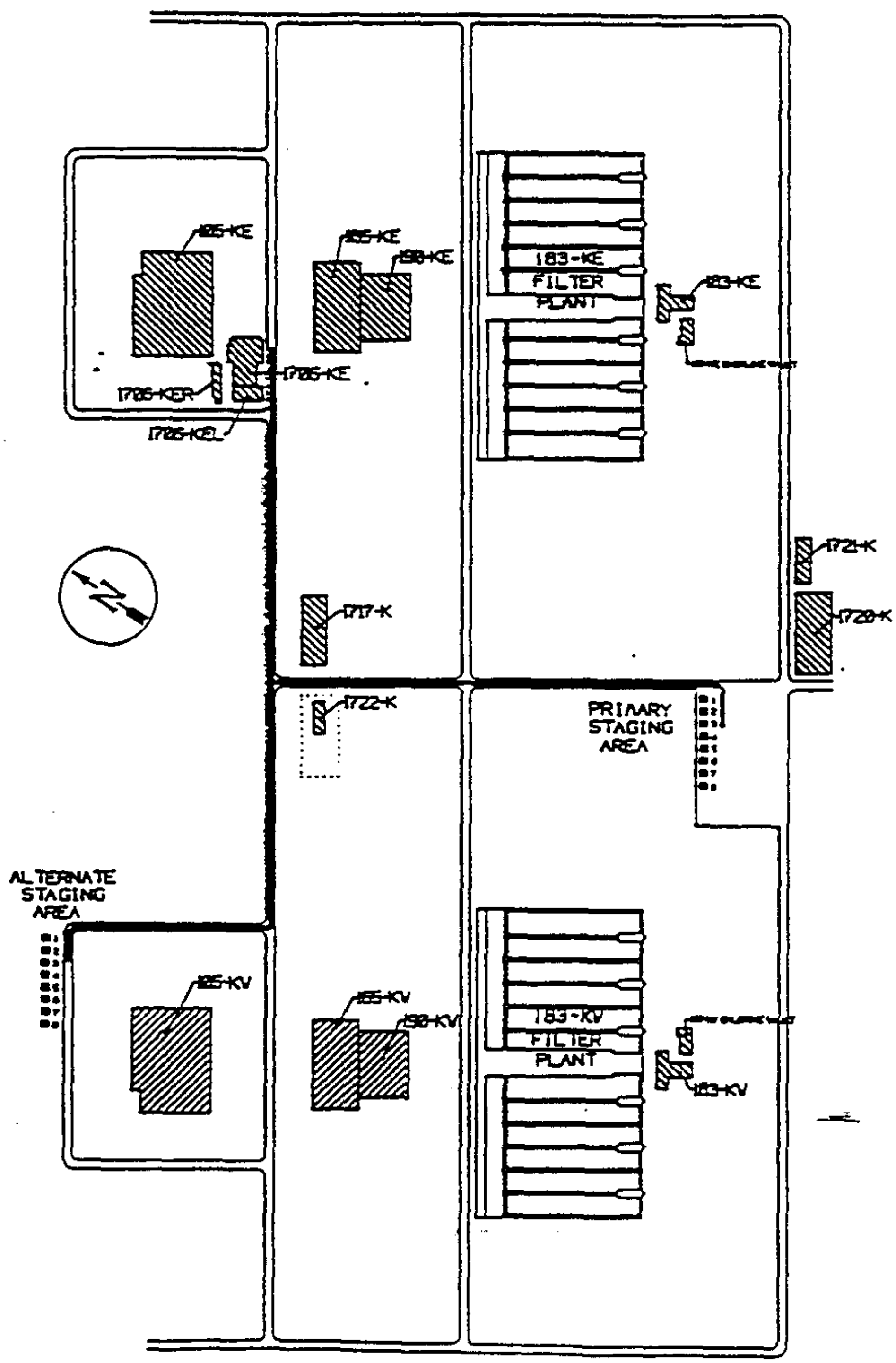
1706KER 0' Level



1706KER -27' Level



1.5.2 Building Evacuation Routes (Building to Staging Area)



9 1 1 2 9 3 2 0 5 4

2.0 PURPOSE

2.1 PURPOSE OF PLAN

The purpose of the 1706KE Building Emergency Plan is to provide employees, and visitors, information necessary to react to emergency situations in order to:

- Maximize employee safety, minimize the risk to life, and provide prompt and efficient treatment for injured persons.
- Ensure continuity of leadership at all times and in all emergency situations.
- Minimize the effects of an accident on the health and safety of the general public and the environment.
- Minimize property damage.
- Ensure prompt internal and external communications with responsible authority.

2.2 EMPLOYEE REQUIREMENTS

Each employee assigned to this facility is required to annually review this plan and document that review using the "Employee Building Emergency Plan Review Checklist" (form number 54-6000-369) as defined in WHC-CM-4-1, Emergency Plan.

3.0 POTENTIAL EMERGENCY CONDITIONS

This section provides a generalized idea of the types and amounts of hazardous materials stored and used in the 1706KE Building.

Job Safety Analysis, Radiation Work Procedures, and/or Material Safety Data Sheets provide the basis for safe use of the materials in the workplace. Each employee shall know the appropriate actions to take in case of a spill or unwanted release (where specified).

3.0.1 Assessment

After identifying the source and nature of the incident, the Building Emergency Director must assess any hazards to human health or the environment. Knowledge of these factors is vital to a practical assessment of such hazards.

- Origin of the leak, fire, or explosion (if known).
- Conditions of the source (e.g., controllable/uncontrollable leak or fire, easily moved, immovable).
- Materials involved
- Physical state of materials present (e.g., solid, liquid, or gas).
- Evidence of reaction(s) (e.g., fumes, flames, evolved gases).
- Odor and color of materials.

3.0.2 Assessment Objectives

The assessment factors gathered at the scene, in conjunction with the detailed information available about materials involved, provides enough data to assess the probability of further hazards resulting from the emergency and determine the appropriate response actions necessary.

Any emergency assessment should consider the potential for each of the following (as appropriate to the emergency conditions present).

- Spread of fire
- Explosion or further chemical reaction
- Increase in spill volume
- Generation of new compounds and their hazards
- Generation or spread of toxic, irritating, or asphyxiating gases
- Identification of exposure and/or release pathways
- Effect of exposure and appropriate safety precautions
- Contaminated run-off from spilled chemicals, response chemicals and/or fire, explosion, or reaction residues
- Impacts beyond the immediate area involved

NOTE: In cases involving soil contamination, assessment requires that sanpling be performed to determine the lateral and vertical extent of contamination. The Building Emergency Director is responsible for coordinating onsite characterization activities which will be performed by Hanford Site organizations.

3.1 EVACUATION AND TAKE COVER

Evacuation alarms at this facility may be activated for the following reasons:

- Release of hazardous material (radioactive or non-radioactive) at this or another facility impacting this facility
- Loss of utilities
- Protective response to emergencies affecting ability to inhabit the facility

Take Cover alarms at this facility may be activated for the following reasons:

- Release of hazardous material outside of a facility
- Attack by hostile factions
- Protective response to emergencies affecting the facility or personnel

3.2 OPERATIONAL EMERGENCIES

The following emergency situations are those considered credible ~~for~~ this facility, unless determined to be N/A (Not Applicable). Described are the types and extent of credible emergency events. The response plan for each type are listed in Section 6.0 of this plan.

The following sections contain a description of the "Worst Case" accident anticipated for each of the identified credible emergencies. This information is typically derived from the facility Safety Analysis Report, hazards evaluation, or risk assessment for the facility.

3.2.1 Bomb Threat

A Bomb Threat is a credible event. Actions necessary to respond to a bomb threat are covered in Section 6.0. 1706KE was not designed to withstand a bomb blast.

3.2.2 Industrial Accidents

A series of incidents with a potential for nuclear criticality accidents are not applicable to 1706KE. Noncriticality, industrial, related accidents include inadvertent chemical release, pressure release (Section 3.2.10), and broken water supply mains.

A criticality is not possible at this facility. Industrial accidents could potentially affect this facility.

3.2.3 Loss of Electricity

The hazards associated with a loss of electricity would create a potential loss of air pressure. A loss of air pressure would create a potential loss of control on the demineralizer system and a loss of ventilation through the contaminated hoods. The portal monitor detectors would not function. Thus, personal surveys would be required at the 1706KE staging area.

3.2.4 Loss of Water - N/A

3.2.5 Loss of Ventilation

The hazards associated with a loss of ventilation are potential airborne contamination and contamination spread.

3.2.6 Loss of Steam - N/A

3.2.7 Loss of Air

Loss of Air would shutdown the facility and require the evacuation of the building. The loss of air would impact the demineralizer system.

3.2.8 Fire and Explosion

There is a potential for hazardous chemical and radioactive releases. Impact of such events should be contained within facility boundaries. Such upsets should be contained within facility boundaries.

3.2.9 Major Tests Upset

There is a potential for chemical and/or low level radioactive releases. There may be electrical hazards.

3.2.10 Pressure Hazards

When operating, the TF-9 test loop, located on the 0' level, operates up to 1500 psi and 300° C. Excessive pressure and temperature may require facility evacuation. Contact the Building Emergency Director.

3.2.11 Security Event - N/A

3.3 NATURAL HAZARDS EMERGENCIES

The following emergencies are those applicable to facilities on the Hanford Site. Response plans for each are contained in section 6.0.

3.3.1 Seismic Event

The Design Basis Earthquake (DBE) for 1706KE is defined as an event producing a maximum horizontal ground acceleration of 0.25 g simultaneously with a maximum vertical ground acceleration of 0.17 g at zero period.

3.3.2 Volcanic Eruption/Ashfall

Hazards associated with a volcanic eruption/ashfall include potential interference with building ventilation and electrical systems.

3.3.3 High Winds/Tornado

The site is subject to frequent strong winds. The probability of a tornado in any year at any point within the 100 mile radius of the Hanford Meteorology Station is 6.8×10^{-6}/year.

3.3.4 Flood

The Probable Maximum Flood (PMF), as defined by the Corps of Engineers, will reach 423 feet MSL. Realistic modes of upstream dam failures or damage would produce a flood not exceeding the PMF. Therefore, a flood emergency is not applicable to 1706KE as the maximum PMF is 8 feet below the building elevation.

3.3.5 Range Fire

Not Applicable. K Area is surrounded by a gravel barrier and no sage is contained within.

3.4 HAZARDOUS MATERIALS AND MIXED WASTE SPILLS/RELEASES

This section addresses the spill and or release of non-radioactive hazardous materials, as well as mixed waste (radioactively contaminated hazardous materials). The term hazardous material as used here means both non-radioactive and mixed waste.

Hazardous materials, including corrosive materials, caustics, acids, carcinogens, and flammable materials are stored and used throughout the plant. For an itemized chemical inventory, refer to the current SARA inventory. Also refer to building personnel.

The primary areas where hazardous material is in use are: 1706KE Lab 1 and waste water pilot plant (1706KEL)

The use, storage and control of hazardous material is controlled by Plant Operating Procedures and Material Safety Data Sheets which are located in the 1706-KE building managers office, Room 4. Spills or releases may result in the following conditions:

3.4.1 Spill of Hazardous Material

Stoddard Solvent is stored in drums and is an upper respiratory/eye irritant of low toxicity. Aqueous solutions of sulfuric acid and sodium hydroxide are stored in above ground tanks and are a contact corrosive. A small quantity (1 lb) of carbon tetrachloride is used in the facility and is a human carcinogen. Small amounts of chemical salts and liquid hydrocarbons are also used or stored in the facility and would require cleanup if spilled, but would not be significant hazard. Acetic acid is used in glass jugs and is a contact corrosive.

3.4.2 Fires or Explosions Involving Hazardous Material

Glycerine and potassium permanganate which are stored in this facility can react explosively if mixed. Flammable gases (acetylene, oxygen) are stored in cylinders and could produce a fire/explosion hazard.

3.4.3 Toxic Fumes Hazards

A spill of one pound of carbon tetrachloride (a human carcinogen) would be a toxic vapor hazard to employees in the immediate area but would not be a hazard in adjacent work areas. A spill of a few pounds of organic solvents stored in this building would be an irritant level of vapors but not a toxic hazard. A spill of aqueous solutions of acids, base or salts stored at this facility would not be a fume or vapor hazard.

3.4.4 Reactive Chemical/Corrosive Material Hazards

Rupture of a tank containing large quantities of sulfuric acid or sodium hydroxide could result in a widespread contact area for hazardous corrosive material. Acids and caustic are also stored inside the facility in jug size containers. Spill of a jug could result in a single exposure to contact with a corrosive material.

3.4.5 Thermal Reactions/Hazards - N/A

3.4.6 Flammable Material/Liquids Hazards

Drums and small containers of flammable liquids (Stoddard Solvent, acetone, methyl ethyl ketone) are stored which could result in the rapid spread of fire within the facility.

3.4.7 Asbestos Release

Much of the walls and piping throughout the 1706KE building has asbestos insulation. The hazard associated with asbestos is that it is a carcinogen. If asbestos insulation is inadvertently exposed, contact the building manager so that the appropriate measures can be taken.

3.5 RADIOACTIVE MATERIALS

Radioactive materials ARE used and stored in 1706KE. The following types of emergencies are those identified as credible for this facility. Described are the credible types and extent of emergency situations, unless identified as N/A (Not Applicable). The response plan for each type of emergency is listed in Section 6.0 of this plan.

3.5.1 Gaseous Effluent Discharges (Stack Releases)

The 1706KE building has 4 hood ventilation stacks that have HEPA filters. A credible accident situation could happen through the HEPA hood ventilation system.

3.5.2 Liquid Effluent Discharges

The test loops have trace amounts of contamination. In case of failure there is a potential release of radioactive liquids. The radioactive liquids are controlled at the floor drains which are plugged. Therefore radioactive release would be contained within the facility.

3.5.3 Significant Contamination Spread/Releases

A policy of exposure control is applied at 1706KE to maintain radiation exposure to personnel, from all sources, as low as reasonably achievable (ALARA).

3.6 CRITICALITY - N/A

3.7 EXPLOSIVE MATERIALS/MUNITIONS HAZARDS - N/A

3.8 SPECIFIC HAZARDS ASSOCIATED WITH ACTIVITIES AT 1706KE

3.8.1 Demineralizer

A demineralizer plant which provides demineralized water for the use of the 1706KE Building, 105KW fuel storage basin and 105KE fuel storage basin is located on the 0' level of 1706KE. A potential exists for the unplanned release of acid and caustic materials.

3.8.2 Bulk Storage Tanks

Two bulk storage tanks containing sulfuric acid and sodium hydroxide for regeneration of the demineralizer are located on the east side of the building. These materials are extremely corrosive and any maintenance activities associated with the tanks will be coordinated with Industrial Safety and Environmental protection. The specific hazards for these tanks are beyond the scope of this plan.

3.8.3 Clearwells

Four clearwells with a capacity of 18,000 gallons each are located in the -13' level of 1706KE. Clearwells 1 & 2 are utilized for accumulation and neutralization of acid and caustic wastes produced during the regeneration of the demineralized water. The clearwells are considered confined spaces and no entry is allowed without a confined space entry permit, appropriate protective clothing, and air quality monitoring as specified by industrial safety.

3.8.4 High Temperature/Pressure Test Loops

When in operation, no personnel other than 1706KE staff are permitted in the immediate area. Contamination is present inside of the containment shields surrounding the loops and in internal piping.

3.8.5 RCRA Protocol Cleaning Procedure

All the components used for sampling and site characterization in accordance with RCRA protocol at Hanford are subjected to a special cleaning procedure in the 1706KEL portion of the building. This process includes rinses with nitric acid which is highly corrosive and hexane which is highly flammable.

See the Building Emergency Director and/or other building personnel for specific hazards associated with each test loop or pilot plant within 1706KE.

3.8.6 Waste Water Pilot Plant

The waste water pilot plant will include pilot-scale testing of various treatment technologies on Hanford waste water streams. The testing will include using acids and bases (corrosives) for pH adjustments to the waste and in ion exchange resin regeneration. Hydrogen peroxide (an oxidizer) will be used in ultraviolet oxidation testing and sodium metabisulfite (hazardous substance) will be used to neutralize the hydrogen peroxide.

4.0 DESCRIPTION OF WHEN AND HOW BUILDING EMERGENCY PLAN WILL BE IMPLEMENTED

4.1 IMPLEMENTATION

The provisions of this Emergency Plan will be implemented when the Building Emergency Director makes a determination that the severity of an incident is such that there is a potential to endanger human health or the environment. The plan will be implemented whenever there is an imminent threat of, or an actual incident as listed in section 3.0.

The Building Emergency Director is responsible for assessing facility emergency incidents, to determine the level of action necessary to protect the personnel, facility, and the environment. If the incident requires assistance from patrol, fire, or ambulance units, notification to the Patrol Operations Center requesting the assistance is made by calling the Hanford Emergency Response Number 811. When additional resources or assistance from outside the facility other than from patrol, fire, or ambulance units is required, notification is given to the Emergency Duty Officer at the Patrol Operations Center business number (373-3800). For a relatively minor incident, the situation will be handled by facility personnel under the direction of the Building Emergency Director and/or line management.

4.2 IDENTIFICATION OF HAZARDOUS MATERIALS

The Building Emergency Director should be aware of the location, types and general amounts of all hazardous or dangerous materials or wastes in the facility. If there is an emergency incident and the materials or wastes involved are unknown, they will be identified by:

- Questioning witnesses or individuals familiar with the operations or area where the incident occurred or is occurring;
- Checking the label or placard on the container or tank, if it is visible from a safe distance;

- If the wastes cannot be identified by the above methods the Hazardous Materials Response Team will be called (811). The Hazardous Material Response Team will sample the waste in accordance with sampling and testing methods specified in WAC 173-303-110 and/or SW-846 (EPA 1986), and following proper chain-of-custody procedures, the samples will be packaged and transported to an analytical laboratory for analysis and identification.

4.3 EMERGENCY DOSE LIMITS

These limits only apply in an emergency. Every effort will be made to maintain doses as low as reasonably achievable.

Circumstances of Exposure	Maximum Single Dose (Whole Body)
Recovery of Hanford Criticality Radiation Dosimeters (see WHC-CM-4-1, Emergency Plan, Section 9.3.3, for guidelines)	3 rem
Recovery of deceased victim, Prevent property loss/reduce hazard	10 rem
In special circumstances, to reduce hazard or prevent substantial property loss	25 rem
Save a life or prevent severe effects on health or safety of public	100 rem

5.0 EMERGENCY RESOURCES

5.1 BUILDING EMERGENCY ORGANIZATION

For the 1706KE Facility, the personnel listed in Attachment A are the minimum recommended emergency staff of the Building Emergency Response Organization. In an emergency which requires implementation of the provisions of this plan, the person acting as the Building Emergency Director has the authority to commit the resources required to respond, including, money, manpower, and/or equipment.

Definitions of roles and responsibilities of the Building Emergency Organization are contained in WHC-IP-4-1, Emergency Plan

Attachment A contains the list of the Building Emergency Response Organization.

5.2 IDENTIFICATION AND DESCRIPTION OF EMERGENCY EQUIPMENT

The 1706KE Facility has fixed and portable emergency equipment as summarized below.

5.2.1 Fixed Emergency Equipment

Type	Location	Capabilities
Fire Control Systems		
Heat Detection System	Throughout bldg	Alerts bldg occupants and Fire Station
Alarms		
Heat detector for fire, see Section 6.3.1		
Pull Boxes (6)	see bldg. map	

Emergency Exits

-13' level	Go through roll up door adjacent to control room and up the ladder on the south side of the building.
-27' pump room	Go up the ladder located near the building compressors to the escape hatch on the south side of the building.
-27' laboratory	Go up the ladder in the -27' cold lab to the escape hatch in the 1706-KER 0' level and exit through the nearest door.
-27' cells	Follow the corridor to the back stairway and then go corridor up to the 1706-KER 0' level and exit through the nearest door.

5.2.2 Portable Emergency Equipment

Type	Location	Capabilities
17 Fire Extinguishers	See Bldg Map	Use on any Class A, B & C fires

CO_2, dry chemical, D for metals

Fire Classification Examples

Class A	wood, cloth, paper
Class B	flammable liquids, gases, greases
Class C	energized electrical equipment
Class D	combustible metals, sodium, lithium

9 1 1 5 3 2 0 5 4

5.2.3 Protective Equipment

Type	Location
SWP Clothing	-27' change room
Filtered Masks	-27' change room
Acid suit	0' men's locker room

5.2.4 Spill Control Equipment

Spill control equipment to be used for nonradioactive hazardous materials during an emergency and/or recovery phase has been identified.

absorbent pillows	next to satellite accumulation area in KEL
absorbent wipes	throughout the building

5.2.5 Emergency Monitoring Kit - N/A

5.3 EMERGENCY NOTIFICATIONS

5.3.1 Notification to Personnel Within The Facility

Notification of facility personnel will be given immediately upon discovering any conditions which affect facility occupants, or operations.

Any person discovering such an incident should leave the immediate area if there is any danger of harm. If the incident is a fire, the nearest fire alarm should be activated. After activating the fire alarm, and for any other emergency incident, go to the nearest phone in a safe area, dial 811 or 373-3800 and provide the following information slowly and clearly:

Your name
Nature of the emergency
Exact location of the emergency

Notification of emergency incidents will be given to facility, area, or site personnel, depending on the severity of the incident, via one or more of the following emergency warning systems:

- Hanford Site Standard Emergency Signals - as summarized in Section 5.4 and more fully described in WHC-CM-4-1, Emergency Plan, Section 6.0, Subsection 6.1.1
- The Building Emergency Director will inform all occupants
- Alarm buzzer

5.3.2 Notifications to Personnel and Organizations Outside of the Facility

The Building Emergency Director, 1706KE line management, and the contractor's environmental protection organization will be responsible for making notifications of all emergency situations requiring contingency plan implementation as required by 40 CFR 264.56 and WAC 173-303-360, and DOE Order 5000.3A.

In the event of a fire or an explosion, the Building Emergency Director or the HWVP line management immediately must notify the Patrol Operations Center by telephone at 811. all emergency incident calls to the Patrol Operations Center (811) are reported to the Hanford Fire Department and the Occurrence Notification Center. In the event of an unplanned release of hazardous or dangerous waste or material, the Building Emergency Director immediately will notify the contractor's environmental protection organization who will notify DOE-RL and the Occurrence Notification Center. DOE-RL must be notified by telephone as soon as possible on the day of the event. The Building Emergency Director or the 1706KE line management much document the event on an Occurrence Report to DOE-RL within 24 hours of categorization of the event. A copy of the occurrence reports will be retained a 1706KE as part of the operating record.

The report to DOE-RL must contain the following information:

- Name and telephone number of person reporting
- Name and address of the facility
- Time of incident
- Type of incident
- Name and quantity of material(s) involved, to the extent known
- Extent of injuries, if any
- Possible hazards to human health or the environment outside the facility

5.4 EMERGENCY ALARMS AND WHEN/HOW THEY WILL BE ACTIVATED

5.4.1 Standard Emergency Alarms

SIGNAL	MEANING	ACTIONS
Steady tone or siren or building P. A. system or area power house whistle, or at Manager's request	Area evacuation radioactive or hazardous material release, bomb threat, or natural phenomena	Get car keys, if time (3-5 minutes)permits, and go to evacuation staging area
Wavering tone or siren (3-5 minutes)	Take cover, hazardous materials release, or security event where evacuation cannot be completed in a timely manner	Take cover in nearest building. Shut windows and doors. Shut off ventilation.
Howler (AH-OO-GAH)	Criticality, nuclear excursion	Run away from alarm sound and go directly to a designated staging area as identified in the Building Emergency Plan
Gong	Fire	Evacuate to staging area
Continuous ringing bell and flashing red light	Potential airborne radiological contamination	Hold your breath and place one barrier between you and alarm
Crash Alarm (200, 300, and 400 Areas), steadily ringing telephone	Emergency communications	Pick up phone and listen. Relay message to Building Warden/Building Emergency Director.
Emergency broadcast system (700 & 1100 Area facilities)	Notification of unusual event requiring protective actions	Tune radio to appropriate station and listen for instructions

5.4.2 Facility Specific Alarms and Emergency Signals

Not applicable.

* Call 3-2345 to hear a recording of the Standard Emergency Signals.

6.0 EMERGENCY RESPONSE PLANS

This section contains Emergency Response Guides that pertain to the 1706KE Facility.

6.1 RESPONSE TO BUILDING EVACUATION AND TAKE COVER ALARMS

This section identifies the proper response to Evacuation and Take Cover alarms within this facility.

6.1.1 EVACUATION - Steady Siren Response

When an Evacuation Siren sounds (STEADY SIREN) employees shall proceed to the Primary or Alternate Staging Area as identified below. The Building Emergency Director will announce to which Staging Area to evacuate.

Area	Location	Lane
PRIMARY STAGING AREA	Parking Lot	Lane 3
ALTERNATE STAGING AREA	River Gate	Lane 3

6.1.2 TAKE COVER - Wailing Siren Response by Phone

When notified of a "Take Cover" by the Building Emergency Director, building occupants should take cover in the nearest building (1706KE).

6.2 BOMB THREAT RESPONSE GUIDES

A Bomb Search Kit containing some or all of the following items is maintained by the Hanford Patrol.

- Flashlights
- Bump hats, and gloves
- Set of maps
- Marking pens (for marking up search plans on maps)
- Mirrors and extension handles
- Crescent wrenches (for mirror adjustments)
- Thread or string (for marking paths to objects for investigation)
- Green tape (for repairs, holding string, etc.)
- Masking tape (for taping off areas searched)

6.2.1 Receivers of Telephoned Threats

An employee receiving a direct telephone threat should respond as follows:

1. Using a copy of the Bomb Threat Checklist (form no. BD-9100-201R), obtain as much information as possible about the threat, caller, background noise etc.

2. Initiate evacuation of the facility

3. Notify the Building Emergency Director

4. Notify the Patrol Operations Center at termination of call.

6.2.2 Receivers of Written Threats

Receivers of written threats should respond as described below:

1. Handle the letter as little as possible to preserve fingerprints and avoid smudging.

2. Immediately notify the Patrol Operations Center (811) and the Building Emergency Director.

3. Record all details of the receipt; i.e., where found, how delivered, when found, etc.

4. Tell no one else.

5. Release the letter only to Security personnel or to a person authorized by Security.

6.2.3 Discoverer of a Bomb or Suspicious Object

Discoverers of a Bomb or suspicious object should respond as described below:

1. Clear the immediate area of personnel. Do not transmit on a radio near the suspected object.

2. Immediately notify the Patrol Operations Center (811) and the Building Emergency Director.

3. Stand guard in a sheltered location and at maximum possible distance to assure that no one enters the area.

6.3 OPERATIONAL EMERGENCY RESPONSE PLAN

The following sections contain response plans for each type of emergency condition or hazard identified in section 3.0.

6.3.1 Utility Disconnect Plan For 1706KE

The purpose of this plan is to provide the steps necessary to place the utilities in a safe and secure condition when an emergency has been declared, or at the direction of the Building Emergency Director.

1. Heating, Ventilation, and Air Conditioning (HVAC)

Shutdown each of the HVAC systems by placing the breaker on the MCC panel in the OFF position. This is located at the -13' level Control Room. (see building map)

2. Electrical

The main power disconnect for 1706KEL (Waste Water Pilot Plant) is located in 165KE and 1706KEL on the West Wall (see building map). The main power disconnect for 1706KE is located at the -13' level, in the Control Room for the "A" & "B" Bus Electrical Power.

3. Fire Sprinkler System

Not Applicable. There are heat detectors in 1706KE. Activate a fire alarm (pull box) if the fire protection system has not sounded. Dial 811 to report the fire. Do not hang up until instructed to do so.

4. Sanitary Water/Sewer

The sanitary water shut off to 1706KE is located right outside the facility. Notify the appropriate maintenance personnel for repair.

5. Process Water

To place the appropriate valves in the OFF position, see the Building Emergency Director.

6. Steam - N/A

7. Telephone Service

Only GTE can disconnect this service
Call GTE at 6-6322 or 6-1611 and state your request.

6.3.2 Industrial

Assess the situation and notify the Building Emergency Director, if appropriate, evacuate the building. Shut off supply water and/or electrical. Dial 811.

6.3.3 Loss of Electricity

If the electricity is lost, the contaminated hood ventilation is lost. Thus, there is potential for loss of control in the building ventilation system. Evacuate the building and notify Health Physics (105KE) to perform an exit and building survey to determine if there is any loss of contamination control. A Building Survey by Health Physics is required for building reentry.

6.3.4 Loss of Water - N/A

6.3.5 Loss of Ventilation

Same as Loss of Electricity. See section 6.3.3.

6.3.6 Loss of Steam - N/A

6.3.7 Loss of Air

Loss of air could create a diminished demineralized water supply.

6.3.8 Fire

Fire fighting in the 1706KE facility is complicated by the presence of radioactive material which may cause contamination. The avoidance of breaching containment of the building is extremely important.

The following actions are the responsibility of the Building Emergency Director, or alternate, and should by taken in the event a fire is detected or an explosion occurs at 1706KE:

- Personnel discovering the fire shall pull the nearest alarm box and notify the Building Emergency Director.
- Call 811 and request Fire Department support.
- Confer with Health Physics and Nuclear Facility Safety for contamination controls and area postings.
- Assign a person to meet the Fire Department and direct the Fire Department to the location of the alarm or fire.
- Proceed to the scene of the incident and make an assessment of the situation, request assistance if necessary.

6.3.8 Fire (con't)

- Facility occupants respond to the fire alarm, standby for further instructions;
- The Fire Department/Hazardous Material Response Team will proceed to the scene of the incident and, coordinating with the Building Emergency Director, initiate actions to control the incident.
- Establish an Incident Command Post in a safe location and request additional assistance as necessary;
- Remove injured personnel to a safe area, provide immediate first aid and prepare for transport to a full service medical facility for medical treatment;
- Establish roadblocks to prevent unauthorized personnel from entering as necessary;
- After the fire has been controlled and extinguished or the cause of the explosion has been eliminated and there is no longer an imminent threat to human health, the Building Emergency Director will announce an "all clear" signal;
- Isolate any hazardous materials and stabilize until they can be removed in a non-emergency mode and properly treated or disposed;
- Clean and repair emergency equipment and return to a condition fit for reuse;
- Replace all expendable supplies.

6.3.9 Major Test Disruption - N/A

6.3.10 Pressure Hazards Emergency Response

The E&ED (Engineering and Environmental Demonstration Laboratory) has several high temperature/high pressure test loops. Pressure hazards exist only if any of the test loops are in operation. See the responsible building personnel to shutdown and depressurize this loop.

6.4 NATURAL HAZARDS RESPONSE PLAN

6.4.1 Volcanic Eruption/Ash Fall

Volcanic eruptions and ash fallout from the Cascade Range are a possibility. Notification to the facility in the event that ash fallout is imminent would be through the telephone. The following actions should be taken upon notification that an ash plume is headed for the Hanford Reservation.

- The Building Emergency Director should contact the Northern Area Emergency Control Center to obtain meteorology data and to determine estimated time of arrival of the ash plume.
- Decide whether to evacuate or initiate take cover emergency response. If the decision is made to evacuate, follow the "Evacuation" response in Section 6.1.
- If the Take Cover response is required, follow the "Take Cover" response in Section 6.2.
- Protect supply air inlets and reduce ventilation flows as appropriate.
- Determine the need for shutting down some or all of the process. Notify appropriate personnel to begin shutdown activities.
- Maintain communication with the Emergency Duty Officer or the Emergency Control Center to discuss building condition and changing fallout conditions.

6.4.2 Seismic Event Response

The WHC Emergency Organizations' primary role in a Seismic Event is to coordinate the initial response to injuries, fires or fire hazards, and to take measures to contain or control radioactive and/or toxic material releases that may have an adverse impact.

1. Seismic Event Response <u>During the Event</u>

Each Building Emergency Organization must be ready to respond following a seismic event affecting the Hanford Site and WHC Facilities, personnel and property. The following guidelines identify the responses necessary to respond to a seismic event at this facility.

- Promptly assess post-earthquake emergency needs
- Take necessary actions to protect building personnel and onsite and offsite personnel
- Report needs to 811 or Emergency Control Center

1. Seismic Event Response <u>During the Event</u> (con't)

- Search for injured or trapped employees
- Conduct accountability
- Render first aid
- Search for fires and other hazards
- Fight fires
- Turn off water, gas, and electricity
- Perform facility inspection
- Consider shutdown of operating systems
- Arrange for rescue of personnel.
- Form a recovery plan
- Perform cleanup

2. Seismic Event <u>Employee Response</u> During the Event

During the earthquake, building personnel should perform the following actions:

- If indoors, remain calm.
- Respond to all emergency signals.
- Seek shelter
- If outside, avoid objects which could fall or release hazardous material

3. Seismic Event Response <u>Following the Event</u>

After the earthquake:

- Follow instructions of the Building Emergency Director
- Check fellow workers for injuries and administer first aid
- Call 811 for emergency assistance and notify Plant management
- Do not use matches or lighters
- Do not touch downed power lines or objects touched by downed wires
- Do not use the telephone except for emergency communications
- Establish damage assessment teams for the local area and areas beyond the facility background.
- Determine if release of inventories of hazardous material (both radioactive and nonradioactive) is occurring or likely to occur
- Determine current local meteorology
- Warn adjacent facilities of event using: telephone, runners, and/or Hanford Patrol rover vehicles.
- Initiate road closures (Highway 240, and/or onsite roadways) to reduce potential exposures
- Provide resources and personnel assistance to other affected personnel and facilities

6.4.3 High Winds/Tornado

If appropriate, take cover at the -13' or -27' levels.

6.4.4 Flood

Remain at or above the 0 foot level. The closest flood would be 8' below 105KE.

6.4.5 Range Fire - N/A

6.5 HAZARDOUS MATERIALS/MIXED WASTE RESPONSE PLAN

Discovery and notification of a nonradioactive hazardous material or mixed waste spill may be made by anyone. Emergency equipment may be used by individuals discovering a spill providing, however, that the individual has been properly trained in the use of the spill equipment and uses proper respiratory and personnel protective equipment.

6.5.1 Spill Response Plan

The following responses should be taken in response to a spill of hazardous material. The Building Emergency Director has overall responsibility to ensure proper response to emergency situations.

- Assess the severity of the situation.
- If the accidental spill and/or container leakage release can be controlled safely and promptly, do so with absorbent pillows and/or absorbent wipes.
- Notify the Building Emergency Director (See Attachment A)
- The Building Emergency Director will assess the situation and determine the type and quantity of material(s) released and the hazards involved.
- Activate the appropriate emergency alarms, if necessary, and notify personnel in the immediate area of the incident via the BED;
- Respond to the emergency alarm and standby for further instructions from the BED;
- If response is within the capabilities of the emergency response organization, actions appropriate for the waste or material involved shall be initiated to contain and control the release.
- If beyond the capabilities of the Building Emergency Response organization, the Building Emergency Director will notify the Hazardous Materials Response Team at 373-2301 or 373-1301; or Patrol Operations Center at 811 to request additional assistance;

6.5.1 Spill Response Plan

- Direct facility personnel to take those actions which can be safely performed to control or contain the release prior to arrival of requested assistance;

- If for any reason personal safety is at risk, immediately call the Hazardous Materials Response Teamfirst and leave the building via the nearest exit. Then contact those listed individuals and apprise them of the situation. Remain at the site until an assessment and disposition of the spill can be accomplished.

- Direct an individual to meet the Emergency Responders from outside the and direct them to the event scene.

- Hanford Fire will proceed immediately to the scene of the incident and, coordinating with the Building Emergency Director, initiate actions to control the incident;

- Establish an incident command post in a safe location and request additional assistance as necessary;

- Rescue personnel, provide immediate first aid and prepare for transport to a full service medical facility;

- Establish roadblocks or other traffic control measures to prevent unauthorized personnel from entering the area;

- After the release has been contained and controlled and there is no longer an imminent threat to human health, announce an "all clear" signal;

- Residual hazardous materials will be isolated and stabilized by covering or other appropriate means until they can be removed in a non-emergency mode and properly treated or disposed;

- Emergency equipment used in the response to the incident will be cleaned and returned to a condition fit for reuse after the cleanup is completed and all expendable supplies used will be replaced.

- All rags, absorbent pillows, absorbent wipes must be disposed of in approved containers and treated as hazardous waste. Avoid inhalation of fumes and smoke.

- In case of fire immediately call 811. Use available fire equipment and or evacuate the building via nearest exits and congregate at the south east corner of the building site or upwind of any smoke or fumes until released by responsible individuals from the site.

6.5.2 Fire and Explosion Associated with Hazardous Materials

Explosions may be the cause or result of a fire or may be totally disassociated. For this plan, fire and explosion are treated simultaneously. Special chemical hazards are addressed in the "Pre-Fire Plans" of the Fire Department which is located in the 1706KE Office exit

1. Discoverer of Fire

   - Avoid inhaling smoke, fumes, or vapors even if no hazardous waste is involved.
   - Pull the nearest fire alarm pull box and call 811
   - Notify the Building Emergency Director or Operations Shift Office. Provide as much information as possible without personal risk.
   - Move and keep people away from fire scene.
   - The Building Emergency Director will identify the character, exact source, amount and extent of any released materials. Request support from Process Engineering for this effort.
   - If the emergency involves a hazardous waste storage area, contact the 100 Areas Hazardous Waste Coordinator (373-1006), to identify the materials involved.
   - Contact the Patrol Operations Center at 811 or 3-3800 and provide as much information as possible. Request additional assistance as required.

2. Building Emergency Director Actions To A Fire

   - Evacuate all of the facility. Ensure that the staging area remains safe.
   - Consider requesting Patrol to evacuate personnel along adjacent streets and roadways.
   - Ensure that the Hanford Fire Department Hazardous Material Response Team has been notified.
   - Relay pertinent information, including telephone number and proposed location of the Technical Support Center.
   - Establish a command post, in a safe location.

6.5.3 Toxic Fume Release

Discovery of a nonradioactive hazardous material toxic fume release may be made by anyone. Rapid communication is a vital part of warning personnel and notifying appropriate response personnel.

1. Discoverer Of A Toxic Fume Release

The person discovering the toxic fumes shall take the following immediate actions:

- ASSUME A FUME RELEASE IS TOXIC UNLESS IT IS ABSOLUTELY KNOWN TO BE HARMLESS.
- Avoid inhaling smoke, fumes, or vapors even if no hazardous waste is involved.
- Do not assume that gasses or vapors are harmless because of lack of smell.
- Contact the Building Emergency Director or Operations Shift office immediately. Provide as much information as possible without personal risk.
- Keep people away from the area of the release.

2. **Building Emergency Director Response To A Toxic Fume Release**

The Building Emergency Director must immediately take the following actions:

- Identify the character, exact source, amount, and extent of any released materials.
- Refer to the Material Safety Data Sheets for information concerning what type of respiratory and personnel protective equipment should be used to isolate the spill area and/or stop the leak.
- If the emergency involves a hazardous waste storage area, contact the Plant Hazardous Waste Coordinator to identify the materials involved.
- If assistance is required, notify the Patrol Operations Center at 811, or 3-3800, and request that the Fire Department Hazardous Material Response Team be dispatched. Provide as much information as possible.
- Assign a representative to meet and direct the HAZMAT Team to the area of the spill.

2. Building Emergency Directors Response for a Toxic Fume Release (continued)

- Assess possible hazards to human health and the environment (considering direct, indirect, immediate and long-term effects) that may result from the spill.
- Contact PNL Meteorology Weather Station on 3-2716 to determine the wind speed, direction and plume stability.
- Take all reasonable measures necessary to ensure that fires, explosions, and releases do not occur, recur, or spread to other dangerous waste at the facility.
- Where applicable, stop processes and operations, collect and contain waste releases, and remove or isolate containers.
- Evaluate the need to evacuate part or all of the facility. Take into account the location of spill and ensure the safety of the evacuation staging area.
- Consider shutdown of the intake air supply system, and/or retain personnel inside the building.

6.5.4 Reactive Corrosive Chemical Hazard

The same as Section 6.5.1, Spill Response Plan. Contain and clean up the spill, if possible.

6.5.5 Thermal Reaction

Add copious amounts of water and contain the release or use the appropriate fire extinguisher (D) in the case of a metal fire. Clean up and/or evacuate as appropriate.

6.5.6 Flammable Liquids/Materials

If the spill is small, contain and clean up. If the spill is large, evacuate immediately. Extinguish open flames immediately. If near electrical equipment, evacuate immediately.

6.5.7 Asbestos Release

Asbestos containing materials are normally well encapsulated so that the asbestos fibers do not become airborne. An asbestos hazard emergency condition arises when a large portion of the encapsulation is damaged and the asbestos containing material is physically dispersed in the area. Much of the piping throughout the 1706KE building has asbestos insulation. The following actions should be taken should the insulation be damaged.

- Evacuate all personnel from the affected area.
- Contact the building manager (BED).
- Isolate and post the area.
- Contact Industrial Safety and Fire Protection to determine remedial action.
- Contact the Building Emergency Director and provide information
- At the direction of Industrial Safety and Fire Protection and a trained asbestos worker supervisor identify a recovery/cleanup plan.

6.6 RADIOACTIVE MATERIALS RESPONSE PLAN

6.6.1 Radioactive Gaseous Effluent Discharge - 4 Stacks

All potentially contaminated gaseous effluent discharges are periodically sampled to determine radioactivity. The hood ventilation stacks for 1706KE are operable. If radioactivity is found in the sample, shutdown and isolate the system.

6.6.2 Radioactive Liquid Effluent Discharge

Control the spill and clean up.

6.6.3 Significant Contamination Spread

Typically the contamination spread will be indicated by a Continuous Air Monitor (CAM) with an alarm. Personnel shall respond to a continuous air monitor alarm by carrying out the following activities:

- Hold your breath
- Move one barrier away from the alarm to safety
- Contact Health Physics and stand by for survey and contamination status
- If the room is found to be contaminated, Health Physics will place the room on airborne contamination status
- Notify immediate manager and Building Emergency Director.

6.7 CRITICALITY RESPONSE PLAN - N/A

6.8 EXPLOSIVE MATERIALS/MUNITIONS HAZARDS RESPONSE PLAN - N/A

6.9 PREVENTION OF RECURRENCE OR SPREAD OF FIRES, EXPLOSIONS, OR RELEASES

To try to ensure that fires, explosions, or releases do not occur, reoccur, or spread, plant/facility operations have been reviewed to identify potential hazards and Plant Operating Procedures have been developed to minimize the occurrence of unplanned incidents. Safety systems such as automatic process shutdown controls, spill containment structures, and contaminated waste stream diversion systems have been installed to assure that if an emergency event occurs the affected areas will be kept to a minimum.

Should an emergency incident occur, upon completion of the emergency response to that incident, the Building Emergency Director is responsible for analyzing the events that lead to the incident and for conducting a critique, including cause(s), impacts, and lessons learned from the incident. The requirements of DOE Order 5484.1 must be followed to ensure that all appropriate parties are aware of, and participate in decisions on the best course(s) of action to take to prevent or minimize the possibility of future occurrences.

Specific steps that may be taken for a particular incident could include:

- Isolating the site of the initial incident by shutting off power, closing off ventilation systems, etc. to minimize the spread of a release and/or the potential for a fire or explosion;
- Inspecting containment structures for cracks or leaks;
- Removing released material and waste remaining inside of containment structures as soon as possible;
- Containing and isolating residual waste material using dikes and absorbents;
- Covering or otherwise stabilizing areas where residual released materials remain to prevent migration or spread from wind or precipitation runoff;
- Installation of new facilities, systems, or equipment to enable better management of hazardous or dangerous wastes or materials.
- Smoking is not permitted anywhere within the 1706-KE facility.

7.0 TERMINATION OF EMERGENCY

Normally, it is a function of the Building Emergency Director to declare the termination of an emergency. However, once the Emergency Organization is activated, only the Area Emergency Director or the WHC Emergency Director shall declare that an emergency has ended. If the DOE RL-EACT is activated, only the RL Director shall officially terminate the emergency. In all cases, however, the Building Emergency Director must be consulted before reentry is initiated.

8.0 ACCIDENT RECOVERY

The recovery phase of the accident is not handled under emergency criteria, but rather according to a recovery plan developed for the specific event. Thus, the facility manager will create an emergency organization encompassing all required aspects of engineering, operations, maintenance, and functional support, with direction provided by the Hazardous Waste Unit and the Industrial Hygiene and Safety Department. This will include making proper notifications to official agencies (i.e., U.S. Department of Energy, U.S. Environmental Protection Agency or Washington State Department of Ecology). Recapture (where possible), store, and dispose of any material that is released, and store and dispose of any contaminated soil or surface water, or any other material that results from a spill, toxic fume generation, fire or explosion.

No waste that may be incompatible with the released material will be treated, stored, or disposed of until cleanup is completed.

All emergency equipment will be cleaned and fit for its intended use immediately following an emergency.

9.0 POST EVENT ANALYSIS AND REPORTING REQUIREMENTS

Damage assessments should be made at the conclusion of the emergency phase and the results of these assessments must be communicated to the Emergency Control Centers. The Building Emergency Director should designate a recovery manager who will determine necessary steps to return the facility to an operational status. The following items should be considered.

- Building Structures (walls, ceilings, systems, etc.)
- Utilities - Electricity, Water, and Telephone
- Hazardous Materials/Processes
  - Radioactive Systems or Equipment
  - Chemical System
  - Toxic
  - Reactive
  - Corrosive
  - Explosive
  - Pressure Systems
  - Pressure Vessels
  - Compressed gas lines - air
  - Cryogenic
- Waste Systems
  - Process sewer line
  - Process water line
  - Sanitary water line
- Heating Ventilation and Air Conditioning
- Safety Eyewash/safety shower
- Sirens & Alarms
  - Fire Alarm
  - Hanford Standard Emergency Alarms

ATTACHMENT A

BUILDING EMERGENCY RESPONSE ORGANIZATION LISTING

A.1 K Area Emergency Director

	Name	Location	Phone
Primary:	Fuel & K/D Operations Manager	1720K	3-1608

A.2 Building Wardens

	Name	Location	Phone
Primary:	Environmental Demo. Lab. Tech.	1706KE	3-1589
Alternate:	Environmental Demo. Lab. Mgr.	1706KE	3-4972

A.3 Staging Area Managers

	Name	Location	Phone
Primary:	Outer Facilities Maint. Secretary	1720K	3-3778
Alternate:	Nuclear Mat. Control Specialist	1720K	3-1681

A.4 Evacuation Bus Drivers

	Name	Location	Phone
Primary:	Driver	165KE	3-3811
Alternate:	Open	1717K	3-3666

ATTACHMENT B

RCRA REGULATED UNIT CONTINGENCY PLAN

B.1 INTRODUCTION

This attachment is supplemental to the 1706KE Building Emergency Plan and provides specific information and response plans for the 100N Area RCRA Regulated Unit. Due to the nature of this regulated unit, special plans identified here are required for response to emergencies at this location.

B.1.1 Facilities (Satellite Accumulation Areas) Covered by this Plan

1706KEL Satellite Accumulation Area (3 pages)

B.1.2 Location of the Facilities

Located in the 1706KE Laboratory 1 near the entrance on the wall adjacent to the change room.

B.1.3 Description of Facilities and Operations

This Accumulation Area accumulates inorganic, nonorganic and mixed wastes.

B.2 PURPOSE OF THE PLAN

The purpose of the plan is to respond to upset conditions or emergencies at each individual satellite accumulation area.

B.3 DESCRIPTION OF POTENTIAL EMERGENCIES

Potential emergencies include fire, explosion, leaks, or spill to the environment.

B.4 DESCRIPTION OF WHEN THE PLAN WILL BE IMPLEMENTED

The plan would be implemented when any abnormality would occur.

B.5 EMERGENCY RESPONSE PLAN - ONE CONTINGENCY PLAN

CONTINGENCY PLAN

100 Area K Facilities

REFERENCES:WHC-CM-7-5

PREPARED BY:____________________

MGR. OF PREPARER:____________________

REVIEWED BY:____________________

ENVIRONMENTAL PROTECTION

ENGINEER

APPROVED BY:____________________

MANAGER OF ENVIRONMENTAL

PROTECTION

INTRODUCTION

Although each individual must assume responsibility for reporting a spill to the appropriate departments, it is not the Operations personnels responsibilities to make determinations on what response is necessary in the case of an accidental spill; there are personnel available on site to assist in determining the appropriate response. However, there are some basic steps that each individual is responsible to take once he or she has identified a spill.

IF YOU HAVE IDENTIFIED OR CAUSED AN ACCIDENTAL SPILL...

Remember to first assure your own safety and the safety of others by whatever means are necessary. This may include roping the area off depending on the nature of the spill.

Contact one of the individuals listed on the next page. They will assume the responsibility of making any further contacts including Environmental Protection personnel.

If you are unable to reach your immediate supervisor, phone the Manager's at 3-3779 or 3-1448. The manager will assume the responsibility for making any further contacts. However, you may be asked to assist in notification or corrective actions.

As the individual identifying a spill it is important to gather as much information about the spill as possible without endangering yourself or others. Important information to compile is as follows:

1. The product that was spilled.

2. The approximate amount of that product that was spilled.

3. The exact location of the spill.

4. The time of the spill. (if known)

5. The MSDS No. for the product that was spilled. (can be obtained from the Manager's office)

When reporting the spill it will be helpful to have this information readily available to provide to your primary contact in addition to your name and a phone number at which you can be reached.

CLEANUP OF A SPILL

The proper method for cleanup of a spill shall be developed on a case by case basis. The Environmental Protection department will review each plan for spill cleanup and approve or disapprove the method described.

The operations personnel will develop the plan for spill cleanup. The information to provide to the Environmental Protection department shall include the 5 items listed on the previous page in addition to a detailed procedure for spill cleanup.

Emergency spill response equipment is identified in the WHC-IP-0263-100N Guide N (Hazardous Chemical or Radioactive Releases) which is attached to this contingency plan. Other means of equipment which may not be identified are available through the Manager.

EMERGENCY CONTACTS: ~~KEN SHOLLENBERGER~~ Bob Riggers

YOUR IMMEDIATE SUPERVISOR

MANAGER'S: JOHN KARNS 3-3779 OR VERN RICE 3-1448

MANAGER ENVIRONMENTAL PROTECTION 3-4949

MANAGER INDUSTRIAL SAFETY 3-1590

PATROL OPERATIONS CENTER POC-811

EMERGENCY DUTY OFFICER 3-3800

ATTACHMENT C

WASTE WATER PILOT PLANT CONTINGENCY PLAN

C.1 INTRODUCTION

Due to the nature of the work at the waste water pilot plant, additional requirements are identified in this attachment that augment the 1706KE Building Emergency Plan.

C.1.1 Facilities Covered by This Plan

Waste water pilot plant

C.1.2 Location of the Facility

Located in the 1706KEL Laboratory as shown on Figure 1.5.1 of the 1706KE Building Emergency Plan

C.1.3 Description of Facilities and Operations

The waste water pilot plant will perform pilot-scale testing on various effluent streams, some of which will be designated as dangerous or mixed waste.

C.2 PURPOSE OF THE PLAN

The purpose of this plan is to provide supplemental emergency response information specific to waste water pilot plant emergency conditions.

C.3 DESCRIPTION OF POTENTIAL EMERGENCIES

Potential emergencies include leaks or spills and fire and explosion.

C.4 DESCRIPTION OF WHEN THE PLAN WILL BE IMPLEMENTED

This plan will be implemented when a leak or spill of hazardous mareial, fire, or explosion would occur. After modification of the waste water pilot plant testing area is complete, this plan will be reviewed and revised as necessary.

C.5 EMERGENCY RESPONSE PLAN

The emergency response plan consists of the 1706KE Building Emergency Plan and the supplemental information contained in this attachment.

WASTE WATER PILOT PLANT
SUPPLEMENT TO THE EMERGENCY RESPONSE PLANS

INTRODUCTION

The waste water pilot plant testing activities will include pilot-scale testing of different types of treatment equipment on a variety of waste water streams. The waste water pilot plant will consist of waste storage tanks and different types of test equipment such as ultraviolet oxidation equipment and ion exchange columns. The test equipment will be provided with secondary containment, where required. The test equipment will be connected together by piping.

The 1706KE Building Emergency Plan includes a description of the following:

- 1706KE Building layout and exits
- Staging areas
- Potential emergency conditions
- Implementation of the building emergency plan
- Internal and external notifications
- Emergency alarms
- Safety equipment
- Prevention of recurrence or spread of fires, explosions, or releases
- Termination of emergency conditions
- Accident recovery
- Post event analysis and reporting requirements.

Also included are emergency response plans for specific emergencies at the 1706KE Building. The emergency response plans include the following:

- Response to building evacuation and take cover alarms
- Response to bomb threats
- Operational emergency response plan
- Natural hazards response plan
- Hazardous materials/mixed waste response plan
- Criticality, explosive materials/munitions hazards.

The 1706KE Building Emergency Plan will be followed during testing at the waste water pilot plant. In addition, the following emergency reponse steps specific to the waste water pilot plant will be included in the emergency response plans as described in the following sections.

ADDITIONAL STEPS FOR ALL EMERGENCY RESPONSES

For the waste water pilot plant activities, the following emergency response steps be added to all emergency response plans.

- At the beginning of any emergency condition terminate all testing activities.
- If emergency conditions allow, stop the flow of waste through the pilot plant by turning off all waste pumps and/or waste control valves from the storage tanks.
- The electrical switches are located near the each waste pump or the power can be shut off at the 1706KE electrical panel, located on the east wall of the pilot plant room (See Figure 1.5.1).
- Follow the steps indicated in the 1706KE Building Emergency Plan, Section 6.0, 'Emergency Response Plans' for the specific emergency condition.

ADDITIONAL STEPS FOR SPILL RESPONSE PLAN

For leaks or spills at the waste water pilot plant, the following emergency response steps will be added.

- At the detection of a leak or spill terminate all testing activities.
- If emergency conditions allow, stop the flow of waste through the pilot plant by turning off all waste pumps and/or waste control valves from the storage tanks.
- The electrical switches are located near the each waste pump or the waste water pilot plant power can be shut off at the 1706KE electrical panel, located on the east wall of the pilot plant room (See Figure 1.5.1).
- If the leak is NOT contained in the secondary containment, follow the steps indicated in the 1706KE Building Emergency Plan, Section 6.5.1, 'Spill Response Plan' for the specific emergency condition.
- If the leak is contained by secondary containment equipment:
  - Terminate the testing until a plan to remove the waste and bring the equipment back into service is implemented
  - Dispose of all rags, wipes and other clean up materials in approved containers and treated as hazardous waste
  - An assessment of the accident should be made to prevent a recurrence of the event.

THIS PAGE INTENTIONALLY
LEFT BLANK