ENVIRONMENTAL RESTORATION AND WASTE MANAGEMENT AT THE ROCKY FLATS PLANT

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ABSTRACT

Environmental restoration and waste management programs at Rocky Flats deal with complex multi-disciplinary activities. Existing environmental contamination is the result of historical spills, disposal, and other former waste management practices. The 178 Individual Hazardous Substance Sites have been grouped into 16 operable units to be remediated under a RCRA/CERCLA tri-party Federal Facility Compliance Agreement (FFCA), called the Inter-Agency Agreement. Waste management activities involve waste packaging, storage, treatment and transport functions in the most efficient manner possible while maintaining strict regulatory compliance with existing laws and other regulatory agreements. Also facing Rocky Flats is the transition of the site mission from one of production of nuclear weapons components to one of site cleanup and Decontamination and Decommissioning (D&D).

INTRODUCTION

The Rocky Flats Plant, located near Denver, Colorado, was a key U.S. Department of Energy (DOE) facility in the nation's nuclear weapons research, development and production complex. Its primary contribution to the nuclear weapons program had involved the fabrication of components from plutonium, uranium, beryllium and stainless steel. The plant is also capable of decommissioning nuclear weapons returned from the stockpile.

The public was largely uninformed about the plant and the work done there during the early years of the plant. Some describe it as a "shroud of secrecy" that surrounded the plant and its activities.

As the 1970s approached, citizens began to question the need for and practices of the nation's nuclear weapons complex. By the end of the 1970s, Rocky Flats was the site of many peace and anti-nuclear demonstrations. The subsequent news media attention served to raise concerns among citizens and the surrounding communities.

Until the late 1980s when an FBI raid occurred at the plant, detailed information about plant operations and their potential effects on public health and the environment was not widely available. This historical lack of information, along with reports of plant accidents and potential releases of radioactive material to the offsite public brought about concern and mistrust among many citizens in the Rocky Flats area. Following the FBI raid in June 1989, a tri-party Inter-agency Agreement (IAG) was negotiated to cleanup the 178 Individual Hazardous Substance Sites, grouped into 16 operable units, under both the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Concerns were also raised about waste handling at the facility. Wastes fall into six categories at Rocky Flats: industrial/municipal solid waste, hazardous (non-radioactive) waste, low-level (radioactive) waste, low-level mixed waste, transuranic (TRU) waste, and TRU mixed waste.

In January 1992, President Bush announced the curtailment of the plutonium production mission at Rocky Flats. In the July 31, 1992, Rocky Flats Transition Plan Report to Congress, the Secretary of Energy outlines the transition process and how facilities will be made ready for decontamination and decommissioning and final disposition.

Site Description

The Rocky Flats plant is located approximately 16 miles northwest of downtown Denver and seven to ten miles from the communities of Boulder, Broomfield, Westminster, Arvada and Golden, Colorado. The 384-acre plantsite is located within a restricted preserve of approximately 6550 acres, which serves as a buffer zone between the plant and the surrounding communities. The plant employs more than 7000 people.

Rocky Flats is directly upstream of two reservoirs, Great Western Reservoir and Standley Lake, which provide drinking water for the cities of Broomfield, Westminster, Northglenn and Thornton. Walnut Creek and Woman Creek naturally drain the area from the plantsite into Great Western Reservoir and Standley Lake, respectively. Surface water in the drainages is collected and detained in holding ponds located within the plant's buffer zone. This allows for water sampling, analysis and treatment, if necessary, prior to discharge offsite. A 1989 population study determined that approximately 50 people live within three miles of the plant. Within this area are ranches that produce crops, raise cattle and breed and train horses. Close to 9000 people live within five miles of the plant, primarily near Standley Lake. Approximately 310,000 people live within a ten-mile radius of Rocky Flats.

History

Plans for the construction of Rocky Flats were announced by the U.S. Atomic Energy Commission in 1951. Operations at Rocky Flats began in 1952, under the management of Dow Chemical U.S.A. Management responsibilities were turned over to Rockwell International in 1975 and then EG&G Rocky Flats, Inc. in January 1990. DOE owns the facility and oversees the work of the management and operating contractor.

The operational history of the plant is marked by three major events that are considered the primary sources of radioactive contamination currently detected in soils on and near the plantsite. The first two events were fires that occurred in plutonium processing buildings on September 11, 1957, and on May 11, 1969. Both fires contributed to the release of plutonium to the environment.

The third event, which contributed to most of the contamination at and near Rocky Flats, was the dispersion of plutonium dust from a former waste drum storage area now known

as the 903 Pad. Hazardous and radioactive materials stored in the drums leaked into the surrounding soil during the 1960's. After the drums were removed in 1967, winds re-suspended and re-deposited the contamination, which is now detected in soils east of the plant and in sediments in Great Western Reservoir and Standley Lake. The former drum storage area was partially remedied and covered with asphalt in 1969.

In May 1973, a tritium release was discovered by the Colorado Department of Health in a water sample taken from Walnut Creek. The release occurred in waste water as a result of the unanticipated presence of tritium in scrap metal shipped to the plant for recovery and reprocessing. As a result of the incident, the plant improved its methods for detecting tritium and developed flood control ponds and an interceptor ditch to divert runoff water around the plantsite.

In 1986, DOE, EPA and the Colorado Department of Health entered into a Compliance Agreement that defined roles and established milestones for environmental operations and remedial investigations at the Rocky Flats Plant. In accordance with the agreement, DOE identified 178 individual hazardous substance sites where contamination is or may be present as a result of past waste management practices and spills.

In June 1989, the plant was the site of a Federal raid, involving EPA, the Federal Bureau of Investigation and the U.S. Department of Justice. The purpose was to gather information in response to allegations of mismanagement and negligent and criminal practices. While no indictments have been issued as a result of the investigation to date, the raid fueled public debate about the plant mission and its operating practices.

In September 1989, just three months after the federal raid, Rocky Flats was placed on the Superfund National Priorities List for cleanup under the Comprehensive Environmental Response, Compensation and Liability Act, as amended by the Superfund Amendments Reauthorization Act. The listing was based on the 178 individual hazardous substance sites identified in earlier studies.

These events, coupled with an historical lack of information about the plant, created a climate of uncertainty and distrust among much of the public in the communities surrounding Rocky Flats. For too long, citizens did not receive adequate answers to their questions about plant activities, nor were they provided opportunities to participate in decisions made about the facility and its operations. DOE is now working to rectify the communication problems of the past with the help of EPA, the state and nearby communities. (1)

Interagency Agreement

In late 1989, DOE, EPA and the State of Colorado began development of a Federal Facility Agreement and Consent Order, also known as the Interagency Agreement (IAG), to replace the 1986 Compliance Agreement. The purpose of the document was to reflect new requirements of the Superfund Amendments Reauthorization Act, to eliminate jurisdictional problems brought about by different cleanup laws, and to further clarify cleanup priorities. In addition, the agreement was to set forth activities and detailed schedules for environmental restoration at Rocky Flats.

The draft IAG was issued for public comment in early 1990, and many of the comments received focused on public involvement, information needs and the priorities of cleanup. The final IAG was signed by DOE, EPA and the State of Colorado on January 22, 1991.

To date, Rocky Flats has completed some 77 milestones under the IAG. Some extensions were requested for technical reasons, however all milestones have been met to date.

In terms of work accomplished, Remedial Investigation (RI) workplans have been completed or are near completion for each of the sixteen operable units (OUs). For some of the workplans already completed, fieldwork to characterize the OUs has already begun. In addition, Interim Measures (IMs)/Interim Remedial Actions (IRAs) are underway at three of the OUs.

At OU 1, the 881 Hillside, the soil and groundwater became contaminated beginning in the 1950s with solvents and radionuclides released from the nearby buildngs. The 881 Hillside is located north of Woman Creek, a drainage that leads to a drinking water source for a number of communities, and is almost two miles from the outer edge of the plant's buffer zone at Indiana Street. A 2100-foot long French drain has been constructed downgradient of the 881 Hillside, but upgradient of Woman Creek, to collect contaminated ground water. The drain was constructed in the alluvial soil, which varies from 10 to 40 feet in thickness, and is tied to the bedrock layer below. Contaminated water collected from the bottom of the drain is pumped to an ultraviolet peroxide and ion exchange treatment unit. The ultraviolet peroxide oxidation is for the destruction of organic compounds and the ion exchange is for removing radionuclides and metals. Treated groundwater is released into the South Interceptor Ditch, which drains into pond C-2, an onsite holding pond. Water held in pond C-2 is sampled and analyzed before offsite release. Groundwater monitoring wells have been installed downhill from the drain to monitor the effectiveness in interception and treatment of contaminated groundwater.

At OU 2, the 903 Pad, Mound and East Trenches, volatile organic compounds and radionuclide contamination exists in the soils and groundwater. The contamination of the 903 Pad and Mound areas is primarily attributed to the storage in the 1950s and 1960s of waste drums that corroded over time, allowing hazardous and radioactive contamination to leak into the surrounding soil. The East Trenches area was used for disposal of plutonium and uranium contaminated waste and sanitary sewage sludge. The IM/IRA for the Walnut Creek drainage basin is designed to collect surface water at three points within constructed diversion structures and to pump the surface water to a treatment facility. The treatment consists of chemical percipitation with microfiltration followed by granular activated carbon adsorption. The chemical preciptation requires chemical additives to cause metals and soluble radionuclides in the water to form particles large enough to be filtered or settled out using microfiltration. Water leaving the microfiltration stage is passed through columns containing granular activated carbon to which volatile organic compounds become attached, or adsorbed. Following treatment, the water is discharged into South Walnut Creek, where samples are collected and analyzed before being released offsite.

OU 4 is made up of five solar evaporation ponds that, beginning in the late 1950s, were used for storage and evaporation of low-level radioactive process waste water containing high concentrations of nitrates and treated acidic wastes. The ponds eventually built up large volumes of sludges at their bottoms. The ponds over time may have leaked into the soil and groundwater. An interceptor trench system was installed

in the 1970s to collect and recycle groundwater contaminated by the ponds and prevent seepage into North Walnut Creek. The IM/IRA for OU 4 requires that intercepted groundwater no longer be recycled to the solar ponds, but instead be pumped to three storage tanks for holding prior to evaporation. Removal and evaporation of approximately eight million gallons of excess liquids from the solar ponds, and removal of the remaining sludge from the ponds will be completed in preparation for characterization and remediation of the soil and groundwater surrounding the solar evaporation ponds. This IM/IRA is still under construction.

Waste Management

Rocky Flats generates wastes that require differing storage and disposal practices, depending upon the amount of hazardous or radioactive materials contained. As mentioned earlier, these wastes fall into six categories: industrial/municipal solid waste, hazardous (non-radioactive) waste, low-level (radioactive) waste, low-level mixed waste, transuranic (TRU) waste, and TRU mixed waste.

Wastes containing hazardous constituents are regulated by the State of Colorado under their RCRA authority as delegated by EPA. Many of the wastes are subject to land disposal restrictions (LDR) under the provisions of RCRA. The LDR portion of existing RCRA regulations requires that waste containing certain constituents be treated to reduce toxicity to specific concentrations before land disposal. The regulations also restrict the length of time untreated mixed waste can be stored. Because of the difficulties encountered in applying the regulations to the mixed wastes, several compliance agreements have been established between the regulators and DOE at Rocky Flats.

As a result of a lawsuit brought against the Plant by the Sierra Club in 1988, the U.S. District Court has determined that mixed (radioactive/hazardous) residues are RCRA regulated wastes and must be managed in strict accordance with RCRA and Colorado Hazardous Waste Management regulations. The resulting Mixed Residue Compliance Order and proposed Consent Decree require that these residues be managed under the provisions of a RCRA permit and eventually be treated and disposed of offsite.

Transition

The proposed change in mission of Rocky Flats stems from recent changes in global politics and the defense needs of the United States. Once the Programmatic Environmental Impact Statement for Reconfiguration of the nuclear weapons complex is complete, it is expected that Rocky Flats functions will be transferred to another site and Rocky Flats will be completely shut down. The bridge for the change in mission is provided by the transition process.

Transition is the range of activities that begins when a building is formally declared surplus to its Defense program production mission and ends when the building is ready for decontamination, dismantlement, removal from service or transfer for alternative uses. Alternative uses may be Departmental operations, operations by other government agencies, or uses by private industry. The objective of transition is to make the physical and administative changes needed to achieve a stable and secure configuration for final disposition.

The first group of buildings, Buildings 771, 776/777, 779, 885 and 886 were formally put into transition on January 1, 1993. These buildings were previously used in plutonium production and nuclear safety studies. Before these buildings can be decontaminated, plutonium, enriched uranium and plutonium residues that are stored in these buildings must be removed. (2)

It is expected that the majority of the remaining buildings on site, excluding Buildings 559, 707 and 371, will be transfered into transition approximately October 1, 1993, shifting the landlord function of Rocky Flats from Defense Programs to Environmental Management. Buildings 559, 707 and 371 are being maintained as a Defense production contingency.

A major goal of the Transition phase and activities is to minimize the economic impact on the plant workers and the surrounding communities as the plant downsizes its overall staffing level and the skills mix of the workers changes with a decreasing emphasis on the need for highly skilled production machinists to an increasing emphasis on skilled workers in the areas of environmental restoration and waste management. A close working relationship has been developed with the Rocky Flats Local Impacts Initiative organization to understand and help mitigate these impacts and to identify economic development opportunities to attract other enterprises which might provide re-employment opportunities for displaced workers.

CONCLUSIONS

The Rocky Flats Plant is currently undergoing a transition from nuclear weapons production mission to an environmental restoration mission. This change is significant to the facility, however it is business as usual for environmental restoration and waste management. The facility continues to make progress on the commitments made in a host of waste management and environmental restoration agreements.

It is imperative that the facility continue working with the regulators on all of the compliance issues and agreements as well as providing open communication with the public on all issues. Consulting with the public and the workers at the plant will help the transition of the facility's mission from nuclear weapons production to environmental restoration and D&D.

REFERENCES

1. J. PAUKERT, S. PENNOCK, and R. SCHASSBURGER, "Public Involvement In Cleanup - The Rocky Flats Experience," Waste Management 92, (February 1992)
2. Report to Congress - Rocky Flats Transition Plan, DOE/EM-0079, U.S. Department of Energy, July 1992