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# **Flammable Gas Project: Criteria for Flammable Gas Watch List Tanks**

Prepared for the U.S. Department of Energy  
Assistant Secretary for Environmental Management

Project Hanford Management Contractor for the  
U.S. Department of Energy under Contract DE-AC06-96RL13200

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# **Flammable Gas Project: Criteria for Flammable Gas Watch List Tanks**

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Duke Engineering & Services Hanford, Inc.

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## 1.0 INTRODUCTION

### 1.1 PURPOSE

The Flammable Gas Watch List is the listing of tanks that are subject to the provisions of Public Law 101-510, Section 3137, "Safety Measures for Waste Tanks at Hanford Nuclear Reservation" (Appendix A). Tanks on the Flammable Gas Watch List are judged to have a serious potential for release of high-level waste due to the ignition of flammable gases released from the waste in the tank. The purpose of this document is to provide criteria for identifying and categorizing the Hanford Site high-level waste tanks to be included on the Flammable Gas Watch List. This document also provides criteria on which to base a recommendation to remove tanks from the Flammable Gas Watch List.

### 1.2 BACKGROUND

The potential for flammable and/or explosive conditions resulting from flammable gas (e.g., hydrogen) generation, retention, and release in high-level radioactive waste has long been recognized as a hazard. In 1990, the entrapment of large quantities of flammable gases within the waste of Hanford Site tank 241-SY-101 was recognized as a unique hazard requiring special attention and control. In April 1990, administrative controls were implemented for controlling activities within tank 241-SY-101 and other tanks that were identified as potentially having similar behavior (Bracken 1990). This was the first application of the term "Watch List" to Hanford tanks.

In May 1990, the U.S. Department of Energy, Richland Operations Office (RL), determined that the matter of hydrogen and nitrous oxide evolution within the material in certain waste tanks and subsequent hypothetical ignition was an unreviewed safety question (USQ) (Lawrence 1990). The USQ was applied to the tanks previously identified as tanks of concern in Bracken (1990).

In November 1990, Public Law 101-510 was passed. Section 3137 (Appendix A), also referred to as the Wyden Amendment, was part of this law. This section requires the Secretary of Energy to identify within 90 days which high-level nuclear waste tanks may have a "serious potential for release of high-level waste due to uncontrolled increases in temperature or pressure." Tanks were identified because they contained flammable gas, ferrocyanide, or organic chemicals, or because they had high radioactive decay heat. In January 1991, Westinghouse Hanford Company (WHC) formally submitted the Watch List of tanks subject to the law (Harmon 1991a). In February 1991, WHC submitted the selection methodology for flammable gas tanks (Harmon 1991b). This selection process was improved from the original 1990 process and two additional tanks were placed on the Watch List. Harmon (1991b) also included a proposed method for removing tanks from the Watch List. This Watch List identified 23 tanks subject to Public Law 101-510, Section 3137, because of

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flammable gas hazards. In 1993, two additional tanks were added to the Flammable Gas Watch List (Fulton 1993, WHC 1993).

In August 1994, WHC issued *Criteria for Flammable Gas Watch List Tanks* (Hopkins 1994). Hopkins (1994) is superseded by this document, HNF-EP-0702, Revision 1. In addition, work controls to address flammable gas hazards have been implemented for all 177 tanks.

In October 1994, the U.S. Department of Energy, Headquarters, issued a memorandum providing guidance on modifications to the Hanford Site high-level waste tanks watch list (Lytle 1994). This memorandum stated that no laws or DOE Orders exist that establish the process or criteria for modifications to the Watch List. The memorandum further established that the Office of Environmental Management is the approval authority for modifications to the Watch List. Guidance was given that RL will discuss any proposed modifications to the Watch List with appropriate stakeholders.

## 2.0 CRITERIA FOR FLAMMABLE GAS WATCH LIST TANKS

The Flammable Gas Watch List is the listing of those single-shell or double-shell high-level nuclear waste tanks at the Hanford Site that may have a serious potential for release of high-level waste because of uncontrolled increases in temperature or pressure. The Flammable Gas Watch List is specific to those tanks in which the initiating event of the uncontrolled increase in temperature or pressure is a potential for flammable gas combustion.

The selection criterion for the Flammable Gas Watch List is as follows:

*Any tank that can have a flammable gas volume in the dome space that, when ignited, would result in pressure above a containment-related tank design limit will be categorized as a Flammable Gas Watch List tank.*

The criterion for removing tanks from the Flammable Gas Watch List is as follows:

*Any tank that no longer satisfies the selection criterion for the Flammable Gas Watch List will be removed from the Watch List.*

Analysis of tanks for gas release behavior must be based on a total reconciliation of all available data for the tank such that a consistent understanding of tank conditions is achieved. Once it is determined that a tank is a candidate for gas release behavior, the data must be assessed to determine that sufficient quality exists to perform quantitative calculations. Only when the data are deemed to be of sufficient quality will calculations of magnitude for potential gas release events be performed.



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**APPENDIX A**

**PUBLIC LAW 101-510 (H.R. 4739), NOVEMBER 1990,  
NATIONAL DEFENSE AUTHORIZATION ACT FOR  
FISCAL YEAR 1991**

**Section 3137: Safety Measures for  
Waste Tanks at Hanford  
Nuclear Reservation**

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**APPENDIX A**

**PUBLIC LAW 101-510 (H.R. 4739), NOVEMBER 1990,  
NATIONAL DEFENSE AUTHORIZATION ACT FOR  
FISCAL YEAR 1991**

**Section 3137: Safety Measures for  
Waste Tanks at Hanford  
Nuclear Reservation**

**(a) Identification and Monitoring of Tanks.** Within 90 days after the date of the enactment of this Act, the Secretary of Energy shall identify which single-shelled or double-shelled high-level nuclear waste tanks at the Hanford Nuclear Reservation, Richland, Washington, may have a serious potential for release of high-level waste due to uncontrolled increases in temperature or pressure. After completing such identification, the Secretary shall determine whether continuous monitoring is being carried out to detect a release or excessive temperature or pressure at each tank so identified. If such monitoring is not being carried out, as soon as practicable the Secretary shall install such monitoring, but only if a type of monitoring that does not itself increase the danger of a release can be installed.

**(b) Action Plans.** Within 120 days after the date of the enactment of this Act, the Secretary of Energy shall develop action plans to respond to excessive temperature or pressure or a release from any tank identified under subsection (a).

**(c) Prohibition.** Beginning 120 days after the date of the enactment of this Act, no additional high-level nuclear waste (except for small amounts removed and returned to a tank for analysis) may be added to a tank identified under subsection (a) unless the Secretary determines that no safer alternative than adding such waste to the tank currently exists or that the tank does not pose a serious potential for release of high-level nuclear waste.

**(d) Report.** Within six months after the date of the enactment of this Act, the Secretary shall submit to Congress a report on actions taken to promote tank safety, including actions taken pursuant to this section, and the Secretary's timetable for resolving outstanding issues on how to handle the waste in such tanks.

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