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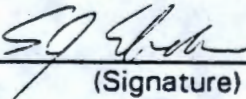
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This document is a plan identifies the information needed to address relevant issues concerning short-term and long-term safe storage and long-term management of Single-Shell Tank (SST) 241-BY-105.		
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# Tank 241-BY-105 Tank Characterization Plan

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Westinghouse Hanford Company

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## LIST OF ABBREVIATIONS

DQO	Data Quality Objective
NCPLX	Non-complexed
DSSF	Double Shell Slurry Feed
SST	Single-Shell Tank
TCP	Tank Characterization Plan
TOC	Total Organic Carbon
BY-105	Tank 241-BY-105
USQ	Unreviewed Safety Question
WHC	Westinghouse Hanford Company

## 1.0 INTRODUCTION

This Tank Characterization Plan (TCP) identifies the information needed to address relevant issues concerning short-term safe storage and long-term management of Single-Shell Tank (SST) 241-BY-105 (BY-105). It should be understood that the various needs and issues surrounding tank BY-105 are evolving as new information about the tank is uncovered. As a result of this progression, this Tank Characterization Plan addresses only the issues that, to this date, have been identified. It is expected that deviations from this plan may occur as additional issues or needs arise which impact the management of SST BY-105. As necessary, this Tank Characterization Plan will be revised to reflect those changes or deviations.

Tank BY-105 was constructed between 1948 and 1949 and was put into service in June 1951. Tank BY-105 received metal waste via cascade. From June 1951 until the fourth quarter of 1951. The metal waste was sluiced for uranium recovery in the third quarter of 1954. The tank started receiving U plant waste from tanks 241-BY-107 and 241-BY-110 in the fourth quarter of 1954. The tank received U plant waste intermittently until the third quarter of 1966. From the third quarter of 1957 until the fourth quarter of 1974, the tank received wastewater. Coating waste was sent to the tank from the second quarter of 1962 until the fourth quarter of 1967. Also, the tank was an in-tank solidification bottoms receiver during the first two quarters of 1967. The tank contained evaporator bottoms waste from the in-tank solidification program between the first quarter of 1968 to the second quarter of 1974. Sixty-three tons of portland cement was added in 1977. Presently, the tank waste is classified as non-complexed. This tank currently has a total waste volume of 1,904.2 kL (503 kgal), which is equivalent to 483.51 centimeters (190.36 inches) of waste as measured from the baseline of the tank. The waste is comprised of 1,275.7 kL (337 kgal) of saltcake; 628.4 kL (166 kgal) of sludge and no supernatant with 639.8 kL (169 kgal) of pumpable liquid remaining (Brevick 1994a).

The tank is an assumed leaker (with a leak of approximately 30.3 kL (8 kgal) in 1984) and was designated out of service in 1973. Tank BY-105 is passively ventilated, was partially isolated in December 1982 and is awaiting interim stabilization. The last solids volume update was obtained on April 28, 1982 (Hanlon 1995) and the last photo was taken on July 1, 1986. The 1986 photographic montage indicates a light tan to light brown saltcake surface (Brevick 1994b).

Two liquid samples from tank BY-105 were analyzed in 1991 for total organic carbon (TOC) (0.20%) and water (54.0%). No other analytical records were found. This tank is on the Ferrocyanide Watch list, but detailed review of the fill history records suggests that much of the FeCN containing waste may have been pumped out of this tank. Near-term sampling and analysis activities are focused on verification of the watchlist tank status, identification of any new safety issues, changing the tank's Watch List status, and/or resolving the USQ. Should any safety issues be identified, further analyses will be directed consistent with the identified issue.

In addition to the resolution of the safety issues, it is intended that all tank waste will be subject to pretreatment and retrieval to prepare for final storage or disposal.

## 2.0 PROGRAM ELEMENTS REQUIRING INFORMATION FOR TANK 241-BY-105

This section identifies the various program elements, and identifies which of these programs require characterization data from tank BY-105.

## 2.1 GENERAL SAFETY ISSUES

The *Tank Safety Screening Data Quality Objective* (Babad et al 1995a) describes the sampling and analytical requirements that are used to screen waste tanks for unidentified safety issues. The primary analytical requirements for the safety screening of a tank are energetics, total alpha activity, moisture content, and flammable gas concentration.

## 2.2 SPECIFIC SAFETY ISSUES

### 2.2.1 Ferrocyanide

This tank is on the Ferrocyanide Watch List. Sampling and analysis requirements must be performed as per *Data Requirements for the Ferrocyanide Safety Issue Developed through the Data Quality Objectives Process* (Meacham 1995). Total fuel concentration, cyanide, total organic carbon (TOC), nickel, and moisture content are the key data requirements. These data will be used to answer the following questions: 1) does ferrocyanide still exist in the tank?; 2) did the ferrocyanide age?; 3) is there enough total fuel to support a propagating reaction?; and 4) is there enough moisture to prevent a propagating reaction? (Meacham 1995).

### 2.2.2 Organic

This tank is not on the Organics Watch List, but recent work by the Organic Safety Program revealed a question regarding organic complexant salts. A potential problem with regard to the complexed salts exists if all the drainable liquid is pumped from the tank (Webb et al 1995). Sampling and analysis requirements must be performed as per *Data Quality Objective to Support Resolution of the Organic Fuel Rich Tank Safety Issue* (Babad et al 1995b). The analyses employed will determine the TOC, presence of a free organic liquid phase, moisture content and tank temperature.

### 2.2.3 High Heat

This tank is not on the High Heat Watch List; therefore, no information needs are currently identified for this program element.

### 2.2.4 Flammable Gas

This tank has been identified by the Flammable Gas Safety Program as meeting the criteria that may indicated potential for flammable gas generation and retention. For this reason, a vapor sample is warranted (as discussed below). Not all potential flammable gas tanks require core sampling and application of the flammable gas core sampling DQO. The program has not requested application of the DQO for this tank.

### 2.2.5 Vapor

The tanks currently scheduled to be vapor sampled may be classified into four categories: (1) those tanks which are to be rotary mode core sampled (a prerequisite to rotary sampling); (2) tanks on the Organic or Ferrocyanide Watch Lists; (3) tanks in C farm; and (4) tank BX-104, due to vapor exposure. Since tank BY-105 is categorized in one of the above four groups, information needs must satisfy *Data Quality Objectives for Generic In-Tank Health and Safety Vapor Issue Resolution* (Osborne et al. 1995) and *Rotary Sampling Core Vapor Sampling Data Quality Objective* (Price 1994). Characterization of the tank headspace is needed to: 1) identify those tanks which can be sampled safely with intrusive equipment without risk of gas ignition; 2) identify

and estimate concentrations of toxicologically significant compounds present in the tank headspace to establish worker safety precautions; and 3) support the startup and operation of the portable exhauster used during rotary-mode core sampling.

### 2.2.6 Criticality

No information separate from that for the general safety issue of tank BY-105 are currently identified for this program element. However, if the general safety screening of tank BY-105 identifies a potential criticality concern, analyses for fissile materials and neutron absorbers and poisons will be performed as identified in the safety screening data quality objective.

### 2.2.7 Screening Approach Evaluation

The safety screening approach is currently under review. Information is required from key tanks to determine if a revised approach to screening may be adopted, as proposed in Meacham 1995. Sampling of this tank is required to confirm original ferrocyanide fuel distribution and waste aging and to support the ferrocyanide and organic safety issues. Organic solubility and distribution theories will be evaluated from both "Grab" and "Core" samples. Data from previous grab sample events combined with analyses of drainable liquid in the core sample will be used to address this need. No further grab samples are currently required.

## 2.3 CONTINUING OPERATIONS

### 2.3.1 Compatibility/Stabilization

Tank BY-105 waste will be sampled to determine compatibility. Sampling and analysis requirements must be performed as per *Data Quality Objectives for the Waste Compatibility Program* (Fowler 1995). The analyses employed will be used to quantify transuranics (TRUs) such as  $^{239}\text{Pu}$  and  $^{241}\text{Am}$ , Total Organic Content (TOC), heat generation (by determining the amount of  $^{90}\text{Sr}$  and  $^{137}\text{Cs}$ ) and measuring the "pumpability" of the waste (i.e. density, viscosity, percent of volume composed of solids...etc).

### 2.3.2 Evaporator

No information needs are currently identified for this program element.

## 2.4 DOUBLE-SHELL TANK WASTE ANALYSIS PLAN

This section does not apply because Tank BY-105 is a single shell tank.

## 2.5 DISPOSAL

### 2.5.1 Retrieval

Current retrieval needs (Bloom 1995) do not call for test samples to be taken from tank BY-105.

### 2.5.2 Pretreatment/Vitrification

Tank BY-105 is identified as a bounding tank for pretreatment/disposal process development (Kupfer et al. 1995).

### 2.6 HISTORICAL MODEL EVALUATION

Bounding tanks and data requirements for historical model evaluations are found in *DQO Historical Model Evaluation Data Requirements* (Simpson et al. 1995). Tank BY-105 has been identified as a primary bounding tank for ferrocyanide and BY saltcake waste types.

### 3.0 HOW INFORMATION WILL BE OBTAINED

The safety screening DQO requires that a vertical profile of the tank waste be obtained from at least two widely spaced risers. This vertical profile may be obtained using core, auger (for shallow tanks), or grab samples. Several sampling events of tank BY-105 are scheduled: grab sampling event and a rotary sampling event. Vapor sampling of this tank has already been completed. No other sampling is scheduled through fiscal year 1996 (Stanton 1995). The rotary mode sampling type has been chosen over other sampling modes due to both the depth of the tank (making auger sampling inadequate) and the fact that the surface of tank BY-105 is comprised of saltcake (which is not conducive to good push mode core sampling recovery). Prior to rotary sampling it is necessary to vapor sample the tank as per requirements of (Price 1994).

The best current estimate of the water content in tank BY-105 solids as determined from process records is 35%, based on the Historical Tank Contents Estimate (Brevick 1994a). Estimates (Toth et al. 1995) of water content in tank BY-105 saltcake and sludge are 43.1% and 37.9% respectively generated from a model based on sample data from similar tanks. The variance of water in tanks already sampled has been used to generate a statistical power curve. This curve is used to determine that three cores are needed to demonstrate a water content above 17% at 95% confidence. Should the measured mean be lower than anticipated or measured variance higher, additional samples may be required. The saltcake TOC is estimated (Toth et al 1995) to be 0.7% (wet basis) which is significantly lower than the level of concern. Ideally three core samples would be requested for this tank to meet the requirements for above parameters.

The best current information indicates that 2 risers are available for sampling of tank BY-105, 12" riser R5 and 4" riser R12A. Since only 2 risers are available, initial information will be taken from these 2 risers and assessed to determine if more samples are required from other locations. Alternate sampling methods, installation of a riser, or removal of equipment from other risers are possible future options.

## 4.0 PRIORITY OF INFORMATION REQUIREMENTS

Vapor sampling has not been completed. Grab sampling was completed on March 21, 1995 (Stanton 1995). Rotary mode sampling is scheduled for FY 1995 (Stanton 1995).

Table 4-1: Integrated DQO Requirements

Sampling Event	Applicable DQO	Sampling Requirements	Analytical Requirements
Vapor Sampling	-Health & Safety Vapor Issue Resolution DQO -Rotary Sampling Core Vapor Sampling DQO	3 SUMMA® canisters 12 Triple Sorbent Traps 6 Sorbent Trap Systems Complete 1994.	Gas Flammability Gas Toxicity -Organic Vapors -Permanent Gases
Rotary Core Sampling	-Safety Screening DQO -Ferrocyanide DQO -Organic Fuel-Rich DQO -Historical Model DQO	Core samples from 2* risers separated radially to the maximum extent possible  *see section 3	Energetics, Moisture, Total Alpha, Organic composition, FeCN breakdown products
Grab Sampling	-Compatibility DQO	3 grab samples. Completed 3/22/95	Energetics, Moisture, Major Anions, Cations & Radionuclides, SpG & pH, Separable Organics

## 5.0 WHEN INFORMATION IS NEEDED

Data are required for Tank BY-105 during FY 1996 for safety screening and to prepare a Tank Characterization report.

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## DISTRIBUTION SHEET

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