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STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

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June 1, 1992

Mr. Phil Hamric, Deputy Manager
Operations and Support
U.S. Department of Energy
P.O. Box 550
Richland, WA 99352



Dear Mr. Hamric:

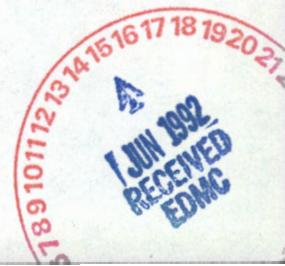
Re: CONTINGENCY PLANNING AND CORRECTIVE ACTIONS FOR SINGLE SHELL
TANK 241-C-106

During the course of this last year, I have forwarded a number of letters to USDOE expressing my increasing concern regarding single-shell tank 241-C-106 (106-C). At the same time, my staff have been working with USDOE and Westinghouse Hanford Company (WHC) scientists and engineers to better understand how this tank is monitored for leaks and to identify actions necessary if this tank is found to be leaking. We have had numerous instructive exchanges during this time, and I am now prepared to share some of our observations and recommendations for action.

Observations:

- 1) Ecology has reviewed available liquid level and psychrometric data for 106-C and concludes that the present surveillance system does not provide a reliable means for detecting leaks from this tank. In fact, existing data are far from conclusive. Nonetheless, a conservative evaluation of data which are available leads me to believe that thousands of gallons of waste may have leaked from this tank in the last year (though this assessment merits further study). A summary of our review in this regard is enclosed.
- 2) Representatives of Ecology, the U.S. Environmental Protection Agency (EPA), U.S. Geological Survey (USGS), U.S. General Accounting Office (GAO), and the 1990 USDOE Tiger Team, as well as numerous WHC staff geophysicists have discussed deficiencies in the tank farms drywell monitoring system. Ecology staff have also indicated that the present drywell monitoring system is inadequate and does not significantly contribute to the sensitivity of leak detection at 106-C.

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Observations (cont.):

- 3) Because of the environmentally damaging effects which would result from a leak from 106-C or 105-C (another high-heat tank), Ecology cannot allow what we view as the current inadequate level of contingency planning for these tanks to continue. I note that the current plan for 106-C, written in 1984, calls for continued water additions in the event of a leak. I also note that corrective actions such as the installation of a sprinkler system or the removal of heat producing sludges, could take months or even years to implement. Meanwhile, tens of thousands of gallons of contaminated liquids could be lost to surrounding soils.

In light of the preceding observations; because of the extremely hazardous nature of the contents of tanks 105-C and 106-C; because the integrity of these two tanks is uncertain; and because these tanks were not designed to accommodate the wastes they now hold, Ecology believes that removal of all sludges and supernatant must be the primary objective of management activities at these tanks. In addition, water additions now and in the future must be minimized while keeping waste and dome temperatures within safe operating limits. These management objectives are fully consistent with the requirements of the Resource Conservation and Recovery Act (RCRA), the State Hazardous Waste Management Act, and the Atomic Energy Act.

I am aware that double-shell tank space is limited, that transfer lines are not immediately available, that waste characterization data is limited, and that the extreme radioactivity of tank contents may preclude immediate waste removal. Nonetheless, I disagree with the suggestion in Ron Izatt's April 6, 1992, letter (page 2, paragraph 4) that compliance with environmental regulations and the Atomic Energy Act are somehow mutually exclusive requirements.

Consequently, in order to reduce the risks of radiation exposure and to protect human health and the environment from releases of contaminated liquids from tanks 105-C and 106-C, I am proposing that USDOE agree to, and take all necessary actions in order to ensure that:

Recommendations:

- 1) Full scale waste retrieval from tank 106-C will begin no later than October 1997. This would meet milestone M-07 for demonstration of waste retrieval technology (Hanford Federal Facility Agreement and Consent Order). Tank 106-C should be selected as the site of the first full scale waste retrieval demonstration.

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Recommendations (cont.):

- 2) Drainable liquids will be removed and water additions ended to tanks 105-C and 106-C no later than September 1996 as required by interim milestone M-05-08.
- 3) USDOE will submit a technical justification for continued water additions to 105-C or discontinue these additions no later than September 1992.
- 4) The 106-C contingency plan will be revised by December 1992 and such revision will include a commitment that upon discovery of a leak from tank 106-C, sufficient sludge will be removed to the extent necessary to end water additions, and thereby eliminate the risk of additional leakage. This expedited waste retrieval should be accomplished by sluicing or other means currently available to USDOE. Retrieved sludge and supernatant to be transferred to a double-shell tank or tanks suited for storage of high-heat waste.
- 5) Any and all equipment required for corrective action in response to a leak from 106-C (e.g., pumps, transfer lines, sprinkler system, in-line waste sampling ports) will be fabricated and on site (or installed if appropriate) no later than May 1993.
- 6) Monitoring systems will be upgraded to provide more reliable and timely detection of leaks from 105-C and 106-C, and that such action will include:
 - a. Daily measurements of ambient and exhaust wet and dry bulb temperatures and inclusion of such data in the monthly surveillance report sent to Ecology beginning no later than July 1992 (the effects of diurnal temperature and humidity changes should also be reviewed),
 - b. Geophysical logging of the 14 drywells around 105-C and 106-C using a spectral gamma probe (this should be repeated three times before December 1992 to provide a baseline comparison with the gross gamma tool),
 - c. Calibration of the gross and spectral gamma-ray probes in a pit model which reflects lithology and well construction in C farm no later than September 1992,
 - d. Reduction of the logging speed of the gross gamma-ray probe from 45 feet per minute to no more than 3 feet per minute no later than September 1992, and

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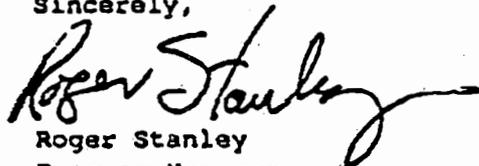
Mr. Phil Hamric
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June 1, 1992

Recommendations (cont.):

- e. Increased frequency of groundwater well sampling, analysis, and data reporting to bimonthly in wells E27-7, E27-12, E27-13, E27-14, E27-15 no later than September 1992.

I believe that the preceding proposed actions constitute a minimally acceptable approach to the very real and disturbing current situation at Hanford's high heat tanks. I would appreciate your expedited review of this issue and the associated draft Hanford Federal Facility Agreement and Consent Order change control forms (enclosed). These new interim milestones are intended to replace change control form M-07-92-01, submitted by USDOE on April 29, 1992. I would appreciate it if you would direct your staff to aid us in finalizing these changes no later than July 1, 1992.

Sincerely,



Roger Stanley
Program Manager
Nuclear and Mixed Waste Management

MG:ph
Enclosures(2)

cc: George Hofer
John Hunter
Narda Pierce
Dan Silver
John Tseng

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COMPARISON OF EVAPORATIVE LOSSES AND WATER ADDITIONS TO 106-C
May 27, 1992

Background:

Liquid level measurements in tank 106-C show steady liquid surface decreases of about 230-270 gallons per day, interrupted every 4-8 weeks by batch additions of 6000-12000 gallons of water (see Figure 1). USDOE/WHC has proposed that these liquid level decreases are caused by the evaporation of water due to the high radioactive decay heat in this tank (waste temperatures were reported to be up to 188F on May 23, 1992). USDOE/WHC monitors the water content of air entering and exhausting from tank 106-C. These monthly measurements can be compared to the water addition records to provide indirect leak detection. The amount of water added to the tank should roughly equal the amount of water vapor released to the atmosphere. If not, 106-C may be leaking.

Question:

Does the amount of water added to tank 106-C equal the amount of water vapor released by this tank?

Procedure:

Evaporative losses have been calculated by USDOE/WHC using ambient and exhaust wet and dry bulb temperatures (also called psychrometric data) measured from December 1990 through September 1991. These temperatures are taken monthly at the locations shown in Figure 2, and the results are summarized in Table 1.

Water additions to 106-C are metered and recorded on Water Addition Data Sheets. Water additions from November 1990 through October 1991 are listed in Table 2. Water Addition Data Sheets for water additions made on December 1, 1990, January 24, 1991, and July 10, 1991, were not available from USDOE/WHC. The dates and volumes of these water additions were estimated from increases in liquid level (FIC) measurements.

Results:

Figure 3 shows cumulative water additions and evaporative losses for November 1990 through December 1991 (Note: Water additions are plotted as a smooth curve though they actually occur in batches). The difference between these two curves indicates water added to the tank but not accounted for in the exhaust vapor. The two curves agree well until May through September 1991 (the last time exhaust vapor was measured) when this cumulative difference grew to about 10000 gallons (more water added to the tank than measured in the exhaust).

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May 27, 1992

Page 2

Interpretation:

The 10000 gallons of unaccounted water may or may not be a significant discrepancy. Water addition data is thought to be very accurate, but calculations of evaporative losses have some unspecified uncertainty associated with them. The error range of the water vapor measurements has not been determined so it is not clear whether the 10000 gallon discrepancy is within measurement error, or whether it represents a leak from the tank.

Other limitations in using psychrometric data for leak detection are:

- Moist air from 104-C and 105-C enters 106-C through a 3 inch overflow pipe. In addition, condensed vapors from 105-C and 106-C are collected in a deentrainer and returned to 106-C. Both sources of water should be added to the water additions for 106-C. If this were done the discrepancy between water additions and evaporative losses would be greater. The volumes of these sources are not known, and should be measured if possible.
- Evaporation rates are calculated on the basis of one monthly measurement which may not be representative or accurate. More frequent measurements are needed. Changes in the evaporation rate throughout each day and from day to day are not known and should be observed to determine an appropriate frequency for future psychrometric surveys.
- The procedure used to measure moisture in the exhaust gas has not been calibrated under controlled (lab) conditions. This should be done to verify that the procedure is appropriate for the temperatures, humidity and airflows encountered in the field.
- The effect of the deentrainer on uncondensed vapors is not known. If the deentrainer is causing some water vapor to condense, this would cause evaporative losses to be overestimated (since evaporative losses are measured before the deentrainer) and would increase the observed discrepancy between water additions and evaporative losses.

Until these limitations are quantified (providing an error range for the measurement), or until other more sensitive leak detection methods are proven, a conservative approach would be to consider that 10000 gallons of tank liquids may have leaked from tank 106-C between May and September 1991.

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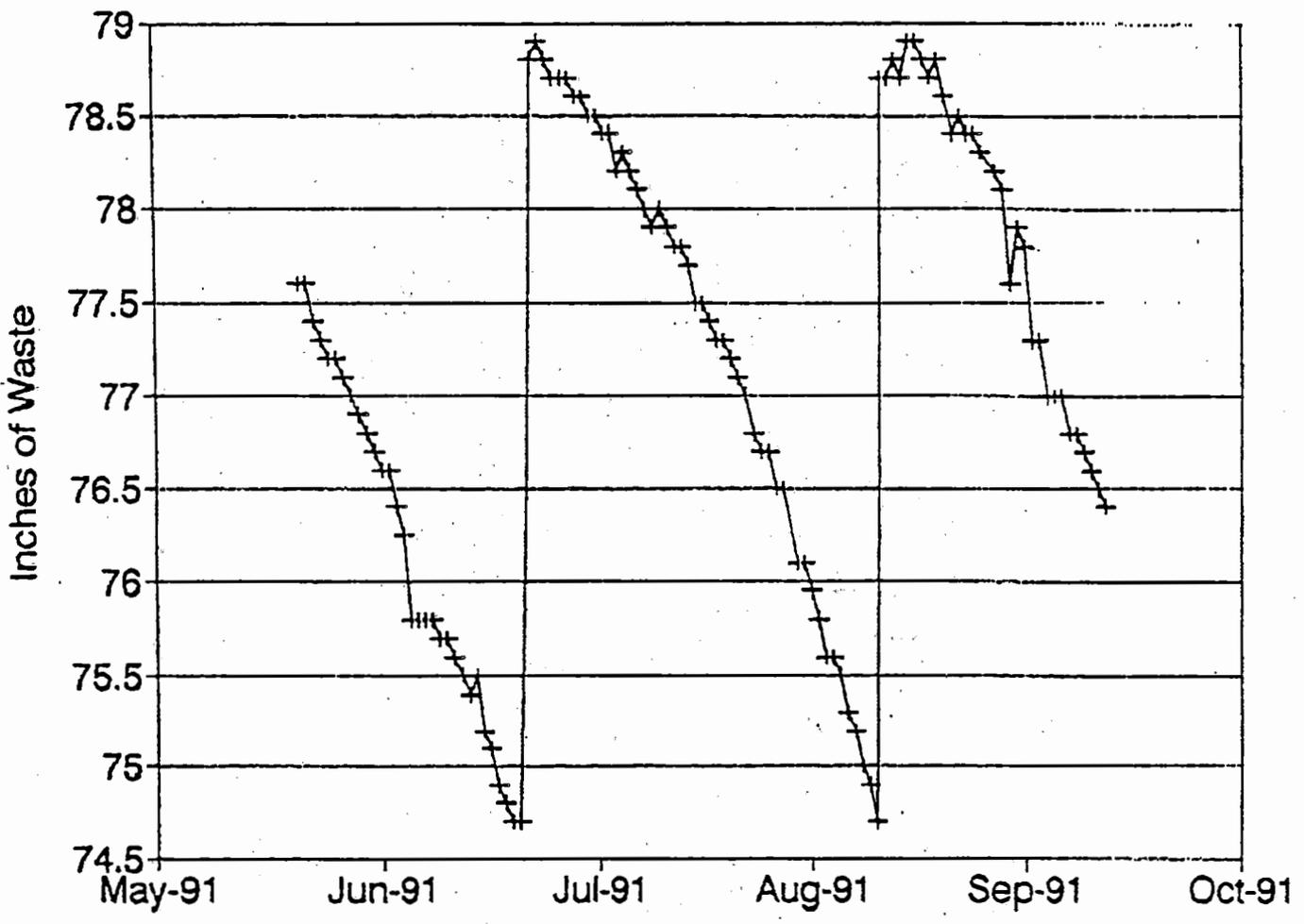
Interpretation (cont.):

Other leak detection methods which could be used to assess this conclusion involve liquid level measurements (FIC data), water addition intervals and drywell data. The first two methods may be useful for detecting large new leaks by observing steeper drops in the FIC data or shorter intervals between water additions. These methods do not, however, seem useful for confirming or rejecting the presence of longstanding leaks. Drywell data could, in principle, be used to observe the accumulation of radionuclides from such long term leaks. But based on recent critical reviews of the tank farms drywell monitoring program, reliance on current gross gamma geophysical logging procedures would be unwise.

A slow (less than 2000 gallons per month) leak which began before 1986 is consistent with data provided to Ecology. Improved tank monitoring systems should discover whether this leak is real or within measurement error.

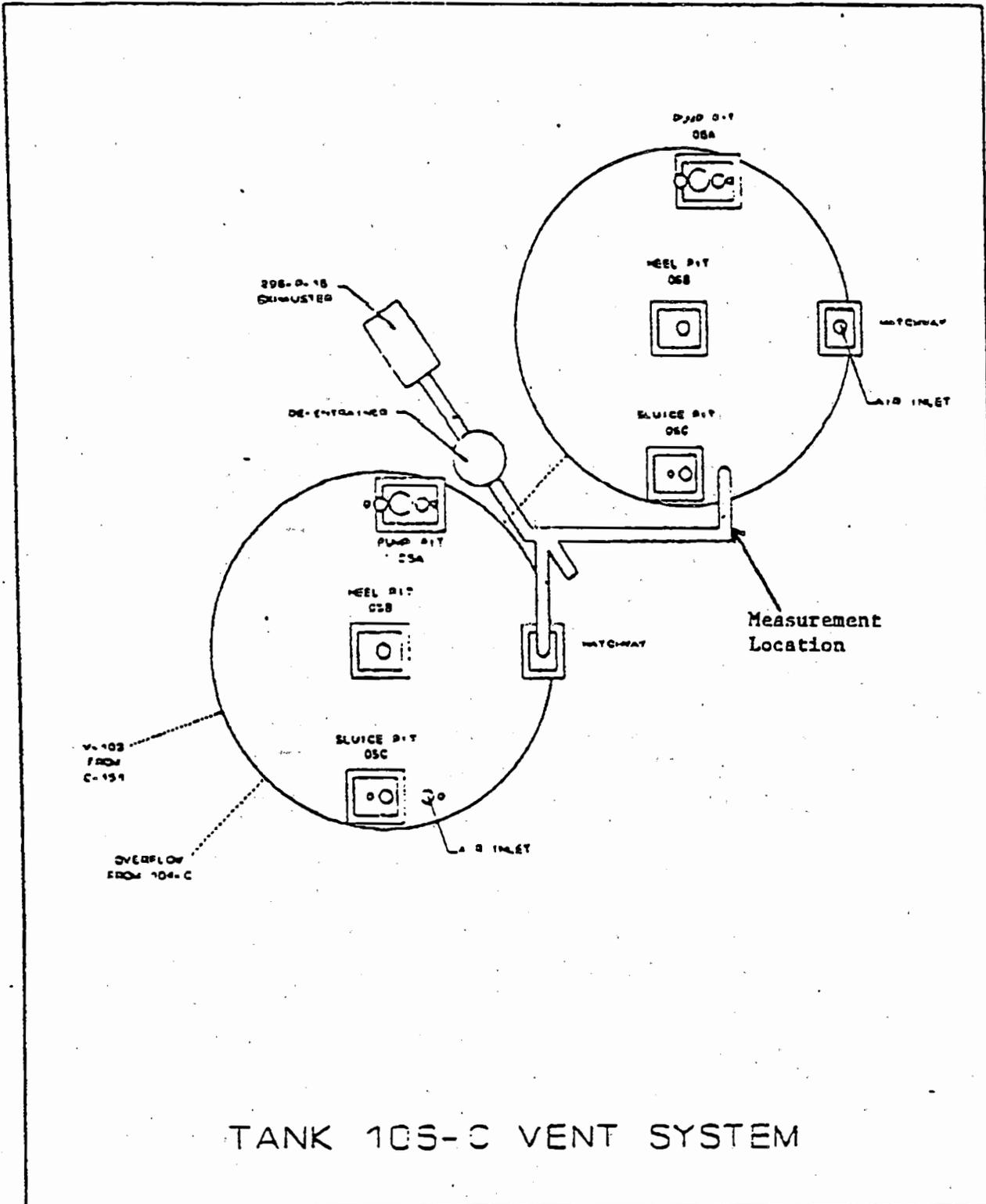
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Liquid Level in Tank 106-C



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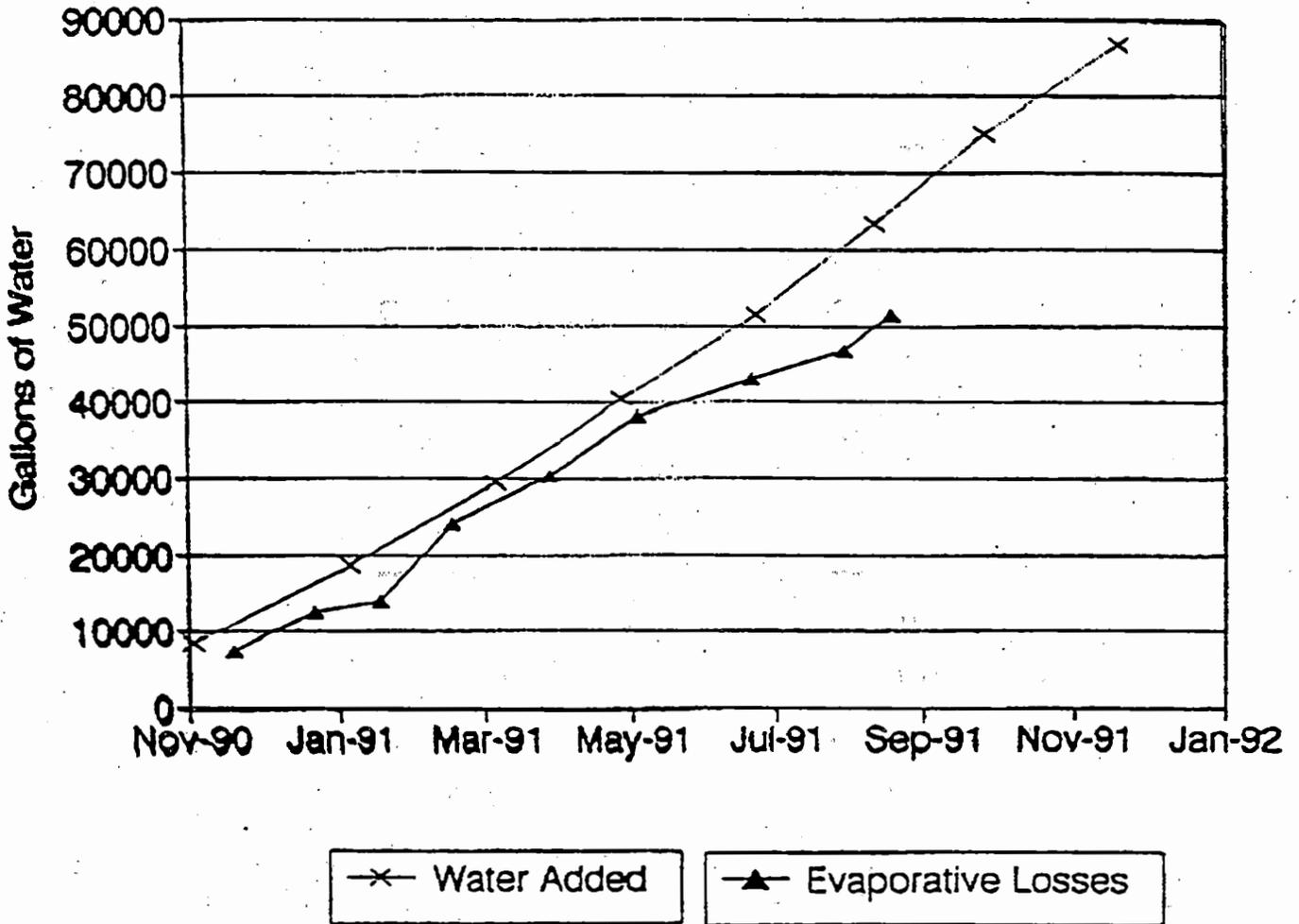
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TANK 105-C VENT SYSTEM

Figure A-3. Tank 106-C Vent System

Tank 106-C Water Balance



PSYCHROMETRIC SURVEY FOR TANK 106-C

DATE	TIME	AMBIENT WET BULB	AMBIENT DRY BULB	TANK OUTLET WET BULB	TANK OUTLET DRY BULB	AIR FLOW RATE	EVAPORATION RATE (GALLONS PER WEEK)	INCHES PER WEEK	TANK HEAT LOAD (BTU PER HOUR)
07-Dec-90	9:30 AM	27.0	27.0	66.0	68.0	1832.0	1655.8	0.602	16957.2
09-Jan-91	9:15 AM	24.0	22.0	66.0	66.0	1407.0	1322.7	0.481	137739.9
05-Feb-91	1:45 PM	49.0	64.0	57.0	75.0	1845.0	301.5	0.110	37980.1
07-Mar-91	10:05 AM	38.0	47.0	70.0	70.0	1580.0	1816.6	0.661	136732.9
15-Apr-91	10:30 AM	50.0	56.0	66.0	68.0	1862.0	1155.9	0.420	86400.7
22-May-91	10:20 AM	53.0	65.0	70.0	75.0	1521.0	1176.6	0.428	79787.7
08-Jul-91	10:00 AM	63.0	82.0	81.0	84.0	707.0	869.3	0.316	48631.7
16-Aug-91	10:30 AM	69.0	86.0	80.0	84.0	1550.0	1338.4	0.487	69395.3
04-Sep-91	9:30 AM	58.0	75.0	70.0	84.0	1580.0	1764.3	0.642	110416.1

Water Additions to Tank C-106

	Gallons
08/24/90	10868
10/03/90	10455
12/01/90	8250
01/24/91	10450
03/25/91	10801
05/17/91	10838
07/10/91	11275
08/28/91	11893
10/12/91	11499
12/05/91	12004

(Shaded values are estimated from FIC data,
all others from Water Addition Data Sheets)

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Change Number M-05-92-XX	FEDERAL FACILITY AGREEMENT AND CONSENT ORDER CHANGE CONTROL FORM <small>Do not use blue ink. Type, or print using black ink.</small>	Date
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DRAFT

Originator Dave Jansen	Phone (206) 438-7021
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Class of Change

I - Signatories (Section 13.0) II - Project Manager III - Unit Manager

Change Title Establish Additional Interim Milestones for Stabilization of High Heat Tanks
241-C-105 and 241-C-106.

Description/Justification of Change

These interim milestones will establish actions necessary for the stabilization of tanks 241-C-105 and 241-C-106. Once stabilized these tanks will no longer require the addition of cooling water. In addition, a new milestone requires a revised contingency plan for response to leaks which may occur before stabilization is complete. Another interim milestone is established to improve methods for detecting leaks from these tanks.

Interim Milestone Descriptions

- M-05-10 Submit a technical justification for continued water additions to tank 241-C-105 or discontinue these additions. (Sept. 1992)
- M-05-11 Submit a revised contingency plan for leaks from 241-C-106 to Ecology. Said contingency plan to stipulate that upon discovery of a leak from this tank, sufficient supernatant and sludge will be removed to eliminate the need for further water additions. (Dec. 1992)

(continued on next page)

Impact of Change

This change will add four new interim milestones and four new target dates. This change will not affect any other existing milestones.

Affected Documents

Hanford Federal Facility Agreement and Consent Order Action Plan, Appendix D (Table D-1 and Figure D-1 Work Schedule).

Approvals	_____ Approved	_____ Disapproved
DOE	_____	Date
EPA	_____	Date
Ecology	_____	Date

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- M-05-12 Complete fabrication and installation of all equipment required for corrective action in response to a leak from tank 241-C-106. (May 1993)
- M-05-13 Upgrade leak detection and site characterization at tanks 241-C-105 and 241-C-106. (Dec. 1992)
- M-05-13-T1 Increase the frequency of psychrometric measurements of water vapor in tank exhaust from tanks 241-C-105 and 241-C-106. (July 1992)
- M-05-13-T2 Complete geophysical logging of the fourteen drywells around 241-C-105 and 241-C-106 using a spectral gamma probe. (Dec. 1992)
- M-05-13-T3 Improve the performance of the gross gamma probe by calibration in a pit model and by reducing the logging speed. (Sept. 1992)
- M-05-13-T4 Increase the frequency of groundwater well sampling, analysis and data reporting to bi-monthly in the groundwater monitoring network for C Farm.

Milestone M-05-10 is being added to determine whether high-heat tank 241-C-105 still requires additions of cooling water to maintain waste and tank temperatures within safe limits. Milestones M-05-11 through M-05-13 are being added to ensure that until tank 241-C-106 is stabilized in 1996, all reasonable actions will be taken to minimize releases. This will be accomplished by improved contingency planning and leak detection.

Target dates M-05-13-T1 through T4 identify measures which the parties agree will improve the leak detection and site characterization for tanks 241-C-105 and 241-C-106.

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FEDERAL FACILITY AGREEMENT AND CONSENT ORDER
CHANGE CONTROL FORM

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M-07-92-XX

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Originator

Dave Jansen

Phone

(206) 438-7021

Class of Change

I - Signatories (Section 13.0)

II - Project Manager

III - Unit Manager

Change Title

Establish Additional Interim Milestones for Retrieval of Waste from Single-Shell Tank
 241-C-106.

Description/Justification of Change

These interim milestones will be used to establish tank 241-C-106 as the first tank for retrieval, and to begin development of waste retrieval methods.

Interim Milestone Descriptions

M-07-01 Submit tank selection criteria, retrieval options and recommended tank selection to Ecology for concurrence. (Sept. 1992)

M-07-06 Submit conceptual design for retrieval of waste from single-shell tank 241-C-106 to Ecology and USEPA. (April 1993)

Milestone M-07-01 is being accelerated from October 1993 to September 1992 to expedite work on the retrieval of waste in single-shell tanks. It is expected that tank 241-C-106 will be the first tank selected. Retrieval of this waste will alleviate concerns related to high heat generation rates and possible degradation of tank structures.

Milestone M-07-06 is being added to status the progress of tank waste retrieval technology development.

Impact of Change

This change will modify an existing milestone and add a new interim milestone. This change will not affect any other existing milestones.

Affected Documents

Hanford Federal Facility Agreement and Consent Order Action Plan, Appendix D (Table D-1 and Figure D-1 Work Schedule).

Approvals

___ Approved ___ Disapproved

XOE

Date

PA

Date

Ecology

Date

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*Reissue

Author: Roger Stanley, Ecology Addressee: Phil Hamric, RL Correspondence No.: Incoming: 9203649

Subject: CONTINGENCY PLANNING AND CORRECTIVE ACTIONS FOR SINGLE SHELL TANK
241-C-106

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