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WHC-EP-0342
Addendum 16

B Plant Steam 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 Steam Condensate Stream-Specific Report

K. A. Peterson

Date Published
August 1990

Prepared for the U.S. Department of Energy
Office of Environmental Restoration
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Westinghouse Hanford Company P.O. Box 1970 Richland, Washington 99352

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B PLANT STEAM CONDENSATE STREAM-SPECIFIC REPORT

K. A. Peterson

ABSTRACT

The proposed wastestream designation for the B Plant Steam Condensate (BCS) wastestream is that this stream is not a dangerous waste, pursuant to the Washington (State) Administration Code (WAC) 173-303, Dangerous Waste Regulations.* *A combination of process knowledge and sampling data was used to make this determination.*

*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 proposed wastestream designation for the B Plant Steam Condensate (BCS) wastewater stream is that the stream is not a dangerous waste pursuant to the Washington (State) Administrative Code (WAC) 173-303, *Dangerous Waste Regulations*.* This proposed designation, based on applying a combination of process knowledge and sample data (before October 1989) for the BCS wastestream, was used to determine if the effluent contains a listed dangerous waste (WAC 173-303-080). Sample data alone, are used to compare to the dangerous waste criteria (WAC 173-303-100) and dangerous waste characteristics (WAC 173-303-090).

For the BCS wastestream, seven samples were collected between December 1985 and December 1988 as the basis for sample data. The stream has had limited operation to allow training for low-level waste concentrator operation. Resampling will occur to address validation concerns raised during the documentation cycle.

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

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LIST OF TERMS

ACL	administrative control limits
ALARA	as low as reasonably achievable
BCP	B Plant Process Condensate
BCS	B Plant Steam Condensate
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CI	confidence interval
conc%	percent concentration
DCG	Derived Concentration Guide
DOE	U.S. Department of Energy
EC%	percent equivalent concentration
Ecology	Washington State Department of Ecology
EP	extraction procedure
EPA	U.S. Environmental Protection Agency
FPMCS	Facility/Process Monitor and Control System
HH	halogenated hydrocarbons
MCL	maximum contaminant level
MSDS	Material Safety Data Sheet
PAH	polycyclic aromatic hydrocarbons
PRV	pressure-reducing valve
PUREX	Plutonium-Uranium Extraction
REDOX	Reduction-Oxidation
SARA	*Superfund Amendments and Reauthorization Act of 1986*
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
WAC	Washington (State) Administrative Code
WESF	Waste Encapsulation and Storage Facility
wt%	weight percent

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B PLANT STEAM 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 from the public were received regarding the reduction of the discharge of liquid effluents into the soil column. As a result, the U.S. Department of Energy (DOE), with 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 the following elements: process data, sampling data, and dangerous waste regulations pursuant to the Washington (State) Administrative Code (WAC) 173-303 (Ecology 1989).

The results of the characterization study are documented in 33 separate reports, one report for each wastestream (see Table 1-1). This document is one of the 33 reports.

1.2 APPROACH

This report characterizes the B Plant Steam Condensate (BCS) wastestream 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 of treatment/alternative disposal practices.

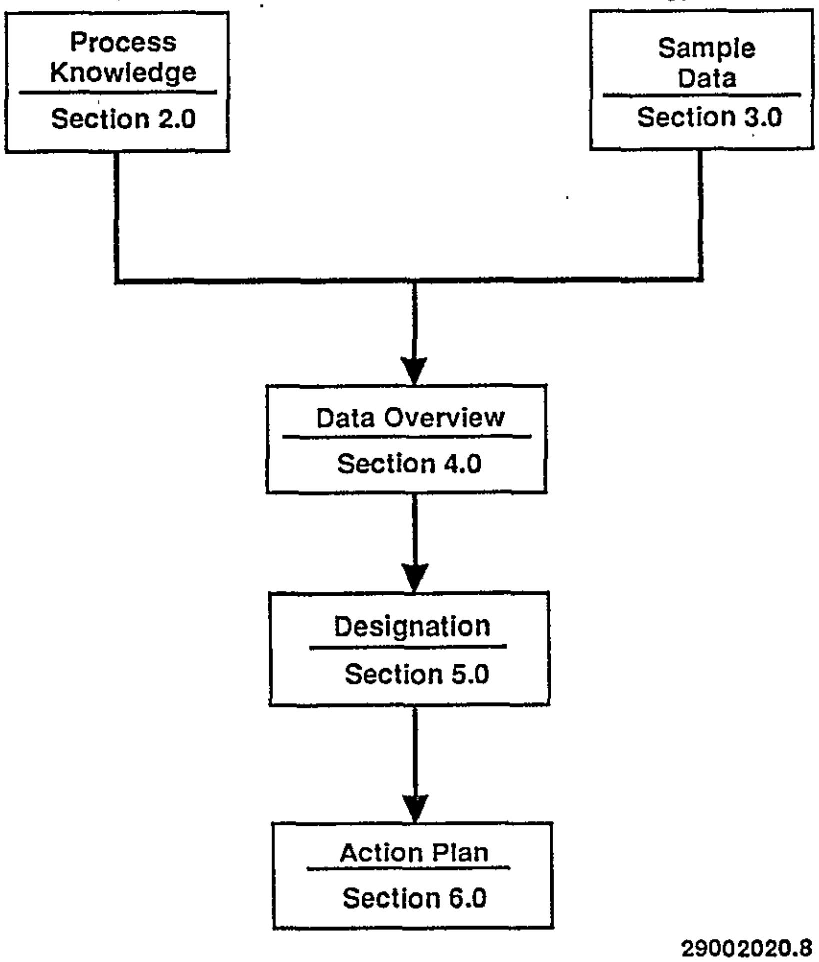
This characterization strategy (see Figure 1-1) is implemented by means of the following steps.

- Describe both process and sampling data (Sections 2.0 and 3.0, respectively).
- Present a data comparison and stream deposition rates (Section 4.0).
- Propose a designation (Section 5.0).
- Design an action plan, if needed, to obtain additional characterization data (Section 6.0).

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-AY/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

Figure 1-1. Characterization Strategy.



1.3 SCOPE

The scope of this report is the characterization of the BCS wastestream. The time perspective of this document 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" data (i.e., October 1989 through March 1990) because the BCS stream was inactive during this period.

2.0 PROCESS KNOWLEDGE

2.1 PHYSICAL LAYOUT (B PLANT GENERIC)

The B Plant is located in the 200 East Area of the Hanford Site (Figure 2-1). The B Plant comprises several adjoining buildings: the 221-B Processing Building; the 271-B Service and Office Building; and the 225-B Building Waste Encapsulation and Storage Facility (WESF), (Figure 2-2). The 221-B Building and its attached service building (271-B Building) were constructed in 1943. Construction of the WESF was completed in 1974.

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

2.1.1 The 221-B Building

The processing portion of the 221-B Building consists of a canyon and craneway, 40 process cells, a hot pipe trench, and a ventilation tunnel.

The service and operating portion of 221-B Building consists of an operating gallery, a pipe gallery, and an electrical gallery (Figure 2-3).

2.1.2 The 271-B Building

The 271-B Building is attached to B Plant and includes offices, aqueous makeup facilities, and maintenance shops.

2.1.3 The 225-B Building

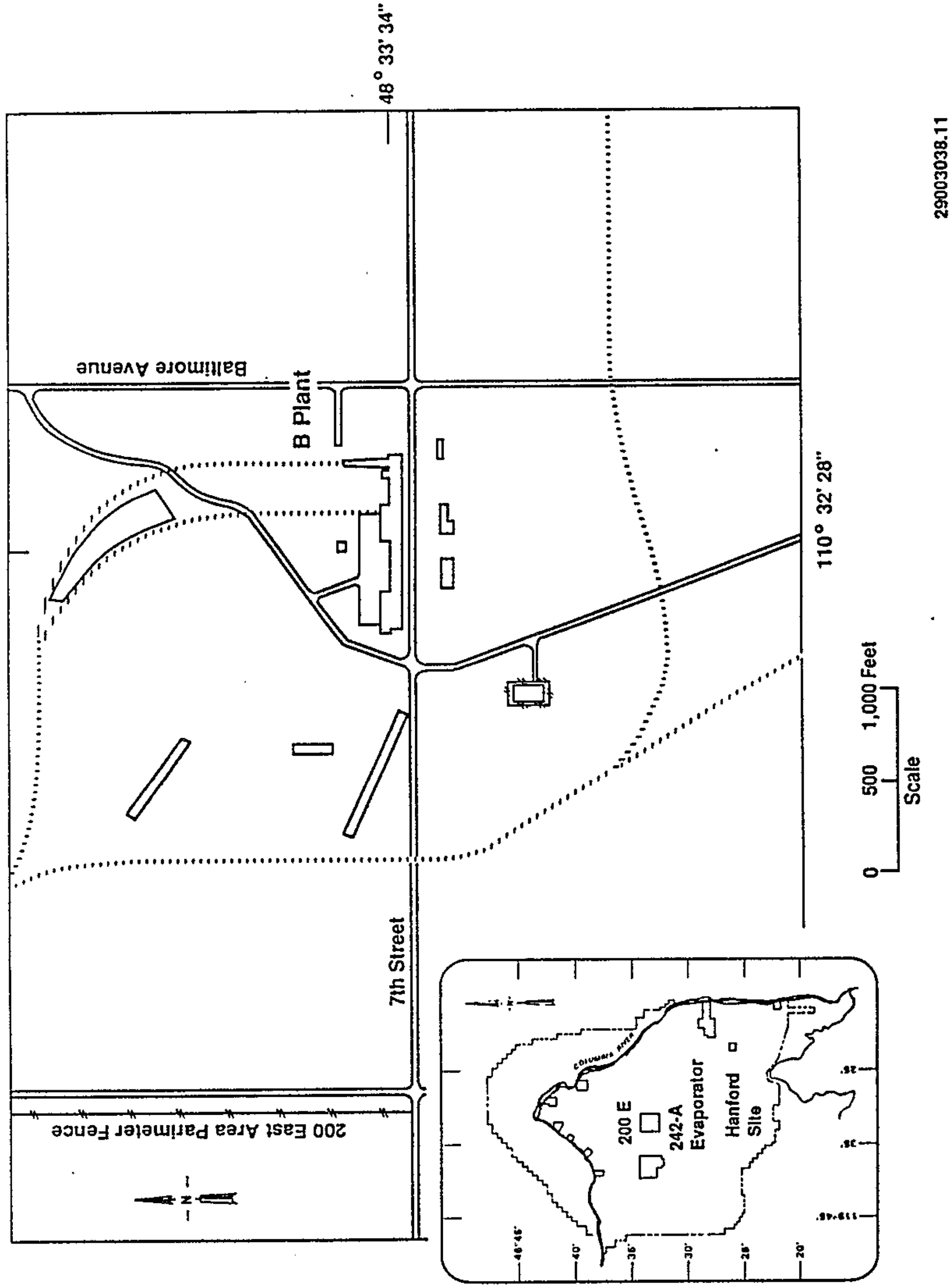
This building's floor plan is partitioned into several functional areas: (1) process hot cell areas, (2) hot cell (canyon) service areas, (3) operating areas, (4) building services areas, and (5) the storage pool area. The area of the building is approximately 20,000 ft^2.

2.2 CONTRIBUTORS

The BCS consists of spent steam condensate used to supply heat to the E-23-3 Concentrator. During operation of the concentrator, the average flowrate of the BCS is 30 to 40 gal/min. The tube bundles in the E-23-3 Concentrator are the only contributors to the BCS (see Figure 2-3).

The E-23-3 Concentrator is used for the processing and concentration of waste. It may contain various combinations of process solutions because of the multiple cycles of the process. However, these solutions are separated

Figure 2-1. B Plant Site Plan.



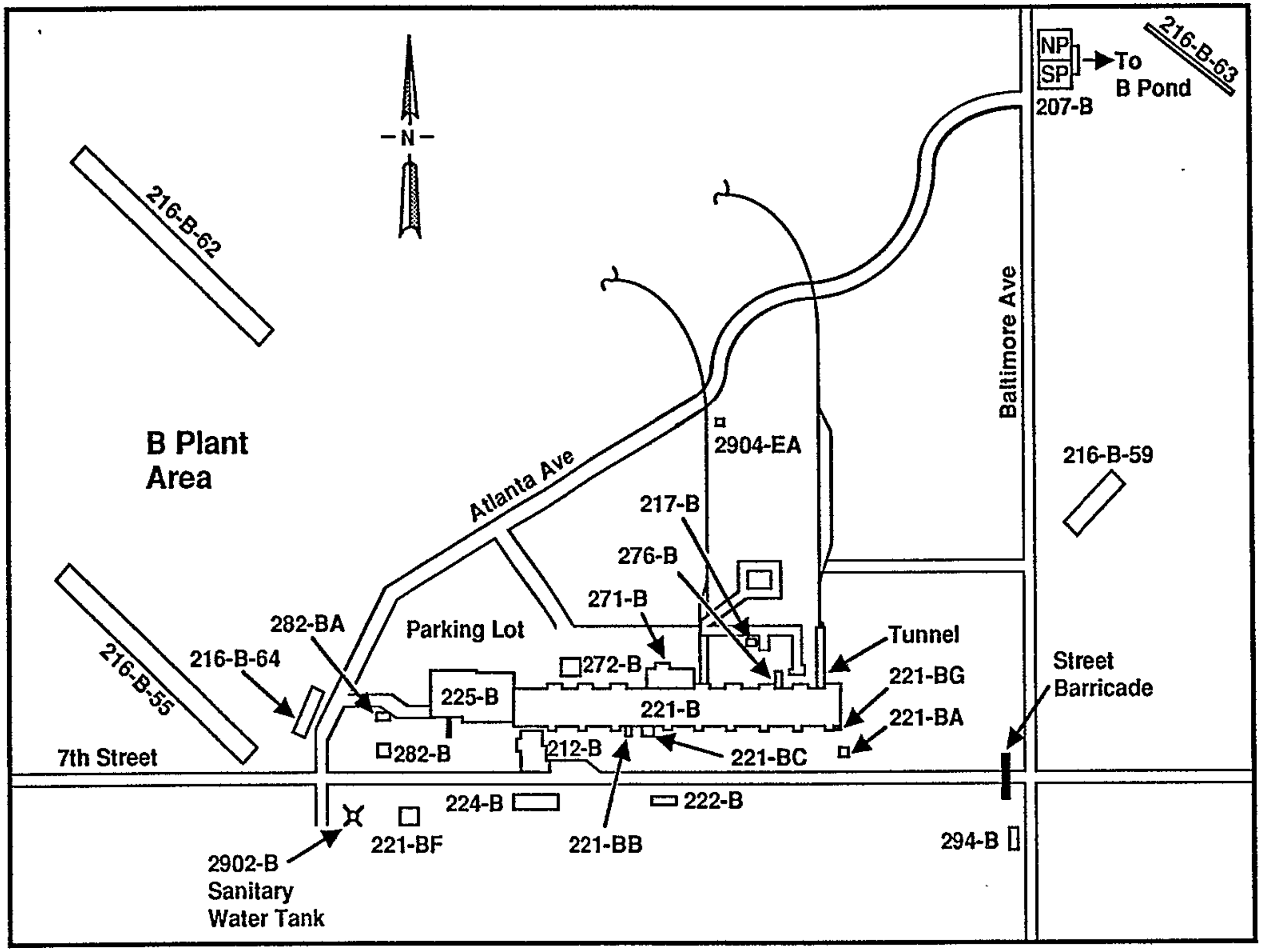
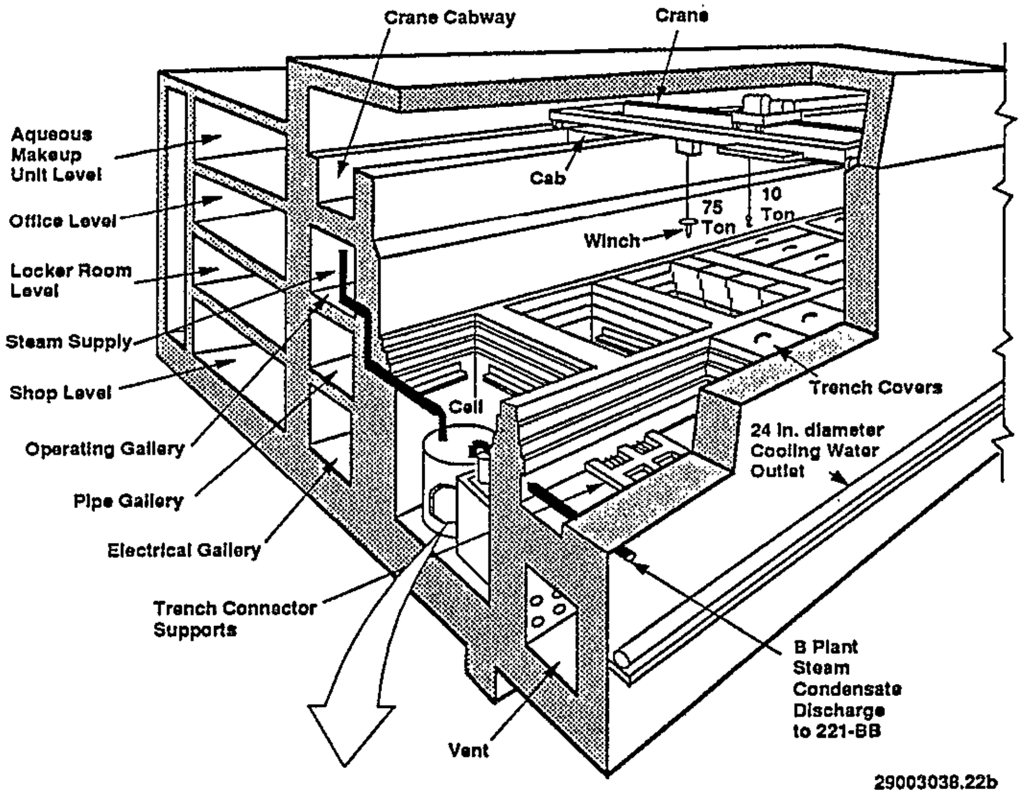
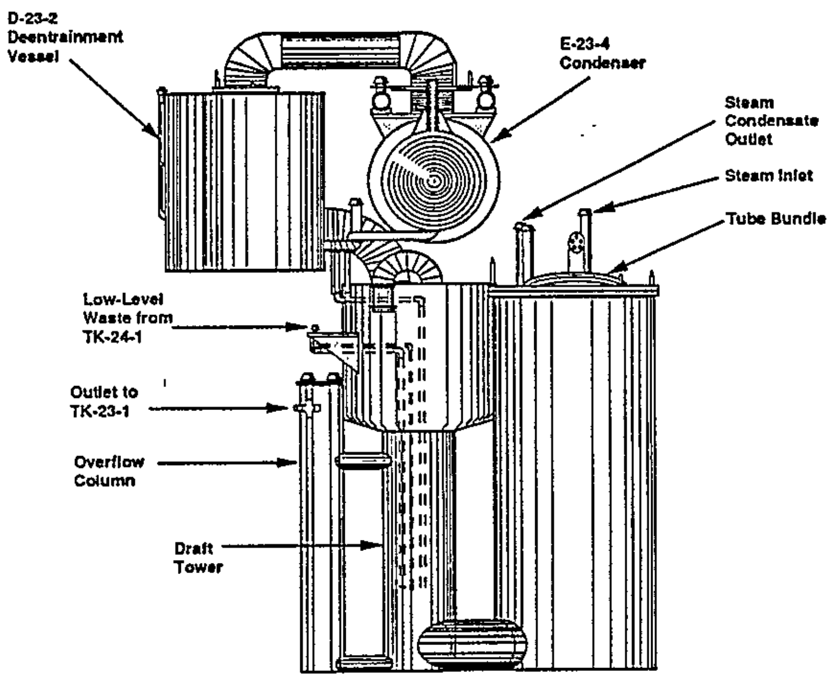


Figure 2-2. B Plant and Related Facilities.

Figure 2-3. B Plant Schematic (221-B and 271-B Cutaway)





E-23-3 Concentrator System

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physically from the BCS stream by the concentrator vessel walls. Failure of a tube bundle during processing is considered as an accident scenario.

Analysis was performed of the current monitoring system's ability to detect leakage of any process solution into the BCS stream. The analysis also serves as a means to document effluent monitoring information required by WHC-CM-7-5, *Environmental Protection* (WHC 1988a).

The analysis evaluates contributors (under accident conditions) to the BCS stream with respect to each constituent. The contributors were rated from greatest to lowest risk with respect to each hazardous or radioactive constituent. The contributors were also rated from greatest to lowest risk based on the equivalent concentrations (WAC 173-303-101) (Ecology 1989) for hazardous substances and "sum of the fractions" (WHC 1988a) for radioactive substances.

Based on knowledge of the monitoring system's performance, it was determined that the monitoring system is able to detect and divert any unacceptable discharge to the BCS stream (Figure 2-4).

As noted previously, the BCS stream consists entirely of steam condensate, and no additions to the BCS stream occur at B Plant. In the unlikely event of leakage of process solution into the BCS stream, up to 12 ions in solution and up to 7 radionuclides could be introduced. Products from the combination of these ions are considered constituents. Radionuclides contained in solution were considered for their radioactive characteristics only.

In each case, the concentration of each combination of ions was based on a 100% combination of anion and cation, limited only by the limiting reactant concentration. No competing reactions or equilibriums were considered. Therefore, all equivalent concentrations (WAC 173-303-101) evaluated were conservative (i.e., high) estimations.

The products or radionuclides potentially introduced into the BCS stream from leakage include up to seven radionuclides and nine hazardous chemicals. In all instances, the radioactive species and hazardous species are intimately mixed. It is, therefore, not possible to introduce any hazardous chemicals without also introducing radionuclides.

An operability test was performed on the online beta monitor, located in the 221-BB Building, for the BCS stream. This test performed a wet calibration on the monitoring system using test solutions of known radiolytic (^{90}Sr and ^{137}Cs) compositions. Samples of these solutions, run through the monitor, were collected for analysis and taken to the analytical laboratories to confirm the strontium and cesium concentrations detected by the monitor. During the operability test, the BCS stream was diverted to the 216-B-64 Retention Basin (no discharge to the environment). Based on the results of the operability test, the online BCS beta monitoring system would detect and provide alarm capability at strontium and cesium concentrations

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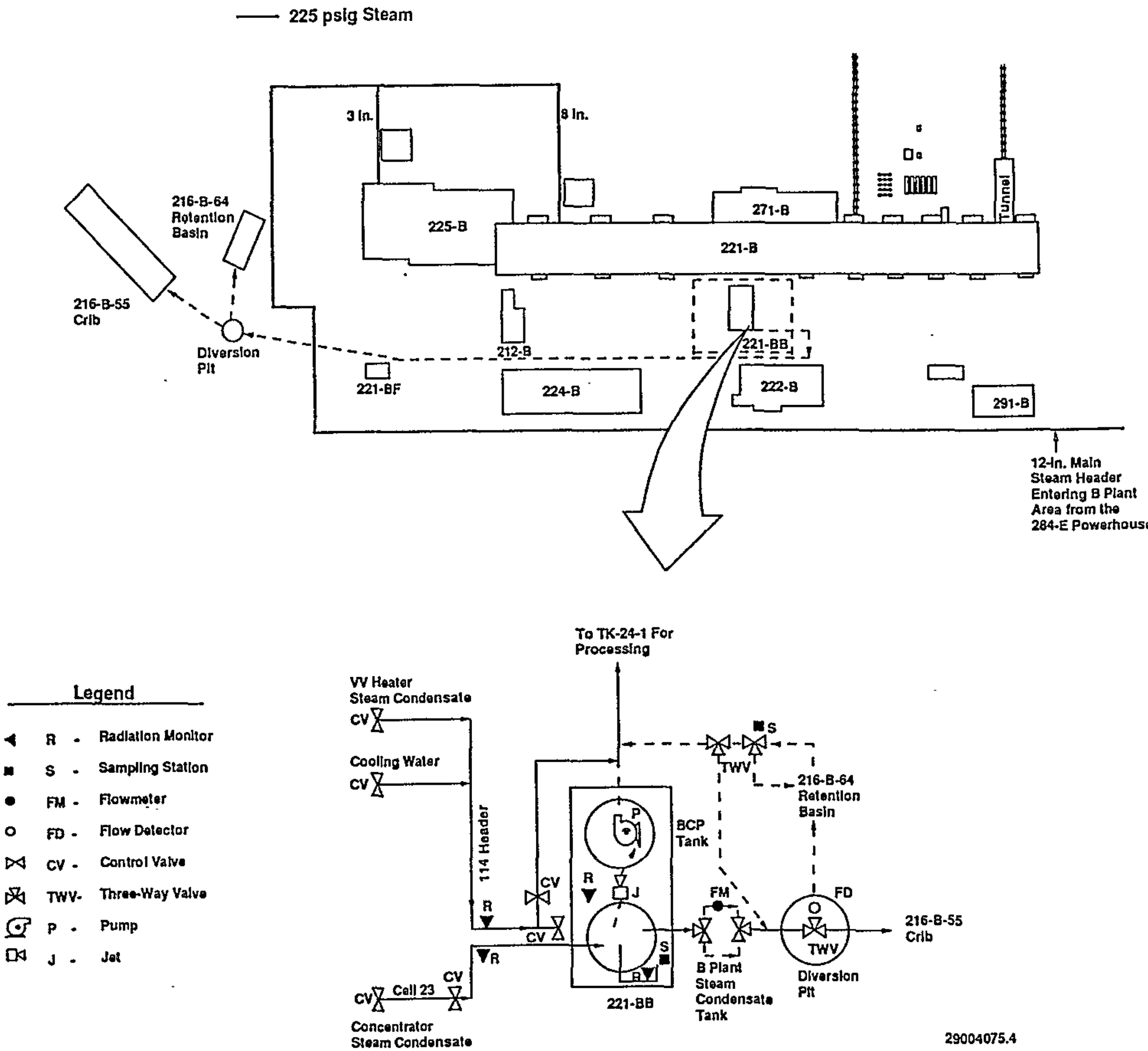

Figure 2-4. B Plant Stream Condensate Flow Diagram.

of 3 E-05 μCi/mL and 5 E-04 μCi/mL, respectively (0.3 and 17 times the administrative control values). Two successive alarms will also automatically divert the BCS stream to the 216-B-64 Retention Basin.

2.3 PROCESS DESCRIPTIONS

2.3.1 Background

A liquid waste concentration/volume reduction process has been undertaken to handle B Plant-WESF low-level radioactive wastes. This operation involves three process cells (23, 24, and 25) located in the canyon of the 221-B Building. The primary cell, Cell 23, contains the steam-heated, low-level waste concentrator (evaporator) E-23-3 (Figure 2-3). Cell 24 contains an 11,000-gal-capacity waste receiver tank, TK-24-1. Cell 25 contains two 4,000-gal-capacity concentrated waste receiver tanks, TK-25-1 and TK-25-2 (Figure 2-5).

As a result of the concentration process, two liquid effluent streams are generated, one of which is the BCS stream. This report focuses on the steam used for the steam-heated evaporator because the steam process condensate generated from its operation is the sole source of the BCS stream.

2.3.2 System Description

The B Plant receives steam from the 200 East Powerhouse. This steam is adjusted to different pressures for building heating and for various process purposes (e.g., steam-operated jet transfers, vessel ventilation systems, and process concentrators). The steam is delivered by a 12-in.-diameter pipe along Baltimore Avenue at 225 lb/in^2 (gage) (Figure 2-4). In B Plant, the steam is routed through pressure-reducing valves (PRV) to reduce the pressure to 100 lb/in^2 (gage) for its use in the low-level waste concentrator, E-23-3. To preclude pressurization, the steam supply is further regulated at the concentrator between 10 and 20 lb/in^2 (gage).

The 3,000-gal-capacity concentrator is a single-pass shell and tube heat exchanger with liquid waste on the tube side and saturated steam, flowing counter currently, on the shell side. The heat is supplied by the steam to (1) raise the liquid waste feed from its initial temperature to the boiling temperature, (2) provide thermodynamic energy to separate liquid solvent (water) from the feed, and (3) vaporize the water. During operation of the E-23-3 Concentrator, the steam is saturated, condenses along the tubes, and is discharged as BCS from the south side of the plant at an average flowrate of 30 to 40 gal/min. The BCS then flows through a 4-in. header below grade to a small tank (600-gal-capacity) located in the 221-BB Building enroute to the underground 216-B-55 Crib located west of B Plant (Figure 2-4).
A crib is defined as an underground structure into which liquid wastes are discharged so that most radionuclides are sorbed in the soil before the liquid reaches the groundwater (WHC 1988a).

9 1 1 1 3 2 5 1 7 1 4

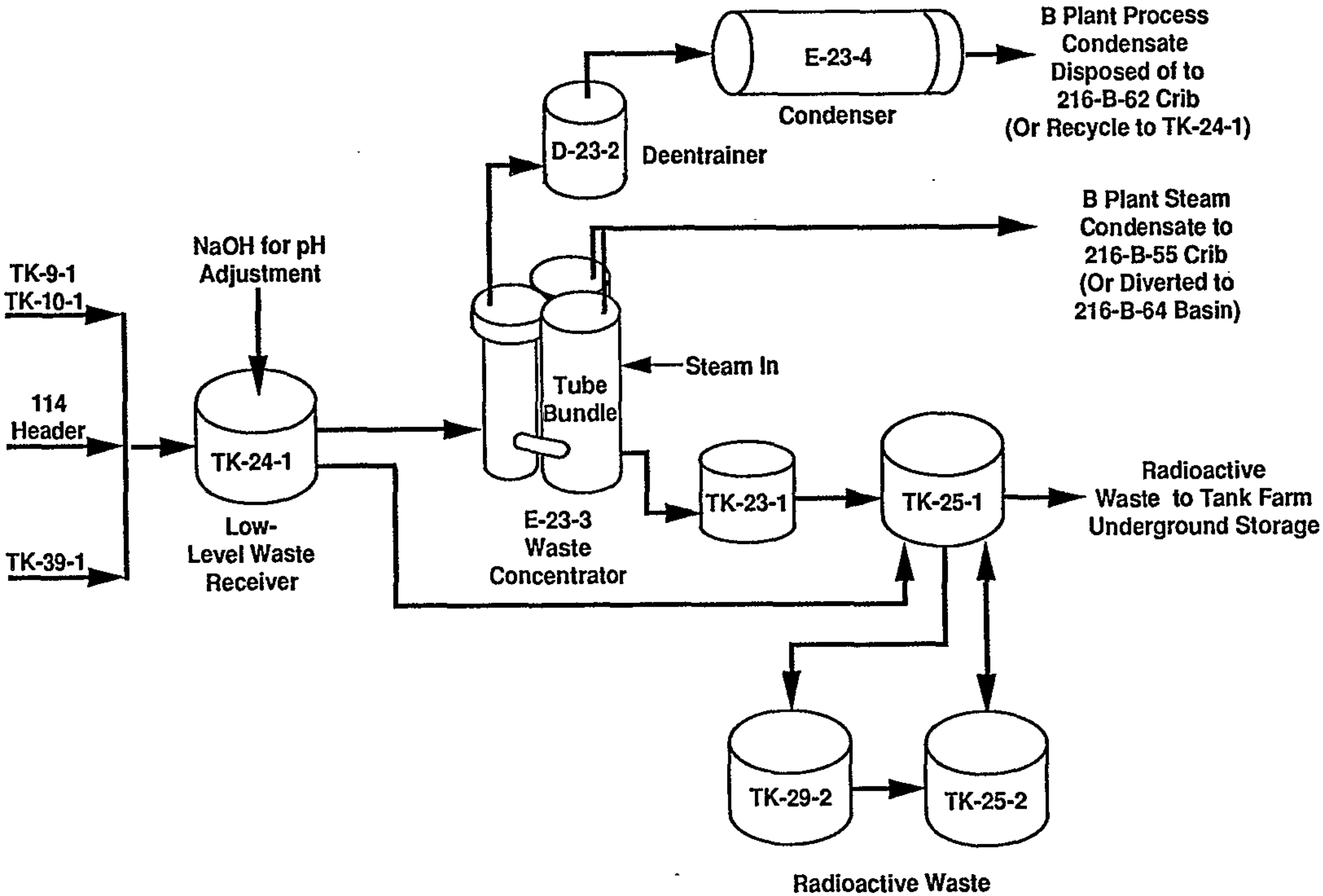

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Figure 2-5. B Plant Low-Level Waste Concentrator Flow Diagram.

Three radiation monitors and a flow proportional sampler are installed to provide continuous beta and gamma radiation monitoring (Figure 2-4) and to provide representative sampling of the BCS stream. Two of the monitors are provided to detect gross gamma radiation and are mounted external to the BCS stream. One is located adjacent to the BCS 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. The third monitor is an online beta radiation monitor and is located in the 221-BB Building. During periods of operation a continuous stream is pumped from the 600-gal condensate receiver tank and circulated through the beta monitor. Each of these monitors and the sampler are connected with the Facility/Process Monitor and Control System (FPMCS) which in turn is occupied by plant operations personnel on an around-the-clock basis. During those periods that the low-level waste concentrator is operating, the online beta radiation monitor will automatically divert the BCS stream to the 216-B-64 Retention Basin if the alarm setpoint for diversion is exceeded.

The design of the BCS system is based on preventing the steam from contacting radioactively contaminated surfaces, solutions, or vapors. The potential exists for contamination of the steam condensate if a heat exchanger tube, gasket, or other sealing mechanism fails (see Section 2.3). Radiological controls for discharge of the BCS to the 216-B-55 Crib are established in *Environmental Compliance Manual* (WHC 1988a) in accordance with DOE guidance.

The DOE has established limits to ensure that all state and federal requirements are met. The policy of the 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 1989a). The B Plant uses sampling, monitoring, and recycle techniques to meet these goals.

2.3.3 Present Activities

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

The B Plant is currently 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 BCS stream is currently inactive. However, during this 6-mo period, 12,600 gal of BCS was discharged to the 216-B-55 Crib (soil column) in January 1990 during training activities at a rate of 30 to 40 gal/min.

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 plant's first mission was the recovery of plutonium using a bismuth phosphate chemical separation process. The process was carried out from April 1945 to October 1952. The B Plant was shut down after the Reduction-Oxidation (REDOX) and Plutonium-Uranium Extraction (PUREX) Plants 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. The proposed future activities for B Plant are discussed in Section 2.3.5 of this report.

The BCS stream was discharged to B Pond from April 1945 until September 1967. In 1967, it was permanently diverted to the 216-B-55 Crib.

A 1969 study recommended rerouting the steam condensates from B Plant cesium product concentrators (located at Cells 5, 20, and 38) from discharging directly to the BCS stream to the low-level waste receiver tank, TK-24-1. Highly concentrated radioactive solutions are contained within each product concentrator. A failure of a concentrator's tube bundle had the potential to release significant quantities of radioactivity to the BCS stream. Steps were initiated that rerouted each of the product concentrators steam condensate to the low-level waste receiver tank, TK-24-1.

A trend of higher-than-normal radioactive sample results for the BCS stream was noted in September 1983. The results, although below existing radioactive discharge limits in place at the time, initiated a review of all influents to a common receiver line, the 114 Header. This header, which included steam condensate from the vessel vent 1 and 2 heaters and cooling coil discharges from tanks TK-28-4, TK-30-2, TK-31-1, and TK-31-3, was isolated from the BCS system by bypassing the 221-BB Building and routing the header influents back into the plant (tank TK-24-1) (see Figure 2-4).

In August 1985, high radioactive BCS activity was detected. An investigation found the source to be from crossties between the Cell 23 concentrator process condensate (also known as B Plant Process Condensate [BCP]) stream and steam condensate 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. The diversion of the 114 Header from the BCS stream and the elimination of the BCS and BCP crossties were performed as additional precautions to ensure that the BCS stream remains below the established administrative control limits (ACL) and ALARA.

Following completion of the cesium processing campaign in December 1985, the feed to the E-23-3 Concentrator was limited to extensive water flushes and cleanup of process equipment. The waste concentrator was shut down in January 1987 and disassembled for replacement of its deentrainer. In addition, process control and instrumentation upgrades during this same outage were completed, providing for operation and control of the low-level waste concentrator by the FPMCS. Since completion of the upgrades in late 1987, use of the concentrator has been limited to operability testing of the new deentrainer and training of operations personnel.

2.3.5 Future Activities

This section covers the interval after March 1990. B Plant's mission is the treatment of selected double-shell tank wastes and wastestream 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. This initiation of the treatment operation at B Plant should not affect the content or designation of the BCS stream.

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3.0 SAMPLE DATA

This section provides an evaluation of the sampling data pertaining to the BCS wastestream. These data are divided into two categories--wastestream data and feed source data. All of the raw sampling data for the BCS wastestream, before October 1989, are contained in Appendix B of this report.

3.1 DATA SOURCE

Two sources of sampling data were used in this analysis: wastestream data and feed source data.

The sampling scheme took representative samples by following procedure sampling and analytical protocol (EPA 1986a). 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 accomplished by taking grab samples from 221-BB (Figure 2-4) 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 1989b).

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 seven samples collected over a 36-mo time period. The dates these samples were taken and the sample identification number are listed in Appendix B of this report. Statistical wastestream data for the BCS are contained in Table 3-2 of this report.

For the BCS system, over 40,000 chemical analytes were of interest. The bulk of these analytes were compiled from a combined mass spectral library from 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 a gas chromatography/mass spectrometer analysis.

Table 3-3 compares the maximum contaminant levels and data from the monthly operating composite samples. Figure 3-1 is a graph comparing the total beta radiological operating composite sample data set to the

Table 3-1. Analytical Methods for the B Plant Steam Condensate.
(sheet 1 of 2)

LEAD# CofC#	50027 50027	50037 50037	50129 50129	50190 50190
Alpha counting	X		X	X
Ammonia	X	X	X	X
Atomic emission spectroscopy	X	X	X	X
Beta counting	X	X	X	X
Conductivity-field	X		X	X
Cyanide	X	X	X	X
Direct aqueous injection (GC/MS)	X	X	X	X
Fluoride (LDL)				
Hydrazine	X	X	X	X
Ion chromatography	X	X	X	X
Lead				X
Mercury	X	X	X	X
pH-field	X	X	X	X
Semivolatile organics (GC/MS)	X	X	X	X
Sulfide	X	X	X	X
Temperature-field	X	X	X	X
Total organic carbon	X	X	X	X
Total organic halides	X	X	X	
Total organic halides (LDL)				X
Uranium	X	X	X	X
Volatile organics (GC/MS)	X	X	X	X

LEAD# CofC#	50037B 50040	50129B 50130	50190B 50191
Volatile organics (GC/MS)	X	X	X

LEAD# CofC#	50448 50448	50494 50494	50522 50522
Alpha counting	X		X
Ammonia	X	X	X
Atomic emission spectroscopy	X	X	X
Beta counting	X	X	X
Conductivity-field	X	X	X
Cyanide	X	X	X
Direct aqueous injection (GC/MS)	X	X	X
Fluoride (LDL)	X	X	X
Hydrazine	X	X	X
Ion chromatography	X	X	X
Lead	X	X	X
Mercury	X	X	X
pH-field	X	X	X
Semivolatile organics (GC/MS)	X	X	X
Sulfide	X	X	X

Table 3-1. Analytical Methods for the B Plant Steam Condensate.
(sheet 2 of 2)

Temperature-field	X	X	X
Total organic carbon	X	X	X
Total organic halides			
Total organic halides (LDL)			X
Uranium	X	X	X
Volatile organics (GC/MS)	X	X	X
LEAD#	50448B	50494B	
CofC#	50449	50495	
Volatile organics (GC/MS)	X	X	

Notes:
Procedures that were performed for a given sample are identified by an "X". Procedure references appear with the data. LEAD# is the Liquid Effluent Analytical Data number that appears in the data reports. CofC# is the chain-of-custody number. Abbreviations: gas chromatography (GC), low-detection limit (LDL), mass spectrometry (MS).

Table 3-2. Statistics for B Plant Steam Condensate.

Constituent	N	MDA	Method	Mean	StdErr	90%CILim	Maximum
Calcium	7	2	LM	1.78E+02	8.88E+01	3.06E+02	6.93E+02
Copper	7	6	DL	1.07E+01	7.14E-01	1.17E+01	1.50E+01
Iron	7	5	DL	9.41E+01	4.82E+01	1.64E+02	3.83E+02
Lead	4	3	DL	5.00E+00	0.00E+00	5.00E+00	5.00E+00
Magnesium	6	5	DL	5.07E+01	6.67E-01	5.17E+01	5.40E+01
Mercury	7	6	DL	1.14E-01	1.43E-02	1.35E-01	2.00E-01
Nickel	7	6	DL	1.01E+01	1.43E-01	1.03E+01	1.10E+01
Nitrate	7	6	DL	9.17E+02	4.17E+02	1.52E+03	3.42E+03
Potassium	7	6	DL	1.00E+02	3.33E-06	1.00E+02	1.00E+02
Sodium	7	5	DL	1.87E+02	2.63E+01	2.25E+02	3.01E+02
#Uranium	6	2	DL	2.67E-01	1.44E-01	4.80E-01	9.54E-01
Zinc	7	4	DL	1.27E+01	7.23E+00	2.31E+01	5.60E+01
Acetone	5	0	n/a	3.14E+01	5.57E+00	3.99E+01	4.10E+01
Ammonia	7	1	LM	1.15E+02	1.95E+01	1.43E+02	2.03E+02
Phenol	7	6	DL	1.01E+01	1.43E-01	1.03E+01	1.10E+01
Unknown	1	0	n/a	3.30E+01	n/a	n/a	3.30E+01
#Alpha Activity (pCi/L)	5	1	DL	3.02E+00	2.46E+00	6.80E+00	1.28E+01
Beta Activity (pCi/L)	7	0	n/a	6.97E+01	3.87E+01	1.25E+02	2.83E+02
Conductivity (uS)	6	0	n/a	2.98E+01	1.04E+01	4.51E+01	6.90E+01
pH (dimensionless)	7	0	n/a	6.31E+00	8.32E-01	5.12E+00	1.08E+01
Temperature (degrees C)	7	0	n/a	5.81E+01	4.98E+00	6.52E+01	8.09E+01

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.

# Denotes an ill-conditioned data set, i.e., one in which at least one reported measurement is less than at least one reported detection limit.

Table 3-3. Radiological Comparison of Maximum Contaminant Level to B Plant Steam Condensate 222-S Data Sets.

BCS (222-S) wastestream data						
Analyte	MCL (pCi/L)[a]	(pCi/L)[c,d]				DCG (pCi/L)[b]
		1985	1986	1987	1988	
Gross alpha	1.5 E+01	1.3 E+01	2.1 E+02	None	7.4 E+00	3.0 E+01
Gross beta	5.0 E+01	1.9 E+03	5.4 E+02	None	7.8 E+02	1.0 E+03
^{137}Cs	1.0 E+02	2.9 E+02	NA	NA	6.5 E+02	3.0 E+03
^{90}Sr	5.0 E+01	7.1 E+02	NA	NA	8.2 E+01	1.0 E+03

[a]*Federal Register*, Vol. 51, No. 189, September 30, 1986.

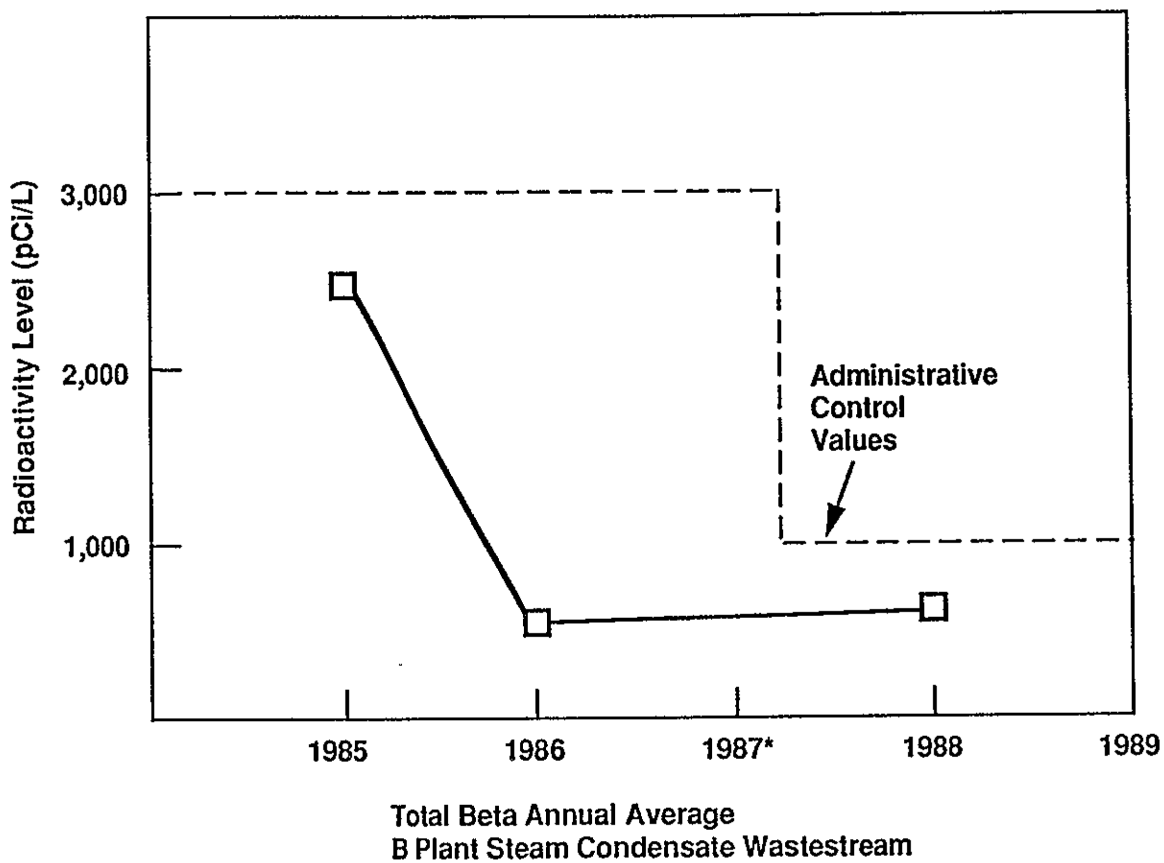
[b]DCG = Derived Concentration Guides refers to a concentration of radioactive materials in the water that would result in a maximum effective committed dose equivalent of 100 mrem/yr using ICRP 30 dose methodology under conditions of continuous use.

[c]Certain data points were below detection limits and not measurable. The less than value assigned in raw data was included during mean calculation. Mean value is conservatively high.

[d]BCS wastestream mean data average for each yr 1985 through 1988.

NA = Data not available.

Figure 3-1. Comparison of Radiological Composite Data to Annual Average Release Limits.



29004098.1b

*B Plant Steam Condensate stream not discharged during 1987. Down for deentrainer replacement.

administrative control values (Table I [DOE 1982] levels before June 1987 and Derived Concentration Guide levels after June 1987). The maximum contaminant level (MCL) for the comparisons in Table 3-3 was taken from the *Federal Register* (Vol. 51, No. 189, September 30, 1986). The operating sample data included radiological measurements for alpha, beta, and individual isotopic concentrations. The operating samples (Table 3-3) are separate and distinct from the seven random grab samples (Table 3-2) used for designation and were collected over the same time period.

Comparison of the 222-S Laboratory data set to the MCL is presented in Table 3-3, and the DCG is also included for comparison to the annual average concentration limit for each analyte. The DCG limit replaced the higher Table I (DOE 1982) limits for annual average concentrations in June 1987. Only the DCG value is shown in Table 3-3.

The data included in the composite data set were for those same years that the random sample data set were taken (1985 through 1988). Annual averages were determined for each analyte by year and are included in Table 3-3. Lower detection limit values were reported by the analytical laboratory for the monthly composite sample results. This value was utilized during the calculation of the annual averages presented in Table 3-3 and Figure 3-1. The reported values represent the detection limit of the analyses and is the maximum that could have been present in the sample. The total beta annual average concentrations for each of the years identified remained below the established annual average concentration release limits at the time the samples were taken.

Sampling and monitoring of the BCS stream is provided to document the compliance with the discharge limits listed in WHC-CM-7-5, *Environmental Compliance Manual* (WHC 1988a).

3.2.2 Raw Water Feed Data

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

The 200 East and West 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 East and West Areas. The river water is pumped into a 25-Mgal 182-B Reservoir for initial settling. The water is then transferred from the 182-B Reservoir to the individual 3-Mgal 200 East and West Area reservoirs for secondary settling. A backup capacity exists in the 100 D Area. The raw water is then pumped directly to the raw water distribution piping and to the 283 Water Treatment Plants for sanitary water.

Table 3-4. 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.

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

[b]Compiled 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).

[c]N 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.

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.

As the water enters the 200 East and West Area treatment plants, on the way to becoming "sanitary water," chlorine is added for pretreatment as needed to control algae. Aluminum sulfate is added at a rate of 5% by weight, via a flash mixer as a coagulant aide. The water is then fed into settling basins through floculators that provide slow mixing to facilitate flocculation. The water then flows through the settling basins, at which time the flocced suspended particles are allowed to settle out.

The water then passes through multimedia filters to remove alum and other particulate matter still in suspension. The filters consist of layers of various grades of gravel, sand, and anthracite coal. The filters reduce turbidity to an average of 0.2 NTU. From the filters, the water flows to two 200,000-gal concrete-lined, covered reservoirs for disinfection. Chlorine is added to maintain a free chlorine residual of 1.5 mg/L.

In addition, each area has storage "high tanks" on the sanitary distribution system that contain 200,000 gal of water in each area. The high tanks serve to maintain pressure on the sanitary system if pumping pressure drops (as backup fire protection).

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4.0 DATA INTEGRATION

This section presents a comparison of the process knowledge set (see Section 2.0) with the sampling data set (see Section 3.0) to determine the identity and concentration levels of the chemical analytes present in the BCS wastestream.

4.1 DATA COMPARISON

The process knowledge from Section 2.0 explains that steam from the 200 East Powerhouse is the sole source for the BCS system. The BCS stream is a closed system, meaning that nothing is added to the effluent stream within B Plant or WESF. The 200 East Area raw water data presented in Section 3.2.2 and the BCS sampling data presented in Section 3.2.1 were used for a comparison in this section. 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 2.2.

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

Constituent	Result a	SV1 b	SV2 c
Copper	1.1E-02	1.0E+00 h	
Iron	9.4E-02	3.0E-01 h	
Lead	5.0E-03	5.0E-02 g	
Mercury	1.1E-04	2.0E-03 g	
Nickel	1.0E-02	1.0E-01 e	
Nitrate	9.2E-01	4.5E+01 e	
Zinc	1.3E-02	5.0E+00 h	
Alpha Activity (pCi/L) (d,n)	3.0E+00	1.5E+01 g	3.0E+01
Beta Activity (pCi/L)	7.0E+01		1.0E+03

NOTES:

[a]Units of results are mg/L unless indicated otherwise. The results are the mean values reported in the Statistics table of Chapter 3.

[b]Screening 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.

[c]Screening 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.

[d]Constituents are identified (d) if any detected result is less than any detection limit.

[n]The SV1 and SV2 values for Gross Alpha are used to evaluate Alpha Activity.

[o]The SV2 for Gross Beta is used to evaluate Beta Activity.

Table 4-2. Deposition Rate for B Plant Steam Condensate.

Flow Rate: 5.18E+05 L/mo

Constituent	Kg/L*	Kg/mo*
Calcium	1.78E-07	9.23E-02
Copper	1.07E-08	5.55E-03
Iron	9.41E-08	4.88E-02
Lead	5.00E-09	2.59E-03
Magnesium	5.07E-08	2.63E-02
Mercury	1.14E-10	5.91E-05
Nickel	1.01E-08	5.23E-03
Nitrate	9.17E-07	4.75E-01
Potassium	1.00E-07	5.18E-02
Sodium	1.87E-07	9.69E-02
Uranium #	2.67E-10	1.38E-04
Zinc	1.27E-08	6.58E-03
Acetone	3.14E-08	1.63E-02
Ammonia	1.15E-07	5.96E-02
Phenol	1.01E-08	5.23E-03
Unknown	3.30E-08	1.71E-02
Alpha Activity #,*	3.02E-12	1.57E-06
Beta Activity *	6.97E-11	3.61E-05

NOTES:

Data collected during December 1985, May 1986, September 1986, November 1986, August 1988, November 1988 and December 1988.

Flow rate 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.

Constituents are flagged (#) if any detected result is less than any detection limit.

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5.0 DESIGNATION

This section proposes that the BCS not be designated a dangerous waste. This designation uses data from both the effluent source description and sample data (Sections 2.0 through 4.0) and complies with the designation requirements of WAC 173-303-070.

The *Dangerous Waste Regulations* (WAC 173-303-070) contain the procedure for determining if a waste is dangerous. 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 (per WAC 173-303-081) or originates from a dangerous waste source (per WAC 173-303-082). The proposed designation was based on a combination of process knowledge and sample data.

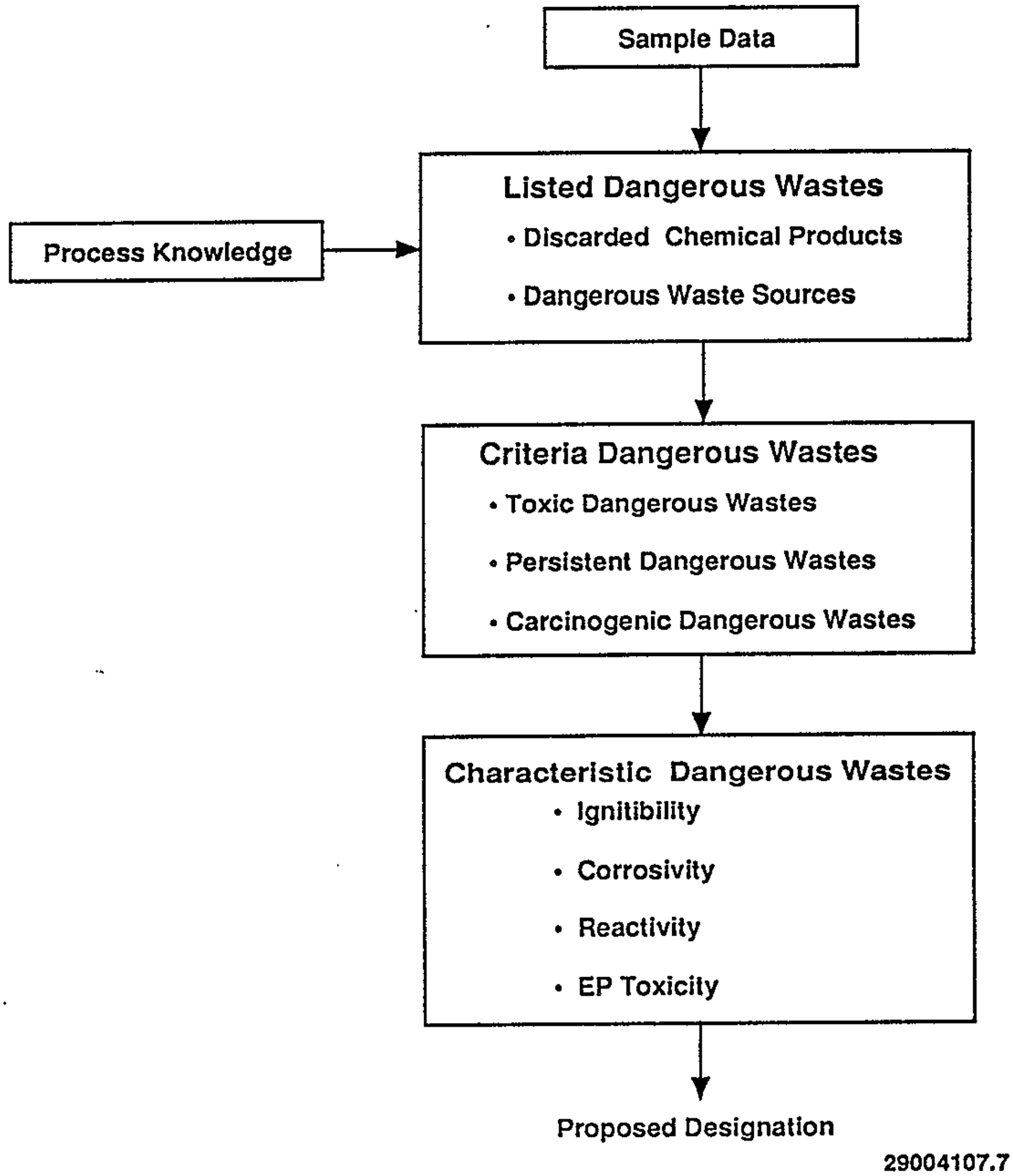
5.1.1 Discarded Chemical Products

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

- The listed constituent is the sole active ingredient in a commercial chemical product that has been discarded. Commercial chemical products that, as purchased, contained two or more active ingredients 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.

Figure 5-1. Designation Strategy.



In this report, the evaluation of this criteria 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 three 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 (e.g., wastes from ink formulation). The third is state sources, which is limited to polychlorinated biphenyl-contaminated transformers and capacitors resulting from salvaging, rebuilding, or discarding activities.

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

5.2 LISTED WASTE DATA CONSIDERATIONS

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

5.2.1 Process Evaluation

The process evaluation begins with a thorough review of the processes contributing to the wastestream. Processes must be reviewed and compared with the discarded chemical products list and the dangerous waste source list. This process evaluation is necessary because the stream is a listed waste in accordance with the mixture rule if a listed waste is known to have been added at any upstream location, even if a listed constituent cannot be detected at the sample point. The process evaluation typically includes 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, appropriate interviews with facility personnel were conducted to determine if there are any procedures or laboratory processes generating a listed waste that may not be evident during other portions of the process evaluation.

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

5.2.2 Sampling Data

Sampling data are used as screening tools to enhance and support the results of the process evaluation. This step compares the results of the sampling data to the WAC 173-303-9903 and -9904 lists. If a constituent is cited on one or both of these lists, an engineering evaluation is performed to determine if the constituent has entered the wastestream as a discarded chemical product or comes 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 cations sodium and calcium along with the anions chloride and nitrate. The possible combinations of substances include the following: 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 has been 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 DESIGNATIONS

A process evaluation, along with a review of sampling data, indicates that the BCS stream does not contain a discarded chemical product or a listed waste source. The following sections discuss the evaluation that was conducted to substantiate this conclusion.

The B Plant does process tank farm solutions, some of which have been designated as dangerous waste. Therefore, the potential for a steam coil leak resulting in a backflow of some of these solutions into the steam line (and hence the BCS) does exist. However, the elevated radionuclide levels provide an easily detectable tracer, especially as radioactivity is closely monitored. The long standing policy of B Plant has been to discontinue use of any source that resulted in the release of radiation exceeding normal release averages in streams going to the environment (see Sections 3.2.2 and 4.1 for a comparison to drinking water standards). There has been no evidence of such leakage as far back as 1985. Thus, it can be stated with a high degree of confidence that the BCS has not been contaminated with any Resource Conservation and Recovery Act-regulated dangerous wastes because of leaks in the steam coils.

5.3.1 Discarded Chemical Products

As discussed in Section 5.2, a process evaluation on the contributors to the BCS stream was conducted. This evaluation included a review of MSDSs at the plant and SARA Title III inventory reports for possible listed waste contributors. Facility interviews and inspections produced no evidence of the discharge of any chemical products into the BCS stream. In addition, the BCS stream is a closed system (see Section 2.0).

Acetone, mercury, and phenol were the only potential discarded chemical products identified from sampling data (using the screening procedure described in Section 5.2).

The only discarded chemical product identified in both the process evaluation and in the screening of the sampling data was acetone.

5.3.1.1 Acetone. Acetone (U002) is used in B Plant for maintenance and operations as a solvent to remove impurities (e.g., adhesive and grease) from various surfaces. Because of the potential fire hazard, the use of acetone is tightly controlled to limit the amount of material present. 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 five of the seven samples taken of the wastewater stream. The average concentration of acetone in the samples of the wastewater was 31 ppb. A thorough review of B Plant, including conversations with maintenance and operating supervisors, found no possible source for this spent solvent to enter the BCS stream. Because the BCS arises solely from steam condensation in the low-level waste concentrator, acetone, if present, would have to come from either an addition to the BCS tank in the 221-BB Building, a leakage in the low-level waste concentrator, or be present in the steam supplied to B Plant. The BCS tank is located in a radiation zone and is a normally closed tank. Physical and procedural controls prevent the introduction of acetone to the BCS tank. In addition, there is strong evidence that no leakage is occurring in the concentrator (see Section 5.3.2).

The B Plant makes no chemical additions to its steam supply (i.e., the BCS stream is a closed system). Also, acetone has periodically been seen in the analyses of blank samples throughout the Site performed by the contract laboratory utilized for this study. Although there were no blank results in the seven BCS sample data from December 1985 to October 1989, it is possible that the low levels of acetone found in some of the samples of the BCS stream are because of sample contamination. In addition, no trip blanks were run during the sample process within this timeframe.

5.3.1.2 Mercury. Mercury (U151) was detected in one of the seven samples at a concentration of 0.2 ppb. The rejection criteria for mercury, based on sanitary water supplies, is less than 0.5 ppb as presented in Section 5.2 of WHC-EP-0342. As the concentration of mercury seen in the sample of this wastewater stream is less than the rejection criteria, this data will not be considered in the designation of the wastestream because it is likely that mercury is present in this wastestream sample because of the presence of mercury in the water supply. This is consistent with the fact that the BCS is a closed system.

5.3.1.3 Phenol. Phenol (U188) was detected in one of the seven samples at a concentration level of 11 ppb. A review of the plant chemical inventory data and interviews with plant personnel did not show phenol to be present in any chemical compound used within B Plant-WESF. Because the BCS is a closed system at B Plant, phenol cannot be added to the stream at B Plant. Phenol may be present as a degradation product of the treatment chemicals used in generating the steam.

Based on the considerations and data presented in the previous sections, 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 wastes), state waste sources (W wastes), or any nonspecific waste sources (F wastes) in WAC 173-303-9904 (Ecology 1989).

None of the activities identified by the specific sources or state sources occur at B Plant. Of the nonspecific sources, only the spent solvent activities occur at B Plant. The BCS stream is a closed system (see Section 2.0) so that wastes resulting from spent solvent operations cannot enter the wastestream. Acetone was identified by the sampling data and could have been F003 (specific spent nonhalogenated solvents) waste.

As noted in Section 3.2.2, the BCS stream contains radioactive material at concentrations slightly above drinking water standards. This radioactivity is believed to arise from past contamination of the piping system. As discussed in Section 2.3.4, past operations have detected specific instances of radioactive cross contamination. These sources have been disconnected from the BCS system and no longer contribute to the stream. However, the residual contamination remains in the piping system to be leached out at very low rates by the continuing BCS stream. The last such event was in 1985. Since that time, the system has been flushed with significantly greater than a triple rinse.

If the radioactivity found in the BCS is totaled for the interval between 1985 and 1989, it is less than 2.4 E-04 g of material. It is very reasonable to postulate this amount of material being deposited on the BCS piping and vessel.

The process solutions in the low-level waste concentrator normally contain radionuclides at concentrations of >0.1 Ci/L. Comparing this to the radionuclide content of the BCS (Table 3-4), a ratio of 1,350 E-12 Ci/0.1 Ci or approximately 10^8 difference is found. Differences of eight orders of magnitude are considered to be leak tight even for helium.

In addition, although the radioactive source term in B Plant was increased in April 1986 because of the receipt of a transfer of double-shell tank waste to the facility, no corresponding increase in BCS radiation levels was seen. Therefore, there is high assurance that no communication exists between the BCS and any B Plant process solutions.

Based on the discussion and data presented in the following section, the wastestream does not have any dangerous waste source.

5.3.2.1 Acetone. Acetone (F003) is used as a solvent at B Plant (see Section 5.3.1.1). Because the BCS stream is a closed system, acetone waste cannot enter the BCS stream at B Plant.

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 for Liquid Effluent Analytical Data* (WHC 1990b).

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

Dangerous Waste Data Designation Report for B Plant Steam Condensate

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
Phenol	U188(EHW)	Not Discarded	Undesignated

Dangerous Waste Sources - WAC 173-303-082

Substance	Review Number	Status	DW Number
Acetone	F003	Unlisted Source	Undesignated

Infectous Dangerous Waste - WAC 173-303-083

No regulatory guidance

Dangerous Waste Mixtures - WAC 173-303-084

	Toxic	Persistant		Carcinogenic
Substance	EC%	HH%	PAH%	Total%
Calcium nitrate	1.25E-08	0.00E+00	0.00E+00	0.00E+00
Copper(II) nitrate	3.47E-08	0.00E+00	0.00E+00	0.00E+00
Lead nitrate	7.99E-09	0.00E+00	0.00E+00	0.00E+00
Magnesium nitrate	3.34E-09	0.00E+00	0.00E+00	0.00E+00
Mercury(II) nitrate	2.18E-09	0.00E+00	0.00E+00	0.00E+00
Nickel(II) hydroxide	1.63E-09	0.00E+00	0.00E+00	1.63E-06
Potassium nitrate	2.59E-09	0.00E+00	0.00E+00	0.00E+00
Sodium nitrate	8.30E-09	0.00E+00	0.00E+00	0.00E+00
Uranyl nitrate	7.94E-10	0.00E+00	0.00E+00	0.00E+00
Zinc nitrate	6.70E-09	0.00E+00	0.00E+00	0.00E+00
Acetone	3.99E-10	0.00E+00	0.00E+00	0.00E+00
Ammonia	1.43E-07	0.00E+00	0.00E+00	0.00E+00
Phenol	1.03E-08	0.00E+00	0.00E+00	0.00E+00
Total	2.35E-07	0.00E+00	0.00E+00	1.63E-06
DW Number	Undesignated	Undesignated	Undesignated	Undesignated

Dangerous Waste Characteristics - WAC 173-303-090

Characteristic	Value	DW Number
Ignitables % (Calc.)	3.99E-06	Undesignated
Corrosivity-pH	5.12	Undesignated
Total Cyanide (mg/kg)	0.00E+00	Undesignated
Total Sulfide (mg/kg)	0.00E+00	Undesignated
Total Lead (mg/L)	5.00E-03	Undesignated
Total Mercury (mg/L)	1.35E-04	Undesignated

Dangerous Waste Criteria - WAC 173-303-100

	Toxic	Persistant		Carcinogenic	
Substance	EC%	HH%	PAH%	Total%	DW Number-Positive
Calcium nitrate	1.25E-08	0.00E+00	0.00E+00	0.00E+00	
Copper(II) nitrate	3.47E-08	0.00E+00	0.00E+00	0.00E+00	
Lead nitrate	7.99E-09	0.00E+00	0.00E+00	0.00E+00	
Magnesium nitrate	3.34E-09	0.00E+00	0.00E+00	0.00E+00	
Mercury(II) nitrate	2.18E-09	0.00E+00	0.00E+00	0.00E+00	
Nickel(II) hydroxide	1.63E-09	0.00E+00	0.00E+00	1.63E-06	Undesignated
Potassium nitrate	2.59E-09	0.00E+00	0.00E+00	0.00E+00	
Sodium nitrate	8.30E-09	0.00E+00	0.00E+00	0.00E+00	

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

Dangerous Waste Data Designation Report for B Plant Steam Condensate

Dangerous Waste Criteria - WAC 173-303-100 - Continued

	Toxic	Persistant		Carcinogenic	
Substance	EC%	HH%	PAH%	Total%	DW Number-Positive
Uranyl nitrate	7.94E-10	0.00E+00	0.00E+00	0.00E+00	
Zinc nitrate	6.70E-09	0.00E+00	0.00E+00	0.00E+00	
Acetone	3.99E-10	0.00E+00	0.00E+00	0.00E+00	
Ammonia	1.43E-07	0.00E+00	0.00E+00	0.00E+00	
Phenol	1.03E-08	0.00E+00	0.00E+00	0.00E+00	
Total	2.35E-07	0.00E+00	0.00E+00	1.63E-06	
DW Number	Undesignated	Undesignated	Undesignated	Undesignated	

Dangerous Waste Constituents - WAC 173-303-9905

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

Substance names may include MB (monobasic), DB (dibasic), or TB (tribasic) to identify the equivalence of hydrogen ion that have been nutralized 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 fomulated and their possible concentrations calculated for designation purposes only. The actual existance in the waste of these substances is not implied and should not be infered.

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

Constituent	ppb	Ion	Eq/g	Normalized
CHARGE NORMALIZATION:				
Calcium	3.06E+02	Ca+2	1.53E-08	
Copper	1.17E+01	Cu+2	3.70E-10	
Iron	1.64E+02	Fe+3	8.79E-09	
Lead	5.00E+00	Pb+2	4.83E-11	
Magnesium	5.17E+01	Mg+2	4.25E-09	
Mercury	1.35E-01	Hg+2	1.34E-12	
Nickel	1.03E+01	Ni+2	3.53E-10	
Nitrate	1.52E+03	NO3-1	2.45E-08	4.98E-08
Potassium	1.00E+02	K+1	2.56E-09	
Sodium	2.25E+02	Na+1	9.77E-09	
Uranium	4.80E-01	UO2+2	4.03E-12	
Zinc	2.31E+01	Zn+2	7.07E-10	
Hydrogen Ion (from pH 5.1)		H+	(7.66E-09)	
Hydroxide Ion (from pH)		OH-	(1.31E-12)	
Cation total			4.98E-08	
Anion total			2.45E-08	
Anion normalization factor:	2.033			

SUBSTANCE FORMATION:

Substance	%	Cation Out	Anion Out
Nickel(II) hydroxide	1.63E-06	0.00E+00	
Mercury(II) nitrate	2.18E-08	0.00E+00	4.98E-08
Copper(II) nitrate	3.47E-06	0.00E+00	4.94E-08
Uranyl nitrate	7.94E-08	0.00E+00	4.94E-08
Lead nitrate	7.99E-07	0.00E+00	4.94E-08
Zinc nitrate	6.70E-06	0.00E+00	4.86E-08
Magnesium nitrate	3.34E-05	0.00E+00	4.44E-08
Potassium nitrate	2.59E-05	0.00E+00	4.18E-08
Calcium nitrate	1.25E-04	0.00E+00	2.66E-08
Sodium nitrate	8.30E-05	0.00E+00	1.68E-08

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).

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

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.

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.

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) (Ecology 1989).

- Collect and analyze multiple samples from the wastestream.
- Calculate the upper limit of the one-sided 90% confidence interval (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 concentration 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 neutral substances formulated for the wastestream.
- Calculate the contribution of each substance to the percent equivalent concentration (EC%).
- Calculate the EC% by summing the contributions 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 substances present at B Plant; however, because the BCS stream is a closed system, none can be added at B Plant. Thirteen 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 EC% values for these substances. Because the EC% is 2.35 E-07%, which is less than the cutoff of 0.001%, the wastestream is not a toxic dangerous waste.

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).

- 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%) contribution of each 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 conc% PAH concentration is greater than 1.0%, per WAC 173-303-9907 (Ecology 1989).

No chemical compounds present in the BCS stream were determined to be HH or PAH. Because none are present, the BCS wastestream 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 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 carcinogenic substances that can exist in an aqueous environment under normal temperatures and pressures.
- Determine which substances in the wastestream are human or animal carcinogens according to the International Agency for Research on Cancer.
- Calculate the weight percent concentration for each carcinogen.
- Sum the resulting weight percent.
- Designate the wastestream as carcinogenic if any of the positive carcinogens are above 0.01% or if the total concentration for positive and suspected carcinogens is above 1.0%.

One substance potentially present in the BCS stream was determined to be a carcinogenic chemical compound. This compound is listed in Table 5-1. The individual and sum percent carcinogens for this chemical are also listed in Table 5-1. Because the concentration of the positive carcinogen in the stream was less than 0.01%, the BCS stream is not a carcinogenic dangerous waste. The only contributor and the percent carcinogen was nickel (II) hydroxide at a concentration of 1.63 E-06%.

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 BCS stream. The value of the index calculated from this constituent is 3.99 E-06%. Therefore, the BCS stream is not an ignitable waste.

5.5.2 Corrosivity

A waste is a corrosive dangerous waste if it has a pH of $\leq$2.0 or $\geq$12.5. 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% confidence interval for a stream with a mean value of pH $\geq$7.25.

Because the mean value of the pH measurements for the BCS was below 7.25, the lower confidence interval limit, 5.12, was used. The wastestream 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* (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.

Because there are no sulfide and cyanide compounds present in the BCS stream (i.e., less than the 100 mg/kg detection limit), this wastestream is not a reactive dangerous waste.

5.5.4 Extraction Procedure Toxicity

A waste is an EP toxic dangerous waste if individual chemical analytes exceed limits of WAC 173-303-090(8)(c). In the absence of specific EP toxicity test results, total analyte concentrations are used. Two analytes with concentrations above detection limits that are on the EP toxic list were found in the BCS stream. The concentrations of these two analytes, lead and mercury, are listed in Table 5-1. Because the lead concentration of 0.005 mg/L does not exceed the limit of 5 mg/L and the mercury concentration of 1.35 E-04 mg/L does not exceed the limit of 0.2 mg/L, the BCS wastestream is not an EP toxic dangerous waste.

5.6 PROPOSED DESIGNATIONS

Because the BCS wastestream does not contain any dangerous waste, as defined in WAC 173-303-070, it is proposed that the wastestream not be designated a dangerous waste.

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6.0 ACTION PLAN

The identification of additional waste characterization tasks will be negotiated between the Ecology, EPA, and the DOE. These negotiations will consider the contents of this report along with the results of the groundwater characterization and waste disposal site assessment aspects of the *Liquid Effluent Study Characterization Data* (WHC 1990c). The implementation schedule for any additional characterization tasks will give consideration to other compliance actions already under way as part of the Tri-Party Agreement (Ecology et al. 1989).

6.1 FUTURE SAMPLING

The random sampling conducted during the December 1985 and December 1988 period covered the process configuration of the BCS system. No other configuration exists for this system. The BCS will be resampled to address validation concerns during the documentation cycle.

6.2 TECHNICAL ISSUES

As described in Section 2.0, the BCS effluent stream was sampled at the 221-BB Building (see Figure 2-4). This sample point was chosen because it is a common, accessible location 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. As a result, the characterization data presented in this report are considered to be representative of the effluent stream.

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APPENDIX A

PROCESS INFORMATION

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APPENDIX A

PROCESS INFORMATION

A-1 POTENTIAL CHEMICAL MATERIAL SAFETY DATA SHEET (MSDS)

None applicable for the BCS stream.

A-2 PROCESS CHEMICAL MATERIAL SAFETY DATA SHEET (MSDS)

None applicable for the BCS stream.

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APPENDIX B

SAMPLING DATA FOR THE B PLANT STEAM CONDENSATE

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Table B-1. Data for B Plant Steam Condensate.
(sheet 1 of 5)

Constituent	Sample #	Date	Method	Result
Calcium	50027	12/17/85	ICP	6.93E+02
Calcium	50037	5/08/86	ICP	<5.00E+01
Calcium	50129	9/10/86	ICP	1.20E+02
Calcium	50190	11/25/86	ICP	1.86E+02
Calcium	50448	8/18/88	ICP	1.41E+02
Calcium	50494	11/14/88	ICP	5.70E+01
Calcium	50522	12/29/88	ICP	<5.00E+01
Copper	50027	12/17/85	ICP	<1.00E+01
Copper	50037	5/08/86	ICP	<1.00E+01
Copper	50129	9/10/86	ICP	<1.00E+01
Copper	50190	11/25/86	ICP	<1.00E+01
Copper	50448	8/18/88	ICP	<1.00E+01
Copper	50494	11/14/88	ICP	<1.00E+01
Copper	50522	12/29/88	ICP	1.50E+01
Iron	50027	12/17/85	ICP	<5.00E+01
Iron	50037	5/08/86	ICP	<5.00E+01
Iron	50129	9/10/86	ICP	<5.00E+01
Iron	50190	11/25/86	ICP	<5.00E+01
Iron	50448	8/18/88	ICP	<3.00E+01
Iron	50494	11/14/88	ICP	4.60E+01
Iron	50522	12/29/88	ICP	3.83E+02
Lead	50027	12/17/85	ICP	<3.00E+01
Lead	50190	11/25/86	GFAA	<5.00E+00
Lead	50448	8/18/88	GFAA	<5.00E+00
Lead	50494	11/14/88	GFAA	<5.00E+00
Lead	50522	12/29/88	GFAA	5.00E+00
Magnesium	50027	12/17/85	ICP	5.40E+01
Magnesium	50129	9/10/86	ICP	<5.00E+01
Magnesium	50190	11/25/86	ICP	<5.00E+01
Magnesium	50448	8/18/88	ICP	<5.00E+01
Magnesium	50494	11/14/88	ICP	<5.00E+01
Magnesium	50522	12/29/88	ICP	<5.00E+01
Mercury	50027	12/17/85	CVAA	<1.00E-01
Mercury	50037	5/08/86	CVAA	<1.00E-01
Mercury	50129	9/10/86	CVAA	<1.00E-01
Mercury	50190	11/25/86	CVAA	<1.00E-01
Mercury	50448	8/18/88	CVAA	<1.00E-01
Mercury	50494	11/14/88	CVAA	<1.00E-01
Mercury	50522	12/29/88	CVAA	2.00E-01
Nickel	50027	12/17/85	ICP	<1.00E+01
Nickel	50037	5/08/86	ICP	<1.00E+01
Nickel	50129	9/10/86	ICP	<1.00E+01
Nickel	50190	11/25/86	ICP	<1.00E+01
Nickel	50448	8/18/88	ICP	<1.00E+01
Nickel	50494	11/14/88	ICP	<1.00E+01
Nickel	50522	12/29/88	ICP	1.10E+01

Table B-1. Data for B Plant Steam Condensate.
(sheet 2 of 5)

Constituent	Sample #	Date	Method	Result
Nitrate	50027	12/17/85	IC	<5.00E+02
Nitrate	50037	5/08/86	IC	<5.00E+02
Nitrate	50129	9/10/86	IC	<5.00E+02
Nitrate	50190	11/25/86	IC	<5.00E+02
Nitrate	50448	8/18/88	IC	3.42E+03
Nitrate	50494	11/14/88	IC	<5.00E+02
Nitrate	50522	12/29/88	IC	<5.00E+02
Potassium	50027	12/17/85	ICP	1.00E+02
Potassium	50037	5/08/86	ICP	<1.00E+02
Potassium	50129	9/10/86	ICP	<1.00E+02
Potassium	50190	11/25/86	ICP	<1.00E+02
Potassium	50448	8/18/88	ICP	<1.00E+02
Potassium	50494	11/14/88	ICP	<1.00E+02
Potassium	50522	12/29/88	ICP	<1.00E+02
Sodium	50027	12/17/85	ICP	2.06E+02
Sodium	50037	5/08/86	ICP	<1.00E+02
Sodium	50129	9/10/86	ICP	3.01E+02
Sodium	50190	11/25/86	ICP	<1.00E+02
Sodium	50448	8/18/88	ICP	<2.00E+02
Sodium	50494	11/14/88	ICP	<2.00E+02
Sodium	50522	12/29/88	ICP	<2.00E+02
Uranium	50037	5/08/86	FLUOR	1.22E-01
Uranium	50129	9/10/86	FLUOR	9.54E-01
Uranium	50190	11/25/86	FLUOR	2.39E-02
Uranium	50448	8/18/88	FLUOR	<3.19E-02
Uranium	50494	11/14/88	FLUOR	3.25E-01
Uranium	50522	12/29/88	FLUOR	<1.43E-01
Zinc	50027	12/17/85	ICP	5.60E+01
Zinc	50037	5/08/86	ICP	<5.00E+00
Zinc	50129	9/10/86	ICP	<5.00E+00
Zinc	50190	11/25/86	ICP	<5.00E+00
Zinc	50448	8/18/88	ICP	<5.00E+00
Zinc	50494	11/14/88	ICP	5.00E+00
Zinc	50522	12/29/88	ICP	8.00E+00
Acetone	50027	12/17/85	VOA	2.60E+01
Acetone	50129	9/10/86	VOA	4.10E+01
Acetone	50448	8/18/88	VOA	4.10E+01
Acetone	50494	11/14/88	VOA	3.70E+01
Acetone	50522	12/29/88	VOA	1.20E+01
Ammonia	50027	12/17/85	ISE	<5.00E+01
Ammonia	50037	5/08/86	ISE	1.24E+02
Ammonia	50129	9/10/86	ISE	5.80E+01
Ammonia	50190	11/25/86	ISE	1.06E+02
Ammonia	50448	8/18/88	ISE	2.03E+02
Ammonia	50494	11/14/88	ISE	1.29E+02
Ammonia	50522	12/29/88	ISE	1.35E+02

Table B-1. Data for B Plant Steam Condensate.
(sheet 3 of 5)

Constituent	Sample #	Date	Method	Result
Dichloromethane	50027	12/17/85	VOA	<1.00E+01
Dichloromethane	50037	5/08/86	VOA	<1.00E+01
Dichloromethane	50037B	5/08/86	VOA	1.70E+02
Dichloromethane	50129	9/10/86	VOA	<1.00E+01
Dichloromethane	50129B	9/10/86	VOA	1.50E+02
Dichloromethane	50190	11/25/86	VOA	<1.00E+01
Dichloromethane	50190B	11/25/86	VOA	9.30E+01
Dichloromethane	50448	8/18/88	VOA	<1.00E+01
Dichloromethane	50448B	8/18/88	VOA	<1.00E+01
Dichloromethane	50494	11/14/88	VOA	<1.00E+01
Dichloromethane	50494B	11/14/88	VOA	<1.00E+01
Dichloromethane	50522	12/29/88	VOA	<1.00E+01
Phenol	50027	12/17/85	ABN	1.10E+01
Phenol	50037	5/08/86	ABN	<1.00E+01
Constituent	Sample #	Date	Method	Result
Phenol	50129	9/10/86	ABN	<1.00E+01
Phenol	50190	11/25/86	ABN	<1.00E+01
Phenol	50448	8/18/88	ABN	<1.00E+01
Phenol	50494	11/14/88	ABN	<1.00E+01
Phenol	50522	12/29/88	ABN	<1.00E+01
Unknown	50448	8/18/88	ABN	3.30E+01
Alpha Activity (pCi/L)	50027	12/17/85	Alpha	7.14E-02
Alpha Activity (pCi/L)	50129	9/10/86	Alpha	1.73E+00
Alpha Activity (pCi/L)	50190	11/25/86	Alpha	4.37E-01
Alpha Activity (pCi/L)	50448	8/18/88	Alpha	1.28E+01
Alpha Activity (pCi/L)	50522	12/29/88	Alpha	<7.99E-02
Beta Activity (pCi/L)	50027	12/17/85	Beta	2.83E+02
Beta Activity (pCi/L)	50037	5/08/86	Beta	1.09E+01
Beta Activity (pCi/L)	50129	9/10/86	Beta	1.57E+01
Beta Activity (pCi/L)	50190	11/25/86	Beta	4.49E+00
Beta Activity (pCi/L)	50448	8/18/88	Beta	5.03E+01
Beta Activity (pCi/L)	50494	11/14/88	Beta	6.29E+00
Beta Activity (pCi/L)	50522	12/29/88	Beta	1.17E+02
Conductivity (µS)	50027	12/17/85	COND-Fld	1.60E+01
Conductivity (µS)	50129	9/10/86	COND-Fld	5.00E+00
Conductivity (µS)	50190	11/25/86	COND-Fld	6.00E+00
Conductivity (µS)	50448	8/18/88	COND-Fld	6.90E+01
Conductivity (µS)	50494	11/14/88	COND-Fld	3.70E+01
Conductivity (µS)	50522	12/29/88	COND-Fld	4.60E+01
pH (dimensionless)	50027	12/17/85	PH-Fld	1.08E+01
pH (dimensionless)	50037	5/08/86	PH-Fld	4.40E+00
pH (dimensionless)	50129	9/10/86	PH-Fld	7.39E+00
pH (dimensionless)	50190	11/25/86	PH-Fld	4.65E+00
pH (dimensionless)	50448	8/18/88	PH-Fld	5.72E+00
pH (dimensionless)	50494	11/14/88	PH-Fld	5.46E+00
pH (dimensionless)	50522	12/29/88	PH-Fld	5.78E+00

Table B-1. Data for B Plant Steam Condensate.
(sheet 4 of 5)

Constituent	Sample #	Date	Method	Result
Temperature (°C)	50027	12/17/85	TEMP-Fld	5.27E+01
Temperature (°C)	50037	5/08/86	TEMP-Fld	7.20E+01
Temperature (°C)	50129	9/10/86	TEMP-Fld	4.90E+01
Temperature (°C)	50190	11/25/86	TEMP-Fld	4.49E+01
Temperature (°C)	50448	8/18/88	TEMP-Fld	8.09E+01
Temperature (°C)	50494	11/14/88	TEMP-Fld	5.38E+01
Temperature (°C)	50522	12/29/88	TEMP-Fld	5.32E+01

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}Americium	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}Strontium	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-CHAP.7
DTITRA	Reactive Sulfide (Distillation, Titration)	USEPA-CHAP.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

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Table B-1. Data for B Plant Steam Condensate.
(sheet 5 of 5)

Constituent		Sample #	Date	Method	Result
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}Iodine				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 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.