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

DATE: January 8, 1993

TO: Dan Duncan - EPA
Cathy Massimino - EPA

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

cc: R. C. Bowman w/o att
[redacted] w/o att

SUBJECT: RD&D PAGE CHANGES

Attached are page changes to Revision 1A of the Waste Water Pilot Plant Research, Development, and Demonstration Permit Application. Please review the page changes and let me know if there problems with the revisions.

MAY 1993
RECEIVED
EDMC

54-3000-101 (12/92) GEF014

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 Plant Process Condensate Treatment Facility. Until the treatment facility is built, the 242-A Evaporator process condensate will be stored in basins at the Liquid Effluent Retention Facility. The U.S. Department of Transportation-approved tanker trucks will be used to transport waste water to and from the 1706-KE Building. After testing the waste will be returned to the LERF basins.

The classes of treatment technologies that will be tested in the waste water pilot plant include the following: pH adjustment, organic removal (granular activated carbon adsorption and ultraviolet light mediated oxidation), inorganic removal (ion exchange and reverse osmosis), and suspended solids removal (filtration). A description of each of the specific treatment technologies is presented. 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 the tests to ensure operational safety of personnel and to ensure that no unacceptable releases to the environment will occur. If additional technologies are to be tested, this permit application will be modified to include these technologies.

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.

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

Prevailing wind speeds and directions across the Hanford Site are presented in Figure 1-2.

The Hanford Facility is defined as a single RCRA facility, identified by the EPA/State Identification Number WA7890008967, that consists of over 60 TSD units conducting dangerous waste management activities. The Hanford Facility consists of the contiguous portion of the Hanford Site that contains these TSD units and, for the purposes of the RCRA, is owned and operated by the U.S. Department of Energy (excluding lands north and east of the Columbia River, river islands, state owned or leased lands, lands owned by the Bonneville Power Administration, lands leased to the Washington Public Power Supply System, and the Ashe Substation). The Hanford Facility is a single site for purposes and provisions regulating 'offsite' or 'onsite' waste handling. The Hanford Facility portion of the Hanford Site is shaded on Figure 1-1.

Topographic maps, showing a distance of at least 1,000 feet (305 meters) around the 1706-KE Building and the LERF are provided in Appendix 1A. These maps are drawn at a scale of 1 centimeter equals 20 meters (1:2000). The contour interval (0.5 meter or 1.6 feet) clearly shows the pattern of surface water flow in the vicinity of 1706-KE Building and the LERF. The maps contain the following information:

- Map scale
- Date
- Prevailing wind speed and direction
- A north arrow
- Surrounding land use
- Location of the 1706-KE Building and LERF
- Access road location
- Access control.

## 1.5 GENERAL WASTE WATER PILOT PLANT DESCRIPTION

Waste water pilot plant testing within the scope of this permit application will be conducted at the following two locations on the Hanford Facility.

- Testing of mixed and dangerous waste will be conducted in the 1706-KE Building. The 1706-KE Building is located in the 100 KE Area (Figure 1-1). Waste will be transported to and from the 1706-KE Building by two 5,000 gallon (18,927 liter) tanker trucks.

- Limited filtration testing of mixed waste will be conducted at the LERF. The LERF consists of three 6.5-million gallon (24.6-million liter) surface impoundments (basins) located on a 39-acre site east of the 200 East Area. The LERF receives process condensate from the 242-A Evaporator.

The QAPP is intended to be generic in nature and will be applicable to testing of synthetic waste and actual dangerous waste. The QAPP will provide the overall requirements under which waste water pilot plant testing will be executed. The QAPP also will establish the requirements for the sampling and analytical services that will be provided by both onsite and offsite laboratories.

It is the intent of the QAPP to allow a graded approach to the application of QA. For example, the portion of the testing activity that will be conducted for process optimization does not require the high level of QA afforded to those tests that will provide data to support permitting or ~~delisting~~ activities. The identification of the appropriate QA level for the data and analytical information related to sampling will be included within the associated test procedure.

Analytical data for process optimization studies will be obtained from a Hanford Site laboratory using procedures based on EPA methods or other recognized and accepted industrial waste water procedures (e.g., American Society for Testing and Materials and American Water Works Association). Analytical data that are to be used in permit applications might be required to be performed offsite by a certified laboratory program (CLP) laboratory.

## 2.3 SCHEDULE

The waste water pilot plant will be used first to support the 242-A Evaporator/PUREX Condensate Treatment Facility. Waste water pilot plant testing with synthetic waste will be performed at the 1706-KE Building after the Hanford environmental compliance (HEC) environmental assessment (EA) finding of no significant impact (FONSI) is approved and the necessary modifications are performed to the 1706-KE Building. The FONSI was approved on March 11, 1992. The 1706-KE Building modifications will include: removing or replacing loose floor tiles, sealing the floor, plugging floor drains, sealing the walls, upgrading the ventilation system, refurbishing the change rooms, installing tanker loading and unloading areas, intermediate storage tanks, process equipment, and associated piping and instrumentation. Synthetic waste testing will be performed at other sites before synthetic testing takes place at the 1706-KE Building.

The 242-A Evaporator has not been operational since 1989 and currently is undergoing upgrade modifications. When the 242-A Evaporator becomes operational, the 242-A Evaporator process condensate will be stored in the LERF. A minimum 2-month period will be required for the waste material to accumulate before using the material in waste water pilot plant testing. This 2-month period is necessary because of operational considerations and because of the need to obtain a representative sample of process condensate. The 242-A Evaporator waste will be available for waste water pilot plant testing within the time frame of November to December 1992.

Two tentative schedules are included (Figure 2-1 and 2-2). Figure 2-1 shows the overall schedule for waste water pilot plant testing. Figure 2-2 provides a detailed schedule for waste water pilot plant testing, as now

# 3.0 WASTE CHARACTERISTICS

This section presents a general description of the types of waste water that will be treated in the waste water pilot plant. A description of the chemical spikes that will be added to the waste during testing also is presented. 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 waste acceptance limits of the waste water pilot plant.

## 3.1 WASTE WATER PILOT PLANT WASTE STREAM TO BE TESTED

The following sections describe the waste water stream to be tested at the waste water pilot plant, and discuss the waste composition and dangerous waste designation of the 242-A Evaporator process condensate.

### 3.1.1 Description of Waste Water

The 242-A Evaporator process condensate stream will be the only waste water tested in the waste water pilot plant; no offsite waste will be received.

The 242-A Evaporator concentrates liquid waste stored in the underground double-shell tanks (DSTs). 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 at the waste water pilot plant. The 242-A Evaporator process condensate will be stored at the LERF until the 242-A Evaporator/PUREX Plant Process Condensate Treatment Facility is operational.

### 3.1.2 Waste Stream Composition

A variety of constituents are contained in the 242-A Evaporator process condensate. 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 tributyl phosphate. Dissolved solids include inorganics and radionuclides. The exact composition of the 242-A Evaporator process condensate is somewhat variable, depending on the source of DST waste that is treated at the 242-A Evaporator. In general, the amount of organic contaminants in the 242-A Evaporator process condensate is less than 100 parts per million (i.e., less than 0.01 percent). The 242-A Evaporator process condensate will be analyzed in accordance with requirements in the 242-A Evaporator and in the LERF Part B permit applications before transfer to the waste water pilot plant.

Analytical results of 34 samples [collected and analyzed in accordance with SW-846 protocols (EPA 1986b)] and other process control samples from the 242-A Evaporator process condensate are summarized in Table 3-1. The samples were collected between August 1985 and March 1989. It has not been possible to collect a 242-A Evaporator process condensate sample since April 1990, when the 242-A Evaporator was taken out of service. Table 3-1 shows the range of constituents that might be encountered in the waste stream. It should be emphasized that no one waste water sample contains all of the constituents listed in the table nor does any one waste water sample contain the maximum concentration of all of these constituents on a regular basis.

### 3.1.3 Waste Stream Designation

In accordance with requirements in WAC 173-303, the 242-A Evaporator process condensate is designated as (1) dangerous because the condensate is derived from a listed waste and (2) 'state-only' toxic dangerous waste because the equivalent concentration percent sum of all applicable constituents is greater than 0.001 percent. The waste designations for the 242-A Evaporator process condensate are contained in the LERF dangerous waste permit application (DOE/RL 1991c) and the 242-A Evaporator dangerous waste permit application (DOE/RL 1991a). Information on these waste designations is provided in the following paragraphs.

The waste is designated dangerous because the process condensate is derived from the DST waste - a 'listed waste'. The DST waste has been designated dangerous (listed waste) due to the presence of spent solvents, namely 1,1,1 trichloroethane (F001), methylene chloride (F002), acetone and methyl isobutyl ketone (F003), and methyl ethyl ketone (F005).

The 1,1,1 trichloroethane was not detected in the 34 samples of the 242-A Evaporator process condensate above a concentration of 0.005 parts per million (detection limit). The 1,1,1 trichloroethane was used as a solvent in decontamination activities at B Plant and has been discarded to the DSTs.

Methylene chloride was not detected in the 34 samples of the 242-A Evaporator process condensate. Methylene chloride was used as a solvent in decontamination activities at T Plant and has been discarded to the DSTs.

Acetone was detected in all 34 242-A Evaporator process condensate samples with an average concentration of 0.980 parts per million. The acetone was used in laboratories to dry glassware and could have been discarded through drains to the DSTs.

Methyl isobutyl ketone (hexone) was detected in 10 of the 34 samples at an average concentration of 0.011 parts per million. Methyl isobutyl ketone was used in the solvent extraction process [reduction-oxidation (REDOX) process] and was discarded to single-shell tanks as a spent solvent and eventually transferred to the DSTs.

Methyl ethyl ketone (2-butanone) was detected in 25 of the 34 samples at an average concentration of 0.051 parts per million. Methyl ethyl ketone was

### 3.3.1 Waste Water Acceptance Criteria

The composition of the waste feed to the waste water pilot plant has been characterized by analyses of 34 samples and other process control samples of 242-A Evaporator process condensate collected over a period of almost 4 years (Table 3-1). Some variability is expected in waste composition, thus a sampling program will be implemented to ensure that the waste composition will be within the operational capabilities of the waste water pilot plant.

The waste acceptance limits for the waste transferred to the waste water pilot plant is shown in Table 3-3. Waste that exceeds acceptance criteria limits will not be received at the waste water pilot plant. The metals include all the toxic metals reasonably anticipated in the 242-A Evaporator process condensate.

The limits were derived by raising the amounts of metals and volatile organics detected in the 242-A Evaporator process condensate by one or two orders of magnitude (10 or 100 times). The basis for the limits is to keep personnel exposure/environmental contamination risk to as low as reasonably achievable.

A further limitation is placed on the shipment of waste water via the tank trailers, i.e., the waste water must be Low Specific Activity (LSA) with respect to the radionuclide content to meet U.S. Department of Transportation requirements.

### 3.3.2 Waste Water Operating Envelope

The operating envelope is defined as the maximum concentration of chemical constituents in the waste water. The operating envelope maximum concentrations are presented in Table 3-4.

After introduction into the waste water pilot plant, the waste composition could be modified by the addition of chemical spikes. Therefore, the waste water operating envelope must take into account the addition of chemical spikes. The maximum concentration in the waste water operating envelope (Table 3-4) was derived by adding the maximum concentration in the waste acceptance limits (Table 3-3) plus the maximum concentration for that constituent in the chemical spike list (Table 3-2). For constituents in the 242-A Evaporator process condensate (Table 3-1) that are not included in the waste acceptance limits, the maximum concentration in the waste water operating envelope (Table 3-4) will be the concentration of the constituent in the process condensate (Table 3-1) plus the concentration in the spike list (Table 3-2).

### 3.3.3 Operating Parameters

Operating parameter limitations are required only for 'critical parameters'. A critical parameter is defined as an operating parameter for which loss of control of the parameter can affect safety of Hanford Site

Table 3-1. 242-A Evaporator Effluent Characterization Data.
(sheet 3 of 3)

| Parameter | Units[a] | Average | 90% CI | Maximum |
|---|---|---|---|---|
| Tin-113 | pCi/L | 540 | 770 | 2,500 |
| Europium-155 | pCi/L | 1,400 | na | 1,400 |

[a] Units: μS = microsiemen
SU = standard pH units
ppm = parts per million
pCi/L = picocuries per liter

[b] Detected only in sample blanks.

[c] Cesium-137 and strontium-90 values have been multiplied by 10 to account for the removal of the existing ion exchange system in the 242-A Evaporator.

Abbreviations: CI = confidence interval
na = not applicable

NOTE: Radionuclide data presented for information only.

Table 3-1. -242-A Evaporator Effluent Characterization Data.
(sheet 2 of 3)

| Parameter | Units[a] | Average | 90% CI | Maximum |
|---|---|---|---|---|
| Caproic acid | ppm | 0.070 | | |
| 3,5-Dimethyl-pyridine | ppm | 0.021 | 0.023 | 0.024 |
| Dimethyl-nitrosamine | ppm | 0.057 | | |
| Dodecane | ppm | 0.043 | 0.052 | 0.046 |
| Ethoxytriethylene-glycol | ppm | 0.099 | 0.12 | 0.15 |
| Ethyl alcohol | ppm | 0.002 | | |
| Hexadecane | ppm | 0.017 | | |
| Heptadecane | ppm | 0.018 | | |
| Methoxydiglycol | ppm | 0.04 | 0.052 | 0.052 |
| Methoxytriglycol | ppm | 0.022 | 0.37 | 0.37 |
| Methylene chloride[b] | ppm | 0.012 | 0.14 | 0.18 |
| Methyl n-propyl ketone | ppm | 0.0093 | 0.0097 | 0.012 |
| Methyl n-butyl ketone | ppm | 0.013 | 0.014 | 0.079 |
| MIBK (Hexone) | ppm | 0.011 | 0.014 | 0.068 |
| 2-Methylnonane | ppm | 0.016 | 0.017 | 0.017 |
| Pentadecane | ppm | 0.020 | | |
| Phenol | ppm | 0.033 | | |
| 2-Propanol | ppm | 0.022 | | |
| Pyridine | ppm | 0.055 | | |
| Tetradecane | ppm | 0.076 | 0.083 | 0.44 |
| Tetrahydrofuran | ppm | 0.037 | 0.039 | 0.17 |
| Tributyl phosphate | ppm | 3.9 | 4.1 | 21.0 |
| 1,1,1-Trichloroethane[b] | ppm | 0.005 | | |
| Tridecane | ppm | 0.07 | 0.077 | 0.35 |
| Triglyme | ppm | 0.09 | | |
| | | | | |
| Alpha | pCi/L | 160 | 35.0 | 750 |
| Beta | pCi/L | 4,600 | 6,000 | 74,000 |
| Strontium-90[c] | pCi/L | 5,200 | 7,600 | 81,000 |
| Ruthenium-106 | pCi/L | 10,500 | 11,080 | 17,800 |
| Cesium-137[c] | pCi/L | 4,400 | 5,400 | 26,000 |
| Promethium-147 | pCi/L | 1,300 | 1,600 | 4,100 |
| Uranium (gross) | pCi/L | 20 | 33 | 140 |
| Tritium | pCi/L | 5,600,000 | 6,300,000 | 24,000,000 |
| Plutonium-239 | pCi/L | 0.00037 | 0.00068 | 0.0024 |

again tested by the operations contractor following installation. Once the filters are installed, they must meet the following criteria.

- Filter in-place leak test requirements. All filters shall remove at least 99.95 percent of dioctyl phthalate (DOP) or dioctyl sebacate (DOS) particles, ranging in size from 0.1 micron to 3.0 microns, with a mean particle size of 0.5 micron.

- The HEPA filter cartridges shall be replaced when continuous exposure rates exceed 1 rad per hour measured at 6 inches (15.2 centimeter) or when the pressure drop across the filter exceeds 4 inches (10.2 centimeter) water gage.

Primary HEPA filtration for the waste water pilot plant ventilation system is provided by a ventilation housing containing nine 24 inch by 24 inch (61 centimeters by 61 centimeters) HEPA filters in a parallel configuration. These are preceded by nine roughing filters of the same size and configuration, to minimize loading on the HEPA filters. The roughing filters are disposable filters of the same construction as household furnace filters. A second stage of HEPA filtration is provided by in-line HEPA filters installed in the waste water pilot plant area ductwork. The primary HEPA filtration system also services the RCRA equipment decontamination lab.

Projected source term values for radionuclide air emissions from the waste water pilot plant are given in Appendix 4B. The air emissions notification document has been submitted to and approved by the Washington State Department of Health.

**4.1.3.2 Controls for Volatile Organics.** Emissions of volatile organics are controlled in two ways; the waste water pilot plant will be engineered to minimize the potential for volatilization and activated charcoal will be utilized in the ventilation system for removal of volatile organics. Also, the amount of volatiles introduced into the pilot plant via the waste water and associated spikes, is controlled by the waste acceptance criteria outlined in Section 3.3.

DELETED "ARSENIC"

Release of volatile organics along with volatile radionuclides and volatile inorganics (e.g., mercury, ammonia) 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. To minimize volatilization while filling the tanker, a fill tube extending to the bottom of the tanker will be used. Once the tanker arrives at 1706-KE Building, any receiving tank will also be bottom filled to control release of volatile components.

The first processing step at the 1706-KE Building will be to adjust the pH to a range of 5.0 to 6.5. At this pH, the ammonia will be converted to ammonium ion and will no longer be vulnerable to release. The adsorption of ammonia on charcoal is negligible. Other inorganics will have a vapor pressure of less than 1 millimeter of mercury at the maximum operating waste water be transferred back and forth between the LERF and the 1706-KE Building. The transfer will be routed over Hanford Facility roadways over a distance of approximately 10 miles (16 kilometers) (one way). The transfers will use two tank trailers.

The following sections describe the transfer process, road and waste routing, tank trailers, and the waste unloading and loading areas at the LERF and the 1706-KE Building. The actual transportation of the waste between the LERF and the 1706-KE Building is not performed by the waste water pilot plant and is not included within the scope of this permit application.

### 4.3.1 Transfer Process Description

Transfers will be accomplished using two 5,000 gallon (18,927 liter) tank trailers. The tank trailers will be pulled by tractors operated by certified drivers. These single-walled tank trailers are built to U.S. Department of Transportation Specification MC-312-SS, and modified to meet waste water pilot plant requirements. The tankers are certified for the transport of hazardous liquids over U.S. public highways (copy of certificate is provided in Appendix 4D).

The 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 Plant Process 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. The waste has a radioactive waste classification of low specific activity (LSA) per 49 CFR 173.403(n).

At LERF, the waste will be loaded into the tank trailers using a submersible pump lowered down an existing LERF Basin 43 riser. The riser connects LERF Basin 43 to the existing LERF catch basin. There will be continuous operator surveillance of the loading lines and the tank liquid level during filling. Unloading of the waste at the LERF after testing will be accomplished using a pump mounted over the existing LERF catch basin.

Unloading at the 1706-KE Building will be accomplished using a self-priming pump located over a catch tank at the waste load/unload station located northwest of the 1706-KE Building. Loading of the waste into the tank trailer after testing will be accomplished using internal 1706-KE Building process pumps. These process pumps will be interlocked to the liquid level instrumentation of the tank trailer 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.

Equipment that is not decontaminated, or other secondary waste not returned to the LERF, will be stored in a RCRA-compliant less than 90-day accumulation area before transfer to a Hanford Site storage, treatment, or disposal unit per Hanford Site procedures.

ADDED TO 4.4
EQUIPMENT DECONTAMINATION

93129560719