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Type B Investigation Report for 241-SY-101 Pump Start and 241-C-106 Pit Cleanout

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Office of Environmental Restoration
and Waste Management

**Westinghouse
Hanford Company**

P.O. Box 1970
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Hanford Operations and Engineering Contractor for the
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LIST OF ACRONYMS

ALARA	As Low As Reasonably Achievable
ATP	Acceptance Test Procedure
DACS	Data Acquisition and Control System
dpm	Disintegrations Per Minute
ECN	Engineering Change Notice
HP	Health Physics
HPT	Health Physics Technician
KEH	Kaiser Engineers Hanford
LANL	Los Alamos National Laboratory
LOI	Letter of Instruction
MORT	Management Oversight and Risk Tree
PIC	Person in Charge
POC	Point of Contact
RPR	Radiological Problem Report
RWP	Radiological Work Permit
SCBA	Self Contained Breathing Apparatus
SOI	Standard Operating Instruction
SWP	Special Work Permit (protective clothing)
TRC	Total Recordable Cases
TRG	Test Review Group
TWRS	Tank Waste Remediation System
WHC	Westinghouse Hanford Company
WTP	Waste Tank Project

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1.0 INVESTIGATION SCOPE AND METHODOLOGY

1.1 SCOPE

The Investigative Board for the *Type B Investigation Report for 241-SY-101 Pump Start and 241-C-106 Pit Cleanout* was tasked specifically to look at two events:

- "Inadvertent Mixer Pump Operation at 241-SY-101"
(RL-WHC-TANK-FARM-1993-069)
- "Inadequate Work Control Results in Personnel Skin Contamination at
241-C-106, Pit B" (RL-WHC-TANK-FARM-1993-071).

The Board was requested to fully explain the elements of the causal factors for these events and describe the management systems that should have or could have prevented the occurrences. Finally, the Board was requested to examine safety issues arising from these events in the Hanford Site tank farms. The review was focused on (1) Westinghouse Hanford Company (WHC) organizations performing operations, maintenance, and radiological safety tasks; and (2) Kaiser Engineers Hanford (KEH) organizations performing major maintenance tasks.

1.2 METHODOLOGY

The Board performed an initial review of the 241-SY-101 mixing pump and 241-C-106 pit events, as well as a review of the tank farms DOE 5000.3B occurrence reports issued for calendar year 1993. The Board focused generally on identification of common causal factors in these events, and specifically on deficiencies in or failures of management controls and barriers. These deficiencies/failures were grouped into topical areas that the Board determined as warranted for further investigation. The initial topical areas were contamination and safety awareness, configuration controls (equipment status awareness), and organizational structure (command and control). As the investigation progressed, these topical areas were refined.

An events and causal factors chart had already been prepared for the 241-SY-101 event by an internal WHC investigation. The Board reviewed this chart and accepted it with minor modifications. The Board developed an events and causal factors chart for the 241-C-106 event. The Board did not perform a separate formal barrier analysis for the two events. The events and causal factors analysis did consider barrier and control failures.

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Based on the topical areas identified in the preliminary reviews, the Board conducted interviews with WHC and KEH personnel. An interview list is provided in Appendix D to this report. A broad cross section of organizations and personnel were involved in the interviews, in order for the Board to understand the climate and attitude factors that influenced the events. In addition to the interviews, field visits and documentation reviews were conducted.

The Board conducted a Management Oversight and Risk Tree (MORT) analysis of the 241-SY-101 and the 241-C-106 events. MORT analysis is a structured method to evaluate both safety program and management system elements. It is axiomatic that deficiencies identified at lower levels are most generally reflections of problems in higher-tier systems. During the preparation of the investigation report the Board felt that, in order to fully fulfill its charter, it was necessary to provide separate descriptions, analyses, and findings for the 241-SY-101 and 241-C-106 events. However, these should be viewed in the context of the general analyses and findings of this report.

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Figure 1. Washington State/Hanford Map.

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2.0 EXECUTIVE SUMMARY

In accordance with the direction of the Department of Energy (DOE) Manager, Richland Operations Office, a Type "B" investigation in accordance with the DOE Order 5484.1, *Environmental Protection, Safety and Health Protection Information Reporting Requirements*, has been conducted. The scope of the investigation included two events:

- The "Inadvertent Mixer Pump Operation at 241-SY-101" (RL-WHC-TANK FARM-1993-069)
- "Inadequate Work Control Results in Personnel Skin Contamination at 241-C-106, Pit B" (RL-WHC-TANK FARM-1993-071) events.

Additionally, at the request of the President of the WHC, a broader investigation into Waste Tank Farm "safety practices" and "Conduct of Operations" was also conducted. The review was focused on (1) WHC organizations performing operations, maintenance, and radiological safety tasks; and (2) KEH organizations performing major maintenance tasks.

The investigation Board consisting of a Chairman, six committee members, and a DOE observer was convened and briefed on the purpose of the investigation on Monday, August 16, 1993. Brief resumes of the board membership are contained as Appendix B to this report.

The manner in which the investigation was conducted included (1) tours of the accessible event sites and other Hanford Site Tank Farm areas; (2) reviews of event reports; (3) reviews of procedures, organization charts, critique reports, and other documents; (4) interviews with personnel directly involved with events, as well as workers and managers in other areas of the tank farms; and (5) observation of work activities. While this investigation was being conducted, the tank farm work activities that were not considered essential to safety had been placed on administrative hold by WHC management; therefore, very little work was in progress at the time of the investigation.

As a result of the review of the information gathered in the early stages of the investigation, the scope of the investigation was expanded to include Management Practices and Radiological Practices.

This report contains a detailed analysis of the events, their causal factors, and the management systems that should have or could have prevented the events. Additionally, a detailed analysis of Conduct of Operations, Safety, Management Practices, and Radiological Practices is included. Specific findings and judgments of need are provided for the events and, as appropriate, for Conduct of Operations, Safety, Management, and Radiological Practices.

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It is the opinion of the Type "B" investigation Board that these events, as well as previous events, have common causes (Figure 2). These include:

- Inadequate management communication and field oversight
- Inadequate understanding and implementation of the principles of Conduct of Operations
- Tolerance for long-standing degraded plant and equipment conditions and inadequate management processes.

This triad of common causes has resulted in a lack of sensitivity of all personnel, including management, to safety and radiological hazards and the need to stop and consult with other expert personnel when unusual or unanticipated conditions are encountered. The result is that personnel attempt to solve issues on their own, without obtaining full knowledge of the results of their actions. Thus, events have occurred and will continue to occur unless the causal triad and its effect, the lack of sensitivity, is addressed as an interactive relationship.

Examples of the results of this relationship are:

1. The failure to recognize that water in the 241-C-106 pit or lowering a rock into the 241-C-106 tank constituted an event that significantly changed and went beyond the work scope.
2. The spread of radioactive contamination across fields and roadways.
3. The failure to install adequate lighting or walkways in the tank farms.
4. The continued use of inadequate personal safety and radiological work practices.
5. The inadequate communications between field workers and management, and between field organizations.

Specific judgments of need for the findings concerning each event and program evaluated are contained in this report.

The investigation committee strongly recommends the formulation of groups consisting of workers and management to work together to develop the means to correct both material conditions and unacceptable work practices prior to the resumption of work activities in the Hanford Site tank farms.

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Figure 2. Root Cause.

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3.0 EVENT FACTS

**3.1 CHRONOLOGY OF THE INADVERTENT START
OF 241-SY-101 MIXER PUMP**

3.1.1 Background Information

The mixer pump for waste tank 241-SY-101 was installed on July 3, 1993 (Figures 3 and 4). The installation occurred later than had been originally planned. The first intended installation had extensive readiness preparations and reviews, and these were updated for the delayed installation.

The pump was installed to mix tank contents in order to prevent the periodic release of hydrogen gas. There was an initial phase A test program to check the pump operation in the tank. The next phase of test was the Acceptance Test Procedure (ATP) on the data acquisition and control system (DACS). A phase B test is planned to further check out the pump and its ability to control periodic hydrogen gas releases. Activities for these phases were analyzed in a Safety Assessment prepared by Los Alamos National Laboratory (LANL).

The pump was not turned over to Facility Operations as operating equipment, and it was to be used for prototype testing so as to demonstrate the mixing concept. Its operation was controlled from the DACS trailer by test engineers reporting to Plant Engineering. Both Facility Operations and Plant Engineering are part of Waste Tank Operations (see Appendix C). The test engineers operated the pump according to test procedures.

To keep the nozzles of the pump from clogging with tank contents, the pump must be run twice daily for about five minutes. This is called a "pump bump." The pump bump is performed in accordance with a test procedure*. This procedure requires Operations to take readings on waste tank instrumentation in the tank farms prior to each pump operation. These readings are referred to as pump bump rounds, and they are taken by shift operators.

Operations had assigned one shift supervisor to be the pump "expert." This person was involved in many aspects of the testing, and also approved some of the changes to the ATP. This individual also had assembled information packages (including drawings and photographs) to assist others. The packages were efficiently assembled, but they were used as an informal tool and not as a controlled document. The expert kept shift personnel informed through the use of information letters. However, there was no formal control over these letters to assure all personnel read and understood the information. No file was

*WHC-SD-WM-TPI-007, Revision 0, *Pump Bump For Tank 101-SY Mitigation-by-Mixing Test*, dated July 26, 1993.

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established for these letters for use as reference material. The assigned "expert" performed these duties in addition to other normally assigned duties as a shift supervisor. This meant that the expert was not always available on the dayshift to provide Operations representation for planning and Test Review Group (TRG) meetings. The TRG is responsible for test monitoring, approval, and evaluation report review. This expert was not the shift supervisor who was on duty at the time of the occurrence.

There was no evidence of formal training of the shift supervisors or operations personnel on the test procedures for the 241-SY-101 pump operation.

The shift supervisors had different levels of understanding of the basic elements of the test procedures, the potential impact of the tests on the waste tank facility, or how operational actions could affect the test. Only the "expert" shift supervisor was knowledgeable of all aspects of the test. Based on interviews, the shift supervisors treated the testing as an area that was isolated from the operating facility by specific boundaries. It was perceived that, within those boundaries, any and all testing could occur without impact on the waste tank facility.

Interviews indicated that one shift supervisor had closed the pump disconnect switch twice prior to the incident, before becoming curious about the potential impact of such an action could have. This shift supervisor took the initiative to talk with the DACS personnel about the system. After the talk, the shift supervisor understood the implications of the disconnect switch operations. Another shift supervisor had the same curiosity, but asked DACS personnel for more information prior to directing the closure of the disconnect switch the first time. The Operations Shift Supervisor involved in this event closed the disconnect switch several times during the week prior to the event, while the crew was on the graveyard shift. At no time did the supervisor pursue the impacts with DACS personnel.

The Operations Shift Supervisor, who authorized the closure of the disconnect switch on August 4, 1993, had been on the graveyard shift the week before and was returning to work after having been off four consecutive days. On that graveyard shift, the routine had been to close the disconnect switch, if it was open, while doing the rounds. This was the only pump bumping experience the Operations Shift Supervisor had prior to the event on August 4, 1993.

Contacts between DACS test engineers and Operations were made twice a day, when the Test Director was required (by step 11.2.7 of the pump bump procedure) to obtain data within four hours of starting the pump. The purpose of the contacts was to coordinate activities for obtaining required data. The status of the testing activities was not always communicated during these contacts, and it appears that the contacts were an ineffective substitute for the specific briefing called for by the Standing Operating Instruction (SOI).

Based on interviews, it is clear that Operations management felt a great deal of ownership for the pump, the 241-SY-101 tank, and the waste tank facility. The senior operations

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Figure 3. 241-SY-101 Overhead.

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Figure 4. 241-SY-101 Cross-section of Mitigation Mixer Pump.

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management, in particular, felt a high degree of ownership. Lower levels of management had a strong overall sense of ownership, but personnel involved with practical applications did not always reflect this sense of ownership. Shift management faced many demands for their time; consequently, the ATP became only a portion of their daily activities. They therefore acted more in a "support" role for ATP testing rather than in a "control" role. For example, the pump nozzle unplugging procedure* is consistent with this support role in that it formally assigns the Test Director as the person who is directing operator actions during the execution of the procedure.

SOI 92-47 (Interface Understandings - Facility Operations and 101-SY Test Engineers) had been issued in October 1992, and specified the requirements for communications between Operations and Test Engineering. SOIs are used to provide long-term direction to shift personnel in completing goals and milestones. A SOI does not provide procedural direction. This SOI was signed by both Test Engineering and Facility Operations. The SOI required the DACS personnel to contact the Operations Shift Supervisor at the start of the shift, so as to communicate the status of the testing. This had been done for a period of time. But, during the months of October through June, activities associated with the mixer pump had been essentially limited to activities in the DACS trailer that had no operational impact on the mixer pump. Following the pump installation, due to the lack of operational activity, contacts between Test Engineering personnel and Operations become less formal and were done on a less frequent basis. When it became necessary to "bump the pump" to prevent plugging, contacts between DACS and Operations personnel had to be made twice a day so that the rounds required for pump bumping could be coordinated between the two groups. These contacts usually occurred at approximately 0400 hours, when DACS personnel arrived on site, and late (after 1400) dayshift (approximately two hours prior to the pump bump) on the swing shift. The status of the acceptance testing was not always provided to operations personnel during these communications. Furthermore, DACS personnel seldom provided the status of the acceptance testing to dayshift operations personnel at any time during their shift.

The routine closure of the disconnect switch on the graveyard shift did not ordinarily pose any hazard, since the computer was down and acceptance testing was not in progress. The basis for the 0400 arrival of DACS personnel was to get the required pump bump completed so normal acceptance testing could be started promptly on the dayshift. Conditions on August 4, 1993, were different because the computer was operating.

The basis for exclusion zone changed from excluding personnel from the tank farm during operation to a 300 meter radius zone, based on the analysis of the potential ammonia hazard. Further analysis allowed variation from a strict 300 meter radius to one that incorporated factors such as wind direction and velocity. On July 26, 1993, a decision was made by a shift supervisor knowledgeable of the variations to allow personnel to remain within the

*WHC-SD-WM-TPI-008, *Unplugging 101-SY Mixer Pump Nozzles*, revision 0, dated July 25, 1993.

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radius exclusion zone. To allow consistent application, the definition of the exclusion zone was subsequently clarified by management to be a 300 meter radius exclusion zone.

On August 4, 1993, the ATP involved closing the main supply breaker and testing the DACS ability to control the mixer pump variable speed coupling device. The disconnect switch was required to be open in order to prevent running the pump (see Figure 5).

The closure of the disconnect switch was not part of pump bump procedure. The ATP controlled the closure in order to assure that the supply breaker and disconnect switch were properly positioned to successfully perform the ATP. The pump bump procedure was independent of the ATP, although the bumping of the pump could not occur while the ATP was in progress.

The disconnect switch had a Operations caution tag installed. However, the caution tag was not specific to component position, and only directed personnel to "contact shift supervisor or test engineering" prior to operation of the disconnect switch. The disconnect switch had been tagged and untagged several times (sometimes with caution tags, other times with danger tags). The last tag, a caution tag, had been authorized and hung on July 11, 1993. The ATP did not contain instructions for tagging components.

3.1.2 Event Description

At approximately 0400 hours on August 4, 1993, DACS personnel arrived on site. They started the computer to allow two hours for stabilization. DACS personnel also contacted Operations in order to coordinate the required rounds prior to the pump bump. The rounds were required to be completed within four hours of starting the pump. Since the pump and disconnect switch are located in a radiological controlled area, operations would close the disconnect switch, if it were open, as a concurrent task with taking normal shift readings.

The mixer pump was successfully bumped by the graveyard shift personnel. Shift turnover was completed at 0730 hours. As a part of this turnover the dayshift Operations Shift Supervisor was made aware of the ATP to be performed on the dayshift. Logbooks and interviews indicated no formal communications occurred between the DACS trailer personnel and the dayshift Operations Shift Supervisor at the beginning of the dayshift.

At approximately 1445 hours the Operations Shift Supervisor and DACS trailer personnel had a discussion about a low nitrogen pressure condition on the column purge. This had been recorded by an operator during performance of surveillance rounds. During the discussion, the DACS engineer told the Operations Shift Supervisor that ATP testing was still ongoing. The Operations Shift Supervisor and Test Director discussed the timing for starting the rounds for the upcoming pump bump. The Operations Shift Supervisor told the DACS engineer that he would direct the rounds to begin to support the pump bump.

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Figure 5. Simplified Electrical Diagram.

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At about 1500 hours the Operations Shift Supervisor directed two operators to begin their rounds. One of the operators had taken readings previously, and was to walk the other operator through the rounds. The inexperienced operator had been temporarily assigned from the 200 east area facilities for the day shift. The operators dressed in the protective clothing that was required for tank farm entry. Just prior to entering the 241-SY Tank Farm, the more experienced operator reminded the Operations Shift Supervisor that the disconnect switch (DS-101-25) would need to be closed in order to perform the pump bump, and asked whether they should close the disconnect switch while performing the rounds. The Operations Shift Supervisor acknowledged that this would be required, and directed the operators to close the disconnect switch.

The operators entered the 241-SY Tank Farm and performed their rounds. When they reached the disconnect switch, they closed the disconnect switch (as they had been directed). But, without their knowledge, the mixer pump then started at 1515 hours. (The pump motor is located inside the tank.)

At 1515 hours DACS personnel were running an ATP on the pump software. They noticed, from the independent current monitor's positive readings, that the pump was running. DACS personnel immediately hit both the normal and emergency stop buttons, resulting in the shutdown of the pump. The mixer pump operated for approximately thirty seconds at maximum of 533 rpm at 74 amps.

At 1522 hours DACS test personnel notified 242-S shift management that (1) the 241-SY-101 mitigation pump had been inadvertently started; (2) breakers VSD-101-1 and VSD-101-2 in the motor controller center had been returned to the off position; and (3) the pump had run for approximately 30 seconds.

The Operations Shift Supervisor, via radio, contacted the two operators who were in the 241-SY Tank Farm and requested that they call him on the telephone. He then called the Manager of Shift Operations, via telephone, to advise him of the inadvertent start of the 241-SY-101 mitigation mixer pump.

The two operators walked to the instrument building within the 241-SY Tank Farm and called the Operations Shift Supervisor, but the telephone line was busy, due to the Operations Shift Supervisor being engaged in discussion with the Manager of Shift Operations. The two operators then called Operations Shift Supervisor via the radio and requested that he call them at the instrument building within 241-SY Tank Farm.

The Operations Shift Supervisor called the two operators in 241-SY instrument building on the telephone and advised them that the mixer pump had started and they should "leave" the tank farm. He did not mention a DACS test engineer, nor any other personnel who might be within the tank farm.

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As the two operators proceeded toward the exit of the tank farm, they encountered a DACS test engineer. They advised the test engineer to exit the tank farm. The test engineer followed their advice after quickly reading a nearby instrument. (The test engineer had obtained Operations Shift Supervisor approval to enter the tank farm a short time prior to the occurrence of the inadvertent pump start.)

At 1530 hours all personnel exited the 241-SY Tank Farm.

At 1535 hours the Operations Shift Supervisor directed DACS test personnel to suspend ATP testing and pump bump preparations pending results of the investigation. The Operations Shift Manager proceeded to make other management notifications.

At 1555 hours the DACS computer printouts were evaluated, and there were no indications of a gas release. The hydrogen, nitrous oxide, and ammonia levels were normal.

At 1600 hours the Safety Assessment was reviewed by the DACS personnel for possible violations.

At 1609 an evaluation of the potential for damage to the pump or associated equipment was made. No damage was noted.

At 1625 hours the Assistant Tank Farms Facility Operations Manager classified the event as an off-normal occurrence in accordance with DOE Order 5000.3B.

At 1655 hours the 241-SY-101 Tank Farm was released for entry.

At 1745 hours the Operations Manager received approval from the Manager of Waste Tank Operations to proceed with the pump bump, but to continue with the suspension of the ATP. This approval had telephone concurrence from the TRG Chairman.

On August 5, 1993, at 0800 hours, a TRG meeting was held with the Chairman attending by telephone. At this meeting, the TRG determined that the presence of personnel within the 300 meter exclusion zone during the pump operation was a violation of a Level II criteria of the Safety Assessment, and would require a full TRG committee approval for resumption of pump bumps and ATPs. This approval was provided.

On August 6, 1993, at 1115 hours, the Occurrence Report was upgraded to an Unusual Occurrence.

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3.2 CHRONOLOGY OF THE 241-C-106 PERSONNEL CONTAMINATION EVENT

As a part of a planned waste tank upgrade program, preparations were made to decontaminate and paint the three pits on waste tank 241-C-106. Work began in the 241-C-106 "heel pit" (Figures 6 and 7). The actual decontamination work was to be performed without entry into the pit area. The pit cover blocks had been removed; temporary covers were placed over the pit; and a glovebox was installed over the area to be decontaminated. When the cover blocks were removed, it was discovered that approximately three inches of sludge and water were covering the floor of the pit. It was decided that, prior to starting decontamination of the pit, a drain path for the existing water as well as for decontamination waste water would have to be established. Neither the work package or the Radiological Work Permit (RWP) that had been written for decontamination of the pit had been revised to include this change in the work scope. The following is a chronology of the activities that resulted in the contamination of a KEH employee.

In May 1993, the As Low As Reasonably Achievable (ALARA) committee, WHC point of contact (POC), and the KEH Superintendent began development of the work plan and safety assessment for the tank pit decontamination and painting job. Radiological planning was based on prior knowledge of radiological conditions in other pits, and on the assumption that entry would not be necessary in the containment.

On July 7, 1993, work package 2E-93-00613K was issued to decontaminate and paint the 241-C-106 tank pits.

On July 30, 1993, RWP #E-S-150 was approved for the "Removal of all existing equipment from the heel pit for decontamination and painting of inner pit walls and floors, including pit cover blocks."

On August 6, 1993, the pit cover blocks for the 241-C-106 heel pit were removed. Temporary covers were installed over the pit. Approximately three inches of sludge and water were discovered in the floor of the pit.

On August 6, 1993, a pre-manufactured glovebox was installed over the heel pit.

On August 9, 1993, a containment was installed over the cover blocks.

On August 10, 1993, at 0845 hours, a tailgate pre-job briefing was conducted by the WHC POC with the help of KEH foreman. Attending were a Health Physics Technician (HPT) and the KEH laborers who were later contaminated. Also attending were several KEH workers who were awaiting their own pre-job meeting. The two KEH laborers were instructed to enter the glovebox installed at the 241-C-106 heel pit and determine if a cover was installed over the pit drain. The POC also asked the laborers to look for an open riser. The laborers interpreted this to mean they should check to find an open flow path to the tank.

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Figure 6. 241-C-106 Overhead.

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Figure 7. 241-C-106 Cutaway.

29301070.3C

Single Shell Tank 241-C-106 (with Sluicing equipment installed)

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On August 10, 1993, at about 1000 hours, the two KEH laborers and the HPT, who had not participated in the pre-job briefing but had been briefed by the other HPT, entered the 241-C-106 heel pit glovebox. The HPT understood the job scope to be the same as that described by the POC. The HPT proceeded to perform a baseline radiation and contamination survey, while the two KEH laborers used a shovel to try to determine if a cover was installed over the drain.

On August 10, 1993, between 1000 and 1015 hours, the following events took place in the order given below.

- The two KEH laborers determined that the pit drain did not have a cover installed and was probably plugged.
- The HPT completed the baseline survey and left the glovebox to count the smears in a lower radiation background area.
- The two KEH laborers observed a 36 inch steel plate in the bottom of the pit, sticking above the water level, and decided to determine if one of the two open penetrations in the steel plate could be used as a possible drain path into the tank.
- A length (approximately 40 feet) of braided nylon cord was obtained. One of the KEH laborers taped a rock to it and it was lowered by the other KEH laborer approximately 25-28 feet into the larger of the two penetrations (Figure 8). When the cord went slack the KEH laborer assumed that this penetration was also "plugged," removed the cord and rock from the penetration, and left it lying on the temporary cover in the glovebox.
- The two KEH laborers exited the glovebox, passing the HPT as he reentered the glovebox to complete his survey. The KEH laborers proceeded to a step off pad to be monitored. The survey found the KEH laborers had high levels of contamination on their SWP clothing, up to 350,000 dpm on their clothing and 23.5 mrad on their gloves.
- The KEH laborers were wearing single sets of SWP clothing that were soaked through with perspiration due to the heat. One laborer had skin contamination levels of 2,000 dpm on his back and on the back of his arms.

At 1045 hours the HPT escorted the one contaminated KEH laborer to the decontamination room at 272-AW and decontaminated him.

On August 10, 1993, at 1430 hours an incomplete critique was held to review the event and identify any near-term actions to be taken.

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Figure 8. Heel Pit Penetration Cross-Section.

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3.3 GENERAL FACTS

The investigation committee collected additional facts about the events through interviews with maintenance personnel, operators, health physics (HP), engineering, and managers. In addition to the two recent events, the Board reviewed other 1993 occurrences related to Tank Waste Remediation System (TWRS) operations. From this review the following groupings of related causal factors were identified.

- Conduct of operations/operational practices
- Safety/safety practices/safety awareness
- Management/management structure/communications
- Management processes/workprocesses
- Radiological practices/contamination/radiation awareness and sensitivity.

The Board used these five groupings, in addition to the specifics from the two events, to form the basis of its analysis.

3.3.1 Conduct of Operations

The purpose of Implementation of Conduct of Operations is to help assure the safety of the public, environment, facility personnel, and facility equipment. Conduct of Operations provides both the philosophy for implementation and the methods for performing operating activities. Rigorous adherence to the philosophy and strict compliance with the methods for performing operating activities are necessary to minimize operating errors and improve overall performance.

Conduct of Operations at the Hanford Site Tank Farms is a requirement of DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*. The program is defined in three documents: (1) the Westinghouse GOCO *Conduct of Operations* manual; (2) a locally prepared document which summarizes the DOE Order; and (3) Section 5.0 of the *Waste Tank Administration Manual* (WHC-IP-0842). Section 5.0 contains a variety of procedures that delineate requirements for performing operating activities and reflect the requirements of both the DOE Order and the Westinghouse GOCO manual containing the DOE order requirements.

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Conduct of Operations training for tank farm personnel is based on the Westinghouse GOCO *Conduct of Operations* manual. Most operators, supervisors, and operations management personnel have received the training. Interviews with operators and supervisors have indicated that the Westinghouse GOCO manual is generally used, and that few operators are aware of the contents of Section 5.0 of the *Waste Tank Administration Manual*.

The eighteen chapters of DOE Order 5480.19, Conduct of Operations, were used to perform an analysis of Tank Farm operating practices and philosophies. Noteworthy facts are noted below, along with specific discussion where poor practices contributed to the two events.

Chapter 1: Operations Organization and Administration

The management oversight and facility monitoring programs established by procedures 5.1.1 (Management Surveillance) and 5.1.2 (Facility Manager's Surveillance) of the *Waste Tank Administration Manual* have had only limited success. Interviews with the coordinator of these programs identified that less than 40% of the scheduled tours were completed. The checklist and observation criterion contained in the procedures are predominately housekeeping and safety oriented, and very little attention is paid to Conduct of Operations. The personnel making the tours are not specifically trained in observation techniques, and they do not have any specific Conduct of Operations training for managers.

Operators and supervisors are routinely "encouraged" to make-do with unacceptable conditions and equipment deficiencies, such as little to no lighting in the tank farms, inoperative exhausters and level indicators, radioactive contamination on roads and walkways, inadequate foul weather apparel, inadequate office space, and a variety of additional unacceptable conditions.

The frequency of meetings between management and workers is minimal, and is generally the result of a reportable event or personnel injury. Planned focus sessions to identify and correct problems and unacceptable conditions are not normally held.

A fifth rotating operations shift had been approved but not implemented. The fifth shift was intended to provide dedicated training time.

Observations of the various shift managers offices and operator "ready" rooms identified a generally cluttered work environment that included the toleration of extraneous reading material (newspapers and magazines) and playing cards.

Chapter 2: Shift Routines and Operating Practices

While nominally responsible for facility operations, the shift manager's authority in the tank farm facilities has been degraded by the presence of various facility managers and operators on day shift. These individuals do not work for the shift manager but perform a variety of "operating" activities in the tank farms.

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There was no operator involvement in the planning and implementation of the 241-C-106 work plan.

While interviewing a shift manager in the shift manager's office, it was observed that the shift manager received phone calls and instructions from three different managers; only one of these was his immediate supervisor.

Chapter 3: Control Area Activities

The control area for the 241-SY-101 mixer pump is located in a structure separate from the shift manager's office. There is no required "tour" routine for areas such as this one.

Chapter 4: Communications

There is no public address system in any of the tank farms.

Pre-job briefings, although required for most work activities, are somewhat informal and do not use the checklist provided for this purpose.

Chapter 6: Investigation of Abnormal Events

Less than half of the occurrences reported in 1992 and those reported to date have had final reports submitted. Event investigation is conducted by dedicated event investigators, not by line management. Line management involvement appears to be minimal. The critique for the 241-C-106 event was terminated before it was completed, and was never restarted. Further investigation was initiated but was halted when it was learned that a Type "B" investigation was to be conducted. Written statements were not obtained from the WHC POC or the KEH supervisors or laborers. Some individuals felt the critique meeting minutes did not reflect all of the pertinent discussion at the critique.

Chapter 8: Control of Equipment and System Status

There is no program to red-line facility-essential drawings in order to document modifications. Essential drawings are updated by ECN incorporation within 30 days of work completion.

The 241-SY-101 mixing pump breakers were not under the control of the Shift Manager.

Chapter 9: Lockout and Tagouts

The disconnect switch for the 241-SY-101 mixer pump had been tagged with an "Information" tag that required the operator to contact the Shift Manager prior to closing the disconnect. No mechanical means to prevent closure (such as a padlock) were used.

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Chapter 10: Independent Verification

In the case of the 241-SY-101 mixer pump, the closure of the disconnect was not the result of the verification of the pump breaker status and was not procedurally controlled. In the case of the 241-C-106 personnel contamination event, there was no requirement for and no attempt made to identify or verify which riser the worker was trying to verify as being unplugged.

Chapter 11: Log Keeping

Interviews with "day" operators identified that, although they maintain logs, the logs are not considered "formal or official" and therefore are not reviewed by shift personnel.

Chapter 12: Operations Turnover

The operations turnover process does not include a briefing between operators and support organizations such as Maintenance, Health Physics, or Test Engineering. Additionally, the "day" operators do not attend a briefing and are not made aware of the tank farm status.

Chapter 13: Operations Aspects of Facility Chemistry and Unique Processes

The requirement for a 300 meter exclusion area when operating the 241-SY-101 mixer pump is not well understood by WHC personnel, and had not been in effect for very long.

Chapter 14: Required Reading

The required reading binder for operators is approximately two inches thick. One document is 200 pages in length.

Chapter 15: Timely Orders to Operators

The 200E and 200W Shift Managers' office contains binders for both "Shift Orders" and "Standing Orders." A brief review of these documents showed that they have not been maintained up to date, and the required shift supervisor and shift manager initials documenting the information were not current.

Chapter 16: Operations Procedures

The closure of the 241-SY-101 mixer pump disconnect was not performed in accordance with an approved procedure. Although an ATP was normally used to control the evolution, it was also not in use by the operators who closed the disconnect switch. ATPs, which are used to operate facility equipment, are not validated by qualified operators prior to use. In addition, specific responsibilities for the control of the 241-SY-101 mixer pump are not clear or well understood.

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Chapter 17: Operator Aid Postings

There are many signs and postings in both tank farms that do not appear to be controlled as operator aids. There is no evidence that this played a role in either event.

Chapter 18: Equipment and Piping Labelling

An equipment and piping labelling program is in progress at the tank farms. Most components are not labelled. Many are not identified on facility drawings.

3.3.2 Safety

The WHC Waste Tank Project has a safety program that is specified in WHC-IP-0842, Section 15.1, Rev. 0, (10/1/92) (WTP). The purpose of the program identified as follows:

"It is the objective of the Waste Tank Project (WTP) to conduct all activities in a manner that protects the safety and health of all employees and the public and to prevent loss or damage to company operated facilities. All activities will be conducted in compliance with applicable health and safety requirements of the U.S. Department of Energy (DOE), and the Westinghouse Hanford Company, and with adherence to generally recognized and accepted high standards in the areas of occupational health, nuclear, radiological, industrial, fire safety, and environmental protection."

The waste tank project (WTP) Safety Program is established to provide guidance and direction to all WTP personnel on how to maximize the following safety elements:

- The safety knowledge of each employee
- The use of safety skills
- The safety performance of each employee
- The national reputation of Hanford Operations for safety achievement.

The KEH President has issued all employees a card. The card summarizes the essence of the KEH safety program. The text of the card is as follows:

We can always restart work - we cannot eliminate an accident after it has happened!

1. You are responsible for your own safety - don't do anything you believe to be unsafe (even if directed to do so) until you are satisfied it is safe.

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2. You have a responsibility for your co-workers' safety - don't let them do anything unsafe. You have "Stop Work Authority," and I expect you to use it whenever you see something you believe to be unsafe.
3. I expect management to help you perform these safety responsibilities. If you have a problem call me at 6-1738.

The safety program is established in the following documents:

- *Waste Tank Administration Manual*, WHC-IP-0842, Section 1.5
- WHC-CM-4-3, *Industrial Safety*
- WHC-CM-4-30, *Nuclear Safety Manual*
- *Westinghouse Conduct of Operations Manual* (implementing DOE-5480.19) July 1990.

Tank Farm safety conditions were reviewed to gain an understanding of personnel safety philosophies and sensitivities. Specific facts about the safety environment are given below.

Lack of lights at the C Tank Farm is perceived by Operations management and operators as causing danger to operators during night rounds. Other tank farms also suffer from lack of lighting. The terrain on the tank farms is not even. No well defined walkways exist. Personnel are suited up in protective clothing and often wear Self Contained Breathing Apparatus (SCBA) or fresh air breathing apparatus that limits vision. These problems are compounded by winter snow and cold conditions. Poor lighting conditions have existed for several years, and no effort has been successful in correcting this problem.

Ventilation systems are considered primary safety systems, since the principle of containment of radioactivity and radioactive contamination relies on higher negative pressure in more contaminated areas. Tank exhausters are used for ventilating buildings and tanks, and they serve as leak detectors in double-shelled tanks. Some exhausters have failed as a result of age or lack of maintenance; several exhausters were observed to be out of service during the investigation.

Tank level indicators are safety systems that provide information on tank contents. Some of the level indicating instruments are inoperable and have been replaced by "temporary" level detectors called "zip cords." Better and more permanent fixes are under consideration, but have not been implemented in most cases.

Loose equipment and debris are spread throughout the tank farm areas. Many concerns have been expressed about tripping hazards on the farms, and this is further emphasized when equipment is allowed to accumulate.

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Managers were asked what safety topics were discussed at their workplace meetings with employees. They responded that they reviewed daily accident reports. Managers knew how many people in their area had been injured, but were unaware of Total Recordable Cases (TRC) goals or year-to-date statistics.

Tank Farms operations management has recently been augmented by the addition of 25 newly trained managers and supervisors. These personnel have completed about six months of training. The new operations shift managers said that this training did not include specific orientation on accident prevention or OSHA awareness. The managers did not receive any training in such topics as the following:

- The supervisor's role in safety
- The means of ensuring a safe work ethic on a day to day basis
- The necessity for continued stressing of safety, statistics, and the need for safety improvement.

HPTs expressed concern that stopping a job required effort and considerable explanation. For all KEH work, a white card is generated to document the reason for job stoppage and loss of productivity. White cards are viewed by HPTs as "traffic tickets."

Interviewed KEH personnel expressed the need to be productive, since they believe non-productive workers are not always given an opportunity to go to the next job. HPTs stated that KEH personnel brought their safety issues to the HPTs rather than to the KEH supervisors.

Operations and radiological control personnel have routine meetings with direct management where safety concerns may be discussed. There are a few routine meetings with level 1, 2, or 3 managers where employees may communicate concerns with higher-level management.

3.3.3 Management Organization

Field work at the Tank Farms is performed by several organizations. Key organizations involved in the two events include WHC Waste Tank Operations, WHC Health Physics, and KEH construction services (detailed organization charts are included in Appendix C). Numerous other organizations provide support (e.g., procedures, training, engineering, industrial safety or quality assurance) or play lead roles in specific facilities (e.g., Low Level Waste Disposal--i.e., the Grout Facility). The support organizations were not reviewed since they did not play a major role in the two events.

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WHC Waste Tank Operations reports to a level 2 manager and primarily consists of Facility Operations, Plant Engineering, Waste Tank Production Control, and Waste Tank Maintenance. Each of these functions reports to a level 3 manager. Facility Operations is further divided into Shift Operations, East Facilities, and West Facilities. A small Conduct of Operations organization is provided in Facility Operations to coordinate Conduct of Operations upgrades. The Shift Operations organization is responsible for routine operations and surveillance in both the East and West Tank Farms. Supervisors in Shift Operations are level 6 managers. The East and West Facilities organizations are divided into groups focusing on specific activities (e.g., core sampling) or specific plant areas (e.g., 242-A Evaporator or AP/AN/C Complex). First-line managers in the East and West Facilities are level 5 managers.

The Plant Engineering organization within Waste Tank Operations provides test engineering, systems engineering, data acquisition/computer support, and shift engineering support for Operations. These activities are organized by topic area (e.g., waste treatment, single shell tanks, double shell tanks, computers, shift work, tests) rather than by plant area. First-line managers in Plant Engineering are levels 4 and 5.

The Waste Tank Production Control organization within Waste Tank Operations provides planning, scheduling, job control system administration, and parts/materials collection for maintenance work. The Planning and Materials services organizations are split into east and west plant area groups, while the other functions serve all of the tank farms. First-line managers in Waste Tank Production Control are levels 4 and 5.

The Waste Tank Maintenance organization within Waste Tank Operations provides maintenance engineering services, craft maintenance, and major maintenance coordination with KEH. Maintenance engineering is organized by engineering discipline (electrical, mechanical, instrumentation, etc.). Craft Maintenance is divided into nine groups; there are four groups for the East Tank Farms, four groups for the West Tank Farms, and one group of insulators and painters that serves all of the tank farms. Major maintenance coordination with KEH is divided into electrical and mechanical upgrades. First-line managers in Waste Tank Maintenance are level 5 managers.

WHC Tank Farm Health Physics reports through the Environmental, Safety, Health and Quality Assurance organization. Tank Farm Health Physics is organizationally independent of Waste Tank Operations. The Health Physics organization is responsible for providing radiological support to field jobs. Radiological work planning and ALARA determinations are made by the HP planning group and the Operations ALARA group. The Tank Farm Health Physics manager is a level 3 manager; first-line managers are level 5.

KEH provides architect engineering, project management, and construction services at the Hanford Site. KEH has four project divisions, an engineering division, and a construction services division, each headed by a manager. These major groups are subdivided and may in turn be subdivided into smaller groups, each led by a manager. KEH typically has no more

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than three levels of management below the President. KEH may be providing engineering or construction services and managing these services in the form of a project with a project management structure, or could be providing labor with craft supervisors (foremen) and superintendents.

When KEH manages a project, they may have sub-contractors or KEH construction forces working to contractor or KEH work packages with KEH quality control and quality assurance, with Health Physics coverage provided by WHC. KEH also provides workers and supervision for tank farm major maintenance work. Work packages are developed by WHC personnel, and are turned over to KEH for assembling materials and personnel who are completing job safety analyses and performing work. KEH comments on work packages are incorporated into work plans. KEH supervision directs KEH workers with a WHC POC assisting to coordinate various elements of the job, including Health Physics and Operations. KEH craft radiation workers are pulled from a large labor pool of union workers, and all have received radiological and safety awareness training for the Hanford Site.

In the case of the 241-C-106 incident, the KEH Construction Services Division, through the 200 Areas Construction Forces Group, provided the workers, their foreman, and the labor superintendent. They were to work to the WHC-developed work package and RWP, and were to be overviewed by the WHC Tank Farm Health Physics organization and a WHC point of contact. KEH work was initiated by a Letter of Instruction (LOI). Initially, KEH tasks were performed by the KEH superintendent and consisted of participation in development of the work plan and preparation of the Job Safety Analysis.

3.3.4 Management Process

3.3.4.1 Maintenance Process. The purpose of the maintenance process is to assure a well maintained facility with equipment and system in good operational order. The process also maintains instruments that are calibrated to assure accurate monitoring of systems within the facility.

The maintenance program is defined in multi-tier documents that establish and implement the policy. The program establishes the flow of process, the requirements for different types of work, the standards for work documents, the quality of the documents, and controls for the interfaces between organizations and programs. The documents below relate directly to the maintenance process. Many other documents in addition to these control various aspects of the maintenance process (such as procurement, environment, quality, safety, standards, other interfacing documents) and others deal with specific aspects (such as welding, operational procedures, splices, records retention) that support the maintenance process.

- WHC-CM-1-1, Management Policies, MP 5.3, "Job Control System"

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- WHC-CM-1-3, Management Requirements and Procedures
 - MRP 3.3, "Records Management"
 - MRP 4.7, "Turndown Work"
 - MRP 5.43, "Impact Levels"
 - MRP 6.11, "Job Control System."
- WHC-CM-8-8, Job Control System
- WHC-IP-0842, *Waste Tank Administration Manual*, Section 9.0, Maintenance and Production Management
- WHC-SP-0850, *Maintenance Implementation Plan for Waste Tank Maintenance and Production Management*.

The purpose of a maintenance work control system is to provide pre-planned, reviewed, and verified work packages that enable qualified personnel to perform quality work. The process is described in WHC-IP-0842, Section 9.5, Rev. 1: "Job Control System."

The Job Control System procedure defines several work control forms. These include the following:

- J-1 Work request -- primary work document
- J-2 Combined form used for impact level 4 work
- J-3 Pre-approved support request
- J-4 Resolution/re-test form
- J-6 Modification impact review
- J-7 Work change notice
- J-8 Work release sheet
- J-9 Partial release sheet.

There are several types of work packages. The most common of those in use are the J-1 Work Request, and the J-3 Pre-Approved Support Request. The J-1 is the more controlled document used for more complex, safety-related work. The J-1 package is made up of the J-1 form plus other J documents and the supporting information. The J-3 is the simplest method of requesting work. It is intended to provide a means for accomplishing simple tasks without going through the formality of the other processes. The work must be on a list of pre-approved tasks, and does not require, but may utilize, formal scheduling tracking.

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Examples are chart recorder re-inking, equipment moves, oil additions, and relamping. The processes are illustrated in WHC-IP-0842, Section 9.5, Rev. 1. The J-3s are logged in and then sent to the appropriate craft manager as fill-in work. Some items are worked as priority items if there is a specific need expressed. Interviews with first line supervisors showed that they normally had about 100 J-3s to be worked at any point in time. They also had no indication which of the J-3s were items related to safety, so they issued the J-3s on a first-in, first-out queue basis.

There has been an improvement within the last few months on the work-off rate of J-3s, because the criteria for the types of work allowed to be performed on J-3s has become more commonly known. This has resulted in lower rejection rates for this type of work request.

Despite the stated level of activity, many operators felt nothing ever got done, or that it took "forever" to get anything done. The interviews support the operators' positions of the length of time required to respond to J-1s.

The more complex J-1 Work Request involves a pre-work review by maintenance personnel. The quoted time from interviews for a J-1 to transverse the system was from a few days to two years. Priority one work is hand carried through the process, and requires the least time. All other work usually requires a few months. Interviews disclosed that maintenance personnel are given insufficient time to review the packages. Following maintenance review, the package is returned to the preparer and then moves on to Planning and Scheduling, where it is released for work.

Interviews also disclosed that the evaluated work packages may not be given to Maintenance until the morning of the day that work is to be accomplished.

3.3.4.2 Test Control Process. The purpose of a test control program is to ensure that tests are planned and reviewed, and that prerequisites and coordination between operations, testing, and other organizations are identified. The control of testing is discussed in WHC-CM-6-1, *Standard Engineering Practices*, EP-4.2, "Testing Practices." The *Waste Tank Administration Manual*, WHC-IP-0842, Section 8.8, Functional Tests, and Section 8.10, Process Tests, discuss normal tests within tank farms. A special document, WHC-SD-WM-MA-014, *Mitigation Test Management*, was written to define the organizational responsibilities and relationships for the 241-SY-101 mixer pump tests.

3.3.4.3 Prioritization Process. A prioritization process assures that required actions are worked in an orderly, controlled manner. Safety, monetary factors, and levels of importance are factored into the decision process. The work priority system is described in WHC-IP-0842, Section 9.5 Rev. 1 ("Job Control System"). This document describes the 4 level priority system, where priority 1s are necessary to recover from unsafe conditions, reestablish the safety envelope, avoid imminent violation of safety requirements, or restore security systems. As the priority number increases from 1 toward 4, the importance of the

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activity decreases. From discussions during the interviews, it appears that work/tasks are being identified as fast (or faster) than the activities are being accomplished.

3.3.5 Radiological Practices

The purpose of Radiological Protection Program is to protect the safety of the public, workers, and the environment from the radiological conditions at the Hanford Site. This includes the planning of evolutions to ensure that work performed under radiological conditions meets the requirements as outlined in the DOE *Radiological Control Manual* (DOE N5480.6;1992).

The DOE *Radiological Control Manual* requires that a site-specific manual be created for the Hanford Site. This program is established in the *Hanford Site Radiological Control Manual* (HSRCM-1). The WHC-CM-1-6 manual was written to reflect the HSRCM-1. WHC-CM-1-6 replaced WHC-CM-4-10, which was the previous WHC radiological control manual. Individual WHC facility procedures were then revised to reflect the new requirements. KEH utilized HSRCM-1 as the requirements source from which lower-tier KEH implementing procedures were written.

Interviews with HPTs have indicated that, although the HPTs are aware of the new WHC-CM-1-6, they are not familiar with the new requirements introduced by this manual.

A review of the two events and the interviews with HP personnel, operators, planners, schedulers, and KEH construction forces personnel identified facts relating to the Hanford Site waste tank farm radiological practices.

3.3.5.1 RWP/Work Plan. The ALARA group's involvement with the RWP and work plan for the decontamination and painting of the 241-C Tank 106 pits, ended with the initial review. They were not aware of the need to enter the glovebox to complete work.

Mockup training was not performed for this job, even though high contamination and radiation levels were anticipated. KEH personnel were unfamiliar with the use of gloveboxes.

Personnel did not recognize that the scope of the job had changed when the water was discovered and the decision was made to enter into the glovebox.

Three separate RWPs with the same number were written to describe work in the heel pit, sluice pit, and the pump pit with identical radiological controls.

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3.3.5.2 Pre-job Briefing. There are requirements for pre-job safety briefings. These were completed for the KEH personnel on August 5 and 6, and addressed the overall decontamination and painting work scope. Only the safety aspects as identified in the Job Safety Analysis are discussed.

The Board could find no evidence of established requirements for pre-job briefings that discuss the full scope of the work (including safety and process aspects). An informal pre-job briefing was held by the POC at the work site. The HPT was called away to cover another job during the briefing. The work scope was not clear to the HPT and workers. The HPT perceived the job scope was limited to the workers using a shovel to attempt to remove a possible drain cover or loosen sediment to unclog the drain, and to determine if there was an open riser. The workers perceived that they were also assigned the task of discovering a method of transferring water from the pit floor into the tank. No drawing or sketch was used to define work at the briefing. The inherent dangers of the tank were never discussed, and it was assumed that all the workers knew to limit actions involving possible contact with contents of the tank. The workers had previously observed operators using "zipcords" to take tank level measurements when the permanent indicators had failed. They also had observed routine dipping of bottles into various waste tanks for samples. Although routinely done, these activities have close HPT supervision and all items are sleeved by plastic as they are removed from the tank.

3.3.5.3 Radiological Coverage. A pre-job survey was not performed prior to entry into the glovebox by the workers. Interviews indicated personnel had many different understandings of the term "continuous coverage." Interviews indicate that KEH workers generally solicit advice and direction from HPTs on how best to meet radiological requirements. The interviewed KEH workers expressed a belief that they could not increase the amount of anti-contamination clothing specified on the RWP.

Radiological Problem Reports (RPRs) are documents issued by all personnel to identify unsatisfactory radiological conditions. During interviews with HPTs, it was disclosed that the HPTs felt the RPR system was ineffective in controlling unsatisfactory radiological conditions.

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TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP START AND 241-C-106 PIT CLEANOUT

4.0 ANALYSIS

This section provides an analysis of the two events, along with key cultural factors and management processes that contributed to the events. The cultural factors and management processes discussed here include Conduct of Operations, Safety, management organization and communication, maintenance and test control processes, and radiological work practices. An analysis is made here of how weaknesses in these areas may have contributed to the cause and severity of the two subject events. As is the case in most investigations of this type, observations, interviews, and reviews of procedures and policies opened new lines of inquiry.

4.1 241-SY-101 ANALYSIS

An events and causal factors chart (Figure 9) was the primary analysis method, with barrier (and control) and change analysis also used to support the events and causal factors analysis. A number of barriers and controls should have prevented this event. Chief among these are communication, knowledge, and test controls.

Communication acts as a barrier to ensure personnel are aware of current test status. SOI 92-47 formalized communications between Operations and Test Engineering. In time SOI 92-47 (issued in October 1992) fell into disuse. Communication of test status and testing implications to other activities did not occur at the shift change. The opportunity to communicate this information during the discussion with DACS personnel just prior to the disconnect switch closure was missed.

Knowledge also represents a barrier to failure by providing an information base that can be used to make proper decisions. In this case operations did not have sufficient information to make proper decisions, as evidenced by the shift supervisor directing the closure of the disconnect switch. Knowledge of the test procedure contents could have made the shift supervisor aware of the potential for inadvertent pump starts. The shift supervisor had not been trained on the test procedure, and was not aware of the contents of the test procedure. The informal training failed to assure that all operations personnel received the training, nor was there a requirement that the personnel who did receive the training demonstrate adequate knowledge.

Definitive control of testing activities ensures that activities are coordinated. Two types of control can be established: physical and administrative. A lockout on the breakers and disconnect switches would have provided physical assurance of their positions. In this case a lockout on the disconnect would have provided a physical barrier. Additionally, verification of the desired position of the disconnect switch was not made prior to directing the switch to be closed.

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Figure 9. Event and Causal Factors Chart for 241-SY-101. (4 pages)

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP START AND 241-C-106 PIT CLEANOUT

Figure 9. Event and Causal Factors Chart for 241-SY-101. (4 pages)

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TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP START AND 241-C-106 PIT CLEANOUT

Figure 9. Event and Causal Factors Chart for 241-SY-101. (4 pages)

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Effective administrative control was not established by the use of procedures, authorizations by Operations in the test procedures, or administrative instruction on the conduct of testing. Additionally, despite statements of Operations and established policy, Test Engineering was in charge of the testing and operation of the mixer pump; Operations was fulfilling a support function. While Operations management stated they "owned" the mixer pump, they did not detect that actual field practice was different. In summary, the change in the testing method and the need for increased control by Operations was not detected by management. Management had communicated their expectations, but was unaware that their expectations were only being partially met.

The board determined that there were three root causes to the inadvertent start of the 241-SY-101 mixer pump. The first root cause is that operations had inadequate knowledge of the mixer pump test procedures. The contributing causes to this root cause are described below.

Training Less than Adequate

Operations had not received formal training on the mixer pump test. One shift supervisor was the expert on the testing. This shift supervisor had provided informal training to other shift personnel, but because the training was informal there was no assurance all personnel received the training or had adequate knowledge of the testing. With the lack of knowledge of the test procedure the shift supervisor had insufficient information to make proper decisions.

Unique Test

The mixer pump is a prototype and, as such, is a unique component. The pump was never intended to be turned over to operations. Because of the limited time the pump was intended to be installed, the regular operator training was not updated to include this pump or its associated systems.

The second root cause of the event was inadequate communications of the planned test activities. The contributing causes to this root cause are described below.

SOI Not Updated

The formal method of communications between the Operations and Test Engineering was established in SOI 92-47. This represented a means for Operations and Test Engineering to communicate the status of the testing and the facility operations. The original testing method envisioned by SOI 92-47 was not the method in use at the time of the event. Additional test engineering shifts had been added with different start and stop times. The SOI was not updated to reflect these changes and, as a consequence, the SOI came into disuse.

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SOI Not Utilized

The formal communications described in the SOI were not used consistently. Despite the inadequacies of the SOI, some of the information needed to make proper decisions could have been transmitted between Operations and Test Engineering.

Pre-test Briefings Less Than Adequate

The pre-test briefings did not consistently occur and contain sufficient information. The shift briefing did not always contain sufficient information to understand the intended testing activities or the current testing status. These briefings are a method to keep current on changing conditions and are necessary to assure Operations and Test Engineering were aware of each others intended actions.

The third root cause was the lack of operational control of the 241-SY-101 mixer pump during testing. The contributing causes to this root cause are described below.

Interface Between Operations and Test Engineering Not Effective

The interface and control requirements had changed as the test program progressed. SOI 92-47 had originally specified a method to accomplish the necessary interface and control, but testing methods and conditions had changed since the SOI was first issued. The SOI was not revised to reflect these changes. This formal administrative control became ineffective because as the testing method changed the relevance of the SOI to the actual conditions diminished. Additionally, management did not detect this change had occurred.

Operations Role in Testing Not Adequately Defined

Operations was fulfilling a support role in the testing despite statements by Operations and established policies. Test Engineering was really in charge of the testing and the operation of mixer pump. Because of this, Operations did not assume strong control. Their view was that the testing was occurring inside a "black box" with little or no impact on the operation of the facility. This led directly to Operations failing to establish effective control over the pump operation.

Disconnect Not Adequately Controlled

The 241-SY-101 mixer pump disconnect was not controlled by the pump bump procedure. Operations could have established definitive control of the test boundaries had they used a mechanical barrier, such as an operations lock on the disconnect switch and breakers. Additionally, a danger tag could have provided a more positive assurance that a more thorough review of conditions was made prior to closing the disconnect switch.

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Independent Verification Not Performed

Independent verification of the desired (or required) position of components is a means to ensure the component configuration is correct for the facility conditions. There were two opportunities to ensure what the proper position of the disconnect switch was: (1) at the time the shift supervisor directed closure of the disconnect switch; and (2) at the time the disconnect switch was actually closed.

4.2 TANK 241-C-106 HEEL PIT CONTAMINATION EVENT

The events and causal factors chart for 241-C-106 is provided as Figure 10. The root cause of this event was a less-than-adequate control of work. The principal contributing factors are discussed in the following paragraphs.

A number of barriers and controls failed that should have or could have prevented this event. Workers failed to understand the precise limits of the work scope. This was due to the rather general wording of the work package and imprecise verbal communication. The ALARA review failed because the ALARA committee was unaware of the scope change. The work control process was ineffective because the change process was not used. HP coverage of the activity, which could have detected and controlled the introduction of the rock into the riser, failed because the HPT was not physically present in the glovebox.

The glovebox was intended as a barrier between the workers and the high contamination inside the pit. The glovebox failed because it was bypassed. The protective clothing failed to provide an adequate barrier, due at least in part to the high temperatures in the pit.

Failure To Incorporate New Scope

The work plan was not modified to incorporate a new scope of work activities. The need to remove the standing water in the heel pit represented an additional work scope that had not been identified in the work planning performed to date. The significance of this change was not recognized. The entry into the containment invalidated the assumption in the RWP, with the result that the protective clothing required by the RWP was not adequate for the new task. When the job scope changed, the work package should have been modified to include the new task and any other additional controls necessary to safely perform the work.

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Figure 10. Event and Causal Factors Chart for 241-C-106. (4 pages)

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

Figure 10. Event and Causal Factors Chart for 241-C-106. (4 pages)

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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Figure 10. Event and Causal Factors Chart for 241-C-106. (4 pages)

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PT CLEANOUT**

Figure 10. Event and Causal Factors Chart for 241-C-106. (4 pages)

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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Inadequate Verbal Instructions

The work scope was not adequately defined during the pre-job briefing. The verbal instructions given to the KEH workers did not definitively limit their activities. This resulted in the workers feeling that they had been given a mission that went beyond simply observing whether or not the existing drain was covered or the risers were capped. Since a baseline radiological survey had not been performed, the HPT was assigned that task, in addition to providing continuous coverage for the two workers. The HPT considered the survey to be his primary task. The consequence of this was his lack of awareness regarding what the workers were doing, and his decision to leave the containment before the workers had completed their task.

Less Than Adequate Supervision

Neither the WHC POC or the KEH foreman accompanied the workers into the containment. This was considered a relatively simple task that did not require close supervision. The HPT was concentrating on obtaining the background survey, and consequently did not effectively control the radiological aspects of the job.

Less Than Adequate Training

The WHC POC had not been trained as a person-in-charge (PIC), although he was functioning in that capacity. The KEH workers appear to have received sufficient training to allow them to recognize the innate hazards of the job, but not the results of their actions. They expected to have their protective clothing contaminated, and accepted this as part of the job.

Lack Of Clarity In The Work Package

The work package did not explicitly describe the technique to be used to perform the task. Due to concerns regarding the expected high contamination levels and radiation dose rates in the 241-C-106 pits (heel, pump, and sluice), the ALARA review recommended that the decontamination and painting be performed from outside the pits, using glovebox ports. The contamination controls specified in the RWP were based upon this concept. This recommendation was adopted in the planning of the work package; however, it was not explicitly described in the package.

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4.3 GENERAL FACTS ANALYSIS

In addition to the two recent events, the Board reviewed other 1993 occurrences related to Tank Waste Remediation System (TWRS) operations. From this review the following groupings of related causal factors were identified.

- Conduct of operations/operational practices
- Safety/safety practices/safety awareness
- Management/management structure/communications
- Management processes/work processes
- Radiological practices/contamination/radiation awareness and sensitivity.

The Board used these five groupings, in addition to the specifics from the two events, to form the basis of its analysis.

The analysis was made to identify weaknesses that may have contributed to the cause and severity of these two and other events. Observations of work activities and interviews with all levels of both the WHC and KEH organizations were conducted. Reviews of completed and in-process work packages and other documentation (including logs and records of rounds) were conducted. Training and qualification records were also reviewed.

Additionally, policies were reviewed and the understandings of these policies for all levels of personnel were tested. Results of overview of activities such as management surveillances, audit and QA surveillance reports, safety reviews and their status were reviewed.

The Board members were looking for performance and program elements that were significant and related to (or impacted the success of) the TWRS program and mission.

The discussion in this section, as well as the facts and findings sections, contains the results and conclusions of these investigations. Specifically, this section discusses and analyses five topics (Conduct of Operations, Safety, Management, Management Processes, and Radiological Practices), and how these topics contributed to safety "cultures" and the two events.

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4.3.1 Conduct of Operations

A review of the causal factors for the two subject events, and the results of interviews with operators, supervisors and managers, have identified a number of weaknesses in the Tank Farm Conduct of Operations. Principle weaknesses include:

- Inadequate management presence in the field
- Poor communications between operating groups and at pre-job briefings
- Insufficient fact finding at critiques
- Insufficient use of logs and shift turnover practices between operating groups and others performing work in the tank farm
- Inadequate use of timely shift orders.

These principal weaknesses all reflect poor communication processes. Good communications are fundamental to an effective operating facility. Failure to resolve the communication issues appears to result from the absence of regular line management involvement in day-to-day operating activities. When asked in interviews how much of their time line managers spent in the field, the answer generally was "very little or none." This observation was made by both managers and their employees.

The lack of a detailed Conduct of Operations implementation plan that includes significant involvement by line managers in observing, teaching, and setting performance standards has had a negative effect on the performance of all tank farm personnel. Efforts to improve performance following events in the past have not achieved desired goals. Workers view plant events/problems as the "systems" problem rather than accepting personal responsibility for making things better.

Interviews and observations have led to the conclusion that there is a pervasive insensitivity to degraded/degrading conditions and work practices on both the part of managers and workers.

4.3.2 Safety

Safety cultures are largely a product of safety sensitivity, the working environment, and management expectations and reinforcement. Required industrial and radiological training occurs at the Hanford Site. However, it appears that safety awareness is lacking in some areas. First line supervisors, work leaders, and employees need the appropriate awareness to stop and involve appropriate personnel when unusual conditions are encountered (e.g., water

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in the 241-C-106 pit). Workers must not proceed on activities without verifying the activity will not have adverse effects (e.g., closing disconnect switch or putting a rock down the pipe).

Safety perspectives are also influenced by the working environment. Personnel in the tank farms routinely work around areas of significant radiological contamination. In addition, equipment in the tank farm is, in some cases (lighting, exhausters), deteriorating. Many employees accept the current situation as the norm rather than as an unacceptable situation. Poor vertical communication with management, and lack of management presence in the field, led to continuation of this norm.

Management appears to be directing a strong safety philosophy, but there does not appear to have been significant progress in motivating people to work safely, making them accountable, and listening to and acting on their suggestions.

4.3.3 Management

The organization and administration of WHC tank farm operations must ensure effective implementation and control of operations activities. Experience has shown that superior, consistent performance is obtained from qualified personnel using approved procedures, especially in those cases where management is involved in workplace monitoring and performance assessment.

Stop work authority must be vested in each and every employee, and this authority must be reinforced and protected by management. The authority to stop work, especially for HPTs, is essential to the safety of personnel. Management must let their expectations be known by frequent, open, and free communication at all levels. Responsibilities (organizational and individual) must be clearly defined and must facilitate safety culture ownership and operational excellence.

The organizational arrangement, responsibilities and processes are established in several places. Organization charts define the organizational hierarchy. Responsibilities and processes are defined in Conduct of Operations manuals, management policies, and governing work control procedures.

This review identified three underlying organizational issues that contributed to the two events. The issues are as follows:

- Division of responsibilities inhibited effective use of processes
- Organizational structure did not encourage task ownership
- Vertical communication within organizations was less than adequate.

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Each of the issues is discussed in more detail below.

4.3.3.1 Division of Responsibilities. Division of responsibilities was an issue in both events. In the 241-SY-101 event the division of responsibilities was not well defined between Shift Operations and Test Engineering. Although an SOI existed, it had not been updated when plant conditions changed and the agreements in the SOI were not actively in use. Operations personnel had only limited participation or knowledge of the 241-SY-101 pump testing. Since the equipment was in a test phase, Operations personnel were unsure of their responsibilities. Test Engineering felt responsible for testing, but not for other tank activities, and did not encourage involvement by Operations. They did not have a focus on ensuring long term success when the equipment was operated by Operations.

Division of responsibilities was a contributing factor in the 241-C-106 event in that the roles of the WHC POC and KEH Superintendent/Foreman were not clearly defined.

4.3.3.2 Organizational Structure. The organizational structure of Waste Tank Operations and Health Physics did not encourage task ownership. Many organizations are grouped by discipline (e.g., mechanical, electrical) or functionally (e.g., single shell tanks) rather than by plant area. Personnel move from a task in one area to the next task in another area. Each new task brings a new grouping of individuals. For these reasons constant work groups are rare. In the case of the 241-SY-101 event, shift operations personnel worked rotating shifts while the test engineers worked straight shifts. The "expert" shift supervisor was not present on-site. At the time of the event one of the operators was inexperienced, having been temporarily assigned from the 200 East facilities for the day shift.

For the 241-C-106 event, the HP personnel assigned to the job changed each week. In addition, a relatively inexperienced HPT was the only HPT who attended the pre-job briefing.

Organizational structure is also a factor in the number of management levels. Ownership and accountability would be better promulgated by a horizontal management structure.

4.3.3.3 Vertical Communication. Communication of priorities, management expectations, milestones/schedules, and equipment/process issues was less than adequate. The involved organizations have up to six management levels. This number of levels makes effective vertical communication difficult. Also, as noted earlier, there was little management presence in the field to detect issues or problems. Without effective top-down communication or management presence in the field, the field performance standards did not improve as required.

Vertical communication is also important to eliminate unintended messages to the field such as "production is more important than safety" or "you must live with safety issues." Examples of these types of problems are given in Section 3.3.2.

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4.3.4 Management Processes

4.3.4.1 Maintenance Process. The long delay in maintenance package preparation and delivery causes a maintenance personnel concern, since there is not sufficient time to prepare, get the work packages corrected (a common need), gather the necessary material, hold a pre-job briefing, and still do the work.

The emphasis on work package completion, coupled with the sometimes poor quality work packages and general lack of coordination, gives the impression to the work force that management only cares about production and not worker safety. Crafts felt this practice was contrary to the stated safety goals delivered by management.

4.3.4.2 Test Controls. In the 241-SY-101 mixer pump inadvertent start, testing was not sufficiently controlled. Many factors contributed to this event, but the interface control of the routine operation of "pump bumping" with the on-going testing did not exist. No procedure had been established to ensure control, nor had an effective method been established to coordinate the testing and routine pump bumping.

From interviews, the situation that resulted in the inadvertent pump start is not uncommon. The organizational structure can allow testing, projects, and some maintenance to be conducted without the knowledge of shift operations. In many cases, individuals overcome the structure and processes in order to keep all informed.

4.3.4.3 Prioritization/Funding. WHC-IP-0842 establishes formal guidelines for prioritization of work. The large backlog of work packages, occurrence reports, audit findings, and waste issues (as well as the large number of external issues), has caused the system to become overwhelmed. To compound the problem, the lack of supporting infrastructure (such as accurate as-built drawings and labeling) has made the process even more difficult. In addition, the number of components that fail due to age, and the difficulty of obtaining the necessary parts, further increases the number of work requests and the time it takes to complete them.

Most interviewees indicated that only the highest priority items of the J-1 tasks are being worked. It is believed that tasks related to the Tri-Party Agreement milestones have a higher priority than tasks that are related to worker safety (i.e., replacing lights in the tank farms or fixing tank level indicators). Worker safety tasks are to be given Priority 1 status; however, unless an item is clearly marked "Safety," it may be given a lower priority and will never be worked.

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4.3.5 Radiological Practices

4.3.5.1 ALARA. The radiological planners failed to follow up to ensure that the RWP and work plan for the decontamination and painting of the 241-C-106 pits met the intent of using the enclosure as a glove bag (no entry).

Mockup training was not performed for this job despite the following:

1. High dose rates, high contamination levels, and the use of air-line respirators were anticipated in the RWP.
2. The glovebox technique for contamination control of a tank pit is a new technique at the tank farms.
3. Kaiser personnel were unfamiliar with the use of gloveboxes.

4.3.5.2 RWP/Workplan. Personnel failed to recognize the significance of the job scope change once water and sludge were detected and it was decided to allow personnel to enter the glovebox. The RWP and work plan did not explicitly discuss the use of the glovebox. The radiological protection requirements were written for work outside the glovebox only.

Three RWPs, all identified with the same number, were written to describe work in the heel pit, sluice pit, and the pump pit with identical radiological controls. This could be a cause of additional confusion.

4.3.5.3 Pre-job Briefings. The pre-job briefing was held by the POC at the work site. This practice can create an air of informality and is distracting to workers who need to comprehend all details of the job.

The HPT was called away to cover another job during the briefing. Not being present at the pre-job briefing is bad practice and contributes to poor communication.

Presentation of the work scope was not clear. The HPT perceived that the job scope was limited to the workers using a rake to attempt to remove a possible drain cover or loosen sediment to unclog the drain. The workers perceived they were assigned the task to discover a method of transferring water from the pit floor into the tank.

The inherent dangers of the tank were never discussed, and it was assumed that all the workers knew to limit actions involving possible contact with contents of the tank. Discussions with operations personnel demonstrated that the use of "zipcords" for tank level indicators, the replacement of broken aging permanent indicators, and the dipping of bottles into various waste tanks for samples occur routinely.

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4.3.5.4 Radiological Coverage. Allowing entry into an area that has not been surveyed for several years prior to a pre-job survey is poor radiological practice. Confirmation of the RWP dose rate and contamination estimates should have been performed prior to work in the pit. If the HPT had stayed at the job site and concentrated on job coverage instead of performing a survey and leaving to count smears, he could have provided additional direction and possibly prevented the event. Interviews indicate that KEH workers generally solicit advice and direction from HPTs.

"Continuous" coverage is not well defined. Current interpretations allow HPTs to provide continuous coverage for more than one job even though the jobs may be separated by considerable distance.

4.4 ANALYSIS OF ROOT CAUSES

The above analysis discussions have dealt with the two specific incidents and the five general topics arising from the review of the 1993 occurrences at TWRS. Taking these areas and reviewing them together, three causes became apparent. One underlying cause relating to less than adequate communications runs through the 241-SY-101 pump incident and the 241-C-106 pit cleanout, as well as the Conduct of Operations discussion.

A second cause that touches on several incidents was the lack of implementation of a strong Conduct of Operations philosophy. The tolerance for degraded plant conditions and equipment, and inadequate processes, appears as a cause (the third) in the safety, radiological, and management process sections.

Also, a stated and sometimes unstated causal factor that appears in several of the analysis sections (241-C-106 pit clean out, safety and radiological practices, etc.) is the awareness of or sensitivity of personnel to conditions, hazards, or changes that could result in unintended action if planned evolutions were to proceed.

Taken together, the three common causes result in this lack of sensitivity of personnel at all levels to safety and radiological hazards. Field personnel fail to recognize the need to stop and consult with experts when unusual or unanticipated conditions are encountered. Instead, they attempt to solve issues without full knowledge of the results of their actions.

Actions to correct any one of the elements of the triad of causes will not have an immediate affect on the lack of sensitivity. All elements of the triad need to be addressed in order to effectively decrease this lack of sensitivity. The causal triad forms an interactive relationship with its primary effect being lack of sensitivity.

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5.0 CONCLUSIONS

5.1 FINDINGS FOR 241-SY-101 EVENT

5.1.1 241-SY-101 Findings

5.1.1.1 241-SY-101 Finding #1: Operations had inadequate knowledge of the mixer pump test procedures.

Causal Factors for Finding #1:

- Operations had no formal training on the mixer pump and associated systems or the test procedures. This resulted in limited knowledge of the ATP content.
- The pump is a prototype and, as such, is a unique component. The pump was never intended to be turned over to operations.

Judgment of Need for Finding #1:

The operations/test engineer activities must have clear definition of training requirements for operations and test personnel. This should include sufficient technical training to ensure operations and test personnel understand the possible impacts of test activities on existing plant equipment, as well as plant evolution effects on testing activities.

5.1.1.2 241-SY-101 Finding #2: Communications of test activities were inadequate between Operations and Test Engineering.

Causal Factors for Finding #2:

- The interface requirements had changed as the test program progressed, but SOI 92-47 had not been revised to reflect these changes (e.g., the bump pump requirements).
- SOI 92-47 was not followed rigorously, which would have ensured some communication about test activities despite the inadequacies of the SOI.
- The pre-test and shift briefings did not always occur or contain sufficient information for the operations personnel to understand the intended testing activities or current testing status.

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Judgment of Need for Finding #2:

Operations management must periodically review the adequacy of communications between operations and testing personnel. The management oversight and monitoring requirements of Chapter 1.0 of the *Conduct of Operations Manual* should be aggressively implemented.

5.1.1.3 241-SY-101 Finding #3: Operations' lack of definitive control of the mixer pump resulted in the inadvertent start of the pump.

Causal Factors for Finding #3:

- The control requirements had changed as the test program progressed, but SOI 92-47 had not been revised to reflect these changes.
- Despite statements by Operations and established policies, Test Engineering was in charge of the testing and the operation of the mixer pump; Operations was fulfilling a support function. Operations did not demonstrate sufficient interest in the testing.
- The 241-SY-101 mixer pump disconnect switch was not controlled procedurally by the pump bump procedure, nor was there a mechanical means (lockout device) used to prevent closure of the disconnect switch.
- Independent verification of the 241-SY-101 mixer pump status did not occur.

Judgment of Need for Finding #3:

Implement the philosophy of operational control over testing as set forth in Chapter 8 of the *Conduct of Operations manual*.

5.1.1.4 241-SY-101 Finding #4: Operations and test personnel were not immediately evacuated outside the 300 meter exclusion zone following the inadvertent pump start.

Causal Factors for Finding #4:

- The significance of the fact that the mixer pump had actually run, and that the potential existed for gas release from the tank, was not recognized.
- There is no locally-installed means to alert personnel that the mixer pump is running, nor is there a public address system.

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Judgment of Need for Finding #4:

Establish a means of assuring all personnel are immediately alerted and evacuated when 241-SY-101 pump operations occur.

5.2 FINDINGS FOR 241-C-106 EVENT

5.2.1 241-C-106 Findings

5.2.1.1 241-C-106 Finding #1: The 241-C-106 pit event resulted from work performed that was outside the scope of the approved work package and RWP.

Causal Factors for Finding #1:

- The scope changes (water in the pit and rock in tank) were not recognized as significant enough to require work package replanning. The entry into the containment was not covered in the work package or the RWP.
- The scope and limitations of the task were not clearly communicated to the workers, either in the work package or in the pre-job briefing.
- The Point-of-Contact, the HPT attending the pre-job briefing, and the KEH foremen and workers were relatively inexperienced at working on jobs with high radiation/contamination risks.
- Continuous HPT presence was not maintained.

Judgment of Need for Finding #1:

The threshold of sensitivity to changes in work conditions and work scope for all activities must be lowered, thoroughly understood, and acted upon by all personnel.

5.2.1.2 241-C-106 Finding #2: The general wording of the RWP and work plan did not preclude entry into the glovebox.

Causal Factors for Finding #2:

- The RWP and work plan were vague and not specifically written to address the original scope and restrictions of the job.

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- Estimates of radiological conditions used to develop the RWP were developed using historical data; they were not verified at the start of work.

Judgment of Need for Finding #2:

- Improve ALARA planning and field implementation to assure the plans are effective and the goals of ALARA are achieved.

5.3 RELATED ISSUES

5.3.1 Conduct of Operations

5.3.1.1 Conduct of Operations Finding. Although well documented by policy and procedures, the Conduct of Operations principles at the WHC waste tank farms have not been successfully implemented and have not resulted in an acceptable level of performance.

Causal Factors for Finding:

- There is no formal progressive, self-validating plan or schedule for implementing Conduct of Operations.
- Vertical communications, management presence in the field, and structured communications between organizations are insufficient.

Judgment of Need for Finding:

Chapter 1 of the Westinghouse GOCO *Conduct of Operations* manual, although entitled "Operations Organization and Administration," contains the philosophy for conducting operations and the guidance for correctly implementing the remaining 17 chapters. When properly understood and followed by line management, Chapter 1 becomes the foundation for the overall Conduct of Operations program.

WHC waste tank farms management must (1) revisit and become thoroughly familiar with the contents of Chapter 1; (2) develop a plan for further improvements in conduct of operations; and (3) execute the plan with the participation and support of all levels of management and supervision.

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

5.3.2 Safety

5.3.2.1 Safety Finding #1. Contamination areas, tripping hazards, and out of service equipment (such as tank farm lights and exhausters) are a common occurrence and have a low probability of being fixed.

Causal Factors for Finding #1:

Insufficient priority is placed on resolution of routine safety concerns and plant equipment deficiencies. Highly visible programs (such as remediation of tank contents) receive the highest priority for resources.

Judgment of Need for Finding #1:

Increase the visibility and priority of repairing out-of-service equipment and correcting contamination control and industrial safety problems.

5.3.2.2 Safety Finding #2. The work force doubts management's commitment to safety.

Causal Factors for Finding #2:

Lack of resolution of work force concerns convinces workers that safety is not the highest priority.

Judgment of Need for Finding #2:

Strong action from management to fix unsafe conditions is essential to convince the work force of the company's intent to be safe.

5.3.2.3 Safety Finding #3. Management expectations for the work force with respect to safe conduct of work are not clear.

Causal Factors for Finding #3:

- Unintended messages are received by the work force when rewards for work stoppages and satisfactory resolutions are rare compared to rewards for completing work on schedule.
- Management has not maintained an adequate presence in the work place to set and reinforce the safety culture.

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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Judgment of Need for Finding #3:

Management presence at the start of work evolutions, during work evolutions, and in one-on-one conversation with workers is needed to fully understand and be effective at resolving work force issues.

5.3.3 Management

5.3.3.1 Management Finding. There is insufficient ownership, teamwork, and support for cultural change within organizations working in the tank farms.

Causal Factors for Finding:

- Organizations are aligned for different functions (i.e., plant areas versus technical topics) versus skill disciplines (e.g., mechanical, electrical).
- Key organizations needed for work planning and performance are not commonly located, assigned, and transported to work sites.
- Operations and Health Physics field personnel do not believe they have sufficient input to facility priorities.
- Management presence in the field is limited and vertical communications are distorted by management layers and physical separation.

Judgment of Need for Finding:

Modify the organizational focus to facilitate ownership, teamwork, and communication.

5.3.4 Radiological Practices

5.3.4.1 Radiological Practices Finding #1. Pre-job surveys are not routinely performed exclusive and prior to the planned work activity. Survey results are not compared to the RWP estimates prior to starting work.

Causal Factors for Finding #1:

- Misapplication of ALARA concepts and productivity pressures have led to this practice.
 - Lack of sensitivity to changing radiological conditions.
-

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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Judgment of Need for Finding #1:

Establish definitive controls and specific guidance for when pre-job surveys must be performed; ensure that they are reviewed prior to the start of the work activity.

5.3.4.2 Radiological Practices Finding #2. There are various levels of understanding by Health Physics of the definition and requirements for performance of "continuous coverage."

Causal Factors for Finding #2:

- HPT management has provided conflicting verbal definitions for the meaning of continuous coverage.
- The Hanford Radiological Control Manual fails to provide a definition for the term "continuous coverage."
- Current work practice allows the HPTs to leave the area for brief periods of time.
- Individual HPTs are currently assigned more than one work activity requiring continuous coverage.

Judgment of Need for Finding #2:

Provide a clear definition of and implement a system for continuous coverage.

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

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**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

APPENDIX A

COMMISSIONING LETTER

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

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**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

Department of Energy

Richland Plant Office

P.O. Box 550

Richland, Washington 99362

AUG 17 1993

9305864B

93-TOB-160

Mr. T. M. Anderson, President
Westinghouse Hanford Company
Richland, Washington

Dear Mr. Anderson:

TYPE "B" INVESTIGATION OF RECENT TANK FARM EVENTS

Confirming conversations with your staff, the Westinghouse Hanford Company (WHC) is requested to conduct a Type "B" investigation of the recent events which occurred in the tank farms complex. The events involved "Inadvertent Mixer Pump Operation at 101-SY," RL-WHC-TANK FARM-1993-069 and "Inadequate Work Control Results in Personnel Skin Contamination at 241-C-106, Pit B," RL-WHC-TANK FARM-1993-0071.

Mr. J. L. Lee has been appointed Chairman of the WHC investigation board. The names and qualifications of the members selected to assist Mr. Lee are:

J. L. Lee, Chairman	Manager, Operations Waste Isolation Division
J. R. Ewalt	Professional, Total Quality and Performance Evaluation, Trained Accident Investigator
R. F. Gessner	Manager, Plant Operations West Valley Nuclear Services Company
L. J. Garvin	Consulting Technical Analyst Kaiser Engineers Hanford
D. H. Shuford	Manager, Special Projects; Root Cause Analyst
S. Smith	Manager, Operations Integration, Westinghouse Savannah River Company
C. E. Upchurch	Radiation Protection Supervisor Kaiser Engineers Hanford

I have selected Mr. Andrew Hon to be an observer and to provide liaison between RL and the board.

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

Mr. T. M. Anderson
93-TOB-160

-2-

AUG 17 1993

Your Type "B" investigation is to be conducted using DOE Order 5484.1, and the report is to be submitted to me by September 13, 1993. The report should fully explain the elements of the causal factors and describe the management systems which should have, or could have, prevented the occurrence. Appropriate judgement of needs for improvement of the management systems will be required.

If you have any questions, please contact me or your staff may contact Mr. Andy Hon, Office of Performance Assessment on 376-7127.

Sincerely,

for John D. Wagoner
Manager

cc: J. C. Tseng, EM-36/HQ
A. Griffith, EM-36/HQ

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

APPENDIX B

BOARD MEMBERS

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

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TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

SIGNATURES

J. L. Lee
Operations Manager Westinghouse
Waste Isolation Division

D. H. Shuford
Acting Manager, UO₂ Plant
Westinghouse Hanford Company

R. F. Gessner
Manager Site Operations
West Valley Nuclear Service Company

J. R. Ewalt
Certified Accident Investigator
Westinghouse Hanford Company

S. J. Smith
Manager, Operation Integration
Westinghouse Savannah River Company

L. J. Garvin
Consulting Technical Analyst
Kaiser Engineers Hanford Company

C. E. Upchurch
Supervisor Health Physics
Kaiser Engineering Hanford Company

A. Hon, DOE-RL
Nuclear Safety Engineer
DOE Observer

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

BOARD MEMBERS RESUMES

Ewalt, J. R. - Board Member

**Senior Engineer, Total Quality and Performance Evaluation
Westinghouse Hanford Company**

MORT/AI certified. Twenty-one years experience in the nuclear industry, including the Navy and Fast Flux Test Facility at various qualification levels in operations. Responsible for the startup of Institute of Nuclear Power Operations Human Performance Enhancement System at the Fast Flux Test Facility. Participated as both board leader and member in a number of investigations and Conduct of Operations assessments.

Garvin, L. J. - Board Member

**Consulting Technical Analyst, Waste Handling Projects Division
Kaiser Engineers Hanford**

Degrees in Chemical, Nuclear, and Metallurgical Engineering. Over 30 years experience in the nuclear industry. Experience includes nuclear construction, Naval Nuclear Power Instructor, NRC Inspector, and Quality Assurance and nuclear safety management.

Gessner, R. F. - Board Member

**Manager, Site Operations
West Valley Nuclear Services Company**

Graduate Metallurgical Engineer. Over 40 years experience in nuclear materials, nuclear fabrication, nuclear reactor plant maintenance, waste treatment and contamination. Responsible for developing and implementing GOCO Conduct of Operations manual and training.

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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Andrew Hon - Observer

**Nuclear Safety Engineer and Lead Auditor, Nuclear Safety and Quality Assessment Staff,
Office of Performance Assessment, DOE-RL.**

**B.S. Nuclear Engineering, Professional Engineer, Maryland; NQA-1 Lead Auditor, and
DOE Accident Investigator. Sixteen years of professional experience in nuclear safety and
quality. This includes leading safety and quality audits, and investigating DOE events. NRC
Resident Inspector and Reactor Inspector at commercial nuclear power plants. Represented
the NRC to commercial nuclear utilities in enforcing federal nuclear regulations and
investigating onsite events. Professional experience includes reactor safety research for
nuclear accident analyses and regulation development.**

Lee, John L. - Board Chairman

**Manager, Waste Isolation Pilot Plant Operations
Westinghouse Waste Isolation Division**

**BS and MS degrees in Chemical Engineering. Seventeen years experience in technical
support and operations management at DOE facilities. Experience includes fourteen years at
the Idaho Chemical Processing Plant managing nuclear fuels dissolution, uranium recovery,
and high and low level waste storage and processing. Current assignment is WIPP
Operations Manager includes responsibility for managing facility operations, maintenance,
procedure development and implementation of Conduct of Operations and Maintenance.**

Shuford, D. H. - Board Member

**Acting Manager, UO₃ Plant
Westinghouse Hanford Company**

**M.S. Chemical Engineering. MORT/AI trained. Twelve years nuclear industry experience.
Background in N Reactor technology support, project engineering, chemical processing
systems engineering, operations programs and operations support. Outage Manager during
preparations for the final UO₃ Plant processing campaign.**

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

Smith, Stephen J. - Board Member

**Manager, Operations Integration
Westinghouse Savannah River Company**

27 years nuclear experience including U.S. Navy, commercial, and government nuclear programs. Held senior management positions including Plant Manager of Sequoyah Nuclear Station and Manager, Reactor Operations, at Savannah River Site. Has participated in 5 previous Type "B" investigations. Responsible for Conduct of Operations implementation at the Savannah River site.

Upchurch, C. E. - Board Member

B. S. Zoology

Twelve years of experience in the nuclear industry. Held positions in health physics and emergency planning at several commercial nuclear power facilities. Member of the National Registry of Radiation Protection Technicians.

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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APPENDIX C

ORGANIZATION CHARTS

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

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TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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Westinghouse Hanford Company Tank Waste Remediation System Organization Charts.

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Westinghouse Hanford Company Tank Waste Remediation System Organization Charts.

N. T. Alumkal 7/16/93
WT Alumkal (date)

Westinghouse Hanford Company Waste Tank Operations Organization Charts

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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Westinghouse Hanford Company Facility Operations Organization Charts.

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

Westinghouse Hanford Company Shift Operations.

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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Westinghouse Hanford Company West Facilities.

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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Westinghouse Hanford Company East Facilities.

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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Westinghouse Hanford Company Waste Tank Maintenance.

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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Westinghouse Hanford Company Major Maintenance.

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Westinghouse Hanford Plant Engineering.

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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Westinghouse Hanford Company Environmental, Safety, Health,
and Quality Assurance Organizational Charts.

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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Westinghouse Hanford Company Health Physics.

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TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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Westinghouse Hanford Company Tank Waste Remediation Health Physics.

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2 of 3

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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Kaiser Engineers Hanford Company Organizational Charts.

Approved R. T. French

CONSTRUCTION SERVICES

PE Registered Professional Engineer

Kaiser Engineers Hanford Company Construction Services.

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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APPENDIX D

INTERVIEWEES

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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LIST OF INTERVIEWEES

Westinghouse Hanford Company

Jeff Andrews	Don Hart
John Bell	Bob Heineman
David Berg	Vern Henzel
B. Biddle	Omar Jaka
John Bloom	J. Jeskey
Tim Bohan	B. Joyce
Bob Bartmettlor	Don Kelley
K. Bonewell	Dennis Kerwick
Sonny Bracamontes	William (Mike) Lane
R. Brooks	Ronald L. Legg
Wayne Brule	Ken Leliefeld
Bill Bryant	Bernie Lueck
Jeff Carlson	L. Marlin
Bill Clark	Jake McMullen
Gordon Coughren	Denny Newland
J. A. Crawford	W. Parnell
Gary Dunford	J. Parrott
Larry Eyre	Dave Reber
Cheryl Fischer	J. Shelor
T. Fisher	Royal Shupe
C. Fricker	S. Stewart
Rod Garrett	David Tubbs
C. Geier	Det Wegener
Bob Gelman	M. Wells
D. Gordon	Bob Wininger
Kevin Hagerty	Stephen Youngerman
Doug Hamrick	

Kaiser Engineers Hanford

Jack Blessing	Bill Stewart
Jim Cockrum	John Stredwick
Rich Root	

Laborer Union Representatives

Mark Reavis
Tom Reynolds

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**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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APPENDIX E

NEWS RELEASES

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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Westinghouse
Hanford Company

News
Information

Media Relations
P O Box 1970
Richland, WA 99352
(509) 376-5101

CONTACT: Craig Kuhlman
(509) 376-6826

FOR IMMEDIATE RELEASE

SAFETY CONCERNS HALT NON-ESSENTIAL WORK IN HANFORD TANK FARMS

Richland, Wash., Aug. 12, 1993 -- Westinghouse Hanford Company, the management and operations contractor at the U.S. Department of Energy's (DOE) Hanford Site, today halted all non-essential work at the Site's waste tank farms because of safety and operations concerns brought about by a series of recent incidents.

Westinghouse Hanford Executive Vice President William Alumkal, who manages the Tank Waste Remediation System at Hanford, announced his decision this afternoon following two recent incidents that show serious deficiencies in safety discipline, conduct of operations and personal accountability.

Alumkal called the two incidents "absolutely unacceptable." The first occurred last week when the mixer pump at Tank 101-SY was inadvertently started during a system test. Another incident happened Tuesday, August 10, when a Kaiser Engineers Hanford employee, acting on his own, taped a rock to a rope and lowered it through an open pipe into a waste tank to see if the pipe was plugged. The employee's hands and clothing were contaminated. In both cases, disciplinary action is being taken.

"Safety is and must be the top priority at Hanford," Alumkal said. "These incidents demonstrate to me that our workforce is seriously deficient in its regard for safety and accountability in performing work in the tank farms.

"Consequently, we are going back to basics. We will not resume work until our managers, supervisors, and operators are retrained and we have determined conclusively that we can conduct our activities safely and effectively. This involves every level of our organization and every category of employee."

-more-

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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Safety Concerns Halt Non-Essential Work in Hanford Tank Farms (Add one)

Essential activities required for safety, monitoring and regulatory compliance will continue. The twice daily starting of the 101-SY mixer pump will continue with rigorous attention to safe operations to prevent tank waste from plugging the pump nozzles.

###

WHC-9308-101.TNK

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

101-SY pump runs by mistake

TRI-CITY HERALD
Tri-Cities, WA

A2
AUG 17 1993

A giant mixer pump inside Hanford's most dangerous high-level radioactive waste tank was accidentally turned on Wednesday afternoon.

The incident happened at 3:15 p.m. while two crews of workers were at Tank 101-SY, but Westinghouse Hanford Co. did not issue a public statement about the incident until 5:30 p.m. Friday.

On Thursday, Westinghouse formally reported the accident to the Department of Energy and established an independent review team to examine the incident, company spokesman Craig Kuhlman said.

He said the accident apparently happened while one crew of workers was preparing to turn the pump on for a test as another crew was preparing to test some computer software. A worker on one team opened the circuit breaker, but a worker on the other team then closed the switch and started the pump.

The pump ran for 30 seconds before it was turned off, Kuhlman said. He said there was no release of hydrogen gas during the incident, and there was no damage to the pump or the waste tank.

The massive pump was recently installed in the tank to prevent the buildup of the potentially explosive gas, which has resulted in periodic "burps" as hydrogen is released.

Westinghouse on Thursday declared an "unusual occurrence", the second-highest of three levels of severity that are assigned to nuclear-related incidents. The highest level would be an emergency.

Computer software testing has been put on hold until the independent review of the incident is finished, Kuhlman said. All other testing at the 1 million-gallon underground storage tank will continue as scheduled, he said.

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

**Pump accidentally turned on
at nuclear site in Hanford**

RICHLAND, Wash. — A pump designed to reduce dangerous gas buildups in a radioactive-waste tank at the Hanford Nuclear Reservation was accidentally turned on during a test.

The incident occurred at 3:15 p.m. Wednesday while two work crews were at Tank 101-SY. Westinghouse Hanford Co. reported it Thursday to the federal Department of Energy.

A review team will examine the incident, company spokesman Craig Kuhlman said. It did not issue a public statement about the incident until 5:30 p.m. Friday.

The accident apparently happened while one crew was preparing to turn on the mixing pump for a test as another crew was preparing to test some computer software. A worker on one team opened a circuit breaker, but a worker on the other team then closed the switch and started the pump.

The pump ran for 30 seconds before it was turned off. Kuhlman said. No hydrogen gas was released and no damage occurred to the pump or the 1 million-gallon waste tank, he said.

The pump was recently installed to prevent buildups of the potentially explosive gas. Such buildups have resulted in periodic "burps" as hydrogen is released.

Westinghouse on Thursday declared an "unusual occurrence," the second-highest of three levels of severity that are assigned to nuclear-related incidents. The highest level would be an emergency.

Computer software testing has been put on hold until the incident is reviewed, Kuhlman said.

THE OREGONIAN
Portland, OR

B2
AUG 09 1993

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

APPENDIX F

241-SY-101 DOCUMENTATION

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October 7, 1992

Page 1 of 1

Standing Order #92-47

Interface Understandings

Facility Operations

&

101-SY Test Engineers

See attached documentation (pages 1 through 3).

APPROVAL:

J. J. Badden, Manager
Shift Operations

NOTE: Original signature in Shift Office

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

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TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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WASTE TANK REMEDIATION SYSTEM

STANDING ORDERS

Interface understandings between Tank Farm Operations and 101-SY Remediation Test Engineers.

1. The Shift Managers are the management authority for Tank Farm Operations as well as the Building Emergency Director. As such the following applies:
 - a. The Shift Manager will conduct any notifications to DOE and management outside of the Test Engineer's immediate chain of command. The Test Engineers will notify the Shift Manager immediately of any events, first aid cases or off-normal conditions.
 - b. The Test Engineers will recognize the authority of the Shift Manager to cause a termination of the test up to and including evacuation of the control trailer, local vicinity and/or the site. (Plans for shutting down the test to allow a "walk-away" should be in place.)
 - c. Performance of the mitigation test is conditional upon shift manager approval.
 - d. The original test procedure document and any changes will be approved by Process Engineering (shift engineer) and Tank Farms Operations Shift Manager/Supervisor.
2. While manning the control area for the 101-SY remediation pump, Test Engineers will be viewed as an operating entity of Tank Farm Operations and therefore subject to Conduct of Operations practices and controls. e.g.:
 - a. A formal narrative logbook will be maintained in accordance with WHC-CM-5-7 Section 1.8
 - b. A formal shift turnover will be conducted in accordance with WHC-CM-5-7 Section 1.6
 - c. A crew briefing will be conducted with the Test Engineers and the TFO Shift Manager/Supervisor. The following, as a minimum, should be discussed:

The oncoming Test Engineers for each shift will call the Shift Supervisor before the start of their shift. They will inform him of the major events during the past shift, the anticipated changes to the test conditions during the next shift, the names of the oncoming Test Engineers, and any other significant information. Two copies of the test plan will be provided to Shift Operation to aid status of progress, turnover and briefings.

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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- d. The Test Engineers will request permission from the Shift Supervisor prior to starting or restarting the mitigation test. Restarts would include starts after established hold points in the test procedure and after unintended aborts. Restarts would not include pump activation after a shutdown as part of a normal cycling as established in the test procedure. (This information should be passed on at the shift briefing.)
 - e. The Test Engineers will promptly notify the West Shift Supervisor of any equipment failure or significant degradation resulting in unintentional abort (whether manual or DACS induced). The cause of the abort and its associated impact on testing shall be identified prior to resuming testing.
 - f. The Test Engineers will abort the test whenever they are directed to by the Shift Supervisor. The Test Engineers will provide an explanation to the Mitigation Test Log.
 - g. The Test Engineers end of shift report will be delivered to the West Tank Farm Shift supervisor by the off going Test Engineers (If available).
3. The attached organization chart identifies shift interfaces by position and name.

Concurred:

Approved:

C. Molteni 6 Oct 92
C. Molteni, 101-SY
Pump Mitigation Test Manager

S. J. Badden 10/6/92
S. J. Badden, Tank Farm
Shift Operations, Manager

TANK FARM OPERATIONS ORGANIZATION
AND
101-SY REMEDIATION TEST ENGINEERS
INTERFACE

*TD Test Director
*TE Test Engineer

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

DISTRIBUTION SHEET					
To DISTRIBUTION	From GT Bear		Page 1 of 1 Date August 5, 1993		
Project Title/Work Order PUMP BUMP FOR TANK 101-SY MITIGATION-BY-MIXING TEST			EDT No. NA ECN No. 600308		
Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
CENTRAL FILES (2)	L8-04	X			
MP BAKA	G6-73	X			
JJ BADDEN (6)	S5-12	X			
TR BENEGAS	H5-09	X			
RA DODD	R1-51	X			
LE EFFERDING	H0-33	X			
LE EYRE	R2-93	X			
JC FULTON	R2-31	X			
SD GODFREY	R1-51	X			
JM GRAY (3)	A4-02	X			
RL ASCHERL	R3-82	X			
TW HALVERSON	R2-50	X			
CE HANSON	H5-09	X			
P HINOJOSA	T4-01	X			
RD HOUSE	R2-83	X			
BM JOHNSON	K1-78	X			
GD JOHNSON	R2-78	X			
NM KIRCH	R2-11	X			
RT ALLEMAN	K7-15	X			
JW LENTSCH	H5-09	X			
ML MCELROY	S1-57	X			
GT BEAR (3)	R1-51	X			
MA PAYNE	R2-50	X			
RW REED	R1-51	X			
L RUFFIN	R1-51	X			
MH SHANNON	H5-30	X			
JD THOMSON	R1-30	X			
LS KROGSRUD	R3-08	X			
GF VARGO, JR.	H5-09	X			
AB ZAMAN	R3-08	X			
DP NEIBUHR	S5-04	X			
RG SOBOCINSKI (2)	H5-09	X			
R JENKS-JOHNSON	H5-09	X			
JL DEICHMAN	B1-59	X			
GS HAUGER	T4-09	X			
LH SULLIVAN	PO BOX 1663 K557 LOS ALAMOS, NM 87454	X			

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R.W. REED
AUG 11 1993

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**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

ENGINEERING CHANGE NOTICE

Page 1 of 2

1. ECN **600308**

Proj.
ECN

2. ECN Category (mark one) Supplemental ☐ Direct Revision ☒ Change ECN ☐ Temporary ☐ Standby ☐ Supersedeure ☐ Cancel/Void ☐		3. Originator's Name, Organization, MSIN, and Telephone No. GT BEAR, TEST ENGINEERING, R1-51, 373-4254		4. Date August 2, 1993	
		5. Project Title/No./Work Order No. HYDROGEN MITIGATION		6. Bldg./Sys./Fac. No. 241-SY-101	
		8. Document Numbers Changed by this ECN (includes sheet no. and rev.) WHC-SD-WM-TPI-007, REV 0		9. Related ECN No(s). 600308, 600310	
				7. Impact Level 2SQ	
				10. Related PO No. N/A	
11a. Modification Work ☐ Yes (fill out Blk. 11b) ☒ No (NA Blks. 11b, 11c, 11d)		11b. Work Package No. N/A		11c. Modification Work Complete N/A	
		Cog. Engineer Signature & Date		11d. Restored to Original Condition (Temp. or Standby ECN only) N/A	
		Cog. Engineer Signature & Date			
12. Description of Change Incorporates latest software changes, relocated steps related to orienting pump nozzles into new Attachment F, included margin markings to identify steps referencing or referenced by other procedures.					
13a. Justification (mark one) Criteria Change ☒ Design Improvement ☐ Environmental ☐ As-Found ☐ Facilitate Const. ☐ Const. Error/Omission ☐ Design Error/Omission ☐					
13b. Justification Details Changes necessary to accomodate related changes made to WHC-SD-WM-TPI-005 (Phase B Test Procedures).					
14. Distribution (include name, MSIN, and no. of copies) See attached distribution sheet.					

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 DATE AUG 04 1993
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**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

ENGINEERING CHANGE NOTICE				Page 2 of 2	1. ECN (use no. from pg. 1) 600308					
15. Design Verification Required ☐ Yes ☒ No	16. Cost Impact <table style="width:100%;"> <tr> <th style="text-align: center;">ENGINEERING</th> <th style="text-align: center;">CONSTRUCTION</th> </tr> <tr> <td>Additional ☐ \$</td> <td>Additional ☐ \$</td> </tr> <tr> <td>Savings ☐ \$</td> <td>Savings ☐ \$</td> </tr> </table>			ENGINEERING	CONSTRUCTION	Additional ☐ \$	Additional ☐ \$	Savings ☐ \$	Savings ☐ \$	17. Schedule Impact (days) Improvement ☐ Delay ☐
ENGINEERING	CONSTRUCTION									
Additional ☐ \$	Additional ☐ \$									
Savings ☐ \$	Savings ☐ \$									
18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.										
SDD/DD ☐ Functional Design Criteria ☐ Operating Specification ☐ Criticality Specification ☐ Conceptual Design Report ☐ Equipment Spec. ☐ Const. Spec. ☐ Procurement Spec. ☐ Vendor Information ☐ OM Manual ☐ FSAR/SAR ☐ Safety Equipment List ☐ Radiation Work Permit ☐ Environmental Impact Statement ☐ Environmental Report ☐ Environmental Permit ☐	Seismic/Stress Analysis ☐ Stress/Design Report ☐ Interface Control Drawing ☐ Calibration Procedure ☐ Installation Procedure ☐ Maintenance Procedure ☐ Engineering Procedure ☐ Operating Instruction ☐ Operating Procedure ☐ Operational Safety Requirement ☐ IEPD Drawing ☐ Cell Arrangement Drawing ☐ Essential Material Specification ☐ Fac. Proc. Samp. Schedule ☐ Inspection Plan ☐ Inventory Adjustment Request ☐	Tank Calibration Manual ☐ Health Physics Procedure ☐ Spares Multiple Unit Listing ☐ Test Procedures/Specification ☐ Component Index ☐ ASME Coded Item ☐ Human Factor Consideration ☐ Computer Software ☐ Electric Circuit Schedule ☐ ICRS Procedure ☐ Process Control Manual/Plan ☐ Process Flow Chart ☐ Purchase Requisition ☐								
19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.										
Document Number/Revision WHC-SD-WM-TPI-005		Document Number/Revision WHC-SD-WM-TPI-008		Document Number/Revision						
20. Approvals										
Signature		Date	Signature		Date					
OPERATIONS AND ENGINEERING										
Cog Engineer GT BEAR <i>[Signature]</i> (TRG)		8-3-93	ARCHITECT-ENGINEER							
Cog. Mgr. RW REED <i>[Signature]</i>		4 Aug 93	PE							
QA -TRG <i>[Signature]</i>		8/18/93	QA							
Safety -TRG T. YEN <i>[Signature]</i>		8/18/93	Safety							
Security			Design							
Environ.			Environ.							
Projects/Programs -TRG: JW LENTSCH <i>[Signature]</i>		8/12/93	Other							
Tank Waste Remediation System -TRG										
Facilities Operations <i>[Signature]</i>		8/15/93								
Restoration & Remediation										
Operations & Support Services										
IRM										
Other										
TRG										
TRG										
TRG - C.E. HANSON <i>[Signature]</i>		8/12/93	DEPARTMENT OF ENERGY Signature or Letter No. ADDITIONAL <i>[Signature]</i> DEPARTMENT OF ENERGY							
TRG - PNL <i>[Signature]</i>		8/2/93								
TRG - LANL										

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

Date Received: Aug 4, 1993		INFORMATION RELEASE REQUEST		Reference: WHC-CN-3-4																																																					
Complete for all Types of Release																																																									
Purpose ☐ Speech or Presentation ☐ Full Paper (Check only one suffix) ☐ Summary ☐ Abstract ☐ Visual Aid ☐ Speakers Bureau ☐ Poster Session ☐ Videotape			☐ Reference ☐ Technical Report ☐ Thesis or Dissertation ☐ Manual ☐ Brochure/Flier ☐ Software/Databse ☐ Controlled Document ☒ Other PROCEDURE																																																						
			ID Number (include revision, volume, etc.) WHC-SD-WM-TPI-007, REV 1																																																						
			List attachments. NONE																																																						
			Date Release Required AUGUST 5, 1993																																																						
Title PUMP BUMP FOR TANK 101-SY MITIGATION-BY-MIXING TEST		Unclassified Category UC-		Impact Level 2S Q																																																					
New or novel (patentable) subject matter? ☒ No ☐ Yes If "Yes", has disclosure been submitted by WHC or other company? ☐ No ☐ Yes (Disclosure No(s)).		Information received from others in confidence, such as proprietary data, trade secrets, and/or inventions? ☒ No ☐ Yes (Identify)																																																							
Copyrights? ☒ No ☐ Yes If "Yes", has written permission been granted? ☐ No ☐ Yes (Attach Permission)		Trademarks? ☒ No ☐ Yes (Identify)																																																							
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<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:40%;">Review Required per WHC-CN-3-4</th> <th style="width:10%;">Yes</th> <th style="width:10%;">No</th> <th style="width:40%;">Reviewer - Signature indicates Approval</th> </tr> <tr> <th></th> <th></th> <th></th> <th>Name (printed) Signature Date</th> </tr> </thead> <tbody> <tr> <td>Classification/Uncontrolled</td> <td>☐</td> <td>☒</td> <td></td> </tr> <tr> <td>Nuclear Information</td> <td>☐</td> <td>☒</td> <td></td> </tr> <tr> <td>Patent - General Counsel</td> <td>☐</td> <td>☒</td> <td></td> </tr> <tr> <td>Legal - General Counsel</td> <td>☐</td> <td>☒</td> <td></td> </tr> <tr> <td>Applied Technology/Export Controlled</td> <td>☐</td> <td>☒</td> <td></td> </tr> <tr> <td>Information or International Program</td> <td>☐</td> <td>☒</td> <td></td> </tr> <tr> <td>WHC Program/Project</td> <td>☐</td> <td>☒</td> <td></td> </tr> <tr> <td>Communications</td> <td>☐</td> <td>☒</td> <td></td> </tr> <tr> <td>RL Program/Project</td> <td>☐</td> <td>☒</td> <td></td> </tr> <tr> <td>Publication Services</td> <td>☐</td> <td>☒</td> <td></td> </tr> <tr> <td>Other Program/Project</td> <td>☐</td> <td>☒</td> <td></td> </tr> </tbody> </table>						Review Required per WHC-CN-3-4	Yes	No	Reviewer - Signature indicates Approval				Name (printed) Signature Date	Classification/Uncontrolled	☐	☒		Nuclear Information	☐	☒		Patent - General Counsel	☐	☒		Legal - General Counsel	☐	☒		Applied Technology/Export Controlled	☐	☒		Information or International Program	☐	☒		WHC Program/Project	☐	☒		Communications	☐	☒		RL Program/Project	☐	☒		Publication Services	☐	☒		Other Program/Project	☐	☒	
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Information conforms to all applicable requirements. The above information is certified to be correct.																																																									
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**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

SUPPORTING DOCUMENT		1. Total Pages 59
2. Title PUMP BUMP FOR 101-SY MITIGATION-BY MIXING TEST	3. Number WHC-SD-WM-TPI-007	4. Rev No. 1
5. Key Words ACCELERATION, MIXING PUMP, DACS, TEST DIRECTOR, PUMP BUMP, MITIGATION TEST LOG, UPDATE, INSTRUMENTATION, RANGE FIRES, CIRCUIT BREAKERS, E STOP.	6. Author Name: GT BEAR <i>G. Bear</i> 8-5-93 Signature Organization/Charge Code TEST ENGINEERING/7C211/N24A2	
7. Abstract This document provides the procedure to be followed to periodically "bump" of jog the Mixer Pump on order to prevent the solidification of waste material inside the pump discharge legs. used to perform the Phase B portion of the 241-SY-101 Mitigation-by-Mixing Test. All safety requirements as defined in LA-UR-92-3196, A Safety Assessment for Proposed Mixing Operations to Mitigate Episodic Gas Release in Tank 241-SY-101 have been implemented into this procedure.		
8. PURPOSE AND USE OF DOCUMENT - This document was prepared for use within the U.S. Department of Energy and its contractors. It is to be used only to perform, direct, or integrate work under U.S. Department of Energy contracts. This document is not approved for public release until reviewed. PATENT STATUS - This document copy, since it is transmitted in advance of patent clearance, is made available in confidence solely for use in performance of work under contracts with the U.S. Department of Energy. This document is not to be published nor its contents otherwise disseminated or used for purposes other than specified above before patent approval for such release or use has been secured, upon request, from the Patent Counsel, U.S. Department of Energy Field Office, Richland, WA. DISCLAIMER - This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or any third party's use or the results of such use of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.		10. RELEASE STAMP OFFICIAL RELEASE BY WHC DATE AUG 04 1993 55 <i>STA. 4</i>
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for

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1 TEST SUBJECT IDENTIFICATION

The operation of the 101-SY Mixer Pump for short periods of time is thought to maintain the downcomer legs and discharge nozzles free and clear of a potential waste sludge plug. It is intended that the 101-SY Mixer Pump will be operated at least once per day either by bumping, as described in this document or by testing, as described elsewhere.

2 GENERAL DESCRIPTION

This procedure implements the applicable requirements of WHC-SD-WM-TP-140, TEST PLAN FOR TANK 101-SY MITIGATION-BY-MIXING TEST, PHASE A and WHC-SD-WM-TP-153, PHASE B TEST PLAN FOR TANK 101-SY MITIGATION-BY-MIXING TEST referred to herein as the Phase A Test Plan and Phase B Test Plan, respectively.

2.1 Test Objective

The primary objective of this procedure is to mobilize a sufficient quantity of waste sludge in the downcomer legs and nozzles of the 101-SY Mixer Pump in order to prevent the solidification of the waste to an extent that it forms a potential obstruction to the normal flow path of the pump.

2.2 Test Method

Subject to compliance with all applicable pre-requisites and requirements contained herein, the 101-SY Mixer Pump will be accelerated (or ramped up) at a rate not to exceed 100 rpm/minute to a speed determined by the Test Review Group (not to exceed 1000 rpm). The DACS will initiate a countdown timer from the time the pump has achieved full speed and automatically trip the pump at the end of the countdown.

During the performance of the bump, process parameters shall be monitored and compared with predetermined abort criteria. The bump shall be terminated should any of the abort criteria be met.

3 TEST CONDITION LIMITS

The requirements given in Sections 3.1, 3.2, and 3.3 below shall be met prior to and during pump bumping.

3.1 Pump Operation Limits

The pump bump shall be conducted in accordance with Section 11.2 of this procedure. With TRG approval, this procedure may be used to bump the pump up to 3 times per day.

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3.2 Abort Criteria

In the event that an abort condition occurs, pump bumping shall be terminated and shall not be continued without required approval in accordance with LA-UR-92-3196 Revised, A SAFETY ASSESSMENT FOR PROPOSED PUMP MIXING OPERATIONS TO MITIGATE EPISODIC GAS RELEASES IN TANK 241-101-SY: HANFORD SITE, RICHLAND, WASHINGTON (referred to herein as the Safety Assessment).

If an alarm is received during pump operation, then exit to the applicable Alarm Response Procedure (ARP), which shall be followed in its entirety.

Abnormal Operating Procedures (AOPs) are provided for those conditions not covered by Alarm Response Procedures. In addition any abort requires followup in accordance with AOP-008, Test Abort Followup Actions.

Initial verification of the operability of all alarm and abort setpoint values is contained in applicable portions of WHC-SD-WM-ATP-046, 101-SY MITIGATION TESTING ACCEPTANCE TEST PROCEDURE, WHC-SD-WM-ATP-058, 101-SY POST PUMP INSTALLATION ACCEPTANCE TEST PROCEDURE and (after the start of Phase B) WHC-SD-WM-ATP-062, PHASE B MITIGATION TESTING SOFTWARE ACCEPTANCE TEST PROCEDURE and WHC-SD-WM-ATP-061, MIT ACCEPTANCE TEST PROCEDURE.

The Test Engineers shall notify the Operations Shift Manager immediately of any abnormal conditions. The Operations Shift Manager shall make any notifications to DOE and management outside the Test Engineers' immediate chain of command.

3.3 Precautions and Limitations

3.3.1 In the event of any emergency condition listed in Attachment B, the Test Manager and the Operations Shift Manager shall be notified immediately. The Operations Shift Manager shall then implement the applicable portion of WHC-IP-0263-TF, WESTINGHOUSE HANFORD COMPANY BUILDING EMERGENCY PLAN.

3.3.2 IF confirmation is not obtained that the pump is running once the PUMP RUNNING circle on the DACS screen is colored green, THEN the pump shall be tripped using the E STOP button. Confirmation that the pump is running requires that both the VSD Keypad speed indication and the independent rpm monitor are in concurrence.

3.3.3 Transition to procedure AOP-006, Contingency Actions shall be made if any of the following conditions occur: tank rollover, hydrogen burn, medical emergency, fire in the DACS Trailer, seismic event, severe weather, or conditions listed in Attachment B.

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4 INSTRUMENTS AND CALIBRATION

The instruments required to be operable prior to and during pump bumping are listed in Attachment A. A system, sub-system, train, component, or device shall be considered OPERABLE or as having OPERABILITY when it is capable of performing its specified function. The operability of the required instruments is verified prior to each time the pump is operated. The checklist of Attachment A shall be used for this purpose.

Instruments that are connected to the DACS are required to have their DACS alarm and abort values verified according to WHC-SD-WM-ATP-046, 101-SY MITIGATION TESTING ACCEPTANCE TEST PROCEDURE; WHC-SD-WM-ATP-058, 101-SY POST PUMP INSTALLATION ACCEPTANCE TEST PROCEDURE; WHC-SD-WM-ATP-061, MIT ACCEPTANCE TEST PROCEDURE; or WHC-SD-WM-ATP-062, PHASE B MITIGATION TESTING SOFTWARE ACCEPTANCE TEST PROCEDURE, as applicable.

5 FACILITIES, EQUIPMENT, AND MATERIALS

The is installed in DST 101-SY, which is located in the 200W area of the Hanford site.

At least once every 24 hours, either a Test Director or a Test Engineer shall verify that the DACS is operational. This shall be done by viewing a DACS history trend display of current data and ensuring that the values are being continually updated. At the time of this verification, an entry shall be made in the Mitigation Test Log to provide record of the DACS operability check.

6 SAFETY

6.1 The number of personnel allowed in the DACS trailer between the beginning of pump operation and the completion of step 11.2.68 shall be limited to the number of SCBAs available in the trailer. All personnel present during these times shall be fully qualified to use SCBAs.

6.2 All requirements set forth in the Safety Assessment for bump operations have been incorporated into this procedure.

6.3 Specific Alarm Response Procedures and Abnormal Operating Procedures are available to the Test Engineer and shall be utilized as the need arises.

7 MAINTENANCE AND FAILURES

7.1 The instruments required to be operable prior to and during pump bumping are listed in Attachment A. In the event that the requirements of Attachment A cannot be met, pump bumping shall not proceed without written TRG approval.

7.2 For each instrument in Attachment A that is declared inoperable, perform the following:

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7.2.1 Make an entry in the Mitigation Test Log describing the circumstances.

NOTE: An inoperable instrument that is not disabled may preclude a pump start. Attachment E, Disabling Inoperable Instruments provides the necessary guidance. Permission to disable an instrument does not invalidate the requirements of step 7.1

7.2.2 Obtain the permission of the Test Manager to disable each inoperable instrument.

7.2.3 Make all applicable entries in the Disabled Instrument List (maintained in the Required Reading Book).

7.2.3.1 All instruments listed in the Disabled Instrument List are assumed to remain disabled until the Returned to Service column is signed off.

7.3 Instruments not recorded in the Disabled Instrument List as disabled shall be assumed to be operable.

8 TEST DATA

The data collected by the DACS during pump bumping will be recorded and transmitted according to the document WHC-SD-WM-PLN-052, DATA MANAGEMENT PLAN FOR TANK SY-101 HYDROGEN MITIGATION EXPERIMENTS.

Data will be automatically stored by the DACS onto the computer hard drives, which are accessible by DACS station 5 computer. Traceability of data is maintained through the use of instrument tag identification numbers. All data recorded by the DACS are automatically referenced to the appropriate tag numbers. In the event that data are recorded manually into the Mitigation Test Log, instrument tag identification numbers shall be used to maintain data traceability.

A blank Comment Sheet is provided at the end of this procedure to document any additional observations, explanations or clarifications that may be useful for data analysis. If used, do not continue comments for one bump on the same Comment Sheet from another bump; start with a blank copy and ensure all identifying information is included.

9 PERSONNEL REQUIREMENTS

This procedure shall be conducted by the qualified Test Directors and Test Engineers assigned by the Test Manager. No other person shall have jurisdiction over the conduct of any part of the bump unless specifically authorized or stated in this procedure. The Test Engineers, Test Directors, Operations Shift Manager, West Area Shift Supervisor, and the Test Manager have the authority to stop the pump bump at any time. The responsibilities of these personnel are defined in WHC-SD-WM-MA-014, MITIGATION TEST MANAGEMENT PLAN.

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At least one Test Director and one Test Engineer shall be present inside the designated CONTROL AREA of the DACS trailer at all times during pump operation to ensure that the bump is constantly being monitored and controlled.

All Test Directors and Test Engineers shall be aware of the current contents of WHC-SD-WM-PROC-004, Alarm Response Procedures for Tank 101-SY Mitigation-By-Mixing Test and WHC-SD-WM-PROC-005, Abnormal Operating Procedures for Tank 101-SY Mitigation-By-Mixing Test, as evidenced by their signatures on the Required Reading List maintained by the Test Manager.

During periods when the mixer pump is not being operated it will not be necessary for the DACS to be continuously monitored, provided that the 101-SY Mixer Pump and its controls are disabled, locked out, and tagged to prevent inadvertent pump start. It shall be the responsibility of the Test Manager to define the time for which the Test Director and Test Engineer shall remain present in the DACS trailer after pump operation is complete.

10 WITNESSES

A Quality Assurance Representative shall witness portions of the bumping effort as necessary to verify that the pump bump is being conducted as written in this procedure and that bump data are being recorded as specified. The Quality Assurance Representative shall periodically perform a brief review of the Mitigation Test Log and data sheets during 101-SY Mitigation Testing to verify compliance with this procedure. The Quality Assurance Representative shall signify completion of these reviews with a log entry in the Mitigation Test Log and signatures in Section 11 where required. The log book entry shall be initialed and dated by the Quality Assurance Representative.

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11 PROCEDURES

Upon completion of each step, the initials of the individual completing the step and the current date shall be placed in the box under each step using black, ball-point pen. All qualified Test Directors and Test Engineers shall provide a sample initial and signature in the space provided in Attachment C to maintain traceability between initials and personnel.

All procedure steps shall be performed in the order specified unless otherwise noted.

Steps requiring **INDEPENDENT VERIFICATION** shall be performed in accordance with WHC-SP-0708, WESTINGHOUSE HANFORD COMPANY CONDUCT OF OPERATIONS MANUAL. Independent Verification is provided for in a separate sign-off box under each step requiring independent verification.

DEFINITIONS

- **VERIFY:** Perform a comparison with the specified requirements. Does not involve manipulation of equipment or instrumentation. May be done by methods other than direct observation.
- **ENSURE:** To confirm, substantiate, and assure that an activity or condition has been implemented in conformance with the specified requirements or take action to make it so if the activity or condition is not found to be in conformance. May be done by methods other than direct observation.

★ 11.1 Pre-Start Conditions

- 11.1.1 Ensure that all required reading is complete for the Test Director and Test Engineer on duty including a review of recent Mitigation Test Log entries.

Initial / Date:	Initial / Date:
	Independent Verification

- 11.1.2 Ensure that [VSD-101-2] TO MIXING PUMP breaker is locked in the OFF position AND is hung with a CAUTION tag.

Initial / Date:	Initial / Date:
	Independent Verification

- 11.1.3 Ensure [VSD-101-1] TO MIXING PUMP ROTATION MOTOR breaker is locked in the OFF position AND hung with a CAUTION tag.

Initial / Date:	Initial / Date:
	Independent Verification

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11.1.4 Reset the GENESIS software to the default settings as follows:

11.1.4.1 At station 5, press <ALT E> and enter "Y" to exit the test strategy.

Initial / Date:

11.1.4.2 In DOS enter "RUNTIME TEST".

Initial / Date:	Initial / Date:
Independent Verification	

11.1.4.3 At station 8, press <ALT E> and enter "Y" to exit the pump strategy.

Initial / Date:

11.1.4.4 In DOS enter "RUNTIME MOTOR".

Initial / Date:	Initial / Date:
Independent Verification	

11.1.4.5 Set DACS security level to "WHC" (level 3).

Initial / Date:

11.1.5 Perform step 1 (including all substeps) of Attachment E.

Initial / Date:	Initial / Date:
Independent Verification	

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Steps performed in Section 11.2 may be verified complete by either a Test Director or a Test Engineer.

11.2 Pump Bump

NOTE: Steps 11.2.1 through 11.2.28 may be performed in any order.

- ★ 11.2.1 Complete Attachment A, Minimum Instrumentation Checklist.

Part A	Part B
Initial / Date:	Initial / Date:
	Independent Verification

- 11.2.2 Disable the abort coils of any instruments that were declared inoperable during the performance of step 11.2.1 in accordance with the guidelines in steps 2 through 7 of Attachment E, Disabling Inoperable Instruments. (Enter "N/A", if no instruments were disabled.)

Initial / Date:	Initial / Date:
	Independent Verification

- 11.2.3 Verify that the Programmable Logic Controller (PLC) abort limits are set correctly in accordance with section 2 of Attachment D.

Initial / Date:	Initial / Date:
	Independent Verification

- 11.2.4 Verify the most recent 7-day average rate of level rise is < 0.15 in/day. (See section 11.3.)

Initial / Date:	Initial / Date:
	Independent Verification

- 11.2.5 Verify Uninterruptible Power System (UPS) is on-line.

Initial / Date:

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- 11.2.6 Enter the amount of time following the pump bump that the Test Manager requires the Test Director and the Test Engineer to remain in the DACS Trailer:

**REMAIN
TIME**

Initial / Date:

NOTE: The waste level measurements used to satisfy step 11.2.7 shall be obtained a maximum of 4 hours prior to operating the pump. If any tank level data are obtained from Tank Farm Operations, the measurement should have been made within these four hours.

- 11.2.7 Verify 101-SY tank level is less than 409.6 inches on all operable level instrumentation. Record actual readings below and time completed:

FIC	RADAR	TAPE
inches	inches	inches

**TIME
COMPLETED**

Initial / Date:

Initial / Date:

Independent Verification

- 11.2.8 Verify Auxiliary Exhauster (P28) is operable.

Initial / Date:

- 11.2.9 Verify that pump column pressurization nitrogen bottle pressure > 500 psig.

Initial / Date:

- 11.2.10 Verify that the pump column centering jack pressures > 100 psig.

Initial / Date:

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PUMP BUMP

- 11.2.11 Calculate the ventilation flow ratio in the box below AND verify that it is ≥ 0.66 .

Calculation for Ventilation Flow Ratio

$$\frac{(\text{FTE50003 cfm}) - (\text{FTE50001 cfm})}{(\text{FTE50001 cfm})} = \geq 0.66$$

DACS Tag FTE50003 = SY Tank Farm Exhaust Flow
DACS Tag FTE50001 = Vent Header Flow (101-SY only)
(DACS Tag FTE50002 may be used in place of FTE50001)

Initial / Date:

Initial / Date:

Independent Verification

- 11.2.12 Request West Area Shift Supervisor (373-2920, Radio Station 24) to perform the following:

- 11.2.12.1 Inform Day Shift (Radio Station 12) of restricted SY Farm access AND install "NO ENTRY" signs at tank farm change station entrances.

Initial / Date:

- 11.2.12.2 Verify that ventilation flow requirements specified by Plant Operating Procedure T0-060-230, OPERATE VESSEL VENT FOR 241-SY TANK FARM are satisfactory for the current shift. Record the verification and name of the shift supervisor in the Mitigation Test Log.

Initial / Date:

NOTE: The following verifications through step 11.2.19 may be accomplished by checking for absence of the associated alarms.

- 11.2.13 Verify tank waste temperature $< 135^{\circ}\text{F}$.

Initial / Date:

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PUMP BUMP

11.2.14 Verify tank dome pressure < -1.0" w.g.

Initial / Date:

11.2.15 Verify 101-SY vent flow > 400 cfm.

Initial / Date:

11.2.16 Verify 101-SY vent flow < 700 cfm.

Initial / Date:

11.2.17 Verify pump column pressure > 7 psig.

Initial / Date:

11.2.18 Verify pump motor oil temperature < 225°F.

Initial / Date:

11.2.19 Verify pump column strain within acceptable limits ($\pm 194 \mu$ in./in.;
N/A if not available).

Initial / Date:

11.2.20 Verify compliance with Section 6.1.

Initial / Date:

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- 11.2.21 Ensure that each SCBA includes a mask inside a sealed container AND all SCBA tanks indicate full.

Initial / Date:

- 11.2.22 Ensure that abort coil on CSMAIN screen is reset AND both E STOP buttons are reset (in the pulled out position, with red lights on).

Initial / Date:

- 11.2.23 Ensure that the E STOP alarm switch is in the NORMAL position.

Initial / Date:

- 11.2.24 Verify no range fires within 5 miles of SY-101 tank. (Perform visual inspection of surrounding area and call Hanford Fire Facility at 373-2745.)

Initial / Date:

- 11.2.25 Verify no significant thunderstorm activity reported or predicted to occur within 1 hour of pump operation. (Perform visual inspection of surrounding area and call Hanford Meteorological Station at 373-2716.)

TIME
COMPLETED

Initial / Date:

- 11.2.26 Verify that hydrogen concentration is < 0.2% by volume (GASSUM screen).

Initial / Date:

Initial / Date:

Independent Verification

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- 11.2.27 Verify that hydrogen concentration in the vent header is > 10 ppm (GASSUM screen, GC#3 H2 PPM Riser 7A).

Initial / Date:	Initial / Date:
Independent Verification	

- 11.2.28 Verify no foaming is present (tank video camera, if available; enter "N/A" if not available).

Initial / Date:	Initial / Date:
Independent Verification	

- 11.2.29 Ensure that steps 11.2.1 through 11.2.28 have been completed.

Initial / Date:

- 11.2.30 Ensure that the in-tank video camera is oriented so that the lowest visible portion of the pump column is in view (enter "N/A" if not available).

Initial / Date:	Initial / Date:
Independent Verification	

- 11.2.31 Obtain permission from the Operations Shift Manager (373-2689) to operate the pump AND enter into the Mitigation Test Log the manager's name.

Initial / Date:

- * 11.2.32 Call the West Area Shift Supervisor (373-2920, Radio Station 24) for the following items:

- 11.2.32.1 Ensure that the "NO ENTRY" signs are posted at the change station entrances to the fenced area of the SY Tank Farm.

Initial / Date:

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- 11.2.32.2 Verify all personnel have been evacuated from the fenced area of SY Tank Farm. Independent verification shall require visual observation from the DACS Trailer.

Initial / Date:	Initial / Date:
Independent Verification	

- 11.2.32.3 Inform the shift supervisor that permission has been granted from the Operations Shift Manager and the pump is about to be operated in DST 101-SY.

Initial / Date:

- ★ 11.2.33 Unlock and position the following circuit breakers:

- 11.2.33.1 Position [VSD-101-2] TO MIXING PUMP to ON.

Initial / Date:

- 11.2.33.2 Position [VSD-101-1] TO MIXING PUMP ROTATION MOTOR to ON.

Initial / Date:

- 11.2.34 Ensure that the two, 2-digit displays on the left side of the PUMP DRIVE keypad read "SP" and "MA" in either order.

Initial / Date:	Initial / Date:
Independent Verification	

- 11.2.35 Ensure that the "KPD LOCKED" light is illuminated on both the DIRECTIONAL DRIVE and PUMP DRIVE keypads.

Initial / Date:	Initial / Date:
Independent Verification	

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- 11.2.36 Verify at station 8 that independent MOTOR RPM indicator (VRINDRPM) is energized.

Initial / Date:	Initial / Date:
	Independent Verification

- 11.2.37 Verify that the DACS is currently recording data by observing that the values on a history trend screen are being periodically updated.

Initial / Date:	Initial / Date:
	Independent Verification

NOTE: Step 11.2.38 is not required IF Phase B Test #9 (section 11.19 of WHC-SD-WM-TPI-005, Phase B Test Procedure for Tank 101-SY Mitigation-By-Mixing Test) has been completed.

- 11.2.38 Rotate the Mixer Pump nozzles to the 0° orientation in accordance with the guidelines of Attachment F, Orienting the Mixer Pump Nozzles (N/A this step if not required):

Initial / Date:	Initial / Date:
	Independent Verification

NOTE: • Test Manager may specify a PUMP BUMP SPEED not to exceed 1000 rpm, as directed by the Test Review Group; otherwise, PUMP BUMP SPEED shall be limited to 380 rpm.

- Test Manager may specify a SET TIME not to exceed 5 minutes, 0 seconds (05:00), as directed by the TRG.

- 11.2.39 Enter the required information as directed below:

--

rpm

PUMP BUMP SPEED

--

minutes:seconds

SET TIME

Initial / Date:	Initial / Date:
	Independent Verification

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PUMP BUMP

11.2.40 Select the "Pump Bump" screen from the MAINMENU screen on DACS station 8 (Pump Control Console).

Initial / Date:

11.2.41 Enter the SET TIME value.

Initial / Date:

Initial / Date:

Independent Verification

11.2.42 Set the ACCELERATION RATE to 100 rpm/sec.

Initial / Date:

Initial / Date:

Independent Verification

11.2.43 Ensure that the pump DECELERATION rate is set to 176 rpm/sec.

Initial / Date:

11.2.44 Set the pump MAX SPEED to the value for PUMP BUMP SPEED in step 11.2.39.

Initial / Date:

Initial / Date:

Independent Verification

11.2.45 Set the pump SET POINT SPEED to the value for PUMP BUMP SPEED in step 11.2.39.

Initial / Date:

Initial / Date:

Independent Verification

11.2.46 If any instrumentation determined to be operable in step 11.2.1 is currently in alarm state, obtain the permission of the Test Manager prior to proceeding. Record the Test Manager's permission and time received in the Mitigation Test Log.

Initial / Date:

Initial / Date:

Independent Verification

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11.2.47 Verify that the time requirements of steps 11.2.7 and 11.2.25 are satisfied.

Initial / Date:

NOTE: Performance of step 11.2.48 automatically updates alarm and abort limits for pump speed, discharge pressure and motor current to the Pump Bump Requirements and enables the fast scan (1 second) data archive rate.

11.2.48 Select the pump ENABLE box (click with mouse pointer and press <enter>).

Initial / Date:

11.2.49 Verify, on the PUMP BUMP screen, that the following display fields have updated as indicated in the table below:

FIELD NAME	DISPLAY VALUE	FIELD NAME	DISPLAY VALUE
SPD ALARM	Value of MAX SPEED + 10	CUR ALM	205
SPD ABORT	Value of MAX SPEED + 20	CUR ABT	210

Initial / Date:

Initial / Date:

Independent Verification

11.2.50 Verify that the display value for the field DISPR ALM corresponds to the curve labeled "alarm" on Chart 1, pg. 23 for the input pump speed.

Initial / Date:

Initial / Date:

Independent Verification

11.2.51 Verify that the display value for the field DISPR ABT corresponds to the curve labeled "abort" on Chart 1, pg. 23 for the input pump speed.

Initial / Date:

Initial / Date:

Independent Verification

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PUMP BUMP	

- ★ 11.2.52 Verify that only authorized PLC aborts are disabled by performing section 1 of Attachment D.

Initial / Date:	Initial / Date:
Independent Verification	

NOTE: Upon completion of step 11.2.53, the "PLC BUMP ENABLED" circle will be colored green for 60 seconds. The pump bump will not proceed IF the "BUMP" box is not selected within these 60 seconds (step 11.2.55).

- ★ 11.2.53 Select the pump ENABLE box (click with mouse pointer and press <enter>).

Initial / Date:

- 11.2.54 Verify that the "PLC BUMP ENABLED" circle is colored green.

Initial / Date:

NOTE: Upon activation of the pump in step 11.2.55 there will be approximately a 5 second delay before the pump "RUNNING" indication is displayed on the DACS.

CAUTION: THE PUMP SHALL NOT BE ALLOWED TO OPERATE FOR MORE THAN THE VALUE OF CAL TIME AFTER INDICATION IS RECEIVED THAT THE PUMP IS RUNNING.

- 11.2.55 Select the pump BUMP box to initiate the pump bump (click with mouse pointer and press <enter>) AND record the time.

START TIME	
-----------------------	--

Initial / Date:

- 11.2.56 Start the independent stopwatch WHEN the pump's rpm increases from zero as displayed on either the PUMP DRIVE keypad OR the Independent Speed monitor (VRINDRPM).

Initial / Date:

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PUMP BUMP

NOTE: The display values for the fields CUR ALM and CUR ABT may not update for short duration pump bumps (less than 15 seconds). This is due to an internal software/hardware time delay.

11.2.57 AFTER the pump has run at MAX SPEED for approximately 15 seconds, verify that the current limits have updated, as follows (N/A this step for pump bumps of less than 15 second duration):

11.2.57.1 Verify that the field CUR ALM corresponds to the curve labled "alarm" on Chart 2, pg. 24 for the input pump speed.

Initial / Date:	Initial / Date:
	Independent Verification

11.2.57.2 Verify that the field CUR ABT corresponds to the curve labled "abort" on Chart 2, pg. 24 for the input pump speed.

Initial / Date:	Initial / Date:
	Independent Verification

11.2.58 Press the E STOP button WHEN the independent stopwatch reaches the value of SET TIME.

Initial / Date:

11.2.59 Ensure that the pump has stopped by verifying at station 8 that HMT MIXING PUMP MOTOR POWER, MOTOR RPM, and MOTOR CURRENT indicate less than or equal to zero.

Initial / Date:

11.2.60 Ensure both E STOP buttons are pushed in (red lights are off).

Initial / Date:

♦ 11.2.61 Record below and in the Mitigation Test Log the time that the Mixer Pump was stopped.

STOP TIME	
--------------	--

Initial / Date:

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PUMP BUMP

11.2.62 Position the following circuit breakers:

11.2.62.1 Position [VSD-101-2] TO MIXING PUMP to OFF AND apply a locking device.

Initial / Date:

11.2.62.2 Position [VSD-101-1] TO MIXING PUMP ROTATION MOTOR to OFF AND apply a locking device.

Initial / Date:

11.2.63 Inform the Operations Shift Manager (373-2689) and West Area Shift Supervisor (373-2920, Radio Station 24) that pump operation has stopped.

Initial / Date:

11.2.64 Monitor the tank level, hydrogen concentrations, and waste surface (using the video camera) to ensure that no abnormal conditions exist for the minimum time specified by the Test Manager in step 11.2.6 following pump operation.

Initial / Date:

11.2.65 Call the West Area Shift Supervisor (373-2920, Radio Station 24) for the following items:

11.2.65.1 Inform the shift supervisor that access to SY farm is now permitted and the "NO ENTRY" signs may be removed.

Initial / Date:

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PUMP BUMP

11.2.65.2 Request the Tank 101-SY post-test waste level and record the results and time completed below. Enter "N/A" for any method that is not available:

FIC: _____ inches
Tape: _____ inches

TIME
COMPLETED

Initial / Date:

11.2.66 Exit MODSOFT as follows:

NOTE: Repeat step 11.2.66.1 until the dialog box in step 11.2.66.2 is displayed.

11.2.66.1 Choose "QUIT" from the menu bar.

11.2.66.2 Answer "Y" to the dialog box: "Do you really want to leave Modsoft? (Y/N)".

11.2.66.3 Answer "Y" to the dialog box: "Offline changes to ... REFERENCE DATA will not be permanently saved to disk! Continue? (Y/N)".

Initial / Date:

11.2.67 Make an entry into the Mitigation Test Log describing the pump test activities.

Initial / Date:

NOTE: The following 3 steps are performed when vacating the DACS Trailer.

11.2.68 Set the GENESIS security level to "0" (view only) at DACS stations 5, 6, 7 and 8.

Initial / Date:

Initial / Date:

Independent Verification

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PUMP BUMP

11.2.69 Ensure that the CPU access doors on the computer workstations are closed and locked.

Initial / Date:

11.2.70 Ensure that both doors of the DACS trailer are locked.

A Quality Assurance review has been conducted as defined in Section 10 of this procedure.

QA representative signature: _____ Date: _____

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Chart 1

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PUMP BUMP

Chart 2

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11.3 Tank Level Monitoring

During all phases of testing, the rate of tank waste level rise will be closely monitored. A change in the rate of hydrogen generation, gas retention within the non-convective layer, or the depth of the foam layer near the top of the tank should be detected by an unexpected change in the tank level or a change in the rate of level rise. Safe limits for the tank waste level and the rate of tank waste level rise have been established in the Safety Assessment.

The tank waste level shall be recorded on Data Sheet 1, Waste Level Rise Rate in Section 15 once per day, preferably within two hours of 12:00 noon. The tank waste level shall be determined using the FIC¹.

The maximum rate of waste level rise established in the Safety Assessment is 0.15 in/day as a 7-day average. If the average determined in column (6) of Data Sheet 1 exceeds 0.15, notify WHC Tank Waste Technology Applications (contact N.W. Kirch @ 373-2380) and request a least-squares analysis of the tank waste level. If a least-squares analysis is performed, record rate of level rise in Comments section of Data Sheet 1 and use the least-squares analysis to satisfy step 11.2.4.

11.4 General Shift Procedures and Requirements

The mitigation Test Directors and Test Engineers shall conduct the mitigation pump bump in accordance with the applicable sections of the WHC-SP-0708, WESTINGHOUSE HANFORD COMPANY CONDUCT OF OPERATIONS MANUAL.

12 DISPOSITION OF TEST SUBJECT

Once the TRG has concluded that all mixer pump testing is completed, the mixer pump will be deactivated and the tank contents allowed to stabilize. The mixer pump will then be removed from DST 101-SY and decontaminated or stored as determined by an as-yet-unwritten procedure.

¹ Manual tape may be used if FIC is not available, but must be so noted on Data Sheet 1.

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13 REFERENCES

- 13.1 WHC-SD-WM-TP-140, TEST PLAN FOR TANK 101-SY MITIGATION-BY-MIXING TEST, PHASE A.
- 13.2 WHC-SD-WM-TP-153, PHASE B TEST PLAN FOR TANK 101-SY MITIGATION-BY-MIXING TEST.
- 13.3 LA-UR-92-3196 Revised, A SAFETY ASSESSMENT FOR PROPOSED PUMP MIXING OPERATIONS TO MITIGATE EPISODIC GAS RELEASES IN TANK 241-101-SY: HANFORD SITE, RICHLAND, WASHINGTON (U.S. Department of Energy).
- 13.4 WHC-SD-WM-ATP-046, 101-SY MITIGATION TESTING ACCEPTANCE TEST PROCEDURE.
- 13.5 WHC-SD-WM-ATP-058, 101-SY POST PUMP INSTALLATION ACCEPTANCE TEST PROCEDURE.
- 13.6 WHC-SD-WM-ATP-061, MIT ACCEPTANCE TEST PROCEDURE.
- 13.7 WHC-SD-WM-ATP-062, PHASE B MITIGATION TESTING SOFTWARE ACCEPTANCE TEST PROCEDURE.
- 13.8 WHC-SP-0708, WHC CONDUCT OF OPERATIONS MANUAL.
- 13.9 WHC-SD-WM-MA-014, MITIGATION TEST MANAGEMENT PLAN.
- 13.10 WHC-SD-WM-PLN-052, DATA MANAGEMENT PLAN FOR TANK SY-101 HYDROGEN MITIGATION EXPERIMENTS.
- 13.11 WHC-IP-0263-TF, WHC BUILDING EMERGENCY PLAN.
- 13.12 H-2-89967, HMT 101-SY TANK MIXING PUMP SYSTEM P & ID
- 13.13 WHC-SD-WM-SAD-012, SAFETY ASSESSMENT FOR THE INSTALLATION AND OPERATION OF INLET FILTERS ON TANK 101-SY.
- 13.14 TO-060-230, OPERATE VESSEL VENT FOR 241-SY TANK FARM.
- ♦ 13.15 WHC-SD-WM-TPI-005, PHASE B TEST PROCEDURE FOR TANK 101-SY MITIGATION-BY-MIXING TEST.
- 13.16 WHC-SD-WM-PROC-004, ALARM RESPONSE PROCEDURES FOR TANK 101-SY MITIGATION-BY-MIXING TEST.
- 13.17 WHC-SD-WM-PROC-005, ABNORMAL OPERATING PROCEDURES FOR TANK 101-SY MITIGATION-BY-MIXING TEST.
- † 13.18 WHC-SD-WM-TPI-008, UNPLUGGING 101-SY MIXER PUMP NOZZLES.
- 13.19 WHC-IP-0842, WASTE TANK PROJECT ADMINISTRATION.

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14 PROCEDURE CHANGES

The Test Director has the authority to make changes to the procedure provided that it is not a change in intent or a change to the administrative controls. Any other changes to the procedure shall require review and approval by TRG. An Engineering Change Notice (ECN) shall be used as the method for changes requiring TRG review and approval.

Test Engineers and Test Directors shall verify by signature in the Required Reading List that they are aware of the current status of all procedures, standing orders and other documents associated with Phase A testing of tank 101-SY. The Required Reading List shall be maintained by the Test Manager and located in the DACS Trailer.

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15 DATA SHEETS

DATA SHEET 1

WASTE LEVEL RISE RATE

(1) DATE (mm/dd/yy)	(2) TIME (hh:mm)	(3) CURRENT LEVEL (inches)	(4) LEVEL 7 DAYS AGO (inches)	(5) LEVEL CHANGE (3)-(4)	(6) RISE RATE (5)+7	(7) INITIALS	(8) INDEPENDENT VERIFICATION

Comments:

NOTES:

- (2) Level reading should be taken within 2 hours of noon.
- (4) Level 7 Days Ago may be obtained from this data sheet or from Tank Farm Operations.

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

**PUMP BUMP
FOR
TANK 101-SY MITIGATION-BY-MIXING TEST**

**WHC-SD-WM-TPI-007
August 2, 1993
Rev. 1**

MINIMUM INSTRUMENTATION CHECKLIST

ATTACHMENT A

The instrumentation listed in ATTACHMENT A, Minimum Instrumentation Checklists shall be operable prior to and during pump operation.

Perform Part A and Part B independently.

Upon completion of the Checklist the Test Director shall review both parts and ensure they concur with each other. This review shall be documented by the Test Director's signature on the line provided at the end of the Checklist.

A "Comments" section is provided at the end of the Checklist; initial any entries made in this section.

This checklist may be reproduced, as required.

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

**PUMP BUMP
FOR
TANK 101-SY MITIGATION-BY-MIXING TEST**

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MINIMUM INSTRUMENTATION CHECKLIST

ATTACHMENT A

PART A Pump Bumping Instrumentation

PARAMETER	REQUIREMENTS	First Verification
		OPERABLE (Y/N)
101-SY Vent Flow Rate	One flowmeter connected to DACS: FTE50001 OR FTE50002	_____
Pump Moisture	One detector connected to DACS: MIP00001	_____
Hydrogen Concentration	One hydrogen monitor from each of the following 2 Groups shall be operable: Group 1: GC3-H2 - 0-100 PPM VENT HDR GC2-H2 - 0-100,000 PPM VENT HDR NIR17B01 - 0-1% RISER 17B GMS1 Group 2: NIR05A01 - 0-10% RISER 12A SHMS3 NITJSY06 - 0-10% RISER 16A SHMS1 NITKSY06 - 0-10% VENT HDR SHMS2	_____ _____ _____ _____ _____ _____ _____
Pump Motor Speed (rpm)	One readout on DACS (VR232050)	_____
Pump Motor Current	One measurement connected to DACS: VR232040	_____
Pump Column Gas Pressure	One pressure measurement connected to DACS: ZIMPE142	_____
Pump Column Orientation	Sensor connected to DACS (ZIMPE112) OR visual observation required	_____ _____
Nozzle Discharge Flow Indication	The lower waste temperature or flow element on each downcomer shall be operable: TIPN0101 OR FIPN0101 AND TIPN0202 OR FIPN0202	_____ _____
Radiation	ARM connected to DACS (for speeds $\geq$ 530 rpm)	_____
Waste Level	FIC Gauge shall be operable and connected to DACs AND One of the following 2 level indications shall be operable: Radar Gauge (LIR13A01) Manual Tape Reading	_____ _____ _____

Pump Bumping Instrumentation

DATE: _____

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PUMP BUMP FOR TANK 101-SY MITIGATION-BY-MIXING TEST	WHC-SD-WM-TPI-007 August 2, 1993 Rev. 1
MINIMUM INSTRUMENTATION CHECKLIST	ATTACHMENT A

PART A Pump Bumping Instrumentation		First Verification
PARAMETER	REQUIREMENTS	OPERABLE (Y/N)
SY Tank Farm Exhaust Stack Flow Rate	One measurement connected to DACS or determined manually: DACS reading Manual Reading (Reference 13.14)	_____ _____
Elapsed Time of Pump Operation	Measured by DACS AND measured by independent stopwatch	_____ _____
Tank Dome Pressure	One sensor connected to DACS: PIR17B04 OR PIR11B01	_____ _____

DATE: _____

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

**PUMP BUMP
FOR
TANK 101-SY MITIGATION-BY-MIXING TEST**

**WHC-SD-WM-TPI-007
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MINIMUM INSTRUMENTATION CHECKLIST

ATTACHMENT A

PART A Pump Bumping Instrumentation

PARAMETER	REQUIREMENTS	First Verification
		OPERABLE (Y/N)
Waste Temperature	No more than 2 of the following devices may be inoperable AND no 2 adjacent devices may be out of service. Bracketed devices may be substituted to meet requirements	
	Group I: Level = 0-50"	
	TIR17B01 (TIR17C01)	
	TIR17B02 (TIR17C02)	
	TIR17B03 (TIR17C03)	
	Group II: Level = 50-100"	
	TIR17B04 (TIR17C04)	
	TIR17B05 (TIR17C05)	
	TIR17B06 (TIR17C06)	
	Group III: Level = 100-150"	
	TIR17B07 (TIR17C07)	
	TIR17B08 (TIR17C08)	
	TIR17B09 (TIR17C09)	
	Group IV: Level = 150-200"	
	TIR17B10 (TIR17C10)	
	TIR17B11 (TIR17C11)	
	Group V: Level = 200-250"	
	TIR17B12 (TIR17C12)	
	TIR17B13 (TIR17C13)	
	TIR17B14 (TIR17C14)	
	TIR17B15 (TIR17C15)	
	Group VI: Level = 250-300"	
	TIR17B16 (TIR17C16)	
	TIR17B17 (TIR17C17)	
	Group VII: Level = 300-350"	
	TIR17B18 (TIR17C18)	
	TIR17B19	
	Group VIII: Level = 350-425"	
	TIR17B20 (TIR17C19)	
	TIR17B21 (TIR17C20)	
	TIR17B22 (TIR17C21)	

Pump Bumping Instrumentation

DATE: _____

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

**PUMP BUMP
FOR
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MINIMUM INSTRUMENTATION CHECKLIST

ATTACHMENT A

PART B Pump Bumping Instrumentation

PARAMETER	REQUIREMENTS	Independent Verification
		OPERABLE (Y/N)
101-SY Vent Flow Rate	One flowmeter connected to DACS: FTE50001 OR FTE50002	_____ _____
Pump Moisture	One detector connected to DACS: MIP00001	_____
Hydrogen Concentration	One hydrogen monitor from each of the following 2 Groups shall be operable: Group 1: GC3-H2 - 0-100 PPM VENT HDR GC2-H2 - 0-100,000 PPM VENT HDR NIR17B01 - 0-1% RISER 17B GMS1 Group 2: NIRO5A01 - 0-10% RISER 12A SHMS3 NITJSY06 - 0-10% RISER 16A SHMS1 NITKSY06 - 0-10% VENT HDR SHMS2	_____ _____ _____ _____ _____ _____ _____
Pump Motor Speed (rpm)	One readout on DACS (VR232050)	_____
Pump Motor Current	One measurement connected to DACS: VR232040	_____
Pump Column Gas Pressure	One pressure measurement connected to DACS: ZIMPE142	_____
Pump Column Orientation	Sensor connected to DACS (ZIMPE112) OR visual observation required	_____ _____
Nozzle Discharge Flow Indication	The lower waste temperature or flow element on each downcomer shall be operable: TIPN0101 OR FIPN0101 AND TIPN0202 OR FIPN0202	_____ _____
Radiation	ARM connected to DACS (for speeds $\geq$ 530 rpm)	_____
Waste Level	FIC Gauge shall be operable and connected to DACS AND One of the following 2 level indications shall be operable: Radar Gauge (LIR13A01) Manual Tape Reading	_____ _____ _____

Pump Bumping Instrumentation

DATE: _____

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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ATTACHMENT A

PART B Pump Bumping Instrumentation

PARAMETER	REQUIREMENTS	Independent Verification
		OPERABLE (Y/N)
SY Tank Farm Exhaust Stack Flow Rate	One measurement connected to DACS or determined manually: DACS reading Manual Reading (Reference 13.14)	_____ _____
Elapsed Time of Pump Operation	Measured by DACS AND measured by independent stopwatch	_____ _____
Tank Dome Pressure	One sensor connected to DACS: PIR17B04 OR PIR11801	_____ _____

Pump Bumping Instrumentation

DATE: _____

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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PUMP BUMP FOR TANK 101-SY MITIGATION-BY-MIXING TEST	WHC-SD-WM-TPI-007 August 2, 1993 Rev. 1
MINIMUM INSTRUMENTATION CHECKLIST	
ATTACHMENT A	

PART B Pump Bumping Instrumentation

PARAMETER	REQUIREMENTS	Independent Verification OPERABLE (Y/N)																																														
Waste Temperature	<p>No more than 2 of the following devices may be inoperable AND no 2 adjacent devices may be out of service. Bracketed devices may be substituted to meet requirements</p> <p>Group I: Level = 0-50"</p> <table style="width:100%;"> <tr><td>TIR17B01</td><td>(TIR17C01)</td></tr> <tr><td>TIR17B02</td><td>(TIR17C02)</td></tr> <tr><td>TIR17B03</td><td>(TIR17C03)</td></tr> </table> <p>Group II: Level = 50-100"</p> <table style="width:100%;"> <tr><td>TIR17B04</td><td>(TIR17C04)</td></tr> <tr><td>TIR17B05</td><td>(TIR17C05)</td></tr> <tr><td>TIR17B06</td><td>(TIR17C06)</td></tr> </table> <p>Group III: Level = 100-150"</p> <table style="width:100%;"> <tr><td>TIR17B07</td><td>(TIR17C07)</td></tr> <tr><td>TIR17B08</td><td>(TIR17C08)</td></tr> <tr><td>TIR17B09</td><td>(TIR17C09)</td></tr> </table> <p>Group IV: Level = 150-200"</p> <table style="width:100%;"> <tr><td>TIR17B10</td><td>(TIR17C10)</td></tr> <tr><td>TIR17B11</td><td>(TIR17C11)</td></tr> </table> <p>Group V: Level = 200-250"</p> <table style="width:100%;"> <tr><td>TIR17B12</td><td>(TIR17C12)</td></tr> <tr><td>TIR17B13</td><td>(TIR17C13)</td></tr> <tr><td>TIR17B14</td><td>(TIR17C14)</td></tr> <tr><td>TIR17B15</td><td>(TIR17C15)</td></tr> </table> <p>Group VI: Level = 250-300"</p> <table style="width:100%;"> <tr><td>TIR17B16</td><td>(TIR17C16)</td></tr> <tr><td>TIR17B17</td><td>(TIR17C17)</td></tr> </table> <p>Group VII: Level = 300-350"</p> <table style="width:100%;"> <tr><td>TIR17B18</td><td>(TIR17C18)</td></tr> <tr><td>TIR17B19</td><td></td></tr> </table> <p>Group VIII: Level = 350-425"</p> <table style="width:100%;"> <tr><td></td><td>(TIR17C19)</td></tr> <tr><td>TIR17B20</td><td>(TIR17C20)</td></tr> <tr><td>TIR17B21</td><td>(TIR17C21)</td></tr> <tr><td>TIR17B22</td><td>(TIR17C22)</td></tr> </table>	TIR17B01	(TIR17C01)	TIR17B02	(TIR17C02)	TIR17B03	(TIR17C03)	TIR17B04	(TIR17C04)	TIR17B05	(TIR17C05)	TIR17B06	(TIR17C06)	TIR17B07	(TIR17C07)	TIR17B08	(TIR17C08)	TIR17B09	(TIR17C09)	TIR17B10	(TIR17C10)	TIR17B11	(TIR17C11)	TIR17B12	(TIR17C12)	TIR17B13	(TIR17C13)	TIR17B14	(TIR17C14)	TIR17B15	(TIR17C15)	TIR17B16	(TIR17C16)	TIR17B17	(TIR17C17)	TIR17B18	(TIR17C18)	TIR17B19			(TIR17C19)	TIR17B20	(TIR17C20)	TIR17B21	(TIR17C21)	TIR17B22	(TIR17C22)	<div style="text-align: center;"> <div style="border-bottom: 1px solid black; width: 100%; height: 15px;"></div> <div style="border-bottom: 1px solid black; width: 100%; height: 15px;"></div> <div style="border-bottom: 1px solid black; width: 100%; height: 15px;"></div> <div style="border-bottom: 1px solid black; width: 100%; height: 15px;"></div> <div style="border-bottom: 1px solid black; width: 100%; height: 15px;"></div> <div style="border-bottom: 1px solid black; width: 100%; height: 15px;"></div> <div style="border-bottom: 1px solid black; width: 100%; height: 15px;"></div> <div style="border-bottom: 1px solid black; width: 100%; height: 15px;"></div> <div style="border-bottom: 1px solid black; width: 100%; height: 15px;"></div> <div style="border-bottom: 1px solid black; width: 100%; height: 15px;"></div> <div style="border-bottom: 1px solid black; width: 100%; height: 15px;"></div> <div style="border-bottom: 1px solid black; width: 100%; height: 15px;"></div> <div style="border-bottom: 1px solid black; width: 100%; height: 15px;"></div> <div style="border-bottom: 1px solid black; width: 100%; height: 15px;"></div> <div style="border-bottom: 1px solid black; width: 100%; height: 15px;"></div> <div style="border-bottom: 1px solid black; width: 100%; height: 15px;"></div> <div style="border-bottom: 1px solid black; width: 100%; height: 15px;"></div> <div style="border-bottom: 1px solid black; width: 100%; height: 15px;"></div> <div style="border-bottom: 1px solid black; width: 100%; height: 15px;"></div> <div style="border-bottom: 1px solid black; width: 100%; height: 15px;"></div> <div style="border-bottom: 1px solid black; width: 100%; height: 15px;"></div> </div>
TIR17B01	(TIR17C01)																																															
TIR17B02	(TIR17C02)																																															
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TIR17B14	(TIR17C14)																																															
TIR17B15	(TIR17C15)																																															
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TIR17B21	(TIR17C21)																																															
TIR17B22	(TIR17C22)																																															

Pump Bumping Instrumentation	DATE: _____
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TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

PUMP BUMP
FOR
TANK 101-SY MITIGATION-BY-MIXING TEST

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MINIMUM INSTRUMENTATION CHECKLIST

ATTACHMENT A

Comments:

This checklist was completed AND the minimum instruments required have been verified operable:

Initial / Date:	Initial / Date:
	Independent Verification

Part A and Part B of this Attachment A are in concurrence with each other.

Test Director signature: _____ Date: _____

Pump Bumping Instrumentation

DATE: _____

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TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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WHC EMERGENCY PLAN CONDITIONS

ATTACHMENT B

In the event that any of the emergency conditions listed below occur or are suspected, the Operations Shift Manager (373-2689) shall be notified immediately and will then implement the applicable Westinghouse Hanford Company Building Emergency Plan (WHC-IP-0263-TF).

Burp of Waste Tank Accompanied by High Pressure Alarm
Suspected Explosion or Fire
Confirmed Explosion in SY Tank Farm with Tank Structural Failure
Bomb Threat
Industrial Accidents
Loss of Electricity
Loss of Water
Loss of Ventilation
Loss of Steam
Loss of Air
Fire
Major Process Upset
Pressure Hazards
Security Event
Seismic Event
Volcanic Eruption and Ashfall
High Winds or Tornadoes
Flood
Range Fire
Spills of Hazardous Material
Fires or Explosions Involving Hazardous Materials
Toxic Fumes Hazards
Reactive Chemical and Corrosive Materials Hazards
Thermal Reactions and Hazards
Flammable Material and Liquids Hazards
Asbestos Release
Gaseous Effluent Discharges (Stack Release)
Liquid Effluent Discharge
Significant Contamination Spread or Release
Criticality
Explosive Materials and Munitions Hazards

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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PLC ABORT VERIFICATION

Attachment D

- 2.4 Verify that the MOD ABORT entry as displayed on screen for each Tag is the same as the corresponding MOD ABORT entry on the hard copy, TABLE D1, Abort Limit Checklist.
- 2.4.1 Use PART A of TABLE D1 for initial checkoff.
- 2.4.2 Use PART B of TABLE D1 for independent verification checkoff.
- 2.4.3 IF any deviations are noted, notify the Test Manager and do not proceed with this procedure.
- 2.5 Independent verification shall require performance of step 2.4 only.

PUMP BUMP
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PLC ABORT VERIFICATION

Attachment D

TABLE D1 ABORT LIMIT CHECKLIST - PART A

Tag	Mod Reg	Mod Abort	Checkoff (Initial)	Description	Unit	Eng Low	Eng High	Eng Abort
HH2LIM	40200	307		HIGH HYDROGEN ABORT LIMIT	%	0	10	0.75
UNUSED	40201	1299	UNUSED	HIGH WASTE LEVEL ABORT LIMIT	IN	397	438	410
HTEMLIM	40203	1606		HIGH TEMP ABORT LIMIT	DEG F	12.5	325	135
HPDPLIM	40204	VARIABLE	UNUSED	HI PUMP DISCHARGE PRESS ABT LIM	PSI	0	150	VARIABLE
HPMOTLIM	40206	2252		HIGH MOTOR OIL TEMP ABORT LIM	DEG F	32	383	225
LVFLLIM	40207	1285		LOW VENT FLOW ABORT LO RANGE	CFM	0	1275	400
HTDPLIM	40208	1229		HIGH TANK DOME PRESSURE	INWG	-4	6	-1
HPCSLIM	40209	2629		HIGH PUMP COLUMN STRAIN	uIN/IN	-684	684	194
PLCPMCAB	40210	VARIABLE	UNUSED	PLC PUMP MOTOR CURRENT ABT LIM	AMPS	0	210	VARIABLE
HMITSLIM	40211	3117		HIGH MIT 17B STRAIN LIMIT	uIN/IN	-684	684	357
HI7CSLIM	40212	3117		HIGH MIT 17C STRAIN LIMIT	uIN/IN	-684	684	357
HPSPDLIM	40213	VARIABLE	UNUSED	HIGH PUMP SPEED ABORT LIMIT	RPM	0	1200	VARIABLE
HH2LIM2	40232	3072		HIGH H2 ABORT LIMIT 0-50%	%	0	1	0.75
HTMPLIM3	40234	2344		TEMP ABORT 0-100	DEG F	32	212	135
LVFLLIM2	40235	688		LOW VENT FLOW ABORT HI RANGE	CFM	-1000	7333	400
HTDPLIM2	40236	655		HIGH DOME PRESS ABORT 2	INWG	-5	20	-1
H1BCSLIM	40237	3683		HIGH 1B COLUMN STRAIN LIMIT	uIN/IN	-684	684	546
LPCSLIM	40238	1467		LOW PUMP COLUMN STRAIN LIMIT	uIN/IN	-684	684	-194
LMITSLIM	40239	979		LOW MIT 17B COLUMN STRAIN LIMIT	uIN/IN	-684	684	-357
L17CSLIM	40240	979		LOW MIT 17C COLUMN STRAIN LIMIT	uIN/IN	-684	684	-357
L1BCSLIM	40241	413		LOW 1B COLUMN STRAIN LIMIT	uIN/IN	-684	684	-546
LPCGFLIM	40252	1147		LOW PUMP COL GAS PRESS ABRT LIM	PSI	0	25	7
HVFLLIM1	40253	2249		HIGH VENT FLOW ABORT LIM 1	CFM	0	1275	700
HVFLLIM2	40254	836		HIGH VENT FLOW ABORT LIM 2	CFM	-1000	7333	700

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PLC ABORT VERIFICATION

Attachment D

TABLE D1 ABORT LIMIT CHECKLIST - PART B

Tag	Mod Reg	Mod Abort	Checkoff (Initial)	Description	Unit	Eng Low	Eng High	Eng Abort
HH2LIM	40200	307		HIGH HYDROGEN ABORT LIMIT	%	0	10	0.75
UNUSED	40201	1299	UNUSED	HIGH WASTE LEVEL ABORT LIMIT	IN	397	438	410
HTEMPLIM	40203	1606		HIGH TEMP ABORT LIMIT	DEG F	12.5	325	135
HPDPLIM	40204	VARIABLE	UNUSED	HI PUMP DISCHARGE PRESS ABTLIM	PSI	0	150	VARIABLE
HPMOTLIM	40206	2252		HIGH MOTOR OIL TEMP ABORT LIM	DEG F	32	383	225
LVFLLIM	40207	1285		LOW VENT FLOW ABORT LO RANGE	CFM	0	1275	400
HTDPLIM	40208	1229		HIGH TANK DOME PRESSURE	INWG	-4	6	-1
HPCSLIM	40209	2629		HIGH PUMP COLUMN STRAIN	uIN/IN	-684	684	194
PLCPMCAB	40210	VARIABLE	UNUSED	PLC PUMP MOTOR CURRENT ABT LIM	AMPS	0	210	VARIABLE
HMITSLIM	40211	3117		HIGH MIT 17B STRAIN LIMIT	uIN/IN	-684	684	357
H17CSLIM	40212	3117		HIGH MIT 17C STRAIN LIMIT	uIN/IN	-684	684	357
HPSPDLIM	40213	VARIABLE	UNUSED	HIGH PUMP SPEED ABORT LIMIT	RPM	0	1200	VARIABLE
HH2LIM2	40232	3072		HIGH H2 ABORT LIMIT 0-50%	%	0	1	0.75
HTMPLIM3	40234	2344		TEMP ABORT 0-100	DEG F	32	212	135
LVFLLIM2	40235	688		LOW VENT FLOW ABORT HI RANGE	CFM	-1000	7333	400
HTDPLIM2	40236	655		HIGH DOME PRESS ABORT 2	INWG	-5	20	-1
H1BCSLIM	40237	3683		HIGH 1B COLUMN STRAIN LIMIT	uIN/IN	-684	684	546
LPCSLIM	40238	1467		LOW PUMP COLUMN STRAIN LIMIT	uIN/IN	-684	684	-194
LMITSLIM	40239	979		LOW MIT 17B COLUMN STRAIN LIMIT	uIN/IN	-684	684	-357
L17CSLIM	40240	979		LOW MIT 17C COLUMN STRAIN LIMIT	uIN/IN	-684	684	-546
L1BCSLIM	40241	413		LOW 1B COLUMN STRAIN LIMIT	uIN/IN	-684	684	-546
LPCGPLIM	40252	1147		LOW PUMP COL GAS PRESS ABRT LIM	PSI	0	25	7
HVFLIM1	40253	2249		HIGH VENT FLOW ABORT LIM 1	CFM	0	1275	700
HVFLIM2	40254	836		HIGH VENT FLOW ABORT LIM 2	CFM	-1000	7333	700

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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PUMP BUMP
FOR
TANK 101-SY MITIGATION-BY-MIXING TEST

WHC-SD-WM-TPI-007
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Rev. 1

DISABLING INOPERABLE INSTRUMENTS

Attachment E

WARNING!

THE INSTRUCTIONS THAT FOLLOW WILL RESULT IN A REDUCTION OF DACS ABORT CAPABILITY. ABORTS MAY ONLY BE DISABLED WITH THE EXPRESS APPROVAL OF THE TEST MANAGER.

- NOTE:
- All steps in Attachment E, Disabling Inoperable Instruments shall be performed at DACS Station 1.
 - The <TAB> key toggles the cursor between the menu bar and the display screen.
 - Use TABLE E1, Abort Coil Cross Reference to identify the applicable abort coil numbers.

- 1 Load the current version of the PLC abort files, as follows:
 - 1.1 Change DOS directory by entering "cd C:\MODSOFT" and start MODSOFT program by entering "MODSOFT".
 - 1.2 Choose "FILER" from the menu bar.
 - 1.3 At the "FILE I/O" pull down on the menu bar, choose "Load All" and <enter>.

NOTE: "HFPLC" is the file name of the current version of the PLC abort data.

- 1.4 Enter "HFPLC" in each of the 6 displayed fields.
 - 1.5 Answer "Y" to the dialog box: "Selecting for LOAD Ready:" to start file loading.
 - 1.6 When files have been loaded, choose "QUIT" from the menu bar.
 - 1.7 At the "ONLINE" pull down on the menu bar, choose "Quick".
 - 1.8 Answer "Y" to the dialog box: "The current program will be deleted from the panel. Continue? (Y/N)".
 - 1.9 At the SEGMENT STATUS DISPLAY screen, enter <alt F2> to call up the REFERENCE DATA screen.
- 2 Enter the abort coil number associated with the inoperable instrument (DACS Tag) in field "F1" on the REFERENCE DATA screen.

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

PUMP BUMP
FOR
TANK 101-SY MITIGATION-BY-MIXING TEST

WHC-SD-WM-TPI-007
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DISABLING INOPERABLE INSTRUMENTS

Attachment E

- 3 Highlight the "F5" field (using the cursor keys), enter a "D" in the field and press <enter> to disable the selected abort coil.
- 4 Highlight field "F3" and ensure that the State block displays a zero (abort coil off).

NOTE: Some instruments may have more than one abort coil. This is indicated in TABLE E1 by a dashed line separating the coil numbers in the row occupied by the DACS Tag of the instrument.

- 5 Repeat steps 2 through 4 for each abort coil associated with an inoperable instrument.
- 6 Ensure that all appropriate entries are made in the Disabled Instrument List (maintained in the Required Reading book).
- 7 Verify disabled abort coils by performing steps 1.1 through 1.4 of Attachment D, PLC Abort Verification.

PUMP BUMP
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DISABLING INOPERABLE INSTRUMENTS

Attachment E

TABLE E1 ABORT COIL CROSS REFERENCE

DACS Tag	DACS Description	Modicon Tag	MODICON Coil Description	Coil No.
FTE50001	VENT HEADER FLOW LOW RANGE	FCE50001	Low Ventilation Flow Abort 1	308
		FHE50001	High Vent Flow Abort 1	342
FTE50002	VENT HEADER FLOW HIGH RANGE	FCE50002	Low Ventilation Flow Abort 2	309
		FHE50002	High Vent Flow Abort 2	343
FICABORT	FIC TANK LEVEL ABORT	FCCABORT	High Waste Tank Level Abort	261
NIRO5A01	MIX PUMP WTKR MON HI H2	NCR05A01	High H2 Abort - Pump	260
NIR17B01	RISER 17B WTKR MON/HI H2	NCR17B01	High H2 - Riser 17B Abort	259
NITJSY06	R-16A WTKR MON/HI H2	NCTJSY06	High H2 - Riser 16A Abort	258
NITKSY06	EXH HDR WTKR MON/HI H2	NCTKSY06	High H2 - Vent Header Abort	257
PIR11B01	TANK DOME PRESSURE RISER 11B	PCR11B01	High Tank Dome Pressure Abort 1	310
PCR12A01	MIXER PUMP PRESSURE	PHR12A01	High Pump Discharge Pressure Abort	304
PIR17B04	MIT TANK DOME PRESSURE	PCR17B04	High Tank Dome Pressure Abort 2	311
TIPN0101	MIX PUMP DIS NOZ 2 TEMP 1	TCPN0101	High Temp Abort Pump 101	300
TIPN0102	MIX PUMP DIS NOZ 2 TEMP 2	TCPN0102	High Temp Abort Pump 102	301
TIPN0201	MIX PUMP DIS NOZ 1 TEMP 2	TCPN0201	High Temp Abort Pump 201	302
TIPN0202	MIX PUMP DIS NOZ 1 TEMP 1	TCPN0202	High Temp Abort Pump 202	303
TIR12A01	MIXER PUMP MOTOR OIL TEMP #1	TCR12A01	High Pump Motor Oil Temp Abort 1	306

**PUMP BUMP
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DISABLING INOPERABLE INSTRUMENTS

Attachment E

DACS Tag	DACS Description	Modicon Tag	MODICON Coil Description	Coil No.
TIR12A02	MIX PUMP MOTOR OIL TEMP 2	TCR12A02	High Pump Motor Oil Temp Abort 2	307
TIR17B01	TANK TEMP RISER 17B, LVL 4"	TCR17B01	High Temp Abort 17A01	278
TIR17B02	TANK TEMP RISER 17B, LVL 16"	TCR17B02	High Temp Abort 17A02	279
TIR17B03	TANK TEMP RISER 17B, LVL 28"	TCR17B03	High Temp Abort 17A03	280
TIR17B04	TANK TEMP RISER 17B, LVL 52"	TCR17B04	High Temp Abort 17A04	281
TIR17B05	TANK TEMP RISER 17B, LVL 76"	TCR17B05	High Temp Abort 17A05	282
TIR17B06	TANK TEMP RISER 17B, LVL 100"	TCR17B06	High Temp Abort 17A06	283
TIR17B07	TANK TEMP RISER 17B, LVL 112"	TCR17B07	High Temp Abort 17A07	284
TIR17B08	TANK TEMP RISER 17B, LVL 124"	TCR17B08	High Temp Abort 17A08	285
TIR17B09	TANK TEMP RISER 17B, LVL 148"	TCR17B09	High Temp Abort 17A09	286
TIR17B10	TANK TEMP RISER 17B, LVL 172"	TCR17B10	High Temp Abort 17A10	287
TIR17B11	TANK TEMP RISER 17B, LVL 196"	TCR17B11	High Temp Abort 17A11	288
TIR17B12	TANK TEMP RISER 17B, LVL 208"	TCR17B12	High Temp Abort 17A12	289
TIR17B13	TANK TEMP RISER 17B, LVL 220"	TCR17B13	High Temp Abort 17A13	290
TIR17B14	TANK TEMP RISER 17B, LVL 232"	TCR17B14	High Temp Abort 17A14	291
TIR17B15	TANK TEMP RISER 17B, LVL 244"	TCR17B15	High Temp Abort 17A15	292
TIR17B16	TANK TEMP RISER 17B, LVL 268"	TCR17B16	High Temp Abort 17A16	293
TIR17B17	TANK TEMP RISER 17B, LVL 292"	TCR17B17	High Temp Abort 17A17	294

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

**PUMP BUMP
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DISABLING INOPERABLE INSTRUMENTS

Attachment E

DACS Tag	DACS Description	Modicon Tag	MODICON Corr Description	Coll No.
TIR17B18	TANK TEMP RISER 17B, LVL 326"	TCR17B18	High Temp Abort 17A18	295
TIR17B19	TANK TEMP RISER 17B, LVL 340"	TCR17B19	High Temp Abort 17A19	296
TIR17B20	TANK TEMP RISER 17B, LVL 368"	TCR17B20	High Temp Abort 17A20	297
TIR17B21	TANK TEMP RISER 17B, LVL 392"	TCR17B21	High Temp Abort 17A21	298
TIR17B22	TANK TEMP RISER 17B, LVL 402"	TCR17B22	High Temp Abort 17A22	299
VR232040	PUMP MOTOR CURRENT	VC232040	High Pump Motor Current Abort	325
VR232050	PUMP SPEED	VC232050	High Pump Motor Speed Abort	326
WIR12A01	PUMP SUPPORT COLUMN STRAIN #1	WCR12A01	High Pump Column Strain Abort 1	313
		WLR12A01	Low 12A-1 Strain Abort	256
WIR12A02	PUMP SUPPORT COLUMN STRAIN #2	WCR12A02	High Pump Column Strain Abort 2	314
		WLR12A02	Low 12A-2 Strain Abort	262
WIR12A03	PUMP SUPPORT COLUMN STRAIN #3	WCR12A03	High Pump Column Strain Abort 3	315
		WLR12A03	Low 12A-3 Strain Abort	263
WIR12A04	PUMP SUPPORT COLUMN STRAIN #4	WCR12A04	High Pump Column Strain Abort 4	316
		WLR12A04	Low 12A-4 Strain Abort	331

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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**PUMP BUMP
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DISABLING INOPERABLE INSTRUMENTS

Attachment E

DACS Tag	DACS Description	Modicon Tag	MODICON Coil Description	Coil No.
WIR17C01	STRAIN GAUGE 17C	WCR17C01	High MIT Column 17C Strain Abort 1	323
		WLR17C01	Low 17C-1 Strain Abort	339
WIR17C02	STRAIN GAUGE 17C	WCR17C02	High MIT Column 17C Strain Abort 2	324
		WLR17C02	Low 17C-2 Strain Abort	340
WIR17B01	STRAIN GAUGE RISER 17B AT LVL	WCR17B01	High MIT Column Strain Abort 1	318
		WLR17B01	Low 17B-1 Strain Abort	332
WIR17B02	STRAIN GAUGE RISER 17B AT LVL	WCR17B02	High MIT Column Strain Abort 2	319
		WLR17B02	Low 17B-2 Strain Abort	333
WIR1BA01	STRAIN GAUGE 1B, LVL 530"	WCR1BA01	High VDTT Column 1B Strain Abort 1	320
		WLR1BA01	Low 1B-1 Strain Abort	334
WIR1BA02	STRAIN GAUGE RISER 1B AT 530"	WCR1BA02	High 1B-2 Strain Abort	337
		WLR1BA02	Low 1B-2 Strain Abort	335
WIR1BA03	STRAIN GAUGE 1B, LVL 530"	WCR1BA03	High VDTT Column 1B Strain Abort 2	321
		WLR1BA03	Low 1B-3 Strain Abort	336
ZIMPE142	MIXER PUMP COLUMN GAS PRESSURE	ZIMPE142	Low Pump Column Gas Pressure Abort	341

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
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ORIENTING THE MIXER PUMP NOZZLES

Attachment F

NOTE: • Actions described in Attachment F, Orienting the Mixer Pump Nozzles must be performed at the DACS Pump Control Console, station 8.

- These guidelines assume that [VSD-101-1], TO MIXING PUMP ROTATION MOTOR breaker and [VSD-101-2], TO MIXING PUMP breaker are closed/on.

- 1 Select the "Manual Nozzle Positioning" soft button from the MAINMENU screen.
- 2 In the "Set Pump Position" portion of the screen, enter the desired nozzle orientation (in degrees) in the field labeled SET POINT POSITION.
- 3 Ensure ENABLE MOVE is displayed in the field immediately below SET POINT POSITION by using the <space bar> as a toggle.
- 4 Press the <enter> button and observe the "Nozzle Position (deg)" display.
- 5 Verify that Meas (measured position) indicator AND SetP (set point position) indicator are both lit green AND indicate the desired position.

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

APPENDIX G

241-C-106 DOCUMENTATION

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

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TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

Westinghouse
Hanford Company

WAF REDISTRIBUTION 05/06/93

P.O. Box 1970 Richland, WA 99352

JR STREDWICK
CW NEEDHAM 9353885

May 5, 1993

W. A. Ferree, Area Manager
Kaiser Engineers Hanford
P. O. Box 888
Richland, Wa. 99352

CWN/REDISTRIBUTION/5-6-93
C. A. Challender
Const. Document Control

Dear Mr. Ferree:

SUBJECT TANK 106-C PIT CLEAN OUT AND PAINTING

INTRODUCTION This letter is to serve as authorization for Kaiser Construction to begin procurement and fabrication of the equipment identified in the "SPECIAL EQUIPMENT" section of this letter, for the clean out and painting activities on Tank 106-C Pits. An additional Letter of Instruction will be sent to begin the actual field work.

SCOPE This activity is to include the procurement and fabrication of the Special Equipment required to support this effort.

SPECIAL EQUIPMENT Kaiser is to purchase an 8 x 12 foot four wheel flat bed trailer for equipment and supplied air system transport. This trailer is to be modified like the TMACS trailer you are building for Mr. Ron Jones of Major Maintenance. Provisions also need to be made for attaching fresh air bottle racks to the crane which will be used in this effort.

SCHEDULE Please begin this activity immediately. Additional LOI's for starting field work will follow.

SAFETY This work is to be performed in accordance with prescribed KEH safety procedures and practices. If any abnormal conditions become apparent to either KEH or WHC, notification will be made to both companies in writing.

COST All costs associated with this activity should be charged to Work Order ER-3022.

PROCUREMENT All materials are to be supplied by KEH.

JCS WORK PACKAGE 2W-93-00613.

POINT OF CONTACT The point of contact for this activity is David Berg, 3-4961.

Very truly yours,

K. W. Liefeld, Manager
Major Maintenance Upgrades

db

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

Westinghouse
Hanford Company

P.O. Box 1970 Richland, WA 99352

June 4, 1993

9355042

W. A. Ferree, Area Manager
Kaiser Engineers Hanford
P. O. Box 888
Richland, Wa. 99352

Dear Mr. Ferree:

SUBJECT W-320, PUMP PIT CLEAN OUT 241-C-106

REFERENCE: Request for Estimate LOI# 935911 and Start Fabrication,
Procurement LOI# 9353885.

INTRODUCTION This LOI authorizes KEH to start work on clean-out of pump pits C-106 A, B, and C.

SCOPE Tank 241-C-106 pits A (pump pit), B (center heel pit), C (south sluice Pit) are to be cleaned-out, decontaminated, and painted.

The pit covers are to be removed and all existing equipment and debris removed. Equipment removed at this time is inclusive of all material presently in the pits with the exception of pumps and "isolation blanks" presently in risers and pit penetrations. All jumpers, unused blanks, and miscellaneous debris is to be removed and placed in approved type A disposal containers. KEH will transport this waste to WHC Solid Waste facilities yet to be determined. No material is to be placed in containers until this determination has been made.

Pit walls, floors, and covers are to be decontaminated to the greatest extent possible. Decontamination efforts will be considered complete when two consecutive smears (between decon efforts) on each surface show no reduction of contamination level. Decontamination will be performed by either water spray or CO2 pellet impingement.

Pit walls, floors, and covers will be painted to the requirements of Federal Specification (FS) TT-P-645 for the primer coat and (FS) TT-E-489 for the finish coat(s). Further definitive instruction will be provided by JCS work request 2E-93-0613-K, KEH will work to the requirements of this work package. No PCI will be necessary. This is a Safety Class 3 Impact Level 3S work effort.

DELIVERABLES Any inspections required will be performed by WHC Quality Control. A letter of completion will be required from Construction Forces stating that the above scope of work has been completed.

SCHEDULE This work is scheduled to be performed from July 21, 1993 through August 31, 1993.

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

Page 2

9355042

SAFETY This work is to be performed in accordance with prescribed KEH safety procedures and practices. If any abnormal conditions become apparent to either KEH or WHC, immediate notification will be made to both companies with follow-up notification in writing. No known asbestos source is located within the work area. All work within 241-C tank farm will be performed with personnel on supplied air due to the known vapor hazard in the tank farm. Radiological condition as encountered at the last pit entry have been previously provided.

COST All costs associated with equipment removal and transportation should be charged to Work Order ER-3986. All costs incurred in cleaning and painting the pits should be charged to Work Order ER-3985.

PROCUREMENT All material required to complete this work will be supplied by KEH.

PERMITS WHC will provide the Radiation Work Permit, KEH will provide any other permits required (JSA etc.)

JCS WORK PACKAGE KEH is requested to perform the work scope identified in JCS work request # 2E-93-0613-K. Adherence to the requirements of this work request is mandatory.

POINT OF CONTACT Mr. David Berg (3-4961) of WHC's Major Maintenance organization will be Construction Supervisions' primary point of contact. Should he be unavailable for any reason Mr. Tim Shaw (2-0305) of my staff is the SST Retrieval Operations/Construction liason.

Very truly yours,

J. M. Henderson, Manager
SST Retrieval

Concurrence _____

[illegible]

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

J-8	WORK RELEASE SHEET		1. Document Number <u>2E-913-006131K</u>
2. Pre-Release Review <u>R. Hutyra</u> <u>1/15/93</u> Signature Date		3. Tagout Number <u>NA</u>	4. Released for Field Work <u>see 5-9</u> <u>1</u> Operations Signature Date
5. Suspension Data:			
5A. Reason for Suspension _____			
5B. System/Component Status _____			
5C. Mode Impact _____			
5D. Tagout Requirements/Status _____			
6. Concurrence			
_____ PIC Signature Date		_____ Operations Signature Date	
2. Pre-Release Review <u>Greg Prodanowski</u> <u>1/8/93</u> Signature Date		3. Tagout Number <u>NA</u>	4. Released for Field Work <u>W.F. Mon</u> <u>1/8/93</u> Operations Signature Date
5. Suspension Data:			
5A. Reason for Suspension _____			
5B. System/Component Status _____			
5C. Mode Impact _____			
5D. Tagout Requirements/Status _____			
6. Concurrence			
_____ PIC Signature Date		_____ Operations Signature Date	
7. Functional Retest Complete		8. Work Complete	
_____ Operations Signature Date		_____ Operations Signature Date	
		9. Post Review	
		Reactor Containment Integrity ☐ Y ☐ N ☐ NA	
		_____ Signature Date	

DON'T SAY IT --- Write It!

DATE 7-19-93

TO _____

FROM _____

~~68-1988~~
54-271366

Pkg 93-613 - Please
release for prep work of
assign the responsibility for
Harrison approval.

[Signature]

✚ "TO MAKE LIFE LAST, PUT SAFETY FIRST" ✚

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

*** RECORD COPY ***

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-----J-1 WORK REQUEST (W110)-----

Page: 1

11:29:42 14 JUL 1993

1. Document Number 2E-93-00613/K CONSTRUCTION WORK

2. Work Item Title *106-C PIT CLEANOUT & PAINTING

3. System GEN GENERAL

4. Components

Component Number	Name
N/A	

Temporary Number	Name
N/A	N/A

5. Location

Facility 2E EAST TANK FARMS	
Bldg/Rm 241-C	Other TANK 106-C Other

6. Associated Components

Component Number	Name
N/A	

7. Originator Name BERG,DA
Telephone No. 3-4961

MSIN SO-09

Date	Organization
04/01/93	7C410

8. Charge Code IN1823

9. Work Item Description

REMOVE ALL EQUIPMENT FROM THE 106-C PITS ,DECON THE SURFACES,
AND REPAINT.

	Signature	Date
10. Operations Review	X HESTER,GA	04/01/93
11. Priority	2	
12. Phase Designator	P2-1 APRIL	
13. Correct Maint. Assessment	N	
14. Personnel Safety Related	N	

15. Cognizant Engineer	RUFFIN,L
16. Cognizant Manager	BEIBESHIMER,E

17. Reference Documents Type

H-2-61967
H-2-37006
H-2-41192
H-2-61962
H-2-41190
H-2-73877 SHT.1&2
H-2-41194

-----J-1 WORK REQUEST (W110)-----

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TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

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*** RECORD COPY ***

-----J-1 WORK REQUEST (W110)-----

Page: 2

11:29:42 14 JUL 1993

1. Document Number 2E-93-00613/K CONSTRUCTION WORK
 2. Work Item Title *106-C PIT CLEANOUT & PAINTING
-

18. Comments

-----J-1 WORK REQUEST (W110)-----

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TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

DATA SHEET 3 PCA TF-0175 Page 3 of 3
RAW WATER USAGE DATA SHEET*

Date 8-9-93

Tank Farm Area in which water is to be used: C FARM

Complete description of water usage: DECON PITS ON C-106

Approximate amount of water needed: 1500 gallons total in three additions

Will this water drain to a single shell tank: Yes (✓) No ()

If Yes, which tank? 106-C If No, where does it drain? N/A

If water drains to a single shell tank, the following approvals are required:

- () Tank has active jet pump, or Process Memo issued by TFPE authorizing water additions to support jet pump startup, or water addition authorized by procedure. 500 GALLON LIMIT

TO-250-200 (PCA TF-371)
Procedure number or Process Memo number

- (✓) Tank does not meet any of the above criteria. The following approvals are required prior to water usage.

Billard for SDCG 8/9/93
Manager, Tank Farm Process Engineering - Date

P. J. O. 8/9/93
Manager, Tank Farm Processing Operations - Date

G. A. 7/10/93 8-9-93
Manager, Tank Farm Operations Analysis & Support - Date
Surveillance

PCA TF-0175
5 MAR. 93

Functional Test

Watermeter Functioning Properly? Y N

Meter Readings

Final Reading _____

Beginning Reading _____

Actual Volume Used _____

Operator's Initials _____ TFPO Review _____

TFOA&S Review _____ TFPE Review _____

*One data sheet is to be used for each water usage activity

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

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-----J-4 RESOLUTION/RETEST (W140)-----

Page: 1

11:30:01 14 JUL 1993

1. Document Number 2E-93-00613/K CONSTRUCTION WORK
Work Item Title *106-C PIT CLEANOUT & PAINTING

2. Essential Systems N/A

3. Resolution

OBJECTIVE:

REMOVE AND DISPOSE OF OLD UNUSED/OUT OF SERVICE EQUIPMENT
FROM THE PUMP PIT, SLUICE PIT, AND HEEL PIT ON TANK 241-106-C.
FOLLOWING THE REMOVAL OF THE EQUIPMENT THE PITS ARE TO BE
DECONNED AND THE SURFACES PREPPED AND PAINTED.

THE FOLLOWING J-4A IS A SUGGESTED WORK PLAN AND ORDER TO
PERFORM THE WORK OUTLINED IN THE OBJECTIVE.

4. Impact Level/Approval Requirements 3-S

5. Tech Spec/OSR Requirements/Reference

DRAWING H-2-73356

OSD-T-151-00030 "OPERATING SPECIFICATIONS FOR WATCH LIST TANKS"

6. Reference Documents Type

\ H-2-61967
\ H-2-37006
\ H-2-41192
\ H-2-61962
\ H-2-41190
\ H-2-73877 SHT.1&2
\ H-2-41194
\ TF-002

RWP R. Lutting 7/15/93

7. Comments

THE OPERATING PROCEDURES TO-350-200 AND TO-040-540 ARE REQUIRED
TO ACCOUNT FOR WATER USAGE WHICH WILL END UP IN THE TANK C-106.

8. Retest Requirement N

9. Mode N/A

10. Retest

NONE

11. QC Involvement in Retest NONE

12. PIC BERG, DA

13. PIC Org. 7C410

14. Resolution By Signature
X BERG, DA

Date
04/28/93

15. Plant Forces Work Review Required Y Number WHC-058-93

16. Approvals Signature
Cognizant Engineer X ALSTAD, AT

Date
05/04/93

-----J-4 RESOLUTION/RETEST (W140)-----

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TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

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-----J-4 RESOLUTION/RETEST (W140)-----

Page: 2

11:30:01 14 JUL 1993

1. Document Number 2E-93-00613/K CONSTRUCTION WORK
Work Item Title *106-C PIT CLEANOUT & PAINTING

Cognizant Manager X BOYLES, VC 05/04/93
Environmental Assurance N/A
Health/Safety Assurance X JENSEN, CE 07/13/93
Quality Assurance N/A
Additional Approvals X SHAW, TN 04/28/93

17. Resources Required

Res Code Description

No. Est Hrs Act Hrs

18. Field Work Complete
19. Retest Satisfactory
20. QC Verify Retest
(If Required)

Signature

Date

-----J-4 RESOLUTION/RETEST (W140)-----

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TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

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*** RECORD COPY ***

-----J-4a RESOLUTION/RETEST (W145)-----
Page: 1 (Cont.) 11:30:25 14 JUL 1993

1. Document Number 2E-93-00613/K CONSTRUCTION WORK
Work Item Title *106-C PIT CLEANOUT & PAINTING

3. Resolution

WORK PLAN

- *1. THE 241-C TANK FARM IS ON "FRESH AIR" AND ALL ENTRANTS WILL REQUIRE "SCUBA" CERTIFICATION.
- *2. CURRENT RADIOLOGICAL CONDITIONS WILL REQUIRE TIME/DISTANCE/SHIELDING FOR ALL ACTIVITIES.
- *3. A MINIMUM OF FOUR RAD. BOXES SHOULD BE AVAILABLE FOR EQUIPMENT DISPOSAL.
- *4. FOUR CONTAINMENT TENT ENCLOSURES WILL BE REQUIRED FOR DECON: AND PAINTING WORK.
- *5. A HIGH PRESSURE CLEANING UNIT AND WATER SUPPLY FOR DECONNING WORK WITH WATER FLOW METER.
- *6. A 8'X12' TRAILER MODIFIED FOR CARRYING SUPPLIED AIR BOTTLES.
- *7. MODIFICATIONS TO THE KEH CRANE TO CARRY SUPPLIED AIR BOTTLES.
- *8. THE PIC/SUPERVISOR OF THE JOB OR TASK SHALL PERFORM THE FOLLOWING:

A. IS HAZARDOUS WASTE GENERATED FROM OR BY THIS JOB?

YES/NO/NA YES 8-2-93
PIC/SOP DATE/TIME

B. ARE THE APPROPRIATE WASTE CONTAINERS AVAILABLE TO PERFORM THIS TASK AND ARE THEY ON THE JOB SITE?

YES/NO YES 8-2-93
PIC/SOP DATE/TIME

C. DAILY: PIC/SUPERVISOR TO RECORD ON THE J-5 THAT ALL OF THE WASTE GENERATED FOR THAT DAY HAS BEEN PROPERLY DISPOSED OF. SIGN AND DATE THE J-5.

D. AT THE COMPLETION OF THE JOB: PIC/SUPERVISOR RECORD ON THE J-5 THAT THE JOB SITE HAS BEEN CLEANED AND ALL WASTE HAS BEEN PROPERLY DISPOSED OF. OPERATIONS TO VERIFY AND SIGN THE J-5.

STEP 1. PERFORM A RADIOLOGICAL AND CONTAMINATION SURVEY OF ALL SURFACE AREAS AFFECTED IN THIS WORK. SNIFFER REQUIRED TO SNIFF THE AREA AT THIS POINT.

-----J-4a RESOLUTION/RETEST (W145)-----
*** RECORD COPY ***

*** RECORD COPY ***

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

*** RECORD COPY ***

*** RECORD COPY ***

-----J-4a RESOLUTION/RETEST (W145)-----

Page: 4

(Cont.)

11:30:25 14 JUL 1993

1. Document Number 2E-93-00613/K CONSTRUCTION WORK

Work Item Title *106-C PIT CLEANOUT & PAINTING

STEP 21. REMOVE ALL ENCLOSURES AND DISPOSE OF IN APPROPRIATE
CONTAINERS. REMOVE ALL TUBE BLOCK FROM THE FARM. ALL EQUIPMENT
USED IN THIS EFFORT TO BE REMOVED FROM THE FARM TO SATTELITE
STORAGE OR OTHER AREAS DESIGNATED BY OPERATIONS.

STEP 22. DISPOSE OF ALL HAZARDOUS MATERIALS IN THE APPROPRIATE
CONTAINERS AT THE SATALITE ACCUMULATION AREA AND NOTIFY
OPERATIONS WHEN THE CONTAINERS ARE FULL.

-----J-4a RESOLUTION/RETEST (W145)-----

*** RECORD COPY ***

*** RECORD COPY ***

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

*** INFORMATION ONLY ***

-----J-4a RESOLUTION/RETEST (W145)-----
Page: 2 (Cont.) 15:14:17 24 JUN 1993

1. Document Number 2E-93-00613/K CONSTRUCTION WORK
Work Item Title *106-C PIT CLEANOUT & PAINTING

STEP 2. RIGGING SUPERVISORS TO PERFORM A VISUAL INSPECTION OF
THE COVER BLOCK LIFTING BAILS PRIOR TO PERFORMING THE PICK.

NOTE: IF LIFTING BAILS ARE FOUND TO BE SUSPECT AS DETERMINED BY
THE RIGGING SUPERVISOR'S VISUAL INSPECTION, THE COVER BLOCK
LIFTING BAILS WILL BE PRE LOAD TEST M.T. INSPECTED, LOAD TESTED
AT 125% ESTIMATED BLOCK WEIGHT, AND POST LOAD TEST M.T.
INSPECTED.

VISUAL ACCEPTANCE WILL BE BASED ON NO VISIBLE DISTORTION,
CRACKING, OR REDUCTION OF ORIGINAL CROSS SECTIONAL THICKNESS.

M.T. INSPECTION ACCEPTANCE, IF NECESSARY, WILL BE BASED ON NO
CRACKS IN EXCESS OF 1/4". IF MULTIPLE CRACKS UNDER 1/4" ARE
FOUND IN THE BEND RADIUS OF A BAIL, THE ENGINEER WILL BE
NOTIFIED.

STEP 3. HOLD PRE JOB SAFETY MEETING PRIOR TO BEGINNING WORK.

STEP 4. WORK TO BE PERFORMED IN THE FOLLOWING SEQUENCE:

1. PIT 06-A^B
2. PIT 06-C
3. PIT 06-B^A

Remove insulation from pit + pit covers disposal

STEP 5. HOLD POINT: HPT SHALL VERIFY A GROUND COVERING IS IN
PLACE FOR REMOVED COVERBLOCKS TO PASS OVER PRIOR TO BREACHING
PIT AREA. HPT _____, DATE: _____.

STEP 6. REMOVE COVER BLOCKS SHALL BE PLACED ON GROUND COVERING
AND WRAPPED FOR CONTAMINATION CONTROL.

STEP 7. A CONTAINMENT COVER SHALL BE PLACED OVER PIT AREA UPON
INDIVIDUAL COVERBLOCK REMOVAL.

STEP 8. HOLD POINT: A CONTAINMENT TENT SHALL BE ERECTED OVER
PIT CONTAINMENT COVERS AND PIT AREA. A HP SUPERVISOR SHALL
VERIFY THE ADEQUACY OF THE CONTAINMENT PRIOR TO USAGE. HP
SUPERVISOR _____, DATE: _____.

STEP 9. REMOVE CONTAINMENT COVERS AND STORE WITHIN CONTAINMENT
TENT LATER USAGE.

STEP 10. LIGHTLY MOISTEN INNER PIT WALLS AND FLOOR PRIOR TO
PERFORMING DECONTAMINATION REMOVAL OF LOOSE SEDIMENT WITHIN PIT
AREA. LOOSE SEDIMENT SHOULD BE INSERTED INTO OPEN RISER OR PIT
FLOOR DRAIN AS DETERMINED BY PIC.

STEP 11. AFTER MAJOR PORTIONS OF SEDIMENT HAS BEEN REMOVED APPLY

-----J-4a RESOLUTION/RETEST (W145)-----
*** INFORMATION ONLY ***

AIM

Association for Information and Image Management

1100 Wayne Avenue, Suite 1100
Silver Spring, Maryland 20910

301/587-8202

Centimeter

Inches

MANUFACTURED TO AIM STANDARDS
BY APPLIED IMAGE, INC.

3 of 3

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

*** INFORMATION ONLY ***

-----J-4a RESOLUTION/RETEST (W145)-----
Page: 3 (Cont.) 15:14:17 24 JUN 1993

1. Document Number 2E-93-00613/K CONSTRUCTION WORK
Work Item Title *106-C PIT CLEANOUT & PAINTING

AN APPROVED FIXITANT TO REMAINING EQUIPMENT. CONTINUE TO APPLY
FIXITANT TO EQUIPMENT DURING REMOVAL.

STEP 12.REMOVE ALL EXCESS EQUIPMENT LOCATED INSIDE THE PIT AND
PLACE INTO RAD BOX FOR DISPOSAL. NOTE: PUMPS ARE TO REMAIN IN
PLACE FOR FUTURE REMOVAL.

STEP 13.ERECT A SECONDARY CONTAINMENT TENT OVER EXISTING PIT *If needed for*
CONTAINMENT FOR PIT FOR ADDITIONAL DECONNING AND PAINTING. *Tempd work*

STEP 14.APPLY FIXITANT TO INTERIOR WALLS AND SURFACES OF PIT
CONTAINMENT TENT PRIOR TO DISMANTLING. THE CONTAINMENT TENT
SHALL BE COLLAPSED AND DISPOSED INTO APPROPRIATE CONTAINER.
HPT _____, DATE: _____.

STEP 15.HPT SHALL PERFORM A DOSE RATE SURVEY AROUND THE OUTER
EDGE OF INNER PIT AREA. HPT SHALL PERFORM A CONTAMINATION SURVEY
OF INNER PIT WALLS AND FLOORS FOR A BASELINE ASSESSMENT OF
DECONTAMINATION LEVELS. HPT _____, DATE: _____, DOSE
RATE _____, CONTAMINATION LEVELS B/G _____, ALPHA _____.

STEP 16.PERFORM DECONTAMINATION OF INNER PIT AREA USING A HIGH
PRESSURE SYSTEM.

STEP 17.HPT SHALL OBTAIN LARGE AREA SMEARS(300 CM2) FOR A DECON
ASSESSMENT. HPT _____, DATE: _____, SMEARABLE LEVELS
B/G _____, ALPHA _____.

STEP 18.DECONTAMINATION EFFORTS SHALL BE DISCONTINUED WHEN
REMOVABLE CONTAMINATION LEVELS FROM HPT SMEAR SWIPES ARE LESS
THAN 50% OF THE LOWEST READING TAKEN.

NOTE: WATER ADDITION TO THE TANK IS LIMITED TO A MAXIMUM
OF 79 INCHES FROM TANK BOTTOM. CONTACT SYSTEMS
ENGINEERING BEFORE AND AFTER COMPLETION OF ANY WATER
ADDITION FOR DECONNING.

If possible before painting

STEP 10. PREPARE SURFACES OF THE PIT INTERIOR AND APPLY AMERCOAT
187 PRIMER WHERE REQUIRED, AND TWO COATS OF AMERCOAT 33 WHITE.

STEP 11. REMOVE ALL ENCLOSURES AND DISPOSE OF IN APPROPRIATE
CONTAINERS. REMOVE ALL TUBE BLOCK FROM THE FARM. ALL EQUIPMENT
USED IN THIS EFFORT TO BE REMOVED FROM THE FARM TO SATTELITE
STORAGE OR OTHER AREAS DESIGNATED BY OPERATIONS.

STEP 12.DISPOSE OF ALL HAZARDOUS MATERIALS IN THE APPROPRIATE
CONTAINERS AT THE SATALITE ACCUMULATION AREA AND NOTIFY
OPERATIONS WHEN THE CONTAINERS ARE FULL.

-----J-4a RESOLUTION/RETEST (W145)-----
*** INFORMATION ONLY ***

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

*** INFORMATION ONLY ***

-----J-4a RESOLUTION/RETEST (W145)-----

Page: 4

(Cont.)

15:14:17 24 JUN 1993

1. Document Number 2E-93-00613/K CONSTRUCTION WORK
Work Item Title *106-C PIT CLEANOUT & PAINTING

-----J-4a RESOLUTION/RETEST (W145)-----

*** INFORMATION ONLY ***

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

HANFORD RADIOLOGICAL WORK PERMIT				Contractor: WESTINGHOUSE HANFORD COMPANY																			
General ☐	Tech. Document No.	Location Code	EAN	RWP Number																			
Job Specific ☒	2E-93-0613/K	6	81	E-S-150																			
Start Date	End Date	Termination Date Extended To:		By																			
7-28-93	10-28-93																						
Responsible Organization Kaiser Engineering																							
Job Location 241-C Tank 106: HEEL PIT																							
Job Description and Type of Area: CONTAMINATION-HIGH CONTAMINATION-HIGH RADIATION AREAS: Removal of all existing equipment from the heel pit for Decontamination and Painting of inner pit walls and floors including pit coverblocks.																							
Primary Isotope(s): ☒ MFP ☐ MAP ☐ Cs ☐ Sr ☐ H-3 ☐ U ☐ Pu ☐ Other																							
Radiation Emitted	Estimated Dose Rates		Contamination Levels		Radiological Worker Training Req.																		
☒ Alpha ☒ Beta ☒ Photons ☐ Neutrons	General Area: <100 mrem/h Maximum Contact: 2000 mrem/h		Beta-gamma: 100,000 dpm/100 cm ² Alpha: 2000 dpm/100 cm ²		1 ☐ 11 ☒																		
Internal Dosimetry Requirements (for routine work under this RWP, except those entering for observation only) ☒ Annual Whole Body Count ☐ Lung Count ☐ Urinalysis Isotopes to Test for (if any):																							
MINIMUM RADIOLOGICAL PROTECTION REQUIREMENTS			SPECIAL INSTRUCTIONS (SI)																				
<table border="1"> <tr> <th>HPT Coverage</th> <th>Dosimetry</th> </tr> <tr> <td>☒ Continuous</td> <td>☒ Multipurpose TLD</td> </tr> <tr> <td>☐ Intermittent</td> <td>☐ Basic TLD</td> </tr> <tr> <td>☐ Start of Job</td> <td>☒ Pocket Dosimeter</td> </tr> <tr> <td>☐ End of Job</td> <td>☐ Electronic Dosimeter</td> </tr> <tr> <td>☐ Self Survey (if qualified)</td> <td>☐ Finger Rings</td> </tr> <tr> <td>☒ HPT Survey Required</td> <td>☐ Time Keeping</td> </tr> <tr> <td>☐ Auto. Survey Device</td> <td>☒ WRAM Access</td> </tr> <tr> <td>☐ See SI#</td> <td>☐ See SI# 3</td> </tr> </table>			HPT Coverage	Dosimetry	☒ Continuous	☒ Multipurpose TLD	☐ Intermittent	☐ Basic TLD	☐ Start of Job	☒ Pocket Dosimeter	☐ End of Job	☐ Electronic Dosimeter	☐ Self Survey (if qualified)	☐ Finger Rings	☒ HPT Survey Required	☐ Time Keeping	☐ Auto. Survey Device	☒ WRAM Access	☐ See SI#	☐ See SI# 3	<p>1. LIMITING CONDITIONS: Whole body exposure limits shall be maintained at 2 Rem/h at 30 cm. Contamination levels outside of open pit area or temporary containment tent equal to or greater than 100,000 dpm/100 cm² Beta-gamma, 200 dpm/100 cm² Alpha shall stop all work activity. Work shall commence ONLY after approval from the Radiological Control Manager.</p> <p>2. ACTION LEVELS: Any detectable removable contamination equal to or exceeding 10,000 dpm/100 cm² Beta-gamma or 200 dpm/100 cm² Alpha shall require decontamination until contamination control has been restored.</p> <p>3. Gammacoms or PAD's shall be worn by personnel in High Radiation areas when exposure levels are equal to or greater than 100 mrem/h.</p> <p>4. The listed respirator is required for radiological conditions related to the work activity described. Respiratory Protection may increase this requirements.</p> <p>5. DECONTAMINATION of open pit areas will require personnel to wear protective rain gear to prevent personnel contamination. The duration of rain gear usage shall be determined by HPT.</p> <p>6. HPT may ONLY increase the Radiological Protection Requirements and Protective Equipment as radiological conditions dictate when within the parameters of the dose estimates and contamination levels.</p>		
HPT Coverage	Dosimetry																						
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MINIMUM PROTECTIVE EQUIPMENT																							
☒ Coveralls	☐ Shoe Covers																						
☐ Lab Coat	☒ Canvas Boots																						
☐ Waterproof Suit	☒ Rubber Overboots																						
☐ Gortex Suit	☐ Rubber Boots																						
☐ Cap	☒ Full Face Respirator																						
☒ Hood	☐ PAPR																						
☒ Surgeon's Gloves	☐ Supplied Air Respirator																						
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☒ Canvas & Surgeon's Gloves																							
☐ Waterproof Gloves																							
☐ No Personal Outer	☐ Undressing Assistance																						
☐ Modesty Clothing																							
☐ See SI# 5	☐ See SI# 4																						
ALARA Review: CLASS 1		Pre-Job Briefing: YES ☒ NO ☐		Post-Job ALARA Review Required YES ☒ NO ☐																			
RWP Prepared By: Randy Boast		Phone: 3-1922		HPT Phone: 373-2526/373-3500																			
Line Management: <i>[Signature]</i>		Phone: 3-3913		Date: 7/29/93																			
Health Physics Supervisor: <i>[Signature]</i>		Phone: 3-3500		Date: 7/30/93																			
<i>[Signature]</i>		Phone: 276-9215		Date: 7/28/93																			
Acknowledged By: <i>[Signature]</i>		373-3940		Date: 7-28-93																			
RWP Change Approvals:				Date:																			

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

HANFORD RADIOLOGICAL WORK PERMIT				Contractor: WESTINGHOUSE HANFORD COMPANY																																					
General ☐	Tech. Document No.	Location Code	EAM	RWP Number																																					
Job Specific ☒	2E-93-0613/K	6	C1	E-S-150																																					
Start Date	End Date	Termination Date Extended To:		By																																					
7-28-93	10-28-93																																								
Responsible Organization Kaiser Engineering																																									
Job Location 241-C Tank 106: SLUICE PIT																																									
Job Description and Type of Area: CONTAMINATION-HIGH CONTAMINATION-HIGH RADIATION AREAS: Removal of all existing equipment from the sluice pit for Decontamination and Painting of inner pit walls and floors including pit coverblocks.																																									
Primary Isotope(s): ☒ HFP ☐ MAP ☐ Cs ☐ Sr ☐ H-3 ☐ U ☐ Pu ☐ Other																																									
Radiation Emitted	Estimated Dose Rates	Contamination Levels		Radiological Worker Training Req.																																					
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MINIMUM RADIOLOGICAL PROTECTION REQUIREMENTS			SPECIAL INSTRUCTIONS (SI)																																						
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ALARA Review: CLASS 1		Pre-Job Briefing: YES ☒ NO ☐		Post-Job ALARA Review Required YES ☐ NO ☐																																					
RWP Prepared By: Randy Boast		Phone: 3-1922		HPT Phone: 373-2526/373-3500																																					
Line Management: Corey Spinks		Phone: 3-3913		Date: 7/29/93																																					
Health Physics Supervisor: Corey Spinks		Phone: 3-35270		Date: 7/30/93																																					
Caj 3 Spinks		Phone: 376-8215		Date: 7/29/93																																					
Acknowledged By: Corey Spinks		Phone: 373-3940		Date: 7-28-93																																					
RWP Change Approvals:				Date:																																					

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP START AND 241-C-106 PIT CLEANOUT

HANFORD RADIOLOGICAL WORK PERMIT				Contractor: WESTINGHOUSE HANFORD COMPANY	
General ☐	Tech. Document No.	Location Code	EAN	RWP Number	
Job Specific ☒	2E-93-0613/K	6	A1	E-S-150	
Start Date	End Date	Termination Date Extended To:		By	
7-28-93	10-28-93				
Responsible Organization Kaiser Engineering					
Job Location 241-C. Tank 106: PUMP PIT					
Job Description and Type of Area: CONTAMINATION-HIGH CONTAMINATION-HIGH RADIATION AREAS: Removal of all existing equipment from the pump pit for Decontamination and Painting of inner pit walls and floors including pit coverblocks.					
Primary Isotope(s): ☒ HFP ☐ MAP ☐ Cs ☐ Sr ☐ H-3 ☐ U ☐ Pu ☐ Other					
Radiation Emitted		Estimated Dose Rates		Contamination Levels	
☒ Alpha ☒ Beta ☒ Photons ☐ Neutrons		General Area: <100 mrem/h Maximum Contact: 2000 mrem/h		Beta-gamma: 100,000 dpm/100 cm ² Alpha: 2000 dpm/100 cm ²	
				Radiological Worker Training Req. I ☐ II ☒	
Internal Dosimetry Requirements (for routine work under this RWP, except those entering for observation only) ☒ Annual Whole Body Count ☐ Lung Count ☐ Urinalysis Isotopes to Test for (if any):					
MINIMUM RADIOLOGICAL PROTECTION REQUIREMENTS				SPECIAL INSTRUCTIONS (SI)	
HPT Coverage		Dosimetry		1. LIMITING CONDITIONS: Whole body exposure limits shall be maintained at 2 Rem/h at 30 cm. Contamination levels outside of open pit area or temporary containment tent equal to or greater than 100,000 dpm/100 cm ² Beta-gamma, 200 dpm/100 cm ² Alpha shall stop all work activity. Work shall commence ONLY after approval from the Radiological Control Manager. 2. ACTION LEVELS: Any detectable removable contamination equal to or exceeding 10,000 dpm/100 cm ² Beta-gamma or 200 dpm/100 cm ² Alpha shall require decontamination until contamination control has been restored. 3. Gammacons or PADI's shall be worn by personnel in High Radiation areas when exposure levels are equal to or greater than 100 mrem/h. 4. The listed respirator is required for radiological conditions related to the work activity described. Respiratory Protection may increase this requirements. 5. DECONTAMINATION of open pit areas will require personnel to wear protective rain gear to prevent personnel contamination. The duration of rain gear usage shall be determined by HPT. 6. HPT may ONLY increase the Radiological Protection Requirements and Protective Equipment as radiological conditions dictate when within the parameters of the dose estimates and contamination levels.	
☒	Continuous	☒	Multipurpose TLD		
	Intermittent		Basic TLD		
	Start of Job	☒	Pocket Dosimeter		
	End of Job	*	Electronic Dosimeter		
	Self Survey (if qualified)		Finger Rings		
☒	HPT Survey Required		Time Keeping		
	Auto. Survey Device	☒	WRAM Access		
	See SI#	*	See SI# 3		
MINIMUM PROTECTIVE EQUIPMENT					
☒	Coveralls		Shoe Covers		
	Lab Coat	☒	Canvas Boots		
*	Waterproof Suit	☒	Rubber Overshoes		
	Gortex Suit		Rubber Boots		
	Cap	☒	Full Face Respirator		
☒	Hood		PAPR		
☒	Surgeon's Gloves		Supplied Air Respirator		
	Leather Gloves		SCBA		
☒	Canvas & Surgeon's Gloves				
	Waterproof Gloves				
	No Personal Outer		Undressing Assistance		
	Modesty Clothing				
*	See SI# 5	*	See SI# 4		
ALARA Review: CLASS I		Pre-Job Briefings: YES ☒ NO ☐		Post-Job ALARA Review Required YES ☐ NO ☐	
RWP Prepared By: Randy Boast		Phone: 3-1922		HPT Phone: 373-2526/373-3500	
Line Management: <i>[Signature]</i>		Phone: 3-3913		Date: 7/29/93	
Health Physics Supervisor: <i>[Signature]</i>		Phone: 3-3500		Date: 7/28/93	
: <i>[Signature]</i>		Phone: 374-8215		Date: 7/28/93	
Acknowledged By: <i>[Signature]</i>		Phone: 373-3940		Date: 7-28-93	
RWP Change Approvals:				Date:	

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

HANFORD RADIOLOGICAL WORK PERMIT		Contractor: WESTINGHOUSE HANFORD COMPANY			
General ☒ [X] Job Specific ☐ []	Tech. Document No. N/A	Location Code N/A	EAN N/A	RWP Number TF-002	
Start Date 3-24-93	End Date 12-31-93	Termination Date Extended To:		By	
Responsible Organization Tank Farm Operations					
Job Location All 200 East & West Tank Farms and Facilities					
Job Description and Type of Area: SURFACE CONTAMINATION/RADIATION AREAS: MAINTENANCE AND OPERATIONS ACTIVITIES REQUIRING HP VERIFICATION SURVEYS.					
Primary Isotope(s): ☒ [X] HFP ☐ [] MAP ☐ [] Cs ☐ [] Sr ☐ [] N-3 ☐ [] U ☐ [] Pu ☐ [] Other					
Radiation Emitted ☐ [] Alpha ☒ [X] Beta ☒ [X] Photons ☐ [] Neutrons	Estimated Dose Rates General Area: <50 mrem/h Maximum Contact: <50 mrem/h		Contamination Levels Beta-gamma: <50,000 dpm/100 cm ² Alpha: SI#5 dpm/100 cm ²		Radiological Worker Training Req I ☐ [] II ☒ [X]
Internal Dosimetry Requirements (for routine work under this RWP, except those entering for observation only) ☒ [X] Annual Whole Body Count ☐ [] Lung Count ☐ [] Urinalysis Isotopes to Test for (if any):					
MINIMUM RADIOLOGICAL PROTECTION REQUIREMENTS			SPECIAL INSTRUCTIONS (SI)		
HPT Coverage		Dosimetry			
☐ [] Continuous	☒ [X]	Multipurpose TLD			
☐ [] Intermittent	☐ []	Basic TLD			
☒ [X] Start of Job	☒ [X]	Pocket Dosimeter			
☐ [] End of Job	☐ []	Electronic Dosimeter			
☐ [] Self Survey (if qualified)	☐ []	Finger Rings			
☐ [] HPT Survey Required	☐ []	Time Keeping			
☐ [] Auto. Survey Device	☐ []	WRAM Access			
☐ [] See SI# 4	☐ []	See SI# 8			
MINIMUM PROTECTIVE EQUIPMENT					
☒ [X] Coveralls	☐ []	Shoe Covers			
☐ [] Lab Coat	☒ [X]	Canvas Boots			
☐ [] Waterproof Suit	☒ [X]	Rubber Overshoes			
☐ [] Gortex Suit	☐ []	Rubber Boots			
☐ [] Cap	☐ []	Full Face Respirator			
☒ [X] Hood	☐ []	PAPR			
☐ [] Surgeon's Gloves	☐ []	Supplied Air Respirator			
☐ [] Leather Gloves	☐ []	SCBA			
☒ [X] Canvas & Surgeon's Gloves	☐ []				
☐ [] Waterproof Gloves	☐ []				
☐ [] No Personal Outer	☐ []	Undressing Assistance			
☐ [] Modesty Clothing	☐ []				
☐ [] See SI# 3	☐ []	See SI#			
1. All personnel shall review the current radiological status map posted at the Access Control Point. The radiological status map is valid one week from the last survey date. 2. All personnel shall record the required information on the Access Control Point Log prior to and after each entry. 3. Leather gloves may only be substituted for Canvas gloves. Additional surgeons gloves may be substituted for canvas gloves for jobs requiring increased dexterity. 4. Personnel exiting 241-TX, 241-LY and 204-AR are required to perform a personnel survey with an Alpha and beta-gamma instrument. 5. Limiting Conditions: This RWP is VOID if Dose-rates exceed 50 mrem/h or contamination levels exceed 50,000 dpm/100cm ² Beta/Gamma or 500 dpm/100cm ² Alpha. 6. Weekly Wram Access: Entry for up to one shift rotation. Personnel shall report to the WRAM station when pocket dosimeter reads >25 mR. Pocket dosimeter shall remain at the Hanford site. 7. AP Tank Farm: The listed work may be performed without the required minimum protective equipment. 8. HPT base line survey required when accessing potentially contaminated systems. When the survey results indicate contamination, a post survey is required.					
ALARA Review: CLASS 3		Pre-Job Briefing: YES ☐ [] NO ☒ [X]		Post-Job ALARA Review Required YES ☐ [] NO ☒ [X]	
RWP Prepared By: Line Management <i>Steve Sparks</i>		Phone: 3-3913		HPT Phone: 373-2526/373-3500	
Health Physics Supervisor <i>John Kelly</i>		Phone: 3-2777		Date: 4-8-93	
<i>John Stredach</i>		Phone: 3-1281		Date: 4-8-93	
Acknowledged By: <i>D. F. ...</i>				Date: 4-12-93	
RWP Change Approvals:				Date:	

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

ALARA MANAGEMENT WORKSHEET

2E-93-00613/K

- A) COVER BLOCKS WILL BE SET AWAY FROM PITS INTO A CONTAINMENT TENT TO BE WORKED ON.
- B) PITS WILL BE DECONTAMINATED/CLEANED AND PAINTED AFTER REMOVING EXCESS JUMPERS AND EQUIPMENT.
- C) LEAD BLANKETS WILL BE HUNG FOR SHIELDING AS NECESSARY AND PRACTICAL TO REDUCE DOSE RATES FROM THE PITS TO PERSONNEL WORKING AROUND THE PITS.
- D)
- E) CONTAINMENT TENTS ARE TO BE USED OVER THE PITS AND COVER BLOCKS.
- F)
- G) YES. SUFFICIENT WASTE CONTAINERS HAVE BEEN ORDERED TO SEGREGATE AND PROPERLY DISPOSE OF ALL WASTE.
- H) NUMBER OF PERSONNEL HAS BEEN REDUCED TO MINIMUM REQUIRED TO SAFELY PERFORM THE TASKS.
- I) NO TOOLS OR MATERIALS ARE STORED AT THE JOB SITE.
- J) ALL ENTRY / EGRESS ROUTES ARE IDENTIFIED.

*** COLLECTIVE DOSE CANNOT BE ESTIMATED UNTIL PITS ARE OPENED DUE TO LACK OF HISTORICAL DATA.

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

<div style="font-size: 1.5em; font-family: cursive;">PIT 'A'</div>		POST ALARA REVIEW		
RWP No. ES-150	Work Package No. 2E-93-00613/K	Area 200-E	Facility 241-C	Specific Job Location TANK 106
Job Title CLEAN & PAINT PITS		Job Description REMOVE EXISTING EQUIPMENT FROM PITS / DECONTAMINATE & PAINT PITS INCLUDING COVER BLOCKS		
Describe any modifications made to the original work plan to <u>increase</u> , <u>decrease</u> , or <u>change</u> the following:				
1. Dosimetry				
2. Respiratory Protection				
3. Protective Clothing				
4. Time/Distance/Shielding				
5. Personnel				
Evaluate the effectiveness of the hazardous substance exposure controls that were implemented. List dose reduction savings, decontamination factors achieved, and installed engineering applications which attributed to reduction.				
Describe any problems encountered, abnormal events, or situations that required the use of stop work authority.				
List <u>Lessons Learned</u> and <u>corrective actions</u> taken to prevent recurrence.				
(If more space is needed, use continuation page)				
Estimated Collective Dose <div style="text-align: right; font-size: 0.8em;">Person/Rem</div>		Actual Collective Dose <div style="text-align: right; font-size: 0.8em;">Person/Rem</div>		Corrected Dose Savings/Difference <div style="text-align: right; font-size: 0.8em;">Person/Rem</div>
Identify the individual performing the Post ALARA Review				
Person in Charge (PIC)			Date	
Cognizant Engineer			Date	
Other			Date	

Distribution: Original - ALARA Program Office Copy - Work Package Copy - Facility ALARA Team Chair

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

POST ALARA REVIEW (Continuation Sheet)				
RWP No. ES-150	Work Package No. 2E-93-00613/K	Area 200-E	Facility 241-C	Specific Job Location TANK 106
Job Title CLEAN & PAINT PITS		Job Description REMOVE EXISTING EQUIPMENT FROM PITS / DECONTAMINATE & PAINT PITS INCLUDING COVER BLOCKS		
No.	<div style="border-bottom: 1px solid black; height: 40px; margin-bottom: 5px;">Problem:</div> <div style="border-bottom: 1px solid black; height: 40px;">Solution:</div>			
No.	<div style="border-bottom: 1px solid black; height: 40px; margin-bottom: 5px;">Problem:</div> <div style="border-bottom: 1px solid black; height: 40px;">Solution:</div>			
No.	<div style="border-bottom: 1px solid black; height: 40px; margin-bottom: 5px;">Problem:</div> <div style="border-bottom: 1px solid black; height: 40px;">Solution:</div>			
No.	<div style="border-bottom: 1px solid black; height: 40px; margin-bottom: 5px;">Problem:</div> <div style="border-bottom: 1px solid black; height: 40px;">Solution:</div>			
No.	<div style="border-bottom: 1px solid black; height: 40px; margin-bottom: 5px;">Problem:</div> <div style="border-bottom: 1px solid black; height: 40px;">Solution:</div>			
Person in Charge (PIC)		Date	Cognizant Engineer	

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

PIT 'B'		POST ALARA REVIEW		
RWP No. ES-150	Work Package No. 2E-93-00613/K	Area 200-E	Facility 241-C	Specific Job Location TANK 106
Job Title CLEAN & PAINT PITS		Job Description REMOVE EXISTING EQUIPMENT FROM PITS / DECONTAMINATE & PAINT PITS INCLUDING COVER BLOCKS		
<p>Describe any modifications made to the original work plan to <u>increase</u>, <u>decrease</u>, or <u>change</u> the following:</p> <ol style="list-style-type: none"> 1. Dosimetry 2. Respiratory Protection 3. Protective Clothing 4. Time/Distance/Shielding 5. Personnel 				
<p>Evaluate the effectiveness of the hazardous substance exposure controls that were implemented. List dose reduction savings, decontamination factors achieved, and installed engineering applications which attributed to reduction.</p> <p>Describe any problems encountered, abnormal events, or situations that required the use of stop work authority.</p> <p>List <u>Lessons Learned</u> and <u>corrective actions</u> taken to prevent recurrence.</p> <p>(If more space is needed, use continuation page)</p>				
Estimated Collective Dose		Actual Collective Dose		Corrected Dose Savings/Difference
Person/Rem		Person/Rem		Person/Rem
Identify the individual performing the Post ALARA Review				
Person in Charge (PIC)				Date
Cognizant Engineer				Date
Other				Date

Distribution: Original - ALARA Program Office Copy - Work Package Copy - Facility ALARA Team Chair

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

JST ALARA REVIEW (Continuation of Set)				
RWP No. ES-150	Work Package No. 2E-93-00613/K	Area 200-E	Facility 241-C	Specific Job Location TANK 106
Job Title CLEAN & PAINT PITS		Job Description REMOVE EXISTING EQUIPMENT FROM PITS / DECONTAMINATE & PAINT PITS INCLUDING COVER BLOCKS		
No.	Problem:			
	Solution:			
No.	Problem:			
	Solution:			
No.	Problem:			
	Solution:			
No.	Problem:			
	Solution:			
No.	Problem:			
	Solution:			
Person in Charge (PIC)		Date	Cognizant Engineer	

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

<div style="display: flex; justify-content: space-between;"> PIT 'C' POST ALARA REVIEW </div>				
RWP No. ES-150	Work Package No. 2E-93-00613/K	Area 200-E	Facility 241-C	Specific Job Location TANK 106
Job Title CLEAN & PAINT PITS		Job Description REMOVE EXISTING EQUIPMENT FROM PITS / DECONTAMINATE & PAINT PITS INCLUDING COVER BLOCKS		
<p>Describe any modifications made to the original work plan to <u>increase</u>, <u>decrease</u>, or <u>change</u> the following:</p> <ol style="list-style-type: none"> 1. Dosimetry 2. Respiratory Protection 3. Protective Clothing 4. Time/Distance/Shielding 5. Personnel <p>Evaluate the effectiveness of the hazardous substance exposure controls that were implemented. List dose reduction savings, decontamination factors achieved, and installed engineering applications which attributed to reduction.</p> <p>Describe any problems encountered, abnormal events, or situations that required the use of stop work authority.</p> <p>List <u>Lessons Learned</u> and <u>corrective actions</u> taken to prevent recurrence.</p> <p>(If more space is needed, use continuation page)</p>				
Estimated Collective Dose		Actual Collective Dose		Corrected Dose Savings/Difference
Person/Rem		Person/Rem		Person/Rem
Identify the individual performing the Post ALARA Review				
Person in Charge (PIC)				Date
Cognizant Engineer				Date
Other				Date

Distribution: Original - ALARA Program Office Copy - Work Package Copy - Facility ALARA Team Chair

POST ALARA REVIEW (Continuation Sheet)				
RWP No. ES-150	Work Package No. 2E-93-00613/K	Area 200-E	Facility 241-C	Specific Job Location TANK 106
Job Title CLEAN & PAINT PITS		Job Description REMOVE EXISTING EQUIPMENT FROM PITS / DECONTAMINATE & PAINT PITS INCLUDING COVER BLOCKS		
No.	Problem:			
	Solution:			
No.	Problem:			
	Solution:			
No.	Problem:			
	Solution:			
No.	Problem:			
	Solution:			
No.	Problem:			
	Solution:			
Person in Charge (PIC)		Date	Cognizant Engineer	
			Date	

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

ALARA MANAGEMENT WORKSHEET (AMW)						
RVP Number E-S-150		Date 6-29-93		Page 1 of 2		
PART I PRE-JOB INFORMATION						
Work Package No. or Equivalent 2E-93-00613/K		Area/Facility/Location 200E/241-C/Tank 106				
Job Title/Description: Removal of all existing equipment from pit(s) for Decontamination and Painting of inner pit walls and floors including pit coverblocks.				ALARA Review Class		
				Check One		
				1	2	3
X						
PART II ALARA REVIEW						
PART IIA ESTIMATED COLLECTIVE DOSE UNKNOWN PERSON/REM						
PART IIB PROTECTIVE MEASURES				YES	NO	Reference/Explanation
A.	Can any or all phases of the work be moved to an area with lower exposure levels?					
B.	Can the item or work area be decontaminated to reduce risk?					
C.	Can additional shielding be used to reduce dose rates?					
D.	Can time saving procedures, techniques, or mock ups be used?					
E.	Can Best Available Technology (BAT) alternatives be employed (i.e., special tools, ventilation systems, temporary containment structures, equipment)?					
F.	Can all hazards, conditional changes or variables that affect the work be planned for?					
G.	Can method for waste minimization, segregation, removal and/or disposal be planned for?					
H.	Can the number of personnel entering the work location be reduced?					
I.	Can existing material, tools, or equipment currently at the job location be used to complete the job (i.e., previously contaminated tools)?					
J.	Can alternate entry and egress routes be identified and planned for prior to initiating work?					
PART IIC ESTIMATED CORRECTED COLLECTIVE DOSE UNKNOWN PERSON/REM						
PART III POST-JOB REVIEW						
Is Post ALARA Review (PAR) required?				YES	NO	
				X		
PART IV AMW REVIEW						
AMW Prepared				Date 7-2-93		
The PIC, Cognizant Engineer, or designee shall review the AMW and sign documenting the review in Part IV below. The completed AMW shall be forwarded to the locations/personnel listed in the distribution portion of this form as soon as possible.						
Person in Charge (PIC)				Date 8-13-93		
Cognizant Engineer				Date		
Other				Date		

DISTRIBUTION: Original - OHS Central Files ALARA Program Office
Facility ALARA Team Chair Work Package

[illegible]

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP START AND 241-C-106 PIT CLEANOUT

JOB SAFETY ANALYSIS										Page 1 of 2	
P. No. <u>W-320 Project</u>		Work Order No. <u>ER3022</u>		Area <u>200-E</u>		Bldg. <u>C-Farm</u>					
Prepared By <u>John R. Stredwick</u>		Date <u>6-8-93</u>		KEH No. <u>LOT-9353885</u>		W-320					
Scope/Description: <u>Tank 106-C Vault Clean Out And Painting</u>											
Emergency Contact Person(s): Primary: <u>John Stredwick</u> Secondary: <u>Jeff Simundson</u>											
Emergency Radio/Phone No.: <u>J-33 1-56 3-1281 3-4685 911</u>											
Specific Work Location(s): <u>Tank 106-C Vaults at C-Tank Farm in 200-E</u>											
KNOWN OR POTENTIAL HAZARDS:											
	Yes	No	Reference			Yes	No	Reference			
			KEH	Contractor				KEH	Contractor		
1. Radiation Area Work	✓	✓		<u>E-S-150</u>	10. Hazardous Materials	✓	✓		<u>Old dumpers</u>		
2. Hazardous Waste Operation	✓	✓		<u>WHC 350 piers</u>	11. Respiratory Hazards	✓	✓				
3. Confined Space	✓	✓			12. Electrical Hazards		✓				
4. Welding/Burning		✓			13. Lock and Tag	✓	✓		<u>15.105</u>		
5. Hazardous Work (WHC Permit)		✓			14. Scaffolding		✓				
6. Roof Work		✓			15. Aerial Lifts		✓		<u>IS 1081 J.L.G.</u>		
7. Fall Hazards (> = 10')		✓			16. Asbestos Removal	✓	✓				
8. Excavation/Trenching		✓			✓ = Formal training required * = Items that require a permit/form/report						
9. Asbestos Inspection Report		✓		<u>OSI report</u>							
Other Hazards:			Yes	No	Control Measures:						
1. Temperature Extremes	✓				<u>Input IS&H procedure Ref. for Heat & Cold/IN 4</u>						
2. Poor Lighting		✓									
3. Animals/Insects		✓									
4. Process Chemicals/Steam		✓			<u>Tank C-106 in C-Farm</u>						
5. Dust		✓									
6. Flammable/Combustible Materials		✓			<u>When Tank C-106 Containment is Open</u>						
7. Ladders		✓									
8. Wet/Slippery Floors		✓									
9. Uneven Terrain		✓			<u>Wear Proper Foot Protection</u>						
10. Open Excavations/Trenches		✓			<u>Barricade Around Open Vaults & Hand Rail</u>						
11. Adjacent Water Hazard		✓									
12. Vehicle Traffic		✓									
13. Heavy Equipment		✓			<u>Stay Clear of Equipment</u>						
14. Rigging Operation		✓			<u>Follow Hanford Hoisting & Rigging Manual</u>						
15. Manual Lifting		✓			<u>Follow Proper Lifting Techniques</u>						
16. Power Tools		✓			<u>Use GFCI on all Electrical Equipment</u>						
17. Pinch Points		✓			<u>Wear leather Gloves or Canvas</u>						
18. Falling Objects		✓									
19. Sharp Objects		✓			<u>Wear leather Gloves or Canvas</u>						
20. Overhead Obstructions		✓									
21. Site Control (Signs/Barricades)		✓			<u>Barricade Around Open Vaults & Hand Rail</u>						
22. Remote Work Area		✓									
23. Other:		✓			<u>See Attached Respiratory Protection Map.</u>						
IM DRESS REQUIREMENTS: Hard Hat, Safety Glasses, Proper Footwear, Full Length Pants, Shirt with Sleeves											
APPROVALS											
Does further evaluation of the job steps, associated hazards, or safety measures need to be performed? Yes ☒ No ☐											
If Yes, continue job safety analysis on the following pages:											
<u>John R. Stredwick 3-1281</u> KEH Supervisor				<u>Jeff Simundson 7/12/93</u> Industrial Safety Representative				<u>Rene B. Givens 7/12-98</u> Industrial Hygiene, if required			
KEH 0898.01 (11/92)											

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

Job Safety Analysis

Pg. 2 of 2

Work Activity	Hazard	Safety Measures
Clean out the Vaults at tank C-106.	Fall hazards present after cover blocks have been removed.	Install steel handrailing before removing vault cover blocks.
		Post signs reading No Entry Fall Hazard Present.
	Potential explosion hazard from Venting tank C-106	Use spark resistant tools for all work activities when Containment open
Take photos of insides of vaults.	Fall hazards	Follow Fall Protection Work Plan Attached To J.L.G.
General Work Activities	Start-Up of pump in Vaults	Lock & Tag pump and all other Electrical Equipment.
Entry into C-Tank Farm	Venting Tanks	Fresh air required. See attached map for respiratory protection zone.
Painting of inside of Vaults. through remote techniques. (Glove box)	Paint product is Flammable	Use copus blower with HEPA filter. Monitor with MSA 260 LEL & O2 monitor Copus blow in from the top & pull out from the bottom.

KEH-398.02 (3-87)

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

DON'T SAY IT -- Write It!

DATE: July 7, 1993

TO: John Stredwick

S2-53

FROM: David Berg

Telephone: 373-4961

SO-09

SUBJECT: ASBESTOS STATEMENT FOR 106-C PIT CLEANOUT

Work package 2E-93-00613/K has been issued to clean out the pits on Tank 241-106-C. This work is not projected to encounter any asbestos containing materials. If any asbestos containing materials are encountered, stop work immediately and contact the Major Maintenance PIC.

Work will resume on direction of the PIC after the area has been assessed and the proper clean up initiated.

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

DON'T SAY IT --- Write It!

DATE October 7, 1992

TO Distribution

FROM J. P. Simundson
3-4685

cc:

SUBJECT JLG FALL PROTECTION WORK PLAN

I have developed a standardized Fall Protection Work Plan for operating boom supported elevated work platforms (JLG type aerial lifts). Attached is a copy of this plan. This Fall Protection Work Plan has been placed with the operation manual on all KEH owned JLG lifts to provide consistency during pre-job planning. Employees utilizing the JLG lift must sign the attached Work Plan Signoff Sheet specific to the lift they will operate.

Although the Fall Protection Work Plan for JLG type lifts has been standardized, Prejob Planning documents are still required per KAP 21.12 for all KEH work activities. The standardized Fall Protection Work Plan should be referenced in the Prejob Planning documents. When KEH work activities require the use of rented or loaned JLG type equipment the standardized Fall Protection Work Plan and Work Plan Signoff Sheet must be attached with the Prejob Planning documents.

Please contact myself or your area Safety Representative for any questions or comments.

+ TO MAKE LIFE LAST, PUT SAFETY FIRST +

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

KAISER ENGINEERS HANFORD		WORK PLAN SIGNOFF		
I have read the attached Prejob Plan, Hazardous Work Permit and/or ISA and understand the hazards associated with this job.				
Job Number <u>ER 3022</u>		Job Location <u>C-Farm Tank C-106</u>		
Date	Payroll No.	Signature	Asbestos Cert. No. and Expiration Date (Asbestos Work Only)	Competent Person Date Assigned
7-21-93	10-435	Larry L. Hall		
7-21-93	11-0640	W. K. H. H.		
7-21-1993	4-805	A. Randy Shipman		
7-21-93	3-1391	Kevin W. Walker		
7-21-93	3-1582	Vance W. Walker		
7-22-93	3-559	SC Brown		
7-22-93	3-1445	Tom J. L.		
7-22-93	10-0487	Larry B. Hunt		
7-22-93	10-0404	A. P. Mortimer		
7-26-93	4-0901	A. P. DAVIS		
7-27-93	04-932	Scott Glenn		
7-27-93	3-1607	Ken Cockburn		
7-27-93	3-1723	D. Larrinaga		
7-27-93	3-1739	R. W. Bellinger		
7-27-93	3-1667	P. L. Waller		
7-29-93	3-1721	R. J. H.		
7-25-93	11-0640	W. K. H. H.		
8-5-93	10-0497	Phil L. L.		
8-5-93	3-1635	Lee		
8-6-93	3-2420	John W. L.		

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

KAISER ENGINEERS HANFORD		WORK PLAN SIGNOFF		
I have read the attached Prejob Plan, Hazardous Work Permit and/or ISA and understand the hazards associated with this job.				
Job Number <u>PCP W105-21</u>		Job Location <u>242A/230E</u>		
Date	Payroll No.	Signature	Asbestos Cert. No. and Expiration Date (Asbestos Work Only)	Competent Person Date Assigned
8-5-93	04-0901	Alan P. Hain		
8-5-93	4-805	A. Randy Shipman		
8-5-93	53-280	Philip R. Joseph		
8/5/93	11-0602	Dale Thornton		
8/5/93	11-0492	John Blanchard		
8/5/93	53-253	J. Bretton		
8/5/93	3-1675	John B. Lanning		
8/5/93	3-1607	Jim Cochrane		
8/5/93	3-1721	Bob [unclear]		
8-5-93	3-1667	P.L. Waller		
8-5-93	3-1552	V. E. Waller		
8-5-93	31635	L.C. Lee		
8-5-93	3-1139	R.W. Bellinger		
8-5-93	3-959	SC Mon		
8-5-93	10-487	L.R. [unclear]		
8-5-93	11-0616	W. H. [unclear]		
8-5-93	10-0497	S. J. [unclear]		
8-6-93	03-1746	Donald G. Girard		
8/6/93	03-1747	[unclear]		
8/6/93	3-1748	Joe [unclear]		
8/6/93	6-3061	John C. [unclear]		
8/6/93	06-2420	John W. [unclear]		
8/6/93	3040911	R.T. [unclear]		

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

Job Safety Analysis

Pg. 2 of 3

Work Activity	Hazard	Safety Measures
Clean out the Vaults at tank C-106.	Fall hazards present after cover blocks have been removed.	Install steel handrailing before removing vault cover blocks.
		Post signs reading No Entry Fall Hazard Present.
	Potential explosion hazard from Venting tank C-106	Use spark resistant tools for all work activities when Containment open
Take photos of insides of vaults.	Fall hazards	Follow Fall Protection Work Plan Attached To J.L.G.
General Work Activities	Start-Up of pump in Vaults	Lock & Tag pump and all other Electrical Equipment.
Entry into C-Tank Farm	Venting Tanks	Fresh air required. See attached map for respiratory protection zone.
Painting of inside of Vaults. through remote techniques. (Glove box) ref 7/12/88	Paint product is Flammable	Use copus blower with HEPA filter. Monitor with MSA 260 LEL & O ₂ monitor Copus blow in from the top & pull out from the bottom.

KEH-898.02 (3-87)

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

JOB SAFETY ANALYSIS (Continued)			Page 3 of 3
Work Activity	Hazards Present	Required Safety Measures/PPE	
<p>REV #1 8/4/93</p> <p>Crane operation</p>	<p>Cascade air- becoming pinched or damaged</p>	<p>One assigned employee to tend operators air line during rigging operation.</p> <p align="right">J.A. 8/4/93 J.R. 8/4/94</p>	
<p>Rigging operation</p>	<p>Crane doesn't have anti- to block cut-out</p>	<p>One assigned Ironworker to watch over rigging operation, to make sure crane doesn't become to- blocked</p> <p align="right">J.R. 8-6-93</p>	

KEN 0898.02 (09/92) KEF047

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

14-00000-10114-001

DON'T SAY IT --- Write It!

John Shedwick-

DATE 7/12-93

FROM

Robert Spivey

n/m

Application of Amercoat 33, Amercoat 10, Amercoat 187, Amercoat 12, Rust-Ulum - Rust Refiner, and PPG-6-330 Safety Yellow will require the following:

- ① Neoprene gloves
- ② Splash goggles
- ③ Recommended to face organic cartridge respirator - products contain organics that will be irritating to some individuals.

for mt of doors

"TO MAKE LIFE LAST, PUT SAFETY FIRST"

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

FALL PROTECTION WORK PLAN

E: Employees shall review the requirements of this fall protection work plan prior to starting work. This plan shall be available at the job site during work activities. Also, employees shall be trained and instructed in accordance with IS-10, Part E.

JOB LOCATION/DESCRIPTION: Operation of boom supported elevating work platforms (JLG type aerial lifts).

1. Identify all fall hazards greater than 10 feet in the work area:

☐ Leading edge	☐ Scaffold erection/disassembly
☐ Perimeter edge	☐ Stairways
☐ Floor openings	☐ Ladders
☒ Other: Falls from JLG man basket	

2. Method of fall protection to be provided:

☐ Fall Restraint	☒ Guardrails	☐ Warning Line
☒ Fall Arrest	☐ Catch Platform	☐ Safety Monitor

Describe: A class III body harness shall be worn by all personnel in the JLG man basket. A lanyard, no longer than six feet, shall be attached to the back "D" ring of the harness and proper attachment point on the JLG platform. Belting off to an adjacent structure or equipment while working from aerial lift shall not be permitted.

3. Describe the correct procedures for the assembly, maintenance, inspection and disassembly of the fall protection system to be used.

Assembly

All class III full body harnesses shall be worn in accordance with the manufacturers recommendations.

Maintenance

When the full body harnesses and lanyards are not in use they shall be stored so that they are not subject to damage.

Inspection

The user of the fall protection system shall inspect the attachment point, harness, and lanyard prior to use. If defective components are found they shall not be used.

Disassembly

The harness and lanyard shall not be taken off until the JLG is stopped and the man basket is positioned on the ground.

4. Describe the correct procedures for the handling, storage, and securing of tools and materials:

Tools and materials shall be hand held or stored on the floor of the man basket at all times.

Describe the method of providing overhead protection for workers who may be in or pass through the area below the work site:

☒ Barricading	☒ Hard hats required

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

FALL PROTECTION WORK PLAN (Continued)

☐ Warning signs ☐ Toeboards on scaffolds and floor openings
Describe: Hard hats are required for all workers below the overhead work site.
Also, work areas shall be barricaded in accordance with KAP 21.25.

6. Describe the method for prompt, safe removal of injured workers:

☒ Initiate emergency response (811)
☐ Utilize lift truck or personnel platform
☐ Utilize ladders
☐ Utilize scaffolds
☐ Use drop lines or retraction devices
Other: In the event of an emergency ground controls can be used to bring injured employees to a safe location.

Approvals:

Fall Protection Plan Completed by: Jeff P. Simundson

Approved by: SEE BELOW
Responsible Supervisor

[Signature]
Safety Representative

[Signature]
Construction Services Manager

[Signature] 9/24/92
Construction Area Manager

[Signature]
Construction Area Manager

[Signature] 9/24/92
Construction Area Manager

[Signature]
Well Drilling Manager

[Signature] 9/24/92
Environmental Restorations Manager

[Signature] 10/2/92
Equipment Shop Superintendant

[illegible]

KEH-1779 00(07/88)

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

SECTION V - HEALTH HAZARD DATA

EFFECTS OF OVEREXPOSURE: Vapor and/or spray/mist can be harmful. Irritating to skin, mucous membranes, eyes and respiratory system. Excessive inhalation of vapors can cause headache, nausea, dizziness or asphyxiation. Can be harmful or fatal if swallowed. Kidney and liver damage can occur. Can cause possible skin and eye burns and/or injury. Skin and respiratory allergic reaction can occur.

EMERGENCY AND FIRST AID PROCEDURES: Overexposure to vapors: provide fresh air. If breathing is labored give oxygen or artificial respiration. For skin contact, wash thoroughly with soap and water. For eyes, flush immediately with plenty of water for at least 15 minutes and get medical attention. Launder contaminated clothing before use. If swallowed, DO NOT induce vomiting; call physician immediately.

SECTION VI - REACTIVITY DATA

STABILITY: Stable **CONDITIONS TO AVOID:** Heat, open flame, arc or sparks

COMPATIBILITY (Materials to Avoid): Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: CO and CO₂, HCl fumes from vinyl resin, iron oxide and nitrogen oxide fumes which should not exceed 5mg/m³

HAZARDOUS POLYMERIZATION: Will not occur **RULE 102:** Non-photochemically reactive

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Eliminate all sources of ignition. Use absorbent cleanup materials.

WASTE DISPOSAL METHOD: In separate closed metal container in accordance with all applicable regulations.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION: NIOSH approved respirator. Air-fed hood or self-contained, supplied breathing apparatus.

VENTILATION: Sufficient ventilation, in volume and pattern, should be provided to keep contaminant concentrations below TLV limit.

PROTECTIVE GLOVES: Neoprene

ADDITIONAL PROTECTIVE EQUIPMENT: Full protective clothing. Use protective shoe coverings. Confined areas, tanks or stagnant air conditions, use explosion- and spark-proof equipment.

FACE PROTECTION: Splash proof goggles or face shield

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: Keep container closed. Store in cool, ventilated area.

PRECAUTIONS: Avoid prolonged breathing of vapors or spray mist or contact with skin and eyes. Destroy all leather material which cannot be decontaminated.

MATERIAL SAFETY DATA SHEET

(Approved by U.S. Department of Labor "Essentially Similar" to Form OSHA-20)

DATE: 06/15/85 SUPERSEDES: 9/80 TRADE NAME: Amercoat

ID CODE NO: 12

PRODUCT CLASS: Cleaner

HEALTH: Danger

INGREDIENTS	CAS NO.	% BY WT	OCCUPATIONAL EXPOSURE LIMITS TLY/(PPM)TWA	VP mm @ 68°F	TOXICITY DATA/LD50/ORA
Acetone	67-64-1	<50	750	185	10.7 ml/kg
Toluene	108-88-3	<30	100/skin	22	0.5-5 g/kg
Xylene	1330-20-7	<20	100	6	0.05-0.5 g/kg
Cycloparaffins	DNA	<20	225	0.3	DNA

<u>BOILING RANGE:</u>	134-282°F	PERCENT VOLATILE	<u>VAPOR DENSITY:</u>	Lighter than air
<u>WEIGHT PER GALLON:</u>	6.8 lbs	BY VOLUME: 100	<u>EVAPORATION RATE:</u>	Faster than ether

FLAMMABLE CLASSIFICATION: OSHA: Flammable liquid-Class IB FLASH POINT: 2°F/PMCC

LEL: 1.3

EXTINGUISHING MEDIA: Foam, CO₂, dry chemical

UNUSUAL FIRE AND EXPLOSION HAZARDS: Isolate from heat, electrical equipment, sparks and open flame. Wear self-contained breathing apparatus.

0164r/3 DNA - data not available NP - not pertinent

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

SECTION V - HEALTH HAZARD DATA

EFFECTS OF OVEREXPOSURE: Vapor and/or spray mist can be harmful. Irritating to skin, mucous membranes, eyes and respiratory system. Excessive inhalation of vapors can cause headache, nausea, dizziness or asphyxiation. Can be harmful or fatal if swallowed. Kidney and liver damage can occur.

EMERGENCY AND FIRST AID PROCEDURES: Overexposure to vapor - provide fresh air. If breathing is labored give oxygen or artificial respiration. For skin contact, wash thoroughly with soap and water. For eyes, flush immediately with plenty of water for at least 15 minutes and get medical attention. Launder contaminated clothing before reuse. If swallowed, DO NOT induce vomiting - call physician immediately.

SECTION VI - REACTIVITY DATA

STABILITY: Stable

CONDITIONS TO AVOID: Heat, open flame, arc or sparks

INCOMPATIBILITY (Materials to Avoid): Strong oxidizers, alkalies

HAZARDOUS DECOMPOSITION PRODUCTS: CO and CO₂

HAZARDOUS POLYMERIZATION: Will not occur

RULE 102: Photochemically reactive

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Eliminate all sources of ignition. Use absorbent cleanup materials.

WASTE DISPOSAL METHOD: In separate closed metal container in accordance with all applicable regulations.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION: NIOSH approved respirator. In confined areas, tanks or stagnant air conditions, use airline hood-type respirator.

VENTILATION: Sufficient ventilation, in volume and pattern, should be provided to keep air contaminant concentrations below TLV limit.

PROTECTIVE GLOVES: Neoprene

OTHER PROTECTIVE EQUIPMENT: Coveralls. In confined areas, tanks or stagnant air conditions, use explosion and spark-proof equipment.

EYE PROTECTION: Splash proof goggles or face shield.

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: Keep container closed when not in use. Store in cool, dry, well-ventilated area.

OTHER PRECAUTIONS: Avoid prolonged breathing of vapors or spray mist or contact with skin and eyes.

**TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT**

NPCA 1-82

MATERIAL SAFETY DATA SHEET

FOR COATINGS, RESINS AND RELATED MATERIALS
(Approved by U.S. Department of Labor "Essentially Similar" to Form OSHA-20)

SECTION I

DATE: 06/15/85 **SUPERSEDES:** 9/80 **TRADE NAME:** Amercoat
MANUFACTURER: Ameron Protective Coatings Division
201 North Berry Street
Brea, CA 92621
(714) 529-1951
PRODUCT CLASS: Thinner
HEALTH: Warning

SECTION II - HAZARDOUS INGREDIENTS

INGREDIENTS	CAS NO.	% BY WT	OCCUPATIONAL EXPOSURE LIMITS TLV/(PPH)/TWA	VP mm Hg @ 68°F	TOXICITY DATA/LOSO/ORA
Methyl Isobutyl ketone	108-10-1	<50	50	16	0.5-5 g/k
Toluene	108-88-3	<50	100/skin	22	0.5-5 g/k
Xylene	1330-20-7	<20	100	6	0.05-0.5 g/k
Naphtha	8030-30-6	<20	200	40	0.5-5 g/k

SECTION III - PHYSICAL DATA

BOILING RANGE: 218-282°F **PERCENT VOLATILE:** 100% **VAPOR DENSITY:** Heavier than air
WEIGHT PER GALLON: 6.8 lbs. **EVAPORATION RATE:** Faster than ether

SECTION IV - FIRE AND EXPLOSION DATA

FLAMMABLE CLASSIFICATION: OSHA: Flammable Liquid Class IB **FLASH POINT:** 36°F/PMCC
DOT: Flammable Liquid **LEL:** 1.4
EXTINGUISHING MEDIA: Foam, CO₂, dry chemical
UNUSUAL FIRE AND EXPLOSION HAZARDS: Isolate from heat, electrical equipment, sparks and open flame. Wear self-contained breathing apparatus.

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

SECTION V - HEALTH HAZARD DATA

EFFECTS OF OVEREXPOSURE: Vapor harmful. Can cause irritation to skin, eyes and mucous membranes. Excessive exposure can cause nausea, vomiting, dizziness or asphyxiation. May be harmful or fatal if swallowed. Kidney and liver damage can occur.

EMERGENCY AND FIRST AID PROCEDURES: - Excessive exposure to vapor - provide fresh air. Give artificial respiration if breathing is labored. For skin contact wash thoroughly with soap and water. For eyes, flush immediately with plenty of water for at least 15 minutes and get medical attention. - If swallowed, DO NOT induce vomiting; call physician. Launder contaminated clothing before reuse.

SECTION VI - REACTIVITY DATA

STABILITY: Stable **CONDITIONS TO AVOID:** Heat, open flame, arc or sparks

COMPATIBILITY (Materials to Avoid): Strong oxidizers

DANGEROUS DECOMPOSITION PRODUCTS: CO and CO₂

DANGEROUS POLYMERIZATION: Will not occur **RULE 102:** Photochemically reactive

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Eliminate all sources of ignition. Use absorbent cleanup materials.

WASTE DISPOSAL METHOD: In separate closed metal container in accordance with all applicable regulations.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION: NIOSH approved respirator. In confined areas, tanks or stagnant air conditions, use airline hood-type respirator.

VENTILATION: Sufficient ventilation, in volume and pattern, should be provided to keep contaminant concentrations below TLV limit.

PROTECTIVE GLOVES: Neoprene

ADDITIONAL PROTECTIVE EQUIPMENT: In confined areas, tanks, or stagnant air conditions, use isolation- and spark-proof equipment.

FACE PROTECTION: Splash proof goggles or face shield.

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: Keep container closed. Store in cool, ventilated area.

ADDITIONAL PRECAUTIONS: Avoid prolonged breathing of vapors or contact with skin and eyes.

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

14-0000-10110-001

DON'T SAY IT --- Write It!

10 John Shedwick-

DATE 7/12-93

FROM Robert D. Jones

sh/hell

Application of Amercoat 33, Amercoat 10, Amercoat 187, Amercoat 12, Rust-Oleum - Rust Reformer, and PPG-6-330 Safety Yellow will require the following:

- ① Neoprene gloves
- ② Splash goggles
- ③ Recommended to face organic cartridge respirator - products contain organics that will be irritating to some individuals.

for mt of done.

TO MAKE LIFE LAST, PUT SAFETY FIRST

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

*****MATERIAL SAFETY DATA SHEET*****
For Coatings, Resins and Related Materials

MSDS # 30306

SECTION I-PRODUCT AND PREPARATION INFORMATION

MANUFACTURER: RUST-OLEUM CORPORATION EMERGENCY AND INFORMATION
ADDRESS: 11 Hawthorn Parkway TELEPHONE: (708) 367-7700
Vernon Hills, IL
60061

PRODUCT CLASS: Vinyl copolymer emulsion
MANUFACTURERS CODE: 7830 and 3575
TRADE NAME: RUST REFORMER
DATE OF PREPARATION: December 18, 1989 (jco)

H 1
F 0
R 0

Irritant, CNS, liver, kidney,
blood, brain, lung, reproductive

SECTION II-HAZARDOUS INGREDIENTS

INGREDIENT/CAS No	EXPOSURE LIMITS				
	WT %	ACGIH-TLV	OSHA-PEL	LEL	mm Hg@20C
Diethylene glycol methyl ether/111-77-3	1%	NE	NE	1.5%	1.0
Tannic acid/1401-55-4	1%	NE	NE	NA	NA

* Nearest 5%

NE-not established NA-not applicable

SECTION III-PHYSICAL DATA

Boiling range: 212-400 F Vapor density- Heavier than air
(100-204 C)
Evaporation Rate: Slower % Volatile: 57% Wt/gal: 10.5 lbs
(Ether=1) (by volume) pH: 1.3-2.3

SECTION IV-FIRE AND EXPLOSION HAZARDS

Flammability Classification: Non-flammable Flashpoint: NA
DOT Classification: Not applicable

Extinguishing Media: Not applicable

Special Fire Fighting Procedures:

Water may be used to cool closed containers to prevent build-up of steam.

Unusual Fire and Explosion Hazards:

Closed containers may explode when exposed to extreme heat due to build-up of steam.

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

SECTION V-HEALTH HAZARD DATA

EFFECTS OF OVEREXPOSURE:

Acute (Inhalation): - High vapor concentrations can irritate eyes, nose and respiratory passages.

Acute (Skin or Eye Contact): Due to the low pH, this product is a slight to moderate irritant in repeated contact.

Ingestion: Non-toxic

Chronic: None recognized

MSDS # 30306

EMERGENCY AND FIRST AID PROCEDURES:

Fumes: Remove from exposure.

Spray (eyes): Flush immediately with large amounts of water for at least 15 minutes. Notify a physician.

Splash (skin): Wash affected area with soap and water and remove contaminated clothing. If redness, itching or burning sensation develops consult a physician and have this information available.

Ingestion: DO NOT induce vomiting. Dilute with water. If gastrointestinal symptoms develop, contact a physician. Never give anything by mouth to an unconscious person.

SECTION VI-REACTIVITY DATA

Stability: Stable

Incompatible: Strong alkalis

Hazardous Decomposition Products: By flame-Carbon monoxide and Carbon dioxide

Hazardous Polymerization: Will Not Occur

SECTION VII-SPILL OR LEAK PROCEDURES

Release or Spill Procedures: Soak up liquid with absorbent and shovel into waste container. Wash spill area with water and flush to sewer serviced by wastewater treatment facility.

Waste Disposal Method: Dispose of according to local, state and federal regulations.

SECTION VIII-SPECIAL PROTECTION INFORMATION

Respiratory Protection: Use NIOSH approved chemical cartridge respirator to remove solid airborne particles of overspray during spray application.

Eye Protection: Use safety eyewear designed to protect against splash of liquids.

Other Protective Equipment: Use gloves to prevent prolonged skin contact. Venti-

lation: Provide general dilution or local exhaust ventilation in volume and pattern to keep TLV of hazardous ingredients below acceptable limits.

SECTION IX-SPECIAL PRECAUTIONS AND REGULATORY ISSUES

Handling and Storage Precautions: Non-flammable. See OSHA 1910.106. Keep from FREEZING.

Other Regulations: Pennsylvania/New Jersey Right-To-Know laws- Other ingredients in this product such as resin, pigment and additives are nonhazardous and considered trade secrets under these regulations.

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP START AND 241-C-106 PIT CLEANOUT

NPCA 1-85 (OSHA 174)

MATERIAL SAFETY DATA SHEET FOR COATINGS, RESINS AND RELATED MATERIALS

MSDS # 10288A

Ameron Protective Coatings
201 North Berry Street
Brea, CA 92621

Information: (714) 529-1951 (H. Kline)
Emergency: (800) 424-9300 (CHEMREC)
Preparation Date: 03-09-90
Supersedes: 03-10-89

SECTION I -- PRODUCT IDENTIFICATION

TRADE NAME: AMERCOAT

PRODUCT CLASS: VINYL COPOLYMER

PRODUCT NO: 33

FOR INDUSTRIAL USE ONLY

HEALTH: WARNING

SECTION II -- HAZARDOUS INGREDIENTS

INGREDIENTS	CAS NO.	X BY WT	EXPOSURE LIMITS				VP mm Hg @ 68 F	TOXICITY	
			OSHA PEL ppm	OSHA PEL mg/m3	ACGIH TLV (TWA) ppm	ACGIH TLV (TWA) mg/m3		LD50 g/kg	LC50 ppm
METHYL ISOBUTYL KETONE (SARA, CERCLA)	108-10-1	31.23	50	205	50	205	15	2	4000
TOLUENE (SARA, CERCLA)	108-88-3	17.97	100	375	100	375	24	5	8000
CHLORINATED PARAFFIN	61788-76-9	<15	dna	dna	dna	2	na	50	dna
(AS PARAFFIN WAX FUME)									
TITANIUM DIOXIDE	13463-67-7	<15	dna	10	dna	10	na	24	6820
(AS TI, POSSIBLE IMPURITIES, <10% SILICA (AMORPHOUS), <6% ALUMINUM HYDROXIDE)									
VINYL CHLORIDE RESIN (SARA, CERCLA)	9005-09-8	<15	1	dna	5	10	na	dna	dna
XYLENE (SARA)	1330-20-7	8.47	100	435	100	435	6.6	4.3	6700
VM & P NAPHTHA	64742-48-9	7.46	500	dna	300	1350	5.2	5	3400
(BENZENE** @ 0-900 PPM)									
• CHROMIUM OXIDE	1308-38-9	<10	dna	0.5	dna	0.5	na	dna	dna
(AS CR)									
METHYL ETHYL KETONE (SARA, CERCLA)	78-93-3	5.86	200	590	200	590	70	2.7	2000
(SIEL 300 PPM)									
VINYL CHLORIDE RESIN (SARA, CERCLA)	9003-22-9	<10	1	dna	5	dna	na	dna	dna
(VC** @ <1 PPM & VA** @ <0.5%)									
• IRON OXIDE	1302-37-1	<10	dna	5	dna	5	na	dna	dna
(AS FE FUME)									
NICA	12001-26-2	<10	dna	3	dna	3	na	na	dna
(CONTAINS >0.1% CRYSTALLINE SILICA**)									
• CARBON BLACK	1333-86-4	<5	dna	3.5	dna	3.5	na	dna	dna

Cancer or Suspected Cancer Agent: NO

Ref. RTEC, ACGIH, Fed OSHA

** CALIF. TITLE 26: 22-12000 (PROP 65)

Contains toxic chemical subject to reporting requirements of SARA and CERCLA (40CFR 302.355, 372)

* Pigment content is dependent on color.

NAME Amercoat 33

MSDS # 10288A

H- 3 F- 3 R- 0

OTHER - Kidney, Liver, CNS

PERMANENT

(C)=Casting; (S)=Skin; LD50=Oral, rat; LC50=Inhalation, rat; LFS=Lowest Flashing Solvent

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

data not available; not applicable; b:ppb

MSDS # 10288A

PRODUCT NO: 33

MATERIAL SAFETY DATA SHEET

Page: 2

SECTION III -- PHYSICAL DATA

BOILING RANGE: 175-202 Deg. F

VAPOR DENSITY: Heavier than air

VOLATILE VOLUME % : 79

EVAPORATION RATE: Butyl acetate = 1

WT PER GAL: 8.0-8.8 LBS

LOW: 0.70 HIGH: 4.60

APPEARANCE: Liquid

ODOR: Solvent

SOLUBILITY IN WATER: na

SECTION IV -- FIRE AND EXPLOSION DATA

FLAMMABILITY: OSHA: Flammable - B

FLASH POINT: 21 F (SEIA)

LFS: 78-93-3

DOT: Flammable

LEL: 0.90

UEL: 11.40

EXTINGUISHING MEDIA: Foam, CO2, dry chemical.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Wear self-contained breathing apparatus. Closed containers may explode when exposed to extreme heat. Isolate from heat, electrical equipment, sparks and open flame. Keep upwind. Vapors may spread long distances, cause flash fire or ignite explosively.

SECTION V -- HEALTH HAZARD DATA

ENTRY ROUTES: Inhalation and skin contact.

MEDICAL CONDITIONS AGGRAVATED: Respiratory, Kidney and liver disorders, Skin, Heart.

EXPOSURE EFFECTS: Vapor, spray mist and/or dust can be harmful. Irritating to skin, mucous membranes, eyes and respiratory system. Excessive inhalation can cause headache, nausea, dizziness or asphyxiation. Repeated and prolonged occupational overexposure to solvents is associated with permanent brain and nervous system damage. Can be harmful or fatal if swallowed. Can be harmful if inhaled or absorbed through the skin. Overexposure can damage central nervous system. Overexposure or ingestion can cause lung, kidney and/or liver damage. Overexposure can cause skin and eye burns and/or injury. Overexposure can cause delayed lung injury.

EMERGENCY AND FIRST AID PROCEDURES: Overexposure to vapor, spray mist or dust - provide fresh air; if breathing labored, give oxygen or artificial respiration. For skin contact, wash thoroughly with soap and water. For eyes, flush immediately with plenty of water for at least 15 minutes and get medical attention. If swallowed; drink 1 or 2 glasses of water to dilute. Do not induce vomiting. Consult physician or poison control center IMMEDIATELY. Treat symptomatically.

SECTION VI -- REACTIVITY DATA

STABILITY: Stable CONDITIONS TO AVOID: Heat, open flame, arc or sparks.

INCOMPATIBILITY (MATERIALS TO AVOID): Strong oxidizers, acids, alkalis.

HAZARDOUS DECOMPOSITION PRODUCT BY FIRE, BURNING OR WELDING: CO and CO2, Hydrogen chloride fumes, Iron oxide fumes.

HAZARDOUS POLYMERIZATION: Will not occur

SECTION VII -- SPILL OR LEAK PROCEDURES

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP START AND 241-C-106 PIT CLEANOUT

U.S. LEAKS: Avoid breathing of vapors or dust. Use absorbent cleanup materials or sweep up. Place in site container. Keep out of public sewers and waterways. If entry is threatened or occurs, notify authorities. Eliminate all sources of ignition.

MSDS # 10288A

PRODUCT NO: 33

MATERIAL SAFETY DATA SHEET

Page: 3

SECTION VII -- SPILL OR LEAK PROCEDURES (continued)

WASTE DISPOSAL: In separate, closed metal container in accordance with all applicable regulations.

EPA WASTE NO: 1001 U161 U220 U239 U159

SECTION VIII -- SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION: NIOSH/MSHA certified respirator. For specific conditions refer to NIOSH Pocket Guide to Chemical Hazards, DHEW NO 78-210. Use air-line respirators in confined or restricted ventilation areas, or with polyurethane or isocyanates. Refer to 29 CFR, OSHA parts 1910, 1915, and 1916 for coating operations.

VENTILATION: Sufficient ventilation, in volume and pattern, should be provided to keep air contaminant concentrations below TLV limit. Remove welding or flame cutting decomposition products. Refer to 29 CFR, OSHA parts 1910, 1915, and 1916 for coating operations.

PROTECTIVE GLOVES: Neoprene or other suitable materials.

EYE PROTECTION: Splash-proof goggles or face shield.

OTHER PROTECTIVE EQUIPMENT FOR APPLICATION OR CLEANUP: Full protective clothing. Spark-proof equipment.

HYGIENIC PRACTICES: Wash thoroughly before eating, smoking or using washroom. Launder contaminated clothing before reuse.

SECTION IX -- SPECIAL PRECAUTIONS

HANDLING AND STORING: Keep container closed, upright when not in use. Store in cool, dry, well-ventilated area. Avoid storage temperatures above 100 degrees Fahrenheit.

OTHER PRECAUTIONS: Do not take internally. Avoid prolonged breathing of dust, vapors or spray mist or contact with skin and eyes. Do not weld or flame cut an empty container. Ground containers when pouring.

<<3 Page Document>>

TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

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TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

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TYPE B INVESTIGATION REPORT FOR 241-SY-101 PUMP
START AND 241-C-106 PIT CLEANOUT

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7/6/94

END