REVISED WASTE MINIMIZATION PLAN FOR EL DORADO CHEMICAL COMPANY, EL DORADO, ARKANSAS

Prepared for
El Dorado Chemical Company
El Dorado, Arkansas

December 1997

Project No. 97B061

Woodward-Clyde

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

TABLE OF CONTENTS (Continued)

1.0 INTRODUCTION

Pursuant to Paragraph 23 of Consent Administrative Order (CAO) 95-070, El Dorado Chemical Company (EDC) is required to have a Waste Minimization Program for the facility's operations if the requirements set forth in Paragraph 22 were not met. In a letter dated May 13, 1997, EDC notified the Arkansas Department of Pollution Control and Ecology (ADPC&E) that EDC would have a written Waste Minimization Plan prepared and available for review by July 1, 1997. According to Paragraph 23 of the CAO, the Waste Minimization Plan will apply to the generation of hazardous waste at the EDC facility. EDC submitted the Plan to the ADPC&E on June 26, 1997. EDC personnel met with the ADPC&E on September 30, 1997. The ADPC&E personnel expressed an opinion that low pH spills should be addressed in the Waste Minimization Plan. Therefore, a revised Waste Minimization Plan for hazardous waste has been prepared for review by the ADPC&E and is contained in this document. This plan has been prepared following the Environmental Protection Agency's (EPA's) "Guidance to Hazardous Waste Generators on the Elements of a Waste Minimization Program", 58 FR 31114 (May 28, 1993). The following information was assembled as a collaborative effort between Woodward-Clyde International-Americas (WCIA) and EDC.

The major tasks involved in the preparation of the plan include the following:

1. Identification of all hazardous wastes from the plant.
2. Prioritization of waste streams according to the costs of management and environmental compliance.
3. Development of a waste reduction/elimination plan for waste streams.
4. Assessment of economic, regulatory and technical feasibility for each alternative.
5. Selection of feasible plans.
6. Preparation of a written waste minimization plan incorporating information gathered in Steps 1-5 and addressing the program elements from the EPA guidance document which are summarized in the following sections.

Section 2.0	Top Management Support
Section 3.0	Characterization of Hazardous Waste Generation and Waste Management Costs
Section 4.0	Waste Minimization Assessments
Section 5.0	Cost Collection System

Section 6.0 Technology Transfer
Section 7.0 Program Implementation and Evaluation.

2.0
TOP MANAGEMENT SUPPORT

The management of EDC is committed to support a company-wide effort to reduce hazardous waste generation from operations at the EDC facility. The top management consists of the following personnel with positions and responsibilities indicated:

Jim Wewers, President, El Dorado Chemical Company
Mr. Wewers is the company official responsible for the fiscal management and operations of El Dorado Chemical Company. He will ensure that the necessary financial support from corporate will be ascertained in order to minimize the generation of hazardous wastes at the EDC plant.

John M. Carver, Vice-President, Safety and Environmental Compliance, LSB Industries
Mr. Carver is responsible for directing matters relating to safety and environmental compliance for LSB Industries, which is the parent company of El Dorado Chemical Company. Mr. Carver will lend corporate support to El Dorado Chemical Company for implementation of the waste minimization program.

Richard L. Milliken, Plant Manager, El Dorado Chemical Company
Mr. Milliken is responsible for plant management and will provide the necessary support to the waste minimization program at the plant level through company policies.

Ralph Freeman, Plant Engineering Manager, El Dorado Chemical Company
Mr. Freeman will be a member of the waste minimization team and will assist with technology transfer for modifying processes to reduce production of waste at the source where economically practical and technically feasible.

Byron Smith, Plant Environmental Manager, El Dorado Chemical Company
Mr. Smith will be responsible for reviewing and updating the waste minimization plan, as necessary, for hazardous waste generation from El Dorado Chemical plant operations.

3.0 CHARACTERIZATION OF HAZARDOUS WASTE GENERATION AND WASTE MANAGEMENT COSTS

3.1 WASTE STREAM CHARACTERIZATION

In order to characterize the hazardous waste streams generated from the EDC plant, a review was completed of the following plant records:

- Annual Hazardous Waste Reports for 1993, 1994, 1995 and 1996
- Uniform Hazardous Waste Manifests for 1993, 1994, 1995 and 1996
- Waste Profile Information and Analytical Test Results for Waste Materials
- Process Descriptions and Flow Charts

For each process, the industrial wastes (non-hazardous) and hazardous wastes generated are shown in Figures 1-6. Each process area and the wastes generated in these areas are described as follows:

Nitric Acid Production

Weak nitric acid (approximately 55% by weight) is produced by the exothermic reaction of ammonia vapor with compressed air, followed by absorption of water. The weak nitric acid is conveyed to storage for shipment or further processing. The weak nitric acid is processed in a nitric acid concentrator (NAC), where strong sulfuric acid (93-94% by weight) is used to remove water from the weak acid to produce 98% by weight nitric acid. The weak sulfuric acid is processed through a direct-fired concentrator where some of the water is removed by evaporation, and the sulfuric acid is then recycled back to the nitric acid concentrator. Three strengths of nitric acid (55%, 65% and 98% by weight) are produced by EDC. The products are shipped by rail or tank trucks.

Periodically, a sulfuric acid sludge which accumulates in the NAC tubes must be removed. The sulfuric acid sludge is a waste generated from the NAC process. It is a corrosive waste and contains lead and chromium at levels which are typically characteristically toxic based on the Toxicity Characteristic Leaching Procedure (TCLP). It carries EPA hazardous waste codes D002 (corrosive), D007 (chromium), and D008 (lead).

An industrial waste also generated from this process is the spent platinum gauze which is the catalyst used in the nitric acid production. Because platinum is a precious metal, the gauze is vacuumed by EDC to capture any dust and the vacuumed material and used gauze are returned to the manufacturer for recycling. This material is not categorized as a hazardous waste.

A one-time production waste was generated from the removal of a concrete foundation. The concentrated nitric acid production equipment had been removed from the concrete foundation. The foundation was removed because it was not suitable for additional equipment. The concrete foundation was classified as a hazardous waste because of TCLP-Lead (D008). It was generated during 1996 and shipped off-site for proper disposal by U.S. Pollution Control, Inc., in Waynoka, Oklahoma.

Wastewater and stormwater runoff from this area are discussed in this section under the heading for "Low pH Wastewater and Stormwater."

Sulfuric Acid Production

Sulfuric acid is produced from combustion of molten sulfur which produces a gas stream of sulfur dioxide and sulfur trioxide which are captured in an absorption tower with sulfuric acid, where sulfur trioxide gas combines with water present in the sulfuric acid to produce strong sulfuric acid (approximately 98% by weight).

Some of the acid produced is used in the nitric acid concentrator and the rest is sent to storage for shipment as product, either in rail or tank trucks.

An industrial waste generated from this process area is the spent vanadium catalyst which is shipped off-site to the vanadium recycler (U.S. Vanadium). The spent vanadium catalyst is not categorized as a hazardous waste.

Wastewater and stormwater runoff from this area are discussed in this section under the heading of "Low pH Wastewater and Stormwater."

Ammonium Nitrate, Liquid and Granular ("Prills")

Superheated ammonia vapor is reacted with hot nitric acid in the "Ammonia Neutralizers" to produce a 90% aqueous solution of ammonium nitrate (AN) which can be stored at the liquid nitrate tank farm for future shipping as a product, or it can be further concentrated and flashdried to produce granular "prills" of ammonium nitrate. There are two areas for AN prill production: K2 for low density product and E2 for high density product.

The AN prills are produced by the quick drying of a heated, highly concentrated aqueous solution of ammonium nitrate inside a forced-air drying tower (the Prill Tower), where the liquid solution is sprayed at the top to form droplets which free-fall and dry before hitting the bottom of the tower.

A waxy coating material, Galoryl, is added to the prills as they are dried and screened. Talc is also added to the prills at the time of shipment to provide cushioning during transportation. The ammonium nitrate prills are stored in cone-bottom bins from which they are transported by a belt to the rail car and truck loading stations.

There are no hazardous wastes generated from this process area. The industrial wastes include spilled or spent additives, (Galoryl and talc), ammonium nitrate mixed with soil from product spills during loading in the rail or truck loading areas. The contractors utilize tarps to minimize the loss of ammonium nitrate product in the loading areas. The waste Galoryl and talc are shipped off-site to the Union County Landfill (UCL).

Water Treatment and Boiler House

The EDC plant obtains all of its industrial and sanitary water supply from five deep wells located on the EDC property. The groundwater quality is generally very soft with low levels of suspended and dissolved solids, and requires minimal treatment for use as process cooling water and for sanitary purposes.

The well water is used as boiler make-up for steam generation; however, it subjected to demineralization before being fed into the condensate system. The cation and anion exchange units are regenerated approximately every 24 hours. The regeneration wastes are discharged into the plant's sewer to the wastewater treatment system.

The water treatment chemicals are completely utilized within this area and there is no hazardous waste generation from the process. EDC uses a re-pour system for small volumes of the water treatment chemicals left in the 55-gallon plastic drums. When a drum nears empty and the chemicals cannot be pumped from the bottom of the barrel, the liquid is consolidated into another drum until a full drum of chemicals is accumulated for use. This is a cost savings measure as well as a waste reduction measure for the water treatment chemicals.

Production Quality Control Laboratory

The laboratory is a source of hazardous waste generation on an intermittent basis. The laboratory is required to use hazardous chemicals as reagents or solvents in chemical analysis methods. Outdated chemical reagents or spent solvents become hazardous wastes. These are usually generated in small quantities and are disposed of in "lab packs". A lab pack is a drum filled with absorbent material surrounding the containers of small quantities of compatible hazardous chemicals. The lab pack is transported to an off-site treatment, storage and disposal facility (TSDF) for disposal generally by incineration. Based on four years of hazardous waste manifest data reviewed from the EDC plant, laboratory waste was reported only during 1996. Because of the small quantities of laboratory wastes, the laboratory will wait until they have enough materials to fill a lab pack to begin accumulation of the waste for disposal. This explains why no laboratory hazardous wastes were reported for the years 1993, 1994, and 1995.

Plant Maintenance Activities

Plant maintenance activities occur throughout the plant and include wastes which are generally classified as industrial wastes and not hazardous wastes. These include asbestos-containing materials, used oil, and parts washer solvents. In 1996, prior to analytical testing, EDC's spent parts washer solvent was assumed to be a hazardous waste. After testing of the spent parts washer solvent, the material was classified in 1997 as an industrial waste. The waste is transported by Safety-Kleen to a recycling facility.

Used oils have been tested prior to disposal by EDC. The used oils have been classified as non-hazardous according to TCLP testing. The used oils are transported to off-site used oil reclamation companies.

Asbestos-containing materials are sometimes generated from the maintenance of insulated equipment or piping. The asbestos-containing materials are handled as an industrial waste and transported to the UCL for disposal.

The manufacturer information for the fluorescent light bulbs was reviewed by EDC for disposal information. The manufacturer information indicates that the light bulbs are not classified as a hazardous waste.

Other Areas

Hazardous waste was generated from a one-time landfill cell remediation in 1993, where soil which contained lead (D008) and chromium (D007) was removed from EDC's industrial landfill and transported off-site for proper disposal to LWD, Inc., in Calvert City, Kentucky. The landfill was subsequently closed in 1995. The ADPC&E Solid Waste Division approved the closure of the EDC landfill in the same year.

Low pH Wastewater and Stormwater

The nitric and sulfuric acid plants occupy the central area of the EDC plant and they include the process areas, the molten sulfur unloading and storage areas, the rail car and tanker truck loading stations and the acid storage tank farms. There are also several cooling towers of various sizes located throughout these areas, to provide the cooling water required for non-contact process cooling. The water makeup to these cooling towers is untreated well water that comes from on-site deep wells. Once-through cooling water for shop and office air conditioning has been routed to the cooling towers in some areas as a water and energy saving measure.

The acid manufacturing process is very nearly a closed system with respect to the generation of wastewater, since most of the excess water is removed from these processes by evaporation. A major source of the wastewater generated in these areas, other than stormwater, is the blowdown from the cooling towers, which in most cases, are continuous streams of water being discharged into the various process drains. All of these process drains are connected to branch sewer connectors that make up the wastewater sewer system. These branch sewer connectors direct the process wastewater through various mains to the wastewater treatment system. Point source identification of the flow is being carried out to reduce water being discharged to the process drains.

The 3rd Street interceptor line runs in a north-south direction along 3rd Street, starting at the northeast corner of the acid plants near the rail car loading stations, and running south to terminate at the 3rd Street sump. The 3rd Street sump discharges to the wastewater treatment system. This interceptor line collects all of the wastewater and some stormwater from the north bulk storage area, as well as Nitric and Sulfuric Acid production and storage areas. A branch main that services the area on the northwest side of the acid plants intersects with the 3rd Street interceptor just north of the laboratory.

De minimus leaks and spills of acid from the process, storage, rail car and tanker truck loading are potential sources of low pH contamination of wastewater and stormwater.

Potential sources in the acid production area of low pH (acid) wastewater and stormwater are described as follows:

1. The rail car barn is a source area for low pH water to enter the wastewater treatment system. Rail cars must be periodically tested to comply with Department of Transportation regulations. The cars are received with small amounts of acid, usually one inch or less. Cars with acid levels above the maximum one-inch are unloaded back to the process to reclaim the acid. The test requires the cars to be hydrostatic tested at set intervals based on the age of the rail car. The hydrostatic test requires the rail car to be filled with water and pressurized. The water dilutes the acid creating 4 to 5 pH water. An inspection is completed while the car is under pressure and the water is released to the process drain system. Overflow lines are installed in the south drain basins to handle any excess flow. Procedures for the draining of cars require the car barn operator to discharge the rail car at a rate not to exceed the drain and overflow capacity. This procedure prevents the discharged water from flowing outside the confines of the car barn to storm drains that flow to Outfall 004 outside the building.

2. The curbed concrete paving originally provided in the acid manufacturing area has deteriorated over the years. In some cases, this curbing was built with the best available material in the late 1940s and early 1950s. Evaluations of these areas are being completed during the waste minimization study. Areas revealed by the study are directed to management and engineering for repairs, material specifications, and design. In areas of potential leaks or spills, limestone rock has been installed to assist with neutralization.

3. The nitric acid storage tanks are located on concrete foundations but the surrounding soil is not provided with any paving or containment curbing. The nitric acid pumping station includes a total of six horizontal, centrifugal pumps mounted on concrete pedestals, with no area containment. The potential for pump leaks and maintenance activities requiring line breaks for repairs has been addressed. A sump system has been installed to direct flow from the existing pump catch pans to a sump. When complete, the sump will also accept pump suction line drainage from the tank to the pump suction should maintenance be required. The drains will be designed for gravity flow to the sump and pumped to weak acid storage tanks.

4. The Nitric Acid area is provided with a large sump at the northeast corner, which contains a closed, horizontal tank and an open-top cylindrical tank. The closed tank, D-309 (approximate dimensions 5 feet diameter by 6 feet long), is a holding tank which holds process fluids drained out of process equipment whenever it is taken out of service for maintenance. These fluids are returned back to the process after start-up.

   The open-top tank (approximate dimensions 8 feet diameter by 6 feet tall) collects all of the fluids leaking from the process as well as the stormwater falling within the process area. These fluids normally are pumped into the process as well. During storm events, the tank can overflow into the sump, in which case the wastewater goes to the process sewer.

5. The sulfuric acid rail car loading stations located on the north side of the acid plants are not curbed or collected. The runoff generated in these areas may contain low pH contaminated water from de minimus leaks and spills during loading. In general, these de minimus losses go to the 3rd Street sewer.

6. The acid tank car and truck loading areas are not provided with drip pans or other means to collect the material dripping after each loading operation.

7. The sulfuric acid storage tanks have not been provided with containment pads and curbing.

EDC is currently evaluating measures to address the above concerns. These are presented in Table 4.

3.2 HAZARDOUS WASTE AMOUNTS BY YEAR

The total amounts of hazardous waste generated by EDC during the past four years (1993, 1994, 1995 and 1996) are shown in the column chart, Figure 7. The annual amounts of hazardous waste are also shown in Table 1. The annual total amounts of hazardous waste shown in Table 1 are broken down between the hazardous wastes shipped off-site and those managed on-site.

Table 1. El Dorado Chemical Company - Hazardous Waste Generation Amounts

Year	Total Hazardous Waste Shipped Off-Site (lbs)	Total Hazardous Waste Managed On-Site (lbs)	Total Hazardous Waste by Year (lbs)
1993	439,540	57,000	496,540
1994	13,200	65,000	78,200
1995	42,350	73,260	115,610
1996	498,071	177,289	675,360

The total amounts of hazardous waste managed on-site are from de minimus leaks and spills of nitric or sulfuric acid which result in low pH wastewater. The increased volume in 1996 may be due, in part, to improved record keeping. EDC is committed to addressing these de minimus spills and leaks through a pollution prevention program which will emphasize source controls. Currently, de minimus spills or leaks in the process area enter the wastewater treatment system and are treated through neutralization.

The hazardous waste streams, source areas, and amounts identified from the waste characterization include the following shown in Table 2:

Table 2. Hazardous Waste Stream Characterization, Amounts Generated by Year

Source	Waste Stream	1993 (lbs)	1994 (lbs)	1995 (lbs)	1996 (lbs)
Nitric Acid Production	Sulfuric Acid Sludge	4,400	13,200	42,350	30,083
Nitric Acid Concentrator	Concrete Foundation Removal (one-time)	0	0	0	460,840
Production Laboratory	Lab Pack Waste	0	0	0	7,080
Plant Maintenance	Parts washer solvent	0	0	0	68
EDC Landfill (closed)	Landfill cell remediation (soil) (one-time)	435,140	0	0	0
Acid Plant Production/ Loading/ Storage Tanks	Acid, Low pH water	57,000	65,000	73,260	177,289

Figures 8 through 13 display column graphs of the amounts for each waste stream by year.

It should be noted that the amount of sulfuric acid sludge generated decreased from 1995 to 1996. This is a result of a change in process with a new nitric acid production unit which utilizes a Direct Strong Nitric Acid (DSN) process instead of the Nitric Acid Concentrator (NAC) process. The DSN process does not generate the sulfuric acid sludge. EDC is currently utilizing the DSN process in preference to the NAC process to reduce the production of hazardous waste at the plant. The NAC process has been operated only when necessary to meet production demands.

The Production Laboratory has small quantities of hazardous wastes generated periodically due to expiration of chemical reagents. The nitric acid/sulfuric acid tested in the laboratory (~ 2.5 L/day) is discharged into the wastewater system.

EDC Plant Maintenance has eliminated the parts washer solvent by substituting a non-hazardous product.

The landfill cell closure created a one-time hazardous waste stream from the remediation.

The low pH wastewater resulting from de minimus leaks and spills is being addressed as described in Section 6.0.

3.3 WASTE STREAM COSTS

The waste transportation and disposal costs by year for each waste stream are shown in Table 3. This information for all waste streams except low pH waters was gathered through a review of the purchase order requisition information in the hazardous waste manifest files at the plant.

The cost information for the wastewater treatment is pro-rated based on 1996 costs for caustic (sodium hydroxide) and soda ash, the neutralization reagents used in the wastewater treatment process. At least 50% of all caustic purchased by EDC is used for boiler feed water treatment.

The nitric acid production concrete foundation removal and the landfill cell remediation were one-time remediation projects.

Table 3. Hazardous Waste Stream Characterization, Costs by Year

Source	Waste Stream	1993 ($)	1994 ($)	1995 ($)	1996 ($)
Nitric Acid Production	Sulfuric Acid Sludge	1,837	3,077	9,865	6,858
Nitric Acid Production	Concrete Foundation Removal (one-time)	0	0	0	81,000
Production Laboratory	Lab Waste	0	0	0	6,956
Plant Maintenance	Parts washer solvent	0	0	0	511
EDC Landfill (closed)	Landfill cell remediation (soil) (one-time)	65,000	0	0	0
Acid Plants /Loading Areas/ Storage Tanks	Acid, Low pH water	60,034[(1)]	68,460[(1)]	77,160[(1)]	186,727 [(1)]

(1) Pro-rated costs for caustic and soda ash usage for wastewater neutralization based on 1996 usage. Includes system operation and maintenance costs (assumed to be 20 % of total neutralization cost).

Since the foundation removal from the sulfuric acid production area and the landfill cell remediation from the EDC solid waste landfill were one-time waste disposal events, these waste streams cannot be addressed with waste minimization strategies for the future.

The sulfuric acid sludge from the NAC, production laboratory waste and parts washer solvent can be addressed through source reduction measures.

The de minimus acid spills and leaks resulting in the low pH wastewater are a waste stream that can be addressed through source control measures.

4.0 WASTE MINIMIZATION ASSESSMENTS

4.1 WASTE MINIMIZATION STRATEGIES

Waste minimization can be achieved through several strategies. Figure 14 shows the various waste minimization strategies. Source reduction, recycling and reuse, and treatment are the three major waste minimization strategies in order of preference by the EPA.

Source reduction is the best solution for waste minimization, because it eliminates the generator's liabilities and other problems associated with transportation and disposal of waste. The source reduction strategy may be the most expensive strategy to implement due to changes in technology. However, some reduction of hazardous waste volume may be gained through improved housekeeping practices, proper segregation of waste, product substitution, or process modification.

Recycling and reuse are the second choice for waste minimization strategies; however, this alternative has limitations due to the low number of commercial recyclers. Recycling on-site is not always an economically feasible alternative.

Treatment should be considered the last alternative for waste minimization. In some cases, treatment may be the only feasible alternative to land disposal, since source reduction and recycling may not be feasible due to economic reasons. Treatment technologies include physical, chemical, thermal and biological.

4.2 WASTE MINIMIZATION STRATEGIES IDENTIFIED FOR EDC HAZARDOUS WASTE STREAMS

Specific waste minimization strategies for each source and waste stream are shown in Table 4.

Table 4. Waste Minimization Strategies For EDC Hazardous Waste Streams

Source Area: Waste Stream	Waste Minimization Strategy	Suggested Technology or Procedure
Nitric acid production: Nitric Acid Concentrator (NAC) Sulfuric Acid Sludge	Source Reduction Recycle	1. Process change: utilize Direct Strong Nitric Acid (DSN) process as primary production method instead of NAC process. 2. Sulfuric acid recycled through NAC system. NAC sulfuric acid sludge sent to off-site recycler.
Nitric Acid Production: Nitric Acid Concentrator Concrete Foundation (one-time disposal)	Not Applicable	Not Applicable
Solid Waste Landfill: Landfill cell remediation (one-time disposal)	Not Applicable	Not Applicable
Production QC Laboratory: Laboratory waste chemicals	Source Reduction Source Control/Treatment	1. Housekeeping improvement; rinsing of container glassware; purchase smaller quantities of chemicals with expiration dates. 2. Segregation/neutralization of acidic or basic wastes.
Maintenance Department: Parts Washer Solvent	Source Reduction	Product substitution: Non-hazardous product substituted by plant.

Table 4. Waste Minimization Strategies For EDC Hazardous Waste Streams (Continued)

Source Area: Waste Stream	Waste Minimization Strategy	Suggested Technology or Procedure
Acid Plant- Rail Car Barn: Acid/Low pH Wastewater	Source Control/Structural Source Control/Process Modification	1. Installation of overflow lines in south drain basins to handle any excess flows. 2. Procedures for draining of cars require the car barn operator to discharge the rail car at a rate not to exceed the drain and overflow capacity. .
Acid Plants -Concrete Pavement/Curbing: Acid/Low pH Wastewater	Source Control/Structural	1. Replace or repair concrete paving with chemical-resistant paving and curbing in the sulfuric and nitric acid process areas. EDC is currently field testing an acid-resistant polymer coating in new Nitric Acid Plant for this purpose.
Nitric Acid Plant - Storage Tanks/Pumping Station: Acid/Low pH Wastewater	Source Control/Structural	1. Repair or replace deteriorated concrete paving with chemical-resistant paving and curbing in the nitric acid process areas. 2. Assess feasibility of chemical- resistant pavement and curbing under pumping station.

Table 4. Waste Minimization Strategies For EDC Hazardous Waste Streams (Continued)

Source Area: Waste Stream	Waste Minimization Strategy	Suggested Technology or Procedure
Nitric Acid Plant Process Sump/Holding Tanks:. Acid/Low pH Wastewater	Source Control/Process Modification	1. Evaluate collection sump holding tanks (D-309 and open-top tank) and assess improvements. Once assessed, implement improvements.
Sulfuric Acid Plant - Rail Car/Tank Loading (north side of plant): Acid/Low pH Wastewater	Source Control/Housekeeping	1. Install collection system to route to wastewater system. 2. Provide drip pans or other means to collect drippings from acid loading areas.
Sulfuric Acid Plant -Storage Tanks: Acid/Low pH Wastewater	Source Control/Structural	1. Evaluate addition of acid-resistant paving, curbing and collection sumps for all of acid storage tanks.

5.0
COST COLLECTION SYSTEM

The costs for the hazardous waste disposal for 1993 through 1996 were summarized in Table 3 by waste stream. Copies of purchase order requisitions and invoices are usually kept with the hazardous waste manifest files in the EDC Environmental Coordinator's office.

In order to maintain the cost collection system for 1997 and future operations, the cost information will continue to be maintained with the waste manifests to track waste disposal costs. Also, the costs of waste minimization alternatives implemented for wastewater minimization are planned to be tracked along with costs for treatment.

The waste disposal costs for each waste stream shall be summarized and reviewed on a yearly basis (January 1 - December 31). This information will allow EDC to evaluate alternative waste minimization technologies and to allow the economic feasibility of the technology to be evaluated against the current waste disposal costs.

6.0
TECHNOLOGY TRANSFER

In order to promote technology transfer, the engineering and environmental groups at EDC will continue to work closely together to promote the waste minimization strategies of source reduction, recycle/reuse and treatment alternatives.

Wherever possible, the most economically feasible source reduction alternatives including good housekeeping practices, proper waste stream segregation and process modification should be utilized by EDC.

To promote the technology transfer, upper management will continue to financially support this effort and provide leadership for EDC by promoting environmental stewardship and responsibility.

As a result of a tentative agreement with ADPC&E, EDC has committed the resources of Kyle Wimsett, Project Manager, to address the issue of low pH (acid) wastewater and stormwater. He has been given the task of evaluating the existing wastewater drainage/treatment system and sources of pollutants and then identifying opportunities for reduction of wastewater contamination. From July, 1997 to date, he has completed evaluations of the rail car barn area, the ammonium nitrate KT (low density product) area, the ammonium nitrate E2 (high density product) area, the nitrate storage area, the sanitary sewer system and the ammonia shipping and storage area. His evaluation of the rail car barn area has been incorporated into this waste minimization report. He is expected to continue this evaluation through June 1999. He has not fully evaluated other process areas relating to the production of low pH wastewater and stormwater. As his evaluations are completed for other source areas, the additionally identified waste minimization alternatives for those areas will be reviewed and incorporated into this waste minimization plan.

In order to select the most cost effective alternative for waste minimization and pollution prevention of each waste stream, the technical, economic, regulatory, and safety information will be evaluated for each alternative.

An annual review will be made by the engineering and environmental staff of the EDC plant to evaluate developing technologies and to promote technology transfer for waste minimization strategies which are economically feasible.

The waste minimization plan will be updated annually to reflect any changes in those waste minimization strategies.

7.0 PROGRAM IMPLEMENTATION AND EVALUATION

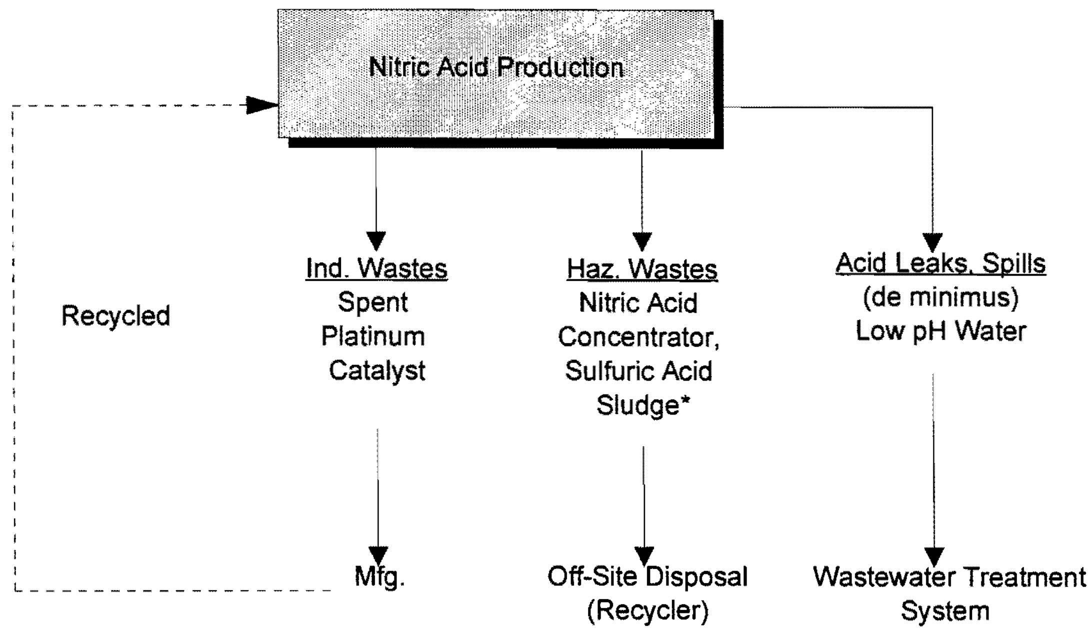
The waste minimization strategies identified in Section 4.0 of this plan have been or will be implemented at the EDC Plant. The strategies identified in Table 4 are those that are already existing and/or economically practical to implement at the plant.

An annual evaluation of the effectiveness of this plan will be made by the environmental and engineering groups at the plant. The cost summary information will be compared to any potential new technologies which could be transferred to the EDC plant for waste stream minimization.

The annual update of this waste minimization plan shall be completed by January 31 following the end of the previous calendar year. Updates of the plan shall be kept for three years from the time of preparation.

FIGURES

ROUTINE INDUSTRIAL AND HAZARDOUS WASTES
FOR PROCESS UNITS
EL DORADO CHEMICAL COMPANY

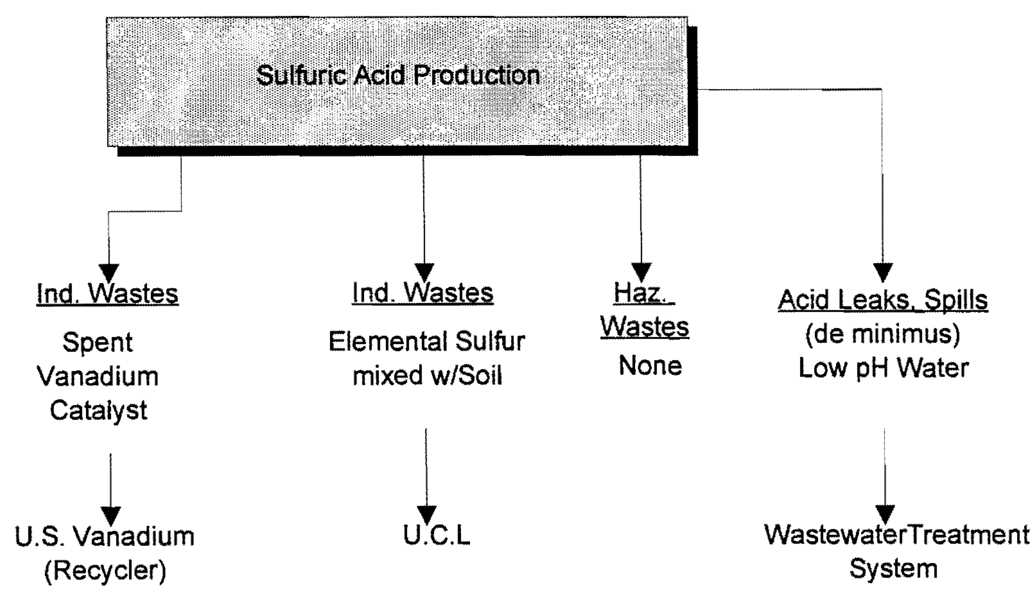


* Sulfuric acid sludge is not generated when using Direct Strong Nitric Acid (DSN) process. EDC is utilizing DSN process to reduce this waste stream.

EDC-HAZ1.AF2

Figure 1. Nitric Acid Production

ROUTINE INDUSTRIAL AND HAZARDOUS WASTES
FOR PROCESS UNITS
EL DORADO CHEMICAL COMPANY

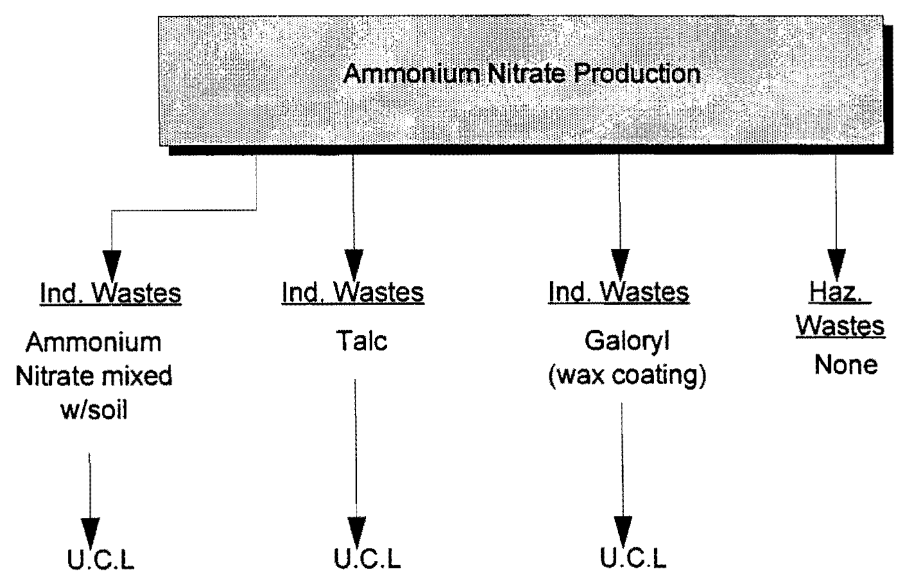


U.C.L. = Union County Landfill

EDC-HAZ2.AF2

Figure 2. Sulfuric Acid Production

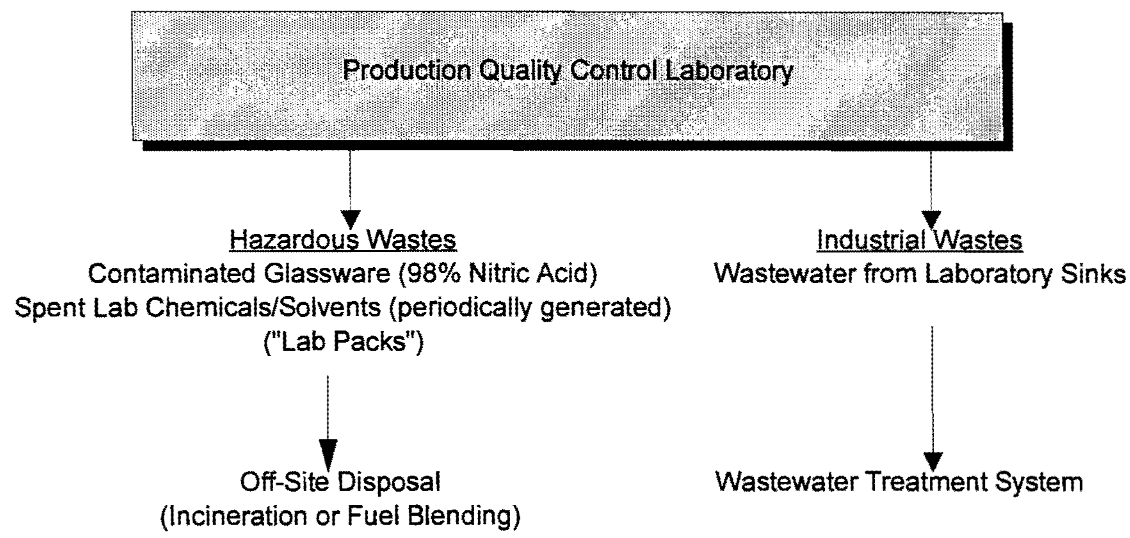
ROUTINE INDUSTRIAL AND HAZARDOUS WASTES
FOR PROCESS UNITS
EL DORADO CHEMICAL COMPANY



U.C.L. = Union County Landfill

Figure 3. Ammonium Nitrate Production

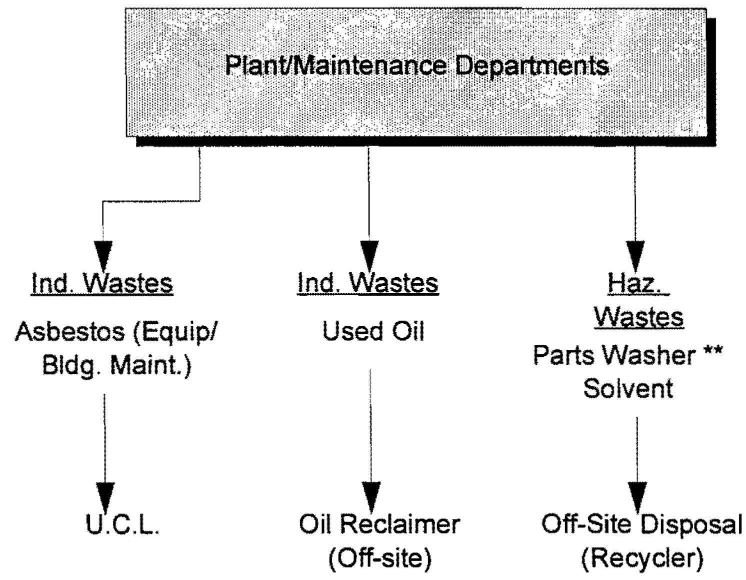
EDC-HAZ3.AF2



EDC-HAZ4.AF2

Figure 4. Production Quality Control Laboratory

ROUTINE INDUSTRIAL AND HAZARDOUS WASTES
FOR PROCESS UNITS
EL DORADO CHEMICAL COMPANY



** Initially assumed to be hazardous, but after testing, waste determined to be non-hazardous.

U.C.L. = Union County Landfill

Figure 5. Plant Maintenance Dept.

EDC-HAZ5.AF2

ROUTINE INDUSTRIAL AND HAZARDOUS WASTES
FOR PROCESS UNITS
EL DORADO CHEMICAL COMPANY

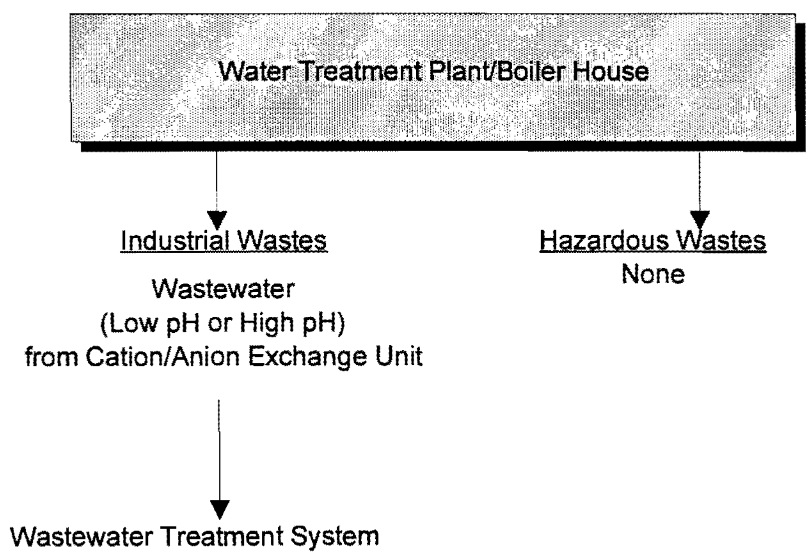


Figure 6. Water Treatment Plant/Boiler House

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El Dorado Chemical Company
Hazardous Waste Generation Amounts by Year

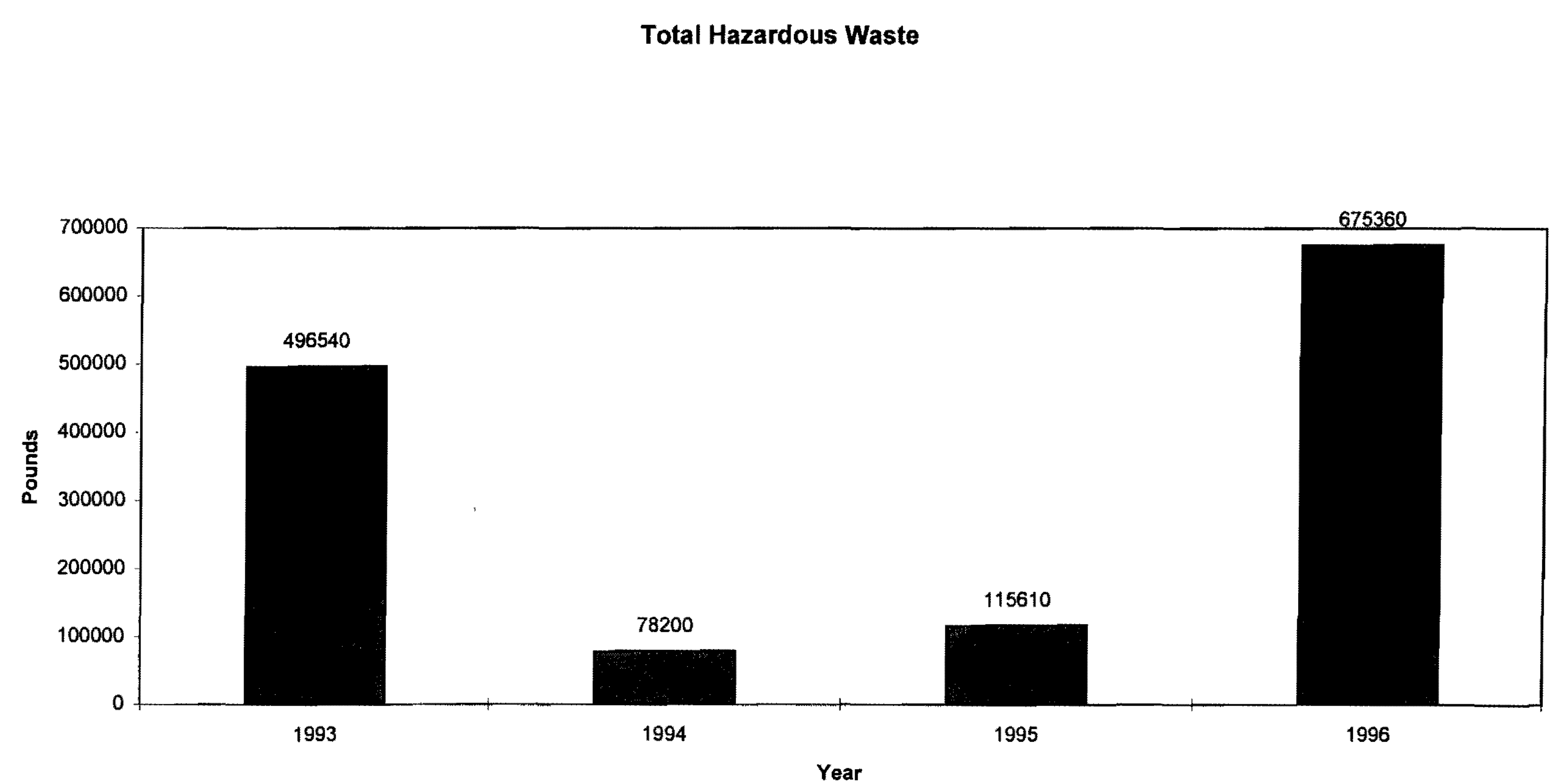

FIGURE 7

El Dorado Chemical Company
Hazardous Waste Generation Amounts by Year

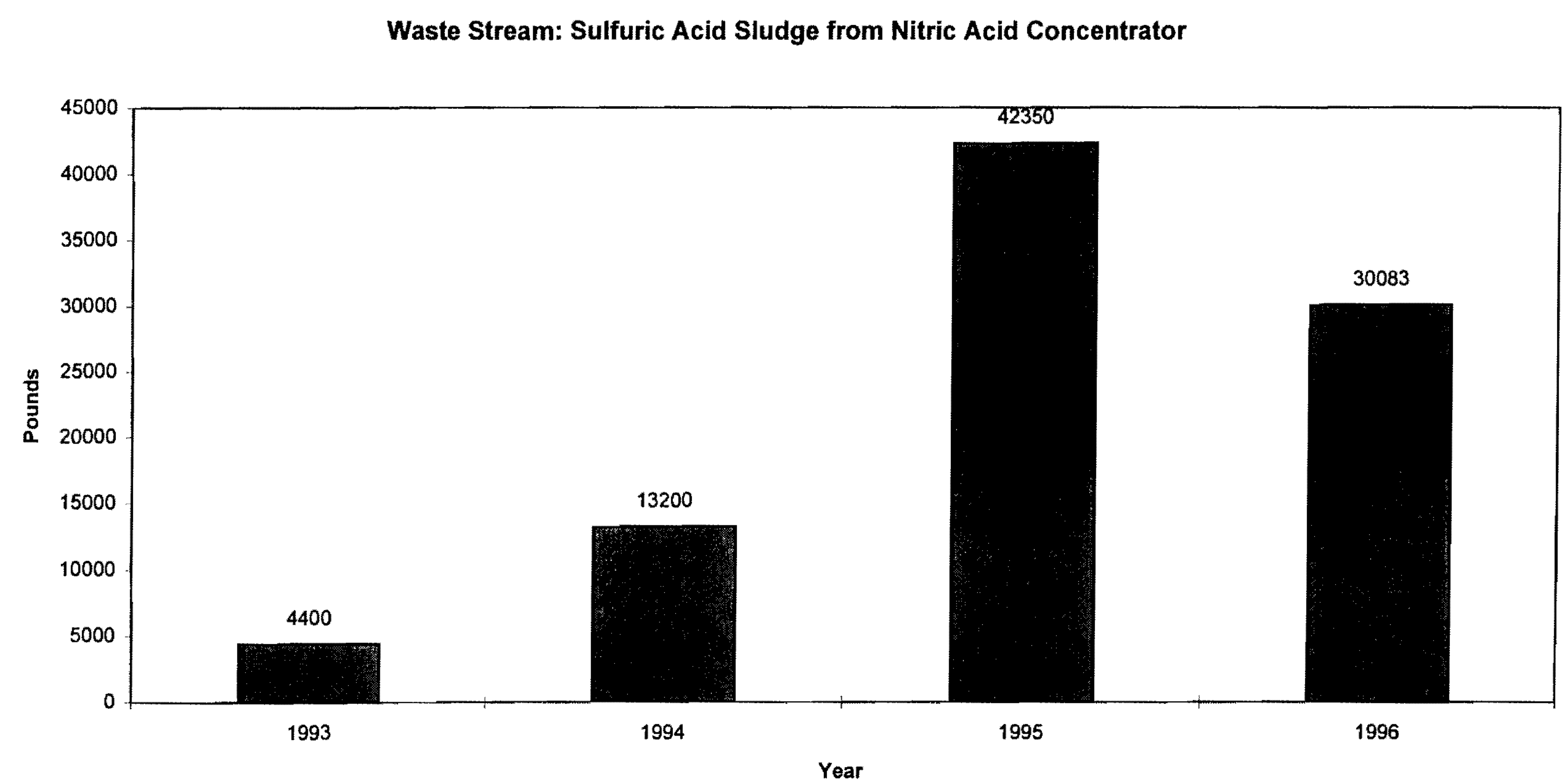

FIGURE 8

El Dorado Chemical Company
Hazardous Waste Generation Amounts by Year

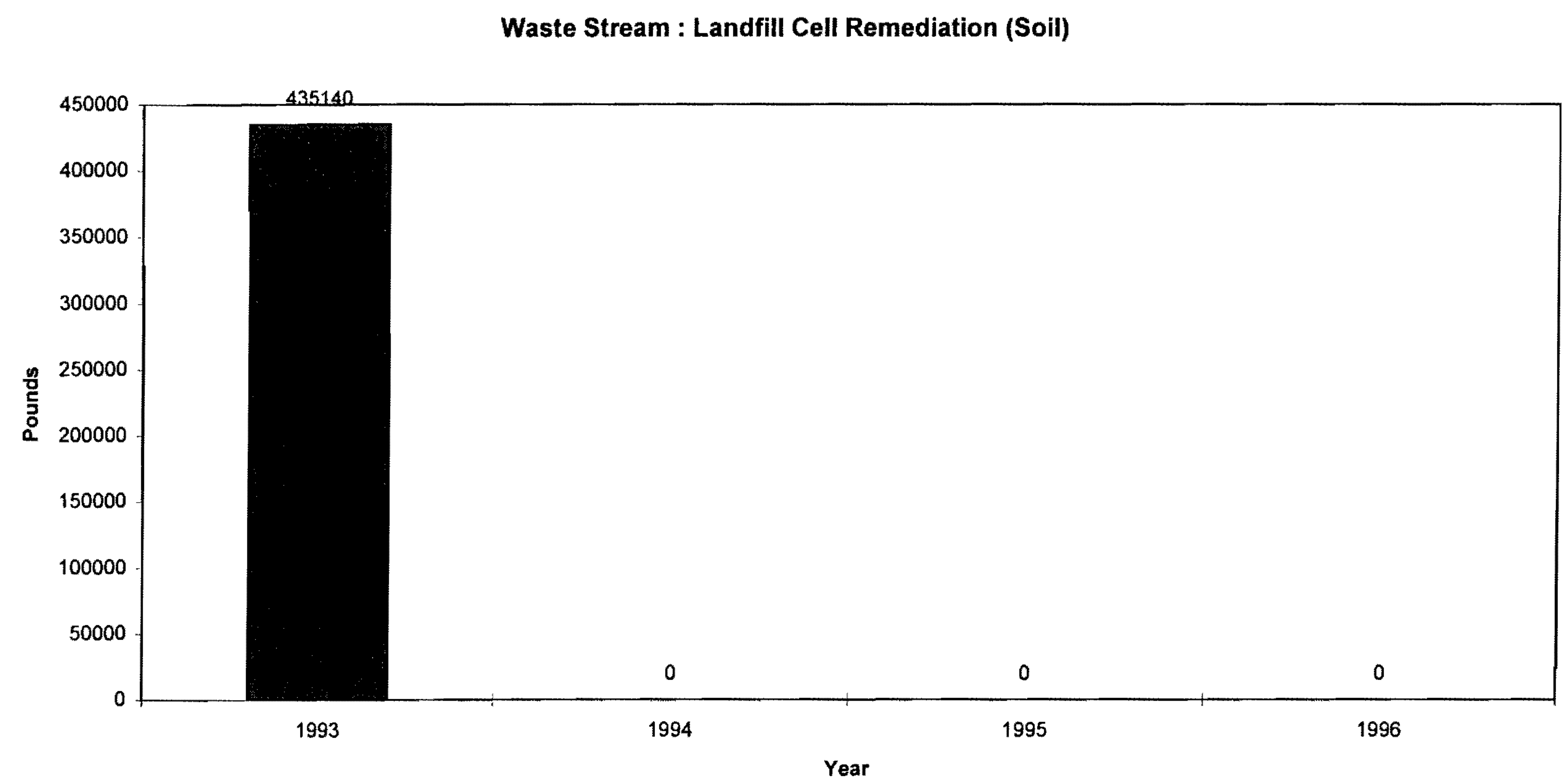

FIGURE 9

El Dorado Chemical Company
Hazardous Waste Generation Amounts by Year

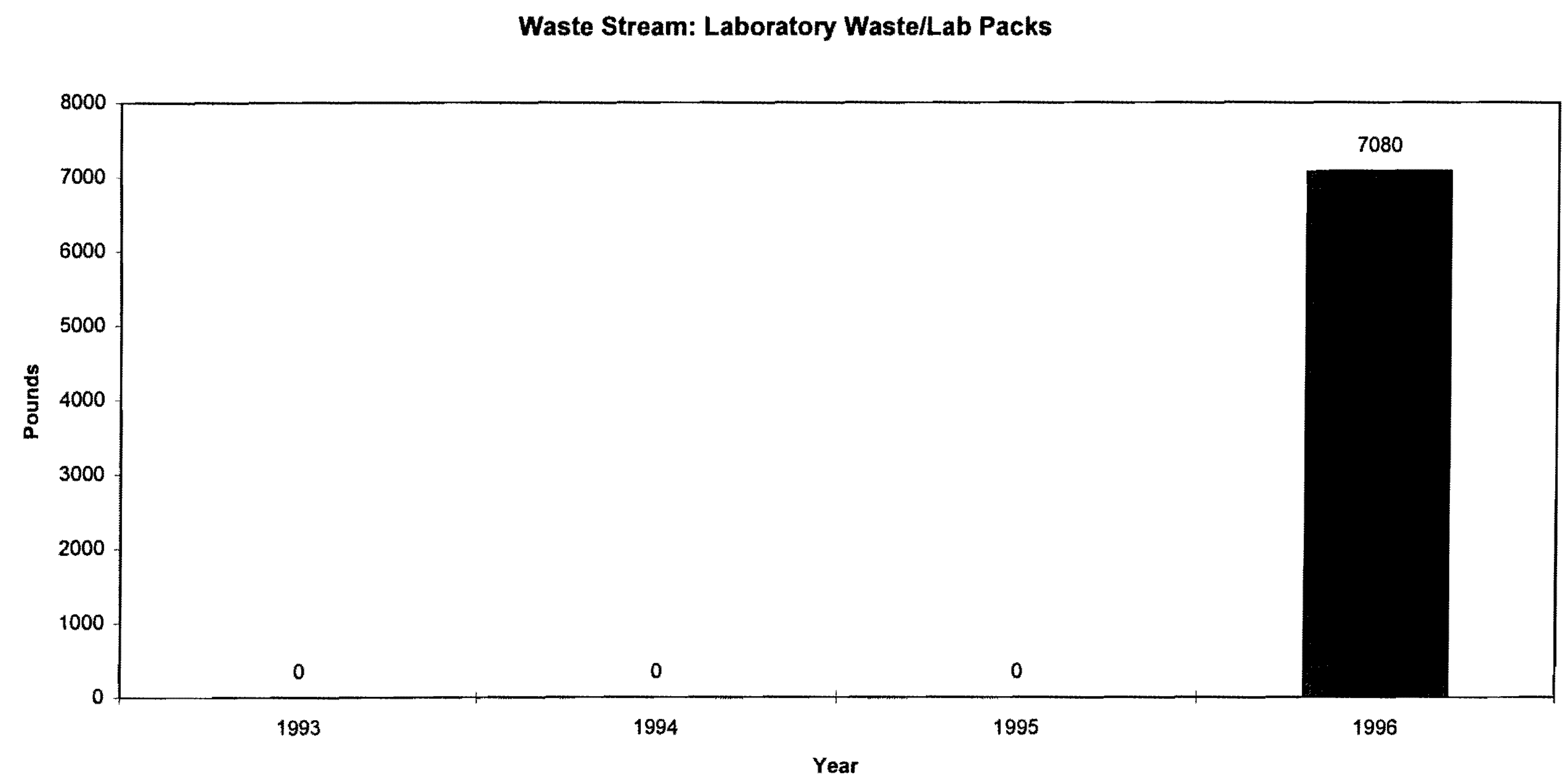

FIGURE 10

El Dorado Chemical Company
Hazardous Waste Generation Amounts by Year

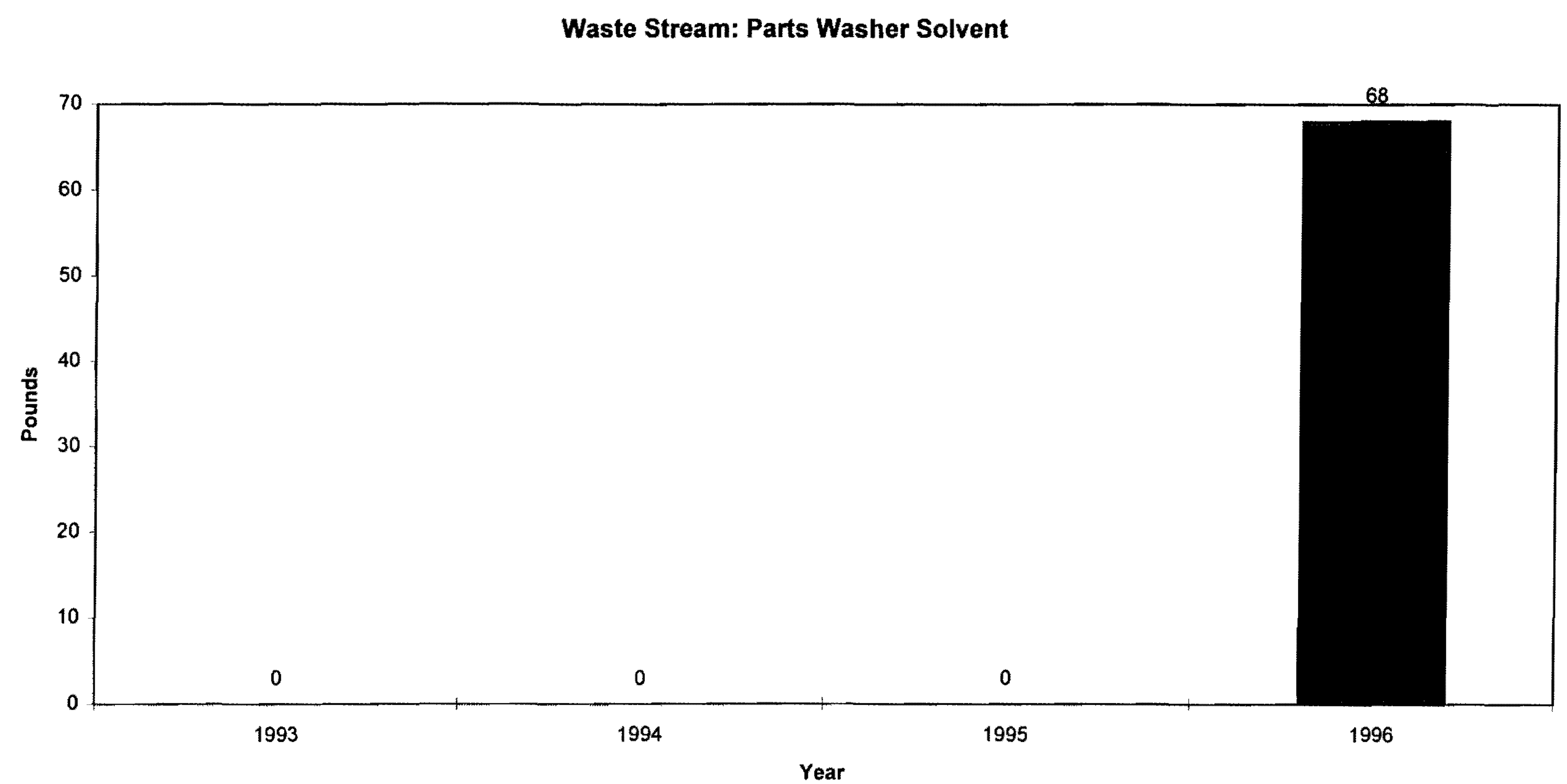

FIGURE 11

El Dorado Chemical Company
Hazardous Waste Generation Amounts by Year

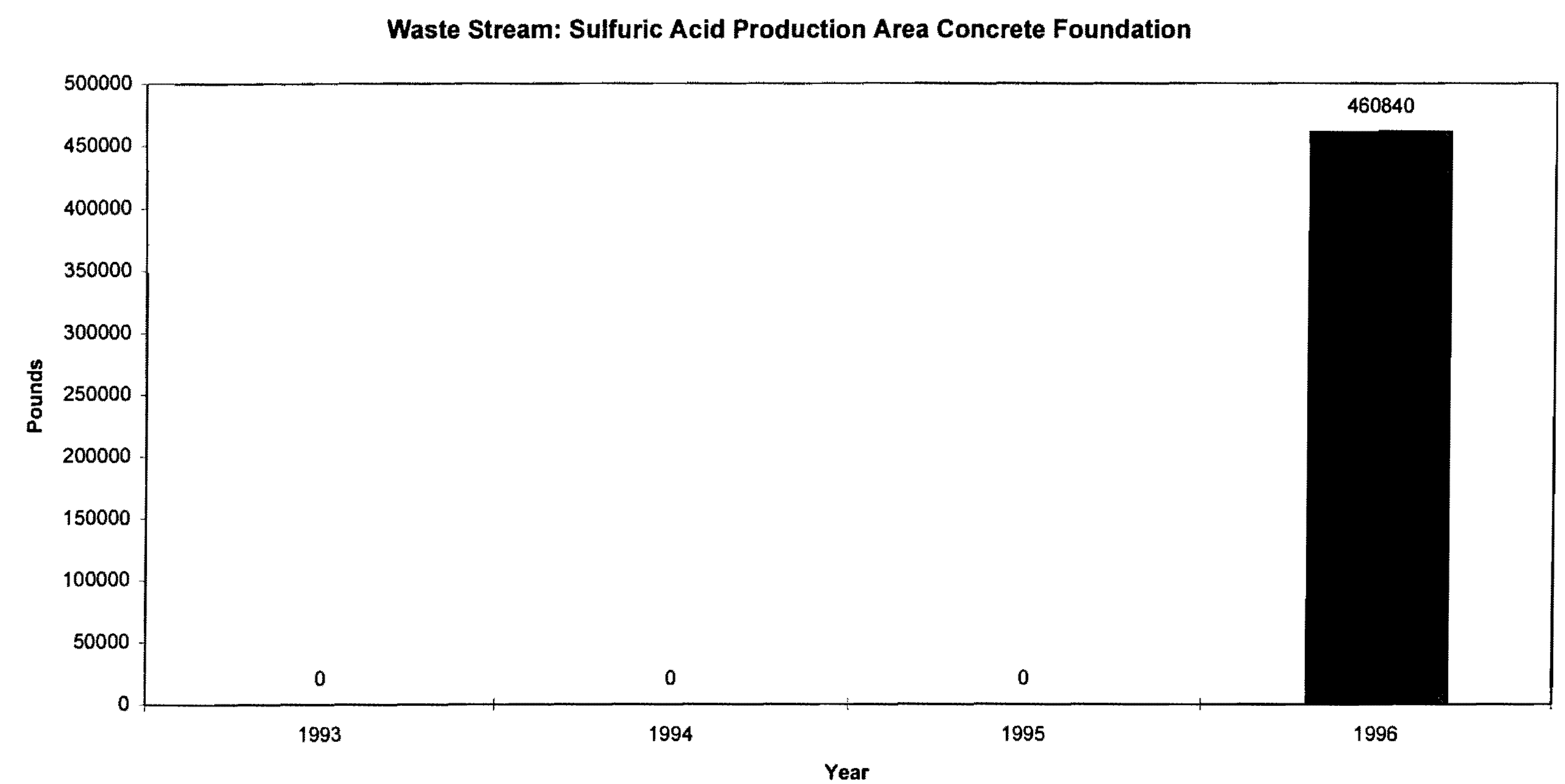

FIGURE 12

El Dorado Chemical Company
Hazardous Waste Generation Amounts by Year

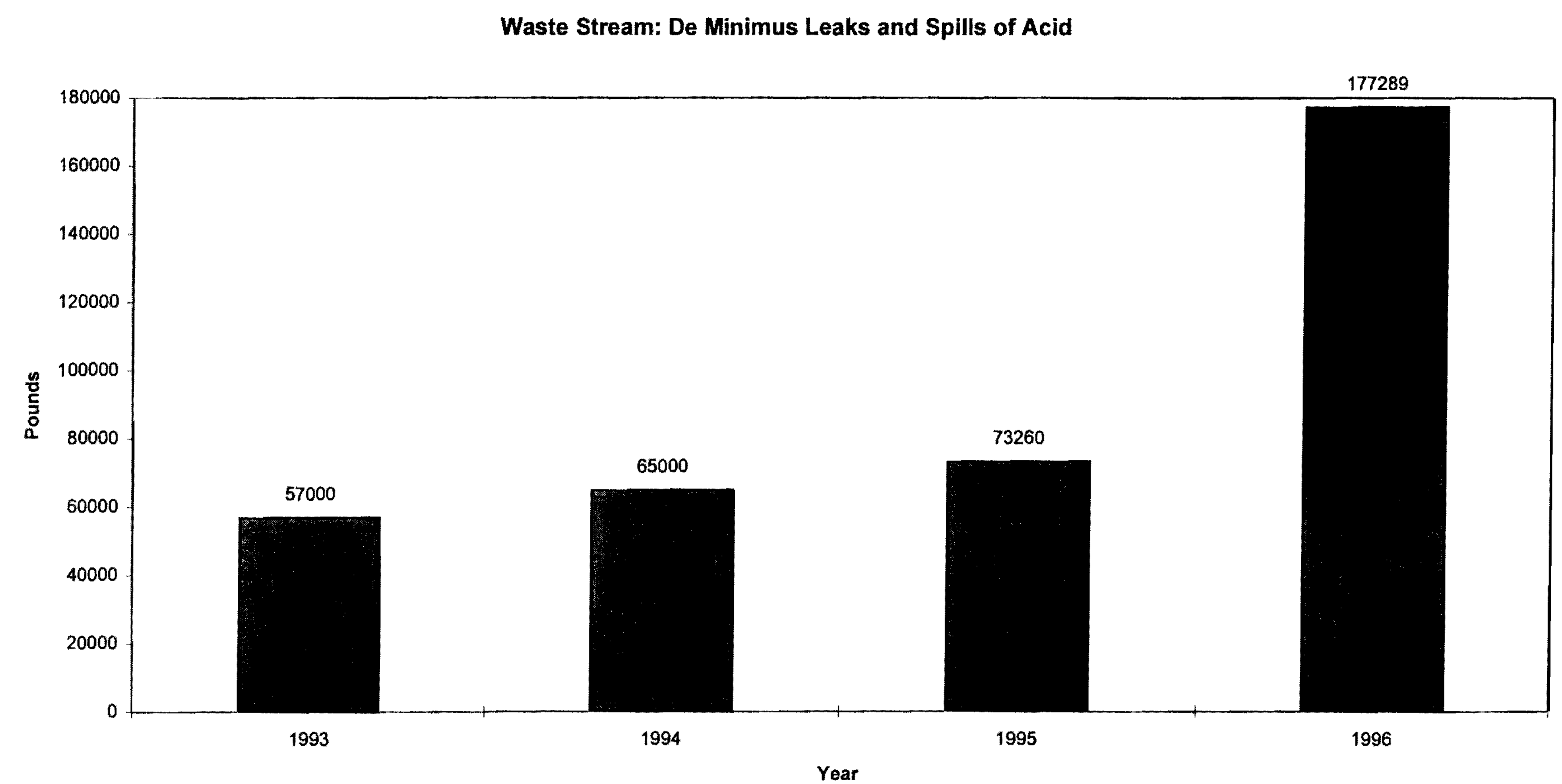

FIGURE 13

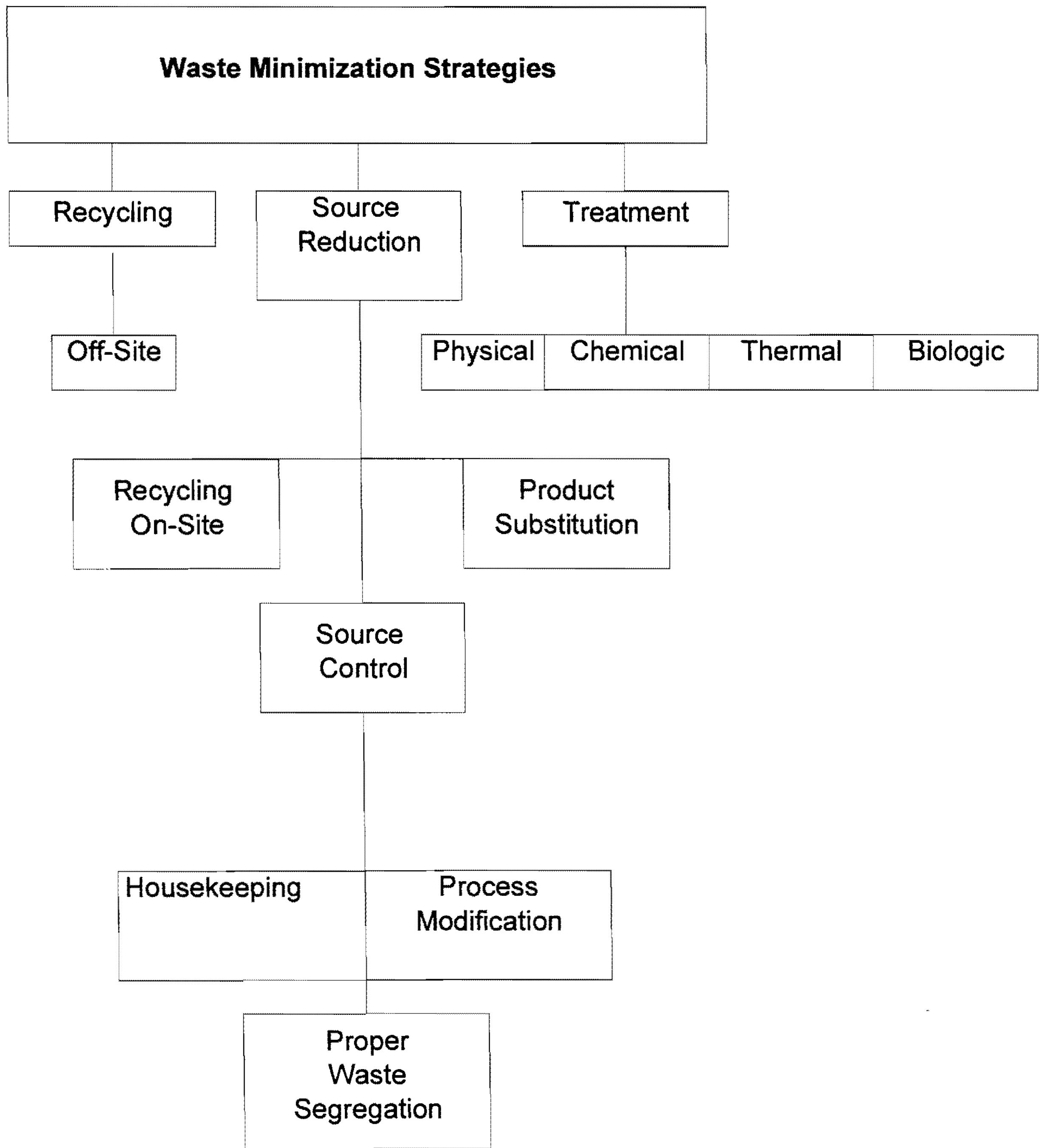

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Figure 14. Waste Minimization Strategies