APPENDIX B.23
RADWASTE SYSTEM DESCRIPTION

B.23.1 SYSTEM DESCRIPTION

The radwaste system is split into two sub-systems identified as high and low activity. The purpose of this design was to separate highly radioactive basin filter sludge from other plant waste water such as laundry, sump waste and decon solutions which are normally very low in activity.

The high activity system dewaters basin filter spent resins and returns the water to the basin while the low activity system processes waste water through an evaporator. The dewatered filter resins and evaporator bottoms are packaged and shipped as radwaste to a burial or processing site. A description of these systems is as follows:

B.23.2 HIGH ACTIVITY SYSTEM (REFERENCE FIGURE 1-16B)

Spent filter media from the basin filter is backwashed to the filter sludge tank (V-134) approximately every four to six weeks. This backwash consists of approximately 3 ft^3 of filter media mixed with 350 - 400 gallons of water. The slurry is then pumped from V-134 to a High Integrity Container (HIC).

The HIC contains four filter septums at various levels to allow for dewatering and are sized by the manufacturer for the filter medium used at this plant (Powdex Resins). The filter water transfer pump (P-520) is a positive displacement diaphragm pump which takes suction on the HIC and transfers the water through a filter (F-520) to the filter water collection tank (V-508). Most particulate remains in the HIC; however, some fines get through the septum and will be removed by the filter, F-520. F-520 is a backwashable filter that can be cleaned by backwashing to the HIC.

When the filter sludge transfer is completed, or at a later date, the water in V-508 is recirculated utilizing P-520. When samples verify the chemistry and activity of the water is acceptable, the water will be pumped to the basin filter inlet for return to the fuel basin.

During cask flush operations, the flush water may be discharged to either the high or low activity system. The choice of direction will be based on water chemistry and activity.

The HIC is located at the north end of the equipment transfer area (ETA) pit. V-508 is located at the south end of the same pit. P-520 and F-520 are located in the aqueous make-up (AMU) room which is adjacent to the ETA. The ETA pit is covered with 6 in. thick steel plates for shielding. The area directly above the HIC includes an additional 7 in. thick lower plate with a 34 by 34 in. access hole for maintenance, removal, and replacement of the HIC. Connections from the HIC to the system are made via the fill-head which mounts to the top of the HIC. Included are four suction connections for dewatering at various levels in the HIC, a fill connection, vent connections, a backwash inlet, and instrument hook-ups. Most connections are quick disconnect hoses that attach to the system piping.

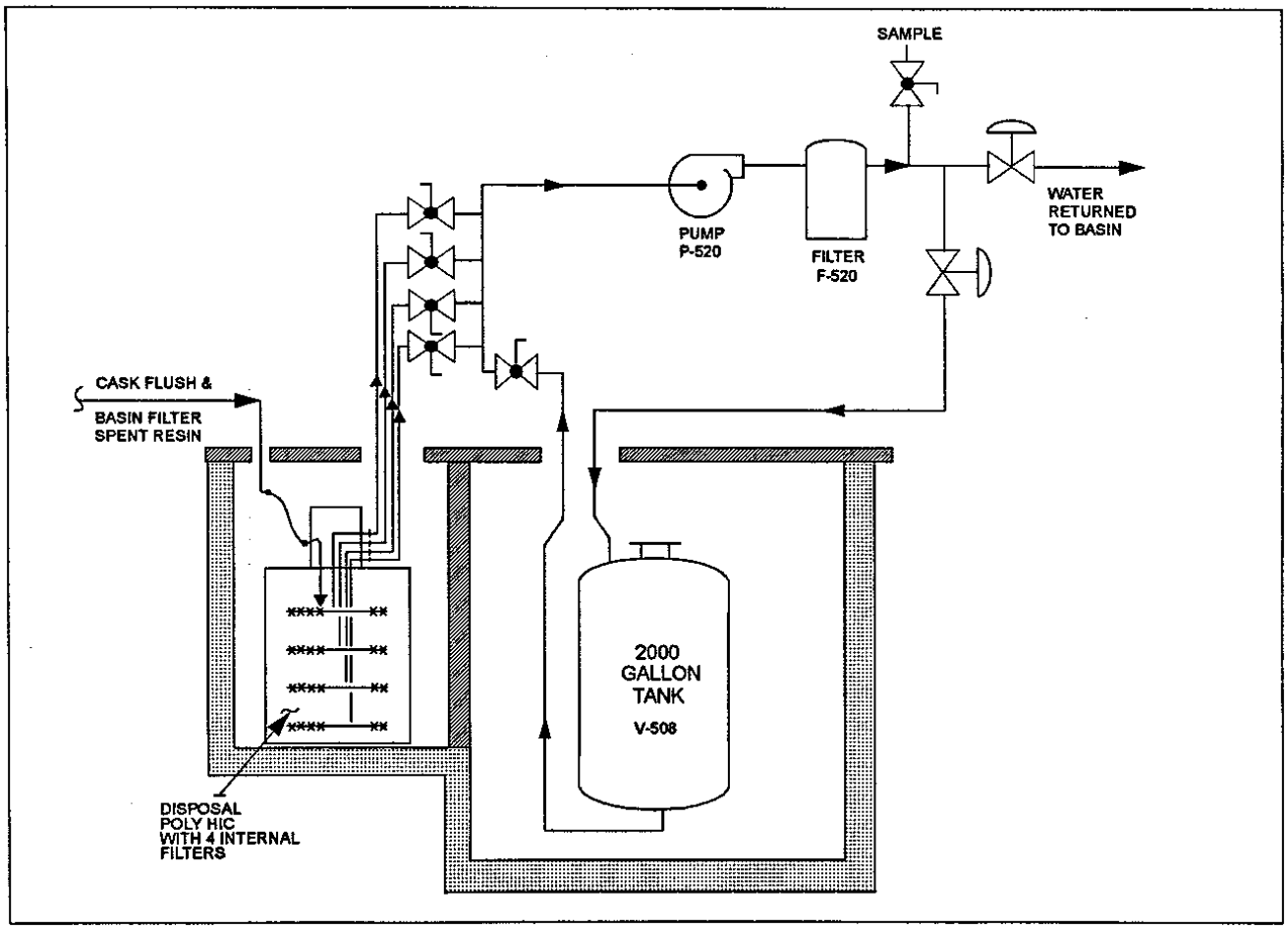

Figure 1-16b. Basin Filter Spent Resin System: Spent resins from the Basin Filter and cask flush solutions are pumped to a shielded Poly High Integrity Container (HIC). Water is removed from the HIC, filtered, and then returned to the Fuel Storage Basin. When filled, HICs are dried and shipped off site for burial.

The HIC is supported by steel plates that position the fill-head assembly at about 10 in. below the steel floor plates in the ETA. Incorporated as part of the support stand is a vertical shielding plate between the HIC and the rest of the pit. This basically provides a 7 ft. by 7 ft. box around the HIC with steel floor and south wall, and concrete on the remaining three sides. Additionally, this area is sealed with a molded plastic liner to contain any spills. Maximum anticipated radiation levels are 40 R/hr at the side of the HIC and 2 mR above the shield plates. HIC capacity is between 122 and 140 $ft.^3$ and, at present fill rates, a HIC will be removed every three to four years for disposal.

The HIC is vented to V-508. This also serves as an overflow; however, due to the fill-head connections to the HIC, it is not intended for this purpose. V-508 has overflow connections to the decon cell and is vented to the plant cold vent header.

The HIC manufacturer provided instrumentation for level indication including closed circuit television for visual observation inside of the HIC. These instruments as well as V-508

instrumentation are located in the AMU. The HIC has both local and CAS/SAS high level alarms. The HIC high level alarm also automatically terminates any flow from P-134. V-508 has level indication both locally and in the CAS/SAS with a high level alarm in the CAS/SAS set at approximately 80% of tank capacity.

All system valves, pumps and filters are located in the AMU or above the steel floor plates in the ETA. The pump and filter are in areas where shielding can be easily installed if required.

B.23.3 LOW ACTIVITY SYSTEM (REFERENCE FIGURE 1-16A)

The low activity system consists of discharges from the laundry, and various sources in the basin area. Laundry, dishwasher, decontamination sink, and decontamination shower drains are collected in the laundry waste collection tank (V-509) which has a capacity of 200 gallons. Transfer pump P-509 is a centrifugal pump which takes suction on V-509 and transfers the water through a bag filter (F-509) to the waste water storage and feed tank (V-503). A suction strainer is installed between the tank (V-509) and pump (P-509) to catch foreign objects which could damage the pump. The tank (V-509), pump, and filter are located in room 142 on 37' elevation. This allows for gravity draining of the various effluents to V-509. Inputs to the system are estimated to be 10,000 gallons per year. Of this total 7,800 is from the washing machine, 1,000 from the dishwasher, 1,000 from the decon sink and 200 from the decon shower.

P-509 controls are automatic with pump start at approximately 50% of tank capacity (100 gallons) and shut off at 30 gallons. Tank level indications are both local and in the CAS/SAS with a high and low level alarm in the CAS/SAS. P-509 is a vertical in-line pump which is identical to several other pumps on site. These pumps can be replaced with a spare in minimal time. The tank, pump, and filter are located within a spill containment area that has a liquid sensor which alarms in the control room in the event of a system leak. High filter differential pressure is also alarmed in the CAS/SAS.

Basin pump room, basin pump room addition, expansion gate, basin intrusion, cask service facility, and cask wash area sumps discharge to and are collected in the basin area waste water collection tank (V-104) which has a capacity of 580 gallons. Transfer pump P-104 is a centrifugal pump which takes suction on V-104 and transfers the water through a filter (F-504) to the waste water storage and feed tank (V-503). Inputs to this portion of the system are estimated to be 7,000 gallons per year. Of this total 3,000 is from the cask wash/decon pad sump, 2,000 from the expansion gate, cladding vault, pump rooms and canyon sumps and 2,000 from miscellaneous sources and special projects.

Alternate flow paths have been provided to discharge the cask wash area sump directly into the filter sludge tank (V-134) for treatment in the high activity system. Discharge to V-134 will be utilized in the event that the cask wash sump contains particulate which is radiologically unacceptable to the low activity system and can be best disposed of in the HIC.

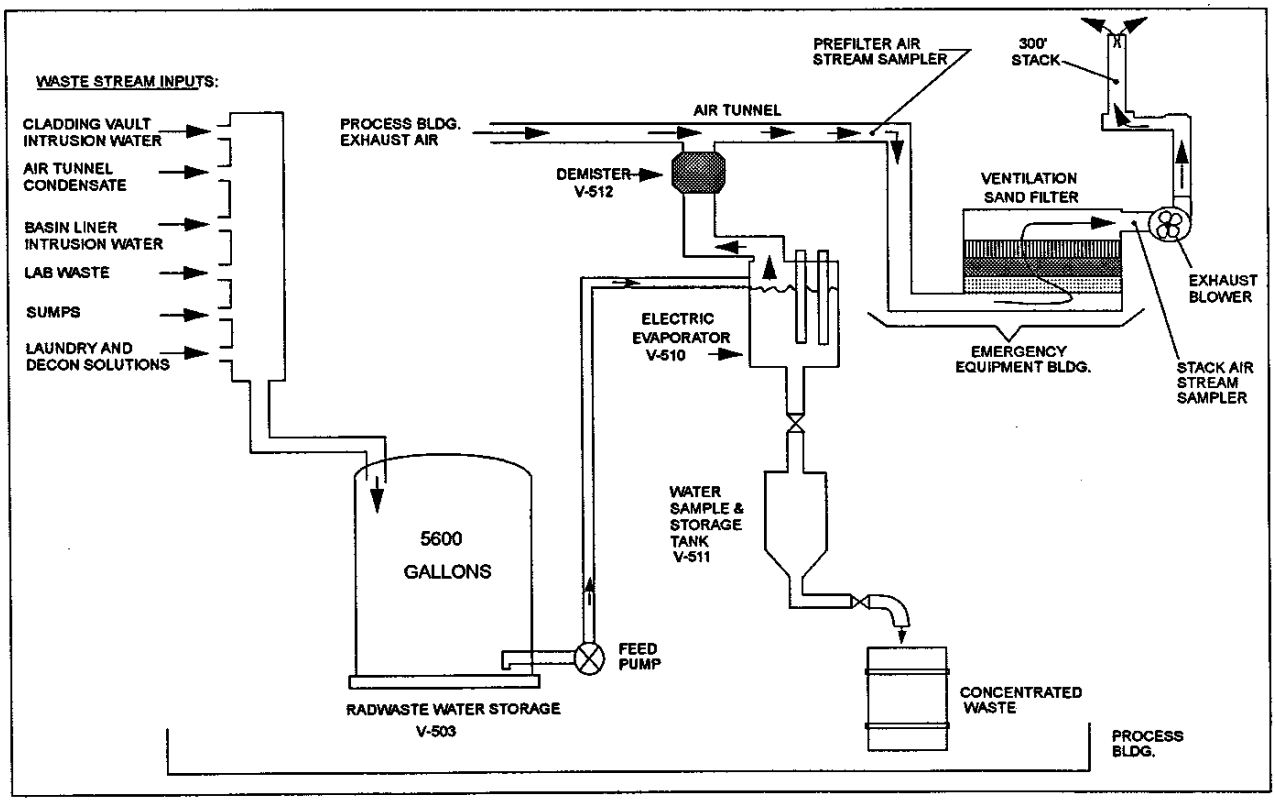

Figure 1-16a. Radwaste System: Low activity radwaste water streams are collected from various sources and piped to the Radwaste Water Storage Tank. Water from this tank is then pumped to an electric evaporator. Evaporator steam is demisted and exhaused via the ventilation system. Evaporator bottoms are put in barrels and shipped off site for processing.

The tank (V-104) and pump (P-104) are located in the basin pump room addition. The tank is vented to the basin filter room which vents to the air tunnel. The various basin area inputs are pumped into a 2 in. drain header which gravity drains to V-104. P-104 pumps the water in V-104 through a filter (F-504) and then to the Radwaste Water Storage Tank V-503. F-504 is a cartridge filter containing six 10 in. cartridges. The filter is located behind a concrete wall which provides shielding for both normal operations and filter replacements.

P-104 controls are manual and require operator action to transfer water to V-503. The manual controls were installed because all the inputs to the system require operator action in the same area. It is anticipated that, unless special work is ongoing, the monthly input to V-104 will be less than 200 gallons.

Level indication for V-104 is by sight glass. The tank level can also be verified by visual examination through the hinged cover on top of the tank. Any leakage of water in this area drains to a sump which has a high level switch that actuates an alarm in the CAS/SAS.

The waste water storage and feed tank (V-503) is in room 133 and is the main storage tank for the low activity system. V-503 has a 5,600 gallon capacity. It is vented and overflows to the

canyon decon cell. Level indication is local with a level indicator and both high and low level alarms in the CAS/SAS. This provides for pump protection on the low end and overflow protection on the high end. The total input to V-503 from both sub-systems is estimated to be 20,000 gallons per year.

The evaporator feed pump (P-503) is a centrifugal pump which takes suction on V-503 and supplies water to the evaporator. P-503 operation is controlled by the evaporator level control system. Due to the pump's excessive capacity flow to the evaporator, it is reduced by an orifice installed in the pump discharge piping with bypass back to V-503.

The evaporator is an electric immersion heater unit with a 200 gallon per day capacity and is located on the mezzanine level (elevation 56 ft.) in room 136. The unit holds 70 gallons when full and the water level is controlled by a magnetic float switch. Additional waste water is fed to the evaporator when the level falls about five gallons. This small amount of feed to the unit allows it to return to boiling in approximately five minutes, depending on the concentration at the time.

The evaporator vapor is discharged to the Process Building air tunnel through a moisture separator and demister which drain any liquid back to the evaporator. The vapor passes through the air tunnel sand filter prior to being discharged to the plant ventilation stack. A sight glass is provided in the vapor line to aid in the detection of excessive foaming. The unit has an anti-foam injection system to control foaming. Foaming is also controlled by the use of low foaming detergents in the laundry and for deconning.

Several protective devices and systems are incorporated to automatically shut the evaporator down in the event of an operating problem. These systems include the following:

- High and low level water switches.
- Overflow line to V-511.
- Loss of air tunnel vacuum.
- High temperature.
- High differential pressure across the demister.

Any evaporator shut down will alarm both locally and in the CAS/SAS. Operation of the evaporator is done from a control panel located in a separate area to reduce exposure to personnel.

The evaporator will cycle and continue to concentrate until a 15 to 20 weight % solids is obtained. Liquid solid concentration will be determined by testing. Once this concentration is obtained, the evaporator contents will be drained to the evaporator bottoms tank (V-511). The solution will then be sampled and then drained to a 55-gallon barrel for later disposal.

In the event that the evaporator heaters scale prior to reaching the established concentration the heaters can be removed and cleaned or replaced. As the heaters are removed through the top of the unit this may be performed without draining the evaporator. An alternate method would

be to drain the evaporator to the bottoms tank, complete the repairs and then recycle the solution back to the evaporator using pump P-511.

The evaporator bottoms tank (V-511) is located in room 136 on the 48 ft. elevation under the evaporator. This allows for gravity draining of the evaporator through a remotely operated ball valve. V-511 is a 200 gallon tank with an electric blade mixer and immersion heater. The tank is provided with three sample points for analysis of the bottoms in preparation for disposal. The heater and mixer are used to keep the solids in solution. V-511 has a GEMAC LI and density indicator system and overflows to the drum solidification pit. The V-511 high level indication alarms both locally and in the CAS/SAS.

The drum solidification area is a pit located in the bottoms tank room. Normal filling of the drums is accomplished by gravity feed from the bottoms tank (V-511) through system piping and hose connections. Current plans are to ship the wet evaporator bottoms off site for processing. A concrete facility could be added later if cost effective.

Normal radiation levels for various low level system vessels are as follows:

- The Evaporator; 5 to 200 mR at contact.
- The Bottoms Tank V-511 (containing 100 gal. of waste); 10 to 300 mR at contact and 15 mR at 2 ft.
- A 55-gal. waste barrel; to 300 mR at contact, 50 mR at 2 ft.

ESTIMATED VOLUMES OF RADWASTE WATER PER YEAR

*	Water used to dump the basin filter (includes about 1,000 gal cask flush water)	6,000 gal/yr.
*	Decon pad wash water	3,000 gal/yr.
*	Basin exp. gate, Clad vault intrusion, pump room & canyon sumps, etc.	2,000 gal/yr.
*	Laundry, Decon sink and Decon shower (various sources: 7,800 from washing machine, 1,000 from dish washer, 1,000 from decon sink and 200 from decon shower)	10,000 gal/yr.
*	Miscellaneous sources & special projects	2,000 gal/yr.
	Total waste water	**23,000 gal/yr.**

Total volume of waste water that will go to the evaporator.....(23,000 less 6,000) = ... 17,000 gal/yr.