APPENDIX I

FIELD VERIFICATION REPORT
ROCKY FLATS PLANT
MAY 2 – 11, 1994

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EXECUTIVE SUMMARY

This report presents the results of a review of chemical safety vulnerabilities associated with facilities owned or operated by the Department of Energy (DOE) at the Rocky Flats Plant (RFP). The field verification review was conducted from May 2 to May 11, 1994, and was part of the Chemical Safety Vulnerability Review being conducted by the Office of Environment, Safety and Health at the direction of the Secretary of Energy. The overall study is intended to use personnel representing line organizations having operational responsibilities. The Office of Environment, Safety and Health is coordinating the effort.

The purpose of the review is to identify and characterize conditions or circumstances involving potentially hazardous chemicals at DOE sites and facilities, with emphasis on facilities being transitioned to, awaiting, or undergoing decontamination and decommissioning. Specifically, the review is designed to identify, characterize, and prioritize chemical safety vulnerabilities associated with conditions or circumstances that may result in (1) fires or explosions from uncontrolled chemical reactions, (2) exposure of workers or the public to chemicals, or (3) release of chemicals to the environment.

Earlier in 1994, an extensive self-evaluation of potential chemical safety vulnerabilities at RFP was performed. The self-evaluation included a review of a range of facilities, in addition to consideration of sitewide programs, such as the Integrated Work Control Program. The facilities reviewed included laboratories, process facilities, receiving and storage warehouses, and waste treatment facilities. Field verification activities at RFP began with an analysis of the self-evaluation and visits to all the facilities specifically examined in the self-evaluation. The review efforts were extended to additional interviews and facilities that were considered to be an integral part of the identified operation (e.g., the chemical preparation and storage rooms directly adjacent to Building 371) or where further information seemed to be important to be able to provide context for an observation.

In all cases, the field verification was conducted with a view toward identifying possible DOE-wide chemical safety vulnerabilities. The effort identified five issues that should be considered as part of the subsequent effort to identify DOE-wide chemical safety vulnerabilities. None of the conditions or circumstances identified requires immediate action to prevent severe consequences:

- Lack of accurate and complete chemical inventories impedes the effective analysis of hazards posed to workers.

- Chemical hazards are provided disproportionately less management support than are radiation hazards; as a result, the range of controls over chemical safety vulnerabilities may be incomplete.

- Resource Conservation and Recovery Act (RCRA) requirements are given precedence over chemical safety, such that operations not yet regulated by RCRA are not likely to be candidates for pilot programs to introduce new or improved controls over hazardous chemicals.

- Deterioration of physical conditions has the potential to create chemical hazards.

- Decisions on budget content and priorities delay correction of known chemical safety issues.

These vulnerabilities, along with those identified during field verification efforts at other DOE sites, will be evaluated to identify DOE-wide generic vulnerabilities. In addition, information from the Office of Environmental Management's Surplus Facilities Inventory Assessment and the extended review of facilities in which there may be potential nitrate-organic vulnerabilities (similar to those at Tomsk-7) will be considered for any additional insights into potential chemical safety vulnerabilities.

1.0 INTRODUCTION

1.1 Purpose and Scope

Based on direction from the Secretary of Energy, the Assistant Secretary for Environment, Safety and Health established the Chemical Safety Vulnerability Working Group to review and identify chemical safety vulnerabilities at facilities operated by the Department of Energy (DOE). The information obtained from the review will provide the Working Group with valuable input for identifying generic chemical safety vulnerabilities that confront the DOE complex. Prioritizing the generic chemical safety vulnerabilities that are identified will establish the proper basis for departmental focus on programs, funding, and policy decisions related to chemical safety. The Secretary directed the Office of Environment, Safety and Health (EH) to lead this review, with full participation from DOE line organizations having operational responsibilities.

The Chemical Safety Vulnerability Review was designed and undertaken to identify and characterize adverse conditions and circumstances involving potentially hazardous chemicals at facilities owned or operated by the Department. Specifically, the review was intended to identify, characterize, and prioritize chemical safety vulnerabilities associated with conditions or circumstances that might result in (1) fires or explosions from uncontrolled chemical reactions, (2) exposure of workers or the public to hazardous chemicals, or (3) release of hazardous chemicals to the environment. Using input provided by line organizations with operational responsibilities, the Working Group developed the "Project Plan for the Chemical Safety Vulnerability Review," dated March 14, 1994, to guide the review.

The field self-evaluation phase of the review used a standardized question set developed and distributed by the Working Group to collect data related to chemical safety from 84 facilities located at 29 sites. Based on analysis of self-evaluation data, nine large sites, including the Rocky Flats Plant (RFP), and four small sites were selected to participate in the field verification phase of the review. The field verification process was designed to use independent teams of technical professionals with experience in a variety of technical disciplines to confirm the accuracy and completeness of the data compiled during the field self-evaluation phase of the review. This report documents activities related to the field verification phase of the Chemical Safety Vulnerability Review.

The field verification team visiting RFP examined a broad range of facilities (based on facility type and operational status), with special attention given to those facilities being transitioned to, awaiting, or undergoing decontamination and decommissioning (D&D). Different types of chemical- and waste-handling facilities were examined to permit identification of vulnerabilities arising from hazardous chemicals and wastes at the site. Facilities selected for review at RFP included Building 551, General Warehouse; Building 559, Plutonium Analytical Laboratory; Building 371, Plutonium Recovery; Building 374, Waste Treatment; Building 881, General Laboratory and Central Computing; and Building 207, Industrial Waste Holding Tank. Specific facilities were selected for review at RFP based on (1) the types of chemical hazards known to exist at given facilities; (2) the need to review a cross-section of laboratory, process, pilot plant, chemical storage, and utility facilities; and (3) the need to examine chemical hazards associated with facilities at different points in their life cycle (i.e., operating, standby, shutdown, abandoned, etc.) or under changing mission.

The field verification team, under the direction of a DOE team leader, was composed of DOE and contractor personnel with technical expertise in various aspects of chemical safety, including management and operations, training, chemical process safety, industrial hygiene, maintenance, environmental protection, and emergency management. The team included a Working Group member and an EH Site Representative who served as site liaisons. A team composition list is provided in Attachment 1 of this appendix.

The team began its review by visiting each of the facilities selected for self-evaluation. The team met with management or technical representatives from each of the facilities reviewed. Individual and small group meetings were also held, and team members conducted walkthroughs, document reviews and personnel interviews to gather information related to potential chemical safety vulnerabilities at RFP. The team leader met daily with management personnel to discuss the team's activities and issues that may have surfaced during the previous day. Before the field verification team left RFP, management from local DOE and contractor organizations conducted a factual accuracy review of the draft report. An outbriefing was conducted on Wednesday, May 11, 1994, and a draft copy of this report was left with DOE and contractor management.

1.2 Site Description

The Rocky Flats Plant is located in northern Jefferson County, Colorado, about 16 miles northwest of downtown Denver and 7–10 miles from the communities of Boulder, Broomfield, Westminster, Arvada, and Golden. The closest community, Leyden, is located about 3 miles to the south. The 384-acre plant site is situated within a 6,550-acre restricted preserve, which serves as a buffer zone between the plant itself and the surrounding communities. (See Figures 1 and 2.)

Construction of the Rocky Flats Plant began in 1951, and initial operations occurred the following year. The plant was operated at that time by Dow Chemical U.S.A., a unit of the Dow Chemical Company. EG&G Rocky Flats, Inc., took over the operating contract on January 1, 1990.

For nearly 40 years, the Rocky Flats Plant was a key facility in the Federal Government's nationwide complex for nuclear weapons research, development, and production. RFP supported the nuclear weapons program and other work related to national defense, providing unique processing capabilities for the fabrication of weapons components from plutonium, uranium, beryllium, and stainless steel. The plant also played a key role in the decommissioning and maintenance of nuclear weapons. In response to the breakup of the Soviet Union and the end of the Cold War, RFP's nuclear production mission was curtailed. The new mission is one of site environmental restoration, waste management, decontamination, and economic development.

1.3 Facilities Visited

Because visiting every DOE facility at the site was not possible under the time constraints of this review, the Working Group focused its efforts to achieve the maximum results possible in the time available. Five facilities at RFP were selected to participate in the self-evaluation phase of the Chemical Safety Vulnerability Review. Based on analysis of the self-evaluation

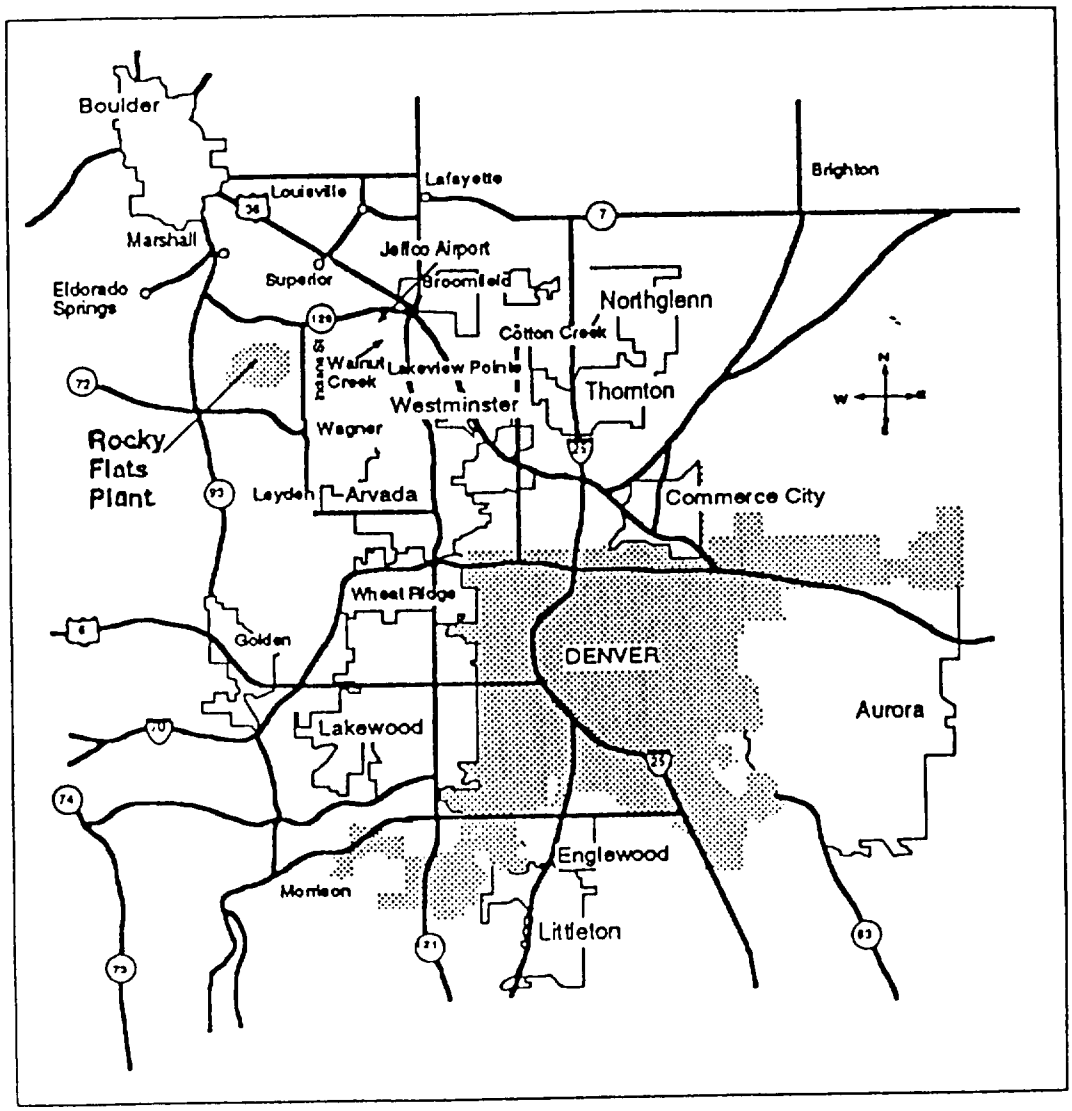

Figure 1. Rocky Flats Plant and Surrounding Communities

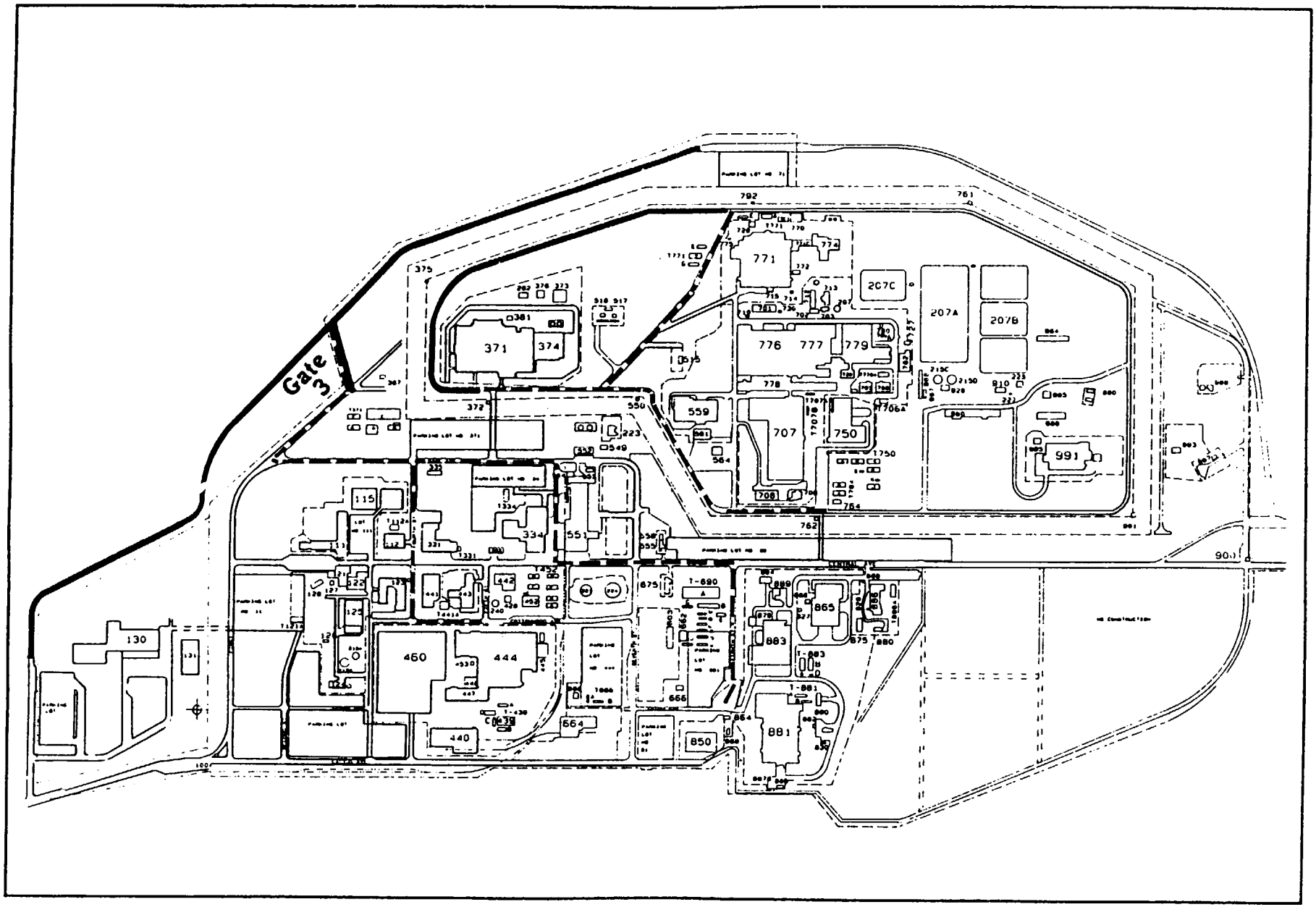

Figure 2. Rocky Flats Plant

data, the facilities identified for self-evaluation were determined to be appropriate for the verification visit. In addition, review efforts were extended to additional facilities that are considered paired building combinations (e.g., Buildings 371/374). Operations activities involving hazardous chemicals at RFP selected for field review include laboratories, process facilities, warehouses, waste treatment facilities, and waste holding tanks. The following facilities were reviewed by the field verification team.

Building 551, General Warehouse: Building 551 is a general-use warehouse facility built about 35 years ago. The facility was constructed for supplying, storing, and shipping supplies and equipment. The facility stores materials and supplies in their original containers. The building contains a paint locker for storage of paint and solvents. Building 551 contains general stores such as rubber gloves, maintenance materials, spare parts, and bulk chemicals used throughout RFP.

Building 559, Plutonium Analytical Laboratory: Building 559 was built in 1967 as a plutonium analytical laboratory to support plutonium processing operations at RFP. Its principal mission was analyzing gaseous, liquid, and solid samples to quantify their major components, including isotopes, alloying agents, and impurities. This facility has an underground waste-holding pit that is no longer in service; the drains leading to the pit are administratively controlled and, in some cases, are engineered to prevent the introduction of process waste. At present, Building 559 is a fully operational, analytical laboratory charged with the mission to provide identification, characterization, and analysis of process-related waste forms generated at RFP. In addition, it provides analytical support to all special nuclear materials projects.

Building 371, Plutonium Recovery: Building 371 is a four-level, partially underground structure of reinforced concrete that was constructed for the recovery and refining of plutonium and is a plutonium storage facility for the plant site. Recovery and refining processes are shut down with no immediate plans for restart. At present, analytical and standards laboratories are operating in the facility. Operation of the process scrubber system continues. Various chemicals are stored throughout the facility with acids and caustic for the treatment of processes constituting the majority of the chemicals present. Building 371 contains two 90-day waste storage areas, four satellite waste storage areas, and 39 active residue storage areas regulated under the Resource Conservation and Recovery Act (RCRA).

Building 374, Waste Treatment: The waste treatment facility treats liquid process wastes for the entire Rocky Flats Plant. The facility, which consists of a main floor, a basement, and mezzanines, contains the waste treatment processing area; tanks for receiving and storing liquid process wastes containing chemical contaminants and low concentrations of radioactive materials; a drum-handling and storage area; and support, mechanical equipment, and utilities areas. Liquid process wastes from plutonium recovery and other process buildings on the plant are transferred to waste treatment after any significant quantities of radioactive materials have been removed by normal recovery operations. Two types of liquids are sent for waste treatment: (1) process wastes, such as nitric acid and sodium hydroxide solutions (which contain large quantities of chemicals and a low concentration of radioactive materials) and (2) liquids such as laundry water, process cooling water, and steam condensate (which contain lesser quantities of chemicals and could contain residual amounts of radioactive materials). Ultimately, the final products are dry sludge, salt, and distilled water.

Building 881, General Laboratory and Central Computing: The original purpose of Building 881, constructed in 1953, was the processing and machining of stainless steel and enriched uranium. Residual enriched uranium remains in some areas of the building, primarily in ventilation ducts and electrical conduits. An ion exchange process, located near Room 114, extends vertically through four levels and was used to process uranium nitrates. Hydrofluoric acid and other reactive chemicals were used in the ion exchange process but are no longer in use. All production of uranium components has been transferred to other manufacturing buildings. At present, laboratory, development support, and administrative operations are performed in Building 881. The laboratories provide general analytical and standards calibration services, development operations provide waste technology development, as well as some development and/or testing of mechanical systems for weapons systems. Administrative operations provide computer support.

Building 207, Industrial Waste Holding Tank: Building 207 is an aboveground, industrial-waste holding tank. It was used as a laundry water feed tank for the Building 774 Evaporator and later as a temporary storage facility for low-level wastewater before the wastewater was moved to the Building 207 A, B, and C Solar Ponds. The tank has been taken out-of-service and has remained inactive or shut down for the past 9 years. Review of this facility was limited to a walkaround. Documentation concerning the contents of the tank was requested but could not be located.

In addition, two facilities that use chlorine, Buildings 124 and 995, were included in the field review as an issue of special concern.

2.0 SUMMARY OF RESULTS

Field verification is one phase in the process being used to arrive at conclusions regarding the existence and significance of chemical safety vulnerabilities across the DOE complex. The field verification process was designed to use independent teams of safety professionals to confirm the accuracy and completeness of the data provided to the Chemical Safety Vulnerability Working Group by RFP facilities selected to participate in the field self-evaluation process. The verification process offered an opportunity to examine site-specific chemical safety vulnerabilities and to make informed judgments about the relevance of these conditions as they relate to determinations of generic chemical safety vulnerabilities.

The goal of the field verification team was to identify and prioritize chemical safety vulnerabilities at RFP. Before arriving on site, the team reviewed the self-evaluation data and other documents to allow team members to develop a list of observations related to potential vulnerabilities for their functional areas. During the onsite portion of the review, team members visited the facilities selected for self-evaluation to confirm reported observations and to look for other conditions and circumstances could result in chemical safety vulnerabilities. In some instances, facilities or areas that were not involved in the original self-evaluation were reviewed and have provided valuable information for the review.

To support effective team management and to expedite the identification of vulnerabilities across a wide range of technical disciplines associated with chemical safety, each field verification review has been organized to include five functional areas:

- Identification of chemical holdings, including the properties of chemicals located at the facility, the characterization of those chemicals, and an analysis of the inventory.

- Facility physical condition, including engineered barriers, maintenance conditions, chemical systems, safety systems, storage, monitoring systems, and hazards identification.

- Operational control and management systems, including organizational structure; requirements identification; hazard analysis; procedural adherence; maintenance control; engineering and design reviews; configuration control; safe shutdown plans; and site programs for quality assurance, chemical safety, inventory control, access control, disposal, transportation and packaging, and corrective actions.

- Human resource programs, including technical competence, staffing, training and qualifications, employee involvement, employee concerns, personnel performance requirements, and visitor and subcontractor control.

- Emergency management program, including the emergency plan, in-plant consequences, environmental issues, coordination with the community, and community right-to-know issues.

These functional areas were evaluated on the basis of lines of inquiry provided in Attachment 1 of the "Field Verification Guide for the Chemical Safety Vulnerability Review," dated April 8, 1994. Verification of the self-evaluation data was accomplished by walkthroughs of facilities, conduct of interviews with management and technical personnel,

examination of facility and site documentation, and review of incident reports and other documents.

The self-evaluation report for RFP was substantial. It identified current weaknesses and plans for improvement. To a large extent, the field verification team confirmed the vulnerabilities identified in the self-evaluation. The team's identification of generic chemical safety vulnerabilities drew on those identified in the self-evaluation but attempted to emphasize those matters that appeared to have DOE-wide implications.

Summaries of the functional areas are provided in the sections below. Completed chemical safety vulnerability forms resulting from the field verification activities at RFP are provided in Attachment 2 of this appendix.

2.1 Identification of Chemical Holdings

In the four buildings reviewed, hazardous chemical inventories total less than 25 percent of the threshold quantities identified in 29 CFR 1910.119 and 40 CFR 68. Although a range of potentially hazardous chemicals, including carcinogens, are routinely used in the different buildings, control measures have been implemented to mitigate personal exposures and generation of significant quantities of hazardous wastes.

Overall, plant-wide progress has been made toward enhancing hazardous chemical control programs through the improvement of existing programs: the Chemical Hygiene Program (CHP), the Environmental Planning and Community Right-to-Know (EPCRA), Chemical Control System (ECCS), the Excess Chemical Program, and the Waste and Environmental Management System (WEMS).

The preliminary design for the ECCS was completed in fiscal year (FY) 91 and has not been implemented sitewide. It was designed to provide compliance with regulatory requirements, including 40 CFR 370, "Emergency Planning and Community Right-To-Know," and Executive Order 12856, "Toxic Material Release Inventory Reporting Program." It was not intended to, nor does it, track all hazardous chemicals on the site. In the ECCS, each chemical is identified by a unique bar-code. As discussed in the self-evaluation, up to 40 percent of hazardous chemicals arrive at their locations without initially entering the ECCS. Only new chemical purchases are entered in the bar-coded system. Because individual building managers determine their own needs and order chemicals directly, the ECCS competes with facility-specific tracking systems that may provide more accurate, real-time information regarding chemical quantities, conditions, and specific locations. (In general, inventory activities performed under the ECCS indicate only that a chemical is located in a given building. The facility-specific inventory data base may identify the cabinet and room number where the hazardous chemical or waste material is located.) Facility-specific data bases, coupled with facility-designated Chemical Control Officers (CCOs), such as those being implemented in Building 559, provide more complete inventory information.

In February 1993, the Excess Chemical Program was established to identify, characterize, and dispose of excess chemicals throughout the site. However, a statement made in the self-evaluation report indicates that "actual movement and disposition of excess chemicals from existing locations has been slow to develop." Furthermore, activities resulting from this

program highlight unique safety issues, in that potentially significant numbers of out-of-date chemicals or reactive chemicals may be identified and consolidated before ultimate disposal. At present, some reactive chemicals housed in Buildings 881 and 551 are being stored inappropriately under potentially unsafe conditions. RFP is currently using outside contractors to dispose of reactive chemicals. In addition, as facility excess chemical inventories were being performed, a number of chemicals were found that had not been bar-coded while they were being used in the facility.

Procedures in 1-1000-HWB, *Hazardous Waste Requirements Manual*, have been implemented across the facility to assist in proper labeling and container management and to ensure that all wastes are characterized and sent to the correct permitted storage area within the allowable accumulation time. The hazardous and mixed waste components of the chemical holdings are tracked under WEMS.

Due to the historical operating conditions and the extended shutdown of some facilities with materials in line, residual chemicals remain in some pipes, drains, and structures. The degree of characterization and quantification for these residuals vary widely within a facility and from facility to facility. For example, detailed studies have been performed in Building 371 to determine "low points," or areas where materials may be located. Efforts to drain these structures are expected to be long term, and detailed schedules and plans for these activities do not yet exist.

Mixed residues (also referred to as "recoverable products") in tanks and piping at Building 371 were declared by a court order (*Sierra Club v. DOE*, 89-B-181, dated April 12, 1990) to be RCRA-regulated waste. Discussions are in progress to determine the best method for managing this waste. Management of this waste poses a vulnerability in that RCRA requirements appear to conflict with those for worker safety (see Vulnerability CSVR-RFP-000-03). All other inventories of hazardous and mixed waste in the buildings reviewed are managed in accordance with State of Colorado waste management regulations under delegated authority from the U.S. Environmental Protection Agency. Containers of hazardous, mixed, and radioactive wastes are stored in a manner that prevents or minimizes the potential for inadvertent releases of contained materials. Waste generators initiate waste collection in Satellite Accumulation Areas (SAAs) and are responsible for proper waste characterization. Personnel known as "RCRA custodians" manage the SAAs, the 90-day accumulation areas, and the "to-be-permitted" areas in their buildings in accordance with the requirements established in the *Hazardous Waste Requirements Manual*. Waste generators and RCRA custodians receive both initial and annual refresher training in hazardous waste management.

Specific information concerning chemical holdings components can be obtained from the programs described above. Individually, these programs provide key information regarding sitewide chemical inventories, but no one program provides accurate and complete site-specific information on chemical inventories. Toward this end, RFP has initiated development of the Chemical Program to provide a more integrated approach to the management of all aspects of hazardous chemicals. The program includes computerized tracking of the chemicals from prepurchase approval through storage, use, and final disposition and is expected to provide the framework for a systematic and comprehensive approach to accurate and real-time information on chemical holdings at RFP. Because of the loss of existing

expertise, the schedule for implementing the integrated Chemical Program, and the limitations of key components of this program, RFP still does not have the ability to manage the hazardous chemical inventory fully at both the facility and site levels. When existing programs are integrated, some expertise from the individual programs will be lost. The group of skilled chemical packers, developed and trained under the current Excess Chemical Program, will not be involved in the newly integrated Chemical Program. Use of the ECCS in conjunction with designated CCOs (i.e., to provide more facility ownership) will not be implemented sitewide for some time. The Chemical Program will be piloted in Building 881 in late FY 94 and FY 95. On the other hand, in Building 559 a CCO currently manages day-to-day operations (e.g., purchasing, receiving, use, disposal, building-specific locations) involving all hazardous chemicals, including hazardous waste. The Building 559 facility data base provides a current, accurate, and complete facility inventory.

As it functions today, ECCS does not provide a comprehensive data base for the management of all hazardous chemical holdings, hazardous chemicals, and hazardous and mixed waste. Facility inventory data generated and maintained for sitewide ECCS use must (1) have facility ownership, (2) be available on a real-time basis (current and accurate), (3) include facility-specific information (location, container type, and condition), and (4) be accepted and consistently used at the facility level. The ECCS must be used in conjunction with other systems that may be incompatible with ECCS (e.g., WEMS, facility-specific data bases) to determine a total facility or total sitewide inventory of hazardous chemicals. This poses a vulnerability (see Vulnerability CSVR-RFP-000-01) in that facility workers do not have real-time, current, and accurate inventories of the chemicals in their workplace. This affects all continued and mission-change operations, including transition to and conduct of D&D, because all hazards analyses associated with hazardous chemicals in the facility and on site are dependent on accurate chemical inventory information. These needs become increasingly important as specific areas of a building are expected to be under continued change, including the number, type, condition, and location of chemical holdings. The inability to provide accurate, current inventory information regarding "areas within a facility" increases the risk of exposure of workers to hazardous chemicals for a selected task.

2.2 Facility Physical Condition

The EG&G Rocky Flats, Inc., self-evaluation presents a factual review of the status of preventive maintenance and engineering configuration change control at RFP. The self-evaluation recognized that preventive maintenance activities have been given a lower priority because of the emphasis placed on reducing the corrective maintenance backlog. The self-evaluation also recognizes that very little predictive maintenance is performed at RFP. It fails, however, to consider the adverse effect on timely completion of corrective and preventive maintenance activities and on morale that results from the complexity of the Integrated Work Control Program (IWCP). Further, the report did not consider the long-term effects of continued reduction in maintenance budget and staff on the physical condition of RFP facilities.

For the facilities reviewed at RFP, the mechanical integrity of the primary and secondary containment systems and equipment is generally satisfactory, but the level to which specific facilities are maintained varies according to the mission status. The corrective maintenance program is reactive. For example, two of three major ventilation fan motors in Building 371

failed within the last several months. Replacement motors have been ordered and will be installed when received. The preventive maintenance program is mission driven. RCRA-regulated facilities and activities (such as stabilization and consolidation) receive attention, whereas standby facilities receive minimal preventive maintenance because of staff and budget limitations. Because of existing plant priorities, completion of preventive maintenance activities has fallen behind and has become secondary to achieving a reduction in the growing corrective maintenance backlog. A preventive maintenance program manager was hired within the past month to focus on this activity. A sitewide predictive maintenance program that indicates the need for preventive maintenance before equipment fails should be considered. With one exception (thermal tomography of high-voltage electric power lines), the predictive maintenance program at RFP is very weak and, where applied, is piecemeal.

Mechanical integrity of pressure vessels, boilers, and process piping is closely monitored by operations and maintenance personnel, with support provided as needed from the Systems Engineering and Design Engineering organizations. However, no formal sitewide pressure vessel or piping inspection program (ultrasonic or radiographic) exists to monitor system deterioration with time. When containment systems must be breached, formal written procedures must be approved by the appropriate engineering, maintenance, and operations personnel. A safety review and a quality assurance review of all procedures are required.

Maintenance management systems are in place to govern corrective and preventive maintenance activities. The EG&G Rocky Flats, Inc., Maintenance Implementation Plan provides a graded approach to comply with the provisions of DOE 4330.4A. The IWCP, a complex and time-consuming work control program, clearly defines all preventive and mitigative measures for nonroutine work activities. It significantly extends the time required to complete routine preventive and corrective maintenance activities and is a factor in the low morale of maintenance crafts personnel. The IWCP permit authorizes personnel to begin work once signatures on the permit indicate all work groups are satisfied that the equipment and the area have been prepared for the assigned work, necessary safety precautions have been taken, and regulatory permits have been received. The IWCP encompasses all preventive and corrective maintenance activities for vital safety systems. About 10 percent of sitewide preventive maintenance activities are undertaken using the IWCP, yet the administrative burden imposed by this program has significantly contributed to the overall time for completing routine maintenance activities and has increased the maintenance backlog. For example, the corrective maintenance work order backlog for Building 371 increased from 1,200 to 1,400 items during the past 11 months (see Vulnerability CSVR-RFP-000-04).

Engineered design safeguards to protect worker safety are included in the facility design or modification package. The Configuration Change Control Program provides control of the technical baseline (1) to ensure continued safe operation by maintaining the existing approved configuration of all elements; (2) to identify breaches in the technical baseline; (3) to provide effective and timely action to restore the technical baseline; and (4) to provide a process for determining that any changes to the baseline are necessary and safe, have been properly reviewed, and have been approved prior to installation. A core group of health and safety personnel interface with engineering design personnel during the project review and approval process. The extent to which the Industrial Hygiene organization participates in the engineering design review is determined by the health and safety core groups. The self-evaluation report concludes that the Configuration Change Control Program needs

improvement. The verification team supports this conclusion, since decisions on implementation of the program rest largely with individual building managers.

At RFP, raw water and wastewater are chlorinated at Building 124 and Building 995, respectively. Both chlorinator facilities are housed in sealed cabinets located outdoors. Each sealed cabinet, and the point at which the chlorine is introduced into the water system, is equipped with continuous chlorine monitors having both audible and visual alarms. Formal, approved, written procedures govern both the changeout of chlorine cylinders and responses to off-normal alarms. Cylinder exchange requires two workers in protective clothing and equipped with full self-contained breathing apparatus.

The reduction in maintenance staff through budget reduction, personnel transfer, retirement, and facility shutdown will continue to result in loss of craftspeople who have intimate knowledge of unrecorded aspects of both operating and shutdown facilities. This loss of craft expertise and undocumented facility-specific information has the potential to affect adversely the safe operation of chemical-handling facilities at RFP.

2.3 Operational Control and Management Systems

Although EG&G Rocky Flats, Inc., has put in place an array of policies and procedures, many of which are related to safe management of hazardous materials, the field self-evaluation identified some chemical safety vulnerabilities. Management has generally recognized those areas where improvements are needed. The configuration change control system at RFP is one important system needing improvement. Complete and accurate drawings for all chemical-related systems are needed to ensure maximum operational safety now and for future activities. The overall chemical safety program will be greatly enhanced if these improvements are completely and correctly implemented.

The self-evaluation document was relatively thorough and provided a direct tie-in between the specific interests of the field verification team and important operational control and management systems at the site. The information contained in the self-evaluation will be valuable as the site addresses the potential chemical safety vulnerabilities identified.

The field verification team had the opportunity to review numerous documents regarding sitewide operational control and management systems, to discuss practices with site staff, and to observe conditions at the facilities selected for review. RFP does not have a centrally organized and integrated system for managing hazardous chemicals. The EG&G Rocky Flats, Inc., policy manual, maintained by the Standards, Audits and Assurance organization, does not provide for such a system, nor does the manual explicitly include safe management of hazardous chemicals as a key activity or priority in the many policy documents contained in the manual. In the fall of 1993, however, an experience at Building 865 gave rise to a lessons-learned evaluation (see memorandum from G.P. Fraser to Distribution, "Lessons Learned Document Corrections - Excess Chemicals in Building 865," dated October 8, 1993) that, in part, has led to the designation of a specific individual mandated to develop an integrated management plan for chemicals at RFP. This activity is just beginning and is being funded out of monies from work packages supporting overhead activities for health and safety. In a related effort, differences between existing programs and those required for inclusion in the Occupational Safety and Health Administration's (OSHA) Voluntary Protection Program

have recently been analyzed. If a commitment is made to move in such a direction, a number of changes will be required to place stronger operational controls on hazardous chemicals.

In some cases, chemical hazards are viewed as being less significant than radiation hazards. Examples include the following:

- The routine monitoring program for ionizing radiation is extensive, whereas the monitoring program for chemical hazards is not fully implemented.

- Although technology limits the amount and type of information that can be collected, meaningful personnel air-sampling data for potential chemical hazards are not readily available.

- The occupational medical program has a considerable amount of radiation exposure data available for use in medical evaluation, although chemical exposure data for use in medical evaluation are minimal.

Clearly, providing employees with enhanced information concerning possible hazards encountered when working with chemicals will improve the occupational health program. This disparity in management support and emphasis is considered a vulnerability (see Vulnerability CSRV-RFP-000-02).

The current hazard analysis methodology with regard to chemical hazards is evolving at RFP. Lessons learned from each activity are being used to modify and improve future activities so that task control is better defined and the safety of workers, the public, and the environment is enhanced. However, the accuracy and usefulness of the hazard analysis process are strongly dependent on the accuracy and specifics of the chemical hazards analyzed (e.g., in room locations, types and conditions of chemicals in each process and room). The hazard analysis methodology employed in Building 771 is fairly comprehensive and may serve as a model for other buildings. The self-evaluation deals extensively with this area and notes the vulnerabilities created by a less-than-adequate characterization of processes involving hazardous chemicals.

As discussed in Sections 2.1 and 3.2 (see Vulnerability CVSR-RFP-000-01), the success and use of hazard analyses are directly related to the accuracy and completeness of chemical inventory information.

Under basic systems that control work involving hazardous chemicals at the site, fundamental decisions are made by the various line management organizations. Work packages are intended to identify needed support services from subject matter experts (e.g., reactive chemical management), with sitewide service programs funded under a separate group of (overhead) work packages. The effectiveness of this system depends on (1) the ability of the line to identify and secure support for its changing resource needs and (2) the willingness of senior management to fund sitewide programs fully enabling progress in the safe management of hazardous chemicals. The self-evaluation report provided information suggesting that this approach is not fully effective, and the field verification team was able to confirm the pertinent information in the self-evaluation report.

Packaging and transportation procedures and requirements appear adequate. Training in this area is standardized and continues to be refined. Department of Transportation regulations provide the basis for this training. The decision to use a single sitewide repackaging procedure will enhance consistency and minimize handling.

2.4 Human Resource Programs

Programs at RFP were reviewed to determine how chemical safety is integrated by EG&G Rocky Flats, Inc., into areas of personnel training and qualification, staffing levels, employee concerns, personnel performance, and communications. The field verification team found that, due to attrition, the level of corporate knowledge of the processes that have not been operated in recent years has reached a low level. The self-evaluation report did not address this issue. This is significant because some facilities were shut down without fully draining the contents from the process equipment. This equipment will have to be operated in some modified form to recover and dispose of these solutions. In the area of hazard communication, the file of material safety data sheets (MSDSs) was not complete, as was recognized in the self-evaluation report. Labels for some equipment that contained chemicals were not current; some low-level waste drums were reported as being improperly labeled in the self-evaluation report.

Although the number of personnel in the various facilities is adequate to perform the current work, the minimal experience level of these personnel may impede their performance where detailed knowledge of equipment and processes is needed. Note the following:

- The six plutonium processing buildings at RFP have not operated since 1989. Operations were suspended with process materials in place in anticipation a of quick resumption of work, and these materials remain in the equipment. In the interim, personnel who were knowledgeable about these processes have been lost through retirement, transfer, reassignment, or other staff actions.

- Personnel currently assigned to these buildings have little experience predating 1989, and their subsequent experience has not been from operation of equipment that will be used to remove residual process solutions. The Transition Management organization is planning to dispose of equipment from these buildings after removal of the process materials. Transition Management is attempting to document everything needed for this work using subject matter experts. In addition, process descriptions are being prepared by the Site Planning and Integration Team.

General training at RFP is provided by the Performance Based Training (PBT) organization. PBT provides General Employee Training to all employees, visitors, and contractors. In addition, PBT provides 8-hour refresher and 24-hour and 40-hour basic training to selected employees to meet OSHA requirements specified in 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response." PBT also provides training to operating personnel on specialty topics (e.g., hazard communication), which in turn allows trained operators to use PBT guides, lesson plans, and reference material to instruct technicians. Workers also receive job-specific and on-the-job safety training for those chemicals to which they are likely to be exposed. Examinations (oral, written, or both) are administered and graded, and the results are documented. In addition, operating procedures contain "notes" that call attention to

hazards associated with chemicals used to perform specific operations. These notes, which help maintain continuing safety alertness, are placed in procedures at steps where these chemicals are used.

The training program meets the requirements of 29 CFR 1910.1200," Hazard Communication"; however, its implementation is weak in that the MSDS files, although extensive, are not current or complete. In addition, labels identifying the chemical contents of some containers are not current. For example, the tanks in Building 374 were labeled for conditions that existed when operations were modified; these labels have not been updated to reflect current conditions.

2.5 Emergency Management Program

The emergency management program at RFP includes provisions that address planning, preparedness, and response for emergencies involving chemicals. The RFP Emergency Plan is the central document that establishes and describes the overall emergency management program. The associated implementing procedures (i.e., the Emergency Plan Implementing Procedures) identify the detailed actions necessary to implement sitewide emergency responses set forth in the plan. Documented responder-specific procedures (e.g., fire department hazardous materials response and RFP shift superintendent response) are currently in place. Facility-specific emergency plans and associated implementing instructions are in place for those facilities that have resumed operational activities (i.e., Buildings 559 and 707). The facilities for which operational activities are planned in the near term (e.g., Buildings 371 and 374) have drafts of emergency plans and procedures in various stages of preparation, and the remaining RFP facilities have no emergency plans or procedures.

Emergency response facilities include a well-equipped, central Emergency Operations Center and satellite functional work centers for use by the RFP emergency response organization. In the event of an emergency, a mobile incident command post, staffed by the RFP shift superintendent, fire and security officers, and technical personnel are established near the scene. Fire response vehicles and equipment, two emergency medical vehicles, a dedicated hazardous-materials-response vehicle, and an equipment trailer are maintained at the RFP fire station. A variety of emergency equipment is maintained in lockers within each facility.

RFP has established a 24-hour-per-day sitewide emergency "2911" telephone call system that contacts the RFP shift superintendent, fire department, and RFP security simultaneously. At the facility level, the shift manager is initially in charge of response and is supported by the Building Emergency Support Team. Facility evacuation is initiated by an appropriate announcement on the Life Safety/Disaster Warning public address system, and facility occupants evacuate to a predesignated assembly point for accountability. Accountability for persons evacuated from most facilities within the protected area is accomplished by means of a personal accountability tag system. In addition, since the system does not provide for positive accountability of facility occupants, search and rescue teams are used to ensure complete facility evacuation.

The RFP fire department provides primary emergency response functions for fire, emergency medical, and hazardous materials events. Fire department staffing includes two onshift

companies (minimum of 12 persons) with all firefighters trained in hazardous materials response (i.e., to the "specialist" or "technician" level to meet the OSHA requirements codified in 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response") and as emergency medical technicians. The onshift chief and captains are trained as Incident Commanders. The captain at the event scene assumes the role of Incident Commander until relieved by the chief officer or RFP shift superintendent. The RFP shift superintendent typically relocates from his central office and establishes the incident command post. Technical support is provided to the Incident Commander by the facility shift manager and by oncall staff from the Industrial Hygiene and Safety Department.

Additional fire, hazardous materials, and/or emergency medical response resources are available from local community response organizations. Formal agreements are in place for emergency medical transportation and hospital care. Informal agreements (a formal mutual aid agreement is pending) are in place for support by the Jefferson County's hazardous materials response organization and community fire districts.

As identified in the RFP self-evaluation, assessment of facility-specific hazards at numerous RFP facilities is evolving. Assessments of facility industrial hygiene and occupational safety hazards are in progress (refer to Section 2.1). Preliminary Hazards Assessments, which incorporate the methodology of DOE 5500.3A, "Planning and Preparedness for Operational Emergencies," but use inaccurate and incomplete chemical inventory information, are in progress for 14 facilities. An integrated approach for conducting hazards assessments, the Integrated Safety Assessment process, has been initiated as a pilot effort for Building 771. This process, intended to satisfy various requirements pertaining to hazards assessment, is designed to be performed by a multidisciplinary team and will establish a baseline of facility-specific hazards. In concert with the State of Colorado, a concurrent effort is in progress to establish emergency planning zones applicable to release of hazardous materials from an RFP facility.

3.0 CATEGORIZATION AND PRIORITIZATION OF VULNERABILITIES

3.1 Criteria

A vulnerability is a weakness or potential weakness involving hazardous chemicals that could result in a threat to the environment, the public, or worker health and safety. Vulnerabilities can be characterized by physical or programmatic conditions associated with uncertainties, acknowledged deficiencies, and/or unacknowledged deficiencies in the area of chemical safety. Conditions required to create the vulnerability should either currently exist or be reasonably expected to exist in the future, based on degradation of systems and chemicals or through expected actions (e.g., D&D of facility).

A vulnerability will be determined to exist if current or expected future conditions or weaknesses could result in the following:

- The death of or serious physical harm[1] to a worker or a member of the public or continuous exposure of a worker or member of the public to levels of hazardous chemicals above hazardous limits; or

- Environmental impacts resulting from the release of hazardous chemicals above established limits.

The prioritization of the chemical safety vulnerabilities is based on the professional judgment of team members concerning the immediacy of the potential consequences posed by each vulnerability and on the potential severity of those consequences. The first step in the prioritization process was to group vulnerabilities according to the timeframe in which they are expected to produce consequences. The following categories have been established for the timeframe within which the consequences are expected to occur:

- Immediate — Any chemical safety vulnerability that could result in immediate consequences.

- Short-Term — Any chemical safety vulnerability at a facility in which there is a significant chance of a consequence occurring within a 3-year timeframe as a result of chemical degradation, change in mission for the facility, degradation of the containment systems, change in personnel at the facility, or other factors affecting the facility.

- Medium-Term — Any chemical safety vulnerability at a facility in which there is a significant chance of a consequence occurring within a 3–10-year timeframe as a result of chemical degradation, change in mission for the facility, degradation of the containment systems, change in personnel at the facility, or other factors affecting the facility.

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[1] Serious physical harm is defined as impairment of the body, leaving part of the body functionally useless or substantially reducing efficiency on or off the job.

- Long-Term — Any chemical safety vulnerability at a facility in which there is a significant chance of a consequence occurring within a timeframe of more than 10 years as a result of chemical degradation, change in mission for the facility, degradation of the containment systems, change in personnel at the facility, or other factors affecting the facility.

Vulnerabilities within each category should be further prioritized to specify "high," "medium," or "low" priority based on the severity of the potential consequences. Examples of the second level of prioritization include the following:

- Prioritize potential harm to workers or the public according to the possible level of injury and/or health effect, ranging from transient reversible illness or injury to death.

- Prioritize environmental impacts based on the level of irreversible damage and/or restoration costs.

3.2 Chemical Safety Vulnerabilities at Rocky Flats Plant

Five vulnerabilities were identified during the conduct of this review. These conditions and circumstances are largely consistent with those already identified by personnel at the Rocky Flats Plant, but they have been recast to a form similar to that already developed for the DOE-wide effort.

CSVR-RFP-000-01: Lack of accurate and complete chemical inventories impedes the effective analysis of hazards posed to workers.

The recognition and control of hazardous chemicals are directly proportional to the accuracy and completeness of chemical inventories. Facility hazardous chemical inventories are generally reported using the Emergency Planning and Community Right-to-Know Act (EPCRA) Chemical Control System (ECCS), a sitewide tracking tool. The ECCS has limitations as both a stand-alone sitewide and facility tracking tool. It is inadequate for uses such as worker hazards assessment, emergency planning, and operating procedures, including D&D. ECCS was designed to track chemicals subject to Title III of the Superfund Amendments and Reauthorization Act and was not intended, nor does it have the capability, to provide current and accurate facility inventories. Hazardous and mixed-waste chemical holdings are tracked separately under the Waste and Environmental Management System (WEMS). There is no systematic approach to the management of chemical holdings at the Rocky Flats Plant in that requirements and practices for purchasing, receiving, handling, storing, and disposing of chemicals vary greatly from facility to facility. Management of chemical holdings in Buildings 371, 551, and 881 is inadequate in that current and accurate "total facility chemical holdings," including location, quantities, and chemical condition, are not available to plant personnel. The ongoing inability to provide total facility inventories places workers at increased risk of exposure to hazardous chemicals in virtually every aspect of their work. This is especially true with pending mission changes and transition activities, where specific areas of a building are expected to be in a continued state of change, including the chemical holdings in those areas. These conditions and circumstances represent a medium- to high-priority vulnerability with a potential for short-term consequences.

CSVR-RFP-000-02: Chemical hazards are provided disproportionately less management support than are radiation hazards.

Potential chemical hazards are not given the same degree of attention as potential ionizing radiation hazards. The need for comprehensive routine monitoring programs for potential chemical exposures comparable to programs required for radiation is not generally recognized. Less than complete personal monitoring creates a void in the data used by industrial hygiene and occupational medicine in evaluating potential chemical hazards. Placing less emphasis on chemical safety than on radiation safety may lead employees to believe that nuclear considerations take precedence over chemical safety. This may result in otherwise avoidable worker exposures to hazardous chemicals. These conditions and circumstances represent a medium-priority vulnerability with a potential for short-term consequences.

CSRV-RFP-000-03: RCRA requirements are given precedence over chemical safety.

Regulatory requirements with clearly established penalties for nonresponse receive management's prompt attention. Attempts to fulfill RCRA inspection requirements may require that employees work in areas where hazardous materials are present. For example, plutonium aqueous recovery system operations in Building 371 ceased in 1984 and the solution remaining in process piping and tanks (containing primarily plutonium nitrate and nitric acid) was never removed. A 1990 U.S. District Court order requires that this material be managed as hazardous waste, subject to regulation under RCRA and Colorado Code of Regulations 6CCR 1007-3, Part 264. These regulations require frequent and total inspections of systems containing this waste. The piping in Building 371 is deteriorating; as this condition continues, the potential for leakage or rupture increases and any entry into the area to perform the inspections can expose employees to hazardous and toxic chemicals. Management's focus has been on regulatory requirements associated with RCRA, which have penalties for noncompliance, rather than on mitigating risks associated with worker activities not yet regulated by RCRA. To date, no strategy has been devised that simultaneously addresses both worker chemical safety and environmental compliance. These conditions and circumstances represent a medium-priority vulnerability with a potential for short-term consequences.

CSVR-RFP-000-04: Deterioration of facility physical conditions has the potential to create chemical safety hazards.

The mechanical integrity of the primary and secondary containment systems and equipment at RFP is generally satisfactory, but the level to which specific facilities are maintained depends on the mission status. The preventive maintenance program is mission driven, with RCRA-regulated facilities and activities such as stabilization and consolidation receiving priority for staffing and budget. Corrective maintenance for all RFP facilities is reactive. With the exception of the thermal tomography of high-voltage power lines, a sitewide predictive maintenance program does not exist at RFP. The Integrated Work Control Program (IWCP) is a complex and time-consuming work control program that clearly defines all preventive and mitigative measures for nonroutine work activities. The IWCP also significantly extends the time necessary to complete routine preventive and corrective maintenance activities contributing to maintenance backlog, and it is a factor in the low morale of maintenance crafts

personnel. The reduction in staff through budget reduction and personnel departure has resulted in the loss of craft expertise and undocumented facility-specific information and has the potential to affect adversely the safe operation of chemical-handling facilities at RFP. These conditions and circumstances represent a low-priority vulnerability with a potential for short-term consequences.

CSVR-RFP-000-05: Decisions on budget content and priorities delay correction of known chemical safety vulnerabilities.

A review of the RFP self-evaluation indicated a number of instances in which the implementation of corrective actions had been delayed because of budget constraints or because relatively low priority had been assigned to chemical safety vulnerabilities. For example, the self-evaluation report notes that "actual movement and disposition of excess chemicals from existing storage locations has been slow to develop" (see page 9). Most work at RFP is accomplished under work packages, which are developed under a formal procedure and management process. The content of these work packages is generally assigned to line managers, who have latitude in determining the need for or actual use of experts in industrial safety, industrial hygiene, emergency management, or hazards assessment. The team verified the self-evaluation report's analysis that the continued existence of some chemical vulnerabilities could be directly traced to relatively low priority assigned to chemical hazards, and to the ability of line managers to unilaterally decide to downscope efforts related to safe management of chemicals. These conditions and circumstances represent a medium-priority vulnerability with a potential for medium-term consequences.

ATTACHMENT 1

TEAM COMPOSITION

Area of Responsibility	Name/Organization
Team Leader	Rebecca F. Hansen Operations Management Division U.S. Department of Energy
Special Assistant to Team Leader	Joseph J. Krupar, Jr. Office of Safety and Quality Assurance U.S. Department of Energy
Management/Operations	Del Bunch Management Strategies, Inc.
Management/Training	Woodson B. Daspit Technical and Professional Services
Chemical Process Safety	Patricia R. Worthington Office of Risk and Policy Analysis U.S. Department of Energy
Industrial Hygiene	Todd F. Lewis Babcock & Wilcox Idaho, Inc.
Environmental Protection	Clifford H. Summers Arthur D. Little, Inc.
Maintenance	F. Richard Myal Compa Industries, Inc.
Emergency Management	Thomas A. Kevern Program Management, Inc.
Site Liaison	Laura E. Cindel Rocky Flats Field Office U.S. Department of Energy
Coordinator	Mary E. Meadows Environmental Management Associates
Technical Editor	Larry D. Warren Evergreen Innovations, Inc.

ATTACHMENT 2

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM

DATE: May 9, 1994

Site/Facility: Rocky Flats Plant

Vulnerability Number: CSVR-RFP-000-01

Functional Area(s): Chemical Process Safety

1. Brief Description of Vulnerability.

   Lack of accurate and complete chemical inventories impedes the effective analysis of hazards posed to workers.

2. Summary of Vulnerability.

   The recognition and control of hazardous chemicals are directly proportional to the accuracy and completeness of chemical inventories. Facility hazardous chemical inventories are generally reported using a sitewide tool, the Emergency Planning and Right-to-Know Act (EPCRA) Chemical Control System (ECCS), which is inadequate for most uses (e.g., worker hazards assessments, emergency planning, operating procedures, decontamination and decommissioning [D&D]) in that it can not provide current and accurate facility inventories on a real-time basis. The ECCS was designed to track only those chemicals regulated under Superfund Amendments and Reauthorization Act (SARA) Title III.

3. Basis.

   a. Requirements:
      - 29 CFR 1910.1200
      - 29 CFR 1910.106
      - 29 CFR 1910.119
      - 29 CFR 1910.1450
      - 40 CFR 350
      - 40 CFR 355
      - 40 CFR 370
      - 40 CFR 262
      - DOE 5480.10
      - DOE 5700.6C

   b. Chemicals Involved: The range of hazardous materials in various types of buildings includes organic solvents, organic and inorganic acids and bases, lead base paint, carcinogens, products/chemicals, heavy metals, and hazardous and mixed wastes located throughout the site.

   c. Relevant Self-Evaluation Data: EG&G Rocky Flats, Inc., "Chemical Safety Vulnerability Field Self-Evaluation," March 29, 1994. Section 2.9 discusses surveillance findings and corrective actions, and Section 2.0 discusses ECCS, the Excess Chemical Program, and the Waste and Environmental Management System (WEMS).

Site/Facility: Rocky Flats Plant

Vulnerability Number: CSVR-RFP-000-01

Functional Area(s): Chemical Process Safety

3. Basis. (Continued)

d. Contributing Causes:
- Facility inventory data are based on the ECCS, which has limitations both as a facility inventory tool and as a sitewide inventory tool.
- As a facility inventory tool, ECCS has limitations because facility-specific inventory data bases have different needs and may be incompatible with ECCS.
- As a sitewide inventory tool, ECCS provides information only on EPCRA (SARA Title III) reportables; it has not been fully implemented sitewide; up to 40 percent of chemicals do not pass through the central warehouse where bar-codes are assigned and arrive at designated facilities without ECCS bar-codes in place; and ECCS does not include all chemicals already on site, in process lines, or in tanks not yet characterized.
- Total facility inventories are performed, at best, on an annual basis.
- Requirements and practices for purchasing, receiving, handling, storing, and disposing of chemicals vary greatly from building to building.

e. Potential Consequences:
- Inability to quantify and characterize hazardous chemical inventories fully (e.g., type, quantity, location, and condition of the chemicals) in the conduct of facility hazard assessments places workers at increased risk of exposure to hazardous chemicals. As facilities at RFP experience mission change or undergo transition to D&D, specific areas of the building (including chemical holdings in those areas) are expected to be in continued change. Adequate material characterization needs to be conducted before any procedures for removal of material or equipment are undertaken. Accurate, real-time inventories are needed to enhance worker protection and to minimize exposure to hazardous chemicals. These conditions and circumstances represent a medium- to high-priority vulnerability with a potential for short-term consequences.

4. Supporting Observations.

RFP is not currently able to provide accurate, complete, and total facility inventories. This inability affects the safety management of hazardous chemicals in the areas summarized below:

Accountability – Use of ECCS as a sitewide tool to provide total facility inventories has resulted in lack of "facility ownership" for inventories. In addition, inventories are generally conducted by ECCS staff, although some facilities have developed their own data bases to get local control of accurate and current data. Building 559 has developed a system for total facility inventory to track all chemicals, including those used in waste management. Only a limited number of facilities have designated Chemical Control Officers (CCOs). These are Building 559, Building 881 (a pilot project for fiscal year 95) and Building 371 (shared CCO with Building 374 on interim basis, effective the week of May 9, 1994).

Site/Facility:	Rocky Flats Plant
Vulnerability Number:	CSVR-RFP-000-01
Functional Area(s):	Chemical Process Safety

4. Supporting Observations. (Continued)
   Management of Change
   - As areas within a building undergo changes to support new missions or transition to D&D, the key to managing these changes is to know what the current inventories are for that area.
   - The Excess Chemicals Program identifies and consolidates (for interim storage) potentially reactive and incompatible chemicals awaiting ultimate disposal.
   - In Building 881, some potentially shock-sensitive chemicals are stored in metal office cabinets that had been designed by RFP for interim storage of reactive chemicals. The metal cabinet containing the shock-sensitive chemical was labeled using temporary tape and a marker. This label was subsequently replaced with a proper sign by the area manager. The location of these metal cabinets (Room 127 hallway) is easily accessible to personnel moving throughout the first floor corridors and could result in the contents of the cabinets being disturbed.
   - Materials identified as reactive are being stored temporarily in the flammable storage area in Building 551. Warehouse personnel have been instructed not to move or disturb these chemicals before removal by designated experts. These chemicals are located on a shelf containing other chemicals and are identified and isolated from the other chemicals by only two strips of yellow tape. Once stabilized, these chemicals will be removed.
   - For Building 371, consolidation of reactive chemicals, including special nuclear materials, in the Central Storage Vault is being considered.
   - As more buildings at the Rocky Flats Plant (RFP) are transitioned to the D&D Program and as chemicals in these buildings continue to age prior to initiation and before completion of the excess chemical identification, the number of reactive chemicals is expected to increase.

Site/Facility:	Rocky Flats Plant
Vulnerability Number:	CSVR-RFP-000-01
Functional Area(s):	Chemical Process Safety

4. Supporting Observations. (Continued)

Process Knowledge

- Process knowledge of hazardous chemical inventory is inadequate for some buildings.

- Process piping and tanks in Building 371 contain "mixed residues" or recoverable products, although an accurate accounting of the quantity of these materials present is not available. Stabilization and removal of some hazardous materials are expected to be long-term efforts, but these programs are not currently active. Before any work commences on these systems (e.g., leaking pipes), personnel should be thoroughly trained on the associated hazards. The longer the delay before action is taken, the less knowledgeable personnel will be and the more difficult it will be to develop new protocols to deal with unknown scenarios.

- Room 4101 in Building 374 contains a number of large tanks with contents that have not been fully documented. Labels on the tanks state that the contents are concentrated acids, but based on historical process knowledge, some also contain dilute acid solutions or water and some are empty.

- Residuals in the piping and drains in Building 881 have not been fully characterized and quantified. The initial baseline study from Building 881 was terminated before completion.

Audits and Corrective Actions

- Corrective actions associated with surveillance findings on the chemical tracking systems are related to full implementation of the ECCS. ECCS was not designed for sitewide inventories for both EPCRA and non-EPCRA chemicals. In addition, facility ownership of inventory tracking is lacking. Any sitewide system used must be accurate, current, and flexible enough to meet individual facility needs. (Individual data bases exist for some buildings but have different formats with different levels of specificity and complexity.)

Process and Equipment Integrity

- Some piping was not designed for its current use (extended shutdown with concentrated nitric acid solutions).
- Chemical holdings currently located in piping and structures adversely affect safe performance of maintenance and inspection activities.

Training and Performance

- To support job-specific training, there is a need to know the current hazardous chemical inventory so that workers are aware of and understand the hazards associated with their assigned tasks.

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM

DATE: May 6, 1994

Site/Facility: Rocky Flats Plant

Vulnerability Number: CSVR-RFP-000-02

Functional Area(s): Operations Control and Management Systems

1. Brief Description of Vulnerability.

   Chemical hazards are provided disproportionately less management support than are radiation hazards.

2. Summary of Vulnerability.

   Potential chemical hazards are not given the same degree of management attention as potential ionizing radiation hazards. Programs for monitoring, evaluating, and characterizing chemical hazards are not as mature as those aimed at radiation hazards. Weaknesses in the hazard communication program limit the information available to employees and occupational health professionals.

3. Basis.

   a. Requirements:
      - 29 CFR 1910.1200, "Hazard Communication"
      - DOE 5480.10, "Contractor Industrial Hygiene Program"
      - DOE 5483.1A, "Occupational Safety and Health Program for DOE Contractor Employees at Government-Owned Contractor-Operated Facilities"

   b. Chemicals Involved: All potentially hazardous chemicals

   c. Relevant Self-Evaluation Data: EG&G Rocky Flats, Inc., "Chemical Safety Vulnerability Field Self-Evaluation," dated March 30, 1994, states in Section 10.7, "Building 371 Occurrence Reporting and Processing Systems (ORPS) data indicated that chemical incidents are not given the same attention as nuclear incidents in the facility." This report also stated that many nuclear considerations apparently take precedence over chemical safety in the ORPS report. Paragraph 1.1 of the field self-evaluation states that the MSDS program is less than adequate.

   d. Contributing Causes:
      - Historical perception that chemicals present an acceptable risk and that ionizing radiation is more hazardous than most chemicals drives emphasis to health physics concerns.
      - The number of MSDSs makes it hard to maintain all sheets current.
      - Some process system components were labeled for a mode of operation that is no longer in use.
      - Work that has been completed has not been documented so that current status is known.
      - Lack of technology that quantifies potential employee exposure to hazardous chemicals.

Site/Facility: Rocky Flats Plant

Vulnerability Number: CSVR-RFP-000-02

Functional Area(s): Operations Control and Management Systems

3. Basis. (Continued)

   e. Potential Consequences:
      - Employees are led to believe that nuclear considerations take precedence over chemical safety
      - Personnel injury due to exposure to hazardous chemicals
      - Release of chemicals to the environment
      - Damage to facilities
      - These conditions and circumstances represent a medium-priority vulnerability with a potential for short-term consequences.

4. Supporting Observations.

   - A comprehensive routine monitoring program for potential chemical exposure is not as fully implemented as the radiation monitoring program.

   - Considerable data for occupational medical surveillance evaluation are available concerning ionizing radiation; personal air sampling data for work with potentially hazardous chemicals are not as readily available.

   - Chemical inventory requirements and specifications are not as well defined as those dealing with nuclear materials.

   - Weaknesses in the Hazard Communication Program result in employees having less information regarding chemical hazards than ionizing radiation hazards. Weaknesses include the following:
     - MSDSs are not always available.
     - In Building 374, tanks and associated piping were labeled for the existing operation, but when operations were modified, the labels were not changed to reflect their current status. In the Building 374 separation area and in Room 4041, equipment is labeled as containing concentrated nitric acid, hydrochloric acid, sulfuric acid, and hydrogen peroxide. Some equipment is reported by facility personnel as containing less hazardous substances or to be empty.
     - In Building 551, material identified as reactive is temporarily stored on a shelf with other chemicals. They only identification consists of two yellow strips of tape, which also serve as isolation. Once stabilized, these chemicals will be removed.
     - Chemical inventories are not always complete.

   - Interviews (e.g., Performance Assurance) clearly identified nuclear issues as a separate and higher priority than chemical issues.

   - Historically, safety analyses for operations at the site emphasized accidents involving potential releases of radioactivity.

   - The radiation protection staff is at least 20 times larger than the industrial hygiene staff.

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM

DATE: May 7, 1994

Site/Facility: Rocky Flats Plant

Vulnerability Number: CSVR-RFP-000-03

Functional Area(s): Identification of Chemical Holdings

1. Brief Description of Vulnerability.

   Resource Conservation and Recovery Act (RCRA) requirements are given precedence over chemical safety.

2. Summary of Vulnerability.

   Regulatory requirements with clearly established financial penalties for nonresponse receive management's prompt attention. Attempts to fulfill RCRA inspection requirements may place employees at risk.

3. Basis.

   a. Requirements:
      - 6 CCR 1007-3, Part 264, Subpart J, "Tank Systems"
      - 40 CFR 264, Subpart J, "Tank Systems"
      - Rocky Flats Plant (RFP) Operational Safety Analysis Program
      - Letter from the Colorado Department of Health (CDH) to DOE, "Conditional Approval of Mixed Residues Tank Systems Management Plan," dated April 13, 1994

   b. Chemicals Involved: The range of hazardous materials in various types of buildings includes organic solvents, organic and inorganic acids and bases, lead base paint, carcinogens, products/chemicals, heavy metals, and hazardous and mixed waste located throughout the site.

   c. Relevant Self-Evaluation Data: Discussions with plant personnel and comments included in the facility self-evaluation. The self-evaluation states that "there is a potential that regulatory guidelines for fineable milestones such as RCRA will often get attention over worker health and safety that does not carry immediate fines and adverse publicity." It further states that "conflicts between nuclear safety and worker safety are not uncommon, but a relatively new phenomenon is the potential for the compromising of worker safety in order to meet environmental requirements such as RCRA milestones and inspections." (Part II, Section 10.7 of EG&G Rocky Flats, Inc., "Chemical Safety Vulnerability Field Self-Evaluation," dated March 30, 1994).

   d. Contributing Causes: The court has determined that recoverable product remaining in piping, drums, and tanks, after the cessation of operations of the aqueous recovery system in Building 371 in April 1984, is to be managed as mixed waste (subject to RCRA requirements), not as recoverable product. Cessation of other operations at RFP, also subject to RCRA requirements, occurred in December 1989. Noncompliance with RCRA regulations can result in fines.

 DATE: May 7, 1994

Site/Facility: Rocky Flats Plant

Vulnerability Number: CSVR-RFP-000-03

Functional Area(s): Identification of Chemical Holdings

3. Basis. (Continued)

   e. Potential Consequences: Should a leak occur during an inspection of the piping in Building 371, there is risk of serious injury to workers from exposure to toxic and radiologic materials. The statement is made (EG&G Rocky Flats, Inc., "Chemical Safety Vulnerability Field Self-Evaluation," March 30, 1994) that "the failure of system components containing chemical solutions continues to provide a great potential for release to the environment or personal injury." There is also risk to workers in other RFP areas (such as the warehouse) in which current practices, non-RCRA regulated, can lead to hazardous and toxic chemical exposure. These conditions and circumstances represent a medium-priority vulnerability with a potential for short-term consequences.

4. Supporting Observations.

- The plutonium aqueous recovery system located in Building 371 was shut down in 1984, with recoverable plutonium (as plutonium nitrate) remaining in tanks and ancillary piping. Inventory in tanks, other containers, and ancillary piping was not removed. Some of the piping is not secondarily contained, and its construction is not chemically suitable for long-term storage of corrosives such as nitric acid. A percentage of the piping to be inspected is above floor level, as well as in spaces that are difficult to access and/or view. In addition, viewing the entire circumference of the piping containing the waste may not be possible due to obstructions. Inspection of the entire circumference of the piping is a RCRA requirement.

- Additional observed examples of practices and procedures currently accepted at RFP, and that do not receive management attention because they are not RCRA-regulated, include the following:
  - Containers of acid loosely stored on the floor in Room 4101 of Building 374.
  - Tanks in Room 4101 of Building 374, incorrectly identified as containing concentrated acids but are stated to be empty.
  - Three-high stacking of drums of hazardous materials in Building 551 (warehouse).
  - Lack of a procedure to obtain and use the most recent MSDSs in Building 551.
  - Lack of a procedural counterpart to manual 1-10000-HWR for nonhazardous wastes.

- RCRA requires daily inspections of tanks and ancillary piping that contain hazardous wastes and are not secondarily contained. The CDH letter to DOE has reinforced this requirement and notes that RFP has not addressed issues regarding tank system integrity assessments in the Mixed Residues Tank Systems Management Plan. The letter includes tank systems inspection requirements. The plant Operational Safety Program requires an Operational Safety Analysis for all work activities in which a potential exists for exposure to toxic materials. These requirements are, at times, at odds with one another. Preparation and implementation of a strategy that meets both RCRA requirements and minimizes worker exposures to toxic and radiological risks are lacking.

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM

DATE: May 6, 1994

Site/Facility: Rocky Flats Plant

Vulnerability Number: CSVR-RFP-000-04

Functional Area(s): Facility Physical Condition

1. Brief Description of Vulnerability:

   Deterioration of facility physical conditions has the potential to create chemical safety hazards.

2. Summary of Vulnerability:

   The cumulative effect of declining maintenance budgets and reduced staffing results in the continued deterioration of an aging physical facility. This deterioration has the potential to adversely impact chemical safety of the Rocky Flats Plant (RFP).

3. Basis.

   a. Requirements: DOE 4330.4A, "Maintenance Management Program"

   b. Chemicals Involved: Various

   c. Relevant Self-Evaluation Data: Based on existing plant priorities, completion of preventive maintenance activities has fallen behind and has become secondary to achieving a reduction in the existing backlog of corrective maintenance activities. More than 2,400 preventive maintenance activities are delinquent by more than 1 month, many of which involve important safety systems—including exhaust fans; pressure relief devices; filter systems; chemical containment systems; and various analyzers, detectors, and alarm systems. (See Section 6.2 of EG&G Rocky Flats, Inc., "Chemical Safety Vulnerability Field Self-Evaluation," dated March 30, 1994.)

   d. Contributing Causes:
      - The preventive maintenance program at RFP is mission driven.
      - Facilities resuming operations or Resource Conservation and Recovery Act (RCRA) regulated facilities receive attention while standby facilities receive minimal preventive maintenance due to staffing and budgetary limitations.
      - The predictive maintenance program at RFP is very weak and, where applied, is piecemeal. No formal sitewide predictive maintenance program exists at RFP.
      - The Integrated Work Control Program (IWCP) as it currently exists is complex, time consuming, and expensive for accomplishing maintenance activities. The IWCP is a contributing cause for unnecessary schedule delays and has adversely affected worker morale.
      - The change in mission from production to environmental restoration, with the declining maintenance budget and resulting staff reassignment and reduction, has adversely affected worker morale.

Site/Facility: Rocky Flats Plant

Vulnerability Number: CSVR-000-04

Functional Area(s): Facility Physical Condition

3. Basis. (Continued)

   e. Potential Consequences:
      - Exposure to hazardous chemicals
      - Personal injury or contamination
      - Release of chemicals to the environment
      - Damage to facilities
      - These conditions and circumstances represent a low-priority vulnerability with a potential for short-term consequences.

4. Supporting Observations.

- Maintenance crafts and supervisory personnel and preventive maintenance funds were stripped from Buildings 371 and 374, which were in standby, and used for resumption of Buildings 559 and 707. The preventive maintenance budget and maintenance personnel were never replaced, resulting in deterioration of the physical condition of Buildings 371 and 374.

- Preventive maintenance in Building 371, which houses the Central Storage Vault (CSV), has been minimal. This is evidenced by the deterioration of certain ventilation, cooling, control, and monitoring systems.

  - Electric motors serving two of the three major ventilation fans have failed within the past 3 months. These two ventilation fans remain out-of-service, leaving one ventilation fan to serve the building.

  - Cooling tower feedwater pump capacity has dropped from 10,000 gpm to 5,000 gpm and can no longer provide sufficient cooling to maintain the CSV temperature at an optimum 70 °F to 80 °F.

  - Electrical discontinuities exist in the standby Vestiune cable for the stacker-retriever vehicle in the CSV.

  - The moisture content analyzer at the CSV is inoperable.

- Corrective maintenance backlog in Building 371 has increased from 1,200 to 1,400 items over the past 11 months.

- Because of lack of funding, a formal predictive maintenance program has not been established at RFP.

- The change of maintenance crafts and supervisory personnel through promotion, transfer, voluntary severance, retirement, and a declining maintenance budget has resulted in a loss of expertise. New maintenance personnel do not have extensive experience with specific facilities and, consequently, are less efficient in conducting routine, facility-specific maintenance activities.

CHEMICAL SAFETY VULNERABILITY REVIEW
VULNERABILITY FORM

DATE: May 6, 1994

Site/Facility: Rocky Flats Plant

Vulnerability Number: CSVR-RFP-000-05

Functional Area(s): Operational Control and Management Systems

1. Brief Description of Vulnerability.

   Decisions on budget content and priorities delay correction of known chemical safety issues.

2. Summary of Vulnerability.

   Funding for the systematic removal of hazardous chemicals from the Rocky Flats Plant (RFP) buildings and the areas surrounding them depends on (1) the allocation of resources to individual work packages and (2) the existence of sitewide policies and programs focused on such activities. Plans for removal of residues in ducts, stabilization and consolidation of special nuclear material , and liquid stabilization appear to have been developed at the expense of funding needed for chemical hazards abatement programs, except where specific constraints were imposed to meet requirements related to the Resource Conservation and Recovery Act (RCRA). As a consequence, staff expertise, staffing levels, and specific remedial actions have lagged behind needs.

3. Basis.

   a. Requirements: Section 161 of the Atomic Energy Act requires DOE to ensure that management and operating contractors "protect health and minimize danger to life or property." DOE implements this requirement through the nuclear safety clause in contracts and through DOE 5483.1A, "Occupational Safety and Health Program for DOE Contractor Employees at Government-Owned Contractor-Operated Facilities," which mandates application of standards comparable to those promulgated by the Occupational Safety and Health Administration (OSHA). Good practices are defined as those identified for OSHA's Voluntary Protection Program (VPP) and contained in 29 CFR 1910.119, "Process Safety Management," even where chemical quantities are below the requirements level.

   b. Chemicals Involved: Bulk quantities of carbon tetrachloride, nitric acid, and hydrogen fluoride and small quantities of many other chemicals in bottles, pipes, and tanks.

   c. Relevant Self-Evaluation Data: Sections 1.3, 2.7, 4.1, and 10.7, of EG&G Rocky Flats, Inc., "Chemical Safety Vulnerability Field Self-Evaluation," dated March 30, 1994. Section 1.3 identifies the limited scope of hazards assessments and notes that only 10 assessments have been completed or are under way. Section 2.7 notes the dependency of the chemical tracking program on operations practice in priority quality input data. Section 4.1 notes the current limitations of the Operational Safety Analysis Program. Section 10.7 provides conclusions regarding Building 371 and the difference in treatment accorded to chemical incidents versus nuclear incidents.

   d. Contributing Causes: Lack of resources applied to the problem, failure to put in place explicit support requirements for management of chemical safety issues, and a Plant Action Tracking System, which does not now collect or aggregate the many issues related to management of hazardous chemicals are all contributing causes.

Site/Facility:	Rocky Flats Plant
Vulnerability Number:	CSVR-RFP-000-05
Functional Area(s):	Operational Control and Management Systems

3. Basis. (Continued)

   e. Potential Consequences: Possible injuries or accidents during cleanout operations due to shortcomings in preplanning and mitigation efforts; lack of expert staff to cope efficiently with more severe, but low-probability accidents, should one occur. Continued deficiency findings by auditors and inspectors. These conditions and circumstances represent a medium-priority vulnerability with a potential for medium-term consequences.

4. Supporting Observations.

- An integrated program is generally regarded as the preferred (i.e., most cost-effective) means of satisfying requirements for safe management of hazardous chemicals. Such a program is not now mandated by any policy, nor does the RFP policy manual explicitly embed safe management of hazardous chemicals as a key activity or priority in the many policy documents contained in the manual.

- A memorandum from G.P. Fraser to Distribution, titled "Lessons Learned Document Corrections – Excessing Chemicals in Building 865," dated October 8, 1993, distributed a lessons-learned evaluation regarding chemical cleanout at Building 865. Sitewide followup has not occurred, other than designation of a new individual with the mandate to develop an integrated management plan for chemicals at RFP. This latter activity is just getting under way and, at present, is being funded out of overhead work packages.

- An analysis was presented (see "Comprehensive Safety and Health Program," R. Cordova presentation, dated January 18, 1994) on the difference between existing programs and those required for VPP status; no decision has been made to undertake those programs needed to move to VPP status.

- Most sites fund industrial safety and industrial hygiene support out of overhead or as a direct charge for performing an activity. In such cases, the adequacy of programs relating to chemical safety can be managed by directing efforts at either the overhead account or the relevant direct account. A hybrid program is used at RFP. Moreover, building managers can unilaterally decide to issue "stop charging" orders without the involvement or concurrence of health and safety.

- Health and safety approval is required in "work in known areas of hazardous material contamination, but not otherwise explicitly required for handling or movement of hazardous chemical, or modification of existing systems/structures" (see "Maintenance Work Package Planning Process," Appendix 1, page 1). This limited scope of health and safety approvals can lead to actions that fail to meet requirements for safe handling of hazardous chemicals.

- More than 8 months have elapsed since a generic issue was identified as a result of Building 865 cleanout. Lack of treatment of chemical hazards and workers in the RFP Safety Analysis Reports has been a longstanding issue.

ATTACHMENT 3

SELECTED ACRONYMS

CFR	Code of Federal Regulations
DOE	Department of Energy
D&D	Decontamination and Decommissioning
EH	DOE Office of Environment, Safety and Health
OSHA	Occupational Safety and Health Act (or Administration)
RCRA	Resource Conservation and Recovery Act
RFP	Rocky Flats Plant