



U.S. Department of Energy
~~Office of River Protection~~

P.O. Box 450, MSIN H6-60
Richland, Washington 99352

JUN 15 2006

06-TED-040

Mr. M. S. Spears, President
and Chief Executive Officer
CH2M HILL Hanford Group, Inc.
Richland, Washington 99352

Dear Mr. Spears:

CONTRACT NO. DE-AC27-99RL14047 – ASSESSMENT REPORT A-06-AMTF-TANKFARM-004 ABOVEGROUND TRANSFER SYSTEM VEHICLE BARRIER ASSESSMENT

This letter transmits the results of the U.S. Department of Energy, Office of River Protection (ORP) assessment of the Tank Farms aboveground transfer system vehicle barriers. The assessment was completed on May 25, 2006. The assessment report A-06-AMTF-TANKFARM-004 is attached.

The ORP assessment team identified three Findings. The assessment team concluded that:

- A rigorous process was not followed for implementation of the Hanford Tank Farms Technical Safety Requirements Administrative Control 5.11: Transfer Controls associated with vehicle barriers;
- The technical basis for the aboveground transfer system vehicle barrier evaluation in the Documented Safety Analysis and technical supporting documents was insufficient to provide appropriate understanding to engineers performing calculations; and
- Problem Evaluation Requests associated with vehicle barriers were inadequately resolved.

Within 30 days of receipt of this letter, ORP requests that CH2M HILL Hanford Group, Inc. provide a written response to the assessment Findings with a plan for corrective actions and dates of expected completion.

The direction herein is considered to be within the limitations of the Technical Direction (TD) clause in the Contract and does not meet any of the conditions described in paragraph (b) (1) through (4) of the TD clause. If, in the opinion of the Contractor, any instruction or direction by the COR in this letter falls within one of the categories defined in TD clause (b)(1) through (b)(4), the Contractor shall not proceed but shall notify the Contracting Officer immediately orally, and in writing within five (5) working days, after receipt of any such instruction or direction and shall request the Contracting Officer to modify the contract accordingly. The Contracting Officer will respond as required by the TD clause.

Mr. M. S. Spears
06-TED-040

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If you have any questions, you may contact me, or your staff may contact Victor Callahan, Assessment Team Lead, (509) 373-9880.

Sincerely,

A handwritten signature in black ink, appearing to read "T. Zack Smith". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

T. Zack Smith
Contracting Officers Representative

TED:VLC

Attachment

cc w/ attach:
CH2M HILL Correspondence
W. M. Linzau, DNFSB
R. G. Quirk, DNFSB

**U.S. Department of Energy
Office of River Protection**

**Tank Farm Contractor
Aboveground Transfer System Vehicle
Barriers Assessment Report**

Final Report

A-06-AMTF-TankFarm-004

May 15 – 18, 2006



Office of River Protection

Victor L. Callahan
Team Leader

REPORT APPROVAL

Victor L. Callahan 6-8-06
Victor L. Callahan, ORP Team Lead Date

J. S. Shuen 6-8-06
Jian-Shun Shuen, ORP Team Member Date

Chris Sorensen 6/8/06
Chris Sorensen, ORP Team Member Date

Dana C. Bryson for DCB 6/9/06
Dana C. Bryson, Tank Farms Engineering Date
Division Director

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EXECUTIVE SUMMARY

The U.S. Department of Energy (DOE), Office of River Protection (ORP) conducted an assessment of the Aboveground Transfer System Vehicle Barriers at the Hanford Site Tank Farms, operated by CH2M HILL Hanford Group, Inc. (CH2M HILL) during the period of May 15-18, 2006. The assessment evaluated the Tank Farm Contractor's (TFC) compliance with the use of aboveground vehicle barriers as specified in the Documented Safety Analysis (DSA) and Technical Safety Requirements (TSR), reviewed technical basis documents for proper documentation of the intended use of vehicle barriers and the validity of the operating assumptions, and conducted interviews with Tank Farms operators and engineers to determine the level of knowledge and how they verified the vehicle barriers in place prior to waste transfer operations through aboveground portions of Hose-In-Hose Transfer Lines (HIHTL).

The ORP assessment team concluded that CH2M HILL lacked a rigorous process for implementing TSR Administrative Control (AC) 5.11, Transfer Controls, regarding aboveground transfer system vehicle barriers. This lack of rigor was evidenced in several key areas. The first Finding was inadequate implementation of AC 5.11.2.a.1 with the following issues:

- Inconsistent knowledge level with operators and engineers in verifying vehicle barriers in place prior to waste transfer operations;
- Inadequate or lack of detailed information in waste transfer procedures to aid operators in verifying vehicle barriers in place prior to waste transfer operations;
- Insufficient technical justification and/or rationale for lack of vehicle barriers at certain aboveground transfer lines; and
- Hanford support drawings do not reflect current field configuration of vehicle barriers.

The second Finding was inadequate technical basis for the aboveground transfer system vehicle barrier evaluation in the Tank Farms DSA and technical supporting documents. The basis for the horizontal load and vehicle mass listed in performance criteria of the DSA does not appropriately account for heavy construction, maintenance, and operations vehicles that routinely enter into Tank Farms. In addition, technical support documents contained two calculation errors and incorrectly referenced one of the DSA performance criteria.

The third Finding was inadequate resolution of ORP initiated Problem Evaluation Requests (PER) associated with vehicle barrier concerns. The first PER involved a concern by ORP technical staff that locations of certain vehicle barriers in SY Farms were not consistent with the DSA. The PER was incorrectly evaluated by responsible TFC staff and subsequently closed without consulting with the ORP staff that initially communicated the concern. The technical basis for closing the PER was later reversed after ORP questioned the same issue for the barrier location at the SY-101 Prefabricated

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Pump Pit. The TFC declared a Potentially Inadequate Safety Analysis which was documented in the occurrence report EM-RP-CHG-TANKFARM-2006-0014. A second PER questioned the adequacy of the jersey barrier stopping distance if the representative Tank Farms speed limit of 5 mph was exceeded by a vehicle hitting the barrier. The entrance to Tank Farms had 10 mph postings. Calculations using speed limits exceeding 5 mph showed that jersey barrier movement, as a result of vehicle collision, could exceed the documented distance between the barrier and the endpoint HIHTL connections that the barrier was designed to protect.

An out-briefing was conducted with TFC management on May 25, 2006 to discuss the above Findings and preliminary corrective actions that the TFC had initiated.

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LIST OF ACRONYMS

AC	Administrative Control
ASCE	American Society of Civil Engineers
ASSD	Anti-Siphon Slurry Device
CFR	Code of Federal Regulation
CH2M HILL	CH2M HILL Hanford group, Inc.
CO	Closure Operations
DOE	Department of Energy
DSA	Documented Safety Analysis
DST	Double-Shell Tank
ECN	Engineering Change Notice
HIHTL	Hose-in-Hose Transfer Line
ISO	International Standards Organization
NS&L	Nuclear Safety & Licensing
OE	Operations Engineer
ORP	Office of River Protection
PER	Problem Evaluation Request
PISA	Potentially Inadequate Safety Analysis
PPP	Prefabricated Pump Pit
QA	Quality Assurance
SMP	Safety Management Program
SSC	Structures, Systems, and Components
SST	Single-Shell Tank
TFC	Tank Farm Contractor
TSR	Technical Safety Requirements
TUF	Track Until Fixed
USQ	Unreviewed Safety Question
WFO	Waste Feed Operations

1.0 INTRODUCTION

The U.S. Department of Energy (DOE), Office of River Protection (ORP) conducted an assessment of the Aboveground Transfer System Vehicle Barriers at the Hanford Site Tank Farms operated by CH2M HILL Hanford Group, Inc. (CH2M HILL) during the period of May 15-18, 2006. The assessment evaluated the Tank Farm Contractor's (TFC) compliance with the use of aboveground vehicle barriers as specified in the Documented Safety Analysis (DSA) and Technical Safety Requirements (TSR), reviewed technical basis documents for proper documentation of the intended use of vehicle barriers and the validity of the operating assumptions, and conducted interviews with Tank Farms operators and engineers to determine the level of knowledge and how they verified the vehicle barriers in place prior to waste transfer operations through aboveground portions of Hose-In-Hose Transfer Lines (HIHTL).

2.0 PURPOSE

To ensure compliance on use of aboveground transfer system vehicle barriers defined as safety significant Structures, Systems, and Components (SSC) in the Documented Safety Analysis.

3.0 METHODOLOGY

CH2M HILL responsibility for compliance of aboveground transfer system vehicle barriers identified as safety-significant SSCs for vacuum exhaust line rupture and waste transfer leak accidents are found within two projects: Closure Operations (CO) and Waste Feed Operations (WFO).

The ORP assessment team conducted the vehicle barrier assessment using the following plan:

3.1 Major Areas of Assessment:

- Verify the types and configuration of vehicle barriers as found in the Tank Farms;
- Verify TSR Administrative Controls (AC) 5.11.2.a.1 requirements for vehicle barriers are met prior to waste transfers using aboveground portions of the HIHTL; and
- Verify that DSA and the technical supporting documents contain adequate technical basis for vehicle barriers design and placement.

3.2 Lines of Inquiry:

- Determine if the types and configuration of vehicle barriers found in the Tank Farms comply with the Performance Criteria described in the DSA, RPP-13033;
- Determine if technical basis documents supporting use of vehicle barriers are adequate and appropriately applied, and the field configuration of vehicle barriers is consistent with configuration evaluated in technical basis documents;
- Determine if placement of vehicle barriers complies with applicable Hanford drawings; and
- Determine how operators verify correct placement of vehicle barriers prior to waste transfer operations through aboveground portions of HIHTL.

3.3 Document Reviews:

- Design Drawings;
- Hanford support drawings and Engineering Change Controls (ECN) showing placement of aboveground vehicle barriers;
- Problem Evaluation Requests (PER);
- Procurement and quality records for jersey barriers;
- Technical basis documents showing calculations used to justify use of each type of vehicle barriers;
- Tank Farm Operations Administrative Controls, HNF-IP-1266;
- Tank Farm operating procedures for waste transfers.

3.4 Interviews:

Interviews were conducted with selected CH2M HILL CO/WFO operations and engineering staff.

4.0 ASSESSMENT RESULTS

4.1 Finding F-01:

Inadequate implementation of AC 5.11 – Transfer Controls Associated with Vehicle Barriers.

Requirement:

1. Hanford Technical Safety Requirement AC 5.11.2.a.1:

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VERIFY that either vehicle restrictions (i.e., vehicle access prohibitions to the Tank Farm) or aboveground transfer system vehicle barriers are in place for aboveground WASTE transfer lines that are PHYSICALLY CONNECTED to an ACTIVE WASTE transfer pump not under administrative lock.

2. 10 Code of Federal Regulation (CFR) 830.122 Quality Assurance (QA) Criteria:
Criterion 2 “Personnel Training and Qualification” (1) Train and qualify personnel to be capable of performing their assigned work.

Assessment Details:

AC 5.11.2.a.1 is required for the waste transfer leak and vacuum exhaust line rupture representative accidents. The purpose of this key element is to ensure physical features are properly positioned or configured as assumed in the hazard and accident analysis prior to initiating a waste transfer. This key element requires verification that either vehicle restrictions (i.e., vehicle access prohibitions to the Tank Farm) or aboveground transfer system vehicle barriers are in place for aboveground waste transfer lines, when aboveground waste transfer lines are physically connected to an active waste transfer pump not under administrative lock. The safety function of this key element is to reduce the frequency or severity of waste leaks in aboveground waste transfer lines caused by vehicle collision, thus decreasing the frequency of a waste transfer leak accident. This control ensures that the transfer line is protected from damage or loss of integrity that may be caused by vehicle impacts. Waste transfer lines protected by this control include the aboveground safety-significant HIHTLs associated with the vacuum retrieval system.

The assessment team documented the following inadequacies that support Finding F-01:

- a. Inconsistent knowledge level in application of AC 5.11.2.a.1. – Transfer System Configuration Management: Verification of aboveground transfer system vehicle barriers are in place for aboveground transfer lines, when aboveground waste transfer lines are physically connected to an active waste transfer pump not under administrative lock.

TFC engineers and operator knowledge level indicated either inconsistent or insufficient knowledge of verifying what TSR controlled vehicle barriers are in place 72 hours prior to start of transfer as shown in TFC operating procedures. TFC personnel were unaware what jersey barriers were TSR controlled SSCs versus barriers used for radiation shielding at the C-200 Tank Farms.

Field interviews revealed the following:

- Interviews with WFO personnel (three Operating Engineer’s and one transfer operator) showed a lack of knowledge as to what constitutes a vehicle barrier

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- and where they are located. The WFO procedure is not prescriptive of their locations or what types are utilized when verifying vehicle barriers in place.
- Interviews with S-Farm retrieval operators revealed knowledge of jersey barriers and where they were located. It also revealed an inconsistent knowledge of “doghouses” or shield box assemblies. They knew that they were located at the S-A valve pit, but they didn’t realize that they were also at the pump pits where the transfer pumps are located. The transfer procedures for S-Farm are not prescriptive as to type of vehicle barriers, or their location, when verifying them in place.
 - C-103 retrieval operators were knowledgeable of “doghouses” and their locations at AN Farm and at valve pits in C Farm. Their knowledge of jersey barriers and their location around the portable valve pit was inconsistent. Some knew that they were approved vehicle barriers and where they were located and one didn’t. One also seemed to think that the shield “barns” over the HIHTL might be an approved vehicle barrier. The C-103 to AN-106 transfer procedure (TO-220-108) contained specific detail about the location of “doghouses” at AN-106, but was vague regarding type and location of vehicle barriers in C Farm.
 - All three operations personnel interviewed regarding C-200 retrievals knew what kind of vehicle barriers are used for this type of transfer and where they are located. One thought that shield barns might be an approved vehicle barrier also. However, their transfer procedure is the most prescriptive of all and tells them specifically what to look for when verifying placement of vehicle barriers prior to removing the administrative lock.
 - Cognizant TFC engineers were unclear on location of TSR vehicle barriers.

As a result of these interviews conducted during the assessment and recent waste transfers, WFO management took action to familiarize responsible operations personnel via e-mail on the various types of vehicle barriers approved for use in Chapter 4, Section 4.4.4. of the DSA. They also issued a revision to the SY-102 to SY-101 transfer procedure, prior to commencing the transfer, specifying exactly what type of vehicle barriers are in place and where they are located.

- b. Procedures were found to be inadequate for verifying vehicle barriers in place when aboveground waste transfer lines are physically connected to an active waste transfer pump not under administrative lock (AC 5.11.2.a.1: Transfer Controls, Transfer System Configuration Management). Specific examples are:
- Procedure TO-220-106 (Transfer from 241-C-200 Series Tanks to 241-AN-106), Checklist 1 (C-200 Farm) states that vehicle impact barrier in C Farms is a concrete jersey barrier, but does not specify exact location of these barriers. However, Checklist 1 (AN Farm) does include the location and type of vehicle barrier for the aboveground transfer system in the AN Tank Farm.

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The procedure specifies that “the only impact barriers are the 241-AN-106 doghouses (shield box assembly).

- Procedure TO-220-108 (Over-Ground Transfer from 241-C-103 to 241-AN-106 and Sluicing of Tank 241-C-103), Checklist 7A/7B (Over-Ground Transfer from 241-C-103 to 241-AN-106 and Sluicing of Tank 241-C-103) specifies to check “All HIHTL to pit transition shields (doghouses)”. Procedure doesn’t require operator to check concrete jersey barriers around the portable valve pit at C-103. Checklist 9 in the same procedure does not specify types of vehicle barriers and locations in C-Farm.
- TFC procedure TO-430-507 (Cross-Site Transfer from 241-SY-101 to 241-AP-107) does not explicitly state the type and location of vehicle barriers used around aboveground transfer system HIHTL, with the exception of the vehicle barrier, Prefabricated Pump Pit (PPP) located at 241-SY-101.
- TO-410-900 (Perform 241-S-112 Waste Retrieval Pumping) Checklist 3 – No description of the types of vehicle barriers in place or location in S-Farm.
- TO-420-905 (Perform 241-S-102 Waste Retrieval Pumping) Checklist 3 – No description of the types of vehicle barriers in place or locations in S-Farm.

- c. Insufficient technical justification for lack of vehicle barriers at certain aboveground transfer line locations in Tank Farms.

During tours of the S and SY Tank Farms, the assessment team noted that concrete jersey barriers were in place on the south side of S-112 transfer pump location, but not on the north side. The TFC staff indicated they had taken credit for various pieces of miscellaneous equipment to preclude a vehicle from impacting above ground transfer lines in these areas without written justification or appropriate reviews. Also, the assessment team noted that jersey barriers are located on the north, east and west sides, but not on the south side of the Anti-Siphon Slurry Device (ASSD) HIHTL connection at SY-102. TFC staff credited a large excavation trench on the south side of the ASSD and the southeast side of the SY-02A pit. It should be noted that this excavation is scheduled to be backfilled in the summer of 2006. While taking credit for these provisions may be a reasonable and prudent thing to do, no written technical basis document exists for justifying this position. This documentation should also have been reviewed under the Unreviewed Safety Question (USQ) process since they met the DSA requirement for using vehicle barriers. CH2M HILL has agreed to perform written technical justification or use jersey barriers in these locations.

The TFC has agreed to maintain vehicle restrictions in S and SY Farms in place until this issue has been resolved.

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- d. Hanford support drawings showing location of vehicle barriers do not reflect current field configuration in affected Tank Farms. Specific drawings showing jersey barrier locations include C-Farms drawing H-14-106032 R3 and related drawings, H-14-106030 and H-14-106081. The ECN-721657-R0 to H-14-106032 R3 changed the quantity of concrete barriers from 13 to “as required” allowing the freedom to arrange the barriers as needed for shielding from potential radiation sources for HIHTL. This ECN allows TSR controlled vehicle barriers to be treated as barriers for radiation shielding and allows flexibility to add or delete the number of barriers. Furthermore, there are no specific notes in the drawings that the vehicle barriers should be re-positioned to a specific location to protect aboveground portions of HIHTL systems if those barriers were moved to support operations.

Tank Farms Operations Administrative Controls for implementing TSRs (HNF-IP-1266), section 5.11.3.C.2.a states for the vacuum retrieval system, “the requirement only applies to the following HIHTLs:

- The vacuum retrieval system vacuum pump discharge line back to the Single-Shell Tank (SST) being retrieved; and
- The vacuum retrieval system slurry pump discharge line to the Double-Shell Tank (DST) system.

Therefore, TSR controlled jersey barriers in C-200 Tank Farms are only those barriers that protect HIHTLs that exit the International Standards Organization (ISO) freight container boxes in the vacuum retrieval system. Section 3.3.2.4.3.3 of the DSA documents that controls are required to reduce the potential onsite toxicological risk due to a (HIHTL system) line shear outside of the ISO freight container wall. Twelve (12) jersey barriers, as currently configured, are placed right next to each other and pinned together to form a continuous chain. These jersey barriers comply with DSA, and are therefore, TSR controlled. The other jersey barriers are placed as barriers to restrict entry in the high radiation areas surrounding the vacuum retrieval system and are not TSR controlled.

The assessment team also discovered that U-200 Series Farms drawing H-14-106007 (sheets 1-3) shows locations of 22 jersey barriers, but there is an ECN-722048-R0 changing the quantity of 22 barriers to “as required”. The justification in the ECN was to allow the field work supervisor to adjust the number of vehicle barriers to be used. Authority to allow changes in the number and location of TSR controlled vehicle barriers should be done under the ECN and USQ review process.

The field configuration for placement of the pipe stanchion vehicle barriers near the PPP located at 241-SY-101 instead of placement next to the concrete foundation of the PPP was consistent with note 2 on drawing H-14-103559. However, note 2 was incorrectly written (“location and quantity are

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approximate”) and did not support the technical basis document, *Calculations for SY-101 Cross Site Connection System*, RPP-7916, Appendix A, p. A-3, and A-11 for resisting a 6000 lbf horizontal load. Removal of the pipe stanchion vehicle barriers near the PPP at SY-101 as a result of the Potential Inadequacy in the Safety Analysis (PISA) not meeting Performance Criteria 1 specified in the DSA was followed up by TFC engineering staff revising SY-101 Cross site transfer system civil site plan (H-14-103559 R2) and S/SX-Farm transfer line shielding layout (H-14-103945 R2) with ECN-723658 R1. Jersey barriers are now used and instructions for placement are specified in flag note 2 in drawing H-14-103559 R2. The ORP assessment team independently identified the same technical basis document (RPP-7916) calculation error that the CH2M HILL engineer stated in support of the PISA before the assessment commenced and prior to PISA being declared. The PISA is documented in occurrence report EM-RP-CHG-TANKFARM-2006-0014.

4.2 Finding F-02:

Inadequate published technical basis for the aboveground transfer system vehicle barrier evaluation in the Tank Farms DSA and technical supporting documents.

Requirement:

1. 10 CFR Part 830, “Nuclear Safety Management,” Subpart 830.204 (b) (4), “*Derive the hazard controls necessary to ensure adequate protection of workers, the public, and the environment, demonstrate the adequacy of these controls to eliminate, limit, or mitigate identified hazards, and define the process for maintaining the hazard controls current at all times and controlling their use.*”
2. DOE Order 420.1A, “Facility Safety,” Section 4.1, “Nuclear Safety,” “*The objectives of Section 4.1 for nuclear safety are to ensure the Department of Energy (DOE) nonreactor nuclear facilities are designed and constructed so as to assure adequate protection for the public, workers, and the environment from nuclear hazards.*”

Assessment Details:

The assessment team documented the following inadequacies that support Finding F-02:

- Inadequate technical basis for the selection of design requirement for the horizontal load used in the aboveground transfer system vehicle barrier analysis.

DSA Chapter 4, Section 4.4.4, *Aboveground Transfer System Vehicle Barriers*, Performance Criteria 1 identifies that aboveground transfer system vehicle

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barriers that are anchored or attached shall be designed to resist a single load of 6,000 lb force applied horizontally in any direction to the barrier system. The 6,000 lb force was adopted from American Society of Civil Engineers (ASCE) 7-98, *Minimum Design Loads for Building and Other Structures*. The 6,000 lb force requirement of the code is based on a typical passenger car traveling in a parking garage setting. The technical basis for adopting the design load of 6,000 lb force for passenger cars from ASCE 7-98 code to Tank Farm applications where heavy construction, maintenance, and operations vehicles routinely enter is not provided in the DSA or any of the supporting technical documents (e.g., RPP-6725, RPP-7916, RPP-15138, RPP-16664). Though no other appropriate code was identified, the basis document should explain what expectations of the barrier were and why this standard would be appropriate.

- Inadequate technical basis for the selection of a vehicle mass for the calculation of jersey barrier stopping distance upon impact by a vehicle.

DSA Chapter 4, Section 4.4.4, *Aboveground Transfer System Vehicle Barriers*, Performance Criteria 2 identifies that aboveground transfer system vehicle barriers that are not anchored or attached shall be designed and located to resist a vehicle of 6,000 lb mass traveling at a velocity of 5 mile/h. Performance criteria 2 identifies that the 6,000 lb mass is adopted from ASCE 7-98 and the 5 mi/h is representative of vehicle speed within the Tank Farms. The vehicle mass and speed information was used in RPP-16664 to calculate the jersey barrier stopping distance upon impact by the vehicle.

The 6,000 lb force requirement in the ASCE 7-98 code is for a horizontal load applied to the vehicle barrier and is not directly relevant to the vehicle mass. Therefore, the basis provided in DSA and RPP-16664 for the 6,000 lb vehicle mass is erroneous. A credible technical basis or rationale for the choice of vehicle mass of 6,000 lb in the jersey barrier stopping distance calculation is not documented in the DSA or any supporting technical document. In response to the ORP review team-identified issue, the TFC provided technical information during the assessment, including the type, mass, and the frequency of common vehicles entering Tank Farms, as well as existing Safety Management Plans (SMP) for vehicle controls and waste transfer equipment protection.

- Technical supporting documents contain two calculation errors or invalid method indicative of inadequate quality control of the peer review process for the development of safety basis supporting documentation.
 - Error in RPP-7916, Rev. 0, page A-12, related to pipe stanchion design calculation. (Report issued in June 2001).
 - Error in RPP-16664, Rev. 0D, pages I-3 and I-4, related to the calculation of jersey barrier stopping distance upon impact by a vehicle. (Report issued in April 2004).

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The error in RPP-7916, page A-12 used a 3 foot wide flat plate as dimension b, even though it was never described or labeled in the diagram. The analysis referred to drawing H-14-104029 (PPP Impact Barriers), but the configurations do not show a 3 foot width plate. The dimensions for the flat steel plates used in SY-Farms are 2 ft in width by 5 ft in length. The stanchion calculation error in RPP-7916, page A-12, described above was self-identified by TFC and also independently identified by the ORP assessment team. A PISA was declared due to the calculation error in RPP-7916. As a result of the PISA declaration, pipe stanchion vehicle barriers were replaced with jersey barriers. The details of this issue are discussed in Finding F-01.d.

The error in RPP-16664 was identified by the ORP assessment team and was related to the method used to derive the vehicle mass for the calculation of the concrete jersey barrier stopping distance. In response to the identified error, the TFC provided technical information during the assessment, which shows, largely by coincidence, despite the erroneous method the results of the calculation still support the existing placement of the concrete jersey barrier (minimum distance of 3 feet from the waste transfer equipment) for the vehicle mass and speed used in the analysis.

The TFC has committed to revising the DSA Chapters 3 and 4 and the related supporting documents to delineate the technical basis for the horizontal load requirement and the vehicle mass used in the vehicle barrier performance analyses. The TFC has also committed to provide inclusion in the DSA of the specific elements of the SMPs currently applied in Tank Farms operating procedures for waste transfer equipment protection against vehicle collision.

- Update the TSR, as needed, to ensure adequate protection of waste transfer system equipment against vehicle impact.

4.3 Finding F-03:

Inadequate resolution of PERs regarding vehicle barriers, PER-2005-3747 (Significance level: PER with resolution) and 2005-3770 (Significance level: TUF).

Requirement:

1. 10CFR830.122 Quality Assurance (QA) Criteria: Criterion 3 “Quality Improvement”
2. TFC-ESHQ-Q_C-C-01, TFC document: *Problem Evaluation Request*

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Assessment Details:

Resolution of PERS regarding vehicle barriers was considered inadequate. The first PER, 2005-3747, was initiated by TFC in October 2005 after discussions by ORP technical staff expressing concerns on the adequacy of the pipe stanchion vehicle barriers located at the HIHTL drop-leg connections at SY-101 and SY-102 ASSD, and the HIHTL connection at the PPP located at SY-101. The technical evaluation by TFC personnel to resolve the PER was incorrect. The evaluators decided that the pipe stanchions at HIHTL drop-leg connections at SY-101 and SY-102 ASSD needed to be relocated by repositioning them closer together and that the horizontal motion of the impact barrier will be resisted by friction between the plate and the soil, and by design, wedged under the vehicle. The technical basis document, RPP-7916 did not even analyze for pipe stanchion barriers free standing at the SY-101 and SY-102 HIHTL drop-legs, nor did the document analyze for the pipe stanchion to be wedged under a vehicle. RPP-7916 did not rely just on the frictional resistance to horizontal motion by the barrier and the soil, but by the combination of this frictional resistance and with the vehicle barrier steel plate bearing (placement) on the concrete foundation of the PPP (Section 2.0, and conclusions on page A-3). The calculations referred to Hanford support drawing H-1404029 in which one flat plate stanchion configuration used a 2 ft width by 5 ft length steel plate dimension. The calculations also assumed that a wheel was placed on the flat plate to resist the bending movement. This assumption was faulty because there was a high probability that a service vehicle or crane wheel could miss the flat plate, either head-on or if the direction of force is applied at nearly any angle to the flat plate. The TFC evaluators incorrectly determined that RPP-7916 did not require an update. PER 2005-3747 was closed on March 9, 2006.

The CH2M HILL engineer who evaluated the accuracy of the PPP pipe stanchion calculations in RPP-7916 as a result of concerns conveyed by DOE facility representatives to TFC personnel at the SY-101 PPP during the most recent cross-site waste transfer for the week of May 8th, 2006 determined that the pipe stanchion vehicle barriers placed near the PPP would not likely provide the intended protection to the HIHTL connection upon vehicle impact to the barrier. Thus, RPP-7916 calculations for the pipe stanchions were considered inadequate, reversing the evaluation performed in PER-2005-3747. As a result, the TFC issued a PISA. The resultant occurrence report is documented in EM-RP-CHG-TANKFARM-2006-0014

In the second PER, ORP technical/safety system staff oversight discussed concerns with the technical support document design calculations using the assumed Tank Farms vehicle speed limit of 5 mph in October 2005 and the adequacy of the jersey barrier distance if 5 mph is exceeded by a vehicle hitting the barrier. The entrance to DST and SST Tank Farms had 10 mph postings. Calculations using speed limits exceeding 5 mph showed that jersey barrier movement as a result of vehicle collision could exceed the 3 ft distance between the barrier and the endpoint HIHTL connections that the barrier was design to protect. PER-2005-3770 was initiated as a result. TFC corrective action was to

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remove all 10 mph speed limits at the entrance of all Tank Farms and replace with 5 mph postings and track until fixed. ORP considered this action to be appropriate.

The ORP assessment team did not find the corrective action for informing Tank Farms personnel of the importance of maintaining 5 mph speed limit was adequate. The resulting action taken by TFC was to use a single power point slide on SST Tank Farm speed limits in a tailgate meeting on January 23, 2006. The slide indicated that SST Farms were being posted with 5 mph speed limit signs and this change has been made to reflect the speed limit assumptions associated with barriers that were in place to protect in-farm above ground structures.

ORP considered this slide inadequate for the following reasons:

- The posting only addressed SST Tank Farms;
- The change did not mention that this was part of the technical basis associated with the DSA to protect aboveground waste transfer system HIHTL endpoint connections. Hence, the slide did not increase operator knowledge or awareness of the purpose or importance of vehicle barriers; and
- ORP technical staff considered that more formal documentation of the briefing, either by required reading or signed briefing rosters would have been more appropriate.

TFC personnel responsible for resolving the PER worked with an ORP facility representative without checking with the cognizant ORP technical /safety system oversight staff regarding final resolution before the PER was closed.

When this issue was discussed during the assessment, the CH2M HILL Director for Engineering Standards made a commitment to discuss the concerns to the TFC team chartered to improve the PER process. Specifically, a commitment was made to improve the PER follow-up process for ORP initiated PERs by adding information to the PER to assure follow-up and resolution with the appropriate ORP staff.

5.0 CONCLUSION

The ORP assessment team concluded that a rigorous process for documenting the technical basis in the Tank Farms DSA and technical support documents, and implementing TSR AC 5.11 requiring verification of vehicle barriers in place prior to starting waste transfer operations was not followed. PER resolution regarding vehicle barriers was considered inadequate because of incorrect engineering evaluation of the safety basis documents, and lack of thorough communication to inform affected TFC personnel of the importance for vehicle barriers in protecting aboveground transfer line portions of HIHTL.

May 15 – 18, 2006

CH2M HILL initiated corrective actions on a number of issues brought up during the assessment. The assessment team acknowledges that CH2M HILL has started the following actions as a result of suggestions discussed during the assessment:

- Corrective actions by initiating an ECN (723658-R1) to revise the drawings to remove the pipe stanchions near the SY-101 PPP and replace them with jersey barriers on drawing H-14-103559;
- Initiated PER-2006-1103: Recommendation to evaluate using aerial photographs of S/SY Farms and C-Farm retrievals as training aids to TFC personnel showing locations of vehicle barriers;
- CH2M HILL system engineer provided a detailed list of vehicle barriers by type, number, and location throughout all Tank Farms. The assessment team suggested that this list be updated as necessary and posted on the CH2M HILL website for all TFC personnel to access, and provided to the Shift Office;
- CH2M HILL Nuclear Safety and Licensing (NS&L) staff committed to provide a detailed level of technical basis and/or rationale for horizontal load and vehicle mass, as well as incorporating existing operational controls for vehicle use in Tank Farms as safety management programs to envelope all types of vehicles that routinely enter Tank Farms. NS&L agreed to provide more detail and rationale in HNF-IP-1266 regarding implementing AC 5.11 controls for vehicle barriers;
- CH2M HILL management commitment to work with the PER Improvement team to improve ORP initiated PER resolution process; and
- Technical basis via formal technical evaluations for lack of vehicle barriers at SY-102 ASSD and S-112 transfer pump location were issued by engineering to operations.