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THESIS

INTEGRATING TOTAL QUALITY MANAGEMENT (TQM)
AND HAZARDOUS WASTE MANAGEMENT

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Submitted by

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Engineering Department

In partial fulfillment of the requirements

for the Degree of Master of Science

Colorado State University

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MASTER

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COLORADO STATE UNIVERSITY

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WE HEREBY RECOMMEND THAT THE THESIS PREPARED UNDER OUR
SUPERVISION BY NANCY KIRK ENTITLED "INTEGRATING TOTAL QUALITY
MANAGEMENT (TQM) AND HAZARDOUS WASTE MANAGEMENT" BE ACCEPTED AS
FULFILLING IN PART REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE.

Committee on Graduate Work

Adviser

Department Head

ABSTRACT OF THESIS

INTEGRATING TOTAL QUALITY MANAGEMENT (TQM) AND
HAZARDOUS WASTE MANAGEMENT

The Resource Conservation and Recovery Act (RCRA) of 1976 and its subsequent amendments have had a dramatic impact on hazardous waste management for business and industry. The complexity of this law and the penalties for noncompliance have made it one of the most challenging regulatory programs undertaken by the Environmental Protection Agency (EPA). The fundamentals of RCRA include "cradle to grave" management of hazardous waste, covering generators, transporters, and treatment, storage, and disposal facilities. The regulations also address extensive definitions and listing/identification mechanisms for hazardous waste along with a tracking system. Treatment is favored over disposal and emphasis is on "front-end" treatment such as waste minimization and pollution prevention.

A study of large corporations such as Xerox, 3M, and Dow Chemical, as well as the public sector, has shown that well known and successful hazardous waste management programs emphasize pollution prevention and employment of techniques such as proactive environmental management, environmentally conscious manufacturing, and source reduction. Nearly all successful hazardous waste programs include some aspects of Total Quality Management, which begins with a strong commitment from top management.

Hazardous waste management at the Rocky Flats Plant is further complicated by

the dominance of "mixed waste" at the facility, which is hazardous waste mixed with radioactive constituents. The mixed waste stems from the original mission of the facility, which was production of nuclear weapons components for the Department of Energy (DOE). A Quality Assurance Program based on the criterion in Department of Energy (DOE) Order 5700.6C has been implemented at Rocky Flats. All of the elements of the Quality Assurance Program play a role in hazardous waste management. Perhaps one of the biggest waste management problems facing the Rocky Flats Plant is cleaning up contamination from a forty year mission which focused on production of nuclear weapon components.

PREFACE

The subject matter of this thesis evolved from the author's interest in protecting the environment (in particular hazardous waste management) and a job assignment to write a Hazardous Waste Management Plan for the Rocky Flats Plant. At first, the task seemed overwhelming since the Resource Conservation and Recovery Act (RCRA) is very complicated and comprehensive. It then became a challenge to better understand this law and the implementing regulations (40 CFR 260 - 268).

After studying the regulations, the author became interested in how other corporations and Fortune 500 type firms addressed the hazardous waste issue. It then became apparent that corporations with well-known and successful programs were going beyond compliance and integrating total quality management principles into their hazardous waste and environmental programs.

Before a firm or any organization can go beyond compliance, it is necessary to first understand compliance. This is the rationale behind Chapter IV, which addresses the regulatory requirements and identifies implementing procedures, and necessary tasks for one firm to obtain full compliance or improve on the existing program.

Finally, Chapter V addresses the elements of a quality assurance program and how they apply to hazardous waste management at EG&G Rocky Flats. It is hoped that this provides guidance for developing a quality assurance program and can serve as an example for others to follow.

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LIST OF KEYWORDS

CDH	Colorado Department of Health
CFR	Code of Federal Regulations
DOE	Department of Energy
DOT	Department of Transportation
EPA	Environmental Protection Agency
RCRA	Resource Conservation and Recovery Act
TSDF	Treatment/Storage/Disposal/Facility

CHAPTER I. Hazardous Waste Management: The Ultimate Challenge

The Hazardous Waste Problem

Widely known environmental disasters such as "Love Canal" and "Valley of the Drums" have alerted this country to the fact that past and current hazardous waste management practices have resulted in serious environmental risks and threats to human health. The management (or mismanagement) of hazardous wastes can lead to liabilities for companies and individuals for corrective action, penalties and fines, and damage to people and property.

It has been estimated that approximately 275 million metric tons of hazardous wastes are produced annually in the United States.¹ This does not include Resource Conservation and Recovery Act (RCRA) exempt toxics or hazardous wastes regulated under other environmental laws such as the Clean Water Act (CWA). An EPA-sponsored survey in 1983 indicated that one in seven generators still dispose of their wastes illegally.² In 1979, the EPA found that the mismanagement of waste causes the following types of environmental damage:

- 1) pollution of groundwater;
- 2) contamination of surface waters;
- 3) pollution of the air;
- 4) fires or explosions;
- 5) poisoning of humans and animals via the food chain; and
- 6) poisoning of humans and animals via direct contact.³

Of the estimated 50,000 inactive disposal sites containing hazardous waste, 1,500 to 2,500 sites are considered to be serious threats to the environment. For many

sites, the most serious risk is that toxic chemicals will enter groundwater and contaminate public drinking supplies.⁴

In summary, hazardous wastes have been generated as a part of modern, post-World War II economic growth. In order to preserve quality of life and the environment, these wastes can no longer be managed in accordance with past practices.

RCRA: Response to the Hazardous Waste Problem

Since the passage of the Resource Conservation and Recovery Act (RCRA) in 1976, the regulations have made a dramatic impact on industries generating or handling hazardous waste. RCRA, an incredibly ambitious regulatory program, is the largest ever undertaken by the U. S. Environmental Protection Agency (EPA).⁵

RCRA, which comprises "Subtitle C" of the Solid Waste Disposal Act (SWDA), was passed in 1976, but implementing regulations issued by the EPA were not in effect until November 19, 1980. In 1984, RCRA was amended again, resulting in major additional regulations and revisions.

The primary goals of RCRA are: 1) to eliminate the "out of sight/out of mind" approach to hazardous waste and reliance on untreated landfill disposal, 2) regulate from "cradle to grave", and 3) encourage waste minimization, pollution prevention, and advanced treatment technologies. RCRA is implemented through Title 40 of the Code of Federal Regulations (CFR). The parts pertaining to hazardous waste are 40 CFR Parts 260-272.

The fundamentals of RCRA can be summarized as nine basic concepts:

1. Focus on hazardous waste--Part 261 of 40 CFR consists of many pages

essentially defining hazardous waste, exclusions, and identification and listing of hazardous waste.

2. "Cradle to grave" permit based regulatory strategy. This simple means that a generator is responsible for his waste from the time of its inception through final disposal.
3. Applies mainly to active facilities and sites.
4. Provides listing/identification mechanisms for hazardous wastes. Part 261 of 40 CFR provides details for defining a solid waste and defining a hazardous solid waste.
5. Covers all who manage a hazardous waste. This includes generators, transporters, and treatment, storage, and disposal facilities (TSDF).
6. Uses a "tracking" system. Accurate and complete records must be kept along with the Uniform Hazardous Waste Manifest.
7. Treatment is favored over disposal or storage. The land disposal restrictions (LDR) were imposed as a result of the 1984 amendments to RCRA in which Congress concluded that certain classes of land disposal are not capable of assuring long-term containment of certain hazardous wastes, and to avoid substantial risk to human health and the environment, reliance on land disposal should be minimized or eliminated.
8. Emphasis on "front-end" treatment such as waste minimization and pollution prevention. This also was a result of the 1984 amendments requiring generators to certify they would have a waste minimization program in place by September 1, 1985.
9. Requires corrective action to clean up past contamination.

There is significant overlap and sometimes confusion between RCRA and the Comprehensive Environmental Response Compensation Liability Act (CERCLA). CERCLA , also known as "Superfund" was enacted in 1980 when Congress realized that RCRA only did "half the job" cleaning up active hazardous sites while ignoring inactive or abandoned sites.

The key provisions of CERCLA that make it different than RCRA are:

1. Focuses on hazardous substances which is a much broader scope than RCRA's focus on hazardous waste.
2. Creates a non-permit response scheme as compared to the permit based regulatory system under RCRA.
3. Applies mainly to inactive or abandoned facilities but also applies to current spill response and even some cleanups of inactive parts of active facilities (for example, the Rocky Flats Plant located near Golden, Colorado)
4. Incorporates other laws' lists for covered substances
5. Creates a complex system of liability and cleanup funding from both private and governmental sources (Superfund).

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3. Hall and Schwartz, p. 1-2.
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CHAPTER II. INDUSTRY'S MANAGEMENT OF HAZARDOUS WASTE: GOING BEYOND COMPLIANCE

Compliance with a law as comprehensive as the Resource Conservation and Recovery Act (RCRA) is a serious challenge for business and industry. Understanding the requirements can be very cumbersome, and the laws and regulations are frequently changing.

1.0 Business and the Environment

Environmental management is taking on a central role in corporate strategy and is one of the most rapidly changing areas of management today. This statement is largely supported by a recent survey of forty-one primarily Fortune 200 firms.¹ Types of industries included in the survey were chemical, petroleum, automotive, defense, forest products, and computers. The survey findings, listed below, reveal some current trends in business with respect to the environment.

- Seventy-seven percent of senior management define environment as critical or important to strategic decisions;
- Environmental management has expanded from traditional areas to other functions such as manufacturing, product development, purchasing, and marketing;
- Greater senior management involvement in environmental issues;
- An expansion of environmental concerns beyond pollution control to a strategic approach that includes pollution prevention, product

development, compliance, and marketing.

The explanation for the emerging strategy in corporate environmental management begins with increased complexity of regulations and requirements. In addition, environmental performance is viewed as a criteria for product quality and firm reputation, affecting stockholders and customer's attitude toward a company.² Nongovernment environmental organizations and public concern for the environment are also placing demands on corporations. The multinational corporation (MNC), with its increased visibility, is undergoing considerable change as the globalization of the world's economy increase.³ These changes include response to environmental and safety issues, which extend to the global arena.

Other sources confirm the notion that proactive environmental policies and strategic environmental management are taking hold in today's business world. Environmental Resources Management (ERM) is a consulting firm dedicated to helping firms with strategic planning implementation. ERM has seen an increase in proactive environmental policies and estimates that about one-quarter to one-third of U. S. companies are seriously engaged in activities that take them beyond straightforward compliance.⁴ This new approach goes beyond U. S. companies as evidenced by the formation of the Global Environmental Management Initiative (GEMI). GEMI is an organization formed by business leaders in April of 1990 to promote environmental protection through improved management practices. It currently has 23 member companies including AT&T, Apple Computer, Amoco, Dow Chemical, DuPont, and Weyerhaeuser, to name a few.⁵

The role of business in environmental management can best be summarized by Allen F. Jacobson, chairman and retired CEO of 3M company, in a speech to

businesses:

Frankly, I doubt whether there's any single business position on the environment, but I do see more and more business people coming to one basic conclusion on this issue: In the 1990s, business is going to have to take the lead in tackling environmental challenges. There was a time when, right or wrong, some businesses were perceived to be dragging their feet on environmental issues. That was never a good idea, and I certainly think that is self-defeating in the 1990s. Concern about the environment is growing stronger. Everything we see tells us that this trend will continue for the foreseeable future.⁶

2.0 Industries Answers to Environmental/Waste Issues

Now that it is clear that the business is becoming more concerned with environmental and waste issues, a more specific assessment of some initiatives and programs by major corporations will be made. This assessment will include the corporations' overall management strategy, technical efforts, and the impact of their efforts which may be measured in dollar savings as well as minimizing harm to the environment. After examining various waste minimization and environmental programs that business has implemented, it is hoped that some general conclusions can be made regarding what constitutes effective hazardous waste management.

Several corporations with well known and well publicized environmental/waste management programs will be examined in depth. The corporations that will be discussed are: Xerox, Arm & Hammer, Digital Equipment Corporation, 3M, Ashland Oil, Inc., General Dynamics, and AT&T. Some efforts in the public sector, such as the Department of Defense and Department of Energy, will also be addressed.

Xerox

Xerox was one of the first U. S. companies to establish environmentally sound practices.⁷ In 1980, Xerox formalized its commitment to the environment by forming a corporate environmental health and safety department. Then, in 1984, the company

initiated the Leadership Through Quality Program, which led to Xerox Business Products and Systems winning the 1989 Malcolm Baldrige National Quality Award.

The Leadership Through Quality (LTQ) program, in essence, was a major culture change for Xerox, consisting of quality principles, management practices, and the use of quality tools. By integrating LTQ with environmental policies and practices, Xerox was able to achieve its goals of continuous improvement, and strive for zero defects, zero disposal, and zero pollution. In other words, the culture change consisted of merging their Environmental Leadership Program with Total Quality Management. With a focus on pollution prevention, some specific environmental initiatives implemented by Xerox, include "asset management" and design for environment, packaging reuse and recycle, recycled paper, and waste reduction and recycling.

The main objective of the asset management program was to design into their products all elements of environmental quality at the outset. The design includes the total life strategy of the product. In addition to form, fit and functions, design involves disassembly, remanufacture, reuse, recycle, and final disposition. This "cradle-to-grave" requirement for design addresses environmental concerns throughout product life cycles, minimizes environmental impact, and provides savings through parts recovery, remanufacturing, and recycling.

The packaging reuse and recycle program involves a comprehensive multinational supplier package program to standardize packaging and pallets and provide for their reuse. Several other packaging innovations have been implemented to minimize environmental impact.

A major project involving nearly every employee at every facility, is waste reduction and recycling. Through the use of teams and training, the program emphasizes the

"Reduce, Reuse, and Recycle" waste reduction hierarchy as well as the purchase of recycled material to close the loop in recycling. The waste reduction hierarchy means that reduction in waste should be considered first, followed by reuse, and finally recycling.

The environmental initiatives at Xerox go hand in hand with the quality principles. The quality principles include customer focus, employee involvement, quality improvement and problem solving, benchmarking and measurement, and reward and recognition.

Customer satisfaction has always been a high priority with Xerox, and this principle has also been applied to environmental matters.⁶ The customer focus includes government agencies and regulators as well as traditional customers for the company's products.

Through employee involvement, Xerox was able to identify opportunities for environmental quality improvement. Employees have started a number of initiatives, from local recycling efforts to world-wide all-plant programs, yielding millions of dollars in added profits each year.

The Xerox Quality Improvement Process includes planning, organizing, and monitoring for quality. The problem solving process includes the steps of analysis, identifying possible solutions, selecting and implementing solutions, followed by evaluating the effectiveness of the proposed solution.

Benchmarking involves identifying the industry leaders and best practices in each area of environmental improvement, then studying their methods and identifying their goals. Best practices is any method used in any work process whose output best meets customer requirements. The goals and practices for Xerox are then based in

part on what is learned from the benchmarking process.

Finally, the quality program includes reward and recognition for the team and individual efforts. Public recognition and environmental awards are provided to teams to encourage continued focus on environmental excellence.

In summary, by applying quality principles to environmental management and focusing on prevention, employee involvement, and teamwork, Xerox is improving profitability for the company in addition to minimizing adverse impacts to the environment.

Arm & Hammer

Arm & Hammer's commitment to the environment began in about 1900 when the company started using recycled paperboard for its packaging. Although this decision was financially driven, it helped establish the company's environmental focus.

In the late 1960s, sales of Arm & Hammer baking soda improved significantly as consumers purchased fewer cleaning products containing phosphates. Today, Arm & Hammer laundry detergent powder is the company's biggest seller and is number two in the United States after Tide.⁹

Church & Dwight Co., Inc. are marketers of Arm & Hammer branded products. In about 1990, Church & Dwight initiated a quality improvement process (QIP) which has been a valuable support for the company's environmental program. The focus of QIP is to empower people to work toward continuous improvement. Now the company is aggressively working toward incorporating environmental improvement into its quality improvement process, with a basic objective of reducing environmental impacts of the manufacturing process.

The Environmental Improvement Process at Arm & Hammer can be visualized as a

pyramid. The foundation on which all else is built consists of four elements. These elements are commitment, accountability, compliance, and alliances. The corporate environmental improvement process begins with the commitment of the chairman and CEO, and board of directors. Key company managers assume responsibility for corporate environmental impact improvement and are accountable for the same. Compliance with government environmental laws and regulations is another element of the foundation. Finally, to keep current on environmental regulations, issues, and technology, information and resource exchange meetings are essential.

Building on the above platform, the QIP moves into "management for assurance" which contains six building blocks outlined as follows:

1. Empowerment. Environmental management for assurance requires the participation and involvement of all company employees
2. Goals/plans. Based on the recommendations of employees and regular audits, quality work groups develop improvement plans and establish goals.
3. Implementation. Each department manager is responsible for overseeing the implementation of the plans by the quality work group.
4. Measurement. In accordance with various schedules, the progress of all environmental improvement initiatives is measured.
5. Refinement. Regular evaluations and measurements of environmental improvement initiatives leads to refinements in objectives.
6. Sharing. The lessons learned from doing and refining is shared across departments as well as outside the company.¹⁰

The empowerment step is an important one and, according to Church & Dwight, takes on many forms. For example, the company has undertaken a long term audit of all the practices not regulated by law, but that could lead to conservation opportunities. The audit is in three phases. Phase I looked at waste reduction, toxic chemical use, and energy utilization. Phases II and III will focus on air quality and

water opportunities.

In summary, Arm & Hammer's environmental and waste management strategy begins with a deep commitment from top management, and moving from a culture of fixing toward a culture of preventing.

Digital Equipment Corporation

Digital Equipment Corporation is a leading supplier of networked computer systems, software, and services. The concept of Total Quality Management (TQM) was introduced in 1977 as a manufacturing-oriented program. This concept has now grown into a company-wide initiative that incorporates all aspects of Digital's business operations.¹¹

Digital has applied TQM measurement principles to its Packaging Waste Management program, which has resulted in an effective means for tracking not only material reduction, but cost savings as well. One of the initial goals of the packaging program was to eliminate 5,400 tons of packaging costs by \$30 million by 1993. The \$30 million figure includes packaging material, manufacturing and distribution processes, and disposal costs. As of summer of 1991, the program has recorded an approximate 1,899 ton reduction in annual packaging waste along with an approximate \$2.7 million annual reduction in packaging cost.¹²

The key to the Packaging Waste Management program was the waste management measurement techniques implemented by Digital. Four specific types of measurement techniques were implemented--measurement at the corporate level, measurement of recycled content in packaging materials, measurement of facilities packaging waste, and measurement of product package redesigns.

The measurement techniques involved several formulas and relied on certain

assumptions to give accurate data. Digital has learned a lot with collecting measurement data for packaging waste. One of their important lessons and words of advice are to pick useful data points that are meaningful, and not measuring things just for the sake of measurement.

3M

The Minnesota Mining and Manufacturing Company (3M) has taken a proactive role in environmental affairs, and has a well known, organized waste reduction program. It is known as the Pollution Prevention Pays or 3P program.

According to Allen F. Jacobson, the company's retired chairman and CEO, the proactive approach means a company setting its own environmental goals and sometimes even tougher goals than the government sets.¹³ Jacobson believes there are several advantages to a company setting its own goals. First, if a company waits for the regulations to be imposed on it, they will probably be more costly, less flexible, and less efficient than goals the company sets for themselves. Second, with the right kind of goals, costs of production can be lowered, and often reduce waste and pollution. Third, the risk of future liabilities are reduced, which can be very serious. Finally, stepping out front with setting goals, the company protects and enhances its reputation. Among the many environmentally oriented goals at 3M, one is to reduce all hazardous releases to air and water, and waste to landfills by 90 percent by the year 2000.¹⁴

Jacobson also envisions a whole new set of demands in the future, coming not only from the government and environmental activist groups, but from 3M's customers. These demands will involve packaging, product formulation, and disposal. Businesses can and should take an aggressive and responsible position on these

demands and on new regulations.

Another key to 3M's waste reduction program is getting people to pay attention to reducing waste generation when and where it first occurs. Senior management has a strong commitment to waste reduction and a commitment to communicate to others the benefits of pollution prevention.

Some specific measures 3M has taken to reduce hazardous waste have also saved money. For example, 3M stopped cleaning flexible metal electronic circuits with toxic chemicals and started scrubbing them with pumice. It reduced hazardous waste by 40,000 pounds annually and saved \$15,000 annually on raw materials, labor, and waste disposal. The \$59,000 cleaning machine paid for itself in three years.¹⁵ 3M used to wash reactor vessels with large quantities of waster, creating considerable amounts of hazardous waste. It bought sonic cleaning equipment for \$36,000 to vibrate residue off instead, and saved \$575,000 in the first year.¹⁶

3M has taken the initiative in the area of waste reduction by setting specific goals, advocating pollution prevention, and following through with specific waste reduction measures.

Ashland Oil, Inc.

Ashland Oil is one of the nation's largest independent petroleum refiners. The company is engaged in a number of related businesses, including marketing and transporting crude oil and petroleum products, petroleum exploration and production, chemicals, and highway construction.¹⁷

One of Ashland Oils' major products is motor oil, which is marketed by their Valvoline subsidiary. Valvoline has made a number of efforts with regard to the environment. A major effort is in the area of used motor oil. At any of the 300

Valvoline instant oil change stores, any consumer can bring in up to five gallons of used motor oil for disposal at no charge. This oil is not considered waste. It is either used as fuel or is re-refined for use as a lubricant.

In a parallel effort, in about 1990, Valvoline formed Ecogard, a company that collects motor oil from retailers for recycling. Valvoline's used motor oil programs benefit both business and the environment. Used motor oil gives the company new options for fuels and feedstocks and also helps the nation reduce its dependence on foreign oil.

Another Ashland company, APAC, is one of the nation's largest highway construction firms.¹⁴In the past, damaged pavement had to be either covered with new pavement or removed and disposed of in a landfill. Both options wasted valuable resources. As an alternative to these options, APAC removes and recycles the top layer of the existing asphalt pavement. This is often mixed with raw materials, such as crushed concrete, brick, clay pipes, and other materials. These are reprocessed into hot mix asphalt concrete, usually in combination with virgin materials.

One final example of Ashland's waste management initiative comes from its chemical company, Ashland Chemical. Ashland Chemical is dedicated to continuous improvements in health, safety, and the environmental programs and is a subscriber to the Chemical Manufacturers Associations Responsible Care initiative. In recent years, Ashland Chemical implemented a program to offer collection services to all generators, regardless of whether they purchased their chemical from Ashland. In 1989, this operation was formally named Ashland Chemical Environmental Services. Key to the success of this program was the development of technologies and markets for recycled chemicals, thus minimizing the need for expensive waste disposal. While

originally the spent chemicals were disposed of, today as much as 60 percent of these so-called waste chemicals are recycled for reuse, or used as fuels in aggregate kilns.¹⁹

Ashland Oil has employed several waste minimization strategies and believes that waste minimization is the way of the future. For example, oil recovery and recycling has routinely been practiced in refineries by oil separation at the end of the pipe (end-of-plant sewer systems). In general, the longer the oily wastewater remains in the system, the more difficult the treatment required. Therefore, to minimize this problem, Ashland installed process unit area oil-water separators, with final oil-water separators at the end of the sewer system.²⁰

Ashland has also taken steps to reduce hazardous waste generated by the WWTP. The WWTP consists of oil separation, equalization, air flotation, and biological oxidation. To reduce the volume of waste requiring disposal from the WWTP, the company installed an automated pressure filtration system to squeeze oil and water from a mixture of oily solids and biological solids. The oil was recovered and reprocessed.

Ashland also believes that waste minimization is not only a process to follow, but also an attitude--an attitude on the part of management and employees to make progress. "There is great economic incentive today to reduce waste, and there will be an even greater incentive tomorrow. The cost of waste disposal will go up, but even more importantly, the availability of waste disposal options will go down."²¹

Dow Chemical Company

Dow Chemical, like many other companies, emphasizes pollution prevention and a proactive approach to waste management. At Dow though, this philosophy goes

beyond just modifying their manufacturing processes and beyond finding ways to recycle materials. Pollution prevention also means examining the very products they produce and their impact on the environment.²² To accomplish this Dow has initiated life-cycle analysis, which involves the total analysis of environmental impact from obtaining raw materials to ultimate disposal and energy recovery.

In the late 1980s, Dow consolidated its pollution prevention efforts into a program called WRAP--Waste Reduction Always Pays. As part of WRAP, a waste management hierarchy was established, with resource consumption and source reduction at the very top of the pyramid as the preferred methods, followed by recycling, recovery, and final disposal of any residual material. Usually, disposal is ash, and through the hierarchical approach, less than one percent of the material ends up in landfills.²³

The success of WRAP is greatly attributed to the creativity and enthusiasm of Dow's people. Dow believes that successful, cost-effective waste reduction is largely a matter of positive attitude, encouraging teamwork and fostering an atmosphere conducive to creativity. Its people are encouraged to seek out waste reduction programs and are rewarded for their efforts. A major goal of WRAP is to have the people look beyond their individual plants and understand the total environmental impact of their chemical processes.

WRAP has also lived up to its name with regard to pay. The profits include materials previously lost being recovered and reused, increased yields, and savings in transportation and disposal costs.

Another program Dow has developed is called Chem-Aware, and is part of the Chemicals and Metals Departments' on-going product stewardship program to help customers respond to the rapidly changing safety, waste disposal, and regulatory

environment.^{24, 25}

Dow sees pollution prevention is also the key to enhancing public credibility as well. As Frank Popoff, President and CEO of Dow says,

In the public mind, the most compelling actions we take are voluntary ones. If we fail to take the initiative, the result will be a regulatory crunch that costs us, and ultimately costs the public. Through pollution prevention we can be viewed as part of the solution, not part of the problem.²⁶

General Dynamics

General Dynamics is a large company employing approximately 100,000 people in over 15 states.²⁷ Its products include space launch vehicles, aircraft, tactical missiles, gun systems, armored tanks, submarines, marine vessels, communications systems, and building and energy materials.

In 1984, the president of General Dynamics launched a new environmental program and personally chartered a new group called Environmental Resources Management (ERM). The purpose of the group was to serve as the focal point at each division and throughout the company for all environmentally related matters. Later the same year, the president directed each of the division general managers to pick a program leader who would "take immediate action to reduce or eliminate the use of, and the generation, discharge, and disposal of, hazardous materials, to achieve zero discharge from all facilities."²⁸

The immediate objectives of the ERM program were (1) to eliminate all electrical equipment that had any detectable polychlorinated biphenyls (PCBs) used as dielectric fluid, (2) to eliminate all single-walled or steel underground tanks, and (3) to eliminate the discharge or disposal of hazardous materials. All of these objectives were completed by 1988.²⁹ In fact, General Dynamics produced 7,784 tons of hazardous waste in 1988, compared to 28,099 tons in 1984.³⁰

General Dynamics environmental program became known as the "zero discharge" program. The president once explained the rationale of the term as being a single target and easy to remember.

The largest hurdle the program faced was not technical in nature, but obtaining the necessary support and cooperation within the departments' organizations. There was difficulty in establishing ownership of the problem and the corresponding solution. More than half of the ERM resources concentrated on a shift in cultural approaches.

With a new ERM division committee of managers acting as department representatives, and the establishment of smaller focus groups, organizational barriers were dissolved and "group dynamics" emerged. Eventually, participation in the environmental program shifted from being a "necessary evil" to an opportunity for the group members to gain recognition for their ideas and inputs.

AT&T

American Telephone and Telegraph (AT&T) has also been a leader in hazardous waste minimization and pollution prevention. AT&T has taken a number of initiatives toward protecting the environment and minimizing hazardous waste.

One concept that AT&T is committed to is environmentally conscious manufacturing. Environmentally conscious manufacturing (ECM) involves developing and implementing manufacturing processes that minimize or eliminate hazardous chemical waste, reduce scrap, or are operationally safer.³¹ This concept goes beyond simple compliance with regulations to include pollution prevention, and shifting from "end-of-pipe" control to avoiding pollution in the first place.

One example of implementing the ECM approach at AT&T is cleaning/solvent

substitution. Cleaning processes produce waste. Traditionally, cleaning mechanical and electrical components has required halogenated solvents. Halogenated organic compounds, known to deplete the earth's ozone layer, are regulated by Clean Air Act. AT&T and Sandia National Laboratories have conducted tests to study the cleaning ability of nonhalogenated, environmentally safe solvents (Sandia is also committed to ECM and some of their programs are discussed in a later section). Another approach to eliminating halogenated solvents is to use a solventless cleaning process. One such process uses hydrogen plasma for cleaning. Heavily oxidized copper surfaces can be cleaned effectively with hydrogen plasma and subsequently soldered without fluxing.³²

AT&T is also involved in very simple environmentally conscious practices, such as recycling office waste. In 1989, recycling saved AT&T \$1.4 million at 120 New Jersey locations.³³

3.0 Hazardous Waste Minimization in the Public Sector

Hazardous waste minimization and pollution prevention are goals of federal agencies as well as private industry. There are several hazardous waste minimization programs that have been implemented in the Department of Defense and the Department of Energy, which are addressed in the following sections.

Department of Defense

A hazardous waste minimization policy has been issued by the Department Assistant Secretary of Defense (Environment). Program guidance stresses source reduction but also encourages actions that reduce hazardous waste disposal. Implementation of hazardous waste minimization is delegated to the military departments and defense agencies who assign responsibilities to various subordinate

commands. In 1990, the military departments adopted goals of 50 percent reduction in hazardous waste disposal by 1992.³⁴

One example of implementing new techniques in industrial processes took place at Anniston Army Depot located in Calhoun County, Alabama. Anniston Army Depot repairs, overhauls, and converts combat vehicles. On-going practices include recycling/reusing spent solvents and cutting oils, filtration and subsequent reuse of chemical paint stripping compounds, metal plating/finishing process modification, spray painting sludge reductions, and new paint formulations.

The Department of the Navy is reducing hazardous waste by minimizing abrasive blast media (ABM). ABM is used with high-pressure air to remove paint and rust from ships. Proper surface preparation is vital to controlling ship hull corrosion, which can affect the life of the vessel. Failure of a coating system can result from poor quality ABM, poor workmanship, or improper application.

Environmental concerns involving ABM's include air-particulate matter, noise, trace metal pollution of navigable waters, and soil and groundwater contamination. In response to health, environmental, and productivity concerns, the Navy developed a new ABM specification, MIL-A-22262A.³⁵ Contaminant limits allowed by this specification are below the standards required to meet a shipyard's water quality discharge permit while assuring abrasive blasting quality. Standards for toxic metals cited in MIL-A-22262A are based on State of California total toxic limit concentrations and soluble toxic limit concentrations for identifying a hazardous waste.³⁶ Use of the new specification avoids the need to dispose of spent abrasives as hazardous waste

due to disposal limits being exceeded in the raw material.

The Navy is committed to using an ABM product that allows adequate safety, effectively performs its abrasive blasting functions, and minimizes hazardous waste disposal. The Navy will continue to evaluate and regulate procurement of ABM to meet these goals.

Controlling the use hazardous chemicals is an integral part of the hazardous waste minimization program at the San Antonio Air Logistics Center (SA-ALC) located at Kelly Air Force Base, San Antonio, Texas. The Directorate of Maintenance (MA) within SA-ALC is responsible for repair and overhaul of large transport aircraft, strategic bombers, and aircraft engines. SA-ALC/MA is dependent on a variety of chemicals (hazardous and nonhazardous) in order to accomplish many processes, including electroplating, engine cleaning, paint stripping, machining, and aircraft painting.³⁷

Hazardous waste minimization is dependent on strict control of the processes and chemicals used in these processes. This is accomplished by a chemical material control program where chemicals are identified as hazardous prior to use and their intended use is evaluated and controlled. One of the key tools used for control of chemicals is a use of a form which must be filled out and maintained for each chemical authorized for each shop. The form contains information such as justification of use of the chemical and all necessary approvals such as the Environmental Branch within MA and Industrial Hygiene. The other key element of the chemical management program is the computerized database that tracks all chemicals issued and links the MA Environmental Branch with Industrial Hygiene, supply function, and seven chemical staging areas.

In addition to new chemical material, the Environmental Branch within MA also uses computerized control over its other waste management programs. With the Environmental Branch having close control on the purchase and issue of hazardous chemicals and the control of their use and the resulting waste, SA-ALC/MA has a chemical management system with all the loopholes closed.³⁶

Department of Energy

The United States Department of Energy (DOE) has a number of facilities across the country that support nuclear weapons production. There are a number of DOE orders pertaining to the management of radioactive and hazardous waste. Three orders in particular, require waste minimization and pollution prevention programs.

DOE Order 5400.1 (General Environmental Protection Program) requires establishment of Waste Minimization Programs and Pollution Prevention Awareness Programs that contain goals for minimizing the volume and toxicity of all waste. DOE Order 5400.1 (Hazardous and Radioactive Mixed Waste Program) states that it is DOE policy to "implement waste minimization measures as specified in RCRA for hazardous and radioactive mixed waste." This order requires managers of DOE Field Organizations to implement a Waste Minimization Program for hazardous and mixed waste. Mixed waste contains both hazardous and radioactive constituents. DOE Order 5820.2A (Radioactive Waste Management) establishes policies, guidelines, and minimization requirements for management of DOE radioactive waste, mixed waste and contaminated facilities.

To supplement these orders related to Waste Minimization, DOE issued a Waste Reduction Policy Statement on June 27, 1990, followed by a Waste Minimization and Pollution Prevention Policy on August 20, 1992. The DOE Waste Minimization and

Pollution Prevention Policy mandates a hierarchy of environmental protection practices as follows:

- First, avoid or reduce the generation of hazardous substances, pollutants, wastes, and contaminants at the source.
- Second, recycle or reuse that which cannot be eliminated.
- Third, treat the remaining waste to reduce volume, toxicity, or mobility before storage or disposal.
- Fourth, dispose of residual waste in an environmentally safe manner.³⁹

Waste Minimization at the Rocky Flats Plant

The Rocky Flats Plant (RFP) is a DOE facility located approximately 16 miles northwest of Denver, Colorado. Historically, the mission of Rocky Flats has been to support production of nuclear weapon components for the U. S. Government. In January 1988, the DOE established a formal Waste Minimization Program at RFP. The DOE Rocky Flats Office (DOE-RFO) appointed a full-time Waste Minimization Coordinator to oversee and guide the program. In addition, the RFP Management and Operating (M&O) Contractor, EG&G Rocky Flats, Inc. (EG&G) established a formal waste minimization department within the plant organization.

With the cancellation of the W-88 Warhead Program in January 1992, the RFP mission changed from nuclear weapons production, to cleanup, deactivation, and preparation for decontamination and disposition of facilities. As a result of this transition, the Waste Minimization Program at RFP is shifting focus from production process modifications to waste minimization techniques applicable to residue elimination, building stabilization, and decontamination.

The EG&G management team is dedicated to minimizing waste generation by giving preference to source reduction, material substitution, and recycling practices over

treatment and disposal of waste. In addition to DOE orders, there are EG&G Plant policies that support waste minimization and pollution prevention. EG&G Rocky Flats, Inc. Policy 10-12 (RCRA-Regulated Material Procurement Control) places certain restrictions on procurement of RCRA-regulated materials. EG&G Rocky Flats, Inc., Policy 6-9 (Radioactive Waste Management) places emphasis on safe processing and packaging of waste materials.

The objectives of the RFP Waste Minimization Program are outlined in the "FY93 Waste Minimization Program Plan for the U. S. Department of Energy, Rocky Flats Plant", published in 1992. This program plan is updated annually in accordance with the Federal Facility Compliance Agreement (FFCAII). The FFCAII, a compliance agreement between the EPA and DOE, was effective May 10, 1991. These objectives are as follows:

1. Reduce or eliminate the generation of waste through raw-material substitutions, product reformulation, process modification, material segregation, improved housekeeping, and closed-loop recycling to achieve minimal facility impact on the environment.
2. Establish specific waste minimization goals, and establish program performance indicators and an information system to report progress realized toward these goals.
3. Conduct continual assessments of RFP operations to identify opportunities for waste minimization and needs for research and development (R&D).
4. Develop, demonstrate, and implement new and existing waste minimization technologies consistent with identified plant needs.
5. Promote a philosophy and work ethic among RFP employees that encourages protection of the environment and preservation of natural resources while achieving the facility's strategic mission.
6. Establish and demonstrate senior and middle management commitment to pollution prevention and waste minimization practices.
7. Enhance communication, both laterally and vertically among RFP

organizations, of waste minimization objectives, goals, ideas, successes, and "lessons learned."

8. Collect and exchange waste minimization information at the local and national levels, utilizing technology transfer, outreach, and educational networks.
9. Develop and implement quality assurance (QA) measures for waste minimization activities.
10. Maintain current offsite recycling programs consistent with RFP policies for release of material to the public, and expand the program to include other items determined to be economically practicable.

There are also goals for the RFP Waste Minimization Program based on a percent reduction in the amount of radioactive and nonradioactive solid waste generated each year compared to Fiscal Year 1991 (FY91). Goals are set for each category of waste generated at the plant, including the recycling programs for office paper and cardboard.

Waste Minimization Projects and Activities for FY93

There were a number of Waste Minimization Program projects and activities scheduled for FY93 at Rocky Flats, all of which are described in the FY93 Waste Minimization Plan (September, 1992). Following, is a brief discussion of three of these projects.

Dustless Decontamination System. Current decontamination procedures used on coated surfaces at RFP are labor-intensive and often involve the use of chemicals. This results in the generation of significant quantities of hazardous and mixed wastes. The Waste Minimization Group is in the process of evaluating a device known as the Dustless Decontamination System (DDS). This device is designed to decontaminate concrete floors, walls, and difficult to reach areas without the use of chemicals and without the use of dust. If the DDS performance evaluation is favorable, a procedure will be written and a training program will be developed. Then the system will be

implemented throughout the plant for various applications.

Contaminated Metal Decontamination and Recycling. This project consists of the purchase and installation of commercially available carbon dioxide blasting equipment for general cleaning, coating removal, and decontamination applications at RFP. Proof-of-principle demonstration for a number of different applications have been and will continue to be conducted. One such application involves decontamination of surplus process equipment and furniture. In past practice, paint stripper containing a listed RCRA solvent was used in decontamination. This practice was not cost effective because two-thirds of all equipment processes were size-reduced and disposed as low-level mixed waste, the remaining one-third was recycled or sold as scrap material. RFP discontinued its use of solvent paint stripper in 1988. A proof-of-principle demonstration completed in FY91 showed carbon dioxide cleaning could be used effectively to remove paint, oil, dirt, and low-level uranium contaminants. A second demonstration of another type of carbon dioxide blast equipment was successful in removing rust, paint, oil, and dirt from 55- and 30- gallon steel drums and miscellaneous equipment.

The contaminated metal cleaning and recycling program will continue on a small scale basis, and it is planned to apply this method to future decontamination and decommissioning work at RFP.

Silver Recovery and Recycle. The primary objective of this project is to increase the recovery and recycling of silver from silver-bearing materials at RFP. The silver can generally be recovered, but not recycled because the silver is considered to be radioactively contaminated. Examples of materials containing silver include radiographic film, photographic fixer solution, photographic rinse water, and filter

cartridges. Silver recovery and recycle efforts will reduce generation of hazardous waste and disposal costs. It will also prevent regulatory issues involving disposal of materials containing silver as characteristic hazardous wastes.

The first silver recovery project implemented at RFP involved the removal of silver from waste photographic solutions, including fixer, developer, and bleach from various sources on plantsite. Silver is recovered in the system using an electric charge to adsorb the silver onto a metal plate. Following recovery, effluent from the system is treated in one of the buildings' precipitation process. Approximately 75 pounds of silver ingots are produced annually.⁴⁰

There are other silver recovery projects at RFP in the early stages, including one for used radiographic film.

Sandia National Laboratories

Sandia National Laboratories is a DOE facility in Albuquerque, New Mexico. Sandia is primarily a research facility and laboratory supporting nuclear weapons and energy research.

Sandia, like AT&T, is committed to environmentally conscious manufacturing, and is coordinating DOE's effort to eliminate the use of halogenated solvents in cleaning. The program is being carried out jointly with the DOE production agencies. One Sandia study involved alternative cleaners for reliability printed wiring board (PWB) assemblies. PWBs require cleaning to remove process residues that can lead to corrosion or degrade their electrical performance. After evaluating four alternative commercially available cleaners, it was found that a terpene-based cleaner was an effective cleaning agent.

Another solution is to eliminate the need for cleaning in the first place. AT&T and

Sandia are pursuing this approach by developing low solids flux (LSF) technology. LSF has a solids content in the range of 2 to 5 weight percent compared to the usual 15 to 35 weight percent.⁴¹ LSF leaves little or no post-solder residue and eliminates the need for subsequent cleaning processes. It eliminates not only cleaning agent waste, but also cleaning machine capital, operating, and maintenance costs.

Sandia is also evaluating replacements for methylene dianiline (MDA), one of several hazardous materials used to produce plastics and polymers. MDA has not been banned, but is a listed carcinogen and is strictly regulated. It is a major constituent of a widely used polymer curing agent. Sandia has been evaluating materials as drop-in replacements for this curing agent. Drop-ins can be substituted without any process changes. One replacement that is commercially available is aromatic amine. This material however, has a slower cure rate than MDA. To increase the cure rate, salicylic acid was added as a catalyst. Tests have shown the new material is an acceptable replacement for MDA.⁴²

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CHAPTER III: THE TQM APPROACH TO HAZARDOUS WASTE

After examining all of the environmental and hazardous waste management programs, strategies, and programs of leading corporations, it is hoped that some common principles have emerged and the result is one model for successful waste management. It is safe to say that there is no single formula for success, but there are some basic principles that all of these organizations have in common.

Extracting all of the elements from each organization's program or success story, some common and recurring themes are evident. These include such things as pollution prevention, waste minimization, total quality management, and employee involvement. What is not only interesting, but also an obvious trend in business today is the overlap of two major concepts which have originated from different disciplines. These concepts are total quality management (TQM) and pollution prevention/waste minimization. These concepts can also be thought of as paradigm shifts. A paradigm is an attitude stemming from a traditional way of viewing and doing things (an example or pattern). Pollution prevention and TQM are paradigm shifts that have evolved in recent years, and have remarkable similarities.

Before discussing the similarities, it will be helpful to elaborate on each of these concepts and what they mean.

1.0 TQM

The TQM movement began with a well known professional in the quality field, W.

Edwards Deming. Deming is an internationally recognized consultant whose work led Japanese industry into new principles of management and emphasis on quality. For Japan, the quality movement began in the 1950's. Much later, when U. S. firms were losing market share because of poor quality, Deming's ideas were recognized in the United States. Deming's 14 points for management are discussed in detail in his book Out of the Crisis.

While TQM seems to be the "buzzword" for the 90s, some firms appear to be jumping on the TQM bandwagon, and there is still widespread misconceptions on this concept. TQM is not merely slogans, banners, and implementation of statistical process control methods. It must begin with an adoption of a new philosophy (Deming's second point) or a new paradigm. It is not a "fad" or program that an organization implements, and then forgets about.

Now that some common mistakes and myths on TQM have been noted, it is appropriate to define what is TQM. There are many definitions, a simple straightforward definition will provide a start:

Total Quality Management is a structural system for meeting and exceeding customer needs and expectations by creating organization-wide participation in planning and implementation of continuous improvement processes. It is a discrete form of organizational management that encompasses all levels of the organization in a focused and ongoing effort to provide products and services that satisfy customer demands.¹

Why TQM? Why does TQM seem to be such a popular concept in today's business world? After studying corporations and organizations that are leading the way in environmental planning and waste management, it is clear that Total Quality Management in some form or fashion is integrated into their way of doing business. Additional research indicates that this concept is here to stay. There is hardly a Fortune 500 company that has not installed some kind of TQM program, and more

firms are competing for the highly prized Malcolm Baldrige Award.² Very few will argue that the 1990's will be a decade of increased competition and organizations that succeed will be ones that produce quality products and services in a timely, cost-effective manner, and strive for continuous improvement. Furthermore, from an international perspective, many organizations currently hold a significant lead over U. S. organizations in TQM development.³

So the question for American business is not "Why TQM?", but rather "how to implement TQM." There are a number of implementation strategies, and many books have been written on this subject. Before TQM can be successfully implemented, a full understanding of the concepts and principles of TQM is necessary.

Principles of TQM

Recent research suggests that one prerequisite to total quality improvement is developing a quality culture.⁴ In addition, several prominent quality experts, such as Deming, J. M. Juran, and Philip Crosby stress the importance of building a quality culture. Quality culture can be defined as "the total of the collective or shared learning of quality-related values as the organization develops its capacity to survive in its external environment and to manage its own internal affairs."⁵ The important point about culture is that it is deep-rooted values and ideology that is formed over time. That is why quality can not be accomplished by a "quick fix" or program of the month type approach. It must be an inherent way of doing business. There are many ways to change quality culture. One method is called culture gap analysis, which involves identifying desired quality values and comparing them with current quality values. There is usually a target group such as upper management or production. If a gap is identified, corrections are then determined and implemented.

Establishing a quality culture is a starting point for implementing TOM. Several principles that are well documented in the literature and used by quality conscious firms (Hewlett-Packard, IBM, Proctor and Gamble, and McDonalds, to name a few) are as follows.

Principle 1. Quality improvement requires top management commitment. This means management must demonstrate their commitment to quality by actions, not just words. This begins by creating and communicating a clear vision of corporate philosophy and desired future state of the firm.

Principle 2. Quality must be part of a company's goals and strategies. It must be a corporate mission with planned goals. This principle is practiced by many leading corporations such as Xerox, Hewlett-Packard, IBM, Westinghouse, and Motorola.

Principle 3. Employees are the key to consistent quality. This principle can also be thought of as employee involvement or empowerment. Employees should be encouraged to participate and be adequately trained (Deming's points 6 and 13). Deming also advocates removing barriers that rob the worker of his right to pride of workmanship and putting "everybody in the company to work to accomplish the transformation."

Principle 4. Quality standards and measurements must be customer-driven. This is also referred to as the customer focus. It is essential that the customer's needs are known and customer satisfaction should continually be monitored. This should include internal customers as well as external customers.

Principle 5. Many programs and techniques can be used to improve quality. There are a multitude of statistical quality control techniques, quality circles, work teams, employee involvement programs, and product design improvement that leading firms

have implemented. No single approach is best for all types of companies.

Principle 6. Teamwork is vital. Quality improvement requires cooperation between managers and employees and between departments. Hewlett-Packard, IBM, and 3M all use the team approach to quality improvement. This is also Deming's point number 9--breaking down barriers between departments and working as a team.

Principle 7. Quality is a never ending process. This can also be thought of as continuous improvement. Quality is not an end but an on-going process.

Principle 8. Quality should be designed into the process. Quality can not be inspected into the product, it must be built into the product from the early design phase. This comes from Deming's point number 3 which says "eliminate the need for inspection on a mass basis by building quality into the product."

Perhaps one final principle or at least essential element of TOM is measurement. As Tom Malone of Milliken & Co. says, "Teams that don't keep score are only practicing." Effective measurements are the key to determining improvements, accountability, and credibility. Measuring environmental results is not too different from measuring any other performance. It must be based on clear identification of customer needs and linked to the quality improvement process. Effective measurement systems may not always be easy to accomplish. When developing a measurement system, it should be noted that measures must be carefully defined and tracked. If possible, measures should be normalized so comparisons can be made between plants, years, or processes.

Companies should not just blindly follow these principles and merely copy the practices of successful companies. Making major changes to the way a company operates and adopting a quality culture takes time, patience, and hard work.

2.0 Pollution Prevention

Pollution prevention is a more recent paradigm shift than TOM, but nevertheless is quickly becoming the essence of environmental and waste management. The old way of thinking assumed the environment was a place to deposit all of society's waste, as long as the levels do not unduly damage public health and the environment. The burden of proof then, was on the regulator to prove that the cost of reducing pollution is justified by the benefits. This paradigm can also be thought of as the "end-of-pipeline" approach to hazardous waste management. Treat the waste after it's already up the stack, out the pipe or in the ground.

Pollution prevention is based on the idea that waste generation should be minimized as much as possible. Otherwise, it becomes almost impossible to prevent environmental degradation when accompanied by economic growth, especially when land disposal is no longer acceptable. If pollution prevention is not possible, the next alternative is re-use or recycle, and the least favored alternative is end-of-pipe treatment of waste.

Pollution prevention requires companies to consider the entire environmental impact of their products and look for substitutes for hazardous substances. It should also be emphasized that pollution prevention is not only the modern, innovative way of doing business, but is also becoming a regulatory requirement. The RCRA statutes require all TSDF facilities to have a waste minimization program in place. This is reinforced by the 1990 Pollution Prevention Act.

The EPA has issued guidance to hazardous waste generators on the elements of a Waste Minimization Program. This guidance is contained in the June 12, 1989 Federal Register. Following is a summary of what the agency believes are the basic

elements of a waste minimization program

- A. Top Management Support. Top management should ensure that waste minimization is a company-wide effort. Some methods to accomplish this goal are also given. These include such things as making waste minimization a company policy, and setting specific goals for reducing the volume or toxicity of waste streams.
- B. Characterization of waste generation.
- C. Periodic waste minimization assessments. This includes tracking materials that eventually wind up as waste, from the loading dock to the point at which they become a waste.
- D. A cost allocation system. Departments and managers should be charged "fully loaded" waste management costs for the wastes they generate, factoring in liability, compliance, and oversight costs.
- E. Encourage technology transfer. Seek or exchange technical information on waste minimization from other parts of your company, from other firms, trade associations, universities, or professional consultants.
- F. Program evaluation. Conduct a periodic review of program effectiveness. Use these reviews to provide feedback and identify potential areas for improvement.

3.0 TQM and Pollution Prevention = TQEM

There are a number of similarities between TQM and pollution prevention. Both focus on employee involvement, strong commitment from top management,, assessments, and evaluation of the program for effectiveness. TQM principles include goal setting--zero defects, while pollution prevention sets zero pollution goals.

An easy way to see how TQM and Pollution Prevention are conceptually similar is

to substitute "environment" into Deming's 14 points. The 14 points as follows were adapted by Greenbridge Management Inc., 1990.⁴

1. Create constancy of purpose toward minimizing detrimental environmental effects with a plan to remain competitive and stay in business.
2. Adopt the new philosophy. You are in a new environmental age. You can no longer live with accepted levels of contamination and environmental destruction.
3. Cease dependence on end-of-pipe treatment of waste streams. Require, instead, statistical evidence that environmental protection is built into processes. Purchasing managers have a new job and must learn it.
4. End the practice of awarding business on the basis of price tag. Instead, depend on meaningful measures of environmental protection, quality, and price.
5. Find problems. It is management's job to work continuously on the system. It is not enough to wait for the environmental inspector on the job.
6. Institute modern methods of training employees in environmental protection on the job.
7. Institute modern methods of supervision of production workers. The responsibility of the foreman must be changed from sheer numbers to environmental protection, quality, and the elimination of waste.
8. Drive out fear, so that everyone can work effectively for the company and so that employees will alert management to environmental problems.
9. Break down barriers between departments. People in research, design, sales, and production must work as a team to foresee problems in production that might be encountered and cause detrimental environmental effects.
10. Eliminate numerical goals, posters, and slogans for the work force that ask employees to protect the environment without providing methods to do so.
11. Eliminate work standards that prescribe numerical quotas with no regard to environmental protection.
12. Remove barriers that stand between the hourly worker and his or her right to environmental protection.
13. Institute a vigorous program of education and training.
14. Create a structure in which top management will push employees every day to meet the first 13 points.

Why Total Quality Environmental Management (TQEM)? There are a number of arguments in favor of TQEM, most of which come from a simple assessment of current trends in business today. It does not take extensive research of periodicals and newspapers to conclude that two of the biggest issues facing business today are quality and the environment. There are a number of drivers for these trends and this shift toward TQEM.

First of all, the amount of environmental regulation continues to increase. For example, Congress is now debating RCRA and the Clean Water Act (CWA). Superfund will be due for debate in 1994. In addition, new laws continue to be added such as the 1990 Pollution Prevention Act. Along with new and expanded regulation, is broader and stronger enforcement. This forces both the public and private sector to spend the dollars to comply or face stiff fines and possible criminal charges.

Second, public opinion polls continue to show that the environment is an important issue in the public's mind. In 1992, an Opinion Research poll said eighty-four percent of the public ranked pollution a more serious crime than insider trading, price fixing, and anti-trust.⁷

Third, there is increasing international focus in the areas of environment, health, and safety. The United States is no longer a leader in these areas, especially with design for recyclability and toxics use reduction.⁸ More and more countries, industries, and customers are requiring their suppliers to have a documented quality system following one of the International Organization for Standardization (ISO) 9000 Series Standards. ISO 9000 will drive TQEM into the product development and supply chain. This is supported by the fact that ISO's technical committee for environmental

management systems met in June 1993 to begin work on a set of international environmental standards that would complement the ISO 9000 quality standards. The standards would cover issues such as environmental management systems, auditing, labeling, life cycle analysis, and performance evaluations.⁹ TOEM is also the primer for the Global Environmental Management Initiative (GEMI), dedicated to promoting worldwide business ethics for environmental management and improve environmental performance of business through example and leadership. The "international environmental movement" is not limited to the European Community which has adopted a voluntary program calling for companies to certify their environmental management systems, and prepare a public statement on their performance. The International Network for Environmental Management (INEM) has set up specific environmental management programs for developing countries, which began with Brazil and Argentina in 1992.¹⁰

Another driver of TOEM is increased pressure on corporations due to information disclosure required under current regulations. For example, the Emergency Planning and Community Right-to-Know Act of 1986 ("EPCRA" or "SARA Title III") requires reporting of toxic emissions, and the 1990 Pollution Prevention Act requires waste minimization reporting.

Finally, business costs is another reason to implement TOEM. Environmental releases are indications of inefficiency--failure to fully utilize resources. This leads to increased raw material costs and increased emission management costs. Compliance and environmental/health/safety costs are increasing dramatically. For many corporations they now approach seven percent of operating costs.¹¹ These costs, however are not spread equally across all products and services and they can be a

significant cost reduction opportunity for some products and services.

In summary, there are many forces motivating firms toward TOEM. In the near future, this concept may be more than a means to gain a competitive advantage--it may be essential to business survival.

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CHAPTER IV: RCRA PROGRAM AT ROCKY FLATS

1.0 GENERAL

1.1 Purpose

The Rocky Flats Plant (RFP) Resource Conservation and Recovery Act (RCRA) Program Description identifies requirements and responsibilities that shall be met to ensure compliance with all regulatory criteria for RCRA-regulated waste and underground storage tanks (USTs). This includes the generation, characterization, segregation, packaging, spill response, storage, treatment, and transportation preparation for RCRA-regulated waste and requirements for USTs containing regulated substances.

1.2 Scope

The RCRA Program Description (RPD) establishes RCRA management program elements and outlines the methods by which RFP shall comply with Department of Energy Rocky Flats Office (DOE-RFO), Environmental Protection Agency (EPA), and Colorado Department of Health (CDH) hazardous waste requirements. The Program addresses all applicable requirements contained in 6 CCR 1007-3 (Colorado Hazardous Waste Regulations), 40 CFR Parts 260-299, and 7 CCR 1101-14 (Underground Storage Tanks).

Hazardous waste includes hazardous waste mixed with low level waste (LLW), transuranic waste (TRU), and residues. However, specific management plans for Low Level Mixed Wastes (LLMW) and TRU Mixed Wastes are contained in the Low Level Waste Management Plan (1-10000-EWQA, Section 1.1) and Transuranic Waste Management Plan (1-10000-EWQA, Section 1.2). Adherence to these plans assures that LLW meets the waste-acceptance criteria for disposal at the Nevada Test Site and TRU waste meets the waste-acceptance criteria for disposal at the Waste Isolation Pilot Plant.

The RPD applies to all personnel in areas and organizations involved in the managing and handling of RCRA-regulated waste and petroleum underground storage tanks. Personnel include all employees of EG&G Rocky Flats, Inc., as well as all contractor personnel who are not directly employed by EG&G Rocky Flats but are under contract with EG&G Rocky Flats or the Department of Energy Rocky Flats Office.

1.3 Site Description

The Rocky Flats Plant facility is part of a nationwide nuclear weapons research, development, production, and plutonium reprocessing complex under the Rocky Flats Operation Office of the Department of Energy (DOE). The Operating contractor for RFP is EG&G Rocky Flats, Inc.

The RFP is located in northern Jefferson County, approximately 16 miles northwest of Denver, and 9 to 12 miles from the neighboring communities of Boulder, Broomfield, Golden, and Arvada. It occupies an area covering approximately 6,550 acres.

1.4 Plant Mission

Since operations began in 1951, the primary mission of Rocky Flats has been to support production of nuclear weapon components for DOE. Historically, production activities have included metal fabrication, machining, and assembly of components from plutonium, uranium, beryllium, and stainless steel. With the cancellation of the W-88 Warhead program in 1992, the RFP mission changed from nuclear weapons production to cleanup, deactivation, and preparation of decontamination and disposition of facilities.

RFP operations generate solid, liquid, and gaseous waste streams. Waste categories at RFP include the following, each uniquely affected by different regulations, orders, and agreements:

- Transuranic waste (TRU)
- Low-level waste (LLW)
- Hazardous waste (HAZ)
- TRU-mixed waste (TRM)
- Low-level mixed waste (LLM)
- Residues (RES), which can be pure radioactive or mixed
- Sanitary waste (SAN)

1.5 Introduction

The RPD is divided into four main sections. Section 1.0 provides the purpose, scope, and introduction. Section 2.0 consists of a requirements hierarchy. Sections 3.0 and 4.0 contain the main body of the program. Section 3.0 provides the overall RCRA Program Management and responsibilities. The specific RCRA program elements are found in Section 4.0. These include the regulatory requirements, how the requirements are implemented, and organizations and responsibilities. The regulatory requirements are stated in sufficient detail to identify the basic requirement.

Program deficiencies and/or program improvements are addressed in the implementation plan found in Appendix A. Appendix B consists of a matrix identifying the regulatory requirements and implementing procedures.

Compliance with RCRA and its implementing regulations are also briefly addressed in the draft RFP Environmental Compliance Plan (ECP) which addresses all environmental laws and regulations that pertain to Rocky Flats. The RPD addresses RCRA regulations and compliance in more detail and also includes the quality elements pertaining to hazardous waste management at Rocky Flats. The tasks identified in the RPD implementation plan include the tasks and milestones found in the ECP.

2.0 REQUIREMENTS HIERARCHY

The following figure shows the requirements hierarchy for the RCRA Program Description.

Figure 2-1. Requirements Hierarchy

NOTE: A solid line indicates a direct requirements flowdown through the RCRA management program. A dashed line indicates an indirect flowdown; the direct flowdown hierarchy for these requirements is not shown.

3.0 RCRA PROGRAM MANAGEMENT

The organization of the RCRA program involves many components, including regulatory guidance, technical support to waste generators, and independent oversight. These functions are carried out in nearly every organization on plantsite. Two main components of the RCRA Program are line implementation and program management. Line management and line personnel are ultimately responsible for implementing environmental and/or waste compliance activities and compliance with applicable requirements. The line-management function has been recently structured under the Environmental Compliance Program developed by Facilities Management and Operations (FM&O). Program management provides guidance and technical support to the line function. The responsibilities for RCRA Program Management reside primarily under Waste Programs within Environmental and Waste Management (E&WM). The Environmental Restoration Management (ERM) organization also has some responsibilities for the RCRA Program at Rocky Flats.

There is some overlap between RCRA and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), also known as Superfund. Generally, RCRA applies to active hazardous waste facilities and CERCLA applies to inactive or abandoned sites. The requirements under RCRA apply to waste generated during remedial activities at Rocky Flats. One of the most important differences between these two laws is that CERCLA focuses on hazardous substances, which is a much broader category than just hazardous waste regulated under RCRA.

3.1 Organizations and Responsibilities

The EG&G organization structure is shown in Figure 1. The following sections describe how each organization is involved in hazardous waste management at Rocky Flats.

3.1.1 Generators

A generator is defined as a facility owner or operator or individual who by their actions or inactions causes a material to become a waste. All generators are responsible for proper identification and characterization of the waste they produce in accordance with the Hazardous Waste Requirements Manual.

3.1.2 Performance-Based Training (PBT)

PBT is responsible, at the direction of the RCRA Training Officer, for developing and implementing formal classroom training for hazardous waste management.

3.1.3 Facilities Management and Operations (FM&O)

Based on the philosophy that RCRA compliance is the responsibility of the line organizations, an organization structure has been established by FM&O consisting of Environmental Coordinators (ECs) and Environmental Program Managers (EPMs). The ECs and EPMs facilitate direct communications to the employees regarding the requirements and their applicability to their specific operations.

ECs and EPMs are currently being established under each director within FM&O. For organizations outside FM&O, a matrixed reporting structure will

Figure 1. EG&G ROCKY FLATS, INC.

be formed. ECs will be assigned to Waste Operations, Analytical Labs (both within E&WM), and Maintenance and Plant Support. All ECs will be trained through a strict training and qualification program. The Qualification Standard Package is presently in draft and under review, and will be implemented as on-the-job and knowledge based training.

Some of the main responsibilities of the Environmental Coordinators are as follows:

- Single points of contact for all environmental compliance issues within their designated buildings;
- Advises Operations/Facility Manager in all areas of environmental compliance, surveillances, and audits;
- Assures building specific "Floor Level" environmental compliance procedures (Level 4) are accurate and include all facility specific environmental information;
- Conducts area specific review of training guidelines, i.e. waste generator, RCRA Custodian concerning qualification guides;
- Ensures Environmental Self-Evaluations are conducted, and through internal surveillances, identifies and facilitates corrective actions;
- Directs and oversees closure of RCRA Units;
- Provides information contained in Waste Stream and Residue Identification and Characterization (WSRIC) documents and reviews and submits changes to WSRIC documents as waste streams change.

Some of the main responsibilities of the Waste and Environmental Program Manager are as follows:

- Acts as the primary liaison with Waste Programs between the Regulators, Department of Energy, Director, Environmental Restoration (ER), Environmental & Waste Management (E&WM), Legal, and other FM&O Environmental Programs departments;
- Provides general and specific environmental technical guidance to management;
- Supports Environmental Coordinators in their duties to achieve and maintain compliance with all applicable environmental requirements. Requests and organizes collection of data for environmental reports and permit applications;
- With Waste Programs, responds to regulatory, Department of Energy (DOE), and company inspections, appraisals, and audits related to the assigned facilities;
- Ensures area environmental self-evaluations are conducted, conducts/coordinates internal surveillances, and coordinates deficiency tracking and finding resolution;
- Serves as board members for qualification of Environmental Coordinators;
- Reviews and approves environmental compliance Action Plans;
- Performs investigations or inquiries of identified concerns, deficiencies or weaknesses.

3.1.4 Environmental & Waste Management (E&WM)

Technical guidance and support for the RCRA program are provided by Waste Programs within E&WM. The groups under Waste Programs that have responsibilities for RCRA are: RCRA Regulatory Programs (RRP), Federal Facility Compliance Act (FFCA) Programs, Waste Identification and Characterization (WIC), Waste Minimization (WM), Radioactive Waste Programs (RWP), Waste Regulatory Programs (WRP), and Waste Technical Support (WTS).

The responsibilities of RRP are as follows:

- Develop RCRA training programs for plantwide implementation;
- Serving as "subject matter experts" for RCRA training programs and RCRA requirements documents;
- Ensuring interim status documents and the RCRA Operating Permit are accurate and up-to-date;
- Preparing permit modifications and changes to interim status;
- Reviewing new regulations and providing the interface between RFP and the state and federal regulators on RCRA issues;
- Conducting design review of engineering packages;
- Coordinating the treatment of reactive chemicals;
- Preparing and maintaining closure plans for active RCRA units;
- Coordinating various programs to ensure RCRA compliance at RFP.

FFCA Programs is responsible for programmatically managing the Land Disposal Restriction (LDR) FFCA to ensure the terms of the FFCA are met. FFCA

Programs are also responsible for ensuring treatment technologies and LDR waste management strategies in support of the FFCA are identified, developed, and implemented.

WIC is responsible for managing the WSRIC documents that generators must use to characterize their waste. Other responsibilities include conducting laboratory interface in prioritizing lab samples, analytical method development, and backlog waste characterization.

WM is responsible for managing all activities that deal with waste minimization including recycling programs, pollution prevention awareness, process waste assessments, and waste-minimization projects.

RWP is responsible for developing and maintaining programs to control and direct activities that deal with low level mixed and transuranic mixed waste to ensure compliance with requirements.

WRP is responsible for release response and reporting that addresses the "Contingency Plan and Emergency Procedures" requirement of the Colorado Hazardous Waste Regulations.

WTS provides daily on-location waste/residue guidance to RFP personnel on generation, characterization (not including backlog), accumulation, packaging, storage, management, recycling, and disposal requirements in accordance with

RFP procedures and policies and federal, state, and local laws/regulations. WTS also reviews and approves WSRIC documents and assists generators in reviewing and revising WSRIC documents.

3.1.5 Environmental Restoration Management

Geosciences within Environmental Restoration Management (ERM) is responsible for groundwater monitoring and protection and the RCRA interim status groundwater monitoring program of three RCRA Units at RFP (West Spray Field, Present Landfill, and the Solar Evaporation Ponds).

The responsibilities of ERM Remediation Project Management within ERM include preparing and amending closure and post-closure plans for all inactive RCRA units.

The Environmental Restoration (ER) Facility Operations Manager (FOM) is responsible for contacting the appropriate subject matter experts to respond to any incident involving a release of a hazardous substance or material within an Individual Hazardous Substance Site (IHSS) or Operable Unit (OU) boundary. The ER/FOM is also responsible for categorizing these release occurrences.

3.1.6 Maintenance and Plant Support

The Traffic department is under the Maintenance and Plant Support Organization and is responsible for all issues concerning waste shipments and compliance to DOT requirements. Traffic is also responsible for the following:

- Generating and maintaining plant procedures specifying the marking and

labeling requirements for waste packages ensuring compliance with DOT regulations;

- Reviewing data and preparing the Bill of Lading and the Uniform Hazardous Waste Manifest;
- Certifying that waste shipments meet all Title 40 and Title 49 CFR hazardous waste and transportation requirements;
- Ensuring that DOT packaging regulations are implemented;
- Performing inspection of waste packages and transportation equipment;
- Providing DOT Hazardous Materials Employee training.

3.1.7 Safety, Safeguards and Security

The Safety, Safeguards and Security organization is primarily responsible for waste container radiation protection surveys, independent accuracy and precision assessments of NDA counting systems, and calibration and maintenance of radiation instrumentation. This is an important function because the NDA counting systems are used to determine the waste category (i.e., TRU or LLW) and subsequently where the waste will eventually be shipped.

3.1.8 Engineering and Technology

The Engineering and Technology Organization supports waste management activities as follows:

- Design, control, documentation, and maintenance of engineering standards and drawings used in waste container procurement;
- Engineering, design, and drawing control of waste management facilities, and capital improvement projects;

- Document control and design of waste container standards and process equipment drawings;
- Ensuring design and repair of new tanks are performed in accordance with the requirements for tanks outlined in the Colorado Hazardous Waste Regulations;
- Testing and integrity assessment of existing tanks;
- Obtaining certifications of repair on such systems which are found to be leaking or unfit for use.

3.1.9 Standards, Audits and Assurance (SAA)

This organization provides independent oversight for the RCRA Program. SAA performs audits, assessments, and surveillances at various levels of the RCRA Program. Surveillances are conducted to determine floor level compliance on 90-Day and satellite accumulation areas, RCRA storage areas, and in-process containers. Audits are conducted to determine the effectiveness and implementation of quality systems.

The Environmental & Waste Assessment/Audits group within SAA perform the LLW and TRU waste certifications to Nevada Test Site (NTS) and Waste Isolation Pilot Plant (WIPP) waste acceptance criteria.

SAA also performs monthly trend analysis of rejected wastes and certify incoming shipments of procured waste containers, packaging hardware, and ancillary equipment to applicable procurement requirements.

4.0 RCRA PROGRAM ELEMENTS AND RESPONSIBILITIES

4.1 Identification and Listing of Hazardous Waste (Part 261)

Part 261 of 6 CCR 1007-3, Colorado Hazardous Waste Regulations (CHWR), is the foundation of the RCRA Regulatory Program because it provides specific mechanisms for identifying and defining hazardous wastes. The first step in deciding whether a waste is a hazardous waste is determining whether it is a solid waste. Part 261 consists of detailed definitions of "solid waste" and "hazardous waste", exclusions (materials which are not solid wastes and solid wastes which are not hazardous wastes), characteristics of hazardous waste, and lists of hazardous wastes.

A solid waste is hazardous if it exhibits a "characteristic" of hazardous waste or it is a "listed" hazardous waste. Characteristics of hazardous waste (ignitability, corrosivity, reactivity, toxicity) are explicitly defined in Subpart C of CHWR (Part 261.20-261.24). Lists of hazardous waste are contained in Subpart D (Part 261.30-261.33). A solid waste is also hazardous if it is mixed with a hazardous waste (known as the "mixture rule") or generated from the treatment, storage, or disposal of a listed hazardous waste (known as the "derived from" rule).

NOTE:

The mixture rule and associated terminology used in the regulations is sometimes confused with "mixed waste", which at Rocky Flats refers to hazardous waste

mixed with low-level waste, TRU waste , or residues. Per DOE Order 5400.3, Radioactive Mixed Waste is subject to Subtitle C of RCRA, and therefore is also subject to the regulations under 6 CCR 1007-3.

Identification and analysis of hazardous waste are addressed in Section 3.0 of 1-10000-HWR, Hazardous Waste Requirements Manual (HWRM). This document provides a detailed procedure for waste identification and analysis of hazardous waste at Rocky Flats. The HWRM is currently being revised to bring it up to date with all of the regulatory requirements (TASK 1, Appendix A). Generators must also follow applicable waste-packaging procedures which include WP-1027 (Nonradioactive Waste Packaging), WO-1100 (Solid Radioactive Waste Packaging Inside the PA), WO-1101 (Solid Radioactive Waste Packaging Outside the PA), WO-1102 (Waste Residue Traveler Instructions), and WO-4034 (Radioactive Waste Packaging Requirements). The generator must also review the WSRIC Building Book which characterizes the various waste streams at Rocky Flats. In addition, the WSRIC Quality Assurance Project Plan (QAPjP) provides a detailed description of the WSRIC program along with the quality elements and goals for activities relating to the characterization of waste streams and residues at Rocky Flats.

4.1.1 Exclusions (Part 261.4)

Certain solid and hazardous wastes are exempt from the regulations. Exclusions include samples collected and sent to an analytical laboratory for testing and samples used for treatability studies. Specific wastes

that are excluded from hazardous waste regulation are identified in Section 3.0 of the HWRM.

Treatability study requirements are outlined in Section 17.0 of HWRM. This section consists of a procedure that defines treatability study, how treatability studies are conducted, and when a Research, Development, and Demonstration (RD&D) permit is required.

4.1.2 Small Quantity Generators (Part 261.5)

Small quantity generators are subject to less restrictive regulations. Small quantity generators may accumulate hazardous waste on-site without a permit or interim status if they satisfy certain requirements. These requirements include a total quantity limit, time limit, and compliance with Part 265, Subpart I, which addresses container management.

RFP as a whole is not a small quantity generator. However, the CDH has issued an EPA Identification number to the Property Utilization and Disposal (PU&D) Broomfield Warehouse, authorizing the generation of hazardous waste at the site. The EPA Identification number classifies the facility as a "small quantity generator" of less than 1000 kilograms of hazardous waste per month. The facility must comply with parts of the HWRM applicable to characterization of hazardous waste, hazardous

waste storage, inspection, personnel training, and recordkeeping. In addition, certain equipment must be maintained in the immediate area where any hazardous waste is stored.

4.1.3 Requirements for Recyclable Materials (Part 261.6)

"Hazardous wastes that are recycled are referred to as 'recyclable materials'" (Part 261.6). Recyclable materials are subject to different regulations depending on the type of recycling activities and the nature of the material being recycled. There are several recyclable materials that are regulated under Subparts C through G of Part 267 of CHWR. These regulations are addressed in Section 4.5 of the RPD. Waste Technical Support also provides guidance to generators on recyclable materials.

4.1.4 Residues of Hazardous Waste in Empty Containers (Part 261.7)

Any hazardous waste remaining in either an empty container or an inner liner removed from an empty container is excluded from the regulations. The regulations are very specific on defining "empty" which varies according to the type of hazardous waste. A container or inner liner is empty when all wastes have been removed using all practical means and no more than 2.5 centimeters of residue remains on the bottom of the container or liner. This so-called "empty container rule" is not a means of getting rid of 2.5 centimeters of waste. In order to qualify, the container must be empty using all practical means.

Waste Technical Support provides guidance to generators on management of empty containers.

4.2 Standards Applicable to Generators (Part 262)

4.2.1 General (Part 262.10-262.12, Subpart A)

This part of the regulations provides standards that apply to all generators of hazardous waste. These standards along with the applicable implementing procedures are:

4.2.1.1 Determine whether a waste is hazardous (Part 262.11)

This requirement is addressed in Section 3.0 of HWRM, WSRIC and WSRIC QAPJP.

4.2.1.2 Obtain an EPA identification number (Part 262.12)

RCRA Regulatory Programs (RRP) is responsible for obtaining this number and has obtained these numbers for all RFP facilities currently generating hazardous waste.

4.2.2 The Manifest (Part 262.20-262.23, Subpart B)

A manifest must be prepared which serves as a tracking device of hazardous waste during transportation. This requirement is implemented in 4-94700-Traffic-502, Hazardous Waste Manifest.

4.2.3 Pre-Transport Requirements (Part 262.30-262.34, Subpart C)

Packaging, labeling, marking, and placarding must be in compliance with DOT regulations (49 CFR 171-180). Labeling and marking for containers with mixed waste shall comply with the Labeling and Marking Procedures for Radioactive Material Containers (1-94700-Traffic-300 Series).

Containers of hazardous waste must have a waste log or a Waste/Residue Traveler. Pre-transport requirements are also implemented in procedures WO-4034, WO-1100, WO-1101, WO-1102, and WP-1027.

In addition, all employees who affect transportation safety and their supervision must take the On-Site DOT Hazardous Materials Employee Training course, 023-434-01.

4.2.3.1 Accumulation Time (Part 262.34)

Generators may accumulate as much as 55 gallons of hazardous waste or 1 quart of acutely hazardous waste near any point of generation for any length of time provided certain requirements are met. Generators may also accumulate hazardous waste on-site for ninety days without a permit or interim status if the waste is placed in containers or tanks and certain requirements are satisfied. These requirements include condition, management, and marking of containers. The generator must meet the requirements of Subpart I of Part 265 (Use and Management of Containers) and Subpart J of Part 265 (Tanks). In addition, during the accumulation period the generator must comply with the following requirements: preparedness and prevention as detailed in Subpart C of Part 265, contingency plans and emergency procedures as detailed in Subpart D of Part 265, personnel training, and developing and following a written waste analysis plan. Implementation of requirements for the 90-Day Accumulation Areas and Satellite Areas are in HWRM-Sections 6.0, 8.0, 9.0 and 11.0.

All employees must complete the RCRA computer-based training course and, with their supervisor, complete the RCRA Hazardous Waste Supervisor's Checklist. In addition, waste generators are required to complete the Waste Generator training course(s). Waste Generator (Radioactive Waste) (Course number 067-576-01) is

required for all waste generators and supervisors who work with solid radioactive waste. Waste Generator (Nonradioactive Waste) (Course number 067-285-02) is required for all waste generators and supervisors who work with nonradioactive waste. Additional training is required depending on the generator's specific job duties. Training requirements are addressed in Section 2.0 of the HWRM.

4.2.4 Recordkeeping and Reporting (Part 262.40-262.44, Subpart D)

4.2.4.1 Recordkeeping (Part 262.40)

The following records must be kept for at least three years: a copy of each manifest signed in accordance with 262.23(a), a copy of each Biennial Report and Exception Report, and any test results, waste analyses, or other determinations made with waste characterization.

4.2.4.2 Biennial reporting (Part 262.41)

Generators must submit biennial reports to CDH on March 1 of each even-numbered year, covering hazardous waste management activities during the preceding year. The regulations specify the form to be used (EPA Form 8700-13A) and all the information to be included in the report.

4.2.4.3 Exception reporting (Part 262.42)

If the generator has not received a copy of the signed manifest within 35 days of the date the waste was accepted by the initial transporter, then the generator must contact the transporter and the TSDF to

determine the status of the hazardous waste. If the generator has not received the manifest within 45 days, then an Exception Report must be submitted to the CDH.

Procedures and documents that implement these requirements include WO-1102 and the Waste and Environmental Management System (WEMS). Recordkeeping requirements for hazardous waste using the WEMS are found in Section 16.0 of HWRM.

4.2.5 Exports of Hazardous Waste (Part 262.50-262.58)

This section does not apply to Rocky Flats.

4.2.6 Imports of Hazardous Waste (Part 262.60)

This section does not apply to Rocky Flats.

4.2.7 Farmers (Part 262.70)

This section does not apply to Rocky Flats.

4.3 Standards Applicable to Transporters (Part 263)

There are specific regulations and requirements that apply to persons transporting hazardous waste within Colorado if the transportation requires a manifest. These regulations do not apply to on-site transportation. However, if a generator or operator of a TSDF moves hazardous waste off-site (which can be just a few hundred feet down a public road), the generator or operator becomes a transporter and must comply with this part of the regulations.

Hazardous waste that is shipped off-site is coordinated by the Traffic organization. The governing regulation for off-site movements is 49 CFR. On-site movements are controlled by the On-Site Transportation Manual.

4.4 RCRA Permitted and Interim Status Facilities (Parts 264 and 265)

Parts 264 and 265 of CHWR apply to owners and operators of Treatment, Storage and Disposal Facilities (TSDF). Part 264 include regulations that apply to RCRA permitted facilities. Facilities that qualify for interim status are subject to Part 265 of CHWR. Unless otherwise indicated, the requirements discussed in this section are contained in both Parts 264 and 265.

4.4.1 General Facility Standards (Part 264.10-264.18, Subpart B)

All owners or operators of hazardous waste facilities must comply with general facility standards. These are outlined below along with applicable implementing procedures.

- 4.4.1.1 Obtain an EPA identification number. RCRA Regulatory Programs is responsible for obtaining this number which has been obtained for Rocky Flats.
- 4.4.1.2 Conduct a general waste analysis before they treat, store, or dispose of any waste. This is addressed in Section 3.0 of HWRM.
- 4.4.1.3 Follow a written analysis plan that describes the procedures that will be followed to keep an accurate and up-to-date detailed chemical and physical analysis of the waste. This is implemented in Section 3.0 of HWRM including Appendices 4 through 7.

- 4.4.1.4 Provide security at the facility to prevent unknowing entry, and minimize possibility of unauthorized entry. Overall security at Rocky Flats is covered in the Plant Policy Manual and Plant Security Manual. In addition, there are fences, walls, or signs around specific Storage Units.
- 4.4.1.5 Conduct inspections. Owners and operators are required to conduct inspections of their facilities, keep inspection records, and implement any corrective action that may be needed as a result of the inspection. Routine inspections are conducted on specific types of TSD facilities (i.e., containers, tanks, surface impoundments) at Rocky Flats. The RCRA Qualified Personnel are responsible for conducting plantwide inspections on RCRA-regulated units to assess compliance with hazardous waste management procedures. Inspection requirements are addressed in Sections 8.0, 9.0, 10.0, 11.0, 12.0, 13.0, and 14.0 of HWRM. Independent assessments and surveillances are also conducted on RCRA-regulated waste management areas. This is addressed in Section 4.9 of the RPD.
- 4.4.1.6 Personnel training. Rocky Flats has a RCRA training and qualification program. All Personnel at Rocky Flats must complete the RCRA computer-based training course on an annual basis. Along with this training course, supervisors are required to complete the RCRA Hazardous Waste Supervisor's checklist. Personnel associated with the handling, packaging, inspection, testing, shipment, and processing of hazardous waste must be trained and qualified to

applicable criteria, in accordance with the Training User's Manual (TUM), 1-10000-TUM.

In addition to the above requirements, RCRA Custodians must complete the following waste training courses:

- Solid Radioactive Waste Generator Training & Qualification Program (067-285-01) or Nonradioactive Waste Generator Training (067-575-01) depending on specific job duties;
- RCRA Hazardous Waste Training Checklist (RF-47174);
- RCRA Compliance Training Course (023-435-01);
- RCRA Custodian Qualification (018-868-01);
- RCRA Custodian Training Classroom (018-868-01);
- DOT Hazardous Materials Transportation Course (023-434-01).

If the specific responsibilities of the RCRA Custodians include hazardous waste tank systems, then the RCRA Tank Custodian (Course number 018-863-01) course is also required.

Additional training is required by 29 CFR 1910.120, which mandates specific levels and types of training to protect workers from hazards at hazardous waste sites. The RF Health Safety Practices Manual (HSPM), Section 21.03, requires training for workers performing

duties in Operable Units and RCRA Hazardous Waste Areas. The 24-Hour Hazardous Waste Operation (Course number 018-691-02) and 40-Hour Hazardous Waste Operation (Course number 018-691-03) courses are offered to fulfill this requirement.

All RCRA-related training and qualification requirements are addressed in Section 2.0 of HWRM. The RCRA training program at RF is currently being revised and expanded into a RCRA Regulatory Training and Qualification program that fully meets the requirements of the regulations and the RCRA permit. This program will also address RCRA/hazardous waste generator supervisor training requirements. This task is addressed in the Hazardous Waste Compliance Program Plan.

4.4.1.7 General requirements for ignitable, reactive, or incompatible wastes.

"The owner or operator must take precautions to prevent ignition or reaction of ignitable or reactive wastes." This requirement is addressed in Section 10.0 of HWRM. In addition, a team of health, safety, and environmental professionals is being formed to address activities and issues associated with reactive chemicals at Rocky Flats (TASK 5, Appendix A).

4.4.1.8 Installation standards. This section pertains to new facilities for treatment, storage, or disposal of hazardous waste. Seismic considerations and the existence of floodplains must be addressed for new and existing facilities.

4.4.2 Preparedness and Prevention (Part 264.30-264.37, Subpart C)

TSDF facilities must provide for adequate fire protection, have and maintain emergency equipment, have access to communication or alarm systems, provide adequate aisle space for emergency equipment, and make arrangements with local authorities. These requirements are addressed in Sections 4.0, 8.0, 9.0, 10.0, 11.0, and 12.0 of the HWRM, Section 21.04 of the HSPM, Rocky Flats Plant Emergency Plan (1-15200-EP-01.00), and RFP Fire Department's Standard Operating Procedures.

4.4.3 RCRA Contingency Plan and Emergency Procedures (Part 264.50-264.56, Subpart D)

A contingency plan, which details procedures to be followed in the event of a hazardous waste incident that impacts human health or the environment, must be maintained at Rocky Flats. There must also be an emergency coordinator on site and emergency procedures are also required. These requirements are outlined in Section VI of the Rocky Flats RCRA Permit. In accordance with the requirements of 6 CCR 1007-3, Part 265.51, the provisions of the plan must be carried out immediately whenever there is a fire, explosion, or release of hazardous waste or hazardous waste constituents which could threaten human health or the environment. In addition, Section VI of the RFP RCRA permit outlines specific criteria for implementing the provisions of the RFP plan.

A program has been implemented that outlines the response and reporting requirements for releases/spills of hazardous substances and materials. These program requirements are also applicable to releases of hazardous wastes. The level of response required to respond to a release is identified as either incidental or emergency. A release requiring an **emergency** response involves a response effort by employees outside the immediate release area or by other designated responders (e.g., HAZMAT Team or Radiological Assistance Team) to an occurrence that results, or is likely to result, in an uncontrolled release of a hazardous substance (or unknown). An **incidental** release includes those leaks, spills, or other releases where the substance can be safely absorbed, neutralized, or otherwise controlled by employees or maintenance personnel in the immediate release area at the time of the release. It also includes releases of hazardous substances for which there are no potential safety or health hazards (i.e., fire, explosion, or chemical exposure) above the normal operating conditions in the work area. If an adequately trained employee has identified an incidental release in his/her work area and the employee is knowledgeable of the associated hazards, the employee may take immediate action(s) to contain and/or control the incidental release prior to reporting a spill or release to supervision. Adequate training is defined in Section 4.0 of HWRM.

The program has also established release reporting requirements. All releases of a hazardous substance or material are reportable to supervision.

A release reportable to the Shift Superintendent and Occurrence Notification Center (ONC) includes all solid and liquid releases from primary containment of a hazardous material (including oil), a hazardous substance (including hazardous waste and radionuclides), or a nonhazardous substance (e.g., water) containing a hazardous constituent greater than or equal to one pound or one pint for aqueous liquids, and all gaseous releases of hazardous materials or hazardous substances from primary containment that threaten or occur inside or outside any building/containment and that are unplanned.

If it is suspected that a release has occurred within an IHSS or OU boundary, the ER/FOM must be notified. The ER/FOM will categorize the release and contact the appropriate subject matter expert to respond to the incident. If the ER/FOM decides that an emergency removal is warranted (reference I.B.10 of the Interagency Agreement) within several hours of the discovery, the ER/FOM will immediately contact DOE. DOE will then notify the EPA and the CDH, as soon as possible, but no later than 12 hours after discovery of release or suspected release. Any information collected for a release that occurs within the boundaries of an IHSS or OU will be considered for incorporation into the Historical Release Report (HRR).

Response and reporting requirements for releases are specified in Section 4.0 of HWRM. Emergency response requirements are also specified in

HSPM, Section 21.04 - Emergency Response and Spill Control, Rocky Flats Plant Emergency Plan (1-15200-EP-01.00), and RFP Fire Department's Standard Operating Procedures.

NOTE:

The RFP Emergency Plan is implemented if the occurrence is classified as an emergency based on criteria contained in DOE Order 5500.3.

The responsibilities of these organizations are outlined in Section 4.0 of HWRM.

4.4.4 Manifest System, Recordkeeping, and Reporting (Part 264.70-264.77, Subpart E)

4.4.4.1 Use of a Manifest System (Part 264.71)

Facilities that receive hazardous waste accompanied by a manifest must comply with the manifest system described in this part of the regulations. Rocky Flats does not routinely receive hazardous waste. However, this requirement applies when Rocky Flats receives sample materials back from an off-site lab (or other vendor) which contain hazardous waste. These shipments may utilize the Uniform Hazardous Waste Manifest.

4.4.4.2 Manifest Discrepancies (Part 264.72)

An attempt must be made to reconcile any "significant discrepancies" (as defined in Part 264.72(a)) between the hazardous waste a facility actually receives and the manifest. If the discrepancy

can not be resolved within 15 days after receiving the waste, a letter describing the discrepancy and attempts to reconcile it must be submitted to the CDH.

4.4.4.3 Operating Record (Part 264.73)

"The owner or operator must keep a written operating record at his facility" (Part 264.73(a)). Records must be maintained on the following: location and quantity of each hazardous waste at Rocky Flats, results of waste analyses, summary reports and details of all incidents that require implementing the contingency plan under 4.4.3, results of inspections, monitoring, testing, or analytical data. These records must be maintained until facility closure. Inspection records must be maintained for three years at the facility.

This section also requires that the permittee have a program in place to reduce the volume and toxicity of hazardous waste (i.e., a waste minimization program in place). Rocky Flats has a waste minimization program and is described in the FY93 Waste Minimization Program Plan (September 30, 1992).

Record storage, preservation, retention schedules, and safekeeping are governed by DOE order 1324.2, "Records Disposition", and FPMR 101-11.4, "National Archives & Records Service General Record Schedules." Requirements based on these documents are contained in the Rocky Flats Records Management manual.

Recordkeeping requirements are also met using the WEMS. The procedure for this system is in Section 16.0 of HWRM.

4.4.4.4 Biennial Report (Part 264.75)

A biennial report (covering hazardous waste management activities during the preceding odd numbered year) must be submitted to the CDH by March 1 of every even-numbered year. RCRA Regulatory Programs is responsible for writing and submitting this report.

4.4.4.5 Unmanifested Waste Report (Part 264.76)

This report is required to be submitted to the CDH if Rocky Flats were to accept unmanifested hazardous waste.

4.4.4.6 Additional Reports (Part 264.77)

Additional reports are required to be submitted to CDH for releases, fires, explosions, and facility closures.

4.4.5 Groundwater Protection (Part 264.90-264.101 & Part 265.90-265.94, Subpart F)

Any regulated unit (i.e., surface impoundment, waste pile, land treatment unit, or landfill) that receives hazardous waste is subject to regulations governing an extensive groundwater monitoring and response program. The interim status standards concentrate mainly on installation of monitoring wells, sampling and analysis, and reporting requirements. The standards for permanent TSDF facilities require mechanisms for detecting leachate plumes at the facility boundary and instituting corrective action when contamination threatens human health or the environment.

4.4.5.1 Interim Status Standards (Part 265.90-265.94)

"The owner or operator of a surface impoundment, landfill, or land treatment facility which is used to manage hazardous waste must implement a ground-water monitoring program capable of determining the facility's impact on the quality of ground water in the uppermost aquifer underlying the facility" [Part 265.90].

4.4.5.1.1 Ground-water Monitoring System (Part 265.91)

There are specific standards for the installation, operation, and maintenance of the groundwater system. At least one monitoring well must be installed upgradient and at least three monitoring wells must be installed downgradient from the limit of waste management area.

4.4.5.1.2 Sampling and Analysis (Part 265.92)

During the first year of the monitoring program, samples of groundwater must be taken and analyzed quarterly for suitability of the groundwater as a drinking water supply and other parameters specified in Part 265.92.

4.4.5.1.3 Preparation, Evaluation, and Response (Part 265.93)

If, by statistical evaluation of the groundwater monitoring data, the owner or operator suspects that the facility may be affecting the ground-water quality, written notice must be provided to the CDH. Subsequently, a more specific plan must be developed and submitted to CDH for a ground-water assessment program.

The Geosciences group within Environmental Restoration Management has the primary responsibility of the groundwater monitoring program at Rocky Flats. The final RFP Ground Water Assessment Plan (GWAP) was issued in February 1993 by the Geosciences group. The plan describes the process for conducting the RCRA interim status groundwater monitoring program for three RCRA-regulated Units at RFP. The three regulated units are: the West Spray Field, the Present Landfill, and the Solar Evaporation Ponds. The GWAP describes the groundwater monitoring well network including groundwater sampling procedures, analytical parameters and procedures groundwater flow assessment procedures and determination of the extent of contamination. Site-specific information for each of the regulated units is also a part of this plan. The site-specific information includes geologic description, hydrology, source and groundwater quality, potential pathways and transport mechanisms, and current groundwater monitoring activities.

4.4.5.1.4 Recordkeeping and Reporting (Part 265.94)

Records of all required analyses and associated groundwater surface elevations, and evaluations must be kept throughout the active life of the facility, and, if applicable, throughout the post-closure care period. Annual reports to the CDH, which detail the "results of the ground-water quality assessment program which includes but is not limited to the calculated (or measured) rate of

migration of hazardous waste or hazardous waste constituents in the ground water during the reporting period", are required.

The reporting and recordkeeping requirements are implemented in Section 3.9 of the GWAP.

4.4.5.2 Standards for Permitted Facilities (Part 264.90-264.101)

One of the main differences between Interim Status standards and Permitted Facility standards is that for permitted facilities, the specific elements of the monitoring and response program are specified in the facility permit. The Groundwater protection standard, hazardous constituents, concentration limits, point of compliance and compliance period (Part 264.92-264.96) are specified in the facility permit.

The groundwater monitoring program for TSDF facilities must consist of a detection monitoring program, a compliance monitoring program and a corrective action program.

4.4.5.3 Detection Monitoring Program (Part 264.98)

The detection monitoring program consists of monitoring for indicator parameters that indicate whether or not a leachate plume has reached the boundary of the waste management area.

4.4.5.4 Compliance Monitoring Program (Part 264.99)

If a plume is detected, the compliance monitoring program begins and is designed to track the migration of the hazardous constituents and

to compare groundwater samples against a groundwater protection standard.

4.4.5.5 Corrective Action Program (Part 264.100)

If the groundwater protection standard is violated, a corrective action program must be implemented. The owner/operator must take corrective action to ensure that regulated units are in compliance with the groundwater protection standard. The facility permit will specify the protection standard, list of hazardous constituents, concentration limits, compliance point, and compliance period. The effectiveness of the corrective action program must also be monitored and reported to the CDH semi-annually.

4.4.5.6 Corrective Action for Solid Waste Management Units (Part 264.101)

"The owner or operator of a facility seeking a permit for the treatment, storage or disposal of hazardous waste must institute corrective action as necessary to protect human health and the environment for all releases of hazardous waste or constituents from any solid waste management unit at the facility, regardless of the time at which waste was placed in such unit" [264.101(a)].

Corrective action will be specified in the permit.

The Groundwater Protection and Monitoring Program Plan (GPMPP) describes all groundwater monitoring wells at Rocky Flats, the sampling and analysis plan and procedures in place for groundwater sampling. The Geosciences group within Environmental Restoration Management (ERM) is responsible for the GPMPP and updates the document every three years.

Procedure ER SOP GW.6 (Groundwater Sampling) describes the procedures used for the collection of all groundwater samples. Data analysis and statistical methods are also described in the GRMPP, Section 4.0.

4.4.6 Closure and Postclosure (Part 264.110-264.120, Subpart G)

The closure period starts when wastes are no longer accepted by a TSD facility and continues while owners or operators complete TSD operations, apply a final cover to or cap landfills, and dispose of or decontaminate equipment. Postclosure is the period after closure during which owners and operators conduct certain monitoring and maintenance activities.

Written closure plans must be prepared and become a condition of the RCRA permit. The plans must identify the steps necessary to perform partial and final closure during any part of a facility's active life and must address, among other requirements, a schedule for closure of each hazardous waste management unit, and for final closure a description of how closure will satisfy the closure performance standard. The closure performance standard is the manner in which the owner or operator must close the facility. It "minimizes the need for further maintenance; and controls, minimizes or eliminates, to the extent necessary to prevent threats to human health and the environment, post-closure escape of hazardous waste...to the ground or surface waters or to the atmosphere" [Part 264.111].

Requirements for closure and post-closure care of RCRA units at Rocky Flats are addressed in Section 15.0 of HWRM. Up-to-date closure plans for all active RCRA units are currently being developed (TASK 4, Appendix A).

4.4.7 Use and Management of Containers (Part 264.170-264.178, Subpart I)

Containers are required to be in good condition and be handled so that they will not rupture or leak. If the container does begin to leak, the waste must be transferred to another container or managed in some other way. Containers must also be made of or lined with materials that are compatible with the hazardous waste. Containers must be kept closed during storage, and the operator must inspect containers on a weekly basis for leaks and deterioration. The use and management of containers also includes special requirements for ignitable or reactive waste and incompatible wastes Part 264.176-177.

The above requirements are addressed in Section 10.0 of HWRM and implemented in the following procedures: WO-4034, WO-1100, WO-1101, WP-1027, and the On-Site Transportation Manual. The requirement for condition of containers is also implemented in Section 6-10 of the Rocky Flats Policy Manual, which states the proper color coding requirements for all 30-gallon and 55-gallon drums used to store

hazardous wastes. In addition, all containers are procured in accordance with 1-50000-ADM-04.01 (Control of Purchased Items and Services) and Procurement Quality Engineering (PQE) procedures (PQE 6000).

4.4.7.1 Inspections (Part 264.174)

At least weekly, inspections must be performed in areas where containers are stored. These inspections should include looking for leaking containers, and deterioration of containers and the containment system caused by corrosion or other factors. Inspection of containers is addressed in Section 10.0 of HWRM .

4.4.7.2 Containment (Part 264.175)

For permitted facilities, container storage areas must have a containment system which meets specific design and operating criteria. The containment system for containers with free liquids must be able to contain 10 percent of the volume of containers or the volume of the largest container, whichever is greater.

This requirement is addressed in Section 10.0 of HWRM and Engineering and Technology (E&T) design-modification packages.

4.4.7.3 Closure (Part 264.178)

"At closure all hazardous waste and hazardous waste residues must be removed from the containment system. Remaining containers,

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liners, bases, and soil containing or contaminated with hazardous waste or hazardous waste residues must be decontaminated and removed" [264.178].

These requirements are addressed in Section 15.0 of HWRM.

4.4.8 Tank Systems (Part 264.190-264.199, Subpart J)

Tank systems (which includes tanks and ancillary equipment) that are used to store or treat hazardous waste are subject to the requirements outlined as follows. Tank systems including sumps are also subject to these requirements. Sumps that essentially function as flow control devices are subject to the requirements for ancillary equipment rather than the requirements for tanks.

4.4.8.1 Assessment of existing tank system's integrity (Part 264.191)

"For each existing tank system that does not have secondary containment...the owner or operator must determine that the tank system is not leaking or is unfit for use" [Part 264.191 (a)]. A written assessment, reviewed and certified by an independent, qualified registered professional engineer, that attests to the tank system's integrity, must be obtained and kept at the facility. Integrity assessments of all existing tanks are performed by Engineering & Technology and are addressed in Section 12.0 of HWRM.

There are several requirements that apply to new tanks and tank systems. These include the following: design and installation requirements, secondary containment, general operating requirements, inspections, response to leaks and spills, special closure and post-closure standards, and special requirements that apply to tank systems that hold ignitable or reactive wastes. The details of these requirements along with applicable implementing procedures are as follows:

4.4.8.2 Design and Installation Requirements (Part 264.192)

A written assessment, reviewed and certified by an independent, qualified registered professional engineer, attesting that the tank system has sufficient structural integrity and is acceptable for storing and treating hazardous waste, is required.

E&T is responsible for the design and installation requirements for tanks. Rocky Flats Plant Standards SM 136 (Standard for Tanks Containing Regulated Substances) and SM 137 (Standard for Inspection of Tanks, Piping Systems, Pressure Vessels and Safety Relief Devices) also apply to tanks and tank systems.

4.4.8.3 Secondary Containment: (Part 264.193)

All new tank systems or components also must have secondary containment before they are put into service. These systems must be designed, installed, and operated to prevent any migration of wastes or accumulated liquid out of the system and be capable of detecting and collecting releases and liquids until the material is removed.

Secondary containment must include a liner (external to the tank), a vault, a double-walled tank, or an equivalent device approved by the CDH.

This requirement is addressed in RF Plant Standard SM 136 and Section 12.0 of HWRM.

4.4.8.4 General Operating Requirements (Part 264.194)

Both new and existing tanks must comply with general operating requirements. Hazardous waste must not be placed in a tank system if it could cause the tank or tank system to rupture, leak, corrode or fail. Appropriate controls and practices must be used to prevent spills and overflows from tank or containment systems.

Operating requirements for tanks are addressed in Section 12.0 of HWRM.

4.4.8.5 Inspections (Part 264.195)

A schedule and procedure must be developed and followed for

inspecting overfills controls. Daily inspections must also be performed on the aboveground portions of the tank system to detect corrosion or releases of wastes.

Inspection requirements are addressed in Section 12.0 of HWRM.

4.4.8.6 Leaks and Spills (Part 264.196)

"A tank system or secondary containment system from which there has been a leak or spill or which is unfit for use must be removed from service immediately" (Part 264.196). In addition, the flow must be stopped into the system and the waste removed from the tank system or secondary containment systems, further migration of the spill must be prevented, and all visible contamination removed. The release must be reported to the CDH within twenty-four hours unless it is one pound or less and immediately cleaned up.

Procedures addressing the requirements for handling leaks and spills from tanks are found in HWRM, Sections 4.0 and 12.0.

4.4.8.7 Closure and Postclosure (Part 264.197)

At closure, all hazardous waste and residues must be removed from the tank, ancillary equipment, and the foundation structure. For tanks without secondary containment, all hazardous residues and contaminated soil must be removed at closure. Post-closure care is required for up to 30 years if all contamination cannot be removed.

Closure and post-closure requirements are addressed in Section 15.0 of HWRM.

4.4.8.8 Ignitable, Reactive, or Incompatible Waste (Part 264.198-264.199)

Ignitable or reactive waste must not be placed in tank systems, unless:

- a) The waste is treated before or immediately after placement in the tank, such that the resulting waste or mixture no longer meets the definition of ignitable or reactive waste;
- b) The waste is stored or treated in such a way that it is protected from any material or conditions that may cause the waste to ignite or react; or
- c) The tank system is used solely for emergencies.

Incompatible wastes must not be placed in the same tank system unless the requirements for ignitable, reactive, or incompatible wastes are complied with under Part 264.17 of the CHWR.

Section 12.0 of HWRM addresses the requirements for ignitable, reactive, or incompatible wastes in tanks. Issues related to reactive chemicals are also being addressed (TASK 5, Appendix A).

4.4.9 Surface Impoundments (Part 264.220-264.231, Subpart K)

Surface impoundments, which include holding ponds, storage impoundments, settling ponds, and aeration pits, ponds, and lagoons, are subject to regulation. For example, the Solar Evaporation Ponds (SEPs)

are surface impoundments at Rocky Flats and are currently subject to closure and remedial activities. The SEPs are considered RCRA Interim Status Closure Units under the Interagency Agreement (IAG) consisting of the EPA, CDH, and DOE.

4.4.9.1 Design and Operating Requirements (Part 264.22)

Any surface impoundment must have a liner for all portions of the impoundment and must be designed, constructed, and installed to prevent any migration of wastes out of the ground water or surface water. A surface impoundment must be designed, constructed, maintained, and operated to prevent overtopping and must have dikes with sufficient structural integrity to prevent massive failure of the dikes.

Management of the SEP are addressed in Section 14.0 of HWRM.

4.4.9.2 Monitoring and Inspection (Part 264.226)

"While a surface impoundment is in operation, it must be inspected weekly and after storms to detect evidence of any of the following:

- Deterioration, malfunctions, or improper operation of overtopping control systems;
- Sudden drops in the level of the impoundment's contents;
- Severe erosion or other signs of deterioration in dikes or other containment devices" (Part 264.226(b)).

The monitoring and inspection requirement are addressed in Section 14.0 of HWRM. This procedure includes checklists for the weekly inspections for the SEP and instructions for conducting the inspections.

4.4.9.3 Emergency Repairs; Contingency Plans (Part 264.227)

"A surface impoundment must be removed from service when the level of liquids in the impoundment suddenly drops and the drop is not known to be caused by changes in the flows into or out of the impoundment or the dike leaks" [Part 264.227(a)].

As stated in Section 14.0 of HWRM: The management of all surface impoundments is explicitly controlled by the Rocky Flats Interim Status, closure plans, and interagency agreements. All surface impoundments must be in compliance with the specific conditions of these documents.

4.4.9.4 Closure and Post-Closure Care (Part 264.228)

There are specific requirements for closure of surface impoundments. The SEPs are currently undergoing the closure process and are subject to the requirements in Sections 14.0 and 15.0 of HWRM.

4.4.9.5 Special Requirements for Ignitable, Reactive, Incompatible and Acutely Hazardous Wastes (Part 264.229-231)

There are special requirements for placing these wastes in surface impoundments. Since no wastes are being added to the SEPs and

they are subject to closure these requirements do not apply.

4.4.10 Waste Piles (Part 264.250-264.259, Subpart L)

A "pile" is defined as a "non-containerized accumulation of solid, nonflowing hazardous waste which are used for treatment or storage" (Part 260.10). Waste piles cannot be used to intentionally dispose of wastes. If wastes are left in place at closure, the waste pile must be managed as a landfill.

There is currently one RCRA unit at Rocky Flats pending CDH approval that may be managed as a waste pile. If approved, implementation of these regulations will be included in the HWRM.

4.4.11 Land Treatment (Part 264.270-264.283)

This section does not apply since Rocky Flats does not perform any land treatment.

4.4.12 Landfills (Part 264.300-264.317, Subpart N)

Landfills that accept hazardous wastes are subject to specific requirements. The Rocky Flats Plant does not dispose of hazardous wastes into the Rocky Flats Sanitary landfill or permit the disposal of any hazardous wastes in a landfill than is not approved to accept it. Controls and procedures are in place to ensure hazardous wastes do not get disposed in the Sanitary Landfill. The Sanitary Waste Management Plan (1-10000-EWQA, Section 1.4) implements the requirements and responsibilities for management of sanitary solid wastes intended for disposal in the RFP Sanitary Landfill.

4.4.13 Incinerators (Part 264.340-264.351, Subpart O)

Incinerators, which include rotary kilns, fluidized bed, and liquid injection incinerators, are subject to certain regulations specified in this subpart. As a part of the trial burn plan required by the permit, a waste analysis of the waste feed must be performed. "An incinerator burning hazardous waste must be designed, constructed, and maintained so that, when operated in accordance with operating requirements, it will meet specified performance standards" [Part 264.343].

In general, the regulations state that except for approved trial burns and certain exemptions, a hazardous waste incinerator may be used only to burn wastes specified in the permit and only under operating conditions specified in the permit.

The incinerators at Rocky Flats are currently not in use. If it is decided at a future date to begin operating these incinerators, implementation of the requirements will be included in the HWRM. A fluidized bed incinerator is currently in development in the Waste Projects group under Technology Development.

4.4.14 Thermal Treatment (Part 265.370-265.383)

At the present time, Rocky Flats does not thermally treat hazardous wastes. However, the construction of the "Fluidized Bed Unit" (also

known as the "Thermal Treatment Process Unit") is planned for Fiscal Year (FY) 1996 or 1997. Appropriate regulatory requirements will be identified for compliance as this date approaches.

4.4.15 Miscellaneous Units (Part 264.600-264.603, Subpart X)

Miscellaneous units are waste management facilities not covered by existing standards in Part 264. The miscellaneous unit standards combine elements of design and operating standards, technical performance standards, containment standards, facility-specific risk assessments, and environmental performance standards.

Requirements for miscellaneous units will be implemented in Section 21.0 of HWRM (Operation of RCRA Treatment Units) (TASK 1, Appendix A).

4.4.16 Chemical, Physical, and Biological Treatment (Part 265.400-265.406)

"The regulations in this subpart apply to owners and operators of facilities which treat hazardous wastes by chemical, physical, or biological methods in other than tanks, surface impoundments, and land treatment facilities" (Part 265.400). The requirements include general operating requirements, waste analysis and trial tests, inspections, closure requirements, and special requirements for ignitable, reactive, or incompatible wastes.

Rocky Flats conducts chemical and physical treatments of hazardous wastes. These treatments include chemical precipitation,

neutralization, clarification, filtration, and evaporation. Requirements for these treatments will be implemented in Section 21.0 of HWRM (Operation of RCRA Treatment Units) (TASK 1, Appendix A).

4.4.17 Underground Injection (Part 265.430)

This section does not apply since there are no underground injection wells at Rocky Flats.

4.4.18 Drip Pads (40 CFR Part 264 & 265, Subpart W)

The requirements in this section of the federal regulations do not apply to Rocky Flats since they apply to hazardous wastes generated in the wood-preserving industry.

4.4.19 Organic Air Emission Standards for Process Vents and Equipment Leaks.

These regulations are contained in 40 CFR Part 265.1030-1036 (Subpart AA) and 40 CFR Part 265.1050-1064 (Subpart BB).

Air emissions from the treatment, storage, and disposal of hazardous waste must be monitored and controlled. Specifically, organic air emissions from process vents and equipment leaks are limited and controlled.

4.4.19.1 Process Vents

Since RFP does not have any regulated process vents this section does not apply.

4.4.19.2 Equipment Leaks

Standards must be met for emissions from valves, pumps, compressors, pressure relief valves, or lines where the equipment contains or contacts hazardous waste streams with organic concentrations of 10 percent by weight or greater. All affected equipment must be identified, equipment that is in heavy liquid service must be determined, and valves that are unsafe or difficult to monitor must be determined. Identification, tagging, and marking requirements are addressed in Section 18.0 of HWRM, which is the procedure for monitoring and repair of organic air emission leaks from specific hazardous waste process equipment.

Equipment leaks require certain test methods, procedures, and recordkeeping and reporting requirements. The WEMS contains the Organic Air Emissions Inventory. The Inventory includes information on equipment inventory and equipment monitoring data. Records of all air emission monitoring results, weekly inspection checklists, and records of detected leaks, dates of repairs, and types of repairs are maintained in accordance with the Rocky Flats Plant Records Management Manual.

Responses to equipment leaks are addressed in Sections 18.0 and 4.0 of HWRM.

4.5 Colorado Financial Requirements (Part 266)

The State of Colorado and the Federal government are exempt from the requirements of Part 266 of the CHWR.

4.6 Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities (Part 267)

4.6.1 Recyclable Materials used in a Manner Constituting Disposal (Part 267.20-267.23, Subpart C)

These regulations apply to recyclable materials that are applied to or placed on the land in a manner that constitutes disposal.

This section does not apply since the Rocky Flats Plant does not dispose of recycled materials that are applied to or placed on the land.

4.6.2 Hazardous Waste Burned for Energy Recovery (Part 267.30-267.35, Subpart D)

The regulations of this subpart apply to hazardous wastes that are burned for energy recovery in any boiler or industrial furnace that is not regulated under Subpart O of Part 264 and 265 of CHWR.

This part of the regulations do not apply since Rocky Flats does not burn hazardous waste for energy recovery.

4.6.3 Recyclable Materials Utilized for Precious Metal Recovery (Part 267.70, Subpart F)

Recyclable materials that are reclaimed to recover economically

significant amounts of gold, silver, platinum, paladium, irridium, osmium, rhodium, ruthenium, or any combination of these are subject to the regulations in this subpart. Anyone who generates, transports, or stores these recyclables is subject to the notification requirements. Generators are subject to Subpart B of Part 262, transporters are subject to Sections 263.20 and 263.21, and persons who store are subject to Sections 265.71 and 265.72 of the CHWR.

Management of precious metal recovery is addressed in the WMPP. Silver recovery is required by Policy 6-2 in the Rocky Flats Policy Manual and DOE Property Management Regulations (DOE-PMR) 109-42.3. There are three silver recovery projects at Rocky Flats discussed in the WMPP.

Procedures covering precious metal recovery will be addressed in a Level 1 procedure entitled Rocky Flats Recycling Procedure (TASK 6, Appendix A).

4.6.4 Spent Lead-Acid Batteries Being Reclaimed (Part 267.80, Subpart G)

Persons who generate, transport, or collect spent batteries are not subject to any RCRA regulation. Only facilities that store spent batteries before reclaiming them are regulated under this subpart. Reclamation facilities that store spent batteries must comply with the notification

requirements and all applicable interim status standards for storage facilities under Part 265 and RCRA permitted standards under Part 264 of CHWR.

Automotive batteries at Rocky Flats are recycled each year with an auto parts company. Procedures addressing batteries will be included in the Rocky Flats Recycling Procedure (TASK 6, Appendix A).

4.7 Land Disposal Restrictions (LDR) (Part 268)

In the 1984 amendments to RCRA, Congress enacted land disposal restrictions (LDRs) in response to past practices of land disposal of hazardous waste resulting in unacceptable risk to human health and the environment. These restrictions prohibit continued land disposal of hazardous wastes beyond specified dates unless it has been demonstrated to a reasonable degree of certainty that there will be no migration of hazardous constituents from the disposal unit for as long as the waste remains hazardous, or the waste meets promulgated treatment standards.

Land disposal is defined as "placement in or on the land and includes, but is not limited to placement in a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome formation, salt bed formation, underground mine, or cave, or placement in a concrete vault or bunker intended for disposal purposes" [Part 268.2(a)].

4.7.1 Waste Analysis (Part 268.7)

The generator must ensure his/her waste is tested or an extract developed using the test method described in Appendix I to Part 268 of the CHWR, or use knowledge of the waste to determine if the waste is restricted from land disposal. If the generator determines that he/she is managing a restricted waste and the waste does not meet the treatment standards found in Subpart D, he must notify the treatment facility in writing and submit test data if available.

Section 2.0 of the RFP Annual LDR Progress Report (March 31, 1993) provides a comprehensive summary of information currently known about each hazardous and mixed waste stream generated and/or stored at RFP. Each LLW mixed, TRU mixed, and hazardous waste form is identified with the following information: item description code (IDC), identification and description, physical form, radioactivity type, process information, LDR determination, potential applicability of debris rule, hazardous constituents, RCRA hazardous waste codes, waste generation history, waste generation rate, quantity of waste, source of hazardous constituents, waste management prior to storage, date waste first placed in storage, physical location of waste, method of storage, and compliance status of storage methods.

4.7.2 Prohibitions on Land Disposal (Part 268.30-268.32)

This section of the regulations outlines prohibitions on land disposal. Waste specific prohibitions include solvent waste (Part 268.30), dioxin-

containing wastes (Part 268.31), California list wastes (Part 268.32), and Third Third wastes (Part 268.35).

4.7.2.1 Waste Specific Prohibitions-Solvent Wastes (Part 268.30)

"Effective November 8, 1986, the spent solvent wastes specified in 6 CCR 1007-3, 261.31 as EPA Hazardous Waste Nos F001, F002, F003, F004, and F005, are prohibited from land disposal (except in an injection well) unless one or more of the following conditions apply..." [Part 268.30(a)]. This section lists the conditions for land disposal.

4.7.2.2 Waste Specific Prohibition Dioxin-Containing Wastes (Part 268.31)

"Effective November 8, 1988, the dioxin-containing wastes specified in 6 CCR 1007-3, 261.31 as EPA Hazardous Waste Nos F020, F021, F022, F023, F026, F027, and F028, are prohibited from land disposal" [Part 268.31(a)] unless the conditions listed apply.

4.7.2.3 Waste Specific prohibitions - California list wastes (Part 268.32)

Effective July 8, 1987 the so called California wastes were prohibited from land disposal. These included liquid hazardous wastes having a pH less than or equal to 2.0, liquid hazardous wastes containing polychlorinated biphenyls (PCBs) at concentrations greater than or equal to 50 ppm, and liquid hazardous wastes that contain halogenated organic compounds (HOCs) in total concentration greater than or equal to 1,000 mg/l and less than 10,000 mg/l HOCs.

4.7.2.4 Waste Specific Prohibitions - Third Third Wastes (Part 268.35)

This section lists wastes that were prohibited from land disposal beginning August 8, 1990. Effective May 8, 1992, hazardous wastes listed in 268.12 that are mixed radioactive/hazardous wastes are prohibited from land disposal.

4.7.3 Treatment Standards (Part 268.40-268.44)

If a restricted waste is treated to meet treatment standards specified in this part of the regulations, it may be land disposed. There are two basic types of treatment standards--concentration based standards and technology based standards which are described as follows:

4.7.3.1 "A restricted waste ...may be land disposed only if an extract from the waste or of the treatment residue of the waste...does not exceed the value shown in the table of Section 268.41 of CHWR" [Part 268.40(a)]. This table is referred to as Table CCWE (Constituent Concentrations in Waste Extract). This treatment standard applies to non-wastewaters. "A restricted waste identified in Section 268.43 may be land disposed only if the constituent concentrations in the waste or treatment residue of the waste do not exceed the value shown in Table CCW [Constituent Concentrations in Wastes] of Section 268.43 for any hazardous constituents listed in Table CCW for that waste" [Part 268.40(c)]. This treatment standards applies to wastewaters.

4.7.3.2 "A restricted waste for which a treatment technology is specified under 268.42(a) may be land disposed after it is treated using that

specified technology or an equivalent treatment method approved by the CDH" [Part 268.40(b)]. This is the treatment standards expressed as specified technologies.

Section 3.0 of the Annual LDR Progress Report (March 31, 1993) describes programmatic options being undertaken to achieve LDR compliance with this portion of the regulations. Its current emphasis is based on a summary of those management options and treatment technologies that are being developed and implemented to ensure that appropriate mixed waste treatment capacity can be obtained. A more detailed description of treatment technologies and options is contained in the Comprehensive Treatment and Management Plan (CTMP).

4.7.4 Variance From a Treatment Standard (Part 268.44)

"Where the treatment standard is expressed as a concentration in a waste or waste extract and a waste cannot be treated to the specified level, or where treatment technology is not appropriate to the waste, the generator or treatment facility may petition the CDH for a variance from the treatment standard" [Part 268.44]. The petition must be submitted in accordance with the procedures and requirement specified in this section of the regulations.

4.7.5 Prohibitions on Storage (Part 268.50)

The storage of hazardous wastes restricted from land disposal is prohibited unless certain conditions are met. Since there is an

acknowledged lack of mixed waste treatment capacity on a RFP specific basis, accumulation of mixed waste at RFP may be considered to be inconsistent with the storage prohibition requirement. Therefore, an LDR FFCA was developed.

The responsible group for addressing the LDR requirements at Rocky Flats is Federal Facility Compliance Agreement (FFCA) Programs. FFCA Programs manage the LDR FFCA to ensure the terms of the FFCA are met, and to ensure that treatment technologies and LDR waste management strategies developed in support of the FFCA are identified, developed, and implemented in a consistent, efficient, and cost-effective manner. A document will be developed and distributed to all affected personnel that addresses the requirements for LDR (TASK 7, Appendix A).

The primary mechanism for achieving compliance is outlined in the Comprehensive Treatment and Management Plan (CTMP) which was delivered to the EPA in June 1992. This plan outlines the approach, schedules, and milestones for developing and implementing treatment systems for treating mixed wastes to satisfy the treatment standards specified in the LDR regulations.

4.8 Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tank (UST) (40 CFR Part 280-Subtitle I, 7 CCR 1101-14)

Underground storage tanks (USTs) that contain petroleum and certain hazardous substances are regulated under Subtitle I of RCRA. The regulations are found in 40 CFR Part 280. The State of Colorado has it's own regulations governing USTs found in 7 CCR 1101-14 (Division of Labor, Underground Storage Tanks). An application for a UST permit must be submitted to the State Inspector of Oils for his approval before beginning construction.

Tanks must meet two requirements to be covered by the UST program. First, the volume of the tank and all associated piping must be ten percent or more beneath the surface of the ground. Second, the tank must hold a regulated substance, which includes any substance defined in CERCLA section 9601(14) and petroleum.

USTs at Rocky Flats subject to these regulations contain petroleum.

4.8.1 UST Systems: Design, Construction, Installation and Notification (7 CCR 1101-14, Part 3)

4.8.1.1 Performance Standards for New UST Systems (7 CCR 1101-014, Part 3.20)

A UST is considered a "new tank system" if installation has commenced after December 22, 1988. New USTs must meet design

and construction requirements, have overfill prevention equipment, be installed in accordance with recognized industry codes and the manufacturer's instructions, and meet leak detection requirements. A certification of installation is also required for new tanks. Owners and operators must use one or more of several methods of certification, testing, or inspection to demonstrate compliance with the installation standards. These methods are outlined in Section 3.20 (e) of 7 CCR 1101-14.

E&T is responsible for design and installation requirements for USTs.

RF Plant Standard SM 137 also applies to USTs at Rocky Flats.

4.8.1.2 Upgrading of Existing UST Systems (7 CCR 1101-14, Part 3.21)

"By December 22, 1998, all existing UST systems must either meet new UST performance standards described under 40 CFR Part 280.20, be upgraded, or closed permanently" (40 CFR Part 280.21(a)). The regulations provide three options for upgrading existing unprotected bare steel tanks. The first option requires internal lining and inspection of the lining at ten years and every five years thereafter. The second option requires installation of cathodic protection to prevent corrosion. The third option requires both internal lining of the tank and installation of cathodic protection. Metal piping must also be upgraded through installation of cathodic protection.

Corrosion-protection requirements are addressed in Section 13.0 of HWRM. There is also a project underway to upgrade all USTs at Rocky Flats (TASK 8, Appendix A).

4.8.1.3 Notification Requirements (7 CCR 1101-14, Part 3.22)

Owners of USTs must notify the State Inspector of Oils of the existence of USTs by various deadlines dependent on when and if tanks were taken out of service. If USTs are brought into use after May 8, 1986, owners are required to notify within thirty days after bringing them into use.

RRP is responsible for notification requirements which are addressed in Section 13.0 of HWRM.

4.8.2 General Operating Requirements (7 CCR 1101-14, Part 4)

Owners and operators of both new and existing USTs must ensure that releases due to spilling or overfilling do not occur. Spills and overfills must be cleaned up, reported, and investigated. New and existing steel USTs must have corrosion protection and the corrosion-protection system must be operated and maintained.

Tanks must be repaired in accordance with nationally recognized industry codes.

Operational and maintenance and repair requirements are addressed in Section 13.0 of HWRM. Inspection requirements are also outlined in this section of the HWRM.

4.8.3 Release Detection Systems (7 CCR 1101-14, Part 5)

New UST systems containing petroleum require a combination of two methods of leak detection for the first ten years: monthly inventory control and tank tightness testing. Monthly inventory control requires reconciliation of deliveries with withdrawals while tank tightness testing involves pressure testing a tank for holes and must be performed once every five years. After ten years, new tanks must be monitored every thirty days using automatic tank gauging or vapor, ground water, or interstitial monitoring. New petroleum UST system piping must also have leak detection equipment.

Release detection requirements are addressed in section 13.0 of HWRM.

4.8.4 Release Reporting, Investigation, and Confirmation (7 CCR 1101-14, Part 6)

The owner or operator of a UST must respond immediately to all actual or suspected leaks. Suspected releases from USTs must be reported to the State Inspector of Oils within twenty-four hours. After reporting, owners and operators must immediately investigate and confirm such releases within seven days.

Release, response, and investigation requirements are addressed in Section 13.0 of HWRM.

4.8.5 Release Response and Corrective Action for UST Systems (7 CCR 1101-14, Part 7)

"Within 24 hours of the confirmation of a release, owners and operators must report the release to the State Inspector of Oils, take action to prevent further release, and mitigate immediate hazards such as fire or explosion" (Part 7.61). Immediate corrective action measures include mitigation of safety and fire hazards, removal of saturated soils and floating free product, and assessment of the extent that further action is required. The Colorado Health Department may require owners and operators to submit additional information or to develop and submit a corrective action plan for responding to contaminated soils and ground water.

Release response and corrective action requirements are addressed in Section 13.0 and 4.0 of HWRM.

4.8.6 Out-of-Service UST Systems and Closure (7 CCR 1101-14, Part 8)

USTs can be closed only in accordance with certain requirements. Different requirements apply to temporary closures, depending on the length of time the tank is closed. At least 10 days before beginning either permanent closure or a change-in-service, owners and operators must notify the State Inspector of Oils of their intent to permanently close or make the change-in-service, unless such action is in response to

corrective action (Part 8.71). Section 8.71 also outlines specific requirements for permanently closing a tank.

4.9 Permit Regulations (Part 100)

"RCRA requires a permit for the treatment, storage, and disposal of any hazardous waste as identified in Part 261" [Part 100.10]. Existing Hazardous Waste Management Facilities (HWM) that have Federal Interim Status must submit a Part A application on the effective date of the CHWR. Existing HWM facilities must submit Part B of their application no later than six months from the date of request by the CDH, unless a longer period is granted by the CDH.

4.9.1 Application For a Permit (Part 100.12)

Any person who is required to have a State RCRA permit shall complete, sign, and submit an application as described in section 100.12 of CHWR.

4.9.2 Recordkeeping Requirements (Part 100.13)

"Applicants shall keep records of all data used to complete permit applications and any supplemental information submitted under this Part for a period of at least 3 years from the date the application is signed" [Part 100.13].

Section 7.0 of HWRM describes steps to be followed in authorizing and modifying RCRA storage/treatment units included in the Parts A & B

RCRA Permit Application or Operating Permit. An internal procedure (within RRP) will be written to describe the overall permitting process at Rocky Flats (TASK 2, Appendix A).

4.9.3 Special Permits (Part 100.2)

4.9.3.1 Interim Status Facilities (Part 100.20)

RCRA requires that existing facilities, referred to as interim status facilities, shall be treated as having been issued a permit. To qualify for interim status, three requirements must be met:

- a. The facility must have been in existence on November 19, 1980, or the effective date when statutory or regulatory changes render a facility subject to a permit requirement.
- b. The owner or operator must comply with notification requirements applicable to generators (Part 264 of 6 CCR 1007-3).
- c. The owner or operator must have applied for a permit by filing a Part A permit application.

Once interim status is established, changes such as additional waste or change in the facility treatment processes or design capacity may be necessary. In order to handle additional wastes not previously identified, a revised Part A application is required. Changes in treatment processes or design capacity, however, are subject to more stringent regulations that are spelled out in Section 100.20 of 6 CCR 1007-3.

Permitting is addressed in Section 7.0 of HWRM. In addition, an RRP internal procedure will be developed to address the overall permitting process at Rocky Flats (TASK 2, Appendix A).

4.9.3.2 Permits By Rule (Part 100.21)

If a TSDF facility meet certain listed conditions they are "deemed" to have a permit and need not apply to the CDH. For example, since Rocky Flats has an National Pollutant Discharge Elimination System (NPDES) permit, this is considered a permit by rule as an operator of a publicly owned treatment works.

4.9.3.3 Short-Term Permits (Part 100.22)

This section applies to emergency permits, trial permits, Hazardous Waste Incinerator Permits, and permits for land treatment demonstration using field tests or laboratory analyses.

4.9.3.4 Research, Development, and Demonstration (RD&D) Permits (Part 100.25)

These types of permits may be issued for "any treatment facility which proposes to utilize an innovative and experimental hazardous waste treatment technology or process for which permit standards have not been promulgated" [Part 100.25(a)]. The permit must include conditions to protect human health and the environment.

Section 17.0 of HWRM describes how one applies to the RRP group to conduct treatability studies, and when a RD&D permit is

required. RCRA Regulatory Programs (RRP) is responsible for evaluating requests to conduct treatability studies. RRP is also responsible for preparing modifications, annual reports, and RD&D permits, where necessary.

4.9.4 Basic Permitting Process (Part 100.40-100.42)

The permit application process consists of two steps--Part A application and Part B application. Part A application contains basic information about the facility and must be filed as soon as a facility becomes subject to the hazardous waste regulatory program. Part B applications require much more detailed information and must be submitted by the date EPA calls in the application or by statutory deadlines, whichever is earlier. This detailed information (Part 100.41) includes details such as analyses of hazardous wastes to be handled at the facility, waste analysis plan, description of security procedures, facility location information (including faults and geologic studies, floodplain information, and detailed plans on storage areas and tanks), and generally all details for managing and complying with the requirements for hazardous wastes at the facility.

There are generally applicable permit conditions (Part 100.42) and permit conditions for individual permits that are established by the CDH on a case-by-case basis. Generally applicable permit conditions include duty to comply, duty to reapply, duty to mitigate or minimize any adverse impact on the environment, proper operation and maintenance,

inspection and entry requirements for CDH personnel, and several other requirements outlined in this section of the regulations.

4.9.5 Changes in Permits (Part 100.60)

In general, a RCRA permit may be modified after issuance only for specified reasons. There are three classes of permit modifications--Class 1, Class 2, and Class 3.

Class 1 modifications cover routine changes such as typographical errors, replacing equipment with functionally equivalent equipment, and upgrading plans and records maintained at the facility. These changes are generally allowed without prior State approval.

Class 2 modifications cover common changes of moderate impact such as changes in the number, location or design of groundwater monitoring wells, or increases in capacity. Class 2 modifications require a request to the CDH, public notice of such a request, an informal meeting between the owner and the public, and a 60- day comment period.

Class 3 modifications cover major changes that substantially alter the facility. Full public notice and hearing requirements, similar to procedures for initial permit issuance, apply to these.

Appendix I to Part 100 of 6 CCR 1007-3 consists of a list of classifications of permit modifications.

The requirements for permit modifications on RCRA storage/treatment units at Rocky Flats are implemented in Section 7.0 of HWRM. The process for making permit modification will also be addressed in the RRP internal procedure (TASK 2, Appendix A). In addition, a major permit modification permit is under development that will, in conjunction with previously submitted modification requests, add all remaining interim status units to the existing RCRA permit (TASK 3, Appendix A).

4.10 Standards for the Management of Used Oil (40 CFR 279.1-279.82)

A formal program for addressing used oils at Rocky Flats has not been established. A complete review of the used oil regulations will be conducted

and a program established to comply with these regulations (TASK 9, Appendix A).

An informal program is in place at RFP for the recycle of nonradioactive used oil. Used radioactive oil however, can not be recycled, and must be characterized as either hazardous or nonhazardous and then managed accordingly. If the used oil is characterized as hazardous, then it must be managed in accordance with the CHWR, Part 264 or 265.

The basic requirements for the management of used oil, in accordance with 40 CFR, Part 279, are stated in the sections that follow. When a formal program for used oil is established, organizations and responsibilities, and RFP implementation of the regulations will be addressed.

4.10.1 Applicability (40 CFR 279.10-279.12, Subpart B)

This subpart identifies those materials which are subject to regulation as used oil. Part 279 also identifies materials that may be subject to regulation as hazardous waste under parts 260 through 266, 268, 270, and 124 of 40 CFR Chapter I. EPA presumes that used oil is to be recycled unless a used oil handler disposes of used oil, or sends used oil for disposal.

Generally, mixtures of used oil and hazardous waste are subject to regulation as hazardous waste. Exceptions are outlined in 40 CFR 279.10(b).

Mixtures of used oil with nonhazardous solid wastes and mixtures of used oil with products are subject to regulation under Part 279.

Exceptions are outlined in Part 279.10(c).

4.10.1.1 Used Oil Specifications (40 CFR 279.11)

Used oil burned for energy recovery, and any fuel produced from used oil by processing, blending, or other treatment, are subject to regulations under this part unless they are shown not to exceed any of the allowable levels of the constituents and properties in the specification shown in Table 1 of part 279. Once used oil that is to be burned for energy recovery has been shown not to exceed any specification and the person making that showing complies with sections 279.72, 279.73, and 279.74(b), the used oil is no longer subject to this part.

Used nonradioactive oil is shipped off-site for fuel blending and subsequent energy recovery. Rocky Flats ships its used oil to a RCRA Part B Permitted Facility, under Subtitle D, that can accept specification and off-specification used oil. Because the permitted facility has an EPA identification number that allows it to burn specification and off-specification used oil, Rocky Flats is able to ship as nonregulated used oil.

4.10.1.2 Prohibitions (40 CFR 279.12)

Used oil shall not be managed in surface impoundments or

waste piles unless the units are subject to regulation under parts 264 or 265 of 40 CFR Chapter I. The use of used oil as a dust suppressant is prohibited (except when such activity takes place in one of the states listed in section 279.82(c)). Off-specification used oil fuel may be burned for energy recovery in only the following devices: industrial furnaces, industrial boilers, utility boilers, and used oil-fired space heaters. There are specific exceptions that apply to all of these devices.

Rocky Flats ships its used oil to a RCRA Part B Permitted Facility for fuel blending and subsequent energy recovery. Used oil is not managed in surface impoundments or waste piles nor used as a dust suppressant on the environment.

4.10.2 Standards for Used Oil Generators (40 CFR 279.20-279.24, Subpart C)

A used oil generator is any person, by site, whose act or process produces used oil or whose act first causes used oil to become subject to regulation. Several exceptions are identified in this part that are not subject to regulation.

4.10.2.1 Hazardous Waste Mixing (40 CFR 279.21)

Generators shall not mix hazardous waste with used oil except as provided in Section 279.10(b)(ii) and (iii).

4.10.2.2 Used Oil Storage (40 CFR 279.22)

Used oil generators are subject to all applicable Spill Prevention, Control and Countermeasures (40 CFR part 112) in addition to the requirements of this Subpart. Used oil generators are also subject to the Underground Storage Tank (40 CFR part 280) standards for used oil stored in underground tanks whether or not the used oil exhibits any characteristics of hazardous waste, in addition to the requirements of this subpart.

As specified in Section 279.10(f), wastewaters containing "de minimis" quantities of used oil are not subject to the requirements of this part, including the prohibition on storage units other than tanks or containers. "'De minimis quantities' of used oils are defined as small spills, leaks, or drippings from pumps, machinery, pipes, and other similar equipment during normal operations. This exception will not apply if the used oil is discarded as a result of abnormal manufacturing operations resulting in substantial leaks, spills, or other releases, or to used oil recovered from wastewaters" (40 CFR, Part 279.10(f))

Used oil generators shall not store used oil in units other than tanks, containers, or units subject to regulation under 40 CFR parts 264 or 265. Condition of the units and labeling requirements are also specified in this section.

There are also requirements for responses to releases of used oil as specified in 40 CFR 279.22(d).

Response to releases are addressed in Section 4.0 of the HWRM and Section 4.4.3 of the RPD.

4.10.2.3 On-site Burning in Space Heaters (40 CFR 279.23)

The requirements of this section do not apply to Rocky Flats since oil-fired space heaters are banned from use on-site.

4.10.2.4 Off-Site Shipments (40 CFR 279.24)

Generators must ensure that their used oil is transported only by transporters who have obtained EPA identification numbers. Certain exceptions, which are identified in this section, allow the generator to transport without an EPA identification number.

Rocky Flats ships its used oil to a RCRA Part B Permitted Facility using transporters who have obtained EPA identification numbers.

4.10.3 Standards for Used Oil Collection Centers and Aggregation Points (40 CFR 279.30-279.32, Subpart D)

The requirements of this section do not apply to Rocky Flats since the site is not considered a used oil collection center and/or a used oil aggregation point.

4.10.4 Standards for Used Oil Transporter and Transfer Facilities (40 CFR 279.40-279.47, Subpart E)

The requirements of this section do not apply to Rocky Flats since the site is not considered a used oil transporter and/or transfer facility.

4.10.5 Standards for Used Oil Processors and Re-Refiners (40 CFR 279.50-279.59, Subpart F)

The requirements of this section do not apply to Rocky Flats since the site is not considered a used oil processor and/or re-refiner.

4.10.6 Standards for Used Oil Burners Who Burn Off-Specification Used Oil for Energy Recovery (40 CFR 279.60-279.67, Subpart G)

The requirements of this section do not apply to Rocky Flats since the site is not considered a used oil burner.

4.10.7 Standards for Used Oil Fuel Marketers (40 CFR 279.70-279.75, Subpart H)

Any person who conducts either of the following activities is subject to the requirements of this section: directs a shipment of off-specification used oil from their facility to a used oil burner, or first claims that used oil that is to be burned for energy recovery meets the used oil fuel specifications set forth in Section 279.11.

Used nonradioactive oil is shipped off-site for fuel blending and subsequent energy recovery. Under Subtitle D, Rocky Flats ships its used oil to a RCRA Part B Permitted Facility, that can accept specification and off-specification used oil. Because the permitted

facility has an EPA identification number that allows it to burn specification and off-specification used oil. Rocky Flats is able to ship as nonregulated used oil and is not considered a used oil fuel marketer.

4.10.8 Standards for Use as a Dust Suppressant and Disposal of Used Oil (40 CFR 279.80-279.82, Subpart I)

The requirements of this subpart apply to all used oils that cannot be recycled and are therefore being disposed.

4.10.8.1 Disposal (40 CFR 279.81)

Used oils that are identified as a hazardous waste and cannot be recycled in accordance with this part must be managed in accordance with the hazardous waste management requirements of Parts 260 through 266, 268, 270, and 124 of 40 CFR Chapter I.

Used oils that are not hazardous wastes and cannot be recycled under this part must be disposed in accordance with the requirements of Parts 257 and 258 of Chapter I (Solid Waste Disposal).

4.10.8.2 Use as a Dust Suppressant (40 CFR 279.82)

The use of used oil as a dust suppressant is prohibited, except when such activity takes place in one of the states listed in section 279.82(c).

Rocky Flats does not use used oil as a dust suppressant on the environment.

CHAPTER V: QUALITY ASSURANCE PLAN FOR HAZARDOUS WASTE MANAGEMENT AT ROCKY FLATS

1.0 Introduction

The importance of integrating TQM into environmental management has been strongly justified and the specific requirements of RCRA have been identified. General concepts of quality and TQM have been discussed. The purpose of this chapter is to describe a specific quality plan as it applies to hazardous waste at the Rocky Flats Plant. It is hoped that this can serve as an example of how to integrate quality into hazardous waste management.

2.0 EG&G Rocky Flats Quality Policy

EG&G RF Management has issued Quality Policy 11-1, Quality Assurance Program, which establishes responsibilities and actions required to ensure that quality requirements are addressed, and risks and environmental impacts are minimized, while safety, security, reliability, and performance are maximized. The Quality Policy also establishes responsibilities for the development, maintenance, implementation, compliance, and assessment of the Quality Program.

The basic principles of TQM are also included in EG&G Rocky Flats Policy 11-4 and is supported by top management. The principles of TQM are also included in the EG&G Rocky Flats Quality Assurance Manual (QAM). The QAM stresses that prevention, not detection, characterizes a strong quality program and that continual improvement should be everyone's goal.

3.0 EG&G Rocky Flats Quality Assurance Manual Structure

The EG&G RF Quality Assurance Program (QAP) is based on the requirements of DOE Order 5700.6C, Quality Assurance. The Order specifies ten quality assurance criteria under three functional categories: Management, Performance, and Assessment. The previous EG&G RF Quality Program was based on DOE Order 5700.6B and structured to the eighteen requirements of ASME NQA-1 and four additional requirements that EG&G RF management determined to be necessary which were: Software Quality Assurance, Quality Improvement, Surveillance, and Cost of Quality. To minimize impact, the twenty-two QR Sections of the previous manual have been modified and expanded to twenty-five QR Sections in support of DOE Order 5700.6C. The twenty-five QR Sections are subdivided under the three functional categories and the ten Criteria as illustrated in Table 1.¹

Table 1. EG&G RF Quality Criteria

<u>DOE 5700.6C Criteria</u>	<u>EG&G RF Quality Requirements (QRs)</u>
MANAGEMENT	
Criterion 1 - Program	QR-1 Organization QR-2A Quality Assurance Program
Criterion 2 - Personnel Training and Qualification	QR-2B Training & Qualification
Criterion 3 - Quality Improvement	QR-16 Corrective Action QR-20 Quality Improvement QR-22 Cost of Quality
Criterion 4 - Documents and Records	QR-6 Document Control QR-17 Quality Assurance Records

DOE 5700.6C CriteriaEG&G RF Quality Requirements (QRs)**PERFORMANCE**

Criterion 5 - Work Processes

QR-5 Instructions, Procedures, and Drawings
QR-8 Identification and Control of Items
QR-9 Control of Processes
QR-12 Control of Measuring and Test Equipment
QR-13 Handling, Storage, and Shipping
QR-15 Control of Nonconforming Items

Criterion 6 - Design

QR-3 Design Control
QR-19 Software Quality Assurance

Criterion 7 - Procurement

QR-4 Procurement Document Control
QR-7 Control of Purchased Items and Services

Criterion 8 - Inspection and Acceptance Testing

QR-10 Inspection
QR-11 Test Control
QR-14 Inspection, Test, and Operating Status

ASSESSMENT

Criterion 9 Management Assessment

QR-2C Management Assessment

Criterion 10 Independent Assessment

QR-2D Independent Assessment
QR-18 Audits
QR-21 Surveillance

In the sections that follow, a brief purpose of each of the QR's will be discussed, followed by a discussion of how this requirement is implemented in the RCRA Program at Rocky Flats.

4.0 Quality Program Elements

4.1 QR-1 - Organization

The purpose of the Rocky Flats Organization is to provide assignment of management responsibilities, quality responsibilities, and independence of the QA Organization oversight function.

The EG&G Rocky Flats, Inc., organization is documented in the EG&G Rocky Flats Organization Manual. This manual includes organization policies, organization bulletins, position descriptions, committee charters, and organization charts that define and illustrate management responsibilities, quality responsibilities and independence of the QA Organization.

Organization and responsibilities pertaining to the RCRA Program are outlined in Chapter IV, Section 3.1.

4.2 QR-2A - Quality Assurance Program

The Quality Assurance Program (QAP) is established and maintained to assure that quality is achieved, and that work is performed in a consistent manner, in accordance with established requirements while protecting personnel, equipment, the environment, and the public.

QAPs are established to document and assure that the applicable requirements of the Quality Assurance Manual are met by organization, projects, and personnel that perform activities affecting quality.

The QAP for the RCRA Program is described as follows:

4.2.1 Waste Segregation and Packaging Overview

This program describes controls that assure hazardous waste shipped

from the RFP meets all applicable acceptance criteria and regulations.

A summary of the RCRA QA program requirements is as follows:

- Controlled procedures for waste packaging, segregation, inspection, assay, transportation, processing, test and certification;
- Training and qualification of waste generators, waste handlers, inspectors, chemical operators, nondestructive assay technicians, and NDT technicians;
- Complete, documented, characterized RFP waste streams published in the "Waste Stream and Residue Identification and Characterization" (WSRIC) building books;
- Documented traceability of each package placed in a waste container to the generation point represented by the unique WSRIC process number;
- Accountability of individual waste package segregation, characterization, and traceability documentation to the person(s) responsible;
- Waste container access control during all phases of waste generation, packaging and handling using locked containers, qualified container custodians;
- 100% verification of container content compliance is achieved by utilizing the generator and a waste verifier during fill operations;
- Independent in-process sample inspection of waste containers

and contents;

- Independent 100% waste container integrity and Waste/Residue Traveler completeness inspection;
- Real-Time Radiography (RTR), or X-ray, of TRU and LLW waste container contents;
- Routine, systematic surveillance of the hazardous waste management activities;
- Independent audit of the hazardous waste management activities to Quality Assurance Program Requirements (ASME NQA-1-1989 plus DOE-RFO amplifications);
- Sampling and analysis of waste to demonstrate compliance to RCRA requirements.

4.3 QR-2B - Personnel Training and Qualification

The purpose of this requirement is to assure EG&G and the DOE that work is performed by trained and qualified personnel, in a consistent manner, in accordance with established requirements so that personnel, equipment, the environment, and the public are protected.

It is EG&G policy that all RFP personnel who manage, handle, or are at risk from hazardous materials and wastes receive the appropriate training to allow them to:

- minimize the risk of exposure to workers, the public, and ecological receptors from hazardous, toxic, or radioactive materials and wastes;

- prevent pollution of natural resources; and
- minimize waste requiring treatment, storage, and disposal.

In meeting these goals, training managers must comply with the requirements in the Colorado Hazardous Waste Regulations, 6 CCR 1007-3, Part 262 for generators and Part 264.16 and Part 265.16 for TSDS facilities. This states that facility personnel must successfully complete a program of classroom instruction or on-the-job training that teaches them to perform their duties in a way that ensures the facility's compliance with the requirements of 6 CCR 1007-3, Part 264 and Part 265."

At Rocky Flats, a graded approach to RCRA training is used. A graded approach to training provides an approved method for selection and implementation of an appropriate level of training that is cost effective.

All personnel at Rocky Flats must complete the RCRA computer-based training course on an annual basis. Along with this training course, supervisors are required to complete the RCRA Hazardous Waste Supervisor's checklist, which identifies job specific tasks that will determine any additional necessary training that may be required. Personnel associated with the handling, packaging, inspection, testing, shipment, and processing of hazardous waste must be trained and qualified to applicable criteria, in accordance with the Training User's Manual (TUM), 1-10000-TUM.

In addition to the above requirements, RCRA Custodians must complete the following waste training courses:

- Solid Radioactive Waste Generator Training & Qualification Program (067-285-01) or Nonradioactive Waste Generator Training (067-575-01) depending on specific job duties;
- RCRA Compliance Training Course (023-435-01);
- RCRA Custodian Qualification (018-868-01);
- RCRA Custodian Training Classroom (018-868-01);
- DOT Hazardous Materials Transportation Course (023-434-01).

If the specific responsibilities of the RCRA Custodians include hazardous waste tank systems, then the RCRA Tank Custodian ((016-863-01) course is also required.

Additional training is required by 29 CFR 1910.120, which mandates specific levels and types of training to protect workers from hazards at hazardous waste sites. The RF Health Safety Practices Manual (HSPM), Section 21.03, requires training for workers performing duties in Operable Units and RCRA Hazardous Waste Areas. The 24-Hour Hazardous Waste Operation (018-691-02) and 40-Hour Hazardous Waste Operation (018-691-03) courses are offered to fulfill this requirement.

4.4 QR-16 - Corrective Action

The purpose of this requirement is to ensure that nonconformances are

promptly identified and actions are taken to correct them and prevent recurrence.

Conditions adverse to waste acceptability are identified promptly through inspections, tests, surveillances and audits and corrected as soon as practical. Cause analysis is performed when significant concerns are identified. Significance is determined by the Site Quality Assurance group and is defined as a nonconformance that will preclude acceptance of waste by the final disposal facility (Nevada Test Site or WIPP for example), or an unacceptable trend of process or building nonconformances. Significant adverse trends must be evaluated for root cause and actions taken to address root cause in order to preclude recurrence. Significant adverse conditions may result in a stop work order issued by the Environmental & Waste Assessment/Audits (EWA/A) organization. Corrective actions originated by EWA/A are initiated, documented and tracked according to QA Manual procedures 15.02, "Stop Work Action" and 16.16, "Corrective Action." Stop work concerns must be corrected prior to resuming waste processing. Significant concerns are reported to all levels of involved RFP management, and follow up is conducted to verify that corrective actions are implemented.

4.5 QR-20 - Quality Improvement

The quality improvement requirement is established and maintained to

ensure that work is performed in a consistent manner, in accordance with established requirements while protecting personnel, equipment, the environment, and the public. Quality improvement, as a process, is a number of management controlled activities designed to establish, obtain, and analyze controlled/measurable inputs, including database indicators for determining the need, extent and type of actions necessary to facilitate improvement in any program.

Waste Management activities embrace a wide range of Quality Improvement concepts: process characterization and qualification, root cause analysis, corrective action verification, program assessments, and use of measurable performance indicators.

Quality Improvement Teams have been formed to address a multitude of hazardous waste issues. These include teams to eliminate excess chemicals at RFP, improve sampling and analysis of hazardous waste, and the many waste minimization efforts described in Chapter II.

4.6 QR-22 - Cost of Quality

Quality costs are used to identify opportunities to improve quality and decrease costs without compromising established requirements or the protection of personnel, equipment, the environment, and the public.

The Waste Stream and Residue Identification and Characterization (WSRIC) program uses a Quality Cost System for gathering various kinds

of costs needed by Process Improvement Teams. The long-term objective of WSRIC's Quality Cost System includes conformance costs, nonconformance costs and activity-based costing. This approach requires the gathering and analysis of quality costs to determine the need for change in order to improve quality and minimize the total cost of quality without compromising safety, established requirements, or customer expectations.

4.7 OR-6 - Document Control

The purpose of this requirement is to ensure that documents generated for activities affecting quality are traceable through unique identifiers (i.e., control numbers, titles, drafts, and /or dates) during preparation, issuance, and changes to the documents. Document control can be defined as those activities designed to provide the most complete, accurate, and current documents, and document changes to those persons responsible for using the documents.

The plantwide Document Control Program, 1-48000, and the procedure for Document Control, 1-11000-PADC-004, are in the process of being implemented. The procedures directly related to and many indirectly related to the RCRA program are within the plantwide document control system. The remaining plant procedures that are not within the plantwide system are in the process of being converted over to the system. Until such time that the plantwide procedure is fully

implemented each involved department is responsible for the content, accuracy, controlled issue, distribution, revision control, and appropriate approval of their procedures. The manager of each department generating and maintaining procedures referenced above is required to ensure that the latest approved issue of procedures, drawings, and instructions are made available to the personnel and departments who need them. Procedures governing the issue, review, approval, and control of documents are required for each organization's procedures.

Those documents that are used as management or operator aids, i.e., lists of qualified waste generators, key custodians for waste containers, qualified RCRA custodians, RCRA sites (that have RCRA Regulatory Program approval), WSRIC tables (from the WSRIC Building Books), but not limited to those listed, shall be maintained as controlled documents. Operations Management is responsible for approving these items prior to use and for controlling them. The mechanism for controlling and maintaining such items shall be the Conduct of Operations Manual, COOP-01, Conduct of Operations and COOP-10, Control of Operator Aids. This procedure shall include, at a minimum, the approval, control, revision, and posting processes for the management/operator aids

4.8 OR-17 - Quality Assurance Records

The purpose of this requirement is to ensure that records which furnish evidence of the quality of items and of activities affecting quality are prepared, validated, indexed, stored, and retrieved in accordance with

established and documented methods.

Quality Assurance (QA) records are maintained in order to furnish documented evidence that wastes are generated, packaged, inspected, assayed, analyzed, tested and shipped according to applicable requirements. Record storage, preservation, retention schedules and safekeeping is governed by the 6 CCR 1007-3 (Colorado Hazardous Waste Regulations), the RCRA Permit for Rocky Flats, and DOE Order 1324.2, "Records Disposition", and FPMR 101-11.4, "National Archives & Records Service General Record Schedules." Retention schedules range from three years for records pertaining to shipments of nonhazardous materials to permanent for records related to shipments of hazardous materials. The Operating Record as described in 6 CCR 1007-3 and the RCRA Permit for Rocky Flats has been fully defined. A complete description of all RCRA records, responsibilities, locations, and retention times will be included in the Rocky Flats Hazardous Waste Requirements Manual.

4.9 OR-5 - Instructions, Procedures, and Drawings

The purpose of this requirement is to assure that activities affecting quality are prescribed and performed in accordance with documented instructions, procedures, and/or drawings.

Hazardous wastes are collected, treated, processed, packaged, inspected, certified, and loaded for shipment according to written approved procedures. The correct execution of these procedures ensure that waste is generated and shipped in compliance with all applicable criteria, including applicable requirements specified by the Department of Transportation and the Department of Energy. Procedures include specified process instructions which direct a trained operator to perform the task at hand in a consistent and repeatable manner.

4.10 OR-8 - Identification and Control of Items

The identification and control of items at Rocky Flats is critical to all processes and programs. Many items are hazardous, expensive, or unique. Through approved instructions, procedures, drawings, specifications, and/or purchase orders items are required to be marked, labeled, tagged or segregated to maintain identification and traceability.

Identification and traceability of waste streams, waste packages, waste containers, involved packaging, testing, and inspection personnel, analytical results, and other items associated with the RCRA Program are required. Items such as waste streams and waste containers are uniquely identified from the initial generation or receipt up to and including use, packaging, storage, transportation, and emplacement at a waste disposal facility. Specific waste characteristics, waste generation sources, applicable chemical analyses, and any inspections, tests, and

certifications for wastes are traceable back to the wastes and containers for an indefinite period after final disposal.

The key document that records traceability information is the Waste/Residue Traveler (RF-47386). This data collection form is generated for each waste container and documents the employee numbers of all waste generators, inspectors, and test technicians directly involved with processing that waste container. The form also documents inspection and test results, waste generation source (process number), and hazardous constituent number (if applicable).

Other information is recorded on the RCRA Uniform Hazardous Waste Manifest; this document records the EPA number and other required information for RCRA regulated hazardous wastes. The system for controlling the identifying numbers, waste items, waste packages, and other associated items is the "Control of Nonconforming Items," as described in Section 2.15 of this document. More specific definitions of traceable control numbers are defined below.

4.10.1 Waste Stream Number

The waste stream number is a unique, thirteen character alpha numeric code which identifies the generator and the generator's waste stream to personnel at the Nevada Test Site disposal facility. A portion of this number, the IDC, is used routinely by Rocky Flats personnel to segregate wastes.

4.10.2 Item Description Code (IDC) Number

The IDC number is a three or four digit number assigned to a waste form type, such as plastics, dry combustibles, light metals, etc. These numbers allow for segregation of wastes into identifiable forms for ease of processing and are also used when assessing nuclear material content during Nondestructive Assay (NDA).

4.10.3 Process Number

The process number designates the unique location that generated the wastes. Each facility has a complete listing of the waste generating processes published in the applicable WSRIC building book.

4.10.4 Chemical Constituent Code

The chemical constituent code is an alpha or numeric designator used to identify potential RCRA hazardous constituents associated with a particular waste stream. The numbers are defined by the Waste Programs department for use by waste generators in identifying and segregating wastes. The waste characteristic constituent code, along with the IDC and process number, are then used to assign the appropriate EPA Hazardous Waste number for storing and shipping of wastes.

4.10.5 EPA Hazardous Waste Number

The EPA Hazardous Waste code is required per Title 40 CFR and/or CDH 6 CCR 1007-3. This number indicates the

characteristic wastes, the nonspecific source wastes, specific source wastes, and commercial chemical products that are regulated as hazardous waste under this statute. This number is recorded on the standard RCRA Uniform Hazardous Waste manifest by the Traffic department, based on instructions from the Waste Programs, RCRA Regulatory Programs group. The generator is responsible for assigning the EPA Hazardous Waste code to all waste containers.

4.10.6 Waste Container Numbers

White drums are assigned a unique number and bar code by Building 664 Waste Assay and Shipping operations personnel as they are issued to generator organizations. The bar code label is attached to the drum in a visible location under the drum ring.

Full and half waste boxes are assigned a unique number and bar code by Waste Inspection personnel, after they have passed a visual acceptance inspection. The bar code label is attached to the box in a visible location.

4.10.7 Tamper Indicating Device (TID) Number

The TIDs are strips of mylar tape imprinted with a unique bar code number. The TID's are attached to all sealed drums containing Special Nuclear Material (Pu isotopes). The tape cannot be removed without visible damage indicating tampering has occurred. The Nuclear Material Control department controls the

issue of TIDs per the Nuclear Material Safeguards (NMS) Manual, Section 7.

Each waste container shall have a TID applied to it, if one is not present, or the existing one has been damaged, one shall be applied in accordance with requirements in the NMS Manual prior to shipment.

4.10.8 Employee Numbers

The unique employee numbers of waste generators, inspectors, RTR operators, NDA segregating counter operators, Radiation Protection Technologists, and others are recorded during each stage of waste processing on the Waste/Residue Traveler and other associated documents. Contractor personnel use Social Security numbers in lieu of the employee number.

4.10.9 Material Transfer and Storage Label

The Material Transfer and Storage Label (RF-46148), sometimes referred to as a "Checkerboard Label," is used to identify individual waste items. Each waste item will have a checkerboard label placed on it. The label has a block for an identification number. The generator is responsible for assigning and recording this number on the label and on the appropriate block on the Waste/Residue Traveler.

4.11 QR-9 - Control of Processes

Processes are controlled to assure uniform results are achieved, and that work is performed consistently in accordance with established requirements.

Waste treatment and packaging operations are controlled through use of qualified processes and equipment, approved procedures, qualified personnel, and documentation of operating conditions. This assures that waste processing activities are conducted in a consistent, repeatable, and acceptable manner. Waste treatment process control is the responsibility of the Waste Operations directorate, with technical and quality control support provided by the Waste Systems Development and Waste Programs directorates. Specific control criteria for treated wastes, untreated wastes, and associated waste processes are addressed in this section.

4.11.1 Supporting Processes

Departmental procedures provide detailed instructions for all routine processes associated with waste generation, inspection, test, certification, and shipping activities. Each department is responsible to develop procedures which adequately describe and control their operations.

In addition to each department having procedures for their processes, each building has its own WSRIC book. The WSRIC

book have all the routine processes for that building listed in it, along with the waste streams associated with that process. Information about the waste stream also includes whether or not the waste produced is LLW or TRU.

4.12 QR-10 - Control of Test and Measuring Equipment

Measuring and Test Equipment (M&TE) is controlled to assure that required and adequate M&TE is acquired, calibrated, and utilized in a consistent manner, in accordance with established requirements and tolerances.

All test and measurement equipment used in support of the RCRA Program is controlled and calibrated in accordance with requirements specified in ASME NQA-1, Section 12, as documented in the Rocky Flats Plant "Quality Assurance Manual," Section QR-12, "Control of Test and Measuring Equipment." Requirements for control and calibration of test and measuring equipment are implemented through 1-50000-ADM-12.01, "Control of Test and Measuring Equipment." Calibration of test and measuring equipment may be performed either internally, using in-house reference standards, or externally by national certifying agencies (e.g., NIST) or manufacturers. All reference standards have valid relationships to nationally recognized standards, i.e., NIST, MIL 1. If national standards do not exist, the basis for calibration is documented. All test and measuring equipment are uniquely identified.

Several Rocky Flats organizations, including the Metrology Laboratories, Analytical Laboratories, and Safeguards Measurements, have responsibilities for controlling and calibrating test and measuring equipment. Procedure 1-50000-ADM-12.01 establishes the Metrology Laboratories as responsible for approving all other calibrating organizations through an active surveillance program. In addition, the Metrology Laboratories are responsible for performing calibrations for a variety of physical dimensional, chemical, and NDA measurements and for preparing and certifying standards for NDA and the Analytical Laboratories Procedure S-A-00008, "Metrology Laboratories Control of Measuring and Test Equipment," describes the recall system which establishes the traceability of all standards and test and measuring equipment under the purview of the Metrology Laboratories. All calibrating facilities shall have mechanisms in place for evaluating inspections or tests where out-of-tolerance instruments were used. These mechanisms shall include methods for evaluating the data obtained from the use of these instruments, and methods for re-testing or correcting the data to ensure data accuracy.

4.13 QR-13 - Handling, Storage and Shipping

The purpose of this requirement is to ensure that handling, storing, cleaning, packaging, and shipping of items comply with regulatory requirements and to prevent damage, deterioration, loss, or substitution. Handling, storage, and shipping processes are controlled to assure that

items are protected and that work is performed in a consistent manner in accordance with established requirements.

Procedures have been developed and implemented to control the marking, handling, storage, labeling, staging, and preparation for shipment of waste packages, in order to prevent damage or loss, to minimize deterioration and to assure safety of operations. Waste generators, inspectors, custodians, field technicians, and certification officials verify and document compliance to these procedures from the initial point of generation of to final shipment.

4.13.1 Storage

Mixed LLW and TRU wastes are stored in RCRA interim status or permitted storage areas. Wastes scheduled for offsite shipment are processed through the Building 664 staging area or the 750 and 904 pads by Waste Operations personnel. Dock inspection, RTR verification, document review, and storage are conducted in accordance with established procedures, drawings, and specifications. Handling Solid Waste, Building 664 (WO-5035) and Shipping/Receiving Building 664 (WO-5001 series) describes the physical handling of waste packages prior to offsite shipment.

4.13.2 Waste Transfer

The Traffic department coordinates the offsite shipment of TRU and LLW mixed waste to the appropriate disposal site. All shipments are made in accordance with applicable DOT, EPA,

state, and local hazardous waste regulations, as well as applicable DOE/NVO requirements contained in NVO-325, Rev. 1 or the Waste Isolation Pilot Plant (WIPP) requirements. Procedures for waste transfer are specified in the "Transportation Manual" and associated Traffic department procedures.

4.13.3 Hazardous Liquid Waste Transfer and Storage

Storage for liquid hazardous wastes is conducted to requirements in 6 CCR 1007-3 Section 262, 264, and 265. Requirements and procedures governing liquid waste transfer operations are defined in document 1-10000-HWR, the "Hazardous Waste Requirements Manual."

4.14 QR-15 - Control of Nonconforming Items

Nonconforming items are controlled to assure that manufactured or purchased items meet established requirements and to preclude their inadvertent installation or use.

The RFP Quality Assurance Manual, Section QR-15, "Control of Nonconforming Items", requires nonconforming items to be identified, controlled, and dispositioned to prevent their inadvertent installation use. The procedure 1-50000-ADM-15.01 "Control of Nonconforming Items" addresses the system to control waste nonconformances.

4.14.1 Untreated Waste Forms

Nonconformances for untreated, heterogenous wastes (ie. mixed

combustibles), and their containers are documented on the Nonconformance Report Form, Procedure 1-50000-ADM-15.01. Rejected waste packages are identified by affixing the waste nonconformance status tag to the waste package showing the container ID number and the unacceptable condition. The waste package is then segregated from the processing stream until corrective action is completed, documented and verified. The remaining portions of the NCR are forwarded to WC supervision who distribute the information to the generator and the certifier.

4.14.2 Inspection

Packages not meeting certification requirements may be returned to the waste generating organization or to Solid Waste Operations for corrective action. Return of the rejected waste package to its originating organization is dependent upon area storage capacity, 90 day storage limitations, and radiation protection requirements. Waste generators receiving the returned nonconforming waste package explain the corrective action taken, using the space provided on the NCR.

When satisfactory completion of the corrective action is verified by WC, the inspector or engineer stamps (or signs) and dates the RESOLVED section of the NCR, and returns the hard copy to supervision. The generator may then reissue the waste for processing/inspection.

4.14.3 Treated Waste Forms (e.g. Pondcrete, Saltcrete, Sewage Sludge and others)

Nonconformances for treated waste forms are recorded on the "Waste Nonconformance Report Form" Procedure 1-50000-ADM-15.01. Distribution is made according to the procedure.

4.15 QR-3 - Design Control

Design processes are controlled to assure that work is performed in a consistent manner. Design process activities at Rocky Flats require identification of requirements, planning, input, documentation, and verification by various engineering organizations prior to design approval. Also required, is conformance to the approved design by various organizations that perform the design work.

Design Control for the RCRA Program Description applies to containers, associated hardware and ancillary equipment, radiation instrumentation, radionuclide assay equipment, and waste treatment and processing equipment.

Design of waste containers, hardware, container liners and ancillary equipment is controlled by the Conduct of Engineering Manual (COEM) and the Rocky Flats Plant Standards Manual. The design of white 55 gallon, white steel waste boxes, full and half size plywood boxes, drum rings and associated hardware, rigid polyethylene drum liners, plastic

bags and other ancillary equipment is controlled by revision issue and multi-discipline approval signatures for each revision. The Engineering and Technology (E&T) group is responsible to provide design control for waste containers, hardware, liners and ancillary equipment. Standards and specifications for these items are found in the SX series of the Rocky Flats Plant Standards Manual.

Design of Radiation Instrumentation is controlled through drawings issued by approved revision and maintained by the Engineering and Technology department. The Electrical/Engineering department initiates design drawing changes. Design control of radiation instrumentation is specified in procedures in the COEM and the Radiation Instrumentation Manual.

Design control of Nondestructive Assay and waste treatment processing equipment is maintained by Engineering and Technology through Configuration Change Control Procedures (CCCP), COEM, and the Integrated Work Control Program (IWCP) procedures. These procedures are found in the COEM, CCCP, and the IWCP Manuals.

4.16 QR-19 - Software Quality Assurance (SOA)

All plant organizations utilized software in the performance of their duties and tasks. To assure work is performed in a consistent manner, certain software systems must be controlled.

Several software systems are related to Waste Management Operations and are controlled during development, use and maintenance, to ensure that the software performs reliably and to expectations.

The responsibility for ensuring software quality assurance rests with the individual department that maintains the software. Specific activities and responsibilities for complying with these requirements are detailed in each individual department's SQA Compliance Procedure. The Compliance procedures are required to contain sections that address software and hardware descriptions, design control, change control, verification, validation, use control and program documentation. The following software systems support the RCRA Program and are controlled:

- The Waste and Environmental Management System (WEMS) is a multi-user software package that operates on the unclassified VAX cluster. This system tracks all waste types (TRU/TRU Mixed, LLW/LLW Mixed, and Hazardous) from "cradle-to-grave," and is the responsibility of the Waste Programs Information Management department. The WEMS software tracks individual waste containers during the waste generation, packing, storage, and shipping process, and is used to prepare shipping manifests to waste disposal sites. The Waste Programs department is responsible for maintaining the WEMS Software Quality Assurance Compliance Procedure, WEMS-CP100, for the WEMS.

- The software used to control Nondestructive Assay systems is accessed by multiple users, and is carefully controlled and maintained by Safeguards Measurements. Executable codes are distributed to various computers controlling these NDA systems at the Rocky Flats Plant. This software package is both automated and interactive, and controls the process by which drums, filters, and crates are assayed. They operate by prompting the user for pertinent information such as operator identification number, drum or container number, IDC, etc. Upon final assay of the drums, filters, or crates, the software automatically calculates and prints out such information as the date of assay, net and gross weight, IDC, radionuclide assay results, and LLW/TRU designation. The Safeguards Measurements organization's controlled software quality assurance procedure is SMIP-4013, for all NDA software packages at Rocky Flats.

The software systems used to barcode and track chemicals, and to calculate the mass balance of chemicals used at Rocky Flats are operated by groups within the Environmental Protection Management directorate of E & WM organization. From the information collected, such data as amounts on hand, locations of chemicals, the annual reporting information, and the predicted amount of chemical wastes to be produced, are generated. The systems are operating, but in a

limited capacity, i.e., the database is being filled and annual reporting information extracted. The system will be fully implemented in FY94.

4.17 QR-4 - Procurement Document Control

To ensure that purchased items and services meet required and expected levels of quality, it is necessary that appropriate procurement controls be established.

Procurement documents for items routinely purchased to support the RCRA Program Description include the requisite specifications and acceptance criteria unique to each item. Procurement documents submitted to suppliers are reviewed by appropriate engineering disciplines to assure they contain adequate scope of work, technical and quality requirements, supplier quality assurance program requirements, reference to applicable procurement specifications, and provisions for reporting and approving disposition of supplier generated nonconformance on items or services. The applicable procurement document controls apply to the following items:

- White 55 gallon drums
- Standard waste box (steel)
- Half and full size plywood boxes
- Hardware and ancillary packing materials

4.17.1 Environmental and Waste Management

Procurement activity for containers and materials supporting the

RCRA Program Description is initiated by E&WM using Procurement requisitions in accordance with 1-46000-PROC-001, Requisitioning Items and Services. The requisition is sent to Procurement after review and approval by Procurement Quality Engineering (PQE).

4.17.2 Procurement Quality Engineering and Procurement Quality Support

The Procurement Quality Engineering (PQE) group reviews requisitions to assure that the latest approved revision of the Procurement Specification (P-Spec) that may be developed by Procurement Support Engineering is listed, along with the acceptance criteria the lot or shipment must comply with. PQE prepares Quality Instruction Directives (QIDS), which state the particular methods unique to each item's acceptance, including dimensional inspection, supplier's certification of conformance to requirements, and tests. Inspections and tests are performed on a representative shipment sample per approved and industry recognized sampling plans.

The quality controls developed and applied to the items is per a graded approach which considers the complexity of the item, the risk of item failure, and the performance of item suppliers. Items to be procured will be identified by "Procurement Levels," as defined in COEM 6.5.14. Specific inspection/acceptance criteria are delineated in Procurement specifications.

Procurement documents require that suppliers have a quality assurance program that applies selected requirements of DOE RFI 5700.6 QA to its operations.

The control system methods and responsibilities are stated in the Procurement Quality Engineering Procedures, COEM and 1-50000-ADM-04.01, Control of Purchased Items and Services. These documents describe the PQE/PQS activities associated with purchase order and requisition review, suppliers qualification and acceptance, nonconforming item control, record keeping and the control and generation of acceptance procedures.

RFP standards (SX series) are maintained by Engineering and Technology. These documents define item design specifications and detailed testing and certification requirements for each type of product.

4.17.3 Procurement

The Procurement department prepares solicitations and submits them to vendors on the Approved Suppliers List, as required as part of the competitive bidding process. A Purchase Order is awarded to successful bidders and a copy is sent to PQE for review. This acts as a suspense copy, awaiting the item shipment and initiation of the verification process by the Quality Certification department. Procurement's role in procurement

document control is specified in the "Procurement System Policy Manual."

4.18 QR-7 - Control of Purchased Items and Services

Due to the various safety and performance factors related to work activities at Rocky Flats, it is essential that items and services meet established requirements and specifications to ensure that safety margins are maintained, and performance expectations are achieved.

Items and services purchased to support the RCRA Program are controlled at all stages of procurement, from requisition and purchase order preparation, specification development and approval, approval and selection of suppliers, supplier bid evaluation and award, verification, control of nonconformance and corrective action, acceptance of item or service, and maintenance of records. The Procurement Support Engineering, Procurement, POE, and Procurement Quality Support (PQS) departments are primarily responsible for managing this system; the system control procedures are found in the Procurement System Policy Manual, COEM procedures, and the Site QA Procedures Manual. The specific quality controls applied are based on the assigned procurement level of the item or service. The POE/PQS departments evaluates supplier QA programs through on-site audits, product performance data, or certificates of conformance to specification.

Procurement selects suppliers from the approved suppliers list which is maintained by PQE. A supplier evaluation is performed by PQS. This evaluation may be based on evaluation of existing or supplier provided documents or records; or by a direct evaluation of the supplier's facilities, personnel, and quality assurance program.

Supplier performance evaluation source acceptance criteria are performed by PQS in accordance with Level 4 procedures (PQE 6000 Series).

4.19 QR-10 - Inspection

Inspections are examinations and/or measurements designed to verify whether an item or activity conforms to specified requirements.

Inspections are planned and performed at appropriate points in the management and handling of hazardous waste. Inspections evaluate conformance to waste acceptance and certification criteria stated process control plans and inspection procedures. Waste Inspection procedures establish the inspection points, define the inspector responsibilities, include standards for acceptance and rejection, and provide instructions for inspection performance. These inspections assess container integrity, drum or box contents conformance, and container documentation, labeling, and marking. Nonconformance to criteria is documented through the procedure "Control of Nonconforming Items," 1-50000-ADM-15.01. The NCR is attached to the drum or crate

Waste/Residue Traveler and returned to the generator or Waste Operations for corrective actions.

The following inspections are performed on a routine basis:

- Issue: conducted at building 664 to assess waste container integrity prior to use;
- In Process: performed on a sample basis at any time during waste generation prior to sealing, to ensure wastes comply with IDC designation, contain no free liquids, compressed gases or gross levels of particulates;
- Dock: performed on filled and sealed boxes and drums on process building docks to assess container integrity, labeling, handling damage and proper documentation; and
- Final Inspection and Loading: performed just prior to loading on shipment vehicles, to ensure proper marking, labeling, tie-down, blocking and bracing, loading, documentation, and container integrity.

4.20 QR-11 - Test Control

Tests are required to verify conformance of an item or activity to specific requirements, and to demonstrate that structures, systems, and components will perform satisfactorily in service. Examples include nondestructive testing, alarm testing, facility inspection, and analytical testing.

Tests performed to verify conformance of an item or activity to specific requirements are planned, controlled and documented to assure consistent, repeatable, and retrievable results. Tests are performed by qualified personnel to procedures that specify test criteria and conditions for acceptance or rejection of the tested item. The tests associated with the RCRA program are:

- Equipment Systems Operations Tests;
- Nondestructive Assay (NDA); and
- Software Validation Tests.

Software validation testing is performed according to the "Software Quality Assurance Compliance Procedure" required by section 1.15 of this plan. Individual software custodians are responsible to perform tests, disposition results, perform corrective actions when needed and maintain testing records.

Systems Operations (SO) tests are performed for newly installed waste processing equipment and coordinated by the Engineering and Technology department. The SO tests validate equipment function and verify performance of equipment to selected design criteria. Systems Operations tests are developed, documented, approved and conducted per the COEM.

Safeguards measurements conducts pre-operational functional tests for

all NDA equipment.

4.21 QR-14 - Inspection, Test and Operating Status

This requirement is necessary to assure that the status of all inspection and test activities are identified either on the item or in documentation traceable to the item. These requirements will also assure that items which have not passed the required inspections and tests will not be inadvertently installed, used, or operated.

The status of certification activities is maintained from the point of waste generation through the final shipment inspection. Required certification activities are identified and described in WC and other procedures and referred to in the corresponding WO procedures.

4.21.1 Processing

The progress and control of waste packages through the waste stream is maintained by forms, labels and markings which require the performance of specific tasks to ensure compliance of each waste package to the applicable requirements. The performance of identified activities is documented by the generator or responsible party affixing their signature at the appropriate location on the documentation. The serialization of each waste container and use of these numbers on all documentation ensures traceability through the system. The inspection status of waste is clearly marked on the forms, labels, and markings attached to

waste containers.

4.21.2 Inspections and Tests

Inspection points in the waste stream verify the performance of required activities. Passage of a waste package through an inspection point is verified by the inspector signing and/or stamping the Waste/Residue Traveler. Waste items found nonconforming must be tagged with a red Waste Nonconformance Status Tag and physically segregated from conforming waste items whenever possible.

4.21.3 Nondestructive Assay for Radioactive Material Content

Measurement control procedures and the controlling software of each NDA counter system ensure proper operating status of the NDA counter. NDA operators must measure a working standard daily before using the counter for actual assays. If the daily working standard measurement does not pass acceptance criteria encoded in the controlling software, the system instructs the operator to contact Safeguards Measurements. In addition, NDA operators must measure calibration standards on a weekly basis. These measurements must also pass acceptance criteria or operators are instructed to contact Safeguards Measurements for corrective action. The weekly calibration standard measurements are documented on the "NDA System Measurement Control Review Form" by Safeguards Measurements. Safeguards Measurements also compiles the measurement control data,

performs a statistical evaluation of the data, and summarizes the results in a monthly measurement control report which is sent to the DOE, RFO, Material Control and Accountability Division.

4.22 QR-2C - Management Assessment

Management assessments are conducted at the discretion and direction of senior management to assess the effectiveness of management to support functions or activities, and to identify and correct problems that hinder the organizations ability to achieve its goals.

4.23 QR-2D - Independent Assessment

All RFP activities, programs, and organizations are required to conduct self-evaluations in accordance with procedure 1-11000-ADM-16.01.

This procedure also requires all RFP organizations to conduct Cost Plus Award Fee (CPAF) Self-Assessments. This evaluation is performed by each Associate General Manager (AGM) organization to document accomplishments as well as deficiencies and corrective actions for activities specified by Performance Evaluation Plan criteria defined by DOE CPAF process.

4.24 QR-18 - Audits

Audits are performed to determine the effectiveness of QA programs, quality of products, and programmatic compliance and adequacy. These audits provide management and DOE with independent audit reports and

information on programs, activities, or functions which are commendable or require improvement.

The Assurance Audit department reports to the Assistant General Manager of SAA and conducts independent audits at Rocky Flats to ensure compliance to contractual and DOE requirements. The Assurance Audit department prepares schedules of quality program audits and coordinates the internal audit program. The individual audits are designed to assess compliance of all waste programs elements and functions. Assurance Audits schedules an audit of the RCRA Program on an annual basis. The Assurance Audit department issues audit reports which identify deficiencies in the LLW Management Plan. An appropriate response to each audit finding is required. Audit reports related to the LLW Management Plan are retained by Assurance Audits. Audits are conducted and files maintained per the Assurance Audits Procedure Manual.

4.25 QR-21 - Surveillance

Rocky Flats has established procedurally controlled processes to conduct internal and external surveillances. The purpose of these surveillances is to provide management and DOE with independent assessment reports and information on the status of selected portions of programs which are commendable or require improvement. Surveillances are normally conducted on a sub-programmatic level to obtain a complete picture of

the status of that portion of the program.

Surveillance of the RCRA Program is conducted to provide an additional mechanism to identify and prioritize corrective actions. Surveillance topics are requested by management in order to obtain more information about suspected deficiencies, to verify program implementation, or to confirm completion of corrective actions for previously identified deficiencies. Surveillance of RCRA management activities is performed by the Waste Surveillance, and the Environmental and Waste Assessment/Audits groups, within the Standards, Audits, and Assurance (SAA) organization. SAA maintains an ongoing surveillance program. The surveillances are formally scheduled and conducted per a written procedure. The schedule is published quarterly and updated monthly. Corrective actions are issued, tracked and closed out per a written procedure. Operations and functional managers are required to provide surveillance personnel free access to documents, work areas, workers, and supervision during surveillance activities. The surveillance results are reported to involved management, and the surveillance activity is conducted according to approved procedures.

REFERENCES

1. "EG&G Rocky Flats Quality Assurance Manual," Revision 0, August 1993.

CHAPTER VI: CONCLUSIONS AND RECOMMENDATIONS

The overall theme of this thesis has been targeted at integrating quality elements into hazardous waste management with strong emphasis on waste minimization and pollution prevention rather than "waste management."

This ideology is here to stay and it is fairly safe to say that few would dispute this approach to hazardous waste and the environment. It's primary application though, is to existing and future facilities. One question remains: What about abandoned facilities that were built and operating long before TQM and pollution prevention became the new paradigms? It is too late to minimize the waste because it has already been buried or put out the pipe.

The Rocky Flats Plant is prime example of a site paying for past practices. As the former Secretary of Energy, Admiral James D. Watkins stated: "Currently the United States is paying a high price for having emphasized the production of nuclear materials and weapons without due consideration for the environment, safety and health of its citizens." This prompted the new mission and shift of emphasis to health, safety and environment at Rocky Flats. Rocky Flats is by no means the only facility with inactive or abandoned waste sites. The Government Accounting Office (GAO) estimates there are approximately 425,000 CERCLA sites.

CERCLA was designed to address the abandoned sites, but it is not clear if this law is solving the problem. The following facts demonstrate the doubt raised about

a law that is supposed to ensure these sites are cleaned up. First, actual completed cleanups are very few--only 108 sites are considered finished as of August 1992, and there is debate whether some are really clean. Many more sites continue to be added to the National Priority List. Second, cleanups are slow. The estimated time from discovery to completion of cleanup is typically over fifteen years. Finally, cleanups are expensive. The average cost is twenty-six million dollars per site.¹ A large percentage of the money goes for "transactional costs" such as lawyers, consultants, and studies with a much smaller amount going to actual cleanup.

It is recommended that future studies consider these issues pertaining to CERCLA sites. Unfortunately, technology alone will not solve this problem. In light of all the other needs in this country--health care, schools, crime, more direct environmental-toxic exposures--one must carefully consider the massive monetary commitment necessary to address this problem. In the meantime, the focus will have to remain on "preventing CERCLA sites" from occurring in the first place.

REFERENCES

1. George Pring, Environmental Laws and Legal Authorities Affecting the Rocky Flats Plant, 1992, p. 152.

APPENDIX A

IMPLEMENTATION PLAN

In assessing the overall RCRA program, a number of weaknesses or program enhancements have been identified. The following tasks provide a means of improving the overall RCRA program at Rocky Flats.

NOTE

Additional programmatic and infrastructure upgrades to the RCRA program are detailed in the Hazardous Waste Compliance Program Plan (HWCPP). The purpose of this document is to describe tasks necessary for continued, comprehensive site-wide RCRA hazardous waste compliance which aims at addressing known deficiencies, correcting new deficiencies, and avoiding their recurrence. While many of the programmatic improvements have already begun, the upgrades described in the HWCPP are primarily targeted toward response to the Notice of Violation (NOV) from CDH on June 17, 1992.

TASK 1- Revise the Hazardous Waste Requirements Manual to bring it up to date with regulatory requirements. This task involves revising and

reformatting each section of the existing manual, adding several new sections (including a section on Operation of RCRA Treatment Units), plantwide review, and distribution to all controlled document holders.

Responsible Organization: RCRA Regulatory Programs

Completion Date: 3/94

TASK 2- Develop a set of internal procedures for RCRA Regulatory Programs to assist the group in their day-to-day activities and responsibilities. Topics to be discussed in the procedures will include permit modification request preparation, change to interim status request preparation, due diligence, regulatory review, interpretation, and implementation of new regulations, compliance document (i.e., RCRA permit) review and controlled distribution, and annual report preparation, notifications, and fee payments.

Responsible Organization: RCRA Regulatory Programs

Completion Date: 7/94

TASK 3- Monitor and follow through with the permit modification request concerning the Training and Contingency Plan sections of the permit to ensure CDH approval of the request. Additionally, complete major permit modification request entitled the TRU/NOID Permit Modification Request #14 which will, in conjunction with previously

submitted permit modification requests, add all remaining interim status units to the existing RCRA permit.

Responsible Organization: RCRA Regulatory Programs

Completion Date: 9/93

TASK 4- Develop and submit up-to-date closure plans for all active RCRA units to the CDH. In addition, develop an internal guidance document entitled the RCRA Closure Strategy, and issue an updated closure section of the HWRM.

Responsible Organization: RCRA Regulatory Programs

Completion Date: 3/94

TASK 5- This task includes the formation of a team of health, safety, and environmental professionals that can respond to reactive chemicals when they are identified at RFP. The team must be selected, trained, and qualified and must develop procedures for their activities. The activities will include identifying potentially reactive chemicals, testing and retesting reactive chemicals, stabilizing and treating reactive chemicals, and determining proper disposition (i.e., shipment off-site or long-term storage) for the reactive chemicals.

Responsible Organization: RCRA Regulatory Programs

Completion Date: 10/94

TASK 6- Update the Rocky Flats Recycling Procedure to address precious metal recovery and management of recyclable materials.

Responsible Organization: Waste Minimization

Completion Date: 10/94

TASK 7- Develop a document (procedure, guidance, or requirements manual), to be distributed plantwide, which provides guidance and requirements for LDR.

Responsible Organization: Waste Programs

Completion Date: To be determined

TASK 8- Upgrade all USTs on plant site to bring them in compliance with 7 CCR 1101-14.

Responsible Organization: RCRA Regulatory Programs

Completion Date: On-going, final completion
12/22/98

TASK 9- Develop and implement a plan to address management of used oil at Rocky Flats.

Responsible Organization: Waste Programs

Completion Date: To be determined

APPENDIX B

REGULATION SUBJECT	REGULATORY REQUIREMENT DESCRIPTION	5 CCR 1007-3 REFERENCE	SECTION OF RPD
IDENTIFICATION AND LISTING OF HAZARDOUS WASTES	Part 261 of 6 CCR 1007-3, Colorado Hazardous Waste Regulations (CHWR) provides the definitions of "solid waste" and "hazardous waste", exclusions (materials which are not solid wastes), characteristics of hazardous waste, and lists of hazardous wastes. This part of the regulations is the foundation of the RCRA regulatory program because it establishes the mechanisms for identifying those wastes that are deemed hazardous. A waste is hazardous if it exhibits a "characteristic" of hazardous waste or it is listed as hazardous waste. Characteristics of hazardous waste (ignitability, corrosivity, reactivity, toxicity) are explicitly defined in Part 261.20 - 261.24. The Lists of hazardous waste are contained in Part 261.30 - 261.33.	261 - 261.33	4.1
Exclusions	Certain solid and hazardous wastes are exempt from the regulations. Exclusions also include samples collected and sent to an analytical laboratory for testing and samples used for treatability studies.	261.4	4.1.1
Small Quantity Generators	Small quantity generators are subject to less restrictive regulations. The small quantity generator may accumulate hazardous waste on-site without a permit or interim status if they satisfy certain requirements. The requirements include a total quantity limit, time limit and compliance with Part 261.5, which is the use and management of containers.	261.5	4.1.2
Requirements for Recyclable Materials	"Hazardous wastes that are recycled are referred to as 'Recyclable materials.' Recyclable materials are subject to different regulations depending on the type of recycling activities and the nature of the material being recycled. There are several recyclable materials that are regulated under Part 267.	261.6	4.1.3
Residues of Hazardous Waste in Empty Containers	Any hazardous waste remaining in either an empty container or an inner liner removed from an empty container is not subject to the CHWR regulations.	261.7	4.1.4
STANDARDS APPLICABLE TO GENERATORS	Part 262 of the regulations provides the standards that apply to all generators of hazardous waste.	262	4.2

REGULATION SUBJECT	REGULATORY REQUIREMENT DESCRIPTION	CCR 1007-3 REFERENCE	SECTION OF RPD
General	Hazardous waste determination is identified in Part 262.11. The EPA number identification is identified in Part 262.12.	262.10 - 262.12	4.2.1
The Manifest	A manifest must be prepared which serves as a tracking device of hazardous waste during transportation.	262.20 - 262.23	4.2.2
Pre-Transport Requirements	Packaging, labeling and marking must be in compliance with DOT regulations (49 CFR 171-180). Containers of hazardous waste must have a waste log or a Waste/Residue Traveler. The Accumulation time, which allows Generators to accumulate hazardous waste on-site without a permit or interim status, must comply with certain requirements. These requirements entail the condition, management and marking of containers.	262.30 - 262.34	4.2.3
Recordkeeping and Reporting	This part of the regulations details numerous recordkeeping and reporting requirements.	262.40 - 262.44	4.2.4
Exports of Hazardous Waste	This section does not apply to the Rocky Flats Plant.	262.50 - 262.58	4.2.5
Imports of Hazardous Waste	This section does not apply to the Rocky Flats Plant.	262.60	4.2.6
Farmers	This section does not apply to the Rocky Flats Plant.	262.70	4.2.7
STANDARDS APPLICABLE TO TRANSPORTERS	This part of the regulations provides specific regulations and requirements which apply to persons transporting hazardous waste within Colorado if the transportation requires a manifest. RF is not a transporter. Hazardous waste that is shipped offsite is coordinated by the Traffic organization.	263	4.3
RCRA PERMITTED AND INTERIM STATUS FACILITIES	These parts of the regulations 264 and 265 apply to owners and operators of Treatment, Storage, and Disposal (TSD) facilities. RCRA permitted facilities are subject to Part 264 of the regulation. Facilities that qualify for interim status are subject to Part 265.	264 & 265	4.4

REGULATION SUBJECT	REGULATORY REQUIREMENT DESCRIPTION	5 CCR 1007-3 REFERENCE	SECTION OF RPD
General Facility Standards	All owners or operators of hazardous waste facilities must comply with general facility standards. These are as follows: (1) obtain an EPA identification number; (2) conduct a general waste analysis before they treat, store or dispose of any waste; (3) follow a written analysis plan that describes the procedure that will be followed to keep an accurate and up-to-date detailed chemical and physical analysis of the waste; (4) security at the facility to prevent unknowing entry, and minimize possibility of unauthorized entry; (5) conduct inspections; (6) personnel training; and (7) general requirements for ignitable, reactive, or incompatible wastes.	264.10 - 264.18	4.4.1
Preparedness and Prevention	TSD facilities must provide for adequate fire protection, have and maintain emergency equipment, have access to communication or alarm systems, provide adequate aisle space for emergency equipment, and make arrangements with local authorities.	264.30 - 264.37	4.4.2
Contingency Plan and Emergency Procedures	A contingency plan must be maintained at the facility which details procedures to be followed in the event of an emergency. There must also be an emergency coordinator on site and emergency procedures are also required.	264.50 - 264.56	4.4.3
Manifest System, Recordkeeping, and Reporting	Facilities that receive hazardous waste accompanied by a manifest, must comply with the manifest system. RF does not routinely accept or receive hazardous waste; however this requirement does apply when RF receives samples containing hazardous waste back from an outside lab or other source. Records must be maintained on the following: location and quantity of each hazardous at the facility, results of waste analysis, summary reports and details of all incidents that require implementing the contingency plan, results of inspections, monitoring, testing, or analytical data. A biennial report must be submitted to the CDH every even numbered year covering hazardous waste management activities during the preceding odd numbered year.	264.70 - 264.77	4.4.4

REGULATION SUBJECT	REGULATORY REQUIREMENT DESCRIPTION	5 CCR 1007.3 REFERENCE	SECTION OF RPD
Releases From Solid Waste Management Units and Groundwater Monitoring	Any regulated unit (i.e. surface impoundment, waste pile, land treatment unit, or landfill that receives hazardous waste) is subject to regulations governing a groundwater monitoring and response program. This program consists of three stages - detection monitoring, compliance monitoring, and corrective action.	264.90 - 264.101	4.4.5
Closure and Postclosure	The closure period starts when wastes no longer are accepted by a TSD facility and continues while owners or operators complete treatment, storage, and/or disposal operations: apply a final cover to or cap landfills; and dispose of or decontaminate equipment. Closure plans must be written and become a condition of the RCRA permit. The plans must identify the steps necessary to perform partial and final closure during any part of a facility's active life and must address, among other requirements, a schedule for closure of each hazardous waste management unit. For final closure, the plans must address how closure will satisfy the closure performance standard.	264.110 - 264.120	4.4.6
Use and Management of Containers	Containers are required to be in good condition and be handled so that they will not rupture or leak. If the container does begin to leak, the waste must be transferred to another container or managed in some other way. Containers must also be made of or lined with materials that are compatible with the hazardous waste. Containers must be kept closed during storage and the operator must inspect containers on a weekly basis for leaks and deterioration. The use and management of containers also includes special requirements for ignitable or reactive waste and incompatible wastes. The management of containers also identifies requirements for container storage areas and requirements at closure.	264.170 - 264.178	4.4.7
Tank Systems	There are requirements that apply to existing and new tank and tanks systems. These include the following: design and installation requirements, secondary containment, general operating requirements, inspections, response to leaks and spills, special closure and postclosure standards, and special requirements that apply to tank systems that hold ignitable or reactive wastes.	264.190 - 264.199	4.4.8

REGULATION SUBJECT	REGULATORY REQUIREMENT DESCRIPTION	5 CCR 1007.3 REFERENCE	SECTION OF RPD
Surface Impoundments	Surface impoundments, which include holding ponds, storage impoundments, settling ponds, aerallon pits, ponds, and lagoons are subject to regulation. The regulations address the design and operating requirements; monitoring and inspection; emergency repairs - contingency plans; closure and post-closure care; and special requirements for ignitable, reactive, incompatible and acutely hazardous wastes.	264.220 - 264.231	4.4.9
Waste Piles	A "pile" is defined as a "non-containerized accumulation of solid, nonflowing hazardous waste which are used for treatment or storage." Waste piles cannot be used to intentionally dispose of wastes. If wastes are left in place at closure, the waste pile must be managed as a landfill.	264.250 - 264.259	4.4.10
Land Treatment	This section does not apply since the Rocky Flats Plant does not perform any land treatment.	264.270 - 264.283	4.4.11
Landfills	Landfills that accept hazardous wastes are subject to specific requirements. The Rocky Flats Plant does not dispose of hazardous wastes into the Rocky Flats Sanitary landfill or permit the disposal of any hazardous wastes in a landfill that is not approved to accept it.	264.300 - 264.317	4.4.12
Incinerators	Incinerators, which include rotary kilns, fluidized bed, and liquid injection incinerators are subject to specific regulations. As part of the trial burn plan required by the permit, a waste analysis of the waste feed must be performed. "An incinerator burning hazardous waste must be designed, constructed, and maintained so that, when operated in accordance with operating requirements it will meet specified performance standards."	264.340 - 264.351	4.4.13
Thermal Treatment	This part does not apply to the Rocky Flats Plant since no thermal treatment of hazardous waste is performed.	265.370 - 265.383	4.4.14
Miscellaneous Units	Miscellaneous units are waste management facilities not covered by existing standards in Part 264. The miscellaneous unit standards combine elements of design and operating standards, technical performance standards, containment standards, facility-specific risk assessments, and environmental performance standards.	264.600 - 264.603	4.4.15

REGULATION SUBJECT	REGULATORY REQUIREMENT DESCRIPTION	5 CCR 1007.3 REFERENCE	SECTION OF RPD
Chemical, Physical, and Biological Treatment	The regulations in this subpart apply to owners and operators of facilities which treat hazardous wastes by chemical, physical, or biological methods in other than tanks, surface impoundments, and land treatment facilities." The requirements include general operating requirements and special requirements for ignitable, reactive or incompatible wastes.	265.400 - 265.406	4.4.16
Underground Injection	This section does not apply since there are no underground injection wells at the Rocky Flats Plant.	265.430	4.4.17
Drip Pads	The requirements in this section of the federal regulations do not apply to the Rocky Flats Plant since they apply to hazardous wastes generated in the wood-preserving industry.	40 CFR 264 & 265	4.4.18
Organic Air Emission Standards for Process Vents and Equipment Leaks	Air emissions from the treatment, storage, and disposal of hazardous waste must be monitored and controlled. Specifically, organic air emissions from process vents and equipment leaks are limited and controlled. Both process vents and equipment leaks require certain test methods, procedures, recordkeeping, and reporting requirements.	40 CFR 265.1030 -1036 265.1050 - 1064	4.4.19
COLORADO FINANCIAL REQUIREMENTS	The State of Colorado and the Federal government are exempt from the requirements of Part 266.	266	4.5
STANDARDS FOR THE MANAGEMENT OF SPECIFIC HAZARDOUS WASTES AND SPECIFIC TYPES OF HAZARDOUS WASTE MANAGEMENT FACILITIES	This part of the regulations provides specific regulations and requirements which apply to recyclable materials.	267	4.6

REGULATION SUBJECT	REGULATORY REQUIREMENT DESCRIPTION	5 CCR 1007-3 REFERENCE	SECTION OF RPD
Recyclable Materials Used in a Manner Constituting Disposal	The regulations of this Subpart apply to recyclable materials that are applied to or placed on the land in a manner the constitutes disposal.	267.20 - 267.23	4.6.1
Hazardous Waste Burned for Energy Recovery	The regulations of the Subpart outline specific standards applicable to hazardous wastes that are burned for energy recovery in any boiler or industrial furnace.	267.30 - 267.35	4.6.2
Recyclable Materials Utilized for Precious Metal Recovery	Recyclable materials that are reclaimed to recover economically significant amounts of precious metals are subject to these regulations.	267.70	4.6.3
Spent Lead-Acid Batteries Being Reclaimed	Facilities that store spent batteries before reclaiming them are regulated under this Subpart.	267.80	4.6.4
LAND DISPOSAL RESTRICTIONS (LDR)	In the 1984 amendments to RCRA, Congress enacted Land Disposal Restrictions (LDR) to minimize or eliminate reliance on land disposal, particularly landfills and surface impoundments. These restrictions prohibit continued land disposal of hazardous wastes beyond specified dates unless it has been demonstrated "to a reasonable degree of certainty that there will be no migration of hazardous constituents from the disposal unit for as long as the waste remains hazardous", or the waste meets promulgated treatment standards. Land disposal is defined as "any placement of...hazardous waste in a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome formation, salt bed formation, or underground mine or cave."	268	4.7
Waste Analysis	The generator must test his waste or an extract developed using the test method described in Appendix I of Part 268 of CHWR, or use knowledge of the waste, to determine if the waste is restricted from land disposal.	268.7	4.7.1

REGULATION SUBJECT	REGULATORY REQUIREMENT DESCRIPTION	5 CCR 1007-3 REFERENCE	SECTION OF RPD
Prohibitions on Land Disposal	This section of the regulations outlines prohibitions on land disposal. Waste specific prohibitions include solvent waste (Part 268.30), dioxin-containing wastes (Part 268.31) and California list wastes (Part 268.32).	268.30 - 268.32	4.7.2
Treatment Standards	If a restricted waste is treated to meet treatment standards specified in this part of the regulations, it may be land disposed.	268.40 - 268.44	4.7.3
Variance from a Treatment Standard	"Where the Treatment standard is expressed as a concentration in a waste or waste extract and a waste cannot be treated to the specified level, or where treatment technology is not appropriate to the waste, the generation or treatment facility may petition the CDH for a variance from the treatment standard." The petition must be submitted in accordance with the procedures and requirements specified in this section of the regulations.	268.44	4.7.4
Prohibitions on Storage	The storage of hazardous waste restricted from land disposal is prohibited unless certain conditions are met. Since there is an acknowledged lack of mixed waste treatment capacity on a RFP specific bases, accumulation of mixed waste at RFP may be considered to be inconsistent with the storage prohibition requirement.	268.50	4.7.5
TECHNICAL STANDARDS AND CORRECTIVE ACTION REQUIREMENTS FOR OWNERS AND OPERATORS OF UNDERGROUND STORAGE TANK (UST)	Underground storage tanks (USTs) that contain petroleum and certain hazardous substances are regulated under Subtitle I of RCRA. The regulations are found in 40 CFR Part 280. Tanks must meet two requirements to be covered by the UST program. First, the volume of the tank and all associated piping must be ten percent or more beneath the surface of the ground. Second, the tank must hold a regulated substance.	7 CCR 1101-14	4.8
UST Systems	The UST program consists of performance standards for new UST systems, upgrading existing UST systems, and notification of new underground tanks.	7 CCR 1101-14, Part 3	4.8.1

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REGULATION SUBJECT	REGULATORY REQUIREMENT DESCRIPTION	6 CCR 1007-3 REFERENCE	SECTION OF RPD
General Operating Requirements	Owners and operators of both new and existing UST's must ensure that releases due to spilling or overfilling do not occur. Spills and overfills must be cleaned up, reported and investigated. New and existing steel USTs must have corrosion protection and the corrosion protection system must be operated and maintained. Tanks must be repaired in accordance with nationally recognized industry codes.	7 CCR 1101-14, Part 4	4.8.2
Release Detection Systems	New UST systems containing petroleum require a combination of two methods of leak detection for the first ten years. After ten years, new tanks must be monitored using automatic tank gauging or vapor, ground water, or interstitial monitoring. New petroleum UST system piping must also have leak detection equipment.	7 CCR 1101-14, Part 5	4.8.3
Release Reporting, Investigation & Confirmation	"The owner or operator of a UST must respond immediately to all actual or suspected leaks." Suspected releases from USTs must be reported within twenty-four hours. After reporting, owners and operators must immediately investigate and confirm such releases within seven days.	7 CCR 1101-14, Part 6	4.8.4
Release Response and Corrective Action for UST Systems	"Within 24 hours of the confirmation of a release, owners and operators must report the release, take action to prevent further release, and mitigate immediate hazards such as fire or explosion." Corrective action is required for all confirmed releases, unless the UST is excluded from the regulations or subject to corrective action elsewhere. Immediate corrective action measures include mitigation of safety and fire hazards, removal of saturated soils and floating free product, and assessment of the extent that further action is required.	7 CCR 1101-14, Part 7	4.8.5
Out-of-Service UST Systems and Closure	USTs can be closed only in accordance with certain requirements. Different requirements apply to temporary closures, depending on the length of time the tank is closed. The CDH must be notified at least thirty days before beginning permanent closure or a change-in-service unless the action is in response to corrective action.	7 CCR 1101-14, Part 8	4.8.6

REGULATION SUBJECT	REGULATORY REQUIREMENT DESCRIPTION	5 CCR 1007-3 REFERENCE	SECTION OF RPD
PERMIT REGULATIONS	In accordance with RCRA, Section 3005(a) a facility cannot treat, store, or dispose of hazardous waste except in accordance with a permit. Existing Hazardous Waste Management Facilities (HWM) that have Federal Interim Status must submit a Part A application on the effective date of the Colorado Hazardous Waste Regulations. Existing HWM facilities must submit Part B of their application no later than six months from the date of request by the CDH, unless a longer period is granted by the CDH.	100	4.9
Application for a Permit	Any person who is required to have a State RCRA permit shall complete, sign, and submit an application.	100.12	4.9.1
Recordkeeping Requirements	*Applicants shall keep records of all data used to complete permit applications and any supplemental information submitted under this Part for a period of at least 3 years from the date the application is signed.*	100.13	4.9.2
Special Permits	RCRA, section 3005(e) states that existing facilities, referred to as Interim status facilities, shall be treated as having been issued a permit. To qualify for Interim status, three requirements must be met. Once Interim status is established, changes such as additional waste or change in the facility treatment processes or design capacity are handled with a revised Part A application. There are three special permits - Permits by rule; Short-term Permits; and Research, Development and Demonstration (RD&D) Permits.	100.2 - 100.25	4.9.3
Basic Permitting Process	The permit application process consists of two steps - a Part A application and a Part B application. Part A application contains basic information about the facility and must be filed as soon as a facility becomes subject to the hazardous waste regulatory program. Part B applications require much more detailed information and must be submitted by the date EPA calls in the application or by statutory deadlines, whichever is earlier.	100.42	4.9.4
Changes in Permits	In general, a RCRA permit may be modified after issuance only for specified reasons. There are three classes of permit modifications - Class 1, 2, and 3.	100.60	4.9.5

REGULATION SUBJECT	REGULATORY REQUIREMENT DESCRIPTION	5 CCR 1007.3 REFERENCE	SECTION OF RPD	
STANDARDS FOR THE MANAGEMENT OF USED OIL	This subpart identifies those materials which are subject to regulations as used oil.	40 CFR 279	4.10	
Standards for Used Oil Generators	A used oil generator is any person, by site, whose act or process produces used oil or whose act first causes used oil to become subject to regulation.	40 CFR 279.20-279.24	4.10.2	
Hazardous Waste Mixing	Generators shall not mix hazardous waste with used oil except as provided in Section 279.10(b)(2) (ii) and (iii).	40 CFR 279.21	4.10.2.1	
Used Oil Storage	Used oil generators are subject to all applicable Spill Prevention, Control, and Countermeasures (40 CFR part 112) in addition to the requirements of this Subpart. Used oil generators are also subject to the Underground Storage Tank (40 CFR part 280) standards for used oil stored in underground tanks whether or not the used oil exhibits any characteristics of hazardous waste, in addition to the requirements of this subpart.	40 CFR 279.22	4.10.2.2	
On-site Burning In Space Heaters	The requirements of this section do not apply to RF since oil-fired space heaters are banned from use on-site.	40 CFR 279.23	4.10.2.3	
Off-site shipments	Generators must ensure their used oil is transported only by transporters who have obtained EPA identification numbers.	40 CFR 279.24	4.10.2.4	
Standards for Used Oil Collection Centers and Aggregation Points	Does not apply since RF is not considered a used oil collection center and/or used oil aggregation point.	40 CFR 279.30-279.32	4.10.3	
Standards for Used Oil Transporter and Transfer Facilities	Does not apply since RF is not considered a used oil transporter and/or transfer facility.	40 CFR 279.40-279.47	4.10.4	

REGULATION SUBJECT	REGULATORY REQUIREMENT DESCRIPTION	6 CCR 1007.3 REFERENCE	SECTION OF RPD
Standards for Used Oil Processors and Re-Refiners	Does not apply since RF is not a used oil processor and/or re-refiner.	40 CFR 279.50-279.59	4.10.5
Standards for Used Oil Burners Who Burn Off-Specification Used Oil for Energy Recovery	Does not apply since RF is not a used oil burner.	40 CFR 279.60-279.67	4.10.6
Standards for Used Oil Fuel Marketers	Any person who conducts either of the following activities is subject to the requirements of this section: directs a shipment of off-specification used oil from their facility to a used oil burner; or first claims that used oil that is to be burned for energy recovery meets the used oil fuel specification set forth in section 279.11.	40 CFR 279.70-279.75	4.10.7
Standards for Use as a Dust Suppressant and Disposal of Used Oil	Applies to all used oils that cannot be recycled and are therefore being disposed.	40 CFR 279.80-279.82	4.10.8
Disposal	Used oils that are identified as a hazardous waste and cannot be recycled in accordance with this part must be managed in accordance with the hazardous waste management requirements of parts 260 through 266, 268, 270 and 124 of 49 CFR Chapter 1. Used oils that are not hazardous wastes and cannot be recycled under this part must be disposed in accordance with the requirements of parts 257 and 258 of Chapter 1 (Solid Waste Disposal).	40 CFR 279.81	4.10.8.1
Use as a Dust Suppressant	Does not apply since RF does not use used oil as a dust suppressant on the environment.	40 CFR 279.82	4.10.8.2

GLOSSARY

Acute Hazardous Waste	Those wastes listed in the Colorado Hazardous Waste Regulations, 6 CCR 1007-3, Sections 261.11(2) or 261.33(e).
Ancillary equipment	Per 6 CCR 1007-3, Section 260.10, any device including, but not limited to, piping, fittings, flanges, valves, and pumps that is used to distribute, meter, or control the flow of hazardous waste from its point of generation to a storage/treatment tank(s), between hazardous waste storage and treatment tanks to a point of disposal on-site or to a point of shipment for disposal off-site.
Closure	The act of securing an active hazardous waste management RCRA Unit or facility. Upon closure the unit or facility will no longer manage hazardous waste.
Container	Per 6 CCR 1007-3, Section 260.10, any portable device in which a material is stored, transported, treated, disposed of, or otherwise handled.
Container Storage Unit	An authorized RCRA Unit where hazardous waste is stored longer than 90 days.
Contingency plan	Per 6 CCR 1007-3, Section 260.10, a document setting out an organized, planned, and coordinated course of action to be followed in case of a fire, explosion, or release of hazardous waste or hazardous waste constituents which could threaten human health or the environment.
Corrosive	Per 6 CCR 1007-3, Section 261.22, a solid waste exhibits the characteristic of corrosivity if a representative sample of the waste has either of the following properties: (1) it is aqueous and has a pH less than or equal to 2 or greater than or equal to 12.5, or (2) it is liquid and corrodes steel (SAE 1020) at a

rate greater than 6.35 mm (0.25 inch) per year at a test temperature of 55 degrees C (130 degrees F).

90-Day Accumulation Area	An authorized RCRA-regulated unit where hazardous waste is accumulated for no more than 90 days.
Disposal	Per 6 CCR 1007-3, Section 260.10, discharge, deposit injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste into or on any land or water so that such solid waste or hazardous waste or any constituent thereof, may enter the environment or be emitted into the air or discharged into any waters, including ground waters.
Emergency Response	An emergency response action is a response effort to an occurrence which results, or is likely to result, in an uncontrolled release of hazardous material or substance. This does not include response to incidental releases of hazardous materials or substances where the material can be absorbed, neutralized, or otherwise controlled at the time of the release by employees or maintenance personnel in the immediate release area. Emergency response is not required to release of hazardous materials or substances for which there is no potential health and safety hazard.
EPA Hazardous Waste Number	The number assigned by EPA to each hazardous waste listed in Part 261, Subpart D, and to each characteristic identified in Part 261, Subpart C, of 6 CCR 1007-3.
Generator	A facility owner or operator or individual who by their actions or inactions causes a material to become a hazardous waste.
Hazardous Material	A substance or material, including a hazardous substance or hazardous waste, which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported and has been designated a hazardous material in Title 49 of the CFR, Section 172.101 or has been designated a hazardous substance in the appendix to 172.101, or is considered a hazardous waste subject to the Hazardous Waste Manifest Requirements of the U. S. EPA as specified in 40 CFR Part 262.

Hazardous Substance	A material which may present a danger to human health or the environment as defined by 40 CFR Part 302 or an Extremely Hazardous Substance as listed in 40 CFR Part 355. A hazardous substance is also defined by 49 CFR 171.8 as a "hazardous material." For the purposes of Section 4.0 of the Hazardous Waste Requirements Manual, a hazardous substance includes any element, compound, mixture, solution, or substance that may endanger human health or the environment including hazardous material (including oil/petroleum products), hazardous substances (including hazardous waste and radionuclides), and nonhazardous substances (e.g., water) contaminated by hazardous substances.
Hazardous Waste	Hazardous waste refers to RCRA-regulated hazardous waste defined in the Colorado Hazardous Waste Regulations, 6 CCR 1007-3, as any solid waste or waste-like material that exhibits any one or combination of the hazardous characteristics identified in the regulations or that is specifically listed as a hazardous waste in the regulations. This includes mixtures of hazardous waste with any other material, such as mixtures with sanitary waste or radioactive waste. Specifically included in the definition of hazardous waste is mixed waste with low-level waste (LLW), transuranic waste (TRU), and residues. A mixed waste is radioactive waste that contains regulated levels of hazardous waste constituents.
Hazardous Waste Constituents	Per 6 CCR 1007-3, Part 261.10, a constituent that caused the CDH to list the hazardous waste in Part 261, Subpart D, or a constituent listed in Table 1 of Section 261.24.
Ignitable	Per 6 CCR 1007-3, Part 261.21, a solid waste exhibits the characteristic of ignitability if a representative sample of the waste has any of the following properties: (1) it is a liquid, other than an aqueous solution containing less than 24 percent alcohol by volume, and has a flash point less than 60 degrees C (140 degrees F), (2) it is not a liquid and is capable, under standard temperature and pressure, of causing fire through friction, absorption of moisture, or spontaneous chemical changes and, when ignited, burns so vigorously and persistently that it creates a hazard, (3) it is an ignitable compressed gas as defined

in 49 CFR, Section 173.300, or (4) it is an oxidizer as defined in 49 CFR, Section 173.151.

Individual Hazardous Substance Site (IHSS)	As defined in the Environmental Restoration Interagency Agreement (IAG), individual locations on the RFP site where hazardous substances have been released or may have been released. These sites use to be identified as Solid Waste Management Units (SWMUs). These sites are identified in the IAG or its amendments. Environmental Restoration Management (ERM) will identify locations of IHSSs on RFP.
Interagency Agreement	An agreement between the EPA, DOE, and CDH which establishes the jurisdictions and responsibilities for conducting Remedial Investigations and Feasibility Studies (RI/FS) and Facility Investigations or closure activities for RCRA corrective actions at RFP.
Interim Status	A condition under which existing RCRA Units must operate until the RCRA Part B Operating Permit is issued by the CDH.
Leachate	Per 6 CCR 1007-3, Section 260.10, any liquid, including any suspended components in the liquid, that has percolated through or drained from hazardous waste.
Mixed Waste (hazardous and radioactive)	Per DOE Order 5400.3, waste containing both radioactive and hazardous components regulated by the Atomic Energy Act (AEC) and RCRA, respectively. The term "radioactive component" refers only to the actual radionuclides dispersed or suspended in the waste substance.
Operable Unit	Per 40 CFR, Section 300.5, a discrete action that comprises an incremental step toward comprehensively addressing site problems. This discrete portion of a remedial response manages migration, or eliminates or mitigates a release, threat of a release, or pathway of exposure. The cleanup of a site can be divided into a number of operable units, depending on the complexity of the problems associated with the site.
Part A Permit Application	An application made to the CDH identifying existing RCRA storage/treatment units thereby establishing interim status.

Part B Permit Application	An application made to the CDH containing detailed information on RCRA storage/treatment units for which Rocky Flats is seeking a Part B operating permit.
Permitted Container Storage/Treatment Unit	An authorized and approved RCRA Unit where hazardous waste is either treated and/or stored longer than 90 days.
Post-Closure	The 30-year (or longer) period of time following the final closure of a RCRA-regulated unit.
Process Knowledge	The act of documenting knowledge of a controlled process or operation to the extent necessary to perform adequate characterization of waste in lieu of other analytical techniques.
Reactive	Per 6 CCR 1007-3, Section 261.23, a solid waste exhibits the characteristic of reactivity if a representative sample of the waste has any of the properties listed in Section 261.23, which include: (1) normally unstable and readily undergoes violent change without detonating, (2) reacts violently with water, (3) forms potentially explosive mixtures with water, or (4) when mixed with water, it generates gases, vapors, or fumes in a quantity sufficient to present a danger to human health or the environment.
Release	Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, or dumping of a hazardous material (including oil) or hazardous substance (including hazardous waste and radionuclides), in any building/containment or to the environment. Release also includes the abandonment or discarding of barrels, containers, and other closed receptacles of any hazardous substance, pollutant, or containment into the environment (i.e., an unplanned release to air, soil, or surface water). Release includes stocking of a reportable quantity of a volatile hazardous substance in an unenclosed containment structure (i.e., open container of solvents stored outside building). An incidental release is an unplanned release that poses no danger beyond that associated with normal operations.
Regulated Substance	Any petroleum product and any substance defined by the List of Hazardous Substances in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 that are not regulated by the RCRA Subtitle C regulations. USTs which store heating oils (e.g., #6 fuel) that are used for heating on

the premises are exempted from the regulations. Gasoline and diesel fuels are contained in the active USTs which are regulated at the Rocky Flats Plant.

Reportable Quantity (RQ)	The quantity of a hazardous substance that triggers reports under CERCLA. If a substance is released in amounts exceeding its RQ, the release must be reported to the National Response Center, the State Emergency Response Commission, and community emergency coordinators for areas likely to be affected.
Resource Conservation & Recovery Act (RCRA)	The federal law originally passed in 1976 and amended in 1984 which addresses the generation, treatment, storage, and disposal of hazardous wastes to protect human health and the environment.
RCRA Custodian	RCRA qualified personnel designated to manage the operation(s) of a RCRA hazardous waste unit or tank system, resulting in compliance with the requirements of the Hazardous Waste Requirements Manual and the Colorado Hazardous Waste Regulations, 6 CCR 1007-3.
RCRA Part B Operating Permit	A permit issued by the Colorado Department of Health which defines the operating conditions for all RCRA-regulated Container Storage/Treatment Units at the Rocky Flats Plant.
RCRA Qualified Personnel	Individuals responsible for handling hazardous waste on a given RCRA hazardous waste unit or tank system. Personnel are also qualified to act as an alternate to the custodian for managing the daily activity of a RCRA Unit and performing inspections.
RCRA Training Officer	EG&G Rocky Flats representative appointed to implement the training requirements defined by the Colorado Hazardous Waste Regulations and direct the RCRA training program.
RCRA Unit	A contiguous area where hazardous waste is placed, or the largest area in which there is significant likelihood of mixing waste constituents in the same area. Examples include an incinerator, a tank and its associated piping and underlying containment, and a container storage area. A container alone does not constitute a unit; the unit includes containers and the land or pad upon which they are placed. Tanks, storage areas and incinerators are examples of nonland

based RCRA Units. Active RCRA Units are those units at which hazardous waste operations are currently being conducted. An inactive RCRA Unit is managed by Environmental Restoration in accordance with the Interagency Agreement.

Satellite Accumulation Area	An authorized accumulation area in which hazardous waste is accumulated at or near the point of generation until the maximum capacity of 55-gallons of hazardous waste or one quart of acute hazardous waste is reached.
Secondary Containment	A physical system designed to prevent migration of hazardous waste out of the original tank, ancillary equipment, or container into the soil, groundwater, or surface water.
Solid Waste	Per 6 CCR 1007-3, Section 261.2, any discarded material which is "abandoned", "recycled" or considered inherently "waste-like." "Abandoned", "recycled", and "waste-like" are further defined in Section 261.2.
Surface Impoundment	A man-made excavation or diked area formed primarily of earthen materials, which is designed to hold an accumulation of liquid wastes or wastes containing free liquids. Examples of surface impoundments are holding, storage, settling, and aeration pits, ponds, and lagoons.
Tank	Per 6 CCR 1007-3, Section 260.10, a stationary device, constructed primarily of non-earthen materials (e.g., wood, concrete, steel, plastic) designed to contain an accumulation of hazardous waste.
Tank System	A hazardous waste or treatment tank and its associated ancillary equipment and secondary containment system.
TCO	Transportation Certification Official - The person(s) who affirm by signature that the Bill of Lading and Uniform Hazardous Waste Manifest are accurate per DOT regulations.
Toxicity	Per 6 CCR 1007-3, Section 261.24, a solid waste exhibits the characteristic of toxicity if using the test methods described in Appendix II of Subpart D, the extract from a representative sample of the waste

contains any of the contaminants listed in Table I at a concentration equal to or greater than the respective value given in that Table.

Treatability Study

A study in which a limited quantity of hazardous waste is subjected to a treatment process to determine:

- (1) Whether the waste is amenable to the treatment process;
- (2) What pretreatment (if any) is required;
- (3) The optimal process conditions needed to achieve the desired treatment;
- (4) The efficiency of a treatment process for a specific waste or wastes; or
- (5) The characteristics and volumes of residuals from a particular treatment process.

A "treatability study" is not a means to commercially treat or dispose of a waste.

Underground Storage Tank (UST)

Any one or combination of tanks (including associated underground piping) that is used to contain an accumulation of regulated substances and the volume of which (including the volume of associated underground piping) is 10 percent or more beneath the surface of the ground.

Waste Certification Official

The individual within Environmental & Waste Assessments/Audits responsible for certification of mixed waste to the burial site that subject waste meets all burial-site Waste Acceptance Criteria.

Waste Environmental Management System (WEMS)

The computer database that serves as part of the Rocky Flats operating record for complete inventory tracking and control of waste containers. The WEMS database consists of an operating log with various types of information for each container. The system provides automated data validation/analysis for compliance with regulations on how to store, inspect, treat, and transport waste. WEMS is controlled by WEMS Program Management, a section within the Waste Programs branch.

Waste/Residue Traveler

An on-site tracking document that accompanies a waste container which indicates the specific waste characteristics (i.e., physical state, written waste description, generating process number, the generator and area of generation), the type of container holding

the waste, the container number, etc.

Waste Stream

A specific output from a specific process consisting of a single physical form (e.g., aqueous, organic, solid) and one or more chemical components.

Waste Stream &
Residue Identification
and Characterization
(WSRIC)

A multi-volume report which identifies and contains the analyses of waste streams and generating processes associated with the operating buildings. The report contains documentation of process knowledge and/or chemical analysis and characterizes the waste stream as hazardous, nonhazardous, or unknown. The report is continuously updated as additional information becomes available. Procedure WP-2301 provides for the maintenance of this report.

Wastewater

Per 6 CCR 1007-6, Section 268.2, wastewaters are wastes that contain less than 1 percent by weight total organic carbon (TOC) and less than 1 percent by weight total suspended solids (TSS), with the exceptions listed in Section 262.2(f).

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