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WHC-EP-0342
Addendum 17

B Plant Process Condensate Stream- Specific Report

Prepared for the U.S. Department of Energy
Office of Environmental Restoration
and Waste Management



Westinghouse
Hanford Company Richland, Washington

Hanford Operations and Engineering Contractor for the
U.S. Department of Energy under Contract DE-AC06-87RL10930

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B PLANT PROCESS CONDENSATE

K. A. Peterson

ABSTRACT

The B Plant Process Condensate wastestream cannot be designated at this time, pursuant to the Washington (State) Administration Code (WAC) 173-303, Dangerous Waste Regulations. Sampling data were not sufficient to make a designation.*

*Ecology, 1989, *Dangerous Waste Regulations*, Washington (State) Administrative Code (WAC) 173-303, Washington State Department of Ecology, Olympia, Washington.

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EXECUTIVE SUMMARY

The B Plant Process Condensate (BCP) wastestream cannot be designated at this time, pursuant to the Washington (State) Administrative Code (WAC) 173-303, *Dangerous Waste Regulations*.^{*} Sample data (January 1987 to October 1989) of the BCP wastestream, was not sufficient to determine if the effluent contains a listed dangerous waste (WAC 173-303-080). Sample data alone is used to compare to the dangerous waste criteria (WAC 173-303-100) and dangerous waste characteristics (WAC 173-303-090).

For the BCP wastestream, two samples were taken during operation under current configuration for sample data. The BCP has had limited operation to support training on the low-level waste concentrator. The concentrator was extensively flushed before training actions. All solution from this training has been recycled. Resampling for the BCP stream will occur when the new system is optimized and again when the system feed changes for treatment of selected double-shell tank wastes and wastestreams to accomplish the separation into high-level, transuranic, and low-level waste fractions. This processing will be in preparation for disposal as either a vitrified or cementitious waste form. Formal designation for the BCP wastestream will occur after optimization and feed change sampling.

^{*}Ecology, 1989, *Dangerous Waste Regulations*, Washington Administrative Code 173-303, Washington State Department of Ecology, Olympia, Washington.

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LIST OF TERMS

ALARA	as low as reasonably achievable
BAT	best available technology
BCP	B Plant Process Condensate
BCS	B Plant Steam Condensate
CERCLA	<i>Comprehensive Environmental Response, Compensation, and Liability Act</i>
CI	confidence interval
CW	concentrated waste
DCG	Derived Concentration Guide
DOE	U.S. Department of Energy
EC	equivalent concentration
Ecology	Washington State Department of Ecology
EP	extraction procedure
EPA	U.S. Environmental Protection Agency
HH	halogenated hydrocarbons
MCL	maximum contaminant level
Mgal	million gallons
MSDS	Material Safety Data Sheet
NCAW	neutralized current acid waste
PAH	polycyclic aromatic hydrocarbons
ppb	parts per billion
PUREX	Plutonium-Uranium Extraction
REDOX	Reduction-Oxidation
SARA	<i>Superfund Amendment and Reauthorization Act</i>
Tri-Party Agreement	<i>Hanford Federal Facility Agreement and Consent Order</i>
VV	vessel ventilation
WAC	Washington (State) Administrative Code
WESF	Waste Encapsulation and Storage Facility

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**B PLANT PROCESS CONDENSATE
STREAM-SPECIFIC REPORT**

1.0 INTRODUCTION

1.1 BACKGROUND

In response to the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1989), comments were received from the public regarding the reduction of the discharge of liquid effluents into the soil column. As a result, the U.S. Department of Energy (DOE), with the concurrence of the Washington State Department of Ecology (Ecology) and the U.S. Environmental Protection Agency (EPA), committed to assess the contaminant migration potential of liquid discharges at the Hanford Site (Lawrence 1989).

This assessment is described in the *Liquid Effluent Study Project Plan* (WHC 1990a), a portion of which characterizes 33 liquid effluent streams. This characterization consists of integrating the following elements, pursuant to the Washington (State) Administrative Code, (WAC) 173-303 (Ecology 1989): process data, sampling data, and dangerous waste regulations.

The results of the characterization study are documented in 33 separate reports, one report for each wastestream. The complete list of stream-specific reports appears in Table 1-1. This document is one of the 33 reports.

1.2 APPROACH

This report characterizes the B Plant Process Condensate (BCP) stream in sufficient detail to both support a designation, per WAC 173-303, *Dangerous Waste Regulations*, and so that an assessment of the relative effluent priorities can be made with regard to the need for treatment and/or alternative disposal practices.

This characterization strategy (see Figure 1-1) is implemented by means of the following steps.

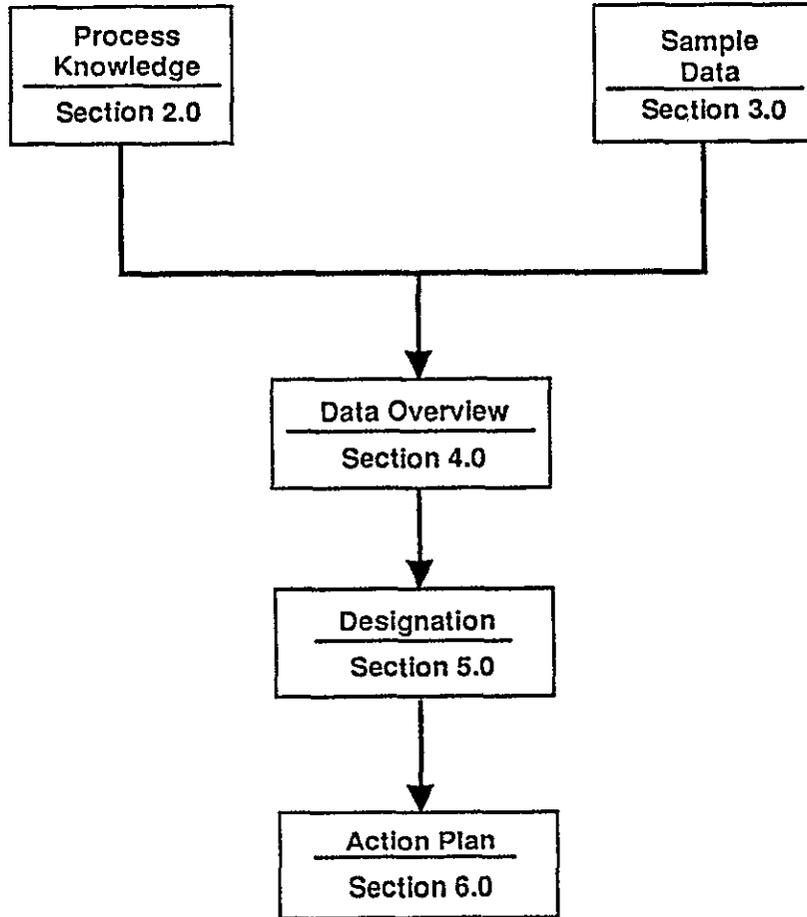
- Describe both process and sampling data (Sections 2.0 and 3.0, respectively).
- Present a data comparison and stream deposition rates (Section 4.0).

Table 1-1. Stream-Specific Characterization Reports.

WHC-EP-0342	Addendum 1	300 Area Process Wastewater
WHC-EP-0342	Addendum 2	PUREX Plant Chemical Sewer
WHC-EP-0342	Addendum 3	N Reactor Effluent
WHC-EP-0342	Addendum 4	163N Demineralization Plant Wastewater
WHC-EP-0342	Addendum 5	PUREX Plant Steam Condensate
WHC-EP-0342	Addendum 6	B Plant Chemical Sewer
WHC-EP-0342	Addendum 7	UO ₃ /U Plant Wastewater
WHC-EP-0342	Addendum 8	Plutonium Finishing Plant Wastewater
WHC-EP-0342	Addendum 9	S Plant Wastewater
WHC-EP-0342	Addendum 10	T Plant Wastewater
WHC-EP-0342	Addendum 11	2724-W Laundry Wastewater
WHC-EP-0342	Addendum 12	PUREX Plant Process Condensate
WHC-EP-0342	Addendum 13	222-S Laboratory Wastewater
WHC-EP-0342	Addendum 14	PUREX Plant Ammonia Scrubber Condensate
WHC-EP-0342	Addendum 15	242-A Evaporator Process Condensate
WHC-EP-0342	Addendum 16	B Plant Steam Condensate
WHC-EP-0342	Addendum 17	B Plant Process Condensate
WHC-EP-0342	Addendum 18	2101-M Laboratory Wastewater
WHC-EP-0342	Addendum 19	UO ₃ Plant Process Condensate
WHC-EP-0342	Addendum 20	PUREX Plant Cooling Water
WHC-EP-0342	Addendum 21	242-A Evaporator Cooling Water
WHC-EP-0342	Addendum 22	B Plant Cooling Water
WHC-EP-0342	Addendum 23	241-A Tank Farm Cooling Water
WHC-EP-0342	Addendum 24	284-E Powerplant Wastewater
WHC-EP-0342	Addendum 25	244-AR Vault Cooling Water
WHC-EP-0342	Addendum 26	242-A Evaporator Steam Condensate
WHC-EP-0342	Addendum 27	284-W Powerplant Wastewater
WHC-EP-0342	Addendum 28	400 Area Secondary Cooling Water
WHC-EP-0342	Addendum 29	242-S Evaporator Steam Condensate
WHC-EP-0342	Addendum 30	241-AZ Tank Farms Steam Condensate
WHC-EP-0342	Addendum 31	209-E Laboratory Reflector Water
WHC-EP-0342	Addendum 32	T Plant Laboratory Wastewater
WHC-EP-0342	Addendum 33	183-D Filter Backwash Wastewater

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Figure 1-1. Characterization Strategy.



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- Propose a designation (Section 5.0).
- Design an action plan, if needed, to obtain additional characterization data (Section 6.0).

1.3 SCOPE

The scope of this report is the characterization of the BCP stream that enters the soil column. The time perspective of this report is focused on the recent past and the near future (approximately 1987 to 1993). Information outside of this time period was included if the data were relevant to the development of the study.

This report contains no "new" sampling data (i.e., October 1989 through March 1990) because the BCP stream was inactive during this time period.

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2.0 PROCESS KNOWLEDGE

This section presents a qualitative and quantitative process knowledge-based characterization of the chemical and radiological constituents of the BCP stream. These process data are discussed in terms of the following factors:

- Location and physical layout of the process facility (Figure 2-1)
- General description of the present, past, and future activities of the process
- Identity of the wastestream contributors
- Concentration of the constituents of each contributor.

2.1 PHYSICAL LAYOUT

The B Plant is located in the 200 East Area of the Hanford Site (Figure 2-1). The B Plant is comprised of three main adjoining buildings: 271-B, 221-B, 225-B, and several auxiliary buildings (Figure 2-2). The 221-B Building, along with its attached service building (271-B), was constructed in 1943; this complex is known as B Plant. Construction of the 225-B Building, the Waste Encapsulation and Storage Facility (WESF), was completed in 1974.

The following sections contain a brief description of each of the buildings.

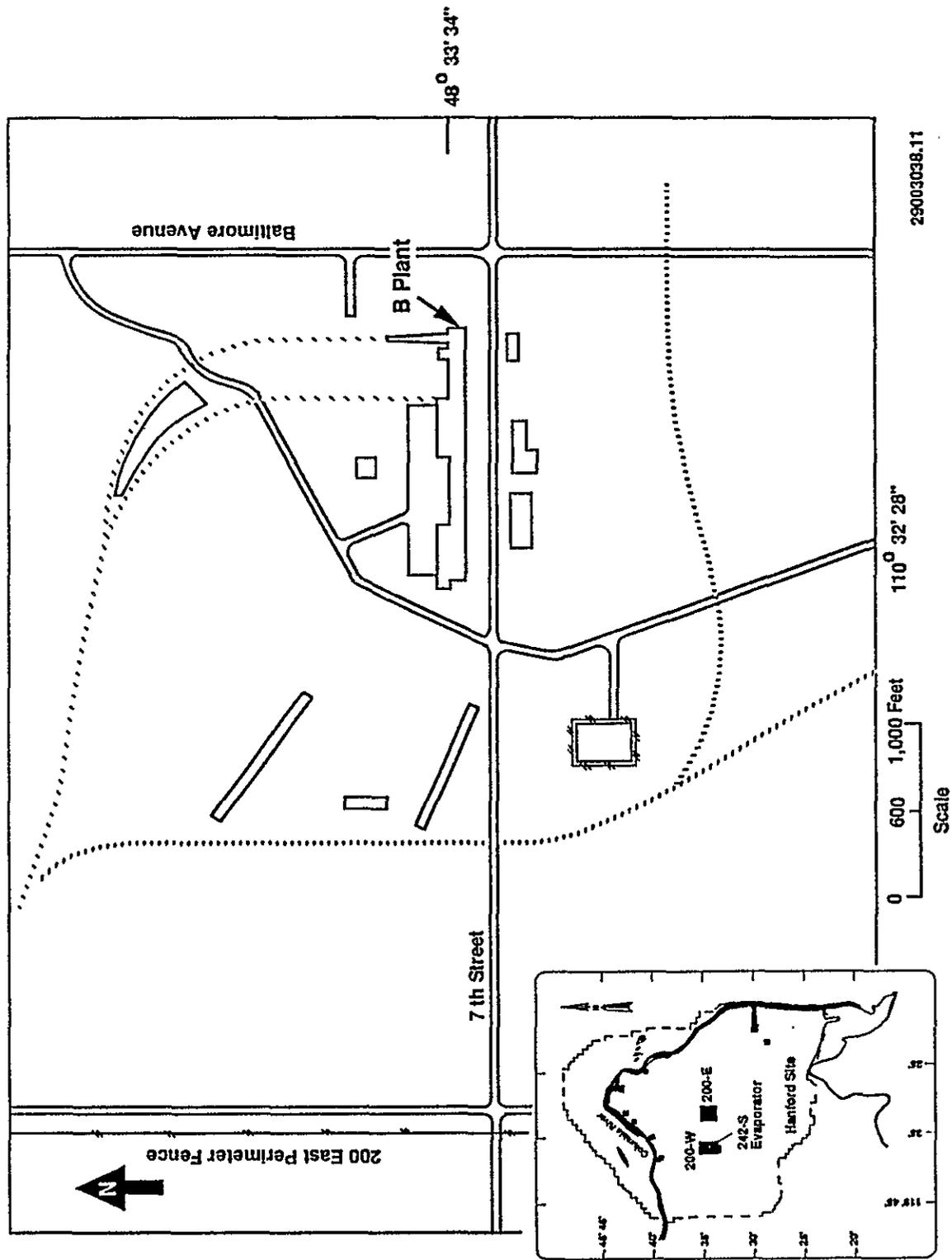
2.1.1 Building 221-B

The 221-B Building is the main processing building of B Plant, located in the 200 East Area of the Hanford Site. The B Plant and related facilities are shown in Figure 2-2. The 221-B Building is divided into two major sections: (1) the processing section and (2) the operating and service section.

The processing section consists of 40 process cells, a hot pipe trench for liquid transfers between cells, and a ventilation tunnel exhausting the ventilation air through the process cells. Above the processing cells, hot pipe trench, and ventilation tunnel is a canyon and craneway for the process crane. The process crane is used for remote maintenance of equipment in the processing section of the 221-B Building.

The operating and service section consists of an operating gallery, pipe gallery, and electrical gallery.

Figure 2-1. The B Plant Site Plan.



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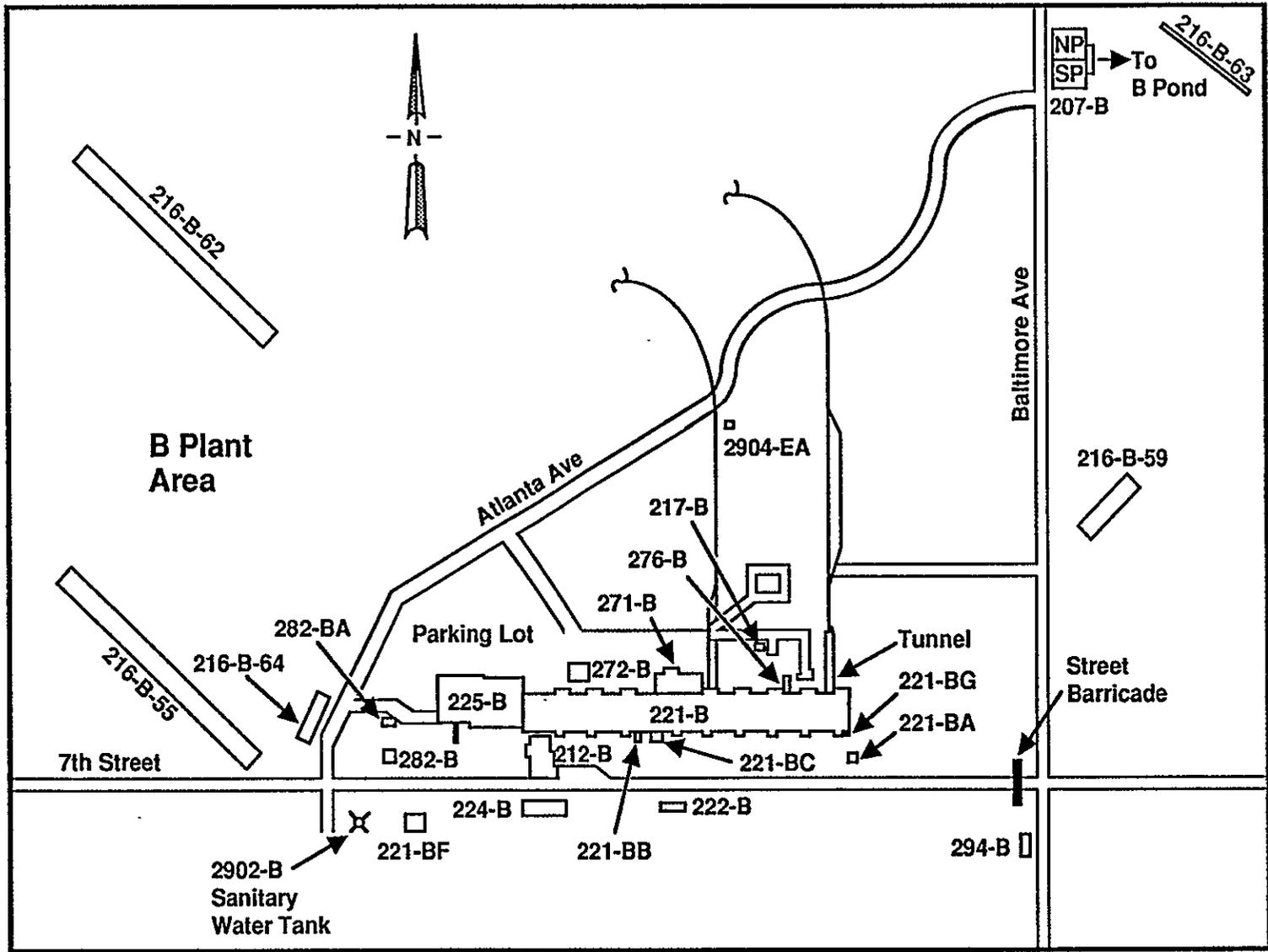


Figure 2-2. The B Plant and Related Facilities.

2.1.2 Building 271-B

The 271-B Building is the service building for, and is attached on the north side of, the 221-B Building. The 271-B Building includes offices, aqueous makeup facilities, and maintenance shops.

2.1.3 The Waste Encapsulation and Storage Facility

The WESF is attached to the west end of the 221-B Building. The WESF is partitioned into several areas according to the functional requirements of each area. These include 7 process hot cells, the hot cell service area (canyon), the operating areas, the building service areas, and 12 storage pool areas.

2.1.4 Building 221-BB

The 221-BB Building is a separate building located south of Cell 27 of the 221-B Building. This building houses equipment for measuring the flow of the BCP. Flow is measured by passing the BCP through a tank that houses a notched weir. The height of the BCP solution over the notched weir is proportional to the flowrate of the BCP. A pump is provided on the weir tank for recycling of the BCP back into the 221-B Building during off-normal conditions. Sampling the BCP during off-normal conditions can also be performed in the weir tank. Instrumentation and equipment for monitoring the B Plant Steam Condensate (BCS) is also located in the 221-BB Building.

2.1.5 Building 221-BF

The 221-BF Building is an underground building located south of the WESF. The 221-BF Building contains storage tanks, and pumping and sampling systems for the BCP.

2.2 CONTRIBUTORS

Low-level waste, hereafter referred to as waste, generated by B Plant is processed by the low-level waste concentration system. The waste concentration system is located in process Cells 23, 24, and 25 of the 221-B Building.

Streams and sources that are possible contributors to the waste concentrator system, and ultimately the BCP, are discussed in the sections that follow. Only those sources going through the low-level waste system are discussed in this report. In particular, this excludes low-level waste generated from the processing during neutralized current acid waste (NCAW) pretreatment.

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The final release of the BCP is based on laboratory analysis of the BCP. The monitors are used for process control aids, not final release monitors.

The BCP stream is a low-risk stream because it is batch released. The BCP currently has the two gamma monitors for detecting gross releases of gamma-emitting radionuclides, one positioned on top of the below grade discharge header between the 221-B and 221-BB Buildings and the other in the 221-BB Building between the two 600-gal condensate receiver tanks. Because of the inaccessibility of these monitors, they are functionally checked with a known source (approximately 20 mR) for operability only. The actual lower end sensitivity has not been determined.

Because the BCP is a batch release process, monitoring systems are not required on this stream. Disposition of the BCP discharge route is based on laboratory analysis of the BCP samples taken in the 221-BF Building. The BCP samples are taken from the holding tanks by means of a suction sampler that draws solution from the tank into the sample container. A sample of 500 mL of solution is taken for quick turnaround laboratory analysis for radionuclide activity and solution pH. In addition, a second sample is pulled for a monthly composite analysis. The second sample volume is based on process throughput and adjusted to ensure that at least 4 L are available to perform the composite analysis. This analysis includes the radionuclide activity level and pH of the composite.

2.2.1 Cell Drainage

This source includes low-level waste from decontamination work and water washdowns in the processing section of the 221-B Building. The liquid drains into the cell drainage header underneath the process cells into a 10,000-gal-capacity collection vessel, TK-10-1. Solution in TK-10-1 is transferred to the low-level waste concentration system or to the tank farms, depending on the content. Decontamination waste solutions generated in the process cells of the WESF are also routed into the 221-B Building via tank TK-39-1. Chemical solutions used for the various types of nonroutine decontamination efforts include:

- Citric acid
- Turco*-decon 4518/4512/4502
- Oxalic acid
- Nitric acid
- Scale-cleen**
- Phosphoric acid

*Turco is a trademark of the TP Industrial, Inc., Lakewood, California.

**Scale-cleen is a trademark of W. R. Grace and Co., New York, New York.

- ND-150*
- Trisodium phosphate.

The following chemicals are used in auxiliary systems that could become feed streams to the concentrator. None of the chemicals in the list that follows are routinely discharged:

- Sodium nitrate
- Sodium carbonate
- Hydroxyacetic acid
- Dearborn**-874
- Diethylene-glycol-monobutyl-ether (light-water foam).

2.2.2 221-B Chemical Sewer Drainage

This source includes steam condensate generated from ventilation units in the 221-B Building and low-level waste from decontamination work in the service and operating section of the 221-B Building. Waste from this source is routed through a 6-in. chemical sewer drain line located in the electrical gallery and runs the length of the 221-B Building. The solution drained through this header can be routed directly to TK-10-1. From TK-10-1, the solution can be sent to either the low-level waste concentrator or to the double-shell storage tanks. In the unlikely event that listed materials are introduced into this substream, it would be sent directly to the tank farms and would not contribute to the BCP stream. This decision is based upon process knowledge of the system, analytical sampling data and plant operating procedures. Plans to utilize the existing TK-900 for the collection and batch handling of the contents of the 6-in. chemical sewer header are in the design/procurement phase. Solution in TK-900 would be agitated and sampled. If the laboratory analysis indicated the solution met the radiological and pH limits established for the B Plant Chemical Sewer, the solution would be pumped out into the 15-in. chemical sewer line located north of the 221-B Building, otherwise the solution would be pumped to a designated tank in Cell 9 or Cell 10.

2.2.3 Vessel Ventilation

Normal steam condensate from the vessel ventilation (VV) #1 steam jet system is discharged into TK-24-1. The steam is used for the VV #1 steam jet as the motive fluid for providing ventilation through process vessels serviced by VV #1.

The ventilation exhaust from process vessels serviced by the VV #2 system is passed through an ammonia scrubber tower in Cell 22 of the 221-B Building. Water is used as the scrub solution for the gases flowing

*ND-150 is a trademark of NCH Corporation.

**Dearborn is a trademark of Grace Dearborn, Hackettstown, New Jersey.

through the ammonia scrubber tower and collects in TK-22-1. The solution in TK-22-1 is recirculated into the tower and any excess solution is pumped into TK-24-1 for processing in the low-level waste concentrator.

2.2.4 Header 114

In the current configuration, steam condensate from the VV #1 and VV #2 system heaters for the 221-B Building is routed to TK-24-1 via header 114 in the 221-B Building, for processing through the low-level waste concentrator. Steam/raw water from various process vessel cooling-heating coils--where the potential for leakage of process solution into the coils is high--are also routed to TK-24-1 through header 114.

2.2.5 Chemical Addition

As discussed previously, all the feeds to the low-level waste concentrator are essentially radioactively contaminated water with the exception of those chemicals used for occasional, nonroutine equipment decontamination. When the feeds are received in TK-24-1, technical-grade sodium hydroxide (NaOH) is added as a process chemical to adjust the solution pH to greater than 9.5. This is the only significant routine process chemical addition to the BCP feed stream.

2.3 PROCESS DESCRIPTION

2.3.1 Background

The functions of the waste concentration processes are (1) the collection, blending, and neutralization of the wastes; (2) volume reduction of the wastes (typically by a factor of 10 to 20); and (3) disposal of the concentrated wastes to underground storage at the tank farms. During operation of the low-level waste concentrator, feed solution pumped into the E-23-3 Evaporator from TK-24-1 is supplied at a rate of 25 to 30 gal/min. This occurs during steady-state operations.

As a result of the concentration process, three streams are generated and disposed of outside of B Plant; these are concentrated waste (CW), BCP, and BCS. The CW is discharged to the underground storage tanks at the tank farms. This report characterizes the BCP liquid effluent.

The DOE has established limits to ensure that all state and Federal requirements for liquid effluents discharged to the environment are met. The policy of DOE is to reduce or eliminate releases of dangerous waste to the environment and to maintain contamination levels as low as reasonably achievable (ALARA) (WHC 1989b). Sampling and recycling, if needed, of the BCP stream is performed by B Plant to meet the previously discussed goals for the BCP.

2.3.2 Description

The low-level radioactive waste concentration system at B Plant consists of a 14,000-gal low-level waste receiver tank (TK-24-1) in Cell 24, the low-level waste concentrator and waste concentrator receiver tank (TK-23-1) in Cell 23, and concentrated waste receiver tanks in Cell 25. The low-level waste concentrator comprises three distinct units: (1) the E-23-3 Evaporator, (2) the D-23-2 Deentrainer, and (3) the E-23-4 Condenser (see Figure 2-3).

During operation of the waste concentrator system, the low-level liquid waste collected in the receiver tank, TK-24-1, is mixed by two motorized agitators mounted on the tank. The solution pH is adjusted to 9.5 or greater, by the addition of 19M sodium hydroxide, to provide better pressure control in the E-23-3 Evaporator and thus improve separation of water from the waste solutions. This becomes the feed solution to the E-23-3 Evaporator. The feed solution is pumped from TK-24-1 into the E-23-3 Evaporator at a rate of 25 to 30 gal/min during steady-state operations (Figure 2-4).

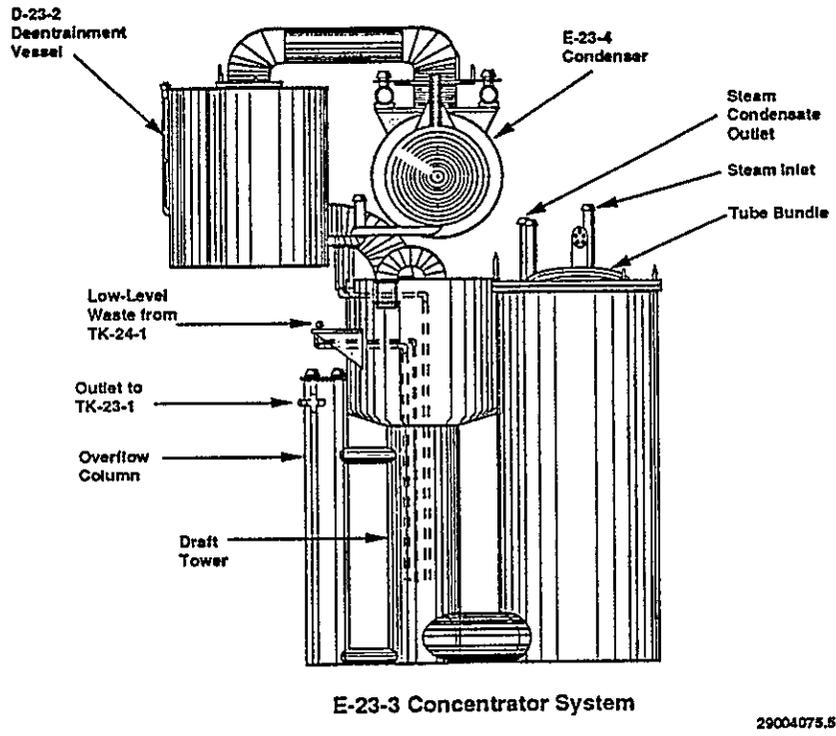
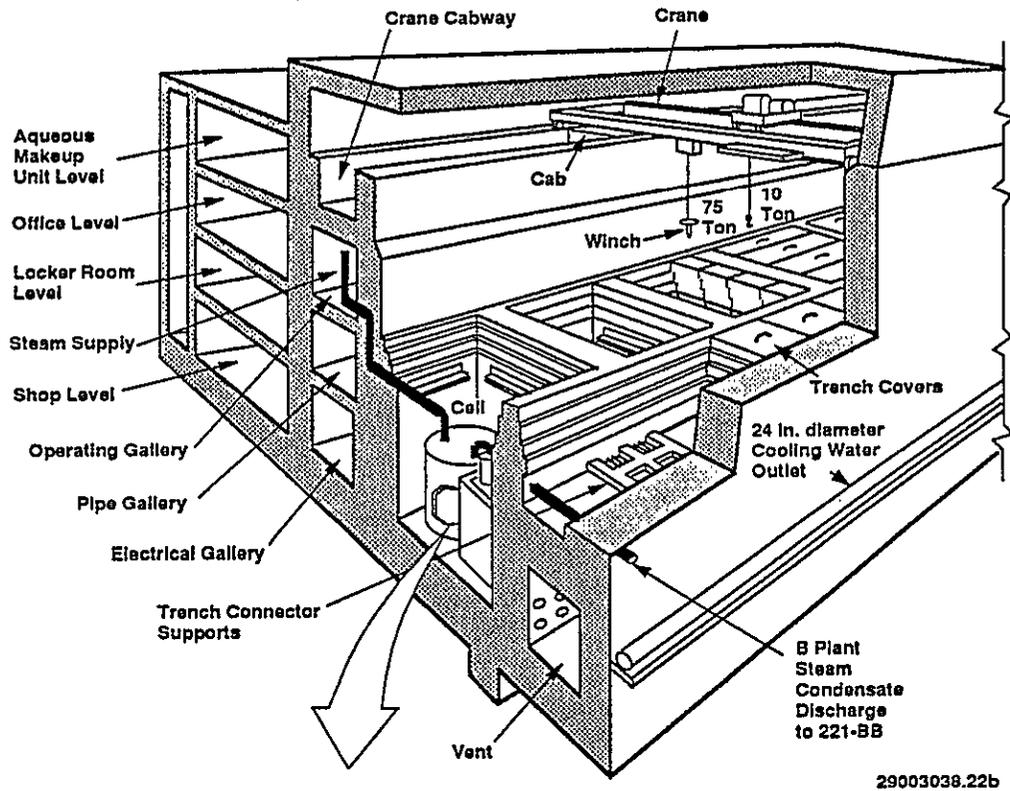
The E-23-3 Evaporator is a vertical, single-pass, shell-tube, thermal-recirculated, and steam-heated evaporator. The evaporator has two removable stainless steel tube bundles in which steam flowing through the shell side evaporates the water from the waste solution in the tube side. Steam is introduced to each tube bundle at 20 lb/in² (gage) at a rate of 6,000 to 8,000 lb/h. Water in the waste solution (BCP) passing through the tube bundles is evaporated at a rate of 25 to 30 gal/min. The BCS from the tube bundles is discharged to the 216-B-55 Crib (Figure 2-4).

A draft tower is situated between the tube bundles. The liquid, induced by boiling, circulates down the draft tower and back into the tube bundle section. An overflow column, located next to the draft tower, collects the CW and gravity drains into the CW receiver tank, TK-23-1. Equipment for measuring the liquid volume and specific gravity of the solution in the E-23-3 Evaporator is located in the overflow column.

The CW collected in TK-23-1 is transferred by a steam jet into the CW collection tanks in Cell 25. The CW is then transferred to underground storage in the tank farms (Figure 2-4).

The liquid is evaporated from E-23-3 Evaporator and is passed through the D-23-2 Deentrainer vessel, located above the E-23-3 Evaporator. The deentrainer is designed to reduce the concentration of contaminants in the evaporator feed by a factor of 1 E+07 by removing entrained liquid in the vapor overhead. Deentrainment of the liquid is accomplished by two demister pads and fogger spray nozzles installed in the D-23-2 Deentrainer. Both pads are made of knitted wire mesh. The upper pad also consists of multifilament stainless steel yarn fiber co-knitted with stainless steel wire. The pressure drops across the demister pads allow the deentrainer vessel to collect most of the liquid that escapes from the evaporator. Demineralized water pressurized to 400 lb/in² (gage) and heated to 210 °F is pumped at a rate of 5 gal/min to the fogger nozzles. The fogger nozzles

Figure 2-3. The B Plant Schematic and the E-23-3 Low-Level Waste Concentrator.



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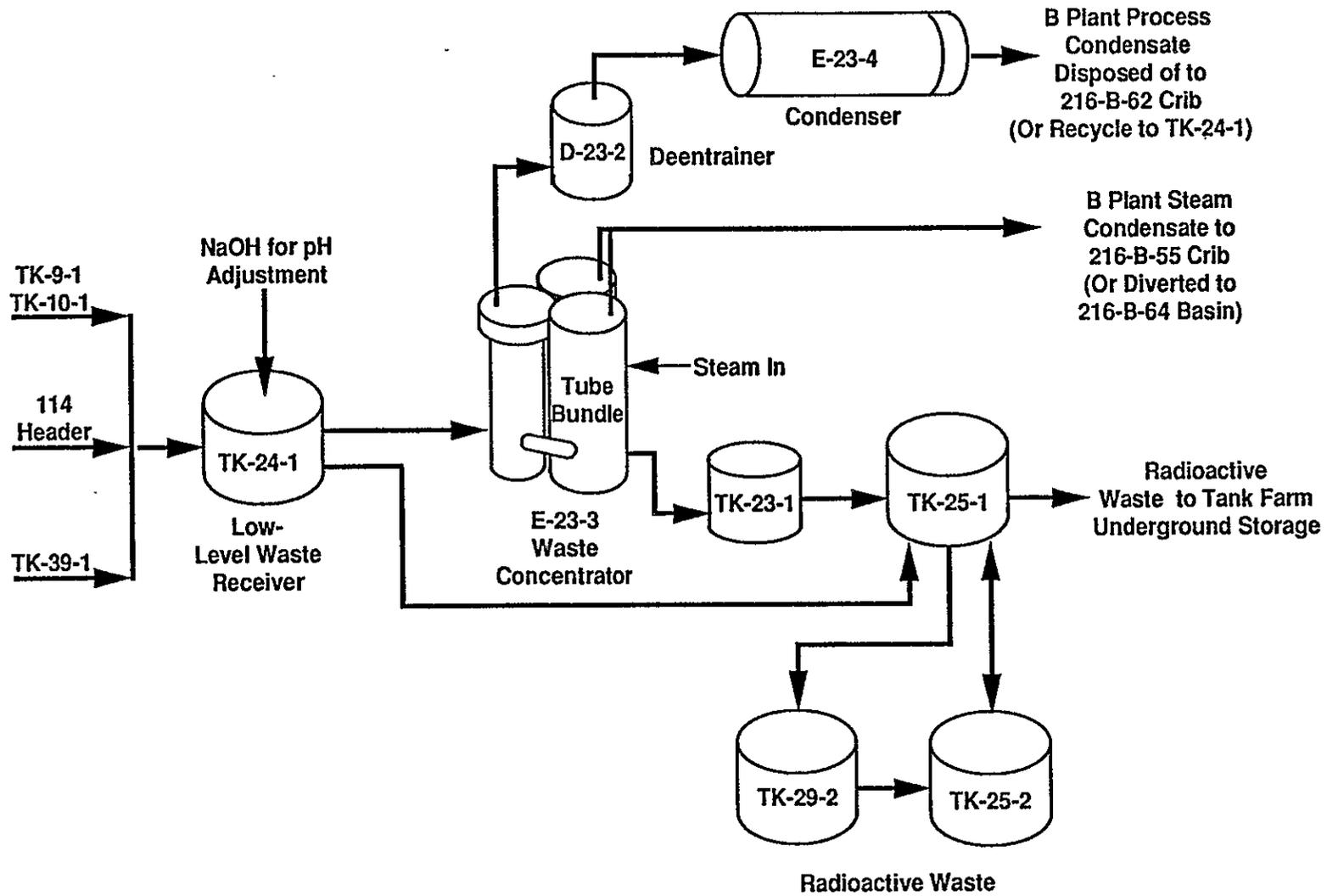


Figure 2-4. B Plant Process Condensate Flow Diagram.

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atomize the demineralized water to produce a mist "fog" between the two demister pads. This "fog" aids in agglomeration of the entrained liquid that pass through the first pad. The larger agglomerated liquid droplets that come in contact with the second pad then become deentrained from the vapor. The deentrained liquid drains back into the E-23-3 Evaporator.

The process vapor passing through the deentrainer is then condensed in the E-23-4 Condenser. The condenser is a single-pass countercurrent unit with raw water as the low temperature medium. The raw water from the condenser is discharged out to 216-B-3 Pond, also known as B Pond. (Characterization of this stream is covered in Addendum 22, B Plant Cooling Water.)

The liquid process condensate leaving the condenser (known as the BCP) is gravity drained into one of two 13,000-gal holding tanks in the 221-BF Building via the 600-gal weir tank in the 221-BB Building. Two gamma radiation monitors are installed for the BCP stream to detect gross gamma radiation and are mounted external to the stream. One is located adjacent to the BCP header at a point between the 221-B Building and the 600-gal tank in the 221-BB Building and the other monitor is adjacent to the 600-gal condensate receiver tank in the 221-BB Building. Each of these monitors are connected to the Facility/Process Monitor and Control System that in turn is occupied by plant operations personnel on an around-the-clock basis. If high levels of radiation are detected, the BCP stream is pumped from the 600-gal tank in the 221-BB Building and recycled to tank TK-24-1 (Figure 2-5). Based on laboratory analysis of the radionuclide sample, either of the 221-BF batch tanks can also be recycled back to TK-24-1.

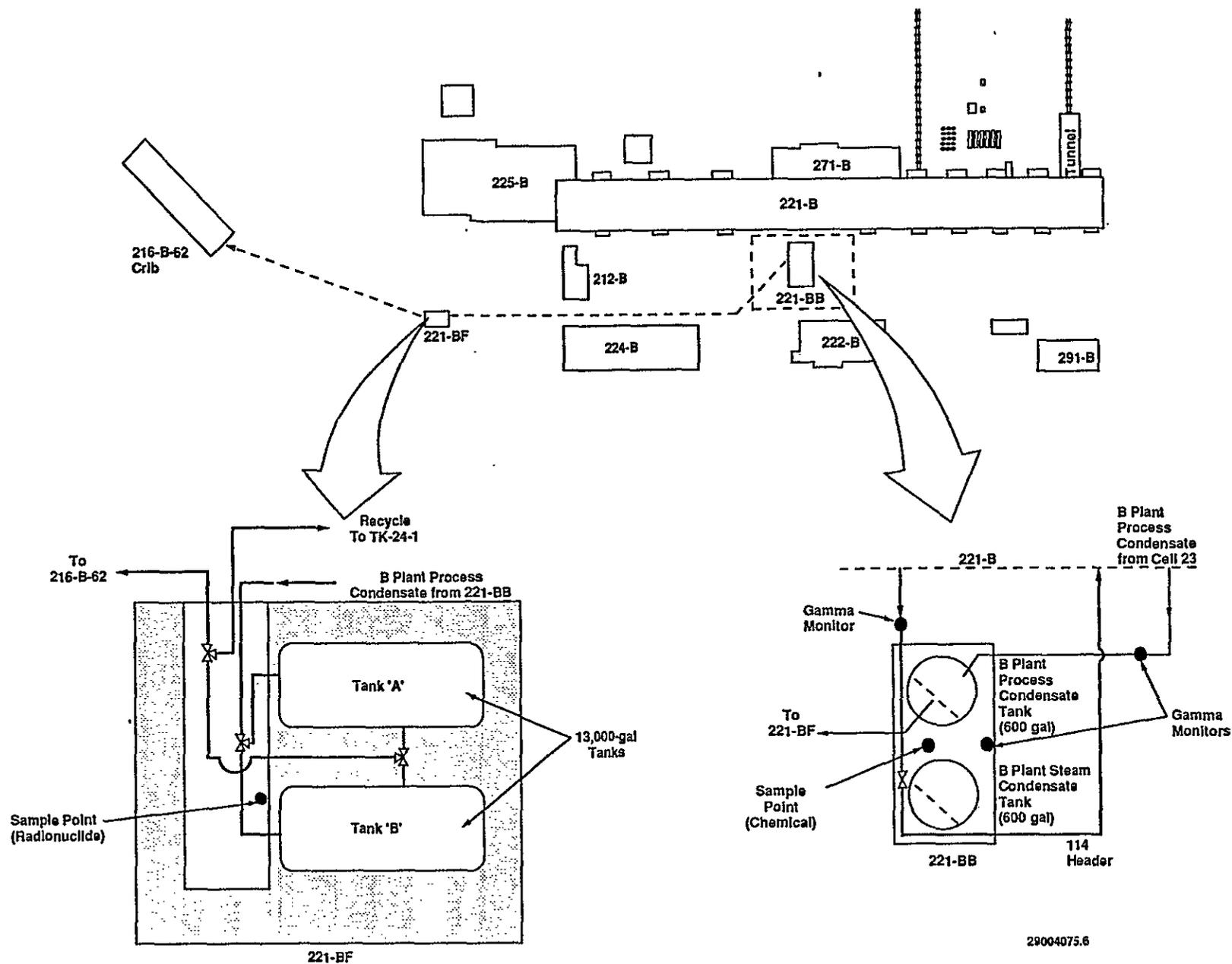
The BCP is agitated in the holding tanks in the 221-BF Building to ensure the BCP samples taken for laboratory analysis are representative of the solution in the tank. Batch sampling, analysis, and emptying of one tank occurs as the other is filling. If laboratory analysis shows the BCP is below set discharge limits for radionuclides and within pH limits listed in WHC-CM-7-5, *Environmental Compliance Manual* (WHC 1988a), the BCP is pumped to the 216-B-62 Crib, located west of B Plant. If out-of-tolerance levels of contaminants are detected in the laboratory analyses of the BCP samples taken from the holding tanks in the 221-BF Building, the BCP is pumped back to TK-24-1 for further processing through the waste concentrator (Figure 2-5).

2.3.3 Present Activities

This section covers the period between October 1989 and March 1990.

The B Plant is currently operating in a maintenance outage in preparation for the treatment of selected double-shell tank wastes and wastestreams to accomplish the separation into high-level, transuranic, and low-level waste fractions. This processing will be in preparation for disposal as either a vitrified or cementitious waste form. The BCP stream is currently inactive and no discharges of this stream to the 216-B-62 Crib (soil column) have occurred.

Figure 2-5. B Plant Process Condensate Disposal Routes.



2.3.4 Past Activities

This section covers the period before October 1989.

A number of missions have been performed at B Plant since its construction in 1943. The first mission was the recovery of plutonium using a bismuth phosphate chemical separation process. The process was used from April 1945 to October 1952. The B Plant was shut down after the Plutonium-Uranium Extraction (PUREX) Plant came online. In 1968, B Plant was modified to begin its second mission--the recovery, purification, and encapsulation of cesium and strontium from wastes received from the tank farms. These campaigns ended in 1983 and 1984 for cesium and strontium purification, respectively.

In August 1985, high radioactive steam condensate BCS activity was detected in excess of the discharge limits. An investigation found the source to be from crossties between the Cell 23 concentrator process condensate (BCP) stream and BCS lines in the 221-BB Building. Contamination from the BCP was carried over to the BCS by these crossties. As a result of the investigation, the BCP system was isolated from the BCS system. This diversion of header 114 from the BCS stream eliminated the crosstie between the BCS and BCP.

An equipment and instrumentation upgrade to the waste concentrator system was completed in April 1988 to improve the radiological decontamination of the BCP stream. Since these upgrades were installed, over 500,000 gal of flush water have been processed through the low-level waste concentration system to ensure that residuals from previous processing have been removed from the system. This flush was disposed of in underground storage at the tank farms. This flushing significantly exceeds a triple rinse of the system (total capacity less than 30,000 gal).

A cesium dechlorination campaign to retrieve encapsulated cesium product was started in October 1985 and was completed in December 1985. After completion of this last campaign, B Plant remained in operation through 1986 for the cleanout of various process vessels at B Plant and WESF. Low-level wastes generated from these missions were processed through the waste concentrator system.

After completion of the upgrades and vessel cleanout activities, sample analysis indicated that the BCP stream meets the radiological requirements for discharging into the 216-B-62 Crib.

B Plant has received no double-shell tank waste since April 24, 1986. In addition, no double-shell tank wastes have been processed through the low-level waste concentrator since late 1986; however, some NCAW solutions have been stored within the facility.

2.3.5 Future Activities

This section covers the period after March 1990.

B Plant's mission is the treatment of selected double-shell tank wastes and wastestreams to accomplish the separation into high-level, transuranic, and low-level waste fractions. This processing with the low-level waste concentrator will be in preparation for disposal as either a vitrified or cementitious waste form.

A 15 million dollar project is under design to install the best available technology (BAT) for the BCP stream. The BCP Treatment Facility, also known as the proposed 221-BH Building, will provide for further removal of ionic contaminants from the BCP. Under Project W-007H, which is associated with Tri-Party Agreement milestone M-17-00, the 221-BB and 221-BF Buildings will no longer be used to collect and sample the BCP stream. Instead, the BCP stream exiting the condenser will flow into a new pump pit building where it will be transferred to the BCP Treatment Facility. The BCP Treatment Facility will contain ion exchange columns that will remove the cation and anion constituents in the BCP stream. The BCP stream will then be collected in 20,000-gal holding tanks for sampling before discharge.

A design for the installation of an online beta and gamma monitoring system in the 221-BB Building has been completed. However, with Project W-007H eliminating the use of the 221-BB Building, the installation of these monitors in the 221-BB Building may not be required. The incorporation of this monitoring design for use in Project W-007H should be considered.

When B Plant's new mission is initiated, the BCP stream will be a listed stream because it will derive from a listed stream (double-shell tank waste).

3.0 SAMPLE DATA

This section provides an evaluation of the sampling data pertaining to the BCP wastewater.

3.1 DATA SOURCE

Two sources of sampling data were used in this analysis: the wastestream data (chemical and radiological) and the feed source data. All of the raw sampling data for the BCP stream, before October 1989, are contained in Appendix B of this report.

The 200 East Area raw water chemical data were utilized as comparative feed source data against the BCP stream data for the following reasons: (1) the intense radiation field present at the feed source (TK-24-1) of the BCP stream, (2) the inability of the contract laboratory to handle a highly radioactive feed source sample, and (3) the fact that water utilized in all facets of plant operation originates from the Columbia River.

The sampling scheme took representative samples by following the *Test Methods for Evaluating Solid Wastes*, SW-846, (EPA 1986a) sampling and analytical protocol. This protocol requires that a sufficient number of samples be taken in a random manner over a period of time sufficient to characterize variability or uniformity of the stream. This was done by taking grab samples in 221-BB and 221-BF Building on a partitioned time random basis. The sampling was randomized by splitting each workday of the month to be sampled into two 4-h periods and selecting one of these time periods by using a random-number generator. All samples were taken to the contract laboratory for analysis. The details of the sampling, analytical, quality control, and quality assurance procedures utilized are contained in Volume 4 of the *Waste Stream Characterization Report* (WHC 1989a).

3.2 DATA PRESENTATION

The analytical methods run on the corresponding samples are identified in Table 3-1.

3.2.1 Wastestream Data

The wastestream data set is composed of two samples taken at the sampling point indicated on Figure 2-5 in the 221-BB Building. The dates these samples were taken and the sample identification number are listed in Appendix B of this report. These two samples were taken after completion of the Cell 23 concentrator upgrades (see Section 2.0) and reflect performance improvements of the concentrator. Statistical wastestream data for the BCP are contained in Table 3-2 of this report and consists solely of data from January 1987 to October 1989.

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Table 3-1. Analytical Methods for the B Plant Process Condensate.

LEAD# CofC#	50026 50026	50065 50065	50131 50131	50484 50484	50520 50520
ABN	X	X	X	X	X
Alpha	X	X	X	X	X
Beta	X	X	X	X	X
COND-F1d	X	X	X	X	X
CVAA	X	X	X	X	X
DIMS	X	X	X	X	X
GEA	X	X	X	X	X
GFAA-Pb				X	X
IC	X	X	X	X	X
ICP	X	X	X	X	X
ISE-F				X	X
ISE-NH3	X	X	X	X	X
LTOX				X	X
PH-F1d	X	X	X	X	X
SPEC-CN	X	X	X	X	X
SPEC-HN	X	X	X	X	X
TEMP-F1d		X	X	X	X
TITRA-S	X	X	X	X	X
TOC	X	X	X	X	X
TOX	X	X	X		
VOA	X	X	X	X	X
LEAD# CofC#		50065B 50066	50131B 50132	50484B 50485	50520B 50521
VOA		X	X	X	X

Notes:

LEAD# is the Liquid Effluent Analytical Data that appear in the data reports. CofC# is the chain of custody number.

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Table 3-2. B Plant Process Condensate Chemical
Data Summary (Postupgrade).

Constituent	N	MDA Method	Mean	StdErr	90%CILim	Maximum
Calcium	2	1 DL	6.92E+03	6.88E+03	2.81E+04	1.38E+04
Iron	2	1 DL	4.75E+01	1.75E+01	1.01E+02	6.50E+01
Lead	2	0 n/a	1.45E+01	5.00E-01	1.60E+01	1.50E+01
Magnesium	2	1 DL	2.43E+02	1.93E+02	8.37E+02	4.36E+02
Manganese	2	1 DL	7.00E+00	2.00E+00	1.32E+01	9.00E+00
Mercury	2	0 n/a	8.40E+00	1.10E+00	1.18E+01	9.50E+00
Nitrate	2	1 DL	9.00E+02	4.00E+02	2.13E+03	1.30E+03
Zinc	2	0 n/a	8.20E+01	7.60E+01	3.16E+02	1.58E+02
Acetone	2	0 n/a	2.92E+02	2.25E+01	3.62E+02	3.15E+02
Ammonia	2	0 n/a	1.25E+03	1.20E+02	1.62E+03	1.37E+03
2-Butanone	2	1 DL	2.70E+01	1.70E+01	7.93E+01	4.40E+01
Decane	1	0 n/a	2.00E+01	n/a	n/a	2.00E+01
Heneicosane	1	0 n/a	3.20E+01	n/a	n/a	3.20E+01
2-Hexanone	2	0 n/a	9.00E+00	3.00E+00	1.82E+01	1.20E+01
Unknown	2	0 n/a	2.80E+01	6.00E+00	4.65E+01	3.40E+01
Unknown aliphatic HC	2	0 n/a	9.10E+01	5.70E+01	2.66E+02	1.48E+02
Alpha Activity (pCi/L)	2	0 n/a	3.27E+00	6.65E-01	5.31E+00	3.93E+00
Beta Activity (pCi/L)	2	0 n/a	2.43E+04	1.52E+04	7.12E+04	3.95E+04
Conductivity (μ S)	2	0 n/a	2.55E+01	5.00E-01	2.70E+01	2.60E+01
pH (dimensionless)	2	0 n/a	8.86E+00	2.55E-01	9.64E+00	9.11E+00
Temperature ($^{\circ}$ C)	2	0 n/a	2.04E+01	3.30E+00	3.06E+01	2.37E+01
TOC	2	1 DL	1.00E+03	3.00E+02	1.92E+03	1.30E+03

NOTES:

N is equal to the number of test results available.

Mean values, standard errors, confidence interval limits and maxima are in ppb (parts per billion) unless indicated otherwise.

The column headed MDA (Minimum Detectable Amount) is the number of results in each data set below the detection limit.

The column headed Method shows the MDA replacement method used: replacement by the detection limit (DL), replacement of single-valued MDAs by the log-normal plotting position method (LM), or replacement of multiple valued MDAs by the normal plotting position method (MR).

The column headed "90%CILim" (90% Confidence Interval Limit) is the lower limit of the one-tailed 90% confidence interval for all ignitability data sets and pH data sets with mean values below 7.25. For all other data sets it is the upper limit of the one-tailed 90% confidence interval.

The column headed "Maximum" is the minimum value in the data set for ignitability, the value furthest from 7.25 for pH, and the maximum value for all other analytes.

For the BCP stream, over 40,000 chemical analytes were of interest. The bulk of these analytes were compiled from the combined mass spectral library's of the EPA, the National Institute of Occupational Safety and Health, and the National Bureau of Standards. This library was composed of approximately 40,000 chemical constituents, each with a unique signature on gas chromatography/mass spectrometer analysis.

3.2.2 Radiological Data

The data presented in Table 3-3 consist of 222-S Laboratory analysis for concentrations of radiological constituents in the BCP samples taken after the upgrades to the low-level waste concentration system were completed in April 1988. These samples were taken from July 25, 1988, through September 12, 1988, at the sample point indicated on Figure 2-5 in the 221-BF Building. Table 3-3 compares the total alpha, total beta, and specific radionuclides detected by the 222-S Laboratory and the contract laboratory, in the BCP stream with the Derived Concentration Guides and the maximum contaminant levels proposed by the EPA for drinking water standards.

The specific nuclide discharge limits are, as identified in the *Environmental Compliance Manual* (WHC 1988a), controlled and limited for the BCP stream to interim concentration values. Table 3-4 compares the same data as Table 3-3 but with the interim control values in place of the DCG.

Table 3-4 shows that concentrations of beta-emitting radionuclides in the BCP, after completion of the upgrades, are below the radiological limits for the BCP stream defined by the *Environmental Compliance Manual* (WHC 1988a).

3.2.3 Raw Water Feed Data

This section contains information about 200 East area raw and sanitary data. For the BCS report, only 200 East area raw water was used as a background reference source (see Table 3-4).

The 200 Areas are the major consumers of water delivered via the Export Water System. This system includes the buildings, pumps, valve houses, reservoirs, and distribution piping that deliver water from the Columbia River to the 200 Areas. The river water is pumped into a 25-Mgal 182-B reservoir for initial settling. The water is then transferred from 182-B to the individual 3-Mgal 200 Area reservoirs for secondary settling. A backup capacity exists in 100D Area. The raw water is then pumped directly to the raw water distribution piping and to the 283 Water Treatment Plants for sanitary water.

Currently, approximately 9-Mgal of both raw and sanitary water are used in the 200 East Area every 24 h. About one-half that amount (or 4.5 Mgal) are used in the 200 West Area. For both areas, raw water usage exceeds the sanitary water usage by a factor of 5 to 1. One-tenth of the sanitary water is used to produce steam.

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Table 3-3. Comparison of Radionuclide Sample Data to Various Guideline Criteria (pCi/L; ratios are dimensionless).

Analyte	Sample result ^a	DCG ^b	DCG ratio	MCL ^c	MCL ratio
Data from Operations Contractor Laboratory ^d					
Alpha	475.0	30	15.8	15	31.7
Beta	62,100.0	1,000	62.1	50	1,242.0
⁹⁰ Sr	25,100.0	1,000	25.1	50	502.0
¹³⁷ Cs	2,960.0	3,000	1.0	100	29.6
Data from Contract Laboratory ^d					
Alpha	3.27	30	0.1	15	0.2
Beta	24,300	1,000	24.2	50	484.0

^aSample results given are averages.

^bDCGs are Derived Concentration Guides used for relating concentrations of radionuclides to a human dose of 100 mrem/yr. The values for total alpha and total beta were developed for Hanford in WHC-EP-0052 (WHC 1988b) and conservatively assume, respectively, all ²³⁹Pu and all ⁹⁰Sr.

^cMCLs are maximum contaminant levels proposed by the EPA for drinking water standards designed to yield a human dose of <4 mrem/yr. (Note that differences in the models used account for the nonlinear relationship between DCGs and MCLs.) The MCL for alpha is from 40 CFR 141.15; the balance, proposed MCLs are from the *Federal Register*, Vol. 51, No. 189, September 30, 1986, ". . . Radionuclides; Advanced Notice of Proposed Rulemaking."

^dPostupgrade data.

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Table 3-4. Comparison of Radionuclide Sample Data to Various Guideline Criteria (pCi/L; ratios are dimensionless).

Analyte	Sample result ^a	ICV ^b	ICV ratio	MCL ^c	MCL ratio
Data from Operations Contractor Laboratory ^d					
Alpha	475.0	NA	--	15	31.7
Beta	62,100.0	NA	--	50	1,242.0
⁹⁰ Sr	25,100.0	100,000	0.25	50	502.0
¹³⁷ Cs	2,960.0	30,000	0.10	100	29.6
Data from Contract Laboratory ^d					
Alpha	3.27	--	--	15	0.22
Beta	24,300	--	--	50	484.0

^aSample results given are averages from contract laboratory data.

^bICVs are Interim Concentration Values for specific radionuclides contained in specific wastestreams. The values for total alpha and total beta were developed for Hanford in WHC-EP-0052 (WHC 1988b).

^cMCLs are maximum contaminant levels proposed by the EPA for drinking water standards designed to yield a human dose of <4 mrem/yr. (Note that differences in the models used account for the nonlinear relationship between DCGs and MCLs.) The MCL for alpha is from 40 CFR 141.15; the balance, proposed MCLs are from the Federal Register, Vol. 51, No. 189, September 30, 1986, ". . .Radionuclides; Advanced Notice of Proposed Rulemaking."

^dPostupgrade data.

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Table 3-5. Summary of 200 East Area Raw Water and Sanitary Water Data (1985-1988).

Constituent/Parameter [all ppb, exceptions noted]	Raw Water ^a (1986-1987)			Sanitary Water ^b (1985-1988)		
	N ^c	AVG	STD DEV	N	AVG	STD DEV
Arsenic				4	<5.00E+00	NA
Barium	5	2.80E+01	3.40E+00	4	*1.05E+02	1.00E+01
Cadmium	5	2.40E+00	8.94E-01	4	<5.00E-01	NA
Calcium	5	1.84E+04	1.47E+03			
Chromium				4	<1.00E+01	NA
Chloride	5	8.71E+02	2.37E+02	4	3.05E+03	6.76E+02
Conductivity-field (μS)	5	9.32E+01	4.61E+01			
Copper	5	1.06E+01	1.34E+00	4	*2.50E+01	1.00E+01
Color (units)				4	<5.00E+00	NA
Iron	5	6.36E+01	2.57E+01	4	*8.25E+01	5.19E+01
Fluoride				4	*1.13E+02	2.50E+01
Lead				4	<5.00E+00	NA
Magnesium	5	4.19E+03	4.83E+02			
Manganese	5	9.80E+00	3.49E+00	4	<1.00E+01	NA
Mercury				4	<5.00E-01	NA
Nickel	5	1.04E+01	8.94E-01			
Nitrate (as N)	5	9.96E+02	8.79E+02	4	*3.72E+02	5.44E+02
pH (dimensionless)	5	7.41E+00	1.18E+00			
Potassium	5	7.95E+02	6.24E+01			
Selenium				4	<5.00E+00	NA
Silver				4	<1.00E+01	NA
Sodium	5	2.26E+03	2.42E+02	4	2.28E+03	1.26E+02
Sulfate	5	1.06E+04	9.97E+02	4	1.68E+04	3.37E+03
Temperature-field (C)	5	1.64E+01	5.84E+00			
TOC (μg/g)	5	1.36E+03	2.53E+02			
TDS (mg/L)				4	8.10E+01	1.69E+01
Trichloromethane	5	1.18E+01	4.02E+00			
Uranium	4	7.26E-01	2.22E-01			
Zinc	5	2.00E+01	2.12E+01	4	<1.00E+02	NA
Radionuclides (pCi/L)						
Alpha Activity	4	8.85E-01	5.30E-01			
Beta Activity	4	4.47E+00	1.76E+00			

NOTES: Averages denoted by an asterisk include a mix of above- and below-detection limit in computations when the actual values are below the detection limit.

See companion table for inorganic detection limits as compiled from Hanford Environmental Health Foundation.

^aCompiled from "Substance Toxicity Evaluation of Waste Data Base," provided by F. M. Jungfleisch (this data is an update of the data presented in WHC 1988b, Preliminary Evaluation of Hanford Liquid Discharges to Ground, Westinghouse Hanford Company, Richland, Washington.

^bCompiled from HEHF 1986, Hanford Sanitary Water Quality Surveillance, CY 1985, HEHF-55, Hanford Environmental Health Foundation, Environmental Health Sciences, April 1986, and HEHF-59; HEHF-71; and HEHF-74 (corresponding reports for CY 1986, 1987, and 1988).

^cN is defined as the number of test results available for a particular analyte. N may reflect both single and multiple data sets.

ppb = parts per billion.

pCi/L = picoCuries/liter.

TOC = total organic carbon.

TOX = total organic halides.

TDS = Total Dissolved Solids.

μS = microsiemen.

μg = microgram.

4.0 DATA OVERVIEW

This section presents a comparison of the process knowledge from Section 2.0 with the sampling data from Section 3.0.

4.1 DATA COMPARISON

There are many different types of feed, collected in tank TK-24-1 and used in the E-23-3 Concentrator. Process knowledge from Section 2.0 explains that because of the intense feed sample radiation, analysis for trace organic impurities in the feed tank (TK-24-1) have not been performed. Because a characterization of the feed source for the BCP stream is not possible and because it is difficult to estimate the feed stream composition based on process knowledge, raw water was used as a background feed source for this stream.

Table 4-1 provides a comparison of average constituent concentrations to various screening criteria. These criteria are not used here for compliance purposes.

4.2 STREAM DEPOSITION RATES

Table 4-2 has been included to provide deposition rates using the average data from Appendix B adjusted according to flow data from Section 2.0.

The deposition rates provided in Table 4-2 are considered to be potential loadings because the BCP stream has been recycled from January 1987 to October 1989 (i.e., the same period that includes the two sample data). This table should be used only as an indication of what magnitudes could be discharged by the BCP stream to a disposal site. Future loading rates will be based on actual flowrates under new missions and resampling activities identified in Section 6.1 or other sampling activities.

Table 4-1. Evaluation of B Plant Process Condensate.

Constituent	Result ^a	SV1 ^b	SV2 ^c
Iron	4.8E-02	3.0E-01 h	
Lead	1.5E-02	5.0E-02 g	
Manganese	7.0E-03	5.0E-02 h	
Mercury	8.4E-03	2.0E-03 g *	
Nitrate	9.0E-01	4.5E+01 e	
Zinc	8.2E-02	5.0E+00 h	
Alpha Activity (pCi/L) ⁿ	6.7E-01	1.5E+01 g	3.0E+01
Beta Activity (pCi/L)	2.4E+04		1.0E+03 *

Notes:

^aUnits of results are mg/L unless indicated otherwise. The results are the mean values reported in the Statistics table of Chapter 3.

^bScreening Value 1 (SV1) lists the value first, basis second and an asterisk (*) third if the result exceeds the regulatory value. The basis is the proposed primary MCL (e), the proposed secondary MCL (f), the primary MCL (g), or the secondary MCL (h). The value is the smaller of two MCLs: the proposed primary MCL (or the primary MCL as a default) or the proposed secondary MCL (or the secondary MCL as a default). See WHC-EP-0342, "Hanford Site Stream-Specific Reports", August 1990.

^cScreening Value 2 (SV2) lists the value first and an asterisk (*) second if the result exceeds the SV2). These values are derived concentration guides obtained from Appendix A of WHC-CM-7-5, "Environmental Compliance Manual", Revision 1, January 1990.

ⁿThe SV1 and SV2 values for Gross Alpha are used to evaluate Alpha Activity.

^oThe SV2 for Gross Beta is used to evaluate Beta Activity.

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Table 4-2. Deposition Rate for B Plant Process Condensate.
 Flow Rate: 3.58 E+04 L/mo

Constituent	Kg/L*	Kg/mo*
Calcium	6.92E-06	2.48E-01
Iron	4.75E-08	1.70E-03
Lead	1.45E-08	5.19E-04
Magnesium	2.43E-07	8.69E-03
Manganese	7.00E-09	2.50E-04
Mercury	8.40E-09	3.00E-04
Nitrate	9.00E-07	3.22E-02
Zinc	8.20E-08	2.93E-03
Acetone	2.92E-07	1.04E-02
Ammonia	1.25E-06	4.47E-02
2-Butanone	2.70E-08	9.66E-04
Decane	2.00E-08	7.15E-04
Heneicosane	3.20E-08	1.14E-03
2-Hexanone	9.00E-09	3.22E-04
Unknown	2.80E-08	1.00E-03
Unknown aliphatic HC	9.10E-08	3.25E-03
Alpha Activity *	3.27E-12	1.17E-07
Beta Activity *	2.43E-08	8.69E-04
TOC	1.00E-06	3.58E-02

Notes:

Data collected during October 1988 and December 1988. Condensate routed to double-shell tanks in 1988. Flowrate is the average of rates from chapter 2. Constituent concentrations are average values from the Statistics Report in chapter 3. Concentration units of flagged (*) constituents are reported as curies per liter. Deposition rate units of flagged (*) constituents are reported as curies per month.

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5.0 DESIGNATION

This section proposes that the BCP stream not be designated at this time. This proposed designation would use data from both the effluent source description and sample data (January 1987 to October 1989) (Sections 2.0 through 4.0) and complies with the designation requirements of WAC 173-303-070 (Ecology 1989).

The procedure for determining whether a waste is a dangerous or extremely hazardous waste is contained in the *Dangerous Waste Regulations* (WAC 173-303-070). This procedure is illustrated in Figure 5-1 and includes the following:

- Dangerous Waste Lists (WAC 173-303-080)
- Dangerous Waste Criteria (WAC 173-303-100)
- Dangerous Waste Characteristics (WAC 173-303-090).

5.1 DANGEROUS WASTE LISTS

A waste is considered a listed dangerous waste if it either contains a discarded chemical product (WAC 173-303-081) or originates from a dangerous waste source (WAC 173-303-082). The proposed designation would be based on a combination of process knowledge and sampling data (from January 1987 to October 1989).

5.1.1 Discarded Chemical Products

A wastestream constituent is a discarded chemical product (WAC 173-303-081) if it is listed in WAC 173-303-9903 and is characterized by one or all of the following descriptions.

- The listed constituent is the sole active ingredient in a commercial chemical product that had been discarded. Commercial chemical products that, as purchased, contained two or more active ingredients that were not designated as discarded chemical products. Products that contained nonactive components such as water, however, were designated if the sole active ingredient in the mixture was listed in WAC 173-303-9903.
- The constituent results from a spill of unused commercial chemical products. (A spill of a discarded chemical product would cause a wastestream to be designated during the time that the discharge is occurring. The approach taken is that the current wastestream would not be designated unless a review of past spill events indicates that the spills are predictable, systematic events that are ongoing or are reasonably anticipated to occur in the future.

In this report, the evaluation of this criterion is based on a review of spill data in accordance with the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA).

- The constituent is discarded in the form of a residue resulting from cleanup of a spill of an unused chemical on the discarded chemical products list. (A chemical product that is used in a process and then released to the wastestream is not a discarded chemical product. Off-specification, unused chemicals, and chemicals that have exceeded a shelf life but have not been used are considered discarded chemical products.)

5.1.2 Dangerous Waste Sources

A list of dangerous waste sources is contained in WAC 173-303-9904, pursuant to WAC 173-303-082. There are two major categories of sources in WAC 173-303-9904. The first is nonspecific sources from routine operations occurring at many industries. The second is specific sources (i.e., wastes from ink formulation, etc.). The third is state sources, which may be limited to polychlorinated biphenyl-contaminated transformers and capacitors resulting from salvaging, rebuilding, or discarding activities.

Of the nonspecific sources, only F001 (specific spent halogenated degreasing solvents), F002 (specific spent halogenated solvents), F003 (specific spent nonhalogenated solvents), and F005 (specific spent nonhalogenated solvents) could apply to the BCP stream.

5.2 LISTED WASTE DATA CONSIDERATIONS

The proposed designation of the wastestream described in this report would be based on an evaluation of process knowledge and sampling data. The following sections describe the types of information used in this designation.

5.2.1 Process Evaluation

The process evaluation began with a thorough review of the processes contributing to the wastestream. Processes were reviewed and compared with the discarded chemical products list and the dangerous waste source list. This process evaluation is necessary because the stream could be a listed waste if a listed waste was known to have been added at any upstream location, even if a listed constituent was not detected at the sample point. The process evaluation included a review of the following information sources:

- Material Safety Data Sheets (MSDS)
- *Superfund Amendments and Reauthorization Act* (SARA) Title III inventory reports

- Operating procedures
- Process chemical inventories
- Physical inspections, where possible.

Additionally, interviews with facility personnel were conducted to determine if there were any procedures or laboratory processes that generated a listed waste that may not have been evident during other portions of the process evaluation.

If a listed chemical was identified, the specific use of the chemical was evaluated to determine if such use resulted in the generation of a listed waste.

5.2.2 Sampling Data

Sampling data were used as screening tools to enhance and support the results of the process evaluation. This screening compared the results of the sampling data with the WAC 173-303-9903 and 9904 lists. If a constituent was cited on one or both of these lists, an engineering evaluation was performed to determine if the constituent had entered the wastestream as a discarded chemical product or came from a dangerous waste source.

Screening organic constituents is a relatively simple procedure because analytical data for organic constituents are reported as substances and are easily compared to the WAC 173-303-9903 and -9904 lists. It is not as simple to screen inorganic analytical data because inorganic data are reported as ions or elements rather than as substances. For example, an analysis may show that a wastestream contains the cations sodium and calcium along with the anions chloride and nitrate. The possible combinations of substances include: sodium chloride, sodium nitrate, calcium chloride, and calcium nitrate. In a situation with many cations and anions, however, the list of possible combinations is extensive.

A procedure was developed for combining the inorganic constituents into substances. This screening procedure is described in WHC-EP-0334 (WHC 1990b) and is intended to be a tool in the evaluation of a wastestream. The listing of the inorganic substances developed by this screening procedure is not intended to be an indication that the substance was discharged to the wastestream, only that the necessary cations and anions are present and an investigation should be conducted to determine how they entered the wastestream.

5.3 PROPOSED LISTED WASTE DESIGNATION

A process evaluation indicated that the BCP stream did not contain a discarded chemical product or a listed waste source. The following sections discuss the evaluation that was conducted for this wastestream.

5.3.1 Discarded Chemical Products

As discussed in Section 5.2, a process evaluation of the contributors to the BCP was conducted. This evaluation included a review of MSDSs and chemical inventories at B Plant compiled for compliance with the SARA Title III chemical inventories for possible listed waste contributors. Of the approximately 500 commercial products used at the B Plant, less than 160 contain ingredients that could affect the designation of the stream based on the listed constituents under WAC 173-303-9903 and -9904.

A thorough review of B Plant, including interviews and inspections, produced evidence that no discharge of any of these chemical products into the BCP stream occurred. A review of plant operating procedures produced evidence to preclude the introduction of any of these chemical products into the BCP stream.

Before 1986, there was a potential for double-shell tank and single-shell tank wastes, some of which have been designated as listed dangerous waste, to enter into the BCP system. Since January 1987, some NCAW solutions have been stored within the facility; however, there has been no waste processed at B Plant, and the system has been flushed with significantly greater than a triple rinse (over 500,000 gal of flush water which was not released to the crib). In addition, an extensive system upgrade was completed in April 1988 (see Section 2.0).

Mercury, acetone, and 2-butanone (methyl ethyl ketone) were the only potential discarded chemical products identified from the sampling data taken between January 1987 and October 1989 (using the screening procedure described in Section 5.2). Two of these three compounds were identified as being present in B Plant during the process evaluation.

5.3.1.1 Acetone. Acetone (U002) is used by maintenance and operations as a solvent to remove impurities such as adhesive and grease from various surfaces. Because of the potential of fire hazards, the use of acetone is tightly controlled to limit the amount of material present. Locations where acetone may be used for these applications are physically separated by walls and access controls from the BCP source stream. Acetone is not used as a process chemical or an active ingredient in any process chemical. Interviews with personnel in maintenance and operations and reviews of the procedures in place for disposal of spent chemicals in these areas provided no evidence that acetone had been disposed of as the sole active ingredient in an unused or out-of-specification chemical product.

Acetone appeared in both of the samples taken between January 1987 and October 1989 at an average concentration of 292 ppb. A thorough review of B Plant, including conversations with maintenance and operating supervisors, found no possible source for this chemical product to enter the BCP stream. Physical barriers and plant procedures preclude its introduction as a discarded chemical product into the BCP stream.

A possible mechanism for acetone to be present in the BCP could be as a degradation product from the biocides used to treat the air washer water or vapors from degradation of residual solvent extraction solutions in canyon tanks, which are feeds to the low-level waste concentrator.

5.3.1.2 2-Butanone (Methyl Ethyl Ketone). 2-Butanone (U159) is not a constituent in any of the products in the potential MSDS inventory (see Appendix A), but does exist in the chemical makeup of some paint supplies used in general plant housekeeping. These paint supplies, remotely stored in the 2716-B Building "Painter's Shack" and located near B Plant, are tightly controlled to limit the amount of material present. Interviews with personnel in these areas and reviews of the procedures in place for disposal of spent chemicals in this area provided no evidence that acetone had been disposed of as the sole active ingredient in an unused or out-of-specification chemical product.

2-Butanone appeared in one of two samples of the wastewater stream at a concentration of 44 ppb. The rejection criteria for 2-butanone based on blank analysis is less than 59 ppb as presented in Section 5.2 of WHC-EP-0342. As the concentration seen in this sample is less than the rejection criteria, this data will not be considered in the designation of the wastestream as it is likely that 2-butanone is present in these wastestream samples because of sample contamination. A thorough review of B Plant, including conversations with maintenance and operations personnel, found no possible source for this spent solvent to enter the BCP stream. Physical barriers and plant procedures preclude its introduction into the BCP stream. With no identified source, 2-butanone is not considered to be a discarded chemical product in the BCP stream.

5.3.1.3 Mercury. Mercury (U151) was detected in both of the samples at 9.5 ppb and 7.3 ppb. At the concentrations seen in these samples, it is likely that mercury is present in the wastestream because of impurities in the sodium hydroxide. The sodium hydroxide used as a process chemical in the BCP stream (Section 2.0) is a technical-grade chemical. In the past, this was normally produced in mercury cells. It is therefore reasonable to expect that low levels of mercury would be present in the sodium hydroxide from these mercury cells.

Based on the considerations and data presented in the previous sections, it is concluded that the wastestream does not contain any discarded chemical products.

5.3.2 Dangerous Waste Sources

The process evaluation (see Section 5.2) was also used to determine if the wastestream included any specific waste sources (K and W wastes) or any nonspecific waste sources (F wastes) listed in WAC 173-303-9904 (Ecology 1989).

As discussed in Section 2.0, the BCP system was upgraded by improving the deentrainer to reduce the amount of radioactive waste carried over by the BCP stream. This affects the characterization; however, because some material is carried over, no change in the listed waste designations occur. Even with the improved decontamination factor associated with the deentrainer upgrades (Section 2.3.3), the BCP stream is a slightly radioactive stream because of material carryover.

Sampling data were utilized to enhance the process evaluation. Two potential listed solvents were identified by the sampling data; these are acetone and 2-butanone. Both of these chemicals appear on B Plant chemical inventories.

5.3.2.1 Acetone. The concentrations of acetone seen in BCP stream samples are discussed in Section 5.3.1.1.

Acetone is used in B Plant as described in Section 5.3.1.1. Interviews with personnel involved in the operations discussed in Section 5.3.1.1 and reviews of the procedures in place for the disposal of spent acetone provided no evidence that acetone had been disposed of as a waste solvent via the BCP stream from B Plant maintenance or operation activities.

5.3.2.2 2-Butanone (Methyl Ethyl Ketone). The concentrations of 2-butanone seen in BCP stream samples are discussed in Section 5.3.1.2.

2-Butanone is used in B Plant as described in Section 5.3.1.2. Interviews with personnel involved in the operations discussed in Section 5.3.1.2 and reviews of the procedures in place for the disposal of spent 2-butanone provided no evidence that 2-butanone has been disposed of as a waste solvent via the BCP steam from B Plant maintenance for operation activities.

As discussed in Section 5.3.1.2, it is concluded that 2-butanone was present in BCP samples as the result of sample contamination.

Based upon the discussion and data presented, it is concluded that the BCP stream cannot be designated at this time. The data available for the BCP stream is part of the pre-October 1989 sample set. Due to validation concerns with this sample set, it was not possible to confirm the existence, presence, or source of suspected analytes. Additional sampling will be controlled to assure these concerns are overcome (see Section 6.0). No activities involving the disposal of listed discarded chemical products or spent solvents from B Plant contribute to the designation of this wastestream. See Section 6.0 for a plan to characterize and designate the stream.

5.4 DANGEROUS WASTE CRITERIA

A waste is considered a dangerous waste if it meets any of the following criteria categories (WAC 173-303-100): toxic dangerous waste, persistent dangerous waste, or carcinogenic dangerous waste. A description of the

methods used to test the sampling data against the criteria is contained in WHC (1990b). Summaries of the methods, along with the results, are contained in the following sections (see Table 5-1).

Table 5-2 documents how ion analytes were assigned to neutral substances that are required for designation. The table accounts for charge balancing the ion assemblage (from Table 3-2 [statistical summary]) and the subsequent formulation of neutral substances. A detailed discussion can be found in *Wastestream Designations of the Liquid Analytical Data*, WHC-EP-0334 (WHC 1990b).

5.4.1 Toxic Dangerous Wastes

The procedure for determining if a wastestream is a toxic dangerous waste is as follows (WAC 173-303-101).

- Collect and analyze multiple samples from the wastestream.
- Calculate the upper limit of the one-sided 90%CI for each analyte in the wastestream.
- Formulate substances from the analytical data. NOTE: This step is only required for inorganic analytes because it is not possible to complete the evaluation based on the concentrations of cations and anions. This methodology is described in WHC (1990b) and is based on an evaluation of the most toxic substances that can exist in an aqueous environment under normal temperatures and pressures.
- Assign toxic categories to the substances formulated for the wastestream.
- Calculate the contribution of each substance to the percent equivalent concentration (EC%).
- Calculate the EC% by summing the contribution of each substance.
- Designate the wastestream as a toxic dangerous waste if the EC% sum is greater than 0.001%, per WAC 173-303-9906.

There are over 500 chemical products present in B Plant. Nine of these substances were found in samples and are listed in Table 5-1 along with their toxic categories. This includes the individual and sum equivalent concentration percent values for these substances. Because the equivalent concentration is 2.46 E-06%, which is less than the limit of 0.001%, the wastestream is not a toxic dangerous waste.

Finding: Undesignated

Discarded Chemical Products - WAC 173-303-081

Substance	Review Number	Status	DW Number
Mercury	U151(EHW)	Not Discarded	Undesignated
Acetone	U002(DW)	Not Discarded	Undesignated
2-Butanone	U159(DW)	Not Discarded	Undesignated

Dangerous Waste Sources - WAC 173-303-082

Substance	Review Number	Status	DW Number
Acetone	F003	Unlisted Source	Undesignated
2-Butanone	F005	Unlisted Source	Undesignated

Infectious Dangerous Waste - WAC 173-303-083

No regulatory guidance

Dangerous Waste Mixtures - WAC 173-303-084

Substance	Toxic	Persistant		Carcinogenic
	EC%	HH%	PAH%	Total%
Calcium nitrate	4.73E-07	0.00E+00	0.00E+00	0.00E+00
Lead nitrate	2.56E-08	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	5.42E-08	0.00E+00	0.00E+00	0.00E+00
Mercury(II) nitrate	1.91E-07	0.00E+00	0.00E+00	0.00E+00
Zinc nitrate	9.15E-08	0.00E+00	0.00E+00	0.00E+00
Acetone	3.62E-09	0.00E+00	0.00E+00	0.00E+00
Ammonia	1.62E-06	0.00E+00	0.00E+00	0.00E+00
2-Butanone	7.93E-10	0.00E+00	0.00E+00	0.00E+00
2-Hexanone	1.82E-10	0.00E+00	0.00E+00	0.00E+00
Total	2.46E-06	0.00E+00	0.00E+00	0.00E+00
DW Number	Undesignated	Undesignated	Undesignated	Undesignated

Dangerous Waste Characteristics - WAC 173-303-090

Characteristic	Value	DW Number
Ignitables % (Calc.)	4.79E-05	Undesignated
Corrosivity-pH	9.64	Undesignated
Total Cyanide (mg/kg)	0.00E+00	Undesignated
Total Sulfide (mg/kg)	0.00E+00	Undesignated
Total Lead (mg/L)	1.60E-02	Undesignated
Total Mercury (mg/L)	1.18E-02	Undesignated

Dangerous Waste Criteria - WAC 173-303-100

Substance	Toxic	Persistant		Carcinogenic	DW Number-Positive
	EC%	HH%	PAH%	Total%	
Calcium nitrate	4.73E-07	0.00E+00	0.00E+00	0.00E+00	
Lead nitrate	2.56E-08	0.00E+00	0.00E+00	0.00E+00	
Magnesium nitrate	5.42E-08	0.00E+00	0.00E+00	0.00E+00	
Mercury(II) nitrate	1.91E-07	0.00E+00	0.00E+00	0.00E+00	
Zinc nitrate	9.15E-08	0.00E+00	0.00E+00	0.00E+00	
Acetone	3.62E-09	0.00E+00	0.00E+00	0.00E+00	
Ammonia	1.62E-06	0.00E+00	0.00E+00	0.00E+00	
2-Butanone	7.93E-10	0.00E+00	0.00E+00	0.00E+00	
2-Hexanone	1.82E-10	0.00E+00	0.00E+00	0.00E+00	
Total	2.46E-06	0.00E+00	0.00E+00	0.00E+00	
DW Number	Undesignated	Undesignated	Undesignated	Undesignated	

Table 5-1. Dangerous Waste Designation Report for B Plant Condensate. (sheet 1 of 2)

WAC-EP-0342 Addendum 17 08/31/90
B Plant Process Condensate

Table 5-1. Dangerous Waste Designation Report
for B Plant Condensate. (sheet 2 of 2)

Dangerous Waste Constituents - WAC 173-303-9905

Substance
 Acetone
 Lead and compounds,NOS
 Mercury and compounds,NOS

Substance names may include MB (monobasic), DB (dibasic), or TB (tribasic) to identify the equivalence of hydrogen ion that have been neutralized from polyprotic weak acids to form their conjugate bases.

Results based on a single datum are noted by an asterisk (*). Others are based on the lower limit of the one-tailed 90% confidence interval for pH data sets with mean values below 7.25 or by the upper limit of the one-tailed 90% confidence interval for all other data sets.

EP Toxic contaminants, ignitability, and reactivity are reported by standard methods when available. In the absence of EP Toxicity data, total contaminant concentrations are evaluated. In lieu of closed cup ignition results, ignitability is estimated from the sum of the contributions of all substances that are ignitable when pure. A waste is flagged as dangerous if sum of the ignitable substances exceeds one percent. Reactivity is by SW-846: 250 mg of cyanide as hydrogen cyanide per kg of waste or 500 mg of sulfide as hydrogen sulfide per kg of waste. Total cyanide and total sulfide are used in lieu of amenable cyanide and amenable sulfide.

Inorganic substances are formulated and their possible concentrations calculated for designation purposes only. The actual existence in the waste of these substances is not implied and should not be inferred.

Table 5-2. Inorganic Chemistry for B Plant Process Condensate.
 (sheet 1 of 2)

Charge normalization: Constituent	ppb	Ion	Eq/g	Normalized
Calcium	2.81E+04	Ca+2	1.40E-06	
Iron	1.01E+02	Fe+3	5.44E-09	
Lead	1.60E+01	Pb+2	1.55E-10	
Magnesium	8.37E+02	Mg+2	6.89E-08	
Manganese	1.32E+01	Mn+2	4.79E-10	
Mercury	1.18E+01	Hg+2	1.18E-10	
Nitrate	2.13E+03	NO3-1	3.44E-08	6.55E-07
Zinc	3.16E+02	Zn+2	9.66E-09	
Hydrogen Ion (from pH 9.6)		H+	(2.29E-13)	
Hydroxide Ion (from pH)		OH-	(4.36E-08)	
Cation total			1.49E-06	
Anion total			7.80E-08	
Anion normalization factor: 19.051				

Substance Formation: Substance	%	Cation Out	Anion Out
Mercury(II) nitrate	1.91E-06	0.00E+00	6.55E-07
Lead nitrate	2.56E-06	0.00E+00	6.55E-07
Zinc nitrate	9.15E-05	0.00E+00	6.45E-07
Magnesium nitrate	5.42E-04	0.00E+00	5.76E-07
Calcium nitrate	4.73E-03	8.25E-07	0.00E+00

Notes:

Statistics based on a single datum are noted by an asterisk (*). With the exception of hydrogen ion and hydroxide, others report the upper limit of the one-tailed 90% confidence interval. Hydrogen ion is based on the lower limit of the one-tailed 90% confidence interval for pH sets with mean values below 7.25 and on the upper limit of the one-tailed 90% confidence interval for pH data sets with mean values of 7.25 or higher. The hydroxide magnitude is equal to $1.00E-20$ (Eq/g)**2 divided by the hydrogen ion value (in Eq/g).

Ion concentrations in equivalents per gram (Eq/g) are based on the statistic. Conversions include scale (ppb to g/g), molecular weight (constituent form to ionic form), and equivalents (charges per ion). The column headed "Normalized" shows normalized concentrations (also in Eq/g) calculated by increasing concentrations of cations, excluding Hydrogen ion, or anions, excluding hydroxide, by the normalization factor. The normalization factor is the larger of the cation total, including Hydrogen ion, or anion total, including hydroxide, divided by the smaller total.

Table 5-2. Inorganic Chemistry for B Plant Process Condensate.
(sheet 2 of 2)

Substance names may include MB (monobasic), DB (dibasic), TB (tribasic) to identify the equivalents of hydrogen ion that have been neutralized from polycrotic weak acids to form their conjugate bases.

Substances are formulated in the order listed. The column headed "%" is the percent of the substance in the waste (gms/100gms). Substances formulated with oxygen are based on the residual concentration of the counterion. Other substance concentrations are based on the limiting residual concentration of the cation or anion. The columns headed "Cation Out" and "Anion Out" indicate the residual concentrations (in Eq/g) of each ion after a substance concentration has been calculated.

0
1
6
1
5
7
1
1
1
1
6

5.4.2 Persistent Dangerous Wastes

The procedure for determining if a wastestream is a persistent dangerous waste is as follows (WAC 173-303-102) (Ecology 1989).

- Collect multiple grab samples of the wastestream.
- Determine which substances in the wastestream are halogenated hydrocarbons (HH) and which are polycyclic aromatic hydrocarbons (PAH).
- Determine the upper limit of the one-sided 90%CI for the analytes of interest.
- Calculate the weight percent (wt%) concentration for HH% and PAH%, separately.
- Sum the resulting weight percent contributors to HH% and PAH% separately.
- Designate the wastestream as persistent if the HH% concentration is greater than 0.01% or if the PAH% is greater than 1.0%, per WAC 173-303-9907.

No chemical compounds present in the BCP stream were determined to be HH or PAH. Because none are present, the BCP stream is not a persistent dangerous waste.

5.4.3 Carcinogenic Dangerous Wastes

The procedure for determining if a wastestream is a carcinogenic dangerous waste is as follows (WAC 173-303-103).

- Collect multiple grab samples of the wastestream.
- Determine the upper limit of the one-sided 90%CI for the analytes of interest.
- Formulate neutral substances from the analytical data. NOTE: This step is only required for inorganic analytes because it is not possible to complete the evaluation based on the concentrations of cations and anions. This methodology is described in WHC (1990b) and is based on an evaluation of the most carcinogenic substances that can exist in an aqueous environment under normal temperatures and pressures.
- Determine which substances in the wastestream are human or animal carcinogenic according to the International Agency for Research on Cancer (IARC).

- Calculate the weight percent (wt%) concentration for each carcinogen.
- Sum the resulting weight percent contributors.
- Designate the wastestream as carcinogenic if any of the positive carcinogens are above 0.01% or if the total concentration for positive and suspected (human or animal) carcinogens is above 1.0%.

No substances present in the BCP stream were determined to be carcinogenic chemical compounds. Because none are present, the BCP stream is not a carcinogenic dangerous waste.

5.5 DANGEROUS WASTE CHARACTERISTICS

A waste is considered a dangerous waste if it is ignitable, corrosive, reactive, or extraction procedure (EP) toxic (WAC 173-303-090). A description of the methods used to evaluate the data in terms of these characteristics is contained in WHC (1990b). Summaries of the methods, along with the results, are contained in the following sections.

5.5.1 Ignitability

One or more ignitable substance is potentially present in the BCP stream. The value of the index calculated from this constituent is 4.79×10^{-5} which is below 1%. Therefore, the BCP stream is not an ignitable waste.

5.5.2 Corrosivity

The comparison to this characteristic was based on the lower limit of the one-sided 90%CI for a stream with a mean value of pH < 7.25 and the upper limit of the one-sided 90%CI for a stream with a mean value of pH > 7.25 .

A waste is a corrosive dangerous waste if it has a pH of ≤ 2.0 or ≥ 12.5 . Because the 90%CI of the pH for the BCP is 9.64, the BCP stream is not a corrosive dangerous waste (WAC 173-303-090(6)).

5.5.3 Reactivity

An aqueous waste is reactive if the waste contains an amount of cyanide or sulfide that, under modified conditions, could threaten human health or the environment (WAC 173-303-090(7)). A recent revision to *Test Methods for Evaluating Solid Wastes* (SW-846) (EPA 1986a) provides a more quantitative indicator levels for cyanide and sulfide. It states that levels of (equivalent) cyanide as hydrogen cyanide below 250 mg/kg or of (equivalent) sulfide as hydrogen sulfide below 500 mg/kg would not be considered reactive.

Total sulfide and total cyanide were undetected in the BCP stream. The equivalent concentrations are 0 mg/kg for cyanide (as hydrogen cyanide) and 0 mg/kg for sulfide (as hydrogen sulfide). This wastestream is not a reactive dangerous waste.

5.5.4 Extraction Procedure Toxicity

A waste is an extraction procedure (EP) toxic dangerous waste if contaminant results from EP toxicity testing exceed the limits of WAC 173-303-090(8)(c). In the absence of specific EP toxicity test results, total analyte concentrations are used. Three analytes with concentrations above detection limits are on the EP toxic list and were found in the BCP stream. The concentrations of these three analytes (barium, lead, and mercury) are listed in Table 5-1. Because the lead concentration, 0.0160 mg/L, does not exceed the limit of 5 mg/L, and the mercury concentration, 0.0118 mg/L, does not exceed the limit of 0.2 mg/L, the BCP stream is not an EP toxic dangerous waste.

5.6 PROPOSED DESIGNATIONS

The BCP stream does not have sample data complete enough to designate at this time, as defined in WAC 173-303-070. It is proposed that the wastestream not be designated until qualified sample data exists including a determination of source for each positive analyte. This designation will be accomplished when the BCP stream is resampled following optimization and again before the initiation of B Plant's new mission.

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6.0 ACTION PLAN

This section addresses recommendations for future waste characterization tasks for the liquid effluents that are within the scope of the *Liquid Effluent Study Characterization Data* (WHC 1990c). The final extent of and schedule for any recommended tasks are subject to negotiation between Ecology, the EPA, and DOE. An implementation schedule for the completion of these tasks will give consideration to other compliance actions already under way as part of the Tri-Party Agreement (Ecology et al. 1989), and on the availability of funding. All effluent monitoring and sampling will be conducted according to DOE Order 5400.1 (DOE 1988).

6.1 FUTURE SAMPLING

The random sampling conducted during the October 27, 1988, and December 29, 1988, period covered the process in the current configuration. The system has not been optimized yet. The feed to the system will change when new missions begin as discussed in Section 2.3.5.

The BCP will be resampled after the system is optimized. In addition, more sampling should be done after the start of B Plant's new mission as explained in Section 2.3.5.

6.2 TECHNICAL ISSUES

As described in Section 2.0, the BCP stream was sampled at the 221-BB and 221-BF Buildings (see Figure 2-5). These sample points were chosen because they are common, accessible locations downstream of all the contributing wastestreams.

The samples collected at this point are considered to be representative of the types of constituents present in the contributing wastestream during routine operation. However, because of validation concerns on the existing data, more sampling must be performed to accomplish a designation for the BCP wastestream.

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APPENDIX A
PROCESS INFORMATION

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Table A-1. Potential Chemicals.

Chemical	Hazardous Constituents	Hanford MSDS Number
Citric acid	None listed	1136
Hydroxyacetic acid	Sodium salt	2790
Dearborn ^a -874	Potassium hydroxide (45%)	10766
Nitric acid	Nitric acid	1384C
Scale-cleen ^d	Sulfuric acid (95%)	12183
Phosphoric acid	Phosphorus oxides	1428
ND-150	1. Sodium metasilicate 2. Ethylene glycol monobutyl 3. Ether	11702
Sodium nitrate	Sodium nitrate	1506
Sodium carbonate	None listed	1473
Trisodium phosphate	None listed	1585
Light water foam	Diethylene-glycol- monobutyl-ether	B25
Turco ^b -decon 4518	Oxalic acid (90%)	12559
Turco ^b -decon 4512	Phosphoric Acid 56%	12558
Turco ^b -decon 4502	Potassium hydroxide (77%) Potassium chromate (3%) Potassium permanganate (20%)	12557
Oxalic acid	None listed	Not available
Sodium hydroxide	Sodium hydroxide (100%)	1497B
ARC 9359	Phenol-formaldehyde resin ^c	20607

^aDearborn is a trademark of W. R. Grace and Co., Lake Zurich, Illinois.

^bTurco is a trademark of the TP Industrial, Inc., Lakewood, California.

^cPotential source for phenol because of degradation of the resin.

^dScale-cleen is a trademark of W. R. Grace and Co., New York, New York.

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APPENDIX B

SAMPLING DATA FOR B PLANT PROCESS CONDENSATE

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Table B-1. Data for the Period January 1987 to October 1989
(Data for B Plant Process Condensate). (sheet 1 of 3)

Constituent	Sample #	Date	Method	Result
Calcium	50484	10/27/88	ICP	1.38E+04
Calcium	50520	12/29/88	ICP	<5.00E+01
Iron	50484	10/27/88	ICP	6.50E+01
Iron	50520	12/29/88	ICP	<3.00E+01
Lead	50484	10/27/88	GFAA	1.50E+01
Lead	50520	12/29/88	GFAA	1.40E+01
Magnesium	50484	10/27/88	ICP	4.36E+02
Magnesium	50520	12/29/88	ICP	<5.00E+01
Manganese	50484	10/27/88	ICP	9.00E+00
Manganese	50520	12/29/88	ICP	<5.00E+00
Mercury	50484	10/27/88	CVAA	9.50E+00
Mercury	50520	12/29/88	CVAA	7.30E+00
Nitrate	50484	10/27/88	IC	<5.00E+02
Nitrate	50520	12/29/88	IC	1.30E+03
Zinc	50484	10/27/88	ICP	1.58E+02
Zinc	50520	12/29/88	ICP	6.00E+00
Acetone	50484	10/27/88	VOA	2.70E+02
Acetone	50520	12/29/88	VOA	3.15E+02
Acetone	50520B	12/29/88	VOA	7.00E+00
Ammonia	50484	10/27/88	ISE	1.37E+03
Ammonia	50520	12/29/88	ISE	1.13E+03
2-Butanone	50484	10/27/88	VOA	4.40E+01
2-Butanone	50484B	10/27/88	VOA	<1.00E+01
2-Butanone	50520	12/29/88	VOA	<1.00E+01
2-Butanone	50520B	12/29/88	VOA	<1.00E+01
Decane	50484	10/27/88	ABN	2.00E+01
Heneicosane	50484	10/27/88	ABN	3.20E+01
2-Hexanone	50484	10/27/88	VOA	1.20E+01
2-Hexanone	50520	12/29/88	VOA	6.00E+00
Unknown	50484	10/27/88	ABN	3.40E+01
Unknown	50520	12/29/88	ABN	2.20E+01
Unknown aliphatic HC	50484	10/27/88	ABN	3.40E+01
Unknown aliphatic HC	50520	12/29/88	ABN	1.48E+02
Alpha Activity (pCi/L)	50484	10/27/88	Alpha	2.60E+00
Alpha Activity (pCi/L)	50520	12/29/88	Alpha	3.93E+00
Beta Activity (pCi/L)	50484	10/27/88	Beta	3.95E+04
Beta Activity (pCi/L)	50520	12/29/88	Beta	9.01E+03
Conductivity (μS)	50484	10/27/88	COND-Fld	2.60E+01
Conductivity (μS)	50520	12/29/88	COND-Fld	2.50E+01
pH (dimensionless)	50484	10/27/88	PH-Fld	8.60E+00
pH (dimensionless)	50520	12/29/88	PH-Fld	9.11E+00
Temperature (°C)	50484	10/27/88	TEMP-Fld	2.37E+01
Temperature (°C)	50520	12/29/88	TEMP-Fld	1.71E+01
TOC	50484	10/27/88	TOC	1.30E+03
TOC	50520	12/29/88	TOC	<7.00E+02

Table B-1. Data for the Period January 1987 to October 1989
 (Data for B Plant Process Condensate). (sheet 2 of 3)

NOTES:

Sample# is the number of the sample. See chapter three for corresponding chain-of-custody number. Date is the sampling date. Results are in ppb (parts per billion) unless otherwise indicated.

The following table lists the methods that are coded in the method column.

Code	Analytical Method	Reference
ABN	Semivolatle Organics (GC/MS)	USEPA-8270
AEA	²⁴¹ Am	UST-20Am01
AEA	Curium Isotopes	UST-20Am/Cm01
AEA	Plutonium Isotopes	UST-20Pu01
AEA	Uranium Isotopes	UST-20U01
ALPHA	Alpha Counting	EPA-680/4-75/1
ALPHA-Ra	Total Radium Alpha Counting	ASTM-D2460
BETA	Beta Counting	EPA-680/4-75/1
BETA	⁹⁰ Sr	UST-20Sr02
COLIF	Coliform Bacteria	USEPA-9131
COLIFMF	Coliform Bacteria (Membrane Filter)	USEPA-9132
COND-Fld	Conductivity-Field	ASTM-D1125A
COND-Lab	Conductivity-Laboratory	ASTM-D1125A
CVAA	Mercury	USEPA-7470
CVAA/M	Mercury-Mixed Matrix	USEPA-7470
DIGC	Direct Aqueous Injection (GC)	UST-70DIGC
DIMS	Direct Aqueous Injection (GC/MS)	"USEPA-8240"
DSPEC	Reactive Cyanide (Distillation, Spectroscopy)	USEPA-CHAPTER 7
DTITRA	Reactive Sulfide (Distillation, Titration)	USEPA-CHAPTER 7
FLUOR	Uranium (Fluorometry)	ASTM-D2907-83
GEA	Gamma Energy Analysis Spectroscopy	ASTM-D3649-85
GFAA	Arsenic (AA, Furnace Technique)	USEPA-7060
GFAA	Lead (AA, Furnace Technique)	USEPA-7421
GFAA	Selenium (AA, Furnace Technique)	USEPA-7740
GFAA	Thallium (AA, Furnace Technique)	USEPA-7841
IC	Ion Chromatography	EPA-600/4-84-01
ICP	Atomic Emission Spectroscopy (ICP)	USEPA-6010
ICP/M	Atomic Emission Spectroscopy (ICP)-Mixed Matrix	USEPA-6010
IGNIT	Pensky-Martens Closed-Cup Ignitability	USEPA-1010
ISE	Fluoride-Low Detection Limit	ASTM-D1179-80-B
ISE	Ammonium Ion	ASTM-D1426-D
LALPHA	Alpha Activity-Low Detection Limit	EPA-680/4-75/1
LEPD	¹²⁹ I	UST-20I02
LSC	¹⁴ C	UST-20C01
LSC	Tritium	UST-20H03
LTOX	Total Organic Halides-Low Detection Limit	USEPA-9020
PH-Fld	pH-Field	USEPA-9040
PH-Lab	pH-Laboratory	USEPA-9040

Table B-1. Data for the Period January 1987 to October 1989
(Data for B Plant Process Condensate). (sheet 3 of 3)

Code	Analytical Method	Reference
SPEC	Total and Amenable Cyanide (Spectroscopy)	USEPA-9010
SPEC	Hydrazine-Low Detection Limit (Spectroscopy)	ASTM-D1385
SSOLID	Suspended Solids	SM-208D
TC	Total Carbon	USEPA-9060
TDS	Total Dissolved Solids	SM-208B
TEMP-Fld	Temperature-Field	Local
TITRA	Alkalinity-Method B (Titration)	ASTM-D1067B
TITRA	Sulfides (Titration)	USEPA-9030
TOC	Total Organic Carbon	USEPA-9060
TOX	Total Organic Halides	USEPA-9020
VOA	Volatile Organics (GC/MS)	USEPA-8240

Analytical Method Acronyms:
atomic absorption spectroscopy (AA)
gas chromatography (GC)
mass spectrometry (MS)
inductively-coupled plasma spectroscopy (ICP).

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- EPA - Various methods of the U.S. Environmental Protection Agency, Washington, D.C.
- UST - Methods of the United States Testing Company, Incorporated, Richland, Washington.
- SM - "Standard Methods for the Examination of Water and Wastewater", 16th ed., American Public Health Association, American Water Works Association and Water Pollution Control Federation, Washington, D.C.
- USEPA - "Test Methods for Evaluating Solid Waste Physical/Chemical Methods", 3rd ed., SW-846, U.S. Environmental Protection Agency, Washington, D.C.

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Table B-2. Total Data with Associates Sample Numbers
 (Data for B Plant Process Condensate). (sheet 1 of 5)

Constituent	Sample #	Date	Method	Result
Barium	50026	12/17/85	ICP	8.00E+00
Barium	50065	6/16/86	ICP	<6.00E+00
Barium	50131	9/10/86	ICP	<6.00E+00
Barium	50484	10/27/88	ICP	<6.00E+00
Barium	50520	12/29/88	ICP	<6.00E+00
Calcium	50026	12/17/85	ICP	4.06E+03
Calcium	50065	6/16/86	ICP	1.30E+02
Calcium	50131	9/10/86	ICP	1.15E+02
Calcium	50484	10/27/88	ICP	1.38E+04
Calcium	50520	12/29/88	ICP	<5.00E+01
Iron	50026	12/17/85	ICP	<5.00E+01
Iron	50065	6/16/86	ICP	<5.00E+01
Iron	50131	9/10/86	ICP	<5.00E+01
Iron	50484	10/27/88	ICP	6.50E+01
Iron	50520	12/29/88	ICP	<3.00E+01
Lead	50026	12/17/85	ICP	<3.00E+01
Lead	50484	10/27/88	GFAA	1.50E+01
Lead	50520	12/29/88	GFAA	1.40E+01
Magnesium	50026	12/17/85	ICP	1.29E+03
Magnesium	50131	9/10/86	ICP	<5.00E+01
Magnesium	50484	10/27/88	ICP	4.36E+02
Magnesium	50520	12/29/88	ICP	<5.00E+01
Manganese	50026	12/17/85	ICP	<5.00E+00
Manganese	50065	6/16/86	ICP	<5.00E+00
Manganese	50131	9/10/86	ICP	<5.00E+00
Manganese	50484	10/27/88	ICP	9.00E+00
Manganese	50520	12/29/88	ICP	<5.00E+00
Mercury	50026	12/17/85	CVAA	1.70E+00
Mercury	50065	6/16/86	CVAA	9.60E-01
Mercury	50131	9/10/86	CVAA	4.60E+00
Mercury	50484	10/27/88	CVAA	9.50E+00
Mercury	50520	12/29/88	CVAA	7.30E+00
Nitrate	50026	12/17/85	IC	<5.00E+02
Nitrate	50065	6/16/86	IC	<5.00E+02
Nitrate	50131	9/10/86	IC	6.68E+02
Nitrate	50484	10/27/88	IC	<5.00E+02
Nitrate	50520	12/29/88	IC	1.30E+03
Potassium	50026	12/17/85	ICP	2.85E+02
Potassium	50065	6/16/86	ICP	<1.00E+02
Potassium	50131	9/10/86	ICP	<1.00E+02
Potassium	50484	10/27/88	ICP	<1.00E+02
Potassium	50520	12/29/88	ICP	<1.00E+02
Sodium	50026	12/17/85	ICP	1.01E+03
Sodium	50065	6/16/86	ICP	1.32E+02
Sodium	50131	9/10/86	ICP	6.21E+02

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Table B-2. Total Data with Associates Sample Numbers
 (Data for B Plant Process Condensate). (sheet 2 of 5)

Constituent	Sample #	Date	Method	Result
Sodium	50484	10/27/88	ICP	<2.00E+02
Sodium	50520	12/29/88	ICP	<2.00E+02
Sulfate	50026	12/17/85	IC	2.75E+03
Sulfate	50065	6/16/86	IC	<5.00E+02
Sulfate	50131	9/10/86	IC	<5.00E+02
Sulfate	50484	10/27/88	IC	<5.00E+02
Sulfate	50520	12/29/88	IC	<5.00E+02
Uranium	50026	12/17/85	FLUOR	2.67E-01
Uranium	50065	6/16/86	FLUOR	3.22E-01
Uranium	50131	9/10/86	FLUOR	1.06E+00
Uranium	50484	10/27/88	FLUOR	<1.67E-02
Uranium	50520	12/29/88	FLUOR	<2.68E-02
Zinc	50026	12/17/85	ICP	3.50E+01
Zinc	50065	6/16/86	ICP	3.10E+01
Zinc	50131	9/10/86	ICP	<5.00E+00
Zinc	50484	10/27/88	ICP	1.58E+02
Zinc	50520	12/29/88	ICP	6.00E+00
Acetone	50026	12/17/85	VOA	1.06E+02
Acetone	50065	6/16/86	VOA	4.50E+01
Acetone	50131	9/10/86	VOA	3.00E+02
Acetone	50484	10/27/88	VOA	2.70E+02
Acetone	50520	12/29/88	VOA	3.15E+02
Acetone	50520B	12/29/88	VOA	7.00E+00
Acetophenone	50026	12/17/85	ABN	<1.00E+01
Acetophenone	50065	6/16/86	ABN	2.40E+01
Acetophenone	50131	9/10/86	ABN	3.10E+01
Acetophenone	50484	10/27/88	ABN	<1.00E+01
Acetophenone	50520	12/29/88	ABN	<1.00E+01
Ammonia	50026	12/17/85	ISE	<1.50E+05
Ammonia	50065	6/16/86	ISE	3.35E+03
Ammonia	50131	9/10/86	ISE	2.95E+03
Ammonia	50484	10/27/88	ISE	1.37E+03
Ammonia	50520	12/29/88	ISE	1.13E+03
2-Butanone	50026	12/17/85	VOA	<1.00E+01
2-Butanone	50065	6/16/86	VOA	<1.00E+01
2-Butanone	50065B	6/16/86	VOA	<1.00E+01
2-Butanone	50131	9/10/86	VOA	7.00E+01
2-Butanone	50131B	9/10/86	VOA	<1.00E+01
2-Butanone	50484	10/27/88	VOA	4.40E+01
2-Butanone	50484B	10/27/88	VOA	<1.00E+01
2-Butanone	50520	12/29/88	VOA	<1.00E+01
2-Butanone	50520B	12/29/88	VOA	<1.00E+01
2-Butoxyethanol	50131	9/10/86	ABN	3.20E+01
Decane	50484	10/27/88	ABN	2.00E+01
Dichloromethane	50026	12/17/85	VOA	<1.00E+01
Dichloromethane	50065	6/16/86	VOA	<1.00E+01

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Table B-2. Total Data with Associates Sample Numbers
 (Data for B Plant Process Condensate). (sheet 3 of 5)

Constituent	Sample #	Date	Method	Result
Dichloromethane	50065B	6/16/86	VOA	1.50E+02
Dichloromethane	50131	9/10/86	VOA	<1.00E+01
Dichloromethane	50131B	9/10/86	VOA	1.50E+02
Dichloromethane	50484	10/27/88	VOA	<1.00E+01
Dichloromethane	50484B	10/27/88	VOA	<1.00E+01
Dichloromethane	50520	12/29/88	VOA	<1.00E+01
Dichloromethane	50520B	12/29/88	VOA	<1.00E+01
2,4-Dimethyl-1-decene	50065	6/16/86	ABN	4.00E+01
2-Ethyl-1-hexanol	50065	6/16/86	VOA	2.00E+01
Heneicosane	50484	10/27/88	ABN	3.20E+01
2-Hexanone	50131	9/10/86	VOA	1.50E+01
2-Hexanone	50484	10/27/88	VOA	1.20E+01
2-Hexanone	50520	12/29/88	VOA	6.00E+00
Phenol	50026	12/17/85	ABN	3.60E+01
Phenol	50065	6/16/86	ABN	<1.00E+01
Phenol	50131	9/10/86	ABN	<1.00E+01
Phenol	50484	10/27/88	ABN	<1.00E+01
Phenol	50520	12/29/88	ABN	<1.00E+01
Unknown	50484	10/27/88	ABN	3.40E+01
Unknown	50520	12/29/88	ABN	2.20E+01
Unknown aliphatic HC	50484	10/27/88	ABN	3.40E+01
Unknown aliphatic HC	50520	12/29/88	ABN	1.48E+02
Alpha Activity (pCi/L)	50026	12/17/85	Alpha	1.08E+01
Alpha Activity (pCi/L)	50065	6/16/86	Alpha	6.33E+01
Alpha Activity (pCi/L)	50131	9/10/86	Alpha	1.49E+02
Alpha Activity (pCi/L)	50484	10/27/88	Alpha	2.60E+00
Alpha Activity (pCi/L)	50520	12/29/88	Alpha	3.93E+00
Beta Activity (pCi/L)	50026	12/17/85	Beta	2.31E+06
Beta Activity (pCi/L)	50065	6/16/86	Beta	1.54E+06
Beta Activity (pCi/L)	50131	9/10/86	Beta	5.56E+06
Beta Activity (pCi/L)	50484	10/27/88	Beta	3.95E+04
Beta Activity (pCi/L)	50520	12/29/88	Beta	9.01E+03
Conductivity (μS)	50026	12/17/85	COND-F1d	6.40E+02
Conductivity (μS)	50065	6/16/86	COND-F1d	1.20E+01
Conductivity (μS)	50131	9/10/86	COND-F1d	1.30E+01
Conductivity (μS)	50484	10/27/88	COND-F1d	2.60E+01
Conductivity (μS)	50520	12/29/88	COND-F1d	2.50E+01
pH (dimensionless)	50026	12/17/85	PH-F1d	6.10E+00
pH (dimensionless)	50065	6/16/86	PH-F1d	8.40E+00
pH (dimensionless)	50131	9/10/86	PH-F1d	8.58E+00
pH (dimensionless)	50484	10/27/88	PH-F1d	8.60E+00
pH (dimensionless)	50520	12/29/88	PH-F1d	9.11E+00
Temperature (°C)	50065	6/16/86	TEMP-F1d	3.17E+01
Temperature (°C)	50131	9/10/86	TEMP-F1d	3.74E+01
Temperature (°C)	50484	10/27/88	TEMP-F1d	2.37E+01
Temperature (°C)	50520	12/29/88	TEMP-F1d	1.71E+01

Table B-2. Total Data with Associates Sample Numbers
(Data for B Plant Process Condensate). (sheet 4 of 5)

Constituent	Sample #	Date	Method	Result
TOC	50026	12/17/85	TOC	2.82E+03
TOC	50065	6/16/86	TOC	<3.79E+02
TOC	50131	9/10/86	TOC	1.54E+03
TOC	50484	10/27/88	TOC	1.30E+03
TOC	50520	12/29/88	TOC	<7.00E+02

NOTES:

Sample# is the number of the sample. See chapter three for corresponding chain-of-custody number. Date is the sampling date. Results are in ppb (parts per billion) unless otherwise indicated.

The following table lists the methods that are coded in the method column.

Code	Analytical Method	Reference
ABN	Semivolatile Organics (GC/MS)	USEPA-8270
AEA	²⁴¹ Am	UST-20Am01
AEA	Curium Isotopes	UST-20Am/Cm01
AEA	Plutonium Isotopes	UST-20Pu01
AEA	Uranium Isotopes	UST-20U01
ALPHA	Alpha Counting	EPA-680/4-75/1
ALPHA-Ra	Total Radium Alpha Counting	ASTM-D2460
BETA	Beta Counting	EPA-680/4-75/1
BETA	⁹⁰ Sr	UST-20Sr02
COLIF	Coliform Bacteria	USEPA-9131
COLIFMF	Coliform Bacteria (Membrane Filter)	USEPA-9132
COND-FlD	Conductivity-Field	ASTM-D1125A
COND-Lab	Conductivity-Laboratory	ASTM-D1125A
CVAA	Mercury	USEPA-7470
CVAA/M	Mercury-Mixed Matrix	USEPA-7470
DIGC	Direct Aqueous Injection (GC)	UST-70DIGC
DIMS	Direct Aqueous Injection (GC/MS)	"USEPA-8240"
DSPEC	Reactive Cyanide (Distillation, Spectroscopy)	USEPA-CHAPTER 7
DTITRA	Reactive Sulfide (Distillation, Titration)	USEPA-CHAPTER 7
FLUOR	Uranium (Fluorometry)	ASTM-D2907-83
GEA	Gamma Energy Analysis Spectroscopy	ASTM-D3649-85
GFAA	Arsenic (AA, Furnace Technique)	USEPA-7060
GFAA	Lead (AA, Furnace Technique)	USEPA-7421
GFAA	Selenium (AA, Furnace Technique)	USEPA-7740
GFAA	Thallium (AA, Furnace Technique)	USEPA-7841
IC	Ion Chromatography	EPA-600/4-84-01
ICP	Atomic Emission Spectroscopy (ICP)	USEPA-6010
ICP/M	Atomic Emission Spectroscopy (ICP)-Mixed Matrix	USEPA-6010
IGNIT	Pensky-Martens Closed-Cup Ignitability	USEPA-1010

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Table B-2. Total Data with Associates Sample Numbers
 (Data for B Plant Process Condensate). (sheet 5 of 5)

Code	Analytical Method	Reference
ISE	Fluoride-Low Detection Limit	ASTM-D1179-80-B
ISE	Ammonium Ion	ASTM-D1426-D
LALPHA	Alpha Activity-Low Detection Limit	EPA-680/4-75/1
LEPD	¹²⁹ I	UST-20I02
LSC	¹⁴ C	UST-20C01
LSC	Tritium	UST-20H03
LTOX	Total Organic Halides-Low Detection Limit	USEPA-9020
PH-Fld	pH-Field	USEPA-9040
PH-Lab	pH-Laboratory	USEPA-9040
SPEC	Total and Amenable Cyanide (Spectroscopy)	USEPA-9010
SPEC	Hydrazine-Low Detection Limit (Spectroscopy)	ASTM-D1385
SSOLID	Suspended Solids	SM-208D
TC	Total Carbon	USEPA-9060
TDS	Total Dissolved Solids	SM-208B
TEMP-Fld	Temperature-Field	Local
TITRA	Alkalinity-Method B (Titration)	ASTM-D1067B
TITRA	Sulfides (Titration)	USEPA-9030
TOC	Total Organic Carbon	USEPA-9060
TOX	Total Organic Halides	USEPA-9020
VOA	Volatile Organics (GC/MS)	USEPA-8240

Analytical Method Acronyms:

- atomic absorption spectroscopy (AA)
- gas chromatography (GC)
- mass spectrometry (MS)
- inductively-coupled plasma spectroscopy (ICP)

References:

- ASTM - "1986 Annual Book of ASTM Standards", American Society for Testing and Materials, Philadelphia, Pennsylvania.
- EPA - Various methods of the U.S. Environmental Protection Agency, Washington, D.C.
- UST - Methods of the contract laboratory.
- SM - "Standard Methods for the Examination of Water and Wastewater", 16th ed., American Public Health Association, American Water Works Association and Water Pollution Control Federation, Washington, D.C.
- USEPA - "Test Methods for Evaluating Solid Waste Physical/Chemical Methods", 3rd ed., SW-846, U.S. Environmental Protection Agency, Washington, D.C.