

**EA Operational Awareness Record
(December 2014)****Report Number:** EA-WTP-HLW-2014-08-18(a)**Site:** Hanford Site**Subject:** Observation of Waste Treatment and Immobilization Plant High Level Waste Facility Radioactive Liquid Disposal System Hazards Analysis Activities**Dates of Activity:**

08/18/14 - 08/28/14

Report Preparer:

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Activity Description/Purpose:

The U.S. Department of Energy (DOE) Office of Environment, Safety and Health Assessments, within the Office of Enterprise Assessments (EA), reviewed the hazard analyses (HAs) for the radioactive liquid waste disposal system (RLD) of the Waste Treatment and Immobilization Plant (WTP) High Level Waste (HLW) Facility. EA observed a portion of the HA activities, reviewed HA event tables developed for the RLD system, and met with Bechtel National, Incorporated (BNI) personnel to discuss comments on the HA event tables. This EA observation is part of a planned multi-phase review (Ref. 1) for assessing the process and results of upgrading the Preliminary Documented Safety Analysis (PDSA) for the WTP HLW Facility being designed and constructed by BNI at the Hanford Site. EA's multi-phase review will evaluate select portions of the HLW Facility, including system descriptions; hazards analysis; accident analysis; controls selection; and functional classification of safety structure, system, and components.

Result:

BNI issued a Safety Basis Development Project Execution Plan (PEP) for the HLW Facility (Ref. 6) to provide a disciplined process for updating the HLW Facility PDSA, resolving technical issues, and aligning the safety basis and the ongoing engineering design. The scope of this PEP includes work that will be performed through fiscal year 2016 according to the BNI engineering work scope. The RLD HA activities observed by EA were being performed to support a Justification for Continued Design, Procurement, and Installation for redesigning the RLD system, which would subsequently lead to a revision of the PDSA.

During this review, EA observed the HLW HA team (HAT) analyze hazard events related to the HLW RLD system and reviewed the draft HA event tables for the RLD system. The HAT used the "what if" methodology to identify potential hazard events and perform the analysis, dividing the system into four analysis nodes: the RLD bulges, the process vessel ventilation bulge, the wet process cell (WPC), and the RLD vessels in the WPC. EA observed the HAT perform the latter part of the analysis of the process vessel ventilation bulge node and the initial analysis of the WPC node. EA then reviewed the completed HA event tables for both bulge nodes and the partially completed WPC node.

Consistent with previous EA activity reports (Refs. 2 through 5) for Low Activity Waste Facility (LAW) HA's, the HLW RLD HAT focused on identifying and evaluating potential events (i.e., process upset conditions that lead to adverse consequences to facility workers, co-located workers, or the public). EA provided comments (regarding the HLW RLD system HA event tables) to BNI for written response. After reviewing the BNI responses, EA met with BNI personnel to establish a mutual understanding of the responses, which led to their subsequent revision. BNI responses identified a number of actions to re-evaluate the HA event tables to resolve specific comments (Ref.7).

Consistent with established practices, the HAT analyzed the hazard events based on unmitigated event sequences. This led the HAT to identify generally reasonable sets of causes and candidate controls for this worst case HA (exceptions are noted below). The HAT provided adequate technical input during the development of postulated events, generally defining physically meaningful scenarios and analyzing both abnormal and bounding events.

EA noted some positive aspects of the HLW RLD HA process, specifically:

- The material-at-risk and consequence information was sufficient to start the HA.
- Radiological consequences were supported by draft calculations and methods, and chemical consequences reflected subject matter expert judgment.
- HLW RLD hazard event consequences are conservatively estimated.
- Appropriate hazards were identified by the HLW HAT and were included in the draft HA event tables.

The EA team did not identify additional hazards that would need to be developed into new hazard events. EA review of the HLW RLD HA event tables and observation of the HAT activities on the RLD system identified deficiencies that warrant further review in subsequent EA HA observations and review activities. These deficiencies are summarized as follows:

- The HLW HAT did not consistently use piping and instrumentation diagrams (P&IDs) to support systematic identification of potential “what if” questions or to analyze the specific event being considered. (However, when P&IDs were used, the discussion was generally well focused and the analysis proceeded efficiently).
- The HLW HA event tables showed instances where candidate administrative controls were applied inconsistently among similar events. (Reference 7, Comments 6, 10, 13, 15, 16)
- Examples of previously identified Potential Concerns 1 and 4 from LAW HA activities continue to be found (see Attachment 1).

BNI intends to implement corrective actions as provided in revised responses.

EA Participants	References
1. James O. Low (lead)	1. DOE/HQ EA-31, <i>Plan for the Independent Oversight Review of the Hanford Site Waste Treatment Plant High-Level Waste Facility Preliminary Documented Safety Analysis Upgrade</i> , July 2014.
2. David Odland	2. DOE/HQ HS-45 Report Number: HIAR-WTP-2013-05-13, <i>Activity Report for Waste Treatment and Immobilization Plant Low Activity Waste Melter Off-gas Process System Hazards Analysis Activity Observation</i> .
3. Kevin E. Bartling	3. DOE/HQ HS-45 Report Number: HIAR-WTP-2013-10-21, <i>Activity Report for Observation of Waste Treatment and Immobilization Plant Low Activity Waste Melter and Melter Off-gas Process System Hazards Analysis Activities</i> .
4. Roy Hedtke	4. DOE/HQ HS-45 Report Number: HIAR-WTP-2014-01-27, <i>Activity Report for the Observation of Waste Treatment and Immobilization Plant Low Activity Waste Facility Off-gas Systems Hazards Analysis Activities</i> .
	5. DOE/HQ EA-31 Report Number: IEA-WTP-2014-06-02, <i>Field Notes for the Observation of Waste Treatment and Immobilization Plant Low Activity Waste Facility Reagent System Hazards Analysis Activities</i> .
	6. BNI Document Number: 24590-HLW-PL-ENS-12-0001, Rev. 1, <i>Safety Basis Development Project Execution Plan for the High-Level Waste Facility</i> , June 2014
	7. E-mail Mitchell Willadsen (BNI) to James Low, RE: Updated EA-31 WTP Hazard Analysis Comment Responses, 8/27/2014 4:47 PM (PST)

Were there any items for EA follow up? Yes No

EA Follow Up Items	
1.	Conduct an independent assessment and issue an independent review report of the final HA report for the HLW RLD system to determine the disposition of the identified deficiencies and conformance to DOE-STD-3009 requirements.
2.	Perform focused observations of BNI’s HA and control selection activities for HLW systems.

**Attachment 1 –
Potential Concerns excerpt from Ref. 2 (Revised)**

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HIAR-WTP-2013-05-13, Activity Report for Waste Treatment and Immobilization Plant Low Activity Waste Melter Off-gas Process System Hazards Analysis Activity Observation, included the following potential concerns about the interim results of the analysis. The items identified by the EA team were labeled as potential concerns because the analysis process is incomplete until the HA reports are completed, internally reviewed, approved by BNI, and thus ready for DOE review. Nonetheless, the following potential concerns, which involve event records with unmitigated high consequences to facility workers or co-located workers, could lead to weaknesses in the final HA reports:

- Potential Concern 1: For several hazard events the described sequence of events did not link directly to the identified causes, e.g., by assuming non-mechanistic or unstated equipment failures or implied operator errors. An unclear sequence description may adversely impact subsequent identification of candidate controls. (Reference 7, Comments 1, 2, 3, 8, 18, and 19)
- Potential Concern 4: Some hazard events did not identify all of the related causes, and the hazard events did not always have a clear relationship between identified causes and subsequent candidate controls. (Reference 7, Comment 9)

Note: Potential Concern 1 was revised (see Ref. 4) to clarify that the event sequence description is not always defined sufficiently to allow the identification of appropriate candidate controls. In some cases, non-mechanistic failures were assumed such that the described sequence of events did not lead to an identified cause. In other cases, the event record contained unstated assumptions that could affect the identification of event causes and corresponding candidate controls.