

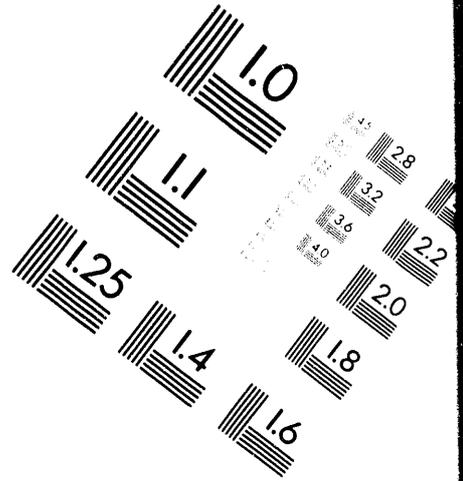
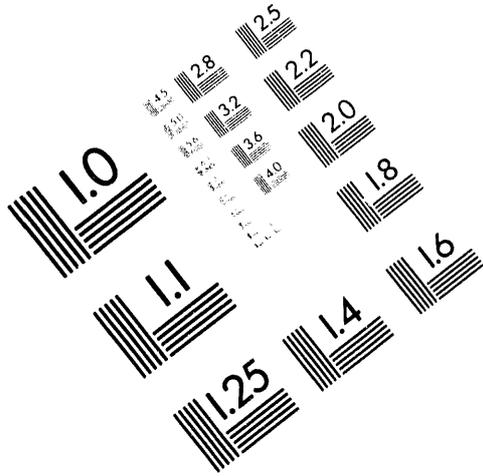


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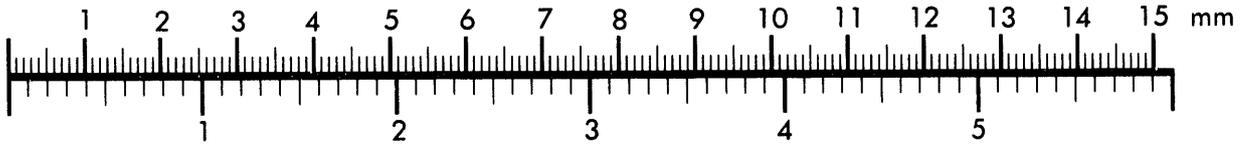
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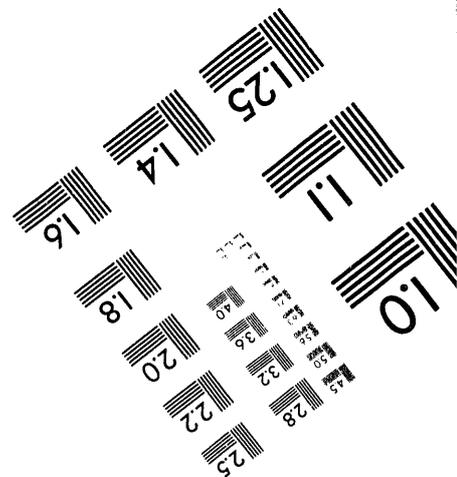
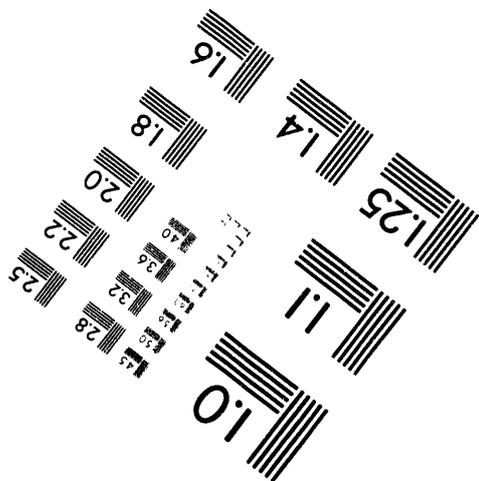
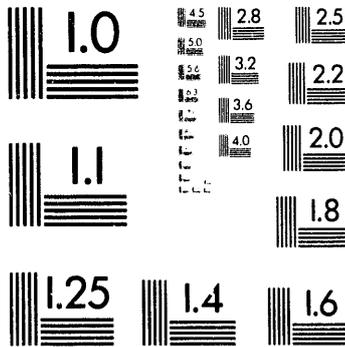
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The Role of Quality Oversight in Nuclear and Hazardous Waste Management and Environmental Restoration at Westinghouse Hanford Company

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THE ROLE OF QUALITY OVERSIGHT
 IN NUCLEAR AND HAZARDOUS WASTE MANAGEMENT
 AND ENVIRONMENTAL RESTORATION
 AT WESTINGHOUSE HANFORD COMPANY

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ABSTRACT

The historical factors that led to the generation of waste at Hanford are outlined. Westinghouse Hanford Company mission and organization are described. The role of the Quality Oversight organization in nuclear hazardous waste management and environmental restoration at Westinghouse Hanford Company is delineated. Tank Waste Remediation Systems activities and the role of the Quality Oversight organization are described as they apply to typical projects. Quality Oversight's role as the foundation for implementation of systems engineering and operation research principles is pointed out.

I. BACKGROUND

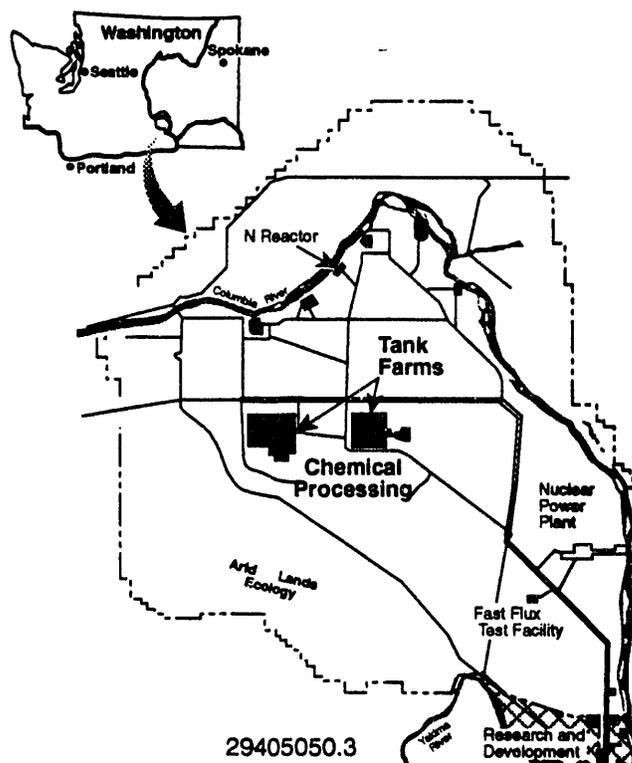
The Hanford Site was established in 1943 by the United States Army Corps of Engineers. Now, Hanford is under the direction of the U. S. Department of Energy (DOE). The Hanford Site is located in the Columbia Basin region of southeastern Washington State. The Columbia River flows through the northern edge of the Site and forms part of the eastern boundary. The area's geology consists of basalt (hard, impermeable volcanic rock), several thousand feet thick and covered in most places by sedimentary soil up to 300 feet in depth.

The Hanford Site has an area of 570 square miles (365,000 acres) of mostly sagebrush-covered land. The climate is mild and dry, with an average annual rainfall of 6.25 inches.

II. HISTORICAL FACTORS

The Hanford Site was established for the manufacture of purified plutonium, a radioactive element needed to produce nuclear weapons for the military.

Figure 1. Hanford Site Location.



Principal factors that led to selection of the Site were:

- availability of a large and continuing quantity of cooling water, plus an ample power supply; and
- the Site's isolation from high-density population areas.

In addition to plutonium, other radioactive elements were produced at the Hanford Site as a result of nuclear

reactions. The basic tasks of the chemical processing facilities had been to:

- Recover and purify plutonium for defense and industrial programs;
- Recover and purify irradiated uranium for re-use as reactor fuel; and
- Recover and purify other reactor-produced products at the request of the U. S. Atomic Energy Commission and its successors, the Energy Research and Development Administration and the U. S. Department of Energy.

Today, almost everything else that leaves the Hanford Site's chemical plants is contaminated with radioactive material and is considered waste.

III. WESTINGHOUSE HANFORD COMPANY'S CURRENT MISSION

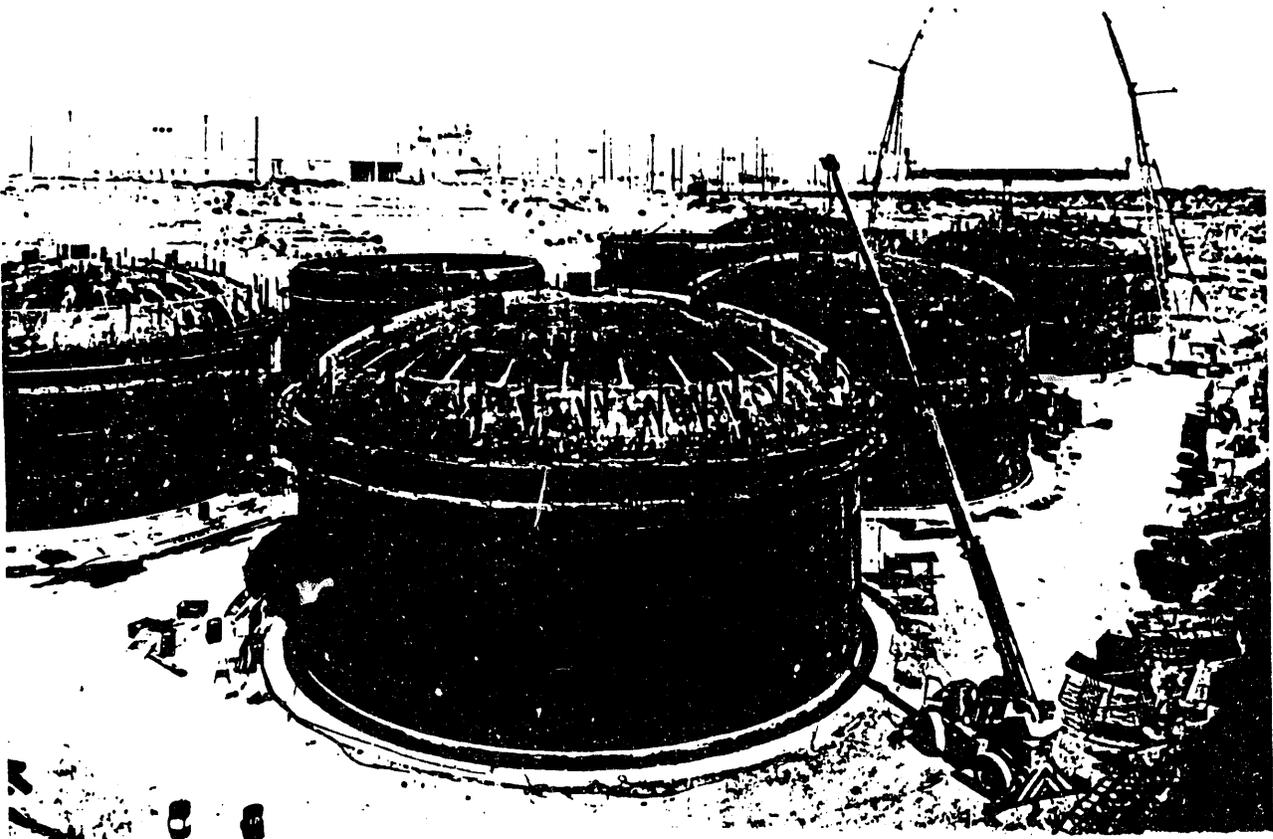
The mission of Westinghouse Hanford Company (WHC), a contractor to the U. S. Department of Energy, is to accomplish nuclear and hazardous waste management and environmental restoration of the

Hanford Site. The Hanford Site played an important role during special nuclear materials production, operating as many as ten reactors of different designs at different times. Thus, the Site has generated a large quantity of nuclear waste. Most of the waste was stored in 149 single-shell tanks and 28 double-shell tanks, located in Hanford Site tank farms, that are now the objects of WHC's nuclear and hazardous waste management and environmental restoration activities. The most recent Tri-Party Agreement (TPA) specifies that low-level and high-level waste vitrification plants will be built to provide a state-of-the-art solution for defense nuclear waste.

IV. WESTINGHOUSE HANFORD COMPANY ORGANIZATION AND THE ROLE OF OVERSIGHT

To achieve its objective, WHC is organized in a multi-lined organization. The Tank Waste Remediation Systems (TWRS) organization includes Projects, Operation and Maintenance, Engineering Upgrades, and Safety Programs, and performs most of the tasks related to the Hanford Site waste tank farms. The Emergency, Safety and Quality (ESQ) organization provides an independent assessment designed to help the different line organizations with regulatory compliance, safety,

Figure 2. Hanford Site Waste Tanks.



quality and environmental compliance, and above all, effectiveness in management by evaluating alternatives.

The ESQ, as an oversight organization, covers safety, quality and environmental assessments. Other branches provide support roles in radiation protection and industrial safety. Most of the experts in the safety, quality and environmental branches are senior members, with a large number of years of expertise in one particular discipline. Thus, the oversight group provides a balanced overview and full integration between the different disciplines.

V. TWRS' MAJOR ACTIVITIES

There are four main lines of activities in TWRS and its supporting projects:

A. Characterization Programs

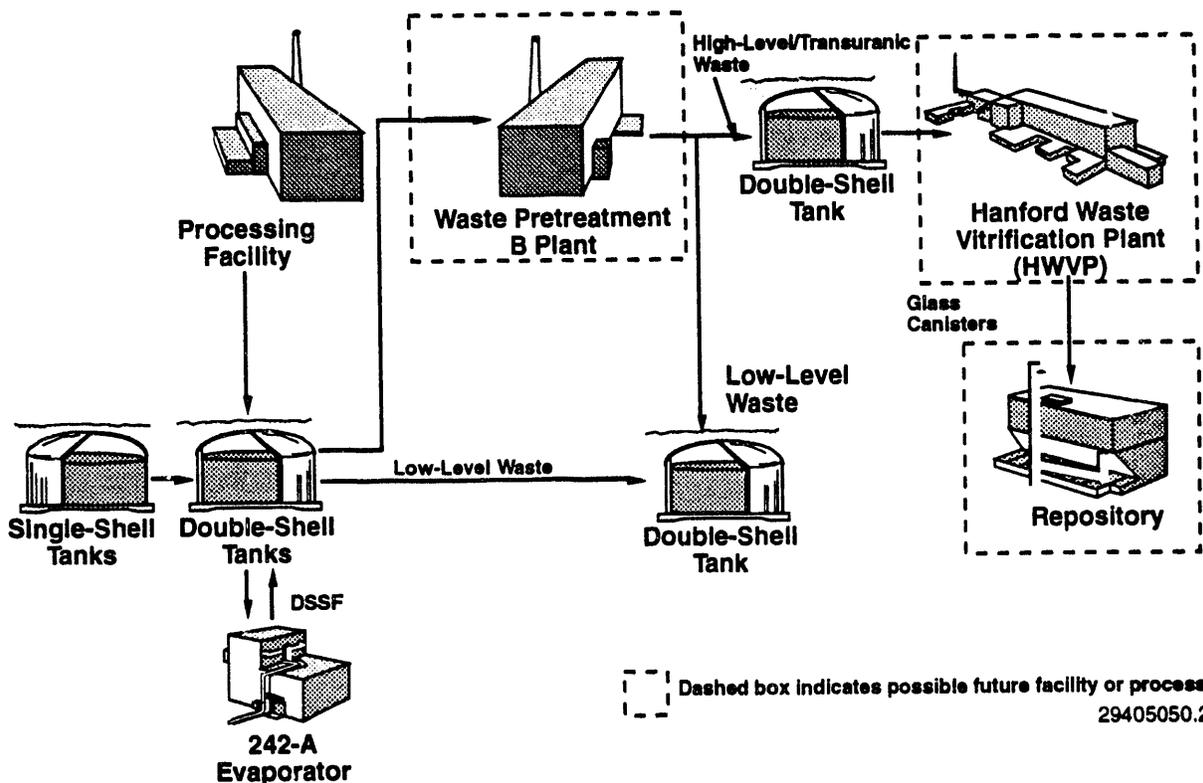
The first line of activity addresses characterization of the waste. Most of the Hanford Site tank waste was mixed in more than one phase of the site operation. Complete reliance on theoretical treatment (Track Program) is not possible. To meet the Resource Conservation and Recovery Act (RCRA) and Comprehensive Environmental Response Compensation

and Liability Act (CERCLA) requirements, a minimum of two waste samples are to be extracted and analyzed for up to 200 elements. The Quality Oversight organization helps prepare the readiness reviews prior to the various sampling campaigns, whether they are for meeting the characterization goals or the various aspects of the safety program addressing unresolved questions of gas generation, ferrocyanide and high hydrocarbons. Recently, other aspects were also added, including criticality safety, noxious odors, and methane generation.

B. Mitigation/Remediation/Retrieval/Restoration Program

TWRS' second major line of activity covers mitigation efforts. A first-of-its-kind mixer pump has been installed in tank SY-101 to resolve the hydrogen generation ("burping") phenomena. In compliance with DOE Order 6430.1A and other supporting safety orders, a detailed Safety Analysis Report (SAR) was prepared by Los Alamos National Laboratory. Quality Oversight was best positioned to address the requirements of the readiness reviews, SAR development, pump testing, installation, and finally successful operation of the pump project, all of which will lead to burn-free tank operation. It is hoped that

Figure 3. Hanford Site Waste Management and Treatment.



the insight gained from automated and computerized data gathering will lead to resolution of the burping phenomena, and also assess the different mitigation mechanisms proposed, including dilution, heating, supersonic vibration and mixing. The review and guidance of the project evaluation covers many aspects of regulatory compliance, including safety, quality, and environmental. All aspects of project implementation manifested the importance and usefulness of the oversight organization in providing an overall integrated function.

C. Long-Term Waste Management

The third major line of activity at TWRS covers the long-term waste management projects. Originally, WHC considered grouting and high vitrification projects. Recent upgrades of the TPA included low-level and high-level waste vitrification. An overview of waste treatment optimization is an intricate, multidisciplinary task.

D. Tank Farms Operation and Maintenance

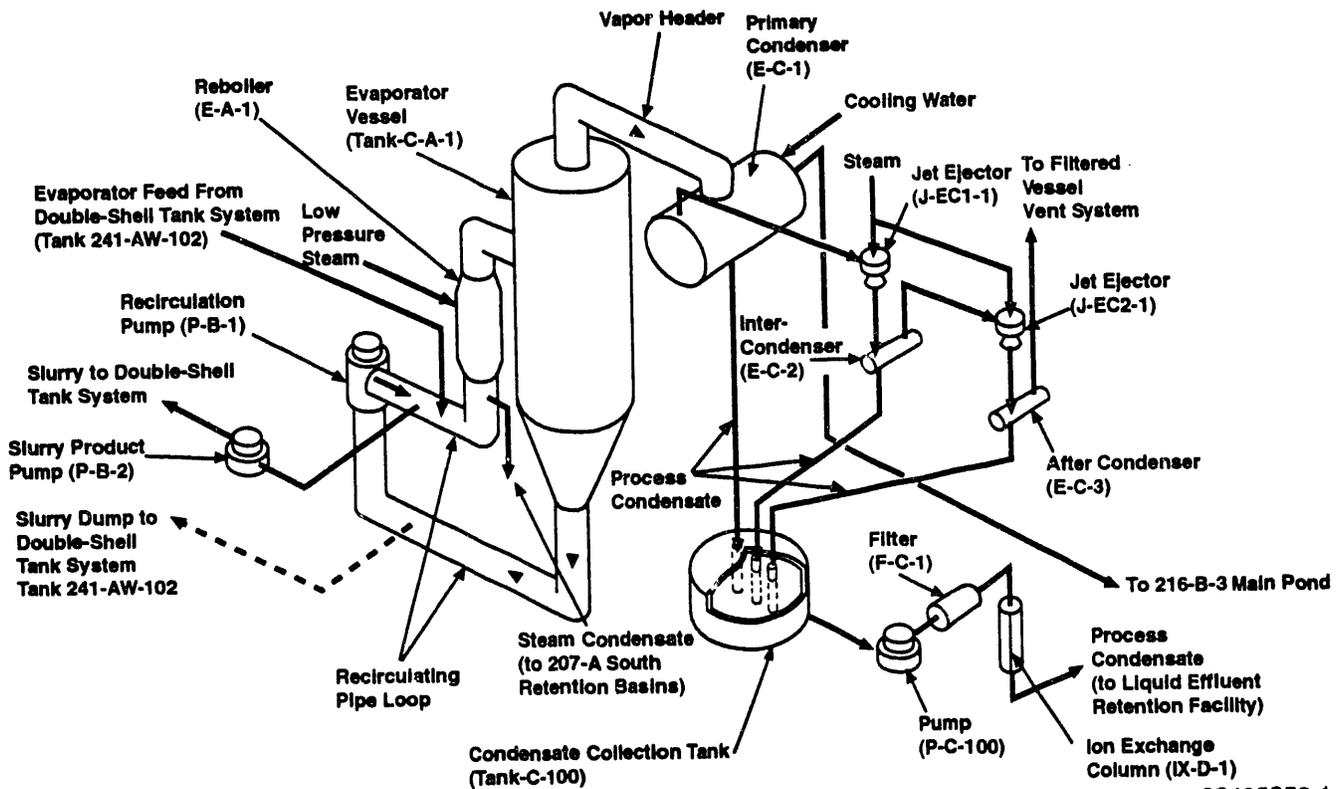
The fourth major TWRS activity line covers tank farms operation and maintenance. The Quality Oversight organization verifies regulatory compliance,

management effectiveness, and overall integration of systems training, operations procedures and implementation adequacy.

VI. SOLID WASTE PROJECTS

Recently, TWRS Quality Oversight had the opportunity to contribute to the oversight of the solid waste projects and activities. As WHC operates burial grounds, and in compliance with the RCRA and CERCLA requirements, full characterization for the burial boxes, barrels, and odd-shaped objects like the high-efficiency particle absorber (HEPA) filters, is needed. The problem represents a challenge of immense technicality. The volume of data management would have been overwhelming without resorting to fully-automated computer systems. Pacific Northwest Laboratory provided an assayer system that performed the required role. The overview of how the systems met environmental and characterization requirements was a challenge that presented an opportunity for the Quality Oversight organization. Each assignment, bringing more multidisciplined challenges, leaves the Quality Oversight organization more prepared for the next.

Figure 4. Evaporation Process.



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VII. THE QUALITY OVERSIGHT ROLES

In all of the above-described activities, Quality Oversight provides two important functions that are otherwise hard to achieve. The first is a multidiscipline regulatory compliance overview, by combining aspects of environmental quality and safety compliance. Assurance of regulatory compliance is achieved through familiarity with DOE orders, the Code of Federal Regulations, industry standards, including Institute of Nuclear Power Operations, Electric Power Research Institute, American Nuclear Society, American National Standards Institute, Institute of Electrical and Electronics Engineers, etc., and how the overall regulatory rules work in synchronism to achieve an assurance of the health and safety of the public and the workers. The second is the overall project integration, assuring that no issue falls into the gaps between the different disciplines. The role of the generalists, in parallel with the specialists, helps achieve overall management effectiveness.

VIII. CONCLUSIONS

The role of Quality Oversight at WHC has manifested that a multidisciplinary approach to regulatory compliance and management effectiveness is

useful and justified. Quality Oversight provides the foundation for implementing the principles of systems engineering and operation research to achieve waste management and environmental restoration goals and realize the best possible results for taxpayer dollars.

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Figure 5. Fuel Processing Plant.



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