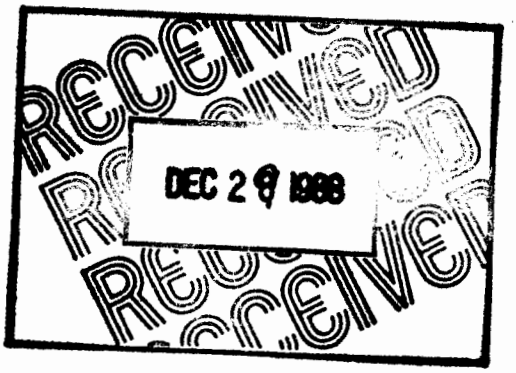
SPARTON

SPARTON TECHNOLOGY



December 28, 1988

Mr. Guy Tidmore
U.S. Environmental Protection Agency
Region VI
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202

Reference: RFI Workplan

Dear Mr. Tidmore:

Pursuant to the requirements of Section IV.A.2 of the Consent Order, we herewith submit the Task II (RFI Workplan) of the Contamination Assessment Plan for Sparton Technology's Coors Road Facility.

Sincerely,

SPARTON TECHNOLOGY, INC.

for/ Richard D. Mico
Vice President/General Manager

RDM:sve

cc: Hazardous Waste Bureau
NM EID, Santa Fe, NM
B. Thompson
J. DeWitt
G. Richardson
V. Samala
J. Mabrey

OGC-003269

Sparton Technology, Inc. ☐ *4901 Rockaway Blvd., SE* ☐ *Rio Rancho, NM 87124* ☐ *P.O. Box 1784* ☐ *Albuquerque, NM 87103* ☐ *(505) 892-5300* ☐ *TWX 910-989-1657*

A Report Prepared for:

Sparton Technology, Inc.
4901 Rockaway Boulevard, NW
Rio Rancho, New Mexico

RCRA FACILITY INVESTIGATION WORKPLAN
SPARTON TECHNOLOGY, INC.
COORS ROAD FACILITY
ALBUQUERQUE, NEW MEXICO

HLA Job No. 6310,039.12

See revised 3-3-89

by

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December 28, 1988

TABLE OF CONTENTS

I INTRODUCTION

This RCRA Facility Investigation (RFI) Workplan has been prepared to describe the methods and procedures to be used to define the limits and extent of the contaminant plume at the Sparton Technology, Inc. Coors Road facility located in Albuquerque, New Mexico.

Prior investigations over the past five years have indicated the presence of two distinct flow zones in the groundwater beneath the site which are separated by an aquitard of variable thickness. The majority of the efforts to date have been focused on the upper flow zone where levels of contaminants have been found which exceed state standards. A minimal amount of data from lower flow zone wells has yielded inconclusive results.

The purpose of this RFI is to define the leading edge of the contaminant plume in the upper flow zone, to determine whether significant levels of contamination exist in the lower flow zone, and, if so, to define the leading edge of the contaminant plume in the lower flow zone.

The following sections of this Workplan describe the methods and procedures to be used to accomplish these goals.

II PROJECT MANAGEMENT PLAN

A. Technical Approach

The technical approach employed for this investigation will build upon the knowledge gained from previous investigations at the site. Historical analyses of multiple on-site wells in conjunction with soil gas surveys of the site and surrounding areas have been utilized to formulate an estimate of the limits of the contaminant plume in the upper flow zone. Based on these estimates, Sparton will select off-site locations to install additional monitor wells in an effort to "bracket" the leading edge of the plume.

Sparton will coordinate closely with EPA and the New Mexico EID in the selection of potential locations for these wells. Under the provisions of the Consent Order Sparton will attempt to "bracket" the leading edge of the plume within 300 feet.

Sparton will utilize analytical data from four recently installed lower flow zone wells (MWs 29-32) to determine whether significant levels of contamination exist in the lower flow zone. Should significant levels of contamination be detected in these wells, Sparton will install additional wells in the lower section of the lower flow zone in close proximity to MWs 29-32, and will initiate a program to define the leading edge of the plume in the lower flow zone

by installing off-site wells in the downgradient direction of the groundwater flow. Again, Sparton will coordinate closely with EPA and EID in the selection of potential locations for these off-site wells.

The upper flow zone off-site wells will be installed with a hollow-stem hole auger rig. When the hole depth or drilling conditions exceed the capabilities of the auger rig, a rotary rig will be used to install the remaining hole or holes.

The auger drilled well(s) will be installed as follows:

- Equipment Set-Up

  Prior to the set-up of the drilling rig on the prospective well site, all underground utilities will be located to assure that the borings would not encounter any buried power, gas, or telephone lines. Additionally, the drill rig and all drilling equipment will be cleaned with a high pressure steam cleaner prior to the start up of drilling and between each of the borings to remove any material which could contaminate the well.

- Drilling and Soil Sample Collection

  Boring will be conducted using a Central Mining Equipment (CME) 55 hollow-stem auger drilling rig. The boring will be advanced using 7.5-inch-diameter hollow-stem augers. Soil

samples will be collected with a 60-inch continuous sampler (3-inch O.D., 2.50-inch I.D.), that extends below the drill bit and is driven downward by the weight of the rig. The boring will advance about seven feet below the water table or to the top of the aquitard between the upper and lower flow zones whichever is less. Soil samples will be obtained from the saturated zone above the aquitard, and from the aquitard itself. These samples will be monitored for volatile organic vapors with a photoionization detector (PID) manufactured by HNu Systems, Inc. (Model 101, benzene referenced). Several readings will be taken on each sample and the highest reading will be recorded.

- Well Construction

The monitor wells will be constructed using 10 feet of 2-inch-diameter, 0.010-inch, continuous slot (wire wrapped), 304 stainless steel screen, 5.0 feet of stainless steel pipe above the screen, and 2-inch-diameter Schedule 40, flush joint threaded PVC riser pipe to the ground surface. Once the pipe and screen are in place, the hollow-stem auger will be pulled and the natural formation will be allowed to collapse around the well screen. A neat bentonite/cement grout will be placed from the top of the collapsed formation

to within one or two feet of the ground surface. A protective steel cover will then be placed around the well standpipe. The cover will be concreted in place.

- Well Development

  The wells will be developed by the surging technique using a surge block to create an inward and outward surging action on the formation. After surging, the well will be bailed to remove any sediments brought through the screen. This procedure will be repeated until essentially sediment-free water is produced. All development fluids and sediments will be disposed of according to the procedures for handling of drill cuttings and fluids.

- Handling of Drill Cuttings and Fluids

  Since no disposal is known to have taken place in the well locations, it is anticipated that the soil cuttings from the unsaturated zone will not be contaminated. However, all cuttings produced from the drilling and sampling procedures will be containerized in 55-gallon plastic drums. After completion of the monitoring well installation, the drums will be opened and the cuttings will be monitored with the PID. Any barrel of cuttings registering a reading on the PID

greater than a background reading taken from an empty barrel stored at the site under similar field conditions will be disposed of as hazardous waste. Any cuttings not registering a reading on the PID greater than background will be spread on the ground surface of the Sparton property.

The water produced from development of the wells will be stored in a tank and disposed of through the sanitary sewer as approved by the City of Albuquerque.

- Decontamination Procedures

  Drilling and sampling equipment will be cleaned with a portable, high-pressure steam cleaner prior to any field work and between each boring to prevent cross-contamination between the boreholes. Soil sampling tools will be decontaminated after each use. Prior to leaving the work site, the drilling and sampling equipment will be steam cleaned so that no contamination is carried off the site. Decontamination fluids and sediments will be disposed of according to the procedures for handling of drill cuttings and fluids.

The rotary drilled wells will be installed as follows:

- Equipment Set-Up

  Prior to the set-up of the drilling rig on the prospective well site, all underground utilities will be located to assure that the borings will not encounter any buried power, gas, or telephone lines. Additionally, all drilling equipment will be cleaned with a high-pressure steam cleaner prior to the start up of drilling activities and between each of the borings to remove any material which could contaminate the well.

- Drilling and Soil Sample Collection

  Boring will be conducted with a 1,000-foot or larger rotary wash drill rig. The rotary wash drilling process involves the use of drilling fluid to suspend and remove drill cuttings obtained by the advancement of a tri-cone drill bit into unconsolidated formations. A bentonite and water mixture will be used as a drilling fluid.

  The borings will be advanced using a 10-inch-diameter tri-cone drill bit to within approximately 5 feet of the zone to be screened. A 6-5/8-inch-diameter steel surface casing will then be installed from the surface to the bottom of the borehole. Grout will then be placed around the casing and

allowed to flow beneath and up into the casing about two feet. The grout will be allowed to set overnight. The following day, the old drilling fluid will be replaced and the boring will be drilled to the desired depth using an 5-3/4-inch-diameter tri-cone drill bit and new drilling fluid. Upon reaching completion depth, the drilling fluid will be thinned to allow placement of the screen, casing, and sand filter pack.

This procedure should prevent contamination of the saturated zone should the unsaturated zone contain contaminants.

Samples of the formations encountered during drilling will be obtained by collecting cuttings suspended in the drilling fluid. Additional data will be obtained by noting the rate and ease of drilling penetration.

- Well Construction

Following completion of each boring, a monitoring well will be installed using 2-inch Schedule 40, flush-jointed PVC casing. Ten feet of 2-inch, 0.010-inch continuous slot (wire wrap) 304 stainless steel well screen and five feet of stainless steel casing above the screen will be installed beneath the PVC casing. The screen will extend about seven feet below the water table or to the aquitard whichever is less.

Stainless steel shall extend above the potential highest water level in the well.

Specially graded (10-20) sand will be placed in the annular space from the bottom of the boring to a minimum of five feet above the top of the well screen. Four to six inches of fine sand will be placed above the filter pack. The remainder of the annulus will then be grouted with a cement/bentonite grout to preclude any surface water from entering the well. A protective steel casing with a locking cap will be placed over the top of each well. The protective casing will be concreted in place.

- Well Development

  Each well will be developed by the surging technique using a surge block to create an inward and outward surging action on the formation. After surging, the well will be bailed to remove sediments brought through the screen. These procedures will be repeated until essentially sediment-free water is produced. All development fluids and sediments will be disposed of according to the procedures for handling of drill cuttings and fluids.

- Handling of Drill Cuttings and Fluids

  Cuttings from the drilling activities will be allowed to settle out of the drilling fluid and will be containerized in 55-gallon plastic drums. The cuttings will then be scanned with the PID to determine if any contamination is evident.

Any cuttings indicating a reading on the PID greater than background will be disposed of as hazardous waste. The remainder of the cuttings will be spread evenly on the ground surface of the Sparton property.

The drilling fluid and water produced from the development of the monitoring wells will be stored in a tank and disposed of through the sanitary sewer as approved by the City of Albuquerque.

- Decontamination Procedures

  Drilling equipment will be cleaned with a portable, high pressure steam cleaner prior to any field work and between each boring to prevent cross-contamination between the boreholes. Prior to leaving the work site, the drilling equipment will be steam cleaned so that no possible contamination will be carried off the site. Decontamination fluids and sediments will be disposed of according to the procedures for handling of drill cuttings and fluids.

Analytical parameters to be tested initially in the on-site monitor wells, for both upper and lower flow zone wells, are shown in Table 1. Two rounds of sampling and analyses for this suite of parameters will be conducted within a 60-day period. Once this data has been reviewed, Sparton will propose to EPA for their approval a

TABLE 1

Analytical Parameters

- Volatile Organic Compounds
- (EPA Method 8240)

- Total Metals (Appendix IX)

  Antimony
  Arsenic
  Barium
  Beryllium
  Cadmium
  Chromium (total)
  Cobalt
  Copper
  Lead
  Mercury
  Nickel
  Selenium
  Silver
  Thallium
  Tin
  Vanadium
  Zinc

- Nitrate as Nitrogen
- Ammonia as Nitrogen
- Total Kjeldahl Nitrogen
- Chloride
- Sulfate
- Fluoride
- Boron
- Manganese

subset of these parameters to be used as indicator parameters for future quarterly monitoring of the on-site wells and for off-site monitor well plume location determinations.

Analytical data from the various wells will be compared to the New Mexico groundwater quality standards for determination of the leading edge of the contaminant plume. These standards are shown in Table 2.

B. Schedules

Sparton has completed the installation of the on-site upper and lower flow zone monitor wells required in the Consent Order. The initial sampling and analyses of these wells will be conducted within the time frame stipulated in the Consent Order.

Sparton has negotiated an access agreement with the City of Albuquerque to allow the placement of the initial set of off-site upper flow zone wells in the city's right-of-way along Irving Boulevard to the south and southwest of the Sparton facility. We anticipate installation of these wells in early 1989.

TABLE 2

New Mexico Groundwater Quality Standards

Parameter	Maximum Concentration mg/l
Arsenic	0.1
Barium	1.0
Cadmium	0.01
Chromium	0.05
Lead	0.05
Mercury	0.002
Selenium	0.05
Silver	0.05
Nitrate as Nitrogen	10.0
Chloride	250
Sulfate	600
Fluoride	1.6
Boron	0.75
Manganese	0.2
Benzene	0.01
Toluene	0.75
Carbon Tetrachloride	0.01
1,2-Dichloroethane	0.01
1,1-Dichloroethylene	0.005
1,1,2,2-Tetrachloroethylene	0.02
1,1,2-Trichloroethylene	0.1
Ethylbenzene	0.75
Total Xylenes	0.62
Methylene Chloride	0.1
Chloroform	0.1
1,1-Dichloroethane	0.025
1,1,1-Trichloroethane	0.06
1,1,2-Trichloroethane	0.01
1,1,2,2-Tetrachloroethane	0.01
Vinyl Chloride	0.001

Schedules for installation of additional off-site wells will depend on analytical results from earlier wells and the time required to negotiate any needed site access agreements. These well installations will proceed in a timely manner, but specific schedules are, at this time, indeterminate.

C. Project Management

This project is being directed by Mr. B. H. Thompson, Vice President and Treasurer of Sparton Corporation, and Mr. R. D. Mico, Vice President and General Manager of Sparton Technology, Inc. Mr. Mico will serve as Sparton's Project Coordinator. Sparton has retained Harding Lawson Associates (HLA) and Metric Corporation as consultants to assist them in this effort. HLA will function as the lead consultant, with Metric Corporation providing expertise and support in geological, hydrogeological, and well installation areas.

1. Harding Lawson Associates

HLA has provided comprehensive engineering and waste management services to commercial, industrial, and government clients for more than 30 years. HLA's services include geotechnical engineering, hazardous and solid waste management, hydrogeology, hydrology, geology, geophysics, geochemistry, chemical engineering, remedial and construction engineering, civil engineering, soils

engineering testing, regulatory compliance, and risk assessment. HLA employs more than 600 people, two-thirds of whom are technical professionals.

HLA has considerable experience conducting remedial investigations at Superfund and similar sites in accordance with requirements of the NCP, CERCLA, SARA, and state regulations. HLA has worked for both regulatory agencies and private sector clients and routinely develops and assesses the feasibility of potential remedial actions.

HLA's comprehensive services in hazardous waste management range from initial site characterization through remedial action design, implementation, and post-implementation monitoring. The firm also has extensive experience serving as a client liaison to regulatory agencies and in developing and implementing strategies to lead the project throughout the complicated regulatory process.

HLA has conducted investigations at sites throughout the United States, investigating contamination in all media: soils, sediments, groundwater, surface water, and air. Contaminants present at these sites have included metals, volatile organics, and other organic compounds such as solvents, pesticides, PCBs, and petroleum derivatives. HLA's highly trained professionals have studied abandoned uncontrolled hazardous waste sites, landfills, hazardous

waste disposal facilities, mining-related sites, manufacturing and industrial complexes, and military bases. These sites range in size from under five acres to more than 25 square miles.

The firm's hazardous waste management staff includes engineers, hydrogeologists, geochemists, geologists, hydrologists, geophysicists, and specialists in waste management, environmental assessment, air quality, industrial hygiene, and regulatory compliance. HLA has capabilities in process engineering and treatment, environmental and public health, health and safety planning and implementation, and quality control/quality assurance.

Potential remedial actions HLA has evaluated included:

- Aquifer restoration, including groundwater extraction, treatment, and reinjection;
- Physical and hydrologic barriers, including slurry walls, grout curtains, subsurface drains, and well pumping for groundwater flow containment;
- Engineered covers and caps;
- Complete or partial excavation and disposal at existing or on-site engineered and permitted landfills;
- Surface water contamination remediation, including source removal, channel modifications, isolation from other surface water systems, and dredging contaminated sediments;
- Gas collection and abatement systems;
- Venting (extraction) of volatile organics in soils;

- Waste treatment, neutralization, and fixation;
- Incineration of solids and liquids;
- Leachate extraction and treatment; and
- Alternative water supply and/or institutional controls such as land use planning.

HLA's experience has included data collection planning, sampling of contaminated media, data analysis, screening of remedial alternatives, quality assurance and quality control (QA/AC), assembly of alternatives, detailed analysis of alternatives, and identification of applicable or relevant and appropriate requirements (ARARs).

2. Metric Corporation

Since its founding in 1980, Metric Corporation has compiled an extensive record of scientific and engineering accomplishments for industrial and governmental clients. Principally, Metric's accomplishments have focused on hydrologic investigations, design and installation of monitoring wells, aquifer testing, and groundwater monitoring. Metric has assisted mining, power, and other industrial companies in preparing plans and permit applications and guiding compliance under state and federal regulations, as well as evaluating and mitigating environmental problems associated with industrial operations.

Metric Corporation maintains equipment for the planning, design, drilling, completion, development, and monitoring of wells. The firm owns and operates a portable tripod-mounted driving rig, a pickup-mounted driving/bailing rig, and a CME-55 rotary/auger drill rig equipped with a 3-1/4-inch I.D. hollow-stem auger for installation of monitor wells. The firm also has split spoon and continuous sampling tools for material retrieval from drill holes. Metric maintains steam cleaning equipment for decontamination of tools and completion materials. Generators, sounders, pumps, bailers, and other equipment are maintained by the firm for aquifer testing and monitoring. The firm also maintains four-wheel drive vehicles and a backhoe to support field operations.

D. Budgets

A large proportion of the tasks associated with this effort have already been completed. Numerous monitor wells have been installed on site, groundwater samples have been gathered and analyzed, and a groundwater recovery and treatment system has been designed and constructed.

Remaining tasks to define the limits of the contaminant plume generally include well installations, chemical analyses, and consultant efforts to analyze the data and prepare required reports. The level of effort required to complete the RFI will depend on the

findings at each step of the investigation. The total cost associated with these efforts is, therefore, not determinate at this point with any reasonable degree of accuracy.

III DATA COLLECTION AND QUALITY ASSURANCE PLAN

A. Introduction

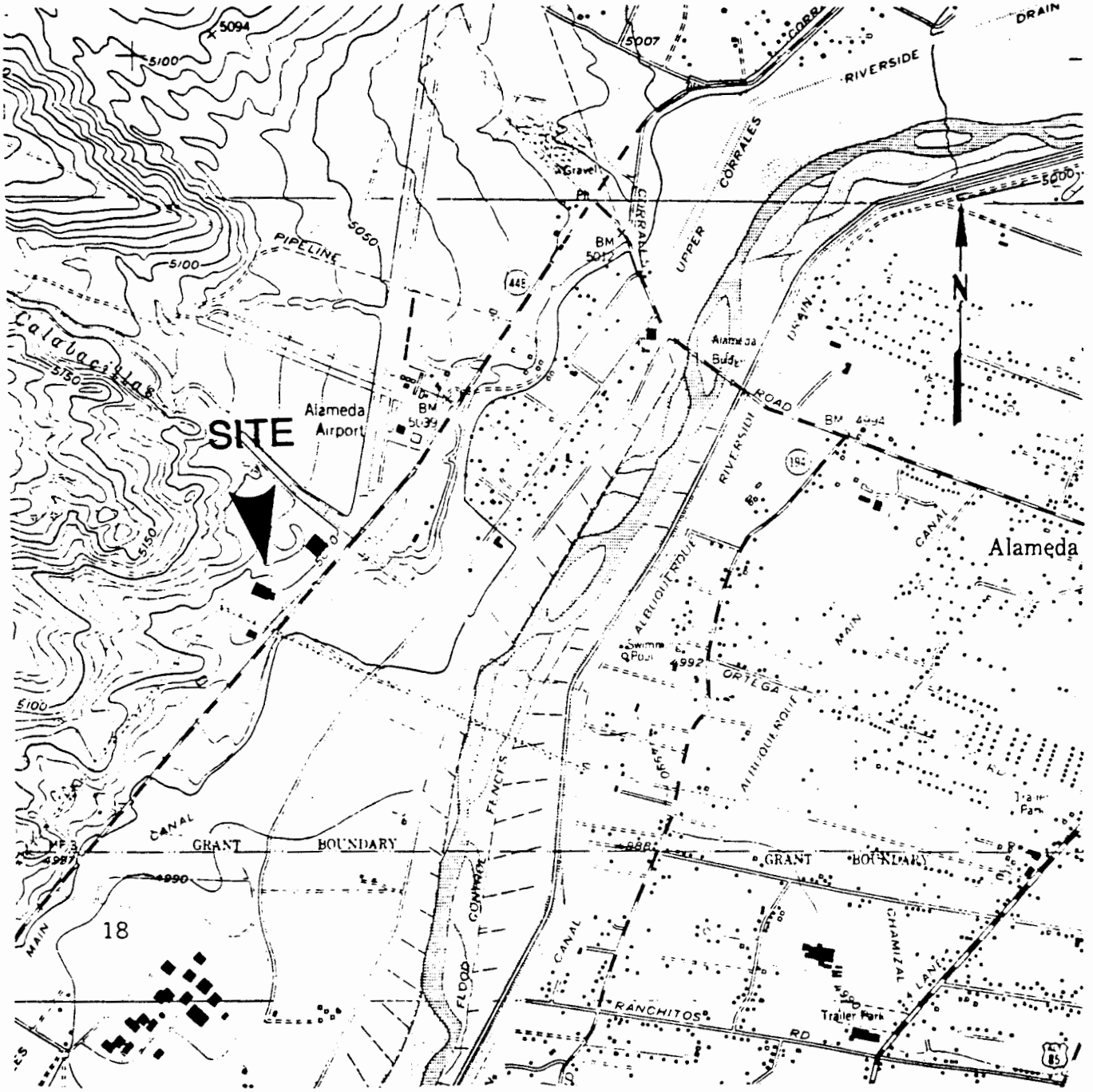
This section of the RFI has been developed to describe the procedures for gathering the data needed to locate the lateral limits of the contaminated plume in the upper flow zone and to characterize the degree of contamination in the lower flow zone of the Coors Road facility.

B. Project Description and Objective

The Sparton Technology facility, stored hazardous wastes on site through 1980 in two surface impoundments and a concrete sump. The wastes emanated from plating operations and contained metals and organic solvents. A site location map is shown in Figure 1. Efforts to date have been focused on defining the contaminant plume in the upper flow zone. The objectives of this plan are to define the procedures for locating the lateral limits of the contaminant plume in the upper flow zone, to determine whether significant levels of contamination exist in the lower flow zone, and if so, to define the leading edge of the contaminant plume in this lower flow zone.

C. Field Monitoring Activities and Procedures

The field monitoring activities are designed to develop information necessary to provide data of adequate technical content to identify the nature and extent of contamination. Environmental media



1000 0 1000 2000 FEET

CONTOUR INTERVAL 10 FEET

Ref: U.S.G.S. Topographic Map, Los Griegos, N. Mex., 7.5 Quadrangle.

Harding Lawson Associates
Engineers, Geologists & Geophysicists

SITE LOCATION PLAN

Sparton Technology Inc.
Coors Road Facility
Albuquerque, New Mexico

FIGURE **1**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
ES	6310,039.12	[illegible]	11/88		

OGC-003291

to be investigated include only groundwater. Sample collection activities for this media have been designed to ensure that the sampling techniques used and the location of samples collected are representative of environmental conditions at the site.

1. Intended Data Use

Intended data usage for data gathered during the groundwater monitoring field activities are for determination of the limits of the contaminant plume, and for design of remediation measures. The selection of analytical methods for analyzing groundwater are consistent with the sample collection activity and the intended data usage. Details of the sample collection activities are specified in this plan.

2. Sample Media, Analytical Parameters, and Sampling Frequency

Environmental samples collected during the groundwater monitoring activities will have chemical analyses performed on them for assessment of the nature and extent of contamination.

The only media to be sampled as part of the this effort is groundwater. Table 3 defines the list of target analyses to be measured. Required sample containers, sample preservation, maximum holding times, filling requirements, and packaging and shipping instructions for samples collected during the groundwater monitoring activities are summarized in Table 4.

TABLE 3

Analytical Parameters

- Volatile Organic Compounds
- (EPA Method 8240)

- Total Metals (Appendix IX)

  Antimony
  Arsenic
  Barium
  Beryllium
  Cadmium
  Chromium (total)
  Cobalt
  Copper
  Lead
  Mercury
  Nickel
  Selenium
  Silver
  Thallium
  Tin
  Vanadium
  Zinc

- Nitrate as Nitrogen
- Ammonia as Nitrogen
- Total Kjeldahl Nitrogen
- Chloride
- Sulfate
- Fluoride
- Boron
- Manganese

TABLE 4

Required Containers, Preservation Techniques, and Holding Times

Name	Container[1]	Preservation	Maximum holding time
Bacterial Tests:			
Coliform, fecal and total	P, G	Cool, 4°C, 0.008% $Na_2S_2O_3$	6 hours
Fecal streptococci	P, G	Cool, 4°C, 0.008% $Na_2S_2O_3$	6 hours
Inorganic Tests:			
Acidity	P, G	Cool, 4°C	14 days
Alkalinity	P, G	Cool, 4°C	14 days
Ammonia	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Biochemical oxygen demand	P, G	Cool, 4°C	48 hours
Bromide	P, G	None required	28 days
Biochemical oxygen demand, carbonaceous	P, G	Cool, 4°C	48 hours
Chemical oxygen demand	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Chloride	P, G	None required	28 days
Chlorine, total residual	P, G	None required	Analyze immediately
Color	P, G	Cool, 4°C	48 hours
Cyanide, total and amenable to chlorination	P, G	Cool, 4°C, NaOH to pH>12, 0.6g ascorbic acid	14 days
Fluoride	P	None required	28 days
Hardness	P, G	HNO_3 to pH<2, H_2SO_4 to pH<2	6 months
Hydrogen ion (pH)	P, G	None required	Analyze immediately
Kjeldahl and organic nitrogen	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Metals:			
Chromium VI	P, G	Cool, 4°C	24 hours
Mercury	P, G	HNO_3 to pH<2	28 days
Metals, except chromium VI and mercury	P, G	HNO_3 to pH<2	6 months
Nitrate	P, G	Cool, 4°C	48 hours
Nitrate-nitrite	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Nitrite	P, G	Cool, 4°C	48 hours
Oil and grease	G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Organic carbon	P, G	Cool, 4°C, HCl or H_2SO_4 to pH<2	28 days
Orthophosphate	P, G	Filter immediately, cool, 4°C	48 hours
Oxygen, Dissolved Probe	G Bottle and top	None required	Analyze immediately
Winkler	do	Fix on site and store in dark	8 hours
Phenols	G only	Cool, 4°C, H_2SO_4 to pH<2	28 days
Phosphorus (elemental)	G	Cool, 4°C	48 hours
Phosphorus, total	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Residue, total	P, G	Cool, 4°C	7 days
Residue, Filterable	P, G	Cool, 4°C	7 days
Residue, Nonfilterable (TSS)	P, G	Cool, 4°C	7 days
Residue, Settleable	P, G	Cool, 4°C	48 hours
Residue, volatile	P, G	Cool, 4°C	7 days
Silica	P	Cool, 4°C	28 days
Specific conductance	P, G	Cool, 4°C	28 days

TABLE 4
(continued)

Required Containers, Preservation Techniques, and Holding Times

Name	Container[1]	Preservation	Maximum holding time
Sulfate	P, G	Cool, 4°C	28 days
Sulfide	P, G	Cool, 4°C, add zinc acetate plus sodium hydroxide to pH>9	7 days
Sulfite	P, G	None required	Analyze immediately
Surfactants	P, G	Cool, 4°C	48 hours
Temperature	P, G	None required	Analyze
Turbidity	P, G	Cool, 4°C	48 hours
Organic Tests:			
Purgeable Halocarbons	G, Teflon-lined septum	Cool, 4°C, 0.008% $Na_2S_2O_3$	14 days
Purgeable aromatic hydrocarbons	G, Teflon-lined septum	Cool, 4°C, 0.008% $Na_2S_2O_3$, HCl to pH2	14 days
Acrolein and acrylonitrile	G, Teflon-lined septum	Cool, 4°C, 0.008% $Na_2S_2O_3$, Adjust pH to 4-5	14 days
Phenols	G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$	7 days until extraction, 40 days after extraction
Benzidines	G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$	7 days until extraction
Phthalate esters	G, Teflon-lined cap	Cool, 4°C	7 days until extraction 40 days after extraction
Nitrosamines	G, Teflon-lined cap	Cool, 4°C, store in dark, 0.008% $Na_2S_2O_3$	40 days after extraction
PCBs, acrylonitrile	G, Teflon-lined cap	Cool, 4°C	40 days after extraction
Nitroaromatics and isophorone	G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$ store in dark	40 days after extraction
Polynuclear aromatic hydrocarbons	G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$ store in dark	40 days after extraction
Haloethers	G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$	40 days after extraction
Chlorinated hydrocarbons	G, Teflon-lined cap	Cool, 4°C	40 days after extraction
TCDD	G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$	40 days after extraction
Total organic halogens	G, Teflon-lined cap	Cool, 4°C, H_2SO_4 to pH<2	7 days
Pesticides Tests:			
Pesticides	G, Teflon-lined cap	Cool, 4°C, pH 5-9	40 days after extraction
Radiological Tests:			
Alpha, beta and radium	P, G	HNO_3 to pH<2	6 months

Prior to sampling both the on-site and off-site wells, the static water levels will be measured. The on-site wells will then be purged (3 to 5 casing volumes or until the well goes dry) and sampled with a teflon bladder stainless steel pump. These pumps are on a dedicated basis for the on-site wells. The off-site wells will be purged (3 to 5 casing volumes or until the well goes dry) and sampled with a stainless steel bailer. Bailers used will be decontaminated by a high-pressure steam cleaner after each use. Bailer rope will be replaced after each use. If the well is bailed dry, an appropriate recharge time (usually 2 to 4 hours) must be allowed before a well can be sampled. Sampling records will be entered in a log and will include the well number, static water level, date, time, and the name of the person sampling. Records will also indicate the suite of parameters tested, preservatives used, and analytical laboratory(ies) used.

Sample containers will be prepared by the analytical laboratory designated to receive the samples. Containers will be washed according to methods presented in the EPA Handbook for Analytical Quality Control in Water and Wastewater Laboratories, Section 4.6.

Chemical preservatives will be added to containers by the analytical laboratory according to the guidelines of 40 CFR 136. The VOC sample containers will be completely filled so as to minimize

unnecessary exposure to entrapped air. Immediately after labeling, the sample will be cooled by packing with ice in insulated coolers. They will be delivered to the analytical laboratory within 24 hours of collection.

At the time of collection, each sample shall be labeled with the well number, the date, and the sampler's initials. The samples will be handled by as few people as possible. Generally, the sampler will maintain personal, physical possession of the samples until delivery to the analytical laboratory. In this case, a laboratory receipt will serve as evidence of adequate control. If any transfers of custody must be made prior to delivery, a Chain-of-Custody document will be used.

All analytical methods will conform to the procedures approved by the U.S. Environmental Protection Agency (EPA) as documented in SW-846.

On-site monitor wells will be sampled and analyzed according to the stipulations set forth in the consent order. Off-site monitoring wells will be sampled upon completion and development and resampled within 30 days. Construction and drilling of additional off-site wells will be contingent upon these findings.

In addition, the static water level measurements recorded on each sampling occasion will be evaluated annually to detect any possible changes in the direction of the hydraulic gradient. If there are any such changes, the locations of existing monitoring wells will be studied to determine if any additional wells would be needed.

D. Sample Chain-of-Custody Procedures

This section describes standard operating procedures for sample custody during the RFI. Sample custody procedures will be followed through sample collection, transfer, analysis, and ultimate disposal. The purpose of these procedures is to ensure that sample integrity is maintained during sample collection, transportation, and storage prior to analysis. Sample custody is divided into field procedures and laboratory procedures as described below.

1. Field Custody Procedures

Samples will be handled by as few people as possible. Each sample will be properly labeled and sealed immediately after collection. The field sampler is personally responsible for custody of the collected samples until they are properly transferred to the laboratory.

Sample identification documents will be carefully prepared to maintain identification and chain-of-custody records and to control sample disposition. Forms will be filled out in waterproof ink.

Sample identification documents that will be utilized during the RFI include:

- Sample labels;
- Field logbook;
- Chain-of-custody forms; and
- Custody seals.

Sample labels are necessary to prevent misidentification of samples. Preprinted sample labels will be provided by the ENSECO laboratory. Where necessary, the label will be protected from water and solvents with clear label protection tape. Each label will contain the following information:

- Sequential label identification number;
- Name of facility;
- Date and time of collection;
- Sample number (fictitious number if sample is a field duplicate);
- Preservative (if necessary);
- Analysis requested; and
- Media type.

Information pertinent to a field survey, measurements, and/or sampling must be recorded in a bound logbook. Entries in the logbook may include:

- Name and title of author, date and time of entry, and physical/environmental conditions during field activity;
- Location of sampling or measurement activity;
- Name(s) and title(s) of field crew;
- Name(s) and title(s) of site visitors;
- Type of sampled or measure media;
- Sample collection or measurement method(s);
- Number and volume of sample(s) taken;
- Description of sampling point(s);
- Description of measuring reference points;

- Date and time of collection or measurement;
- Sample identification number(s);
- Sample preservative (if necessary);
- Sample distribution (e.g., laboratory);
- Field observations/comments;
- Field measurement data (pH, conductivity);
- References for all maps and photographs of sampling site(s); and
- Sample documentation including dates and methods of sample shipment and bottle lot numbers.

The chain-of-custody record for each sample will originate at the Sparton Technology site, where samples will be prepared for shipment to the selected laboratory. Sparton will be responsible for completion of the chain-of-custody record throughout the sampling program until the samples have been shipped or delivered to the laboratory. The chain-of-custody record will be continued through sample preparation and shipment to the laboratory. This record will be completed in order to establish the documentation necessary to trace sample possession from sample collection through sample analysis. The sampling portion of the chain-of-custody record will contain:

- List of sampling team members;
- Sample number;
- Signature of sampler or bottle preparer;
- Date and time of sample collection;
- Sample depth;
- Media type;
- Signatures of persons involved in the chain-of-possession;
- Inclusive dates of possession; and
- Preservation.

The laboratory portion of the form should be completed by laboratory personnel and will contain:

- Name of person receiving the samples;
- Laboratory sample number;
- Date of sample receipt by the laboratory;
- Analyses requested; and
- Sample condition and temperature (recorded in "Remarks").

Samples will always be accompanied by a chain-of-custody record. When transferring samples, the individuals relinquishing and receiving the samples will sign, date, and note the time on the chain-of-custody record. Sample bottles will be properly packaged for shipment and will be dispatched to the field for sample collection or to the laboratory for analysis. The method of shipment, courier name(s), and other pertinent information will be entered in the chain-of-custody record.

Custody seals will be affixed to each package (ice chest) of sample containers prior to shipment. These seals will go over opposite edges of the package. The purpose of the seal is to prevent tampering of the samples while in transit.

The samples will be shipped via overnight courier to the laboratory. Samples will be packaged in approved Department of Transportation (DOT) containers with adsorbant material. All outside labeling and required documents will be filled out in accordance with DOT and shipper requirements.

2. Laboratory Custody Procedures

A sample custodian will be designated by the selected laboratory to receive shipment of the samples from the field. The custodian will accept custody of the samples shipped from the field to the laboratory and will verify that the information on the sample label matches the information of the chain-of-custody record(s). Pertinent information relating to shipment, pickup, and courier will also be verified on the chain-of-custody record(s). The custodian will enter the appropriate data from the chain-of-custody record into the laboratory sample tracking system, using the sample number from the sample label or assigning a unique laboratory number to each sample. The custodian will transfer the sample(s) to the proper analyst(s) or will store the sample(s) in the appropriate secure area.

Laboratory personnel are responsible for custody of sample from the time they are received until the sample is exhausted. All data sheets and laboratory records will be retained as part of the documentation. The laboratory will be asked as part of its report to include the following:

- Instrument calibration data;
- Matrix spike/duplicate information;
- Time and date of analysis;
- Surrogate spike recovery data; and
- Chromatograms of analysis.

3. Corrections to Documentation

Original data recorded in field logbook, chain-of-custody records, and other forms will be written in waterproof ink. None of these documents will be altered, destroyed, or discarded even if they are illegible or contain inaccuracies that require a replacement document.

If an error is made on a document assigned to one individual, that individual will make the correction by drawing a line through the error, entering the correct information, and initialing and dating the change. The erroneous information will not be obliterated. Any additional error(s) discovered on a document will be corrected by the person who made the entry. All corrections will be initialed and dated by the author.

E. Internal Quality Control Procedures

Internal quality control (QC) procedures are designed to ensure and document the overall quality of data. Two types of QC checks (project and laboratory) will be employed to evaluate the performance of the laboratory's analytical procedures. The QC checks represent the system checks and controlled samples introduced into the sample analysis stream that are used to validate the data and to calculate the accuracy and precision of the chemical analysis program.

Laboratory analysis will be performed by ENSECO's Rocky Mountain Analytical Laboratory in Denver, Colorado, for which a Statement of Qualifications has been provided in Attachment 1.

Project QC checks are accomplished by submitting controlled samples that are introduced to the laboratory from the field. The types of samples to be used are field blanks and trip blanks.

1. Laboratory Quality Control Checks

Laboratory QC checks are accomplished through the use of system checks and QA/QC samples that are introduced into the sample analysis stream. Laboratory system checks and QA/QC procedures are included in Attachment 2.

2. Project Quality Control Checks

The level and types of project QC check samples that will be introduced into the analytical program for groundwater are described below.

The following project QC check samples will be submitted for analyses to ensure and document groundwater data quality:

Blanks:

- Field blank
- Trip blank

The field blank will consist of a sample of deionized water collected during the sampling activities in a sample container prepared by the laboratory. The purpose of this sample is to detect field procedures which result in erroneous analytical results. The trip blank will consist of a sample of deionized water shipped from the laboratory along with the empty, prepared sample containers. This sample will be returned to the laboratory for analysis to detect any shipping and handling factors which may have led to cross-contamination of the field samples.

F. Procedures for QA/QC Assessment of the Chemical Data

This section summarizes QA/QC procedures for assessing the quality of chemical data generated during the groundwater monitoring.

The data validation procedures will be used by the QC Managers or designated representatives for evaluating results of laboratory system checks and project laboratory QC samples that are submitted to the analytical laboratory from the field or generated internally by the laboratory. The purpose of implementing these procedures is to verify that the chemical data generated during the RFI is accurate, precise, and complete and therefore representative of site conditions.

1. Procedures for Assessing Data Accuracy, Precision, and Completeness

Chemical data derived from the groundwater sampling will be assessed for accuracy, precision, and completeness for both the

laboratory analytical program and field sample collection activities. The primary goal of the program is to ensure that the data generated during the RFI are representative of environmental conditions at the site. Review and evaluation of QA/QC data from the lab will be conducted by HLA's Project Manager upon completion as well as by representatives of Sparton Technology. In addition, review and evaluation of the field blanks and trip blanks will also be conducted by HLA's Project Manager and Sparton Technology upon completion and implementation of the blanks. If problems arise and the data are found to deviate from previous analyses or surrounding conditions, the data will be annotated. Sample recollection and analysis will be used only in extreme cases of QC problems (see Corrective Actions, Section G).

G. Corrective Action Procedures

This section describes the field and laboratory corrective action program developed for the RFI and project personnel responsible for initiating the corrective action and individuals responsible for approving corrective action, if necessary.

1. Field Situations

The need for corrective action will be identified as a result of the field audits previously described. If problems become apparent that are identified as originating in the field, immediate corrective action will take place. If immediate corrective action does not resolve the problem, appropriate personnel will be assigned to

investigate and evaluate the cause of the problem. Once a corrective action is implemented, the effectiveness of the action will be verified such that the end result is elimination of the problem.

2. Laboratory Situations

The need for corrective action resulting from QA audits will be initiated by the laboratory QA Manager in consultation with HLA's Project Manager. Corrective action may include, but is not limited to:

- Reanalyzing the samples, if holding-time criteria permit;
- Evaluating and amending sampling and analytical procedures;
- Accepting data with an acknowledged level of uncertainty; and
- Resampling and analyzing.

In the event that the above corrective actions are deemed unacceptable, an alternate laboratory will be selected to perform necessary or appropriate verification analyses.

Any equipment and/or instrument malfunctions will require immediate corrective action. The actions taken will be noted in laboratory logbooks. These on-the-spot corrective actions will be applied on a daily basis if necessary.

The need for long term corrective action may be identified by standard QC procedures, control charts, and/or performance audits. Any procedural or data quality problem that cannot be solved by immediate corrective action falls into a long-term category.

The essential steps in a long-term corrective action system are:

- Identification and definition of the problem;
- Investigation and determination of the cause of the problem;
- Determination and implementation of a corrective action to eliminate the problem; and
- Verification that the corrective action has eliminated the problem.

Documentation of the problem is important in corrective action. In general, the respective QA Manager will investigate the situation and determine who will be responsible for implementing the corrective action.

IV DATA MANAGEMENT PLAN

A. Objectives

The purpose of this Data Management Plan is to describe how the data and documents from the RFI activities will be managed, distributed, and preserved.

B. Data Overview

Technical data generated during the RFI will include both field data, analytical data, and supporting documentation.

Field data includes the raw data and supporting documentation generated from field investigations or activities and may include the following:

- Field notebooks;
- Field instrument readings;
- Field log of borings;
- Field well completion data;
- Well test data;
- Groundwater sampling forms;
- Sample tags;
- Chain-of-custody forms;
- Liquid level measurements;
- Maps; and
- Photographs.

Analytical documentation includes data from chemical and physical analyses of field samples conducted during this RFI. This documentation may include the following:

- Raw and reduced data summaries of chemical analyses of environmental samples;
- Quality assurance data for chemical analyses; and
- Physical test results from analyses of solid samples.

Data analysis documentation will include the results of technical evaluation and interpretation conducted during this RFI. This documentation may include the following:

- Maps;
- Geologic sections;
- Analysis/calculations; and
- Computer modeling data

C. Data Management

Sparton and its consultants will maintain a data record which will contain copies of all raw field data. These data will be available for inspection by EPA and EID, and may be included, if appropriate, in reports generated during the course of this RFI.

Boring logs and well completion diagrams will be developed for all new monitor wells as the wells are installed.

Chemical analyses from the analytical laboratory will be managed electronically on an IBM-compatible personal computer utilizing the R-Base System V database software. Report formats will be developed for data printouts which will present the data in an easy-to-read tabular summary.

An area map will be developed showing the Coors Road facility and the surrounding area. This map will include the location of all existing monitor wells. New off-site wells will be added as the wells are installed.

Copies of this master map will be used to show groundwater contamination contours based on the analytical data from the monitoring wells. These contour maps will be updated as new groundwater data is developed.

The groundwater analytical data and the maps will be used to evaluate potential plume movement and location, and to select potential sites for additional monitor wells, if necessary.

D. Information Transfer

Copies of all boring logs, well installation diagrams, laboratory analytical data and summaries, well location maps, groundwater contaminant contour maps, reports, and any additional pertinent documents will be included in the monthly reports to EPA and EID.

Copies of all electronically managed data will be made available to EPA and EID on 5.25-inch floppy discs upon request. This data can be exported from the R-Base System V software into a variety of formats to facilitate use by other software systems.

V HEALTH AND SAFETY PLAN

The Health and Safety Plan is included in Attachment 3.

VI COMMUNITY RELATIONS PLAN

A. Introduction

This Community Relations Plan (CRP) has been prepared by Harding Lawson Associates (HLA) for Sparton Technology, Inc. The activities presented will be implemented for the RCRA Facility Investigation (RFI) at the Sparton Facility in Albuquerque, New Mexico.

The objective of the community relations program is to provide public access to information concerning the Corrective Action Plan (CAP) for the Sparton Albuquerque Facility. The CRP will be updated as needed throughout the RFI. These activities will be conducted in cooperation and close coordination with the New Mexico Environmental Improvement Division, Hazardous Waste Bureau and the United States Environmental Protection Agency, Region VI (EPA).

The CRP plan is divided into the following sections:

1. Introduction
2. Community Notification of RCRA Facility Investigation and Corrective Measures Study
3. Public Information Repository
4. Sparton Project Contacts
5. Community Relations Plan Updates

E. Community Relations Plan Updates

As project activities progress, this plan will be revised, if necessary, to include additional tasks and/or activities to address changing community concerns.

LIST OF ATTACHMENTS

1. ENSECO Statement of Qualifications, Analytical Laboratory Services

2. ENSECO Quality Assurance Program Plan for Environmental Chemical Monitoring

3. Job Safety Plan

ATTACHMENT 1

ENSECO Statement of Qualifications
Analytical Laboratory Services

Rocky Mountain
Analytical Laboratory

Enseco Incorporated

Enseco

STATEMENT OF QUALIFICATIONS

ANALYTICAL LABORATORY SERVICES

July 1986

Enseco - Rocky Mountain Analytical Laboratory

4955 Yarrow Street
Arvada, Colorado 80002
303/421-6611

Facsimile: 303/431-7171

NOTICE:

Rocky Mountain Analytical Laboratory has finalized a merger with several other laboratories. Appendix A describes the capabilities of the new corporation, ENSECO. The resources of the corporation described in this appendix are currently available for any project.

INTRODUCTION

Rocky Mountain Analytical Laboratory (RMAL) provides analytical chemistry services to industry and government in a variety of technical areas, but specializing in the environmental field. Located near Denver, Colorado, RMAL's work is national, with well over 75% coming from outside the Rocky Mountain region. Analytical services for the investigation of environmental problems require technically advanced laboratory capabilities. RMAL has the facilities, staff, and experience to excel in solving both routine and highly challenging environmental problems with an approach which is both technically sound and cost effective.

The key factors to consider when comparing RMAL qualifications are summarized below:

- The laboratory facility is equipped with all of the instrumentation required to support virtually any type of environmental project, ranging from very large investigations which require a capability to analyze a high volume of samples to complex environmental issues which require a high degree of technical talent and specialized analyses.

- RMAL has assembled a large staff of experienced analysts with a high proportion of senior scientists. The senior staff contribute to the development of the environmental analysis field through active participation in conferences and trade organizations and have extensive experience in defining appropriate monitoring strategies to support environmental assessment projects.

- RMAL provides data of the highest quality at a reasonable cost and turnaround. The laboratory is the largest supplier of inorganic services to the EPA Superfund program (currently over 1,000 samples/month) and was in 1984 technically rated as the best organic laboratory participating in this program. In 1983, RMAL was the referee laboratory for EPA's dioxin analysis program.

- RMAL uses EPA published and approved methodology whenever possible. However, the laboratory has the capability of developing and applying new techniques when required and has been involved in the promulgation and evaluation of new methods, including EPA Methods 624, 625, 300.7, 8240, 8270 and 8330 as well as a set of methods developed specifically for the petroleum refining industry.

- RMAL has an extensive Quality Assurance and Control program (QA/QC) that exceeds EPA guidelines. This program is supported by a QA director and separate QC coordinators for organic and inorganic analyses. RMAL actively participates in laboratory accreditation and certification programs.

CORPORATE QUALIFICATIONS

Rocky Mountain Analytical Laboratory offers a broad range of analytical testing services in the environmental, energy, industrial problem solving, geochemical and forensic fields. RMAL has the staff, equipment and facilities to handle complex research problems. At the same time, RMAL routinely provides services for large scale monitoring projects that require both a cost effective approach and rapid data turnaround.

RMAL has comprehensive capabilities for solving complex environmental and hazardous waste analytical problems. RMAL provides the complete capability to support monitoring related to all EPA legislation including CERCLA (Superfund), FWPCA, TSCA, RCRA, SDWA, and the Clean Air Act. Whether a project requires extensive GC/MS characterization or GC or HPLC analysis of specific organic chemicals, ICP analysis for 28 metals simultaneously or merely the determination of BOD, RMAL routinely handles all these needs. RMAL has extensive experience with all samples commonly and uncommonly encountered - ground and surface waters, industrial wastes and oil, wastewaters, air and biological samples, sludges, sediments, solid and hazardous wastes.

RMAL not only has extensive experience with methods promulgated by the EPA, but in fact has participated in the development of many of these techniques. For example, RMAL was one of the participants in the interlaboratory validation of Methods 624 and 625, the GC/MS methods developed for priority pollutants. In fact, several of the staff, while in prior positions, helped develop the 600 methods for organics, including the isotope dilution GC/MS methods 1624 and 1625. More recently, RMAL was one of two laboratories in the country which performed analyses which led to the establishment of ion chromatography as an accepted EPA technique (EPA Method 300.7).

RMAL is a leader in establishing analytical methods to meet new and changing RCRA regulations. For example, RMAL's constructive criticism of various methods proposed for use by the petroleum refining industry for waste delisting and landfarm demonstration projects has resulted in a substantial improvement of the methods. RMAL also participated in an interlaboratory study of EPA Methods 8240, 8270 and 8330 for measuring Appendix VIII constituents for the Chemical Manufacturers Association. Currently, for the EPA Office of Solid Waste, RMAL is establishing method performance data for selected Appendix VIII constituents using Method 8270 and is also developing methods for determining reactive sulfide and cyanide.

Since 1981, RMAL has supported EPA-Superfund investigations for the analysis of hazardous wastes. RMAL has exceeded the requirements concerning workload, data quality and data turnaround on each contract. For example, EPA Contract No.

68-01-6430, to provide inorganic analytical services to support EPA Superfund activities required RMAL to analyze 2,400 samples over 30 months with a data turnaround of 30 days. RMAL, in fact, analyzed 4,000 samples over 22 months with an average data turnaround of 24 days. In addition, RMAL reported acceptable data for every parameter on every blind and quarterly performance evaluation sample, and passed every quarterly audit. To date, RMAL has analyzed over 12,000 inorganic samples for the EPA.

The primary area of work emphasis at RMAL over the past several years has been the analysis of solid and hazardous wastes as well as groundwaters from waste sites. RMAL routinely analyzes groundwaters for the three suites of parameters required by 40 CFR Part 265.92 - groundwater quality, suitability and indicators and wastes for the RCRA waste characteristics. More importantly, RMAL has extensive experience in the analysis of Appendix VIII hazardous constituents as well as the specific parameters designated for the petroleum refining industry.

RMAL has been under contract to the American Petroleum Institute RCRA Refinery Waste Characterization Task Force for over one and a half years. Activities to date have included the evaluation of the EPA program objectives and study approach, review of sampling procedures, evaluation and development of analytical methods and analysis of samples split with the EPA. As part of this process RMAL has critically reviewed several versions of the "Refining Handbook" and was instrumental in the development of the October, 1984 handbook. RMAL has continued to work with both API and EPA/OSW to define and establish appropriate methods for refinery wastes. In a second project, RMAL has prepared comments for API on the proposed rulemaking, October 1, 1984, by EPA to make SW-846 "Test Methods for Evaluating Solid Waste, Chemical/Physical Methods", methods mandatory for all RCRA Subtitle C testing.

RMAL has helped define the sample collection, preservation procedures and interpretation of data, related to analyzing a wide variety of wastes, landfarm soils, and groundwaters. In the process of performing these studies, RMAL has analyzed hundreds of refinery waste samples for the various EPA target lists of chemicals and currently has the largest base of data on organic chemicals found in refinery wastes.

RMAL participates in EPA biannual drinking water performance evaluation studies. The RMAL performance, which is excellent, is documented by RMAL's certification by the State of Colorado. Furthermore, as a result of contracts with the EPA Superfund Program for inorganics, GC-GC/MS organics and dioxin, RMAL must analyze double blind performance samples every 90 days as well. RMAL was considered the referee laboratory for the EPA dioxin monitoring program in Missouri in 1983. In August, 1984, RMAL was selected by the EPA as the best organic laboratory in the Superfund Program out of twenty-eight companies from across the country.

As a result of Superfund activities, an EPA audit team reviews the entire RMAL laboratory operation every 90 days. Sample handling and chain-of-custody, staff qualifications, analytical methods and quality control procedures are evaluated in depth. This review provides an invaluable independent verification of the quality of the RMAL analytical work product. In addition, RMAL staff have testified numerous times in criminal, civil, adjudicatory and administrative hearings.

STAFF QUALIFICATIONS

One of the principal elements which qualifies RMAL to effectively provide high quality analytical services is the experience of the staff. The laboratory is staffed by over 80 professionals. Three of the senior staff have Ph.D.'s. Most of the other laboratory staff have B.S. or M.S. degrees in chemistry or a related science. While these educational credentials provide a solid base, the diversity and depth of the staff's experience is more important in defining RMAL's capability. The staff work with state-of-the-art GC/MS, GC, LC, ICP and AA instrumentation, all of which are highly automated.

A key factor to RMAL's success has been the capabilities of both the laboratory supervisors as well as the senior managers. Table 1 presents the qualifications of these staff. Resumes for each individual are available on request.

Since 1980, RMAL has consistently developed and applied a variety of innovative and responsive management methods to call-ordered projects for many different governmental and industrial clients. The RMAL staff are organized functionally by technical discipline. While this approach results in the best quality data, large projects need additional coordination. RMAL solves this problem by assigning one senior staff member as a Technical Project Manager for every RMAL project to coordinate all external client contracts as well as direct all internal project activities. This approach results in RMAL efforts being more responsive to project objectives.

RMAL applies proven management control processes including planning and resource management as well as timely reporting and reviews. RMAL uses these processes to design procedures and control systems to monitor daily and long-term project activities, ensure the timely completion of contract deliverables, prepare and distribute reports of work, and discharge other project responsibilities. A comprehensive management approach allows us to retain the flexibility necessary to maintain a timely and responsive posture even in the face of evolving or unpredictable project requirements. Most importantly, our project-oriented management approach allows RMAL to quickly and easily identify both actual and potential problem areas, whether of a technical or resource nature, and provide the appropriate mechanisms for timely and effective problem resolution.

For example, since its inception in 1980, RMAL has been a key link in the contract laboratory network assembled in support of EPA's Superfund Program. During this time, RMAL has analyzed over 15,000 environmental and hazardous waste samples under long-term EPA fixed-price/indefinite quantity contracts as well as under short-term special analytical services contracts. RMAL, therefore, has in place and operational all

the management systems and controls that are needed to effectively perform a contract of this type.

The overall project management strategy is designed to allow the RMAL project team to respond to priorities and to unpredictable contingencies in project execution. Responsiveness and flexibility are the most important criteria of the management plan. The criteria are satisfied by the following elements of corporate management strategy:

- a corporate philosophy supportive of the following four service objectives--delivery of high-quality technical services, cost-effective execution of projects, timely completion of projects, and client-oriented project design and execution;

- a flexible corporate organizational structure and a strong project orientation that allows personnel to be easily moved from one project to another in response to changing priorities;

- a highly qualified, experienced and versatile technical staff accustomed to working on more than one project at once and on rapid changes in direction in response to changing technical requirements or client priorities; and

- availability of both long and short-term technical services contracts and internal research and development projects to allow flexibility in the advantageous assignment of personnel.

TABLE 1. QUALIFICATIONS OF RMAL SENIOR AND SUPERVISORY STAFF

Name	Degree	Years Of Experience	Technical Expertise
Dr. Mark Bollinger	Ph.D., Chemistry, 1982	6	Project Management, Inorganics, Metals
Lindsay Breyer	B.A., Chemistry, 1975	11	Inorganics, Industrial Hygiene
Michael Brooks	B.S., Chemistry, 1972	14	GC/MS
Dr. Mark Carter	Ph.D., Chemistry, 1973	13	Project Management, Inorganics
Kathy Carlberg	B.S., Chemistry, 1971	15	Project Management, Pesticides
Owen Callaway	M.A., Chemistry, 1972	16	Project Management, Inorganics, Metals
Ken Faust	B.A., Biology, 1978	7	GC/MS, EPA Superfund
Bob Hanisch	M.A., Chemistry, 1974	16	Project Management, GC/HPLC
Steve Hiatt	B.A., Economics, 1979	6	Metals
Scott Hoatson	B.A., Biology, 1976	8	Metals
Beth Kelly	B.S., Chemistry,	8	Sample Receiving
John Laferty	B.A., Chemistry, 1982	5	Metals
John Logsdon	B.A., Chemistry, 1973	13	GC/MS, Computer Systems
Jeff Lowry	M.A., Chemistry, 1984	4	GC/MS
Tony Maiorana	A.A., Science, 1969	17	Metals, EPA Superfund
Maureen McDevitt	B.S., Chemistry, 1979	7	GC, Industrial Hygiene
Rick Mealy	M.S., Water Resources, 1984	3	Quality Control
Joe Miller	B.S., Chemistry, 1976	10	Computer Systems
Robert Moul	H.S. Diploma, 1976	4	Organic Sample Prep
Wally Okuno	B.A., Chemistry, 1951	30	Pesticides, GC, HPLC
Jerry Parr	B.S., Chemistry, 1972	14	Project Management, GC/MS
Dr. Michael Phillips	Ph.D., Chemistry, 1980	8	Project Management, GC/MS
Will Pratt	B.A., Chemistry, 1984	7	Metals
Brian Rahn	B.A., Chemistry, 1984	2	Metals
Jan Redenbarger	B.S., Agriculture, 1976	8	Organic Sample Prep
Dave Roberts	B.S., Microbiology, 1979	7	Metals
Toni Stovall	M.S., Chemistry, 1970	12	Inorganics
Gary Torf	B.S., Natural Resources, 1979	6	Organic Sample Prep
Chuck Wibby	M.S., Chemistry, 1981	6	Metals, Project Management
Marilyn Williams	B.S., Zoology, 1969	16	Pesticides, GC

The QA/QC Plan is evaluated at least annually and revised as required.

RMAL has developed and successfully implemented quality assurance programs for a variety of laboratory analyses. The laboratory quality control program is blended with contractual QC requirements to provide an effective and efficient laboratory protocol. Standard analytical methods are used whenever available. When standard methods are not available, a technical note is developed describing the characteristics of the method used.

Because successful implementation of a quality control program depends, ultimately, upon the competence of laboratory personnel, quality control programs in each laboratory address the periodic assessment of training needs and describe the manner in which training is to be accomplished on an external and internal basis.

The requirements for facilities, instrumentation, consumables, and services are determined by the type of analyses made and the objectives of each project. Each section manager is responsible for assuring that the facilities, instrumentation, supplies, and services are adequate to produce data of the desired quality. The specific laboratory facilities, instrumentation, supplies, and services required for each analysis or project are defined in the appropriate written RMAL method.

LABORATORY FACILITIES, INSTRUMENTATION AND EQUIPMENT

The laboratory and offices occupy 45,000 square feet of new construction which is protected by a monitored electronic security and fire detection system. Entrance to the facility is controlled at all times. The laboratory is designed to allow handling of both high concentration potentially hazardous chemicals in a regulated facility as well as samples requiring ultra-trace analyses. This is accomplished by segregating work areas, incorporation of a specially designed HVAC air system and by use of isolation techniques such as a chemical carcinogen glove box.

As shown in Table 1, state-of-the-art instrumentation is used throughout the laboratory. All instrumentation has been purchased and installed since September, 1980. Criteria for the selection of instrumentation are that it must have the sophistication to solve problems requiring great specificity and ultra sensitivity, be automated to rapidly handle heavy analytical loads and be reliable so that crucial problems can be rapidly solved.

Dedicated sample management and preparation laboratories are provided for both organic and inorganic laboratory operations. The sample preparation laboratories are equipped with all necessary glassware, equipment, concentration apparatus and digestion systems needed to perform one-of-a-kind complex separations of organic mixtures as well as performing a high volume of routine operations.

A Hazardous Materials Laboratory (HML) facility is available for handling, preparation and analysis of hazardous materials. The laboratory is equipped with an independent air handling system and is operated at a negative pressure with respect to the rest of the laboratory facilities. It has two six foot fume hoods and a chemical carcinogen glove box. Special laboratory equipment and glassware are used only in this laboratory to avoid contamination of other facilities and equipment. Whenever possible, disposable glassware is used.

Identification and quantification of organic compounds are performed in the Gas Chromatography/Mass Spectrometry (GC/MS) Laboratory. The GC/MS Laboratory is equipped with eight Finnigan mass spectrometers, each computer-controlled with a dedicated data system. An additional stand alone computer is equipped with 9-track magnetic tape for data review and processing. Equipped with both packed and capillary column injectors and interfaces, each system handles both simple and complex chromatographic problems. Tekmar LSC-2 purge-and-trap concentrators and automatic laboratory samplers are used for analysis of volatile organics in water, soils, and sludges. Each system can be operated fully automated for solvent injection analyses using a Varian Series 8000 autosampler and RMAL's custom data collection and

processing software. The 31,000 compound NBS mass spectrum library is routinely used for unknown compound identification. Data are stored on a 9-track magnetic tape system in an EPA compatible format.

The Chromatography Laboratory contains twelve gas chromatographs equipped with a wide selection of GC detection systems and a high performance liquid chromatograph (HPLC). In addition to multi-purpose flame ionization detectors, RMAL provides linearized ^{63}Ni electron capture detectors for low level detection of halogen-containing compounds, and a thermionic detector for analysis of phosphorous- or nitrogen-containing compounds. The laboratory also utilizes a Hall Electrolytic Conductivity Detector (HECD) operated in the halogen mode for the selective detection of halogenated compounds. This detector is also available for routine analysis of sulfur- or nitrogen-containing compounds. An HNU Systems Photoionization detector (PID) is used to determine volatile aromatic species. All gas chromatographs are equipped with digital temperature programmers. Data recovery and manipulation is achieved by using either dedicated microprocessor printer/plotters or a Nelson Analytical Model 3000 chromatography data system. This system is comprised of an IBM PC microcomputer, several Nelson Analytical Series 760 A/D converters, a graphics-compatible printer, and associated software. In addition, to standard data acquisition, peak identification, and integration features, this system provides the laboratory with the capability of performing post-run recalculation, reintegration and replotting of chromatographic data. Three GCs are equipped with capillary injections systems. All capillary-GC analysis programs utilize bonded phase, fused silica columns.

A Waters Model 204 HPLC equipped with a gradient elution solvent delivery system, a U6K injector, a Model 440 Dual Channel Absorbance Detector, and a Waters Model 420 Fluorescence Detector is available for analysis of polycyclicaromatics, herbicides, and other chemicals. The laboratory also utilizes a Hewlett Packard HP1090A HPLC equipped with a gradient elution solvent delivery system, an auto sampler and a variable wavelength diode array UV detector. These detection systems provide selectivity and sensitivity for a wide variety of trace organic analyses.

Analyses are performed in the Inorganic Laboratory by both traditional wet chemical techniques and by instrumental methods. Two Jarrell-Ash Model 9000 Inductively Coupled Argon Plasma Emission Spectrometers (ICAP) are the heart of the metals analysis capability. An on board computer operates the instrument, which simultaneously analyzes 28 elements. A N+1 channel allows the analysis of almost every other metal and metalloid in the periodic table. The atomization source operated at 10,000° Kelvin, allows for the analysis of many second and third row transition and lanthanide elements that cannot be analyzed by atomic absorption techniques. The plasma source results in excellent detection limits and a wide dynamic range. In

addition, the ICAP has the ability to analyze with ease difficult matricies such as digests of biological and geological materials and petroleum samples diluted in a solvent. A 63-point spectrum shifter and dedicated software on an external Apple II computer performs a statistical analysis of the data and formats the results in a manner that makes evaluation easy to perform.

Atomic absorption detection is provided on all spectrometers by graphite furnace; traditional flame detection techniques are available. Double beam and background correction techniques are used to enhance stability and selectivity. Currently, the laboratory operates six Perkin-Elmer Model 2380 and two Perkin-Elmer Model 5000 atomic absorption spectrometers. The combination of deuterium arc and Zeeman background correction on these instruments provides a great deal of flexibility so that the best combination of low detection limits and freedom from interferences can be achieved. The Model 5000 also features a computer operated system featuring a video display, which allows for the optimization of operating parameters and enhance data reporting. A supply of over 25 hollow cathode and electrodeless discharge lamps is maintained, including all 13 priority pollutant metals and all metals on the primary and secondary drinking water lists.

A Dionex Model 2110i ion chromatograph equipped with auto sampler and data processing software is routinely used for anion analysis and research applications. RMAL has recently obtained a Dionex Model 4000i which has gradient elution capabilities and can be used for special applications. A completely automated Dohrmann DC-80 total organic carbon analyzer equipped with a purgeable organics module uses a highly efficient UV-reactor for sample oxidation, a linearized infrared detector and a microprocessor electronic control system. High or ultra-trace levels of organic and inorganic carbon can be measured.

A two channel Technicon Auto Analyzer II System for the automated colorimetric analysis of nutrient, mineral and demand parameters is set up to analyze ammonia nitrate, chloride and cyanide. This allows for rapid sample through-put with excellent quality control.

TABLE 1. SUMMARY OF ANALYTICAL EQUIPMENT

Organic Analysis Instrumentation	Number
GC/MS Systems	8
Finnigan 1020/OWA	3
Finnigan 4500	4
Finnigan 5100	1
Gas Chromatographs	12
Hewlett Packard 5880	2
Hewlett Packard 5790	3
Hewlett Packard 5890	6
Perkin-Elmer Sigma 3B	1
Waters Model 204 HPLC	1
HP 1090A HPLC	1
ABC Gel Permeation Chromatograph	1
Pensky-Martens closed cup tester	1
Parr bomb calorimeter	1
Brookfield LVT viscometer	1
Grob Closed Loop Stripping Apparatus	1
Tekmar LSC-2 Sample Concentrators	4
Inorganic Analysis Instrumentation	
Jarrell-Ash Model 9000A ICAP	2
Atomic Absorption Spectrophotometers	8
Perkin-Elmer 5000	2
Perkin-Elmer 2380	6
Spectro Products HG-3 Mercury Analyzer	1
Dionex Model 2110i Ion Chromatograph	1
Dionex Model 4000i Ion Chromatograph	1
Dohrmann DL-80 Total Organic Carbon Analyzer	1
Dohrmann Enviroteck Total Organic Halogen Analyzer	2
Bausch & Lomb Model 88 Spectrophotometer	1
Spectronic Model 501 Spectrophotometer	1
Hach Model 2100A Turbidimeter	1
Fisher Model 397 Amperometric Titrator	1
Technicon Auto Analyzer II system	1
YSI Model 32 Conductivity Meter	1
Orion pH Meters	4
Perkin-Elmer Model 1310 Infrared Spectrophotometer	1

APPENDIX A.

DESCRIPTION OF ANALYTICAL SERVICES

OF THE

NEW ENSECO CORPORATION

July 1986

INTRODUCTION AND SUMMARY

This document describes the combined resources of the new ENSECO, Inc. to perform various analytical services. The new ENSECO, Inc. as a result of a merger in June, 1986, combined the resources of ERCO, Cambridge, Massachusetts, and Houston, Texas; Gollob Analytical Service, Berkeley Heights, New Jersey; CAL Lab East (CLE), Richmond, Virginia; Rocky Mountain Analytical Laboratory (RMAL), Denver, Colorado; and California Analytical Laboratory (CAL), Sacramento, California. These combined resources resulted in the largest and most experienced independent environmental laboratory in the country. The new ENSECO makes the commitment to aggressively apply its extensive corporate resources and over 50 years of combined experience to provide timely, quality assured data.

The regional facilities enable ENSECO to provide close technical support to clients establishing and managing the laboratory aspects of large or complex environmental monitoring projects. Through a unique project management concept, ENSECO staff routinely consult with clients in establishing the sampling procedures, analytical and biological methodology and field and laboratory quality assurance programs. These regional facilities also enable the company to provide regional consulting services and to respond to projects involving rapid turn-around or time-dependent analyses.

Over 320 staff, $14 million in highly automated laboratory instrumentation and 120,000 square feet of laboratory space give ENSECO the unique capability to handle "Super-Projects" or complex research. The company can provide a high volume of inorganic and organic analyses of water, soil, waste, biological and air samples collected during RCRA, Superfund, SDWA, NPDES or Clean Air Act studies as well as a wide diversity of industrial samples. A rigorous corporate QA program combined with computerized data management and extensive electronic communications enable the corporation to provide reliable and uniform analytical services to large corporate clients with nationwide monitoring needs.

ENSECO is managed by Harvey G. Felsen, Drs. Paul A. Taylor and Mark J. Carter, previously chief executives of ERCO, California Analytical Laboratories and Rocky Mountain Analytical Laboratory, respectively. William D. Ruckelshaus, former EPA administrator, is Chairman of the Board of Directors and Chairman of the Executive Committee. Dr. Curt D. Rose (ERCO), Dr. Fred Gollob (Gollob Analytical Service), Dr. Paul Dymerski (CAL Lab East) Ms. Kathleen A. Carlberg (Rocky Mountain Analytical Lab), and Dr. Charles J. Soderquist (CAL Lab) manage the ENSECO subsidiaries.

EXPERIENCE

ENSECO has amassed an extensive and proven track record in all of the technical and managerial realms critical for the successful execution of environmental monitoring. For example, ENSECO laboratories are active participants in the Contract Lab Program administered by the EPA to support Superfund investigations and in fact represent the largest supplier of analytical services to the Agency. ERCO and CAL facilities have participated in the program since its inception in 1980 and the RMAL facility has been a participant since shortly after the founding of the laboratory. Together, the ENSECO laboratories have analyzed over 40,000 samples for the EPA.

As a whole, ENSECO has a collective staff experience in the analysis of environmental samples that is unsurpassed in the industry. Forty of the senior staff have advanced degrees. Most of the other laboratory staff of 350 have B.S. degrees in chemistry or a related science. While these educational credentials provide a solid base, the diversity and depth of the staff's experience is more important in defining ENSECO's capability.

ENSECO not only has extensive experience in the use of methods promulgated by the EPA, but in fact has participated in the development and refinement of many of these methods. ENSECO is frequently asked to provide comments on improving analytical methods and is generally the first laboratory to implement changes in methodology. For example, RMAL and CAL were two of the participants in the interlaboratory validation of Methods 624 and 625, the GC/MS methods developed for priority pollutants. In fact, several of the staff helped develop the 600 methods for organics including the isotope dilution GC/MS methods 1624 and 1625 as well as Method 613 for dioxins.

ENSECO is a directing influence in the establishment of analytical methods to meet new and changing RCRA regulations. For example, RMAL's constructive reviews of various methods proposed for use by the petroleum refining industry for waste delisting and landfarm demonstration projects has resulted in a substantial improvement of the methods. RMAL also participated in an interlaboratory study of EPA Methods 8240, 8270 and 8330 for measuring Appendix VIII constituents for the Chemical Manufacturers Association. ERCO is establishing method performance data for the EPA Office of Solid Waste, for selected Appendix VIII constituents using Method 8270, and is also developing methods for determining reactive sulfide and cyanide.

ENSECO is recognized as a leader in the application of new technology to environmental analyses. The staff are also actively involved in the development of new analytical techniques. ENSECO's expertise is shared with the technical community through participation in professional societies such as ASMS, ASTM, ACS and SAS.

RESOURCES

ENSECO operates four major laboratories specializing in environmental analyses, an aquatic toxicology facility and a laboratory specializing in gas analysis. Each environmental analytical laboratory within ENSECO (ERCO, CLE, RMAL, CAL) possesses certain features designed for solving both routine and highly challenging environmental problems with an approach which is both technically sound and cost effective.

ENSECO's analytical laboratories are equipped (See Table 1) and organized to offer analytical support for large scale undertakings, such as comprehensive sampling and analysis programs, specialized research efforts, and routine analysis of standard analytical parameters. Each laboratory facility offers the combination of capacity, size, computerization, versatility and safety needed for virtually any project. Each laboratory is designed and equipped such that sufficient space and instrumentation are available to allow dedication of facilities and equipment to virtually any project. The criteria established at ENSECO for instrument reliability, sensitivity, and performance which control the selection process has resulted in a high proportion of advanced late model instrumentation. Special facilities and procedures have been developed to provide for the safe handling of highly hazardous chemicals, reference materials and environmental samples during all stages of preparation and analysis. Each laboratory tightly controls visitor access with a 24-hour/day monitored security system to assure sample and data confidentiality.

A recent example of the application of ENSECO's resources relates to a study of a water treatment operation in Alaska. With only a two week advance notice, ENSECO received over 500 samples during a three week period. These samples ranged from relatively clean treated waters to petroleum contaminated waters to sludges. Each sample had a specific set of analytical requirements ranging from analyses for selected organics and metals to full characterization. Each phase of a multiphase sample was analyzed separately. Work was performed at the RMAL and CAL facilities concurrently. One report was prepared containing all results. This work was mandated by a letter from the State of Alaska which required submission of various data packages at specified times. All deliverables were achieved.

ENSECO's ability to perform work of a technically demanding nature is best demonstrated by another example. Two of the ENSECO facilities, ERCO and RMAL, are highly involved in the analysis of hazardous wastes. However, these two laboratories were recently awarded the only two contracts granted by the U.S. Geological Survey for performing trace level groundwater analyses for organic compounds. The contract awards were predicated on successful performance in analyzing a groundwater sample spiked with sub ppb levels of organic compounds.

TABLE 1. SUMMARY OF MAJOR ANALYTICAL INSTRUMENTATION AT ENSECO

A. MAJOR INSTRUMENTATION

Instrument	Number of Instruments per Facility				
	ERCO	CLE	RMAL	CAL	TOTAL
GC/MS	6	5	8	12	31
HPLC*	1	6	2	2	11
GC*	13	5	12	22	52
ICP	2	0	2	2	6
AA	5	0	9	5	19

B. ADDITIONAL INSTRUMENTATION

Instrumentation	Number
TOC	3
TOX	4
Ion Chromatographs	4
Technicon AutoAnalyzer	4
FTIR	1
High Resolution GC/MS	1
MS/MS	1
GC/MS/NCI	1
LC/MS	2

*Instruments are configured with a variety of detector systems.

ENSECO LABORATORIES AND OFFICES

California Analytical Laboratory (CAL Lab)
2544 Industrial Blvd.
West Sacramento, CA 95691
(916)372-1393

CAL Labs East
2240 Dabney Rd.
Richmond, VA 23230
(804)359-1900

ERCO
2400 West Loop South, Suite 3000
Houston, TX 77027
(713)960-9411

ERCO
205 Alewife Brook Pkwy.
Cambridge, MA 02138
(617)661-3111

Gollob Analytical Service
47 Industrial Rd.
Berkeley Heights, NJ 07922
(201)464-3331

Rocky Mountain Analytical Laboratory (RMAL)
4955 Yarrow Street
Arvada, CO 80002
(303)421-6611

ATTACHMENT 2

ENSECO Quality Assurance Program Plan
for
Environmental Chemical Monitoring

ENSECO INCORPORATED
QUALITY ASSURANCE
PROGRAM PLAN
FOR
ENVIRONMENTAL CHEMICAL MONITORING

Prepared by:

Enseco Incorporated
4955 Yarrow Street
Arvada, CO 80002

Revision 3.2
June, 1988

Approval:

Kathleen Carlberg
Vice President
Quality Assurance

Table of Contents

List of Figures

List of Tables

1. INTRODUCTION

Enseco Incorporated (Enseco) is the largest and most experienced independent environmental testing laboratory in the United States. The environmental component of Enseco consists of the combined resources of Erco Laboratory (Erco) in Cambridge, Massachusetts; Enseco East in Somerset, New Jersey (scheduled to begin operation in July, 1988); Rocky Mountain Analytical Laboratory (RMAL) in Denver, Colorado; and California Analytical Laboratory (CAL) in Sacramento, California. Two Enseco facilities specializing in aquatic toxicology are located in Marblehead, Massachusetts and Houston, Texas.

Enseco is committed to providing quality environmental analytical services. To ensure the production of scientifically sound, legally defensible data of known and proven quality, an extensive Quality Assurance (QA) program has been developed within Enseco. This program is closely monitored at both the Corporate and Divisional levels and relies on clearly defined objectives, well-documented procedures, a comprehensive audit system, and management support for its effectiveness.

2. DEFINITION, PURPOSE, AND SCOPE

Definition of Terms

Quality Assurance (QA): the total integrated program for assuring the reliability of data generated in the laboratory.

Quality Control (QC): the routine application of specific, well-documented procedures to ensure the generation of data of known and accepted quality, thus fulfilling the objectives of the QA program.

Quality Assurance Program Plan: an assemblage of management policies, objectives, principles, and general procedures outlining the techniques by which the laboratory produces data of known and accepted quality.

Standard Operating Procedure (SOP): a detailed, written description of a procedure designed to systematize and standardize the performance of the procedure.

Quality Control Manual: an assemblage of detailed SOP's describing the laboratory implementation of the QA Program Plan.

Quality Assurance Project Plan (QAPP): an assemblage of detailed SOP's describing how the laboratory will generate data that meet the data quality objective of a specific project.

Purpose of Document

The Enseco QA Program Plan presents an overview of the essential elements of our QA program. Enseco has modeled this plan along EPA guidelines as outlined in "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans," Office of Monitoring Systems and Quality Assurance, Office of Research and Development, U.S. Environmental Protection Agency (U.S. EPA), EPA-600/4-83-004, February, 1983.

Scope

This QA Program Plan is designed to control and monitor the quality of data generated in the Enseco laboratories. The described QA program is geared toward generating data that comply with federal regulatory requirements specified under the Clean Water Act (CWA), the Safe Drinking Water Act (SDWA), the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and their amendments (WQA, SARA, etc.) and state equivalents. Although the QC requirements of these various programs are not completely consistent, each of the programs base data quality judgments on three types of information:

- Data that indicate the overall qualifications of the laboratory to perform environmental analyses;
- Data that measure the laboratory's daily performance using a specific method; and
- Data that measure the effect of a specific matrix on the performance of a method.

The operational elements that are involved in making each of these assessments are described in Table 2-1 along with the pertinent section number from this document in which each is discussed.

Table 2-1

DATA QUALITY ASSESSMENT

Evaluation Criteria	Operational Elements	Section of QA Plan
LABORATORY QUALIFICATIONS	Facilities/equipment/staff.....	*
	Written SOP's for all laboratory procedures, including:.....	15
	Sample custody.....	5
	Calibration procedures.....	6
	Analysis procedures.....	7
	Data validation.....	8
	Documented QA program.....	1-15
	Laboratory certifications.....	10
LABORATORY PERFORMANCE	Check samples.....	9
	Reagent blanks.....	9
	Calibration data.....	6
	Method detection limits (determined on reagent blank).....	12
MATRIX EFFECTS	Matrix spike/matrix duplicate/ matrix spike duplicate analyses.....	9
	Sample surrogate recoveries.....	9
	Standard additions.....	9
	Field blanks.....	9
	Method detection limits (determined with specific sample matrix).....	12

* Described in a separate document available from Enseco.

3. RESPONSIBILITIES AND AUTHORITIES

Executing an effective QA program in a large and complex multi-laboratory system demands the commitment and attention of both management and staff. The QA effort at Enseco is managed by the QA office which reports directly to the Chief Executive Officer (CEO) and has the responsibility of overseeing and regulating all laboratory functions (see Figure 3-1). The QA office operates independently of all areas, generating analytical data to ensure complete objectivity in the evaluation of laboratory operations.

The QA Office is managed by an Enseco Vice President (VP) whose sole responsibility is to direct the Enseco QA program. The implementation of the QA program within each individual laboratory is the responsibility of the Divisional QA Director. The QA Director reports to both the VP of QA and to the Divisional Director, who manages the laboratory. In addition, all scientists within the organization play a vital role in assuring the quality of our work. We believe that the success of Enseco is dependent upon the continued commitment of all within the organization to a strong and viable QA Program. The responsibilities and levels of authority within the organization are described below.

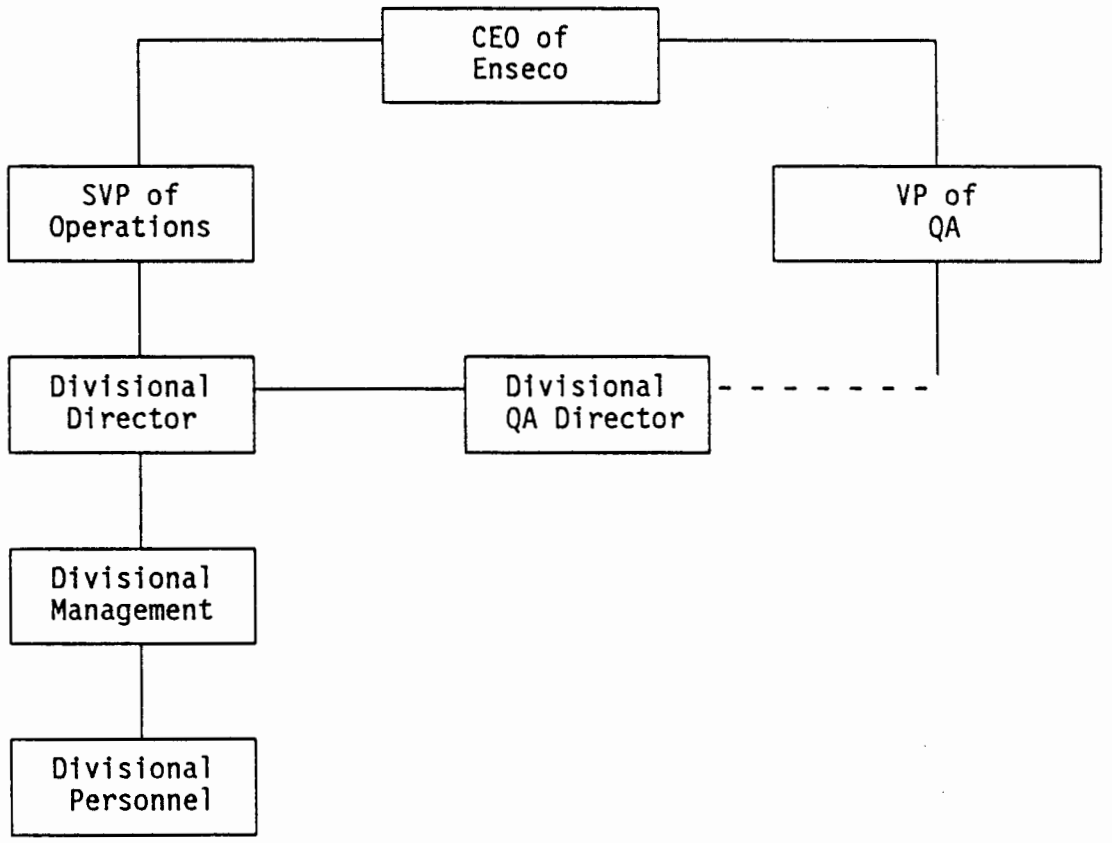
Corporate Quality Assurance Office

Members

The QA effort within Enseco is directed by the Corporate VP of QA who reports directly to the CEO of Enseco. The Corporate QA office also includes QA specialists who assist the VP in carrying out the responsibilities of the department.

Figure 3-1

ENSECO QA ORGANIZATIONAL CHART



Responsibilities

The VP of QA is responsible for:

- Developing and implementing a Corporate QA program that ensures that all data generated in Enseco laboratories are scientifically sound, legally defensible, and of known precision and accuracy;
- Monitoring the QA Plan to ensure compliance with QA objectives in all Enseco laboratories;
- Developing and implementing new QA procedures within the corporation to improve data quality;
- Conducting audits and inspections of all Enseco laboratories on a regular basis, reporting the results of those audits to management, and applying corrective actions as needed to ensure compliance with the Enseco QA Plan;
- Distributing Performance Evaluation (PE) samples to all Enseco laboratories on a routine basis, evaluating the results of those samples, reporting to management, and applying corrective actions as needed to ensure that all Enseco laboratories are able to generate data that meet the data quality objectives defined in the QA Plan;
- Establishing data bases that accurately reflect the performance of each of the Enseco laboratories;
- Maintaining copies of all SOP's;
- Directing Laboratory QA Directors in the implementation of the Enseco QA Plan within individual facilities;
- Chairing the Enseco QA Committee, a working committee which includes all of the Laboratory QA Directors and QA Specialists and deals with QA issues on an ongoing basis;
- Coordinating certification programs within Enseco;
- Conducting seminars on QA issues for both clients and laboratory staff; and
- Promoting sound QA practices within the environmental regulatory and analytical communities.

Authority

The VP of QA is the final authority on all issues dealing with data quality and has the authority to require that procedures be amended or discontinued, or analyses suspended or repeated. He also has the authority to suspend or terminate employees on the grounds of dishonesty, incompetence, or repeated non-compliance with QA procedures. In addition, the VP of QA has the authority to overrule decisions and actions of the Divisional QA Directors and must approve the termination or transfer of any Divisional QA Director. The authority of the VP of QA comes directly from the CEO of Enseco.

Divisional Quality Assurance Departments

Members

Each Divisional QA Department is managed by a Divisional QA Director. The QA Director reports directly to the Divisional Director and indirectly to the Corporate VP of QA. The QA Director is supported by a QA staff within the laboratory.

Responsibilities

The Divisional QA Director is responsible for:

- Implementing Enseco QA policies;
- Monitoring the QA Plan within the laboratory to ensure complete compliance with QA objectives;
- Conducting in-house audits to identify potential problems and ensuring compliance with written SOP's;
- Performing statistical analyses of QC data and establishing data bases that accurately reflect the performance of the laboratory;

- Prescribing and monitoring corrective actions;
- Serving as the in-house client representative on all project inquiries involving data quality issues;
- Monitoring the preparation and verification of analytical standards;
- Assisting chemists in the writing of SOP's;
- Reporting the status of the laboratory QA program to the Corporate VP of QA with formal and informal communications;
- Maintaining records and archives of all QA/QC data, PE results, audit comments, and customer inquiries concerning data quality;
- Distributing current SOP's to the laboratory staff;
- Monitoring laboratory performance in the areas of holding times, turn-around times, and meeting contractual obligations;
- Conducting seminars on QA issues for clients and laboratory staff;
- Preparing QA project plans when needed;
- Assisting the Corporate QA office in the writing of QA manuals and procedures;
- Serving as a member of the Enseco QA Committee; and
- Auditing subcontractors.

Authority

The Divisional QA Director is the final authority within each laboratory on all issues dealing with data quality. He has the authority to require that procedures be amended or discontinued or analyses suspended or repeated. He can make recommendations to the Division Director and the Corporate VP of QA regarding suspension or termination of employees for incompetence or non-compliance with QA procedures. The authority of the Divisional QA Director comes directly from the Corporate VP of QA.

Divisional Management

Members

The supervisors and managers who direct the analytical work at each laboratory are directly responsible for ensuring that all employees reporting to them are complying with the Enseco QA Plan.

Responsibilities

Laboratory management is responsible for:

- Actively supporting the implementation of the Enseco QA Plan within the laboratory;
- Maintaining accurate SOP's and enforcing their use in the laboratory;
- Maintaining a work environment that emphasizes the importance of data quality; and
- Providing management support to the Corporate and Divisional QA departments.

Authority

The managers and supervisors of the laboratory have the authority to accept or reject data based on well-defined QC criteria. In addition, managers and supervisors, with the approval of the QA department, can accept data that fall outside of normal QC limits if, in their judgment, there are technical reasons which warrant the acceptance of the data. These circumstances must be well documented and any need for corrective action identified by the incident must be defined and initiated. The authority of the laboratory management comes directly from the Corporate VP of Operations and the Divisional Director.

Divisional Personnel

Members

All laboratory personnel involved in the generation and reporting of data have a responsibility to understand and follow the Enseco QA Plan.

Responsibilities

Laboratory personnel are responsible for:

- Having a working knowledge of the Enseco QA Plan;
- Ensuring that all work is generated in compliance with the Enseco QA Plan;
- Performing all work according to written SOP's;
- Ensuring that all documentation related to their work is complete and accurate; and
- Providing management with immediate notification of quality problems.

Authority

Laboratory personnel have the authority to accept or reject data based on compliance with well-defined QC acceptance criteria. The acceptance of data that fall outside QC criteria must be approved by laboratory management. The authority of the laboratory personnel flows from the Division Director.

4. SAMPLING PROCEDURES

The generation of quality data begins with the collection of the sample, and therefore the integrity of the sample collection process is of concern to the laboratory. Samples must be collected in such a way that no foreign material is introduced into the sample and no material of interest escapes from the sample prior to analysis. To ensure sample integrity, the following must be considered:

- Samples must be collected in appropriate containers. In general, glass containers are used for organic parameters and polyethylene containers for inorganic/metal parameters;
- The sample containers must be properly cleaned to ensure that the sample is not contaminated during the collection process;
- Samples must be preserved appropriately to ensure that no material of interest is lost due to adsorption, chemical or biological degradation, or volatilization;
- Appropriate volumes of sample must be collected to ensure that the required detection limits can be met and quality control samples can be analyzed; and
- Samples must be properly shipped to the laboratory, in the appropriate time frame, to ensure that holding times for the analyses can be met.

Enseco can assist in the sample collection process by providing consultation and assistance to clients designing sampling programs and also by making available to the client the Enseco "Sample Safe™", a set of appropriate sample containers that are properly cleaned and preserved for use in sample collection.

The maximum holding times recommended by Enseco, appropriate containers and preservatives, and minimum sample volumes required for routine organic, metal and conventional parameters are given in Appendix I. The Enseco holding times are in general agreement with EPA recommended holding times, as stated in the Contract Laboratory Program (CLP), RCRA, and National Pollution Discharge Elimination System (NPDES) programs. Other holding times can be honored if special arrangements are made with the laboratory.

5. SAMPLE CUSTODY

Upon receipt by Enseco, samples proceed through an orderly processing sequence specifically designed to ensure continuous integrity of both the sample and its documentation.

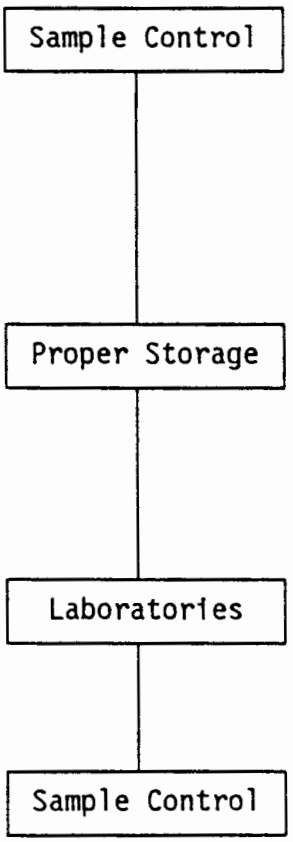
All samples are received by Enseco's Sample Control Group and are carefully checked for label identification, and completed, accurate chain-of-custody records. Photographs document the condition of samples and each sample is then assigned a unique laboratory identification number through a computerized Laboratory Data Management System (LDMS) that stores all identifications and essential information. The LDMS system and internal chain-of-custody procedures track the sample from storage through the laboratory system until the analytical process is complete and the sample is back in the custody of Sample Control for disposal or return to the client. This process is summarized in Figure 5-1. Access to all Enseco laboratories is restricted to prevent any unauthorized contact with samples, extracts, or documentation.

An example of the Enseco Chain-Of-Custody Record used to transmit samples from the client to the laboratory is given in Figure 5-2. The Chain-Of-Custody Record (Interlaboratory Analysis Form) used to transmit samples between laboratories within Enseco is given in Figure 5-3.

In addition, sample bottles provided to the client by Enseco are transmitted under custody using the Enseco "Sample Safe™".

Figure 5-1

ENSECO SAMPLE PROCESSING FLOW CHART



* Check and document physical condition of sample
* Verify documentation and parameter assignment
* Log into LDMS
* Send acknowledgement letter to client

* Store sample according to preservation guidelines
* Transfer sample to lab with proper documentation

* Document analytical work
* Return unused samples to Sample Control

* Return sample to client or arrange for sample disposal

Enseco

CHAIN OF CUSTODY

No.

Attn: _____

Enseco Client _____

Project _____

Sampling Co. _____

Sampling Site _____

Team Leader _____

SAMPLE SAFE™ CONDITIONS

1. Packed by: _____ Seal # _____
2. Seal Intact Upon Receipt by Sampling Co.: Yes No
3. Condition of Contents: _____
4. Sealed for Shipping by: _____
5. Initial Contents Temp.: _____ °C Seal # _____
6. Sampling Status: Done Continuing Until _____
7. Seal Intact Upon Receipt by Laboratory: Yes No
8. Contents Temperature Upon Receipt by Lab: _____ °C
9. Condition of Contents: _____

Date	Time	Sample ID/Description	Sample Type	No. Containers	Analysis Parameters	Remarks

OGC-003359

Figure 5-2

CUSTODY TRANSFERS PRIOR TO SHIPPING

	Relinquished by: (signed)	Received by: (signed)	Date	Time
1				
2				
3				

SHIPPING DETAILS

Delivered to Shipper by: _____

Method of Shipment: _____ Airbill # _____

Received for Lab: _____ Signed: _____ Date/Time _____

Enseco Project No. _____

White and Pink Copies to Lab Yellow to Sampler

SS-001

Figure 5-3

Page _____ of _____

File Index _____

Enseco

INTERLABORATORY ANALYSIS

SHIP TO: *(circle one)*	SEND RESULTS TO:
CAL ERCO CLE GAS MAR HOU	
Attention:	Attention:
CLIENT NAME	PROJECT NO.

Relinquished by: *(Signature)* Received by: *(Signature)* Date Time

Relinquished by: *(Signature)* Received by: *(Signature)* Date Time

Import Lab ID	Enseco ID	Client ID	Matrix (a, s, w)	Date Sampled	Date Rec'd	Date Auth.	Analysis Requested/ P.L. Item #	Sample Condition Upon Receipt

a. Written results required by (date): _____ Verbal results required by (date): _____

b. QC: ☐ Standard Enseco ☐ CLP Protocol ☐ Project-Specific _____

c. Sample Disposal: ☐ Enseco ☐ Return to Client ☐ Phone RMAL

d. Raw Data Copies Needed: ☐ Yes ☐ No

e. Detection Limits: ☐ Standard Product ☐ Other*

f. Holding Times: ☐ Enseco ☐ EPA-CLP ☐ Other*

g. *Special Instructions: _____

h. Intercompany Rebate: *(circle one)* 0% 5% 10% i. P.O. Number _____

6. CALIBRATION PROCEDURES AND FREQUENCY

Standard/Reagent Preparation

A critical element in the generation of quality data is the purity/quality and traceability of the standard solutions and reagents used in the analytical operations. Enseco continually monitors the quality of reagents and standard solutions through a series of well-documented procedures.

To ensure the highest purity possible, all primary reference standards and standard solutions used by Enseco are obtained from the National Bureau of Standards, the EPA Repository or other reliable commercial sources. All standards and standard solutions are logged into a data base that identifies the supplier, lot number, purity/concentration, receipt/preparation date, preparer's name, method of preparation, expiration date, and all other pertinent information.

Standard solutions are validated prior to use. Validation procedures can range from a check for chromatographic purity to verification of the concentration of the standard using a standard prepared at a different time or obtained from a different source. Stock and working standards are checked regularly for signs of deterioration, such as discoloration, formation of precipitates, or change of concentration. Care is exercised in the proper storage and handling of standard solutions, and all containers are labeled as to compound, concentration, solvent, expiration date, and preparation data (initials of preparer/date of preparation).

Reagents are examined for purity by subjecting an aliquot or subsample to the analytical method corresponding to its intended use; for example, every lot of dichloromethane (for organic extractables) is analyzed for undesirable contaminants prior to use in the laboratory.

A data base is used to store essential information on specific standards or reagents. The system is designed to serve various functions (e.g., the system issues warnings on expiration dates and allows chemists to obtain a list of all working standard solutions prepared from the same stock solution). The program also facilitates the management and auditing of reagents and standards.

Instrument Calibration and Tuning

Calibration of instrumentation is required to ensure that the analytical system is operating correctly and functioning at the proper sensitivity to meet established detection limits. Each instrument is calibrated with standard solutions appropriate to the type of instrument and the linear range established for the analytical method. The frequency of calibration and the concentration of calibration standards is determined by the manufacturer's guidelines, the analytical method, or the requirements of special contracts.

Gas Chromatography/Mass Spectrometry (GC/MS)

Each day prior to analysis of samples, the instrument is tuned with bromofluorobenzene (BFB) for volatile compounds and decafluorotriphenylphosphine (DFTPP) for semivolatile compounds (according to the tuning criteria specified in the U.S. EPA CLP). No samples are analyzed until the instrument has met tuning criteria.

The instrument is then calibrated for all target compounds. An initial calibration curve is produced and certain key compounds referred to as system performance calibration compounds (SPCC) and continuing calibration compounds (CCC) are evaluated on a daily basis to ensure that the system is within calibration. If the daily standard does not meet the established criteria, the system is recalibrated.

Chromatography

The field of chromatography involves a variety of instrumentation and detection systems. While calibration standards and acceptance criteria vary depending on the type of system and analytical methodology required for a specific analysis, the general principles of calibration apply uniformly. Each chromatographic system is calibrated prior to performance of analyses. Initial calibration consists of determining the linear range, establishing limits of detection, and establishing retention time windows. The calibration is checked on a daily basis to ensure that the system remains within specifications. If the daily calibration check does not meet established criteria, the system is recalibrated and samples analyzed since the last acceptable calibration check are reanalyzed.

Metals

Metals analysis basically involves two types of analytical instrumentation: inductively coupled argon plasma emission spectroscopy (ICP), and atomic absorption spectroscopy (AA).

Each ICP is calibrated prior to the analyses being performed using criteria prescribed in the CLP protocol. The calibration is then verified using standards from an independent source. The linear range of the instrument is established once every quarter using a linear range verification check standard. No values are reported above this upper concentration value without dilution.

A calibration curve is established daily by analyzing a minimum of two standards, one of which is a calibration blank. The calibration is monitored throughout the day by analyzing a continuing calibration blank (CCB) and a continuing calibration verification standard (CCV). The standard must meet established criteria or the system is recalibrated and all samples analyzed since the last acceptable calibration check are reanalyzed.

An interelement check standard is analyzed at the beginning and end of each analytical run, and on a continuing basis, to verify that interelement and background correction factors have remained constant. Results outside of the established criteria trigger reanalysis of samples.

Each AA unit is calibrated prior to analyses being conducted. A calibration curve is prepared with a minimum of a calibration blank and three standards and then verified with a standard that has been prepared from an independent source at a concentration near the middle of the calibration range. The calibration is verified on an ongoing basis with a midpoint calibration standard. If the ongoing calibration standard does not meet established acceptance criteria, the system is recalibrated and all samples analyzed since the last acceptable calibration check are reanalyzed. All samples are spiked to verify the absence of matrix effects or interferences. The method of standard additions is used when matrix interferences are present.

Conventional Analyses

The field of conventional, non-metals analysis involves a variety of instrumental and wet chemical techniques. While calibration and standardization procedures vary depending on the type of system and analytical methodology required for a specific analysis, the general principles of calibration apply universally. Each system or method is calibrated prior to analyses being conducted. Calibration consists of defining the linear range by use of a series of standard solutions, establishing limits of detection, and identifying potential interferences. The calibration is checked on an ongoing basis to ensure that the system remains within specifications. If the ongoing calibration check does not meet established criteria, the system is recalibrated and all samples analyzed since the last acceptable calibration check are reanalyzed.

7. ANALYTICAL PROCEDURES

Most analyses performed by Enseco are driven by regulatory concerns. Therefore, methods used at Enseco predominantly originate from regulatory agencies. Generally the methods used are those specified by the U.S. EPA and other federal agencies, state agencies, and professional organizations, as provided in the following references:

- Current EPA (CLP) protocols for the analysis of organic and inorganic hazardous substances including chlorinated dioxins and furans.
- "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act," 40 CFR, Part 136.
- "Methods for Chemical Analysis of Water and Wastes," EPA-600/4-79-020 (revised March, 1983).
- "Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater," EPA-600/4-82-057 (July, 1982).
- "Test Methods for Evaluating Solid Waste" (SW-846), 2nd Edition (revised), Update I (1984), Update II (1985), 3rd Edition (1986), Office of Solid Waste and Emergency Response, U.S. EPA.
- "Standard Methods for the Examination of Water and Wastewater," 16th Edition, American Public Health Association, American Water Works Association, Water Pollution Control Federation, Washington, DC (1985).
- "Official Methods of Analysis," 14th Edition, Association of Official Analytical Chemists, Arlington, VA (1984).
- "Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water," U.S. EPA, Environmental Monitoring and Support Laboratory - Cincinnati (September, 1986).
- "Annual Book of ASTM Standards," Volumes 11.01 and 11.02, American Society for Testing and Materials (ASTM), Philadelphia, PA (1987).
- "Techniques of Water Resources Investigations of the United States Geological Survey (USGS), Book 5, Laboratory Analysis," USGS, Washington, DC (1979).

The choice of method is dependent on the objectives of the study in terms of qualitative certainty, quantitative sensitivity, precision and accuracy, and the type of matrix to be analyzed. Each method used routinely is documented in the form of an SOP. The SOP contains detailed instructions concerning the both the use and the expected performance of the method. Any deviations from published methodology are documented and explained in the SOP. A complete description of the contents of laboratory SOP'S is given in Section 15.

Before any methods are routinely used to generate analytical data, the method is validated. Validation criteria consist of:

- Method selection by a senior staff member;
- Documentation of the method in an SOP. This includes a summary of the method, detailed description of the analytical procedure, calculations, reporting formats, safety concerns, and special remarks;
- Testing of the method to verify detection limits and linear range and establish precision and accuracy criteria; and
- Establishment of data acceptance criteria that must be approved by a senior staff member and the Division QA Director.

8. DATA REDUCTION, VALIDATION, AND REPORTING

Data Reduction and Validation

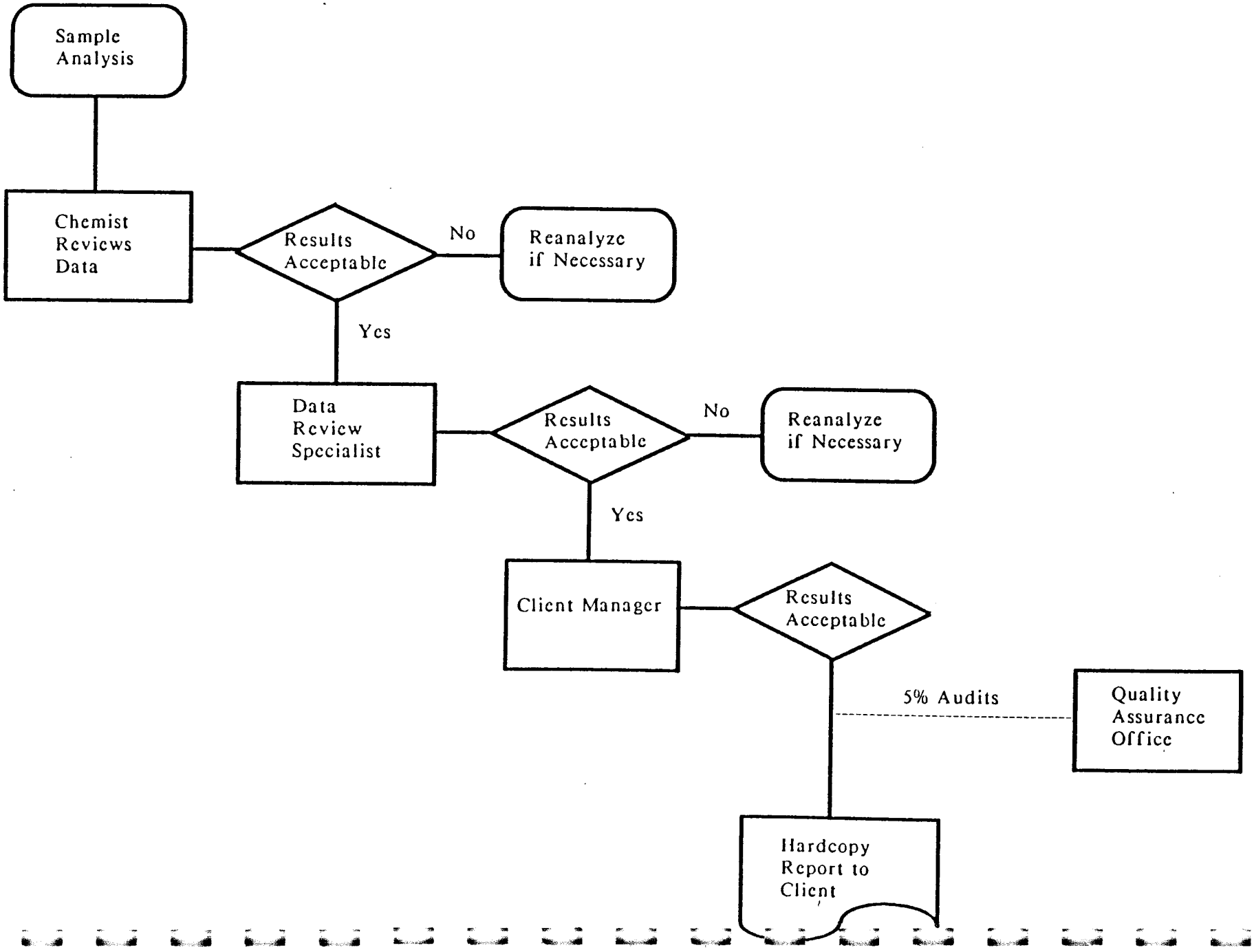
All analytical data generated within Enseco laboratories are extensively checked for accuracy and completeness. The data validation process consists of data generation, reduction, and three levels of review, as described below (also see Figure 8-1).

The analyst who generates the analytical data has the prime responsibility for the correctness and completeness of the data. All data are generated and reduced following protocols specified in laboratory SOP'S. Each analyst reviews the quality of his work based on an established set of guidelines. The analyst reviews the data package to ensure that:

- Sample preparation information is correct and complete;
- Analysis information is correct and complete;
- The appropriate SOP'S have been followed;
- Analytical results are correct and complete;
- QC samples are within established control limits;
- Blank correction procedures have been followed;
- Special sample preparation and analytical requirements have been met; and
- Documentation is complete (e.g., all anomalies in the preparation and analysis have been documented, Out-of-Control forms [if required] are complete; holding times are documented, etc.).

Figure 8-1

Data Validation Scheme



The data reduction and validation steps are documented, signed and dated by the analyst. This initial review step, performed by the analyst, is designated Level 1 review. The analyst then passes the data package to an independent reviewer, who performs a Level 2 review.

Level 2 review is performed by a data review specialist whose function is to provide an independent review of the data package. This review is also conducted according to an established set of guidelines and is structured to ensure that:

- Calibration data are scientifically sound, appropriate to the method, and completely documented;
- QC samples are within established guidelines;
- Qualitative identification of sample components is correct;
- Quantitative results are correct;
- Documentation is complete and correct (e.g., anomalies in the preparation and analysis have been documented; Out-of-Control forms [if required] are complete; holding times are documented, etc.);
- The data are ready for incorporation into the final report; and
- The data package is complete and ready for data archive.

Level 2 review is structured so that all calibration data and QC sample results are reviewed and all of the analytical results from 10% of the samples are checked back to the bench sheet. If no problems are found with the data package, the review is complete. If any problems are found with the data package, an additional 10% of the samples are checked to the bench sheet. The process continues until no errors are found or until the data package has been reviewed in its entirety.

An important element of Level 2 review is the documentation of any errors that have been identified and corrected during the review process. Enseco believes that the data package submitted by the analyst for Level 2 review should be free of errors. Errors that are found are documented and transmitted to the appropriate supervisor. The cause of the errors is then addressed with additional training or clarification of procedures to ensure that quality data will be generated at the bench.

Level 2 data review is also documented and the signature of the reviewer and the date of review recorded. The reviewed data are then approved for release and a final report is prepared.

Before the report is released to the client, the client manager reviews the report to ensure that the data meet the overall objectives of the client, as understood by the client manager. This review is labeled Level 3 review.

In addition, the Divisional QA department randomly audits 5% of all projects reported. The QA audit includes verifying that holding times have been met, calibration checks are adequate, qualitative and quantitative results are correct, documentation is complete and QC results are complete and accurate. During the review, the QA department checks the data from 20% of the samples back to the bench sheet. If no problems are found with the data package, the review is complete. If any problems are found with the data package, an additional 10% of the samples are checked to the bench sheet. The process continues until no errors are found or until the data package has been reviewed in its entirety.

Data Reporting

A variety of reporting formats, from computerized data tables, to complex reports discussing regulatory issues, to a CLP-deliverables package, are available. In general, Enseco reports contain:

General Discussion: Description of samples types, tests performed, any problems encountered and general comments are given.

Analytical Data: Data are reported by sample, by test, and are blank corrected (see Section 9). Pertinent information including dates sampled, received, prepared, and extracted are included on each results page. The Enseco reporting limit and regulatory limit (if appropriate) for each analyte is also given.

QC Information: Analytical results for laboratory blanks are given. Also, the results (percent recovery and relative percent difference) of the LCS/SCS (see Section 9) analyzed with the project are listed. Control limits are given and out-of-control values are flagged.

Results of any matrix spikes, duplicates, matrix spike duplicates or other project-specific QC are also reported.

Methodology: Reference for analytical methodology used is cited.

Custom Services: Special services including data interpretation, special consultation, and raw data packages (when requested) are included.

9. INTERNAL QC CHECKS

The Enseco QA/QC program monitors data quality with internal QC checks. Internal QC checks are used to answer two questions:

1) Are laboratory operations "in control," (i.e., operating within acceptable QC guidelines), during data generation?

2) What effect does the sample matrix have on the data being generated?

The first question is answered by laboratory performance QC. Laboratory performance QC is based on the use of a standard, control matrix to generate precision and accuracy data that are compared, on a daily basis, to control limits. This information, in conjunction with reagent blank data, is used to access daily laboratory performance.

The second question is addressed with matrix specific QC. Matrix specific QC is based on the use of an actual environmental sample for precision and accuracy determinations and commonly relies on the analysis of matrix spikes, matrix duplicates, and matrix spike duplicates. This information, supplemented with field blank results, is used to assess the effect of the matrix and field conditions on analytical data.

Laboratory Performance QC is provided as a standard part of every routine Enseco analysis. Matrix Specific QC is available as an option to the client and should be specified based on the types of matrices to be analyzed and the data quality and regulatory requirements of the project.

A complete discussion of the Enseco Internal QC Check program follows.

Laboratory Performance QC Program

Laboratory Performance QC is provided as a standard part of every routine Enseco analysis. The main elements of Laboratory Performance QC are:

- The analysis of Laboratory Control Samples (LCS) and Surrogate Control Samples (SCS);
- The analysis of reagent blanks; and
- The generation of daily calibration data.

The LCS/SCS program and the analysis of reagent blanks are discussed below. Please refer to Section 6 of this manual for a discussion of calibration procedures.

The LCS Program

The LCS is used to monitor the laboratory's day-to-day performance of routine analytical methods. An LCS consists of a standard, control matrix that is spiked with a group of target compounds representative of the method analytes. The LCS is analyzed with environmental samples to provide evidence that the laboratory is performing the method within accepted QC guidelines.

Accuracy (recovery) and precision (Relative Percent Difference [RPD]) data from the LCS are compared to control limits that have been established for each of the analytes monitored in the LCS. Initially, control limits for analytes spiked into the LCS are taken directly from the CLP program. If CLP limits are not available, Enseco historical data are used to set the control limits. As sufficient laboratory data become available, the control limits are redefined based upon the most recent six months of LCS data. Control limits for accuracy are based on the historical average recovery of the LCS plus or minus three standard deviation units. Control limits for precision are based on the historical RPD and range from zero

(no difference between duplicate LCS results) to the average RPD plus three standard deviation units. Calculated control limits tend to be tighter than CLP limits because of the use of a control matrix. However, if the calculated limits are broader than the CLP limits, the CLP limits are used to control the laboratory.

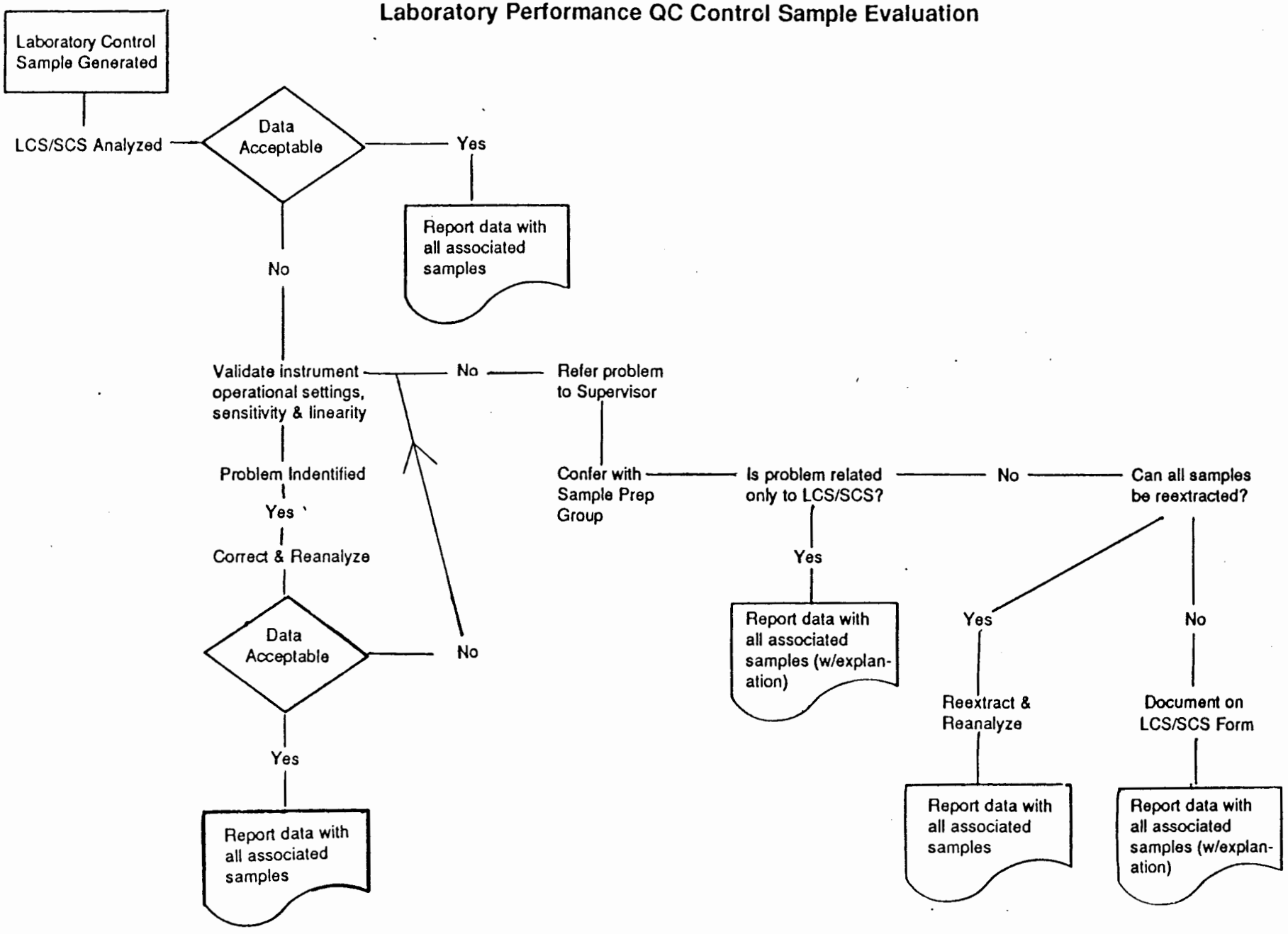
Analytical data that are generated with an LCS which falls within the established control limits are judged to be in control. Data generated with an LCS which falls outside of the control limits are considered suspect and are repeated or reported with qualifiers. The procedure used to evaluate data from control samples is given in Figure 9-1. The protocols include examination of instrument performance and preparation and analysis information, consultation with the supervisor, and finally a decision path for determining whether reanalysis is warranted.

An LCS has been established for each routine analytical method. Reagent water is used as the control matrix for the analysis of aqueous samples. The LCS compounds are spiked into reagent water and carried through the appropriate steps of the analysis. As stated in SW-846, Third Edition, a universal blank matrix does not exist for solid samples and therefore no matrix is used. The LCS for solid samples consists of the LCS compounds spiked into a reagent blank and carried through the appropriate steps of the analysis.

The LCS is analyzed at a frequency of no less than one pair of duplicate LCS per 20 samples. The LCS program is supplemented with the SCS program to ensure that laboratory performance QC is available with each batch of samples processed (see following subsection).

LCS precision and accuracy data are archived in the LDMS. In addition, the associated LCS data are reported with each set of sample results to allow the client to make a quality assessment of the data.

Figure 9-1
Laboratory Performance QC Control Sample Evaluation



OGC-003375

The SCS Program

As stated above, duplicate LCS are performed for every 20 samples to measure the precision and accuracy of an analysis on an ongoing basis. However, samples are often analyzed in lots of less than 20, due to holding time or turn-around time requirements. Since it is necessary to have a measure of laboratory performance with each batch of samples processed, Enseco has instituted the SCS program.

An SCS consists of a control matrix that is spiked with surrogate compounds appropriate to the method being used. In cases where no surrogate is available, (e.g., metals or conventional analyses) a single LCS serves as the control sample. An SCS is prepared for each sample lot for which the duplicate LCS are not analyzed. Recovery data generated from the SCS are compared to control limits that have been established for each of the surrogates being monitored. Initially, CLP control limits or Enseco historical data are used to set the control limits. When sufficient SCS data are available, control limits are redefined based on the most recent six months of data. Control limits for SCS components are based on the historical average recovery in the SCS plus or minus three standard deviation units.

Analytical data that are generated with an SCS which falls within the control limits are judged to be in control. Data that are generated with an SCS which falls outside of acceptance criteria are considered suspect and are reanalyzed or reported with qualifiers. The protocols for evaluating SCS are identical to those established for LCS (see Figure 9-1).

SCS recovery (accuracy) data are archived in the LDMS. In addition, the associated SCS data are reported with each set of sample results to allow the client to make a quality assessment of the data.

Reagent Blanks

Reagent or analytical blanks are analyzed to assess the level of contamination which exists in the analytical system and which might lead to the reporting of elevated concentration levels or false positive data.

As part of the standard Enseco QC program, an analytical blank is analyzed with every batch of samples that is processed. An analytical blank consists of reagents specific to the method that are carried through every aspect of the procedure, including preparation, clean-up, and analysis. Ideally, the concentration of an analyte in the blank is below the reporting limit for that analyte. However, some common laboratory solvents and metals are difficult to eliminate to the parts-per-billion levels commonly reported in environmental analyses. Therefore, analytical data are corrected for blank contamination before it is reported to the client.

The protocol for blank correction of data is as follows:

1) If the blank value is above the detection limit but below the Enseco reporting limit, the blank value is subtracted from the sample, the reporting limit remains unchanged.

Example: EPA Method 624/HSL
Chloromethane — Reporting Limit = 10 ug/L
Blank Value = 8 ug/L — Sample = 12 ug/L

Report the analyte as "Not Detected" (ND) with a reporting limit at 10 ug/L.

2) If the blank value lies between the reporting limit and three times the reporting limit, the blank value is subtracted from the sample, and the reporting limit adjusted to the level found in the blank.

Example: EPA Method 624/HSL

Chloromethane	Reporting Limit = 10 ug/L
Blank Value = 15 ug/L	Sample = 25 ug/L

Report the sample as ND with a reporting limit of 15 ug/L.

3) If the blank value lies above three times the reporting limit, the supervisor is consulted to schedule the blank and all samples associated with the blank for repreparation and/or reanalysis.

Matrix Specific QC

Matrix specific QC is used to assess the effects of a sample matrix or field conditions on the analytical data. The main elements of matrix specific QC are:

- The analysis of matrix spikes, matrix duplicates, and matrix spike duplicates;
- Monitoring the recovery of surrogate compounds from environmental samples;
- Monitoring the results of standard additions in environmental samples;
- The analysis of field blanks; and
- The determination of method detection limits in a specific matrix.

Different regulatory programs have different requirements in terms of matrix specific QC (see Table 9-2). In order to ensure that the data generated meet all data quality objectives, Enseco encourages its clients to include matrix specific QC that fulfills the data quality objectives and regulatory requirements of the project. A discussion of the different elements of matrix specific QC follows.

TABLE 9-2

FREQUENCY OF QUALITY CONTROL SAMPLES

Analytes	Methods	Blanks		Duplicates			Matrix Spike Sample	Lab Control Sample	Surro-gates	PE Samples
		Method Blank	Field Blank	Field Dup.	Dup. Samples	Spike Dup.				
RCRA										
Soil, Waste Samples										
GC "8000" Series	8010-8150*	ESS	NS	-	ESS	ESS	ESS	-	100%	-
GC/MS VOA	8240*	Daily	NS	-	ESS	ESS	ESS	-	CLP	-
GC/MS Semivolatiles	8250,8270*	ESS	NS	-	ESS	ESS	ESS	-	CLP	-
Dioxin & Furans	8280*	ESS	NS	NS	ESS	-	ESS	-	CLP	NS
HPLC (PAH)	8310*	ESS	NS	-	ESS	-	ESS	-	-	-
Metals - Acid Dig.	3000	ESS	NS	NS	20%	-	ESS	ESS	-	-
AA	7000	ESS	NS	NS	5%	5%, 10%	20%	-	-	-
ICP	8010*	ESS	NS	NS	5%	20%	5%	-	-	-
CERCLA - Superfund (CLP)										
Water, Soil, Waste Samples										
GC - Pest. & PCB's	608-CLP	5%, ESS	Rec	-	-	5%, ESS	5%, ESS	-	Req	Qtrly
Dioxin (2378)	613-CLP	ESS	Rec	-	-	5%, ESS	5%, ESS	-	ACC	ESS
GC/MS Purgeables (VOA)	624-CLP	Daily, ESS	Rec	-	-	5%, ESS	5%, ESS	-	ACC	Qtrly
GC/MS Semivolatiles	625-CLP	5%, ESS	Rec	-	-	5%, ESS	5%, ESS	-	ACC	Qtrly
Metals - AA	200.0-CLP	5%, ESS	Rec	-	5%	-	5%, ESS	ESS	-	Qtrly
ICP	200.7-CLP	5%, ESS	Rec	-	5%	-	5%, ESS	ESS	-	Qtrly
CWA										
Water & Wastewater Samples										
GC Purgeables	601-602	Daily	-	NS	-	-	10%	Daily	-	-
GC "600" Series	603-619	ESS	-	NS	-	-	10%	-	-	-
GC/MS Purgeables (VOA)	624	Daily	-	NS	-	-	5%	Daily	Req	-
GC/MS Semivolatiles	625	ESS	-	NS	-	-	5%	-	Req	-
AAS Metals	200.0	ESS	-	NS	Opt., 10%	-	-	-	-	Yearly
ICP Metals	200.7	ESS	-	NS	-	-	-	-	-	-
SDWA										
Finished Drinking Water and Raw Source Water										
Organic "500" Series	502.1-531	Daily	ESS	10%	-	-	-	10%	-	Qtrly
Metals - Same as CWA										

ACC - Surrogates required, acceptance criteria CLP - CLP criters are used ESS - Each samples set NS - Not Specified
Opt - Optional Qtrly - Quarterly Rec - Recommended Req - Surrogates required, no acceptance criteria * SW-846 3rd edition

Matrix Spikes, Matrix Duplicates, and Matrix Spike Duplicates

A Matrix Spike (MS) is an environmental sample to which known concentrations of analytes have been added. The MS is taken through the entire analytical procedure and the recovery of the analytes is calculated. Results are expressed as percent recovery. The MS is used to evaluate the effect of the sample matrix on the accuracy of the analysis.

A Matrix Duplicate (MD) is an environmental sample that is divided into two separate aliquots. The aliquots are processed separately and the results compared to determine the effects of the matrix on the precision of the analysis. Results are expressed as RPD.

A Matrix Spike Duplicate (MSD) is an environmental sample that is divided into two separate aliquots, each of which is spiked with known concentrations of analytes. The two spiked aliquots are processed separately and the results compared to determine the effects of the matrix on the precision and accuracy of the analysis. Results are expressed as RPD and percent recovery.

Surrogate Recoveries and Standard Additions

Surrogates are organic compounds which are similar to the analytes of interest in chemical behavior, but which are not normally found in environmental samples. Surrogates are added to samples to monitor the effect of the matrix on the accuracy of the analysis. Results are reported in terms of percent recovery.

Enseco routinely adds surrogates to samples requiring GC/MS analysis and reports these surrogate recoveries to the client. The surrogate recoveries are used by the laboratory to assess matrix effects. Decisions concerning laboratory performance of the method are based on QC data generated from a control matrix (LCS and SCS).

Standard Additions (SA) is the practice of adding a series of known amounts of an analyte to an environmental sample. The fortified samples are then analyzed and the recovery of the analytes calculated. The practice of SA's is generally used with metal and conventional analyses to determine the effect of the sample matrix on the accuracy of the analyses.

Field Blanks

Field blanks are check samples that monitor contamination originating from the collection, transport or storage of environmental samples. One example of a field blank is an equipment blank. An equipment blank is blank water that is poured through the sample collection device to check the adequacy of the cleaning procedures for the sampling equipment. Another type of field blank is a trip blank. A trip blank is a laboratory control matrix (typically water) which is sent to the field, remains unopened in the field, and then is sent back to the laboratory. The purpose of the trip blank is to assess the impact of field and shipping conditions on the samples. The results from field blanks are reported to the client as samples in the same concentration units as the samples. No correction of the analytical data is done in the laboratory based on the analysis of field blanks.

Matrix Specific Detection Limits

Method Detection Limits (MDL's) determined on a specific sample matrix are called Matrix Specific Detection Limits. See Section 12 for a discussion of detection limits.

10. PERFORMANCE AND SYSTEM AUDITS

Enseco laboratories participate in a variety of federal and state certification programs, (including the U.S. EPA CLP), that subject each of the laboratories to stringent system and performance audits on a regular basis. A system audit is a review of laboratory operations conducted to verify that the laboratory has the necessary facilities, equipment, staff and procedures in place to generate acceptable data. A performance audit verifies the ability of the laboratory to correctly identify and quantitate compounds in blind check samples submitted by the auditing agency. The purpose of these audits is to identify those laboratories that are capable of generating scientifically sound data. Enseco is certified to perform environmental analyses under programs administered by the U.S. EPA, U.S. Army, U.S. Navy, and over 15 states. The most current list of Enseco certifications is available upon request.

In addition to external audits conducted by certifying agencies or clients, Enseco regularly conducts the following internal audits:

- Monthly systems audits conducted by the Division QA Director.
- Quarterly audits conducted by the Corporate VP of QA.
- Special audits by the Divisional QA Director or Corporate VP of QA when a problem is suspected.

Enseco laboratories also routinely analyze internal check samples as described below:

- Laboratory QC check samples (LCS, SCS, and blanks) are analyzed at a frequency equal to at least 10% of the total number of samples analyzed (see Section 9).
- An independent commercial firm is contracted to provide all laboratories with blind check samples on a monthly basis. The results of the analyses of these samples are evaluated by the VP of QA.

The results of these internal check samples are used to identify areas where additional training is needed or clarification of procedures is required.

11. PREVENTIVE MAINTENANCE

To minimize downtime and interruption of analytical work, preventive maintenance is routinely performed on each analytical instrument. Designated laboratory personnel are trained in routine maintenance procedures for all major instrumentation. When repairs are necessary, they are performed by either trained staff or trained service engineers employed by the instrument manufacturer.

Each laboratory has detailed SOP's on file that describe preventive maintenance procedures. The laboratories also maintain detailed logbooks documenting the preventive maintenance and repairs performed on each analytical instrument.

12. SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA QUALITY AND DETERMINE DETECTION LIMITS

Data Quality Assessment

The effectiveness of a QA program is measured by the quality of data generated by the laboratory. Data quality is judged in terms of its precision, accuracy, representativeness, completeness and comparability. These terms are described as follows:

Precision is the degree to which the measurement is reproducible. Precision can be assessed by replicate measurements of reference materials, environmental samples, or LCS. Enseco routinely monitors precision by comparing the RPD between LCS measurements with control limits established at plus three standard deviations from the mean RPD of historical LCS data.

Precision is frequently determined by comparison of replicates. Standard deviation of a sample of size n of measurements of x is commonly used in estimating precision.

Sample standard deviation (S) is calculated as follows:

$$S = \sqrt{\frac{1}{n-1} \sum_{i=1}^{n} (Xi - \bar{X})^2}$$

where a quantity x (e.g., a concentration) is measured n times.

The relative standard deviation (or sample coefficient of variation, CV), which expresses standard deviation as a percentage of the mean, is generally useful in the comparison of three or more replicates (although it may be applied in the case of n = 2).

$$RSD = 100\ (s/\bar{X})$$

or

$$CV = 100\ (s/\bar{X})$$

where: RSD = relative standard deviation

CV = coefficient of variation

s = standard deviation

$\bar{X}$ = mean

In the case of duplicates, the RPD between the two samples may be used to estimate precision.

$$RPD = \frac{|D_1 - D_2|}{(D_1 + D_2)/2} \times 100$$

where: RPD = relative percent difference

D_1 = first sample value

D_2 = second sample value (duplicate)

Accuracy is a determination of how close the measurement is to the true value. Accuracy can be assessed using standard reference materials, LCS, or spiked environmental samples. Unless specified otherwise in special contracts, Enseco monitors accuracy by comparing LCS results with the control limits established at plus or minus three standard deviation units from the mean of historical LCS results.

The determination of the accuracy of a measurement requires a knowledge of the true or accepted value for the signal being measured. Accuracy may be calculated in terms of percent recovery as follows:

$$\text{Percent Recovery} = \frac{X}{T} \times 100$$

where: X = the observed value of measurement

T = "true" value

Representativeness is the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Analytical data should represent the sample analyzed regardless of the heterogeneity of the original sample matrix. Enseco strives to accommodate all sample matrices. Some samples may require analysis of multiple phases to obtain representative results.

Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount that was expected to be obtained under correct normal conditions.

To be considered complete, the data set must contain all QC check analyses verifying precision and accuracy for the analytical protocol. In addition, all data are reviewed in terms of stated goals in order to determine if the data base is sufficient.

When possible, the percent completeness for each set of samples is calculated as follows:

$$\text{Completeness} = \frac{\text{valid data obtained}}{\text{total data planned}} \times 100\%$$

Comparability expresses the confidence with which one data set can be compared to another data set measuring the same property. Comparability is ensured through the use of established and approved analytical methods, consistency in the basis of analysis (wet weight, volume, etc.), and consistency in reporting units (ppm, ppb, etc.).

Detection Limits

The sensitivity of an analytical method is related to the detection limit, (i.e., the lowest concentration of an analyte that can be detected at a specific confidence level). Definitions of Instrument Detection Limit (IDL), MDL, Limit of Quantitation (LOQ), and Practical Quantitation Limit (PQL) follow. The relationship of these terms is expressed graphically in Figure 12-1.

An IDL is the smallest signal above background noise that an instrument can detect at a 99% confidence level. An IDL is measured by analyzing replicate blank samples. It is calculated by the mean plus two standard deviations for a normal distribution, or three standard deviations for data which does not obey a normal distribution.

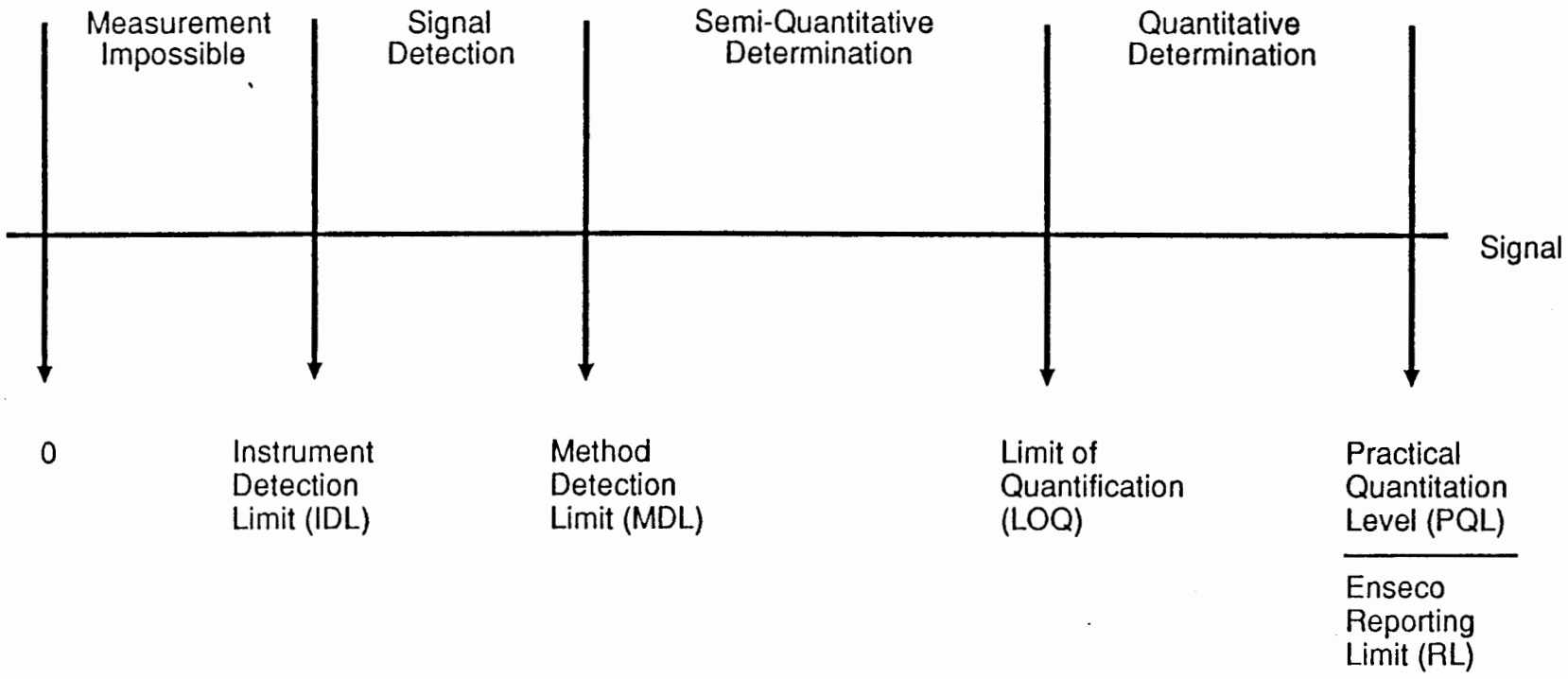
An MDL is the minimum signal level required to qualitatively identify a specific analyte by a specific procedure at a confidence level which is greater than 97%. An MDL is measured by analyzing a minimum of seven (7) replicates spiked at one (1) to five (5) times the expected method detection limit. It is calculated by the standard deviation times the the Student t-value at the desired confidence level.

An LOQ is the minimum signal level required to quantitate a specific analyte by a specific procedure at the desired confidence level (intralaboratory). An LOQ is measured by analyzing a minimum of seven (7) replicates spiked at one (1) to five (5) times the expected method detection limit. It is calculated by ten times the standard deviation obtained in the MDL study.

A PQL is the minimum level that can be reliably achieved by a method within specified limits of precision and accuracy. A PQL is measured by the analysis of check samples containing analytes at concentrations of one (1) to five (5) times the MDL. It is calculated by evaluation of interlaboratory check sample results to derive a PQL.

Figure 12-1

Graphical Representation of Detection Limits



NOTE: The spaces along the horizontal "signal" axis between the various analytical limits are not meant to indicate any relative or absolute signal values.

MDL, LOQ and PQL may be determined in a blank matrix or a specific sample matrix, depending on the objectives of the determination. Enseco determines the MDL for routine method using a blank matrix. MDL's are determined in a specific sample matrix when requested by the client as matrix specific QC (see Section 9).

13. CORRECTIVE ACTION

When errors, deficiencies, or out-of-control situations exist, the QA program provides systematic procedures, called "corrective actions," to resolve problems and restore proper functioning to the analytical system.

Laboratory personnel are alerted that corrective actions may be necessary if:

- QC data are outside the warning or acceptable windows for precision and accuracy;
- Blanks, LCS or SCS contain contaminants above acceptable levels;
- Undesirable trends are detected in spike recoveries or RPD between duplicates;
- There are unusual changes in detection limits;
- Deficiencies are detected by the QA department during internal or external audits or from the results of performance evaluation samples; or
- Inquiries concerning data quality are received from clients.

Corrective action procedures are often handled at the bench level by the analyst, who reviews the preparation or extraction procedure for possible errors, checks the instrument calibration, spike and calibration mixes, instrument sensitivity, and so on. If the problem persists or cannot be identified, the matter is referred to the laboratory supervisor, manager and/or QA department for further investigation. Once resolved, full documentation of the corrective action procedure is filed with the QA department. Corrective action documentation is routinely reviewed by the VP of QA.

14. QA REPORTS TO MANAGEMENT

The reporting system is a valuable tool for measuring the overall effectiveness of the QA program. It serves as an instrument for evaluating the program design, identifying problems and trends, and planning for future needs. Divisional QA Directors submit extensive monthly reports to the VP of QA and the Divisional Director. These reports include:

- The results of the monthly systems audit including any corrective actions taken;
- Performance evaluation scores and commentaries;
- Results of site visits and audits by regulatory agencies and clients;
- Performance on major contracts, (including CLP);
- Problems encountered and corrective actions taken;
- Holding time violations; and
- Comments and recommendations.

In addition, on a weekly basis, a summary of the 5% QA audit of reported data is sent to the Corporate QA Office.

The VP of QA submits weekly reports to the CEO and monthly report to the Enseco Management Committee and each Divisional Director. These reports summarize the information gathered through the laboratory reporting system and contain a thorough review and evaluation of laboratory operations throughout Enseco.

15. LABORATORY DOCUMENTATION

Complete and accurate documentation of analytical and procedural information is an important part of the QA program. The following describes different types of documentation used in the Enseco laboratories.

SOP's

Details of analytical and QC protocols are contained in SOP's. SOP's are documents that contain detailed information on the requirements for the correct performance of a laboratory procedure. Enseco has four categories of laboratory SOP's:

- SOP's for Performance of an Analytical Method;
- SOP's for Preparation of Standards and Reagents;
- SOP's for Equipment Operation, Calibration, and Maintenance; and
- SOP's for General Laboratory Procedures.

The formats for these SOP'S are shown in Figures 6 through 9.

All SOP'S are approved by the QA Department before being implemented. The distribution of current SOP'S and archiving of outdated ones is controlled through the QA Department by the Document Custodian.

LDMS

Enseco laboratories rely on a LDMS as the primary data base. Client information, sample results, and QC results are all stored in the LDMS. Reports are generated directly from the data base to eliminate transcription errors. A tiered security system is in place to control the

ability of lab personnel to make changes, and the system is designed with an audit trail that identifies when information has been changed and who changed it. The most recent two to three months of analytical data are kept on-line. All other data are archived on magnetic tape or optical disk.

Laboratory Bench Sheets

Laboratory bench sheets are used to document information from routine laboratory operations, including sample preparation and analysis. Bench sheets are used to ensure that the information is recorded in a complete and organized manner and that the analysis can be reconstructed, if necessary. Portions of information from the bench sheet are also stored in the LDMS.

Laboratory Notebooks

Laboratory notebooks are used to document information that cannot easily be recorded in the LDMS. Information typically recorded in laboratory notebooks includes unusual observations or occurrences in the analysis of samples, or methods development information. Each page in a laboratory notebook is initialed and dated as information is entered.

Project Files

A project file is created for each project handled within the laboratory. The project file contains all documents associated with the project. This includes correspondence from the client, chain-of-custody records, raw data, copies of laboratory notebook entries pertaining to the project, and a copy of the final report. When a project is complete, all records are passed to the Document Custodian who inventories the file, checks for completeness, and puts the file into document archive.

APPENDIX I

ENSECO RECOMMENDED MAXIMUM HOLDING TIMES AND SAMPLE COLLECTION/PRESERVATION INFORMATION

ENSECO RECOMMENDED MAXIMUM HOLDING TIMES AND SAMPLE COLLECTION/PRESERVATION INFORMATION

A. ORGANICS

Parameter	Method No.	Matrix	Holding Time[a] (from date sampled)	Container	Preservative	Min. Sample Size
Volatile Halocarbons	601	Water	14 days	40 ml VOA vial (duplicate)	4°C	40 ml
	8010	Soil/Waste		core tube or	4°C	10 g
		-Direct Purge	14 days	glass jar		
		-Methanol Extn.	14 days extn. 7 days anal.			
Volatile Aromatics	602[b]	Water	7 days[b]	40 ml VOA vial (duplicate)	4°C	40 ml
	8020	Soil/Waste		core tube or	4°C	10 g
		-Direct Purge	14 days	glass jar		
		-Methanol Extn.	14 days extn. 7 days anal.			
Phenols	604	Water	7 days extn. 40 days anal.	One liter glass	4°C	1,000 ml
	8040	Soil/Waste	14 days extn. 40 days anal.	core tube or glass jar	4°C	50 g
Phthalate Esters	606	Water	7 days extn. 40 days anal.	One liter glass	4°C	1,000 ml
	8060	Soil/Waste	14 days extn. 40 days anal.	core tube or glass jar	4°C	50 g
OC Pesticides/ PCB's	608	Water	7 days extn. 40 days anal.	One liter glass	4°C	1,000 ml
	8080	Soil/Waste	14 days extn. 40 days anal.	core tube or glass jar	4°C	50 g
Polyaromatic Hydrocarbons	610	Water	7 days extn. 40 days anal.	One liter glass	4°C	1,000 ml
	8310	Soil/Waste	14 days extn. 40 days anal.	core tube or glass jar	4°C	50 g

A. ORGANICS (Cont.)

Parameter	Method No.	Matrix	Holding Time[a] (from Date Sampled)	Container	Preservative	Min. Sample Size
OP Pesticides	614	Water	7 days extn. 40 days anal.	One liter glass	4°C	1,000 ml
	8140	Soil/Waste	14 days extn. 40 days anal.	core tube or glass jar	4°C	50 g
Phenoxy Acid Herbicides	615	Water	7 days extn. 40 days anal.	One liter glass	4°C	1,000 ml
	8150	Soil/Waste	14 days extn. 40 days anal.	core tube or glass jar	4°C	50 g
Volatiles	624	Water	7 days[b]	40 ml VOA vial (duplicate)	4°C	40 ml
	8240	Soil/Waste -Direct Purge -Methanol Extn.	 14 days 14 days extn. 7 days anal.	core tube or glass jar	4°C	10 g
Semivolatiles	625	Water	7 days extn. 40 days anal.	One liter glass	4°C	1,000 ml
	8270	Soil/Waste	14 days extn. 40 days anal.	core tube or glass jar	4°C	50 g
Carbamate & Urea Pesticides	632	Water	7 days extn. 40 days anal.	One liter glass	4°C	1,000 ml
	632-S	Soil/Waste	14 days extn. 40 days anal.	core tube or glass jar	4°C	50 g
Dioxins/Furans	8280-W	Water	7 days extn. 40 days anal.	One liter glass	4°C	1,000 ml
	8280	Soil/Waste	None required	core tube or glass jar	4°C	50 g
Petroleum Hydrocarbons	PH-GC	Water	7 days extn. 40 days anal.	One liter glass	4°C and H_2SO_4	500 ml
	PH-GC	Soil/Waste	14 days anal. 40 days anal.	core tube or glass jar	4°C	50 g

(a) extn.: extraction anal.: analysis; (b) If preserved with HCl:, 14 day holding time

B. METALS

Parameter	Method No.	Matrix	Holding Time[a] (from Date Sampled)	Container	Preservative	Min. Sample Size
Metals (ICP)	200.7	Water	6 months	Poly	HNO_3 to pH < 2.0	100 ml
	6010	Soil/Waste	6 months	core tube/glass jar	4°C	10 g
Arsenic (GF-AA)	206.2	Water	6 months	Poly	HNO_3 to pH < 2.0	100 ml
	7060	Soil/Waste	6 months	core tube/glass jar	4°C	10 g
Mercury (CV-AA)	245.1	Water	28 days	Poly	HNO_3 to pH < 2.0	100 ml
	7470	Soil/Waste	28 days	core tube/glass jar	4°C	10 g
Selenium (GF-AA)	270.2	Water	6 months	Poly	HNO_3 to pH < 2.0	100 ml
	7740	Soil/Waste	6 months	core tube/glass jar	4°C	10 g
Thallium (GF-AA)	279.2	Water	6 months	Poly	HNO_3 to pH < 2.0	100 ml
	7841	Soil/Waste	6 months	core tube/glass jar	4°C	10 g
Lead (GF-AA)	239.2	Water	6 months	Poly	HNO_3 to pH < 2.0	100 ml
	7421	Soil/Waste	6 months	core tube/glass jar	4°C	10 g
Chromium (III/VI)	312B	Water	24 hours	Poly	4°C	100 ml
	312B	Soil/Waste	24 hours extn. [b]	core tube/glass jar	4°C	10 g
Silica	200.7	Water	28 days	Poly	4°C	100 ml
	6010	Soil/Waste	28 days	core tube/glass jar	4°C	10 g

(a) Listed preservative is for total metals. Dissolved or suspended metals require filtration prior to pH adjustment.

C. CONVENTIONALS

Parameter	Method No.	Matrix	Holding Time[a] (from Date Sampled)	Container	Preservative	Min. Sample Size
Color	110.2	Water	48 hours	Poly	4°C	100 ml
Oil and Grease	413.1	Water	28 days	Glass	4°C, H_2SO_4 to pH < 2	1000 ml
Specific Conductance	120.1	Water	28 days	Poly	4°C	50 ml
Acidity	305.1	Water	14 days	Poly	4°C	50 ml
pH	150.1	Water	24 hours	Poly	4°C	50 ml
Alkalinity	310.1	Water	14 days	Poly	4°C	50 ml
Hardness	200.7	Water	6 months	Poly	HNO_3 to pH < 2	50 ml
Biochemical Oxygen Demand	405.1	Water	48 hours	Poly	4°C	200 ml
Chemical Oxygen Demand	410.4	Water	28 days	Glass	4°C, H_2SO_4 to pH < 2	100 ml
Organic Carbon (TOC)	415.1	Water	28 days	Glass	4°C, H_2SO_4 to pH < 2	100 ml

C. CONVENTIONALS (Cont.)

Parameter	Method No.	Matrix	Holding Time[a] (from Date Sampled)	Container	Preservative	Min. Sample Size
Orthophosphate	365.3	Water	48 hours	Poly	4°C	100 ml
T. Phosphorus	365.3	Water	28 days	Glass	H_2SO_4 to pH < 2	100 ml
Total Kjeldahl Nitrogen	351.2	Water	28 days	Glass	4°C, H_2SO_4 to pH < 2	100 ml
Ammonia	350.1	Water	28 days	Glass	4°C, H_2SO_4 to pH < 2	50 ml
Nitrite	354.1	Water	48 hours	Poly	4°C	50 ml
Nitrate	353.2	Water	48 hours	Poly	4°C	50 ml
Nitrite plus Nitrate	353.2	Water	28 days	Glass	4°C, H_2SO_4 to pH < 2	50 ml
Total Solids	160.3	Water	7 days	Poly	4°C	100 ml
Total Suspended Solids	160.2	Water	7 days	Poly	4°C	100 ml
Total Dissolved Solids	160.1	Water	7 days	Poly	4°C	100 ml

C. CONVENTIONALS (Cont.)

Parameter	Method No.	Matrix	Holding Time[a] (from Date Sampled)	Container	Preservative	Min. Sample Size
Total Volatile Solids	160.4	Water	7 days	Poly	4°C	100 ml
Turbidity	180.1	Water	48 hours	Poly	4°C	50 ml
Sulfate	300.0	Water	28 days	Poly	4°C	50 ml
Sulfite	377.1	Water	ASAP	Poly	4°C	100 ml
Sulfide	376.2	Water	7 days	Poly	4°C, NaOH, $Zn(C_2H_3O_2)_2$	100 ml
Cyanide	335.1/ 335.2/335.3	Water	14 days	Poly	4°C, NaOH to pH > 12	250 ml
Coliform, Fecal & Total	909A/ 909C	Water	24 hours	Sterile poly	4°C, $Na_2S_2O_3$	100 ml
Bromide	Dionex	Water	28 days	Poly	4°C	50 ml
Chloride	300.0	Water	28 days	Poly	4°C	50 ml
Chlorine, residual	330.2	Water	24 hours	Poly	4°C	100 ml

C. CONVENTIONALS (Cont.)

Parameter	Method No.	Matrix	Holding Time[a] (from Date Sampled)	Container	Preservative	Min. Sample Size
Fluoride	340.2	Water	28 days	Poly	4°C	50 ml
Iodide	Dionex	Water	NA	Poly	4°C	50 ml
Organic Halogen (TOX)	9020	Water	14 days	Glass	4°C, H_2SO_4 to ph < 2	200 ml
Phenolics	420.1/ 420.2	Water	28 days	Glass	4°C, H_2SO_4 to ph < 2	100 ml
Surfactants	425.1	Water	48 hours	Poly	4°C	100 ml
Gross Alpha, Beta and Radium	9310/ 9315	Water	6 months	Poly	HNO_3 to ph < 2	2,000 ml

a) Parameters with holding times of 24 hours or less are analyzed on the day of receipt in the laboratory. Parameters with holding times between 24 and 48 hours are analyzed within one day of receipt in the laboratory.

NA: Not applicable. No holding time listed in the method.

APPENDIX II

FORMATS FOR STANDARD OPERATING PROCEDURES (SOP)

FORMAT FOR SOP - LABORATORY, ANALYTICAL METHOD

Title (includes method number)

1. Scope and Application
   - 1.1 Analytes
   - 1.2 Detection limit (instrument and method)
   - 1.3 Applicable matrices
   - 1.4 Dynamic range
   - 1.5 Approximate analytical time (i.e., 5 minutes, 2 days)

2. Summary of Method
   - 2.1 Generic description of method and chemistry behind it (i.e., extract with solvent, convert to methyl ester, analyze by electron-capture gas chromatography)

3. Comments
   - 3.1 Interferences
   - 3.2 Helpful hints

4. Safety Issues (specific to the method)

5. Sample Collection, Preservation, Containers, and Holding Times

6. Apparatus

7. Reagents and Standards

8. Procedure (detailed step-by-step)
   - 8.1 Sample preparation
   - 8.2 Calibration
   - 8.3 Analysis

FORMAT FOR SOP - LABORATORY, ANALYTICAL METHOD (cont.)

9. QA/QC Requirements

   9.1 QC samples

   9.2 Acceptance criteria (precision and accuracy, % of multi-component QC analytes which must be within windows)

   9.3 Corrective action required (reference current QC manual)

10. Calculations

11. Reporting

   11.1 Reporting units

   11.2 Reporting limits

   11.3 Significant figures and reporting values below detection limit

   11.4 LDMS data entry

12. References

   12.1 Method source

   12.2 Deviations from source method and rationale

FORMAT FOR SOP - LABORATORY, EQUIPMENT OPERATION, CALIBRATION, AND MAINTENANCE

Title

1. Purpose

2. Safety Issues (applicable to the specific equipment)

3. Procedure

   3.1 Initial start-up
   3.2 Calibration and performance documentation
   3.3 Example output
   3.4 Shut-down
   3.5 Maintenance and maintenance records

4. Responsibilities

5. Comments

6. Definitions

FORMAT FOR SOP - LABORATORY, STANDARDS AND REAGENTS

Title

1. Reagent/Standard Name

2. Type (reagent, calibration standard, LCS, SCS, stock solution, etc.)

3. Constituents/concentration

4. Solvent

5. Safety Issues (specific to the reagent or standard)

6. Shelf Life

7. Procedure

   7.1 Preparation
   7.2 Documentation (purchase date, open date, labeling, etc.)
   7.3 Verification

FORMAT FOR SOP - LABORATORY, PROCEDURAL

Title

1. Purpose
2. Policies
3. Safety Issues
4. Procedure
5. Responsibilities
6. Comments
7. Definitions

ATTACHMENT 3

Job Safety Plan

V JOB SAFETY PLAN

This job safety plan is specifically prepared for: Sparton Technology, Inc.

Project location Albuquerque, New Mexico

Job number 6310.039.12

The possible hazards on this job are expected to be: low level organic volatiles, hazards associated with nearby highway traffic, overhead and underground utility clearances for drilling rig (to be cleared prior to field work).

Required personal protective equipment for this project: Level D (Level C equipment will be available on site).

All personnel participating in the field must be trained in the general and specific hazards unique to the job and, if applicable, meet recommended medical examination requirements.

This plan is prepared to inform all field personnel, including HLA contractors and HLA subcontractors, of the potential hazards on the site. However, each contractor or subcontractor must assume responsibility for his own employees' health and safety.

HARDING LAWSON ASSOCIATES
JOB SAFETY PLAN

1. **Site:** Sparton Technology, Inc. **2. Job No.:** 6310,039.12

3. **Location:** near 9621 Coors Road, NW; Albuquerque, New Mexico 87114

4. **Plan Prepared:** Rodney D. Lee (Name) — December 6, 1988 (Date)

5. **Plan Approved:** Jay E. Mabrey, P.E. (PM) — December 21, 1988 (Date)

   Gary L. Richardson (DHSO) — December 21, 1988 (Date)

6. **Plan Revised:** _____ (Name) — _____ (Date)

7. **Revision Approved:** _____ (PM) — _____ (Date)

   _____ (DHSO) — _____ (Date)

8. **Facility Description:** Electronics manufacturing facility.

9. **Status (active, inactive, unknown):** Active

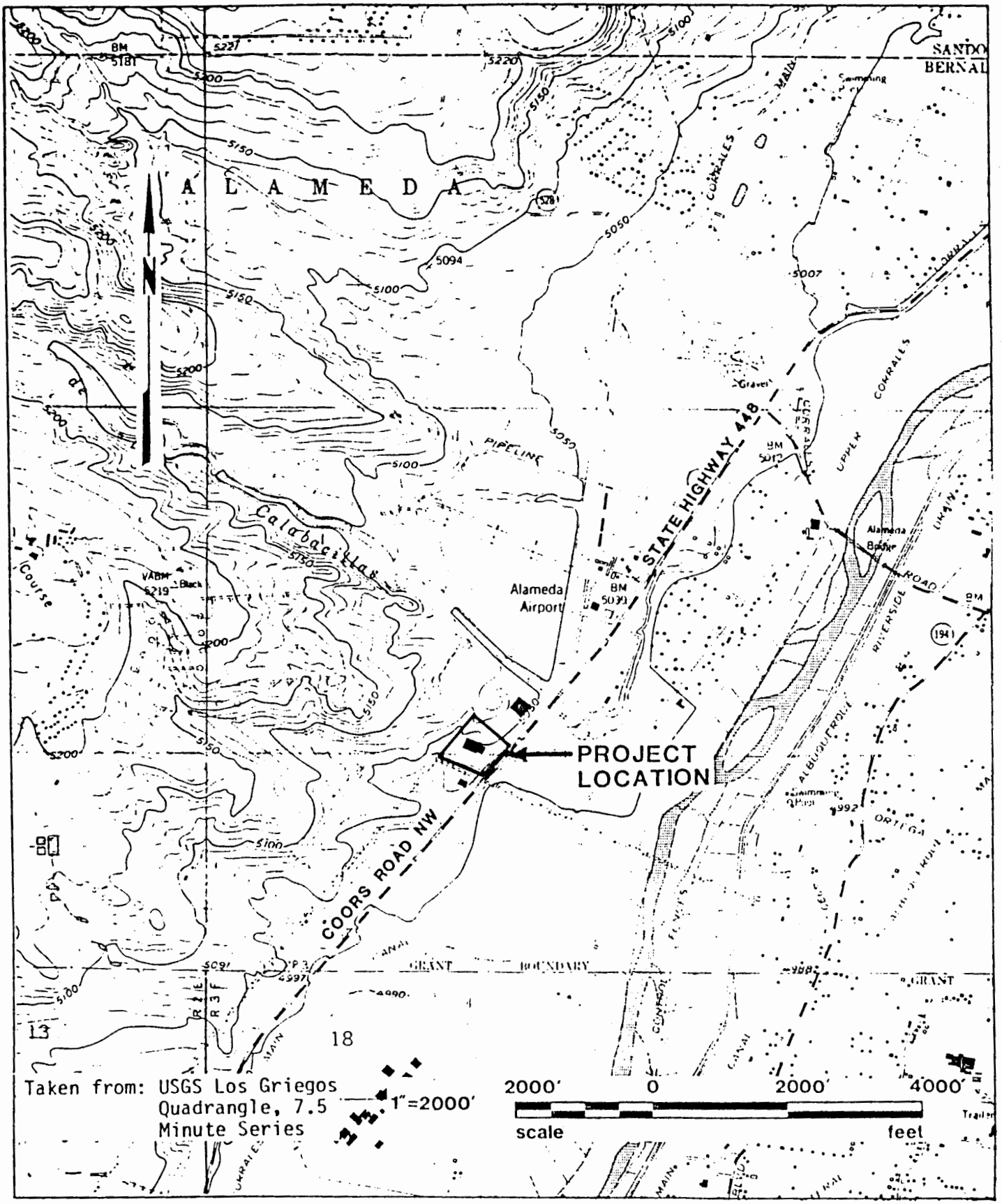
10. **Surroundings (location with respect to residences, businesses, natural features, etc.):**
    Facility is on State Highway 448 about 0.5 mile south of Alameda Airport, 0.5 mile west of Rio Grande River. Commercial/unimproved land use, low density population.

11. **Site map (attach map showing salient features, including location of HLA's work and location of contaminated areas).**
    See Plates 1 through 5

12. **Climate**

    12a. Average wind speed and direction: January-N or SE, July-SE, Annual avg.-SE and NW

	July	October	January	April
12b. Mean High Temperature	90		45	
Mean Low Temperature	60		20	



Harding Lawson Associates
Engineers Geologists & Geophysicists

LOCATION MAP

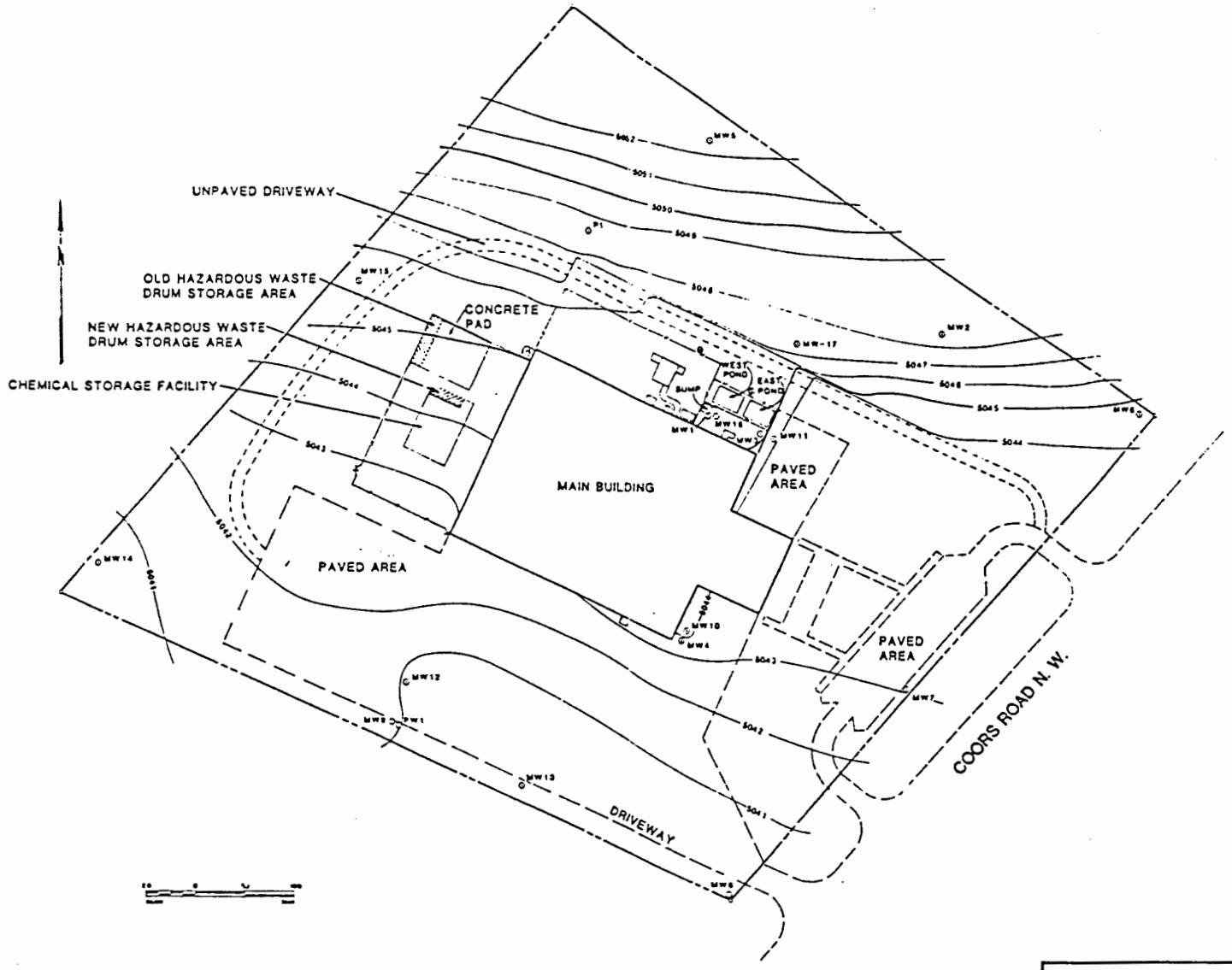
Sparton Technology, Inc.
Albuquerque, New Mexico

1

SP	6310,039.12	F	XG	12-17-85

OGC-003411

OGC-003412



HLA Harding Lawson Associates Engineers, Geologists & Geophysicists

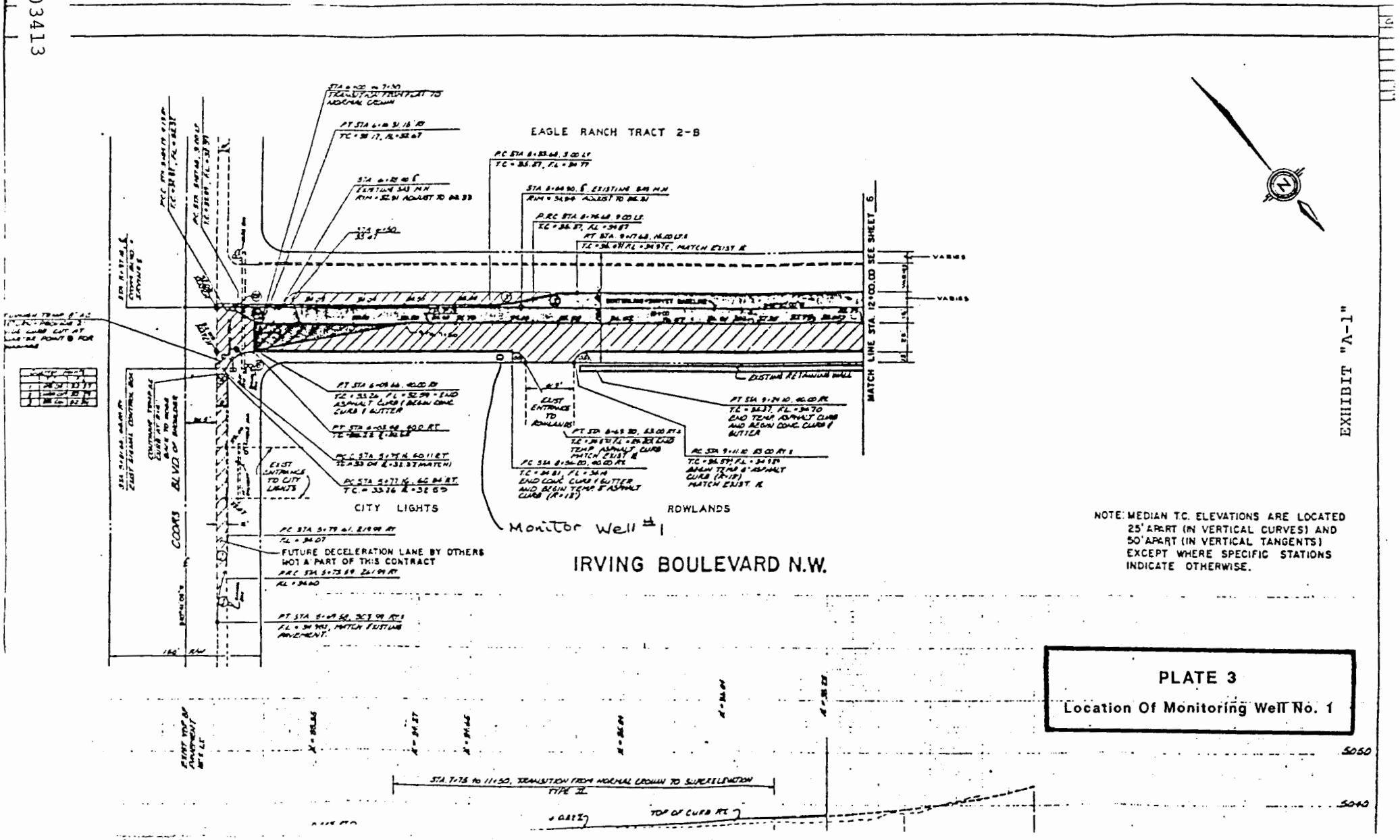
PLOT PLAN

SPARTON TECHNOLOGY, INC
ALBUQUERQUE, NEW MEXICO

2

MK · 8310.012.12

OGC-003413



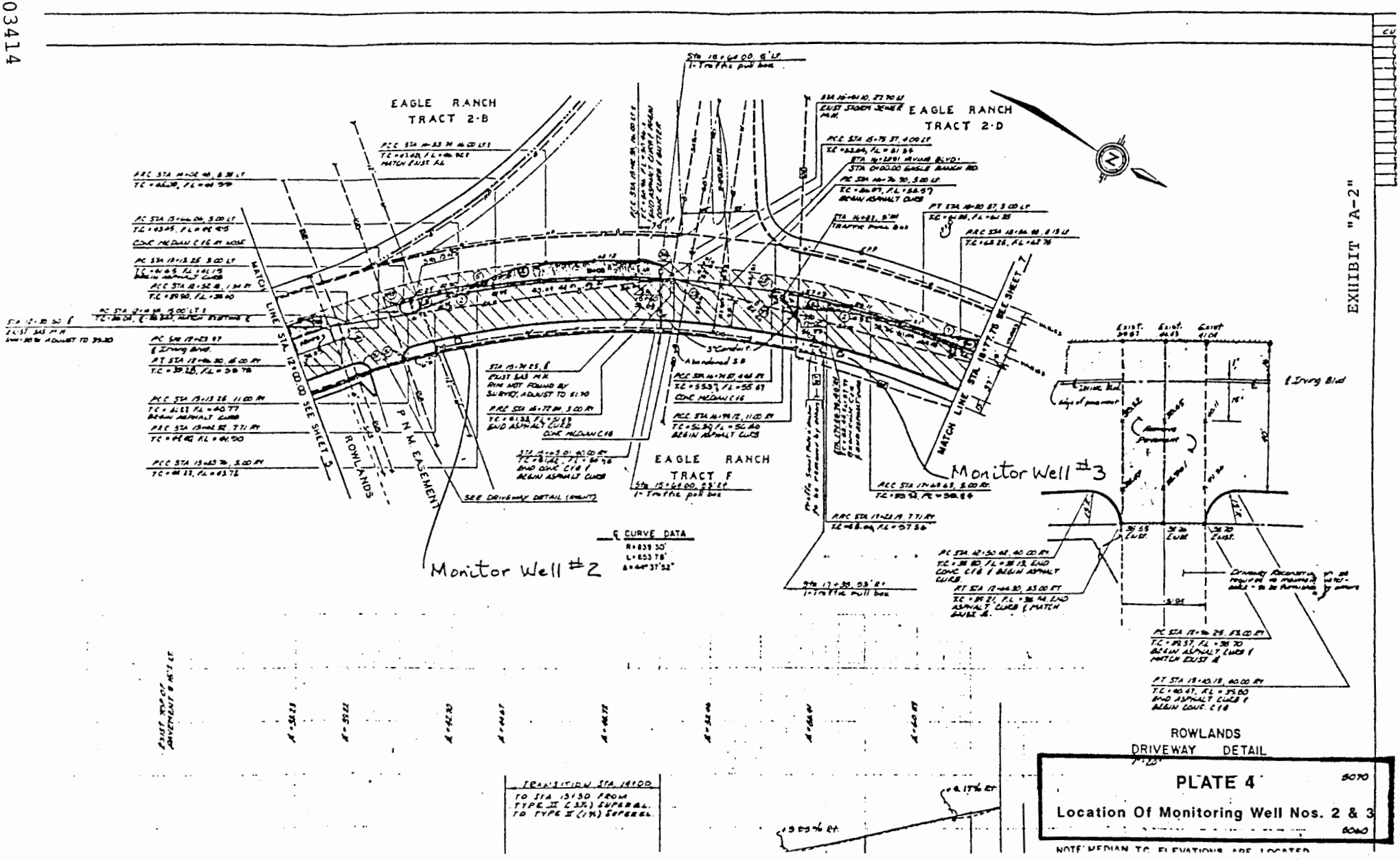
NOTE: MEDIAN T.C. ELEVATIONS ARE LOCATED 25' APART (IN VERTICAL CURVES) AND 50' APART (IN VERTICAL TANGENTS) EXCEPT WHERE SPECIFIC STATIONS INDICATE OTHERWISE.

EXHIBIT "A-1"

PLATE 3

Location Of Monitoring Well No. 1

OGC-003414


EAGLE RANCH TRACT 2-B
EAGLE RANCH TRACT 2-D
EAGLE RANCH TRACT F
EXHIBIT "A-2"
MATCH LINE STA 12+00.00 SEE SHEET 3
MATCH LINE STA 18+77.75 SEE SHEET 7
ROWLANDS
P N M EASEMENT
Monitor Well #2
Monitor Well #3
SEE DRIVEWAY DETAIL (RIGHT)
℄ CURVE DATA
R=839.50'
L=653.78'
Δ=44°37'52"
℄ Irving Blvd
ROWLANDS
DRIVEWAY DETAIL
PLATE 4
Location Of Monitoring Well Nos. 2 & 3
NOTE: MEDIAN TO ELEVATIONS ARE LOCATED

OGC-003415

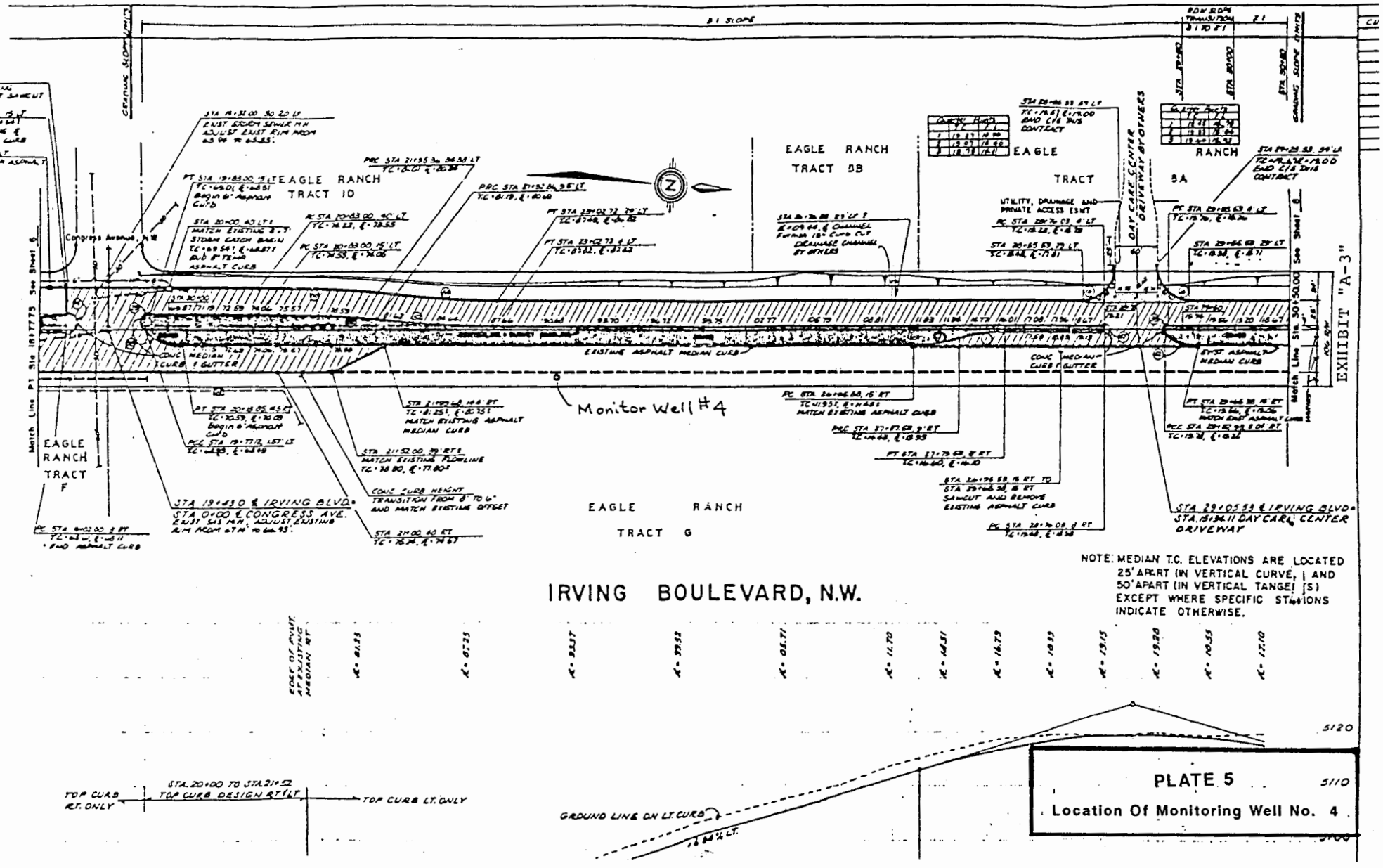


PLATE 5

Location Of Monitoring Well No. 4

13. **Site history (origin of contamination and history of injuries, exposure, chemical spills, complaints, etc.):** Old drum area used 1981, sump closed 1980, ponds closed, one drum storage area used 1980 to present.

14. **Description of HLA's work (including location with respect to areas of known or suspected contamination):** Drilling and installation of 4 groundwater monitoring wells to a depth not to exceed 200 feet below ground surface. Work to be performed in utility right-of-way owned by City of Albuquerque along Irving Boulevard NW and located approximately 500 feet south of Sparton Technology facilities. Contamination suspected in right-of-way.

15. Chemical Contaminants

15a. List chemical contaminants that have been identified, their concentration, and the environmental media in which they are present. Hazardous property information for selected chemicals appears in the appendix. Review this information for all chemicals listed below. If chemicals are not listed in the appendix, you must enter the hazardous property information in the appendix in the spaces provided.

Chemical	Environmental Media (Enter Code)	Measured Concentration, mg/l Minimum	Maximum
Methylene Chloride	GW	ND	2.7
1,1,1-Trichloroethane	GW	0.0068	24.0
Trichloroethylene	GW	0.019	26.0
1,1-Dichloroethylene	GW	0.011	2.4

ND = Not Detected.

* Minimum concentration values taken from wells on south side of property only. Maximum concentrations from wells near pond and sump area (center of property).

Chemical	Environmental Media (Enter Code)	Measured Concentration Minimum	Maximum

Code for environmental media:

Sl	Sludge
GW	Ground water
SW	Surface water
LW	Liquid waste
So	Soil
A	Air

Other - Specify

15b. List chemical contaminants that are suspected to be present.

15c. Has the site been adequately characterized to the best of your knowledge?

Yes __X__ No ____

If yes, list applicable references or previous reports/studies.

See Appendix 1

6. Hazard Analyses

List all activities in the Job Activity Column and assign a number to each activity (example: 1. Ground Water Sampling)
Identify how each category of hazard exists at each activity. See example hazard analyses in Appendix 2.

Activity Number	Job Task	Mechanical	Electrical	Chemical	Temperature	Acoustical	Radioactive	O2 Deficiency-Confined Space	Biohazard
1	Drilling, Soil Sampling and Well Installation	Rig Equipment and from Traffic Near Right-of-Way	Overhead and Underground Utilities (to be cleared prior to drilling)	In soils and groundwater	Potential Cold Stress	Rig Noise	NE	NE	NE

*NE = Not Expected

17. **Procedures to mitigate hazards**

Identify procedures to mitigate all hazards listed in Item 16 by placing the task number next to the appropriate mitigating measure. Listing of standard procedures is not inclusive. A specific procedure must be entered to mitigate each hazard identified in Item 16.

Activity List Number	Mechanical Hazards
Not Applicable	Do not stand near backhoe buckets and earth moving equipment.
1	Verify that all equipment is in good condition.
Not Applicable	Do not stand or walk under elevated loads or ladders.
Not Applicable	Do not stand near unguarded excavation and trenches.
Not Applicable	Do not enter excavation or trenches over 5 feet deep that are not properly guarded, shored or sloped.
1	Consult DHSO if other mechanical hazards exist.
1	Special safety considerations in regard to traffic hazard- exercise caution while working near road.

	Electrical Hazards
1	Locate and mark buried utilities before drilling.
1	Utilities located by: on
1	Maintain at least 10 foot clearance from overhead power lines.
1	Contact utility company for minimum clearance from high voltage power lines.
1	If unavoidably close to buried or overhead power lines, have power turned off, with circuit breaker locked and tagged.
Not Applicable	Properly ground all electrical equipment.
Not Applicable	Avoid standing in water when operating electrical equipment.
Not Applicable	If equipment must be connected by splicing wires, make sure all connections are properly taped.
1	Be familiar with specific operating instructions for each piece of equipment.

Chemical Hazards

1	Use personal protective equipment indicated in Section 18.
1	Conduct direct reading air monitoring to evaluate respiratory and explosion hazards (list instrument, action level, monitoring location, and action to be taken in Section 19).
1	Consult DHSO for personal air monitoring.
1	Breathing zone to be monitored with HNu Systems, Inc. photo-
	ionization detector.

Temperature Hazards

Heat Stress

Not Applicable	When temperature exceeds 70°F, take frequent breaks in shaded area. Unzip or remove coveralls during breaks. Have cool water or electrolyte replenishment solution available. Drink small amounts frequently to avoid dehydration. Count the pulse rate for 30 seconds as early as possible in the rest period. If the pulse rate exceeds 110 beats per minute at the beginning of the rest period, shorten the work cycle by one-third.

Cold Stress

1	Wear multilayer cold weather outfits. The outer layer should be of wind resistant fabric.
1*	0° to -30°F total work time is 4 hours. Alternate 1 hour in and 1 hour out of the low-temperature area. Below -30°F, consult industrial hygienist.
1	Drink warm fluid. Provide warm shelter for resting. Use buddy system. Avoid heavy sweating.
*	Total work time to be determined in field by DHSO.

Acoustical Hazards

1	Use earplugs or earmuffs when noise level prevents conversation in normal voice at distance of three feet.

O_2 Deficiency - Confined Space Hazards

Confined spaces include trenches, pits, sumps, elevator shafts, tunnels, or any other area where circulation of fresh air is restricted or ability to readily escape from the area is restricted. Consult DHSO and Corporate Health and Safety Policy prior to entering confined space.

Not Applicable	Obtain permit for confined space entry
Not Applicable	Monitor O_2 and organic vapors before entering. If following values are exceeded, do not enter: - O_2 less than 19.5 percent or greater than 25%. - Total hydrocarbons greater than 5 ppm above background, if all air contaminants have not been identified. - Concentrations of specific contaminants exceeding action level in Section 19 if all air contaminants are identified.
Not Applicable	Monitor O_2 and organic vapors continuously while inside confined space. If values cited in Item 1 are exceeded, evacuate immediately. Record instrument readings.
Not Applicable	At least one person must be on standby outside the confined space who is capable of pulling workers from confined space in an emergency.
Not Applicable	Use portable fans or blowers to introduce fresh air to confined spaces whenever use of respirator is required.
Not Applicable	Work involving the use of flame, arc, spark, or other source of ignition is prohibited within a confined space.

Radiation Hazards

Not Applicable	If radiation meter indicates 2 mR/hr or more, leave the area and consult DHSO.

Biohazards

Not Applicable	Poison oak, poison ivy.
Not Applicable	Infectious waste.
Not Applicable	Rabid animals.
Not Applicable	Ticks, mosquitoes, and other insects (disease carriers or poisonous). Avoid breathing dust in dry desert or central valley areas (valley fever).
Not Applicable	Biological or animal laboratories.
_____	_____
_____	_____
_____	_____

18. Required Personal Protective Equipment

Place the activity number from Section 17 next to each item of personal protective equipment required for that task. All personal safety equipment must meet ANSI standards or equivalent.

LEVEL: _____ A _____ B _____ C __X__ D

HEAD

__1__ HARDHAT

EYE/FACE

__1__ SAFETY GLASSES
_____ GOGGLES
_____ FACE SHIELD

HAND

_____ NEOPRENE
_____ VITON
__1__ NITRILE
_____ UNDERGLOVE
_____ PVC
__1__ OTHER (latex or cotton work glove with underglove)

BODY

_____ FULL ENCAPSULATING SUIT: _____
_____ TWO PIECE RAINSUIT, MATERIAL = _____
_____ ONE PIECE SPLASH SUIT, MATERIAL = _____
__*__ HOODED TYVEK SUIT
_____ HOODED TYVEK/SARANAX SUIT
_____ HOODED TYVEK/POLYETHYLENE SUIT
__1__ CLOTH COVERALLS
_____ HIGH VISIBILITY VEST
_____ OTHER _____

LUNG

_____ SCBA (open circuit, pressure demand): _____
_____ FULL FACE RESPIRATOR, cartridge = _____
__*__ HALF MASK RESPIRATOR, cartridge = _____
_____ OTHER _____

EAR

* Available on site.

*	EARPLUG, type =	Discretionary
	EARMUFF, type =	

FOOT

1	STEEL TOED BOOTS, type =	Discretionary
	DISPOSABLE OVERBOOTS, type =	

OTHER SAFETY EQUIPMENT

X	Traffic cones		Lifeline harness
	Barrier tape		Ventilation blower/fan
	Blast alarm		Radiation Dosimeter
	Ground fault circuit interruptor		

19. Action Levels

A. Protection Levels

1. Unknown Contaminants

For totally unknown contaminants, the following levels of protection should be utilized:

Breathing Zone HNu/OVA
Reading for 1 minute

Background	Level D
>0-5 ppm above background	Level C
5-500 ppm above background	Level B
500-1000 ppm above background	Level A

* Available on site.

2. Known Contaminants

Instrument & Date of Calibration	Calibration Standard	Span Setting/ Gas Select	Action Level Above Background (Breathing Zone)	Action
PID	53 ppm	9.8/benzene	0 to 5 ppm	Don respirator (Level C)
				Leave area (Level C)
				Upgrade to Level B
				Upgrade to Level A

B. Explosion Hazard

Instrument & Date of Calibration	Action Level Above Background (Ambient Air)	Action
Combustible gas indicator	Less than 20% LEL	Leave area

C. Oxygen Deficiency

Instrument & Date of Calibration	Action Level (Ambient Air)	Action
O_2 meter	Less than 19.5% O_2 More than 23% O_2	Do not enter

D. Other Instruments

Instrument & Date of Calibration	Action Level (Breathing Zone/Ambient Air)	Action
	Date	
Draeger pump/tubes _____	_____	_____
Radiation monitor _____	_____	_____
Heat stress meter _____	_____	_____
Noise meter _____	_____	_____
H_2S meter _____	_____	_____
Others _____	_____	_____
_____	_____	_____

20. Site Control/Work Zones

Describe location of exclusion zone, hot line, contamination reduction zone, and decontamination area and other control procedure(s). Show location on site plan.

To be designed by DHSO on site, if warranted.*

21. Decontamination Procedures

21a. Equipment Decontamination:

Pressurized steam-washer for cleaning drill rig, rods, samplers, tools, etc. between borings. Samplers to be cleaned with D.I. water and Alconox soap between sampling events. Steam-cleaning to be performed over polyethylene sheeting.

* Refer to Appendix 2 for equipment decontamination procedures if Level C conditions are warranted.

21b. Personnel Decontamination:

Disposable gloves

No smoking or eating within work area

* Refer to Appendix 2 for personnel decontamination if Level C conditions are warranted.

22. Investigation-Derived Material Disposal

Drill cuttings/well water: To be disposed in 55-gallon container with proper labeling.
Decontamination solutions: To be disposed in 55-gallon container with proper labeling.
Protective clothing: To be disposed in 55-gallon container with proper labeling.
Other:

23. Site Resources

Toilet facilities: Located within plant facilities.
Drinking water supply: Located within plant facilities.
Telephone: Located within plant facilities.
Radio: Not Applicable
Other:

24. Required Emergency Equipment Location

Safety shower/eyewash: Eyewash on site.
First aid kit: On site.
Fire extinguisher: On site.
Other:

25. Emergency Telephone Numbers

Ambulance:	911 or 765-1100	
Police:	911	
Fire department:	911	
Hospital:	841-1111	
Client contact:		
Poison Control Center:	**(800) 233-3360**	
in San Francisco:	**(415) 821-8324**	
Project Manager	**Office** (713) 789-8050	**Home**
DHSO	**Office**	**Home**

26. **Emergency Routes: Attach map showing route to nearest hospital.**

Presbyterian Hospital - Go south on Coors Road, east on Interstate 40, and south on Interstate 25. Exit Grand/Central and turn east on Central Avenue. Immediately look to south side of Central Avenue to see hospital and emergency entrance.

27. **Contingency Plans: Describe contingency plans for emergencies, including emergency signals and evacuation routes. If formal contingency plan document has been prepared, attach a copy.**

Evacuation to proceed down Irving Boulevard NW in an upwind direction.

28. **Project Personnel List and Safety Plan Distribution Record**

28a. HLA employees

All project staff must sign, indicating they have read and understand the Safety Plan. A copy of this Job Safety Plan must be made available for their review and readily available at the job site.

Employee Name	Date of Hazmat or other applicable Safety & Health Training	Date Distributed	Signature

28b. Contractors, Subcontractors

Copy of safety plan shall be provided to contractors and subcontractors who may be affected by activities covered under the scope of this Job Safety Plan. All contractors and subcontractors must comply with applicable OSHA, EPA, and local government rules and regulations.

Firm Name	Contact Person	Date Distributed
Metric Corporation	Gary L. Richardson	

29. Health and Safety Meeting - All personnel participating in the project must receive initial health and safety orientation. Thereafter, a brief tailgate safety meeting is required as deemed necessary by the Site Safety Officer.

Date	Topics	Name of Attendant	Firm Name	Employee Initials

30. Visitor - It is HLA's policy that visitor must furnish his/her own personal protective equipment. All visitors are required to sign the visitor log and comply with the safety plan requirements. If the visitor represents a regulatory agency concerned with job site health and safety issues, the site safety officer shall also immediately notify DHSO.

VISITOR LOG

Name of Visitor	Firm Name	Date of Visit	Signature

APPENDIX 1

FACILITY INVESTIGATION REPORTS
SPARTON TECHNOLOGY, INC.
COORS ROAD FACILITY
ALBUQUERQUE, NEW MEXICO

Date of Report	Report Title
6/29/83	Groundwater Monitoring Program, Sparton Southwest, Inc., 9621 Coors Road, Northwest, Albuquerque, New Mexico; Harding Lawson Associates (includes: Monitoring Well Installation Report, Sparton Southwest, Inc., Coors Road).
3/19/84	Investigation of Soil and Groundwater Contamination, Sparton Technology, Inc., Coors Road Facility, Albuquerque, New Mexico; Harding Lawson Associates.
3/13/85	Hydrogeologic Characterization and Remedial Investigation, Sparton Technology, Inc., 9621 Coors Road, Northwest, Albuquerque, New Mexico 87114; Harding Lawson Associates.
5/07/85	Hazardous Waste Facility Closure Plan, Sparton Technology, Inc., Coors Road Plant, Albuquerque, New Mexico; Harding Lawson Associates.
6/30/86	Soil Investigation of the Unsaturated and Upper Saturated Zones, Sparton Technology, Inc., Coors Road Plant, Albuquerque, New Mexico; Harding Lawson Associates.
7/15/86	Vertical Profiling Program, Sparton Technology, Inc., Coors Road Plant, Albuquerque, New Mexico; Harding Lawson Associates.
4/87	Aquifer Testing, Sparton Technology, Inc., Coors Road Plant, Albuquerque, New Mexico; Metric Corporation.
07/23/87	Corrective Measure Study Report, Sparton, Technology, Inc.; Coors Road Plant Albuquerque, New Mexico; Harding Lawson Associates.

APPENDIX 1
(continued)

Date of Report	Report Title
10/19/87	Off-Site Investigation, Sparton Technology, Inc., Coors Road Plant, Albuquerque, New Mexico; Harding Lawson Associates.
3/3/88	Definition of Groundwater Contaminant Plume, Sparton Technology, Inc., Coors Road Facility, Albuquerque, New Mexico; Harding Lawson Associates.
10/25/88	Interim Measures Work Plan, a report prepared for Sparton Technology, Inc., Coors Road facility, Albuquerque, New Mexico; Harding Lawson Associates.

APPENDIX 2

DECONTAMINATION PROCEDURES

Personnel

At the end of each work period (before eating, drinking, smoking, or leaving the site) each person will decontaminate by passing through the designated decontamination area. Each of the following stations will be used as appropriate.

- Equipment/Tool drop station
- Boot Wash - soiled boots will be washed in a tub containing a detergent solution
- Boot Rinse - personnel will step into a tub containing rinse water after washing boots
- Glove Wash - intact gloves will be wiped clean over a glove wash bucket containing detergent and water
- Glove Rinse - washed gloves will be rinsed with water or wiped with a water wet towel
- Used tyvek suits will be dropped into a bag lined garbage can for approved disposal
- Spent respirator cartridges will be dropped into a bag lined garbage can for approved disposal
- Personnel will shower as soon as possible at the end of the work day

Equipment

1. Prior to drilling equipment demobilization, loose mud will be removed using brushes and scrapers, as necessary, and equipment will be steam cleaned over polyethylene sheets. The perimeter of the sheeting will be elevated using formwork.

2. Polyethelene sheeting, mud, and wash water will be placed in drums for subsequent disposal.

3. After each boring, augers and sampling tools will be cleaned similarly to the process described above.

APPENDIX 3

HAZARDOUS PROPERTY INFORMATION

This appendix contains hazardous property information for selected compounds. Place a check mark next to each compound identified in Section 15, and review the hazardous property information for those compounds. If you have identified compounds in Section 15 that are not listed in the appendix, you must list the compounds and enter the appropriate information.

CHEMICAL PROFILE

Methylene Chloride

CHEMICAL NAME
METHYLENE CHLORIDE

FORMULA
CH2CL2

SYNONYMS
DICHLOROMETHANE
METHYLENE DICHLORIDE
NCI-C50102
SOLAESTHIN
R 30
UN 1593
METHANE, DICHLORO-
AEROTHENE MM
DCM
FREON 30
METHANE DICHLORIDE
METHYLENE BICHLORIDE
NARKOTIL
SOLMETHINE

PERMISSIBLE EXPOSURE LIMIT
500 PPM OSHA TWA -- 1000 PPM OSHA CEILING
2000 PPM OSHA 5 MINUTE PEAK
100 PPM ACGIH TWA
75 PPM NIOSH RECOMMMENDED TWA
500 PPM NIOSH RECOMMENDED 15 MINUTE CEILING
INDEFINITE ANIMAL CARCINOGEN (IARC)
EXPERIMENTAL CARCINOGEN (NTP)
POSITIVE MUTAGEN (RTEC)
REPORTABLE QUANTITIES -- 1 LB CWA 307(A) -- 1 LB RCRA 3001
5000 LB PROPOSED RQ
CERCLA HAZARD RATINGS -- TOXICITY 2 -- IGNITABILITY 0 -- REACTIVITY 1 --
PERSISTENCE 2

TOXICOLOGY: ACUTE INHALATION OR INGESTION CAUSES MILD CENTRAL NERVOUS SYSTEM DEPRESSION. THE PRIMARY TOXIC EFFECT IS NARCOSIS. OTHER TOXIC EFFECTS ARE PULMONARY EDEMA, ENCEPHALOPATHY AND HEMOLYSIS. METHYLENE CHLORIDE IRRITATES THE EYES, SKIN AND RESPIRATORY TRACT. NO SYSTEMIC EFFECTS HAVE BEEN REPORTED IN HUMANS, ALTHOUGH EXCESSIVE CONCENTRATIONS HAVE CAUSED LIVER AND KIDNEY DAMAGE IN ANIMALS.
THE THRESHOLD LIMIT VALUE WAS ESTABLISHED TO PREVENT CARBOXYHEMOGLOBIN FORMATION.

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATION
5000 PPM
OSHA/NIOSH

PHYSICAL DESCRIPTION
COLORLESS LIQUID WITH A CHLOROFORM-LIKE ODOR

CHEMICAL AND PHYSICAL PROPERTIES
MOLECULAR WEIGHT: 85
BOILING POINT AT 1 ATM, F: 104F
SOLUBILITY IN WATER, G/100 G WATER AT 20C: SLIGHT
FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF OC): NONE
VAPOR PRESSURE @ 20 C, MMHG: 350MM
MELTING POINT, F: -142F
UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: UNAVAILABLE
LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: 12%

SPECIFIC GRAVITY: 1.333
VAPOR DENSITY (AIR=1): 2.9
ODOR THRESHOLD: 200 PPM

INCOMPATIBILITIES
STRONG OXIDIZERS
AUSTICS
ACTIVE METALS
SODIUM
POTASSIUM
MAGNESIUM
ALUMINUM POWDER
NITRIC ACID
LITHIUM
METALS
POTASSIUM TERT-BUTOXIDE
SODIUM-POTASSIUM ALLOY
DINITROGEN PENTAOXIDE
DINITROGEN TETRAOXIDE

PERSONAL PROTECTIVE EQUIPMENT
FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

PREVENT REPEATED OR PROLONGED SKIN CONTACT
WEAR IMPERVIOUS CLOTHING
WEAR GLOVES
WEAR FACESHIELD (8 INCH MINIMUM)

-- -- --

ACGIH "GUIDELINES FOR SELECTION OF CHEMICAL PROTECTIVE CLOTHING" INDICATES THE FOLLOWING MATERIALS AND PROTECTIVE RATINGS BY INDEPENDENT VENDORS AGAINST UNSUBSTITUTED ALIPHATIC HALOGEN COMPOUNDS:
EXCELLENT/GOOD:
VITON
FLUORINATED ETHYLENE PROPYLENE POLYMER OR POLYTETRAFLUOROETHYLENE

FAIR/POOR:
NATURAL RUBBER
NEOPRENE
NEOPRENE/NATURAL RUBBER
NITRILE RUBBER
POLYETHYLENE
CHLORINATED POLYETHYLENE
POLYVINYL CHLORIDE

FAIR/GOOD:
BUTYL RUBBER
NEOPRENE/STYRENE-BUTADIENE RUBBER
NITRILE/POLYVINYL CHLORIDE
POLYURETHANE
STYRENE-BUTADIENE RUBBER

A WIDE VARIATION IN RATINGS IS INDICATED FOR POLYVINYL ALCOHOL

GLES
PREVENT REASONABLE PROBABILITY OF EYE CONTACT

WASHING CHEMICALS FROM THE SKIN
PROMPTLY WHEN SKIN BECOMES WET

ROUTINE CHANGING OF WORK CLOTHING
NOT APPLICABLE

CLOTHING REMOVAL FOLLOWING ACCIDENTAL CONTAMINATION
PROMPTLY IF IT IS NON-IMPERVIOUS AND CONTAMINATED

SPECIFIC EMERGENCY PROVISIONS
NO NIOSH/OSHA DATA, ADVISE:
EYE-WASH FOUNTAIN WITHIN IMMEDIATE WORK AREA WHERE EMPLOYEES' EYES MAY BE EXPOSED TO SUBSTANCE
QUICK DRENCHING FACILITIES WITHIN IMMEDIATE WORK AREA WHERE EMPLOYEES MAY BE EXPOSED TO SUBSTANCE
EATING AND SMOKING SHOULD NOT BE PERMITTED IN IMMEDIATE WORK AREA
WATER FOUNTAIN PROHIBITED IN WORK AREA
CLOSED SYSTEM IF SUBSTANCE TO BE USED

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

5000 PPM
- SUPPLIED-AIR RESPIRATOR
  WITH A FULL FACE-PIECE, HELMENT, OR HOOD
- SELF-CONTAINED BREATHING APPARATUS
  WITH A FULL FACE-PIECE

ESCAPE
- GAS MASK
  WITH AN ORGANIC VAPOR CANISTER
  (CHIN-STYLE OR FRONT- OR BACK-MOUNTED CANISTER)
- SELF-CONTAINED BREATHING APPARATUS

FIREFIGHTING
- SELF-CONTAINED BREATHING APPARATUS
  WITH A FULL FACE-PIECE
  OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

ROUTE OF ENTRY INTO BODY
INHALATION
INGESTION
SKIN OR EYE CONTACT

SYMPTOMS
FATIGUE
WEAKNESS
SLEEPINESS
LIGHTHEADEDNESS
NUMBNESS EXTREMITIES
HEADACHE
EYE IRRITATION
SKIN IRRITATION
NAUSEA
ANGINA PECTORIS
CENTRAL NERVOUS SYSTEM DEPRESSION
PERIPHERAL NEUROPATHY
ERYTHEMA
NARCOSIS
ACIDOSIS
HEMOLYSIS
UNCONSCIOUSNESS
RESPIRATORY EDEMA
HEMATURIA

INCOORDINATION
PNEUMONIA
COMATOSE
HYPOTHERMIA
LIVER DAMAGE IN EXPERIMENTAL ANIMALS
KIDNEY DAMAGE IN EXPERIMENTAL ANIMALS

FIRST AID PROCEDURES FOLLOWING EXPOSURE
INHALATION OF METHYLENE CHLORIDE:
EMERGENCY TREATMENT -- REMOVE FROM EXPOSURE. GIVE ARTIFICIAL RESPIRATION. REMOVE CONTAMINATED CLOTHING. DO NOT GIVE STIMULANTS.
FURTHER TREATMENT -- TREAT PULMONARY EDEMA.
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

PULMONARY EDEMA -- RELIEVE ANXIETY. GIVE MORPHINE SULFATE, 10 MG, TO DECREASE RATE OF RAPID, INEFFICIENT RESPIRATION. GIVE 40% OXYGEN BY FACE MASK. USE INTERMITTENT POSITIVE-PRESSURE OXYGEN RESUSCITATOR FOR SHORT PERIODS. GIVE AMINOPHYLLINE, 0.5 G, INTRAVENOUSLY, TO RELIEVE ASSOCIATED BRONCHIAL CONSTRICTION. TREAT EDEMA CAUSED BY MORPHINE OR MORPHINE ANALOGS BY GIVING NALOXONE AND OXYGEN.
(MEDICATION MUST BE GIVEN BY QUALIFIED MEDICAL PERSONNEL)
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

WHEN THIS CHEMICAL HAS BEEN SWALLOWED AND PERSON IS CONSCIOUS, IMMEDIATELY GIVE PERSON LARGE QUANTITIES OF WATER. AFTER WATER HAS BEEN SWALLOWED, TRY TO GET THE PERSON TO VOMIT BY HAVING HIM TOUCH THE BACK OF HIS THROAT WITH HIS FINGER. DO NOT MAKE AN UNCONSCIOUS PERSON VOMIT. GET MEDICAL ATTENTION IMMEDIATELY.

INGESTED METHYLENE CHLORIDE:
EMERGENCY TREATMENT -- REMOVE BY GASTRIC LAVAGE OR EMESIS USING ACTIVATED CHARCOAL.
FURTHER TREATMENT -- TREAT HEMOLYTIC REACTION. GIVE HYDROCORTISON, 200 MG, EVERY FOUR HOURS.
SPECIAL TREATMENT -- TREAT ASPIRATION PNEUMONIA WITH ANTIBIOTICS. GIVE BLOOD TRANSFUSIONS IF GASTROINTESTINAL HEMORRHAGE IS EXCESSIVE. TREAT ACIDOSIS AND PULMONARY EDEMA.
(MEDICATION MUST BE GIVEN BY QUALIFIED MEDICAL PERSONNEL)
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

GASTRIC LAVAGE - GIVE PATIENT GLASS OF WATER PRIOR TO PASSING OF STOMACH TUBE. LAY PATIENT ON ONE SIDE, WITH HEAD LOWER THAN WAIST. IMMOBILIZE A STRUGGLING PATIENT WITH A SHEET OR BLANKET. MEASURE DISTANCE ON TUBE FROM MOUTH TO EPIGASTRIUM, MARK TUBE WITH INDELIBLE MARKING OR TAPE. REMOVE DENTURES AND OTHER FOREIGN OBJECTS FROM MOUTH. OPEN MOUTH, USE GAG IF NECESSARY. EXTEND HEAD BY LIFTING THE CHIN. PASS TUBE OVER TONGUE AND TOWARD BACK OF THROAT WITHOUT EXTENDING HEAD OR NECK. IF OBSTRUCTION IS MET BEFORE THE MARK ON TUBE REACHES LEVELS OF TEETH, DO NOT FORCE, BUT REMOVE TUBE AND REPEAT PROCEDURE UNTIL TUBE PASSES TO MARK. PLACE END OF TUBE IN GLASS OF WATER. IF TUBE IS OBSTRUCTED WHEN INTRODUCED ABOUT HALFWAY TO THE MARK, IT MAY HAVE ENTERED TRACHEA.
AFTER TUBE IS PLACED IN STOMACH, ASPIRATE FIRST TO REMOVE STOMACH CONTENTS BY IRRIGATION SYRINGE. SAVE STOMACH CONTENTS FOR EXAMINATION, AND REPEAT INTRODUCTION AND WITHDRAWAL OF 100-300 ML WARM WATER UNTIL AT LEAST 3 LITERS OF CLEAR RETURN ARE OBTAINED. USE ACTIVATED CHARCOAL AT BEGINNING OF LAVAGE TO AID IN POISON INACTIVATION. LEAVE 50 GRAMS OF CHARCOAL SUSPENDED IN WATER IN THE STOMACH. IF INTRODUCTION AND REMOVAL OF LAVAGE FLUID BY GRAVITY REQUIRES MORE THAN FIVE MINUTES, ASSIST WITH ASEPTIC SYR

AVOID GIVING LARGE QUANTITIES OF WATER.

MASSAGE OF EPIGASTRIUM WHILE STOMACH TUBE IS BEING ASPIRATED MAY AID IN POISON REMOVAL.

IF PATIENT COMATOSE, INTUBATE TRACHEA WITH CUFFED ENDOTRACHEAL TUBE. SUCCINYLCHLORINE MAY BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL TO EASE INSERTION OF TRACHEAL CATHETER PRIOR TO PASSAGE OF STOMACH TUBE.
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

ACTIVATED CHARCOAL -- GIVE ACTIVATED CHARCOAL WITHIN FIRST MINUTES OF POISONING. GIVE PORTION EQUIVALENT TO ABOUT 5 ML/KG, ORALLY OR BY GASTRIC LAVAGE. REMOVE BY SUCTION OR EMESIS AND REPEAT UNTIL A TOTAL OF 100 GRAMS OF CHARCOAL HAS BEEN INTRODUCED AND RECOVERED. ONE GRAM OF CHARCOAL ADSORBS 100--1000 MG OF POISON. DO NOT MIX CHARCOAL WITH OTHER AGENTS TO INCREASE PALATABILITY.
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

HEMOLYTIC REACTION - FOR HEMOGLOBINURIA WITH NORMAL KIDNEY FUNCTION, MAINTAIN URINE OUTPUT AT 200 ML/HOUR BY GIVING 4-8 LITERS OF FLUID DAILY ORALLY OR INTRAVENOUSLY. FLUROSEMIDE, 20-80 MG ORALLY OR INTRAVENOUSLY EVERY 4-8 HOURS, MAY BE NECESSARY. ALKALINIZE URINE BY GIVING 1-2 GRAMS SODIUM BICARBONATE EVERY FOUR HOURS. MONITOR CENTRAL NEROUS PRESSURE AND ELECTROLYTES DURING FORCED DIURESIS. MANNITOL ADMINISTRATION MAY BE NEEDED TO MAINTAIN URINE OUTPUT.

IF SERUM HEMOGLOBIN EXCEEDS 1.5 G/DL, TOTAL EXCHANGE TRANSFUSION MAY PREVENT RENAL FAILURE.

TREAT METHEMOGLOBINEMIA WITH METHYLENE BLUE.
(MEDICATION MUST BE GIVEN BY QUALIFIED MEDICAL PERSONNEL)
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

ACIDOSIS - MAINTAIN ADEQUATE AIRWAY; GIVE ARTIFICIAL RESPIRATION; TREAT ANURIA.
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

ACUTE RENAL FAILURE -- TREAT SHOCK. FOR HEMOLYTIC REACTIONS, GIVE SODIUM BICARONATE, 5 G EVERY 1-2 HOURS AS NECESSARY TO MAINTAIN AN ALKALINE URINE.
(MEDICATION MUST BE GIVEN BE QUALIFIED MEDICAL PERSONNEL)
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

PULMONARY EDEMA - RELIEVE ANXIETY. GIVE MORPHINE SULFATE, 10 MG, TO DECREASE RATE OF RAPID, INEFFICIENT RESPIRATION. GIVE 40% OXYGEN BY FACE MASK. USE INTERMITTENT POSITIVE-PRESSURE OXYGEN RESUSCITATOR FOR SHORT PERIODS. GIVE AMINOPHYLLINE, 0.5 G, INTRAVENOUSLY, TO RELIEVE ASSOCIATED BRONCHIAL CONSTRICTION. TREAT EDEMA CAUSED BY MORPHINE OR MORPHINE ANALOGS BY GIVING NALOXONE AND OXYGEN.
(MEDICATION MUST BE GIVEN BY QUALIFIED MEDICAL PERSONNEL)
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

ORGANS
CENTRAL NERVOUS SYSTEM
CARDIOVASCULAR SYSTEM
SKIN
RESPIRATORY SYSTEM
EYES

STATUS OF REGULATORY ENFORCEMENT
OSHA STANDARD 29CFR1910.1200 HAZARD COMMUNICATION
REQUIRES CHEMICAL MANUFACTURERS AND IMPORTERS TO ASSESS THE HAZARDS

WORKPLACES IN THE MANUFACTURING DIVISION, STANDARD INDUSTRIAL CLASSIFICATION CODES 20 THROUGH 39, TO PROVIDE INFORMATION TO THEIR EMPLOYEES CONCERNING HAZARDOUS CHEMICALS BY MEANS OF HAZARD COMMUNICATION PROGRAMS INCLUDING LABELS, MATERIAL SAFETY DATA SHEETS, TRAINING, AND ACCESS TO WRITTEN RECORDS
48FR53280 11/25/83

FOLLOWING OSHA STANDARDS APPLICABLE TO SUBSTANCES LISTED 29CFR1910, OTHERWISE ADVISE:

OSHA STANDARD 29CFR1910.1000 AIR CONTAMINANTS
TABLE Z-2

OSHA STANDARD 29CFR1910.94 VENTILATION

OSHA STANDARD 29CFR1910.134 RESPIRATORY PROTECTION

OSHA STANDARD 29CFR1910.20 ACCESS TO EMPLOYEE EXPOSURE AND MEDICAL RECORDS

OSHA STANDARD 29CFR1910.132 PERSONAL PROTECTIVE EQUIPMENT

OSHA STANDARD 29CFR1910.141 SANITATION

OSHA STANDARD 29CFR1910.151 MEDICAL SERVICES AND FIRST AID

OSHA STANDARD 29CFR1910.133 EYE AND FACE PROTECTION

40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT ALLEGED TO HAVE BEEN CAUSED BY A SUBSTANCE OR MIXTURE. EPA MAY INSPECT AND REQUIRE REPORTING OF SUCH RECORDS.
48FR38178 08/22/83

SUBSTANCE LISTED TOXIC SUBSTANCES CONTROL ACT INVENTORY

SUBSTANCE LISTED AS TOXIC POLLUTANT UNDER CLEAN WATER ACT (CWA) SECTION 307(A)

40CFR116 DESIGNATION OF HAZARDOUS SUBSTANCES
DESIGNATED AS HAZARDOUS SUBSTANCE IN ACCORDANCE WITH SECTION 311(B)(2)(A) OF THE FEDERAL WATER POLLUTION CONTROL ACT, AS AMENDED. INCLUDES ANY ISOMERS AND HYDRATES, AS WELL AS ANY SOLUTIONS AND MIXTURES CONTAINING THIS SUBSTANCE.
43FR10747 03/13/78
43FR27533 06/26/78
44FR10266 02/16/79 (AMENDMENT)
44FR10268 02/16/79 (AMENDMENT)
44FR65400 11/13/79 (AMENDMENT)
44FR66602 11/20/79 (AMENDMENT)

40CFR261.33(F) DISCARDED COMMERCIAL CHEMICAL PRODUCTS, OFF-SPECIFICATION SPECIES, CONTAINERS, AND SPILL RESIDUES THEREOF
COMMERCIAL CHEMICAL PRODUCT OR MANUFACTURING CHEMICAL INTERMEDIATE IDENTIFIED AS TOXIC WASTE UNLESS OTHERWISE DESIGNATED.
45FR33084 05/19/80

49CFR172.101 TABLES OF HAZARDOUS MATERIALS, THEIR DESCRIPTION, PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER REQUIREMENTS
DESIGNATED IN HAZARDOUS MATERIALS TABLE AS HAZARDOUS MATERIAL FOR THE PURPOSE OF TRANSPORTATION.
41FR15974 04/15/76

45FR62030 09/18/80 (AMENDMENT)
45FR74649 11/10/80 (AMENDMENT)
46FR17739 03/19/81 (AMENDMENT)
46FR19235 03/30/81 (AMENDMENT)

49CFR172.102 TABLES OF HAZARDOUS MATERIALS, THEIR DESCRIPTION, PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER REQUIREMENTS
DESIGNATED IN OPTIONAL HAZARDOUS MATERIALS TABLE WITH ALTERNATIVES TO CORRESPONDING REQUIREMENTS IN 49CFR172.101 FOR INTERNATIONAL SHIPMENTS AS AUTHORIZED BY 49CFR171.12
41FR15996 04/15/76
46FR29393 06/01/81 (AMENDMENT)
46FR32250 06/22/81 (AMENDMENT)

THIS SUBSTANCE TESTED FOR CARCINOGENESIS BY THE NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES (NIEHS)

TECHNICAL ASSISTANCE DATA COMPLETED/PUBLISHED CLEAN WATER ACT (CWA) SECTION 311

TECHNICAL ASSISTANCE DATA COMPLETED/PUBLISHED FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT (FIFRA)

REGULATION PROMULGATED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR260

CONTROL TECHNOLOGY DEVELOPMENT COMPLETED/PUBLISHED CLEAN WATER ACT (CWA)

SUMMARY REVIEW COMPLETED/PUBLISHED TOXIC SUBSTANCES CONTROL ACT (TSCA)

PREREGULATORY ASSESSMENT IN DEVELOPMENT/PROGRESS SAFE DRINKING WATER ACT (SWDA)

SOURCE/EXPOSURE ASSESSMENT COMPLETED/PUBLISHED CLEAN AIR ACT (CAA)

ANALYTICAL METHODS DEVELOPMENT COMPLETED/PUBLISHED CLEAN AIR ACT (CAA)

SUBSTANCES LISTED APPENDIX A -- CONSENT DECREE LIST OF INDUSTRIES AND TOXIC POLLUTANTS. SETTLEMENT AGREEMENT BETWEEN U.S. EPA AND NATIONAL RESOURCES DEFENSE COUNCIL, ET AL U.S. DISTRICT COURT DISTRICT OF COLUMBIA, JUNE 7, 1976. 5ITC 8ERC2120, DDC 1976. MODIFIED MARCH 9, 1979, 5ITC 12ERC1033, DDC 1979 AND AGAIN ON OCTOBER 26, 1982.

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.31 EPA HAZARDOUS WASTE NO. F001: SPENT HALOGENATED SOLVENT USED IN DEGREASING AND SLUDGES FROM RECOVERY OF THIS SOLVENT IN DEGREASING OPERATIONS. (T)
SENATE BILL S.757 WOULD DIRECT EPA TO REVIEW, BY 7/1/85, DISPOSAL OF WASTES CONTAINING THIS SUBSTANCE TO DETERMINE WHETHER IT SHOULD BE BANNED FROM LAND DISPOSAL

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.31 EPA HAZARDOUS WASTE NO. F002: SPENT HALOGENATED SOLVENT AND STILL BOTTOMS FROM RECOVERY OF THIS SOLVENT.(T)
SENATE BILL S.757 WOULD DIRECT EPA TO REVIEW, BY 7/1/85, DISPOSAL OF WASTES CONTAINING THIS SUBSTANCE TO DETERMINE WHETHER IT SHOULD BE BANNED FROM LAND DISPOSAL

(8150) 5174 OR TITLE 8 OF CALIFORNIA ADMINISTRATIVE CODE AND DIVISION 5, CHAPTER 2.5 OF CALIFORNIA LABOR CODE

WATER QUALITY CRITERIA COMPLETED/PUBLISHED CLEAN WATER ACT (CWA) SECTION 304(A) 45CFR231

WATER QUALITY CRITERIA DOCUMENT COMPLETED/PUBLISHED CLEAN WATER ACT (CWA) SECTION 304(A)

REGULATION IN DEVELOPMENT/PROGRESS COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT (CERCLA) SECTION 101

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.32 EPA HAZARDOUS WASTE NO. K009: DISTILLATION BOTTOMS FROM THE PRODUCTION OF ACETALDEHYDE FROM ETHYLENE. (T)

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.32 EPA HAZARDOUS WASTE NO. K010: DISTILLATION SIDE CUTS FROM THE PRODUCTION OF ACETALDEHYDE FROM ETHYLENE. (T)

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.31 EPA HAZARDOUS WASTE NO. F024: WASTES, INCLUDING BUT NOT LIMITED TO, DISTILLATION RESIDUES, HEAVY ENDS, TARS, AND REACTOR CLEANOUT WASTES FROM THE PRODUCTION OF CHLORINATED ALIPHATIC HYDRO-CARBONS, HAVING CARBON CONTENT FROM ONE TO FIVE, UTILIZING FREE RADICAL CATALYZED PROCESSES. (THIS LIST DOES NOT INCLUDE LIGHT ENDS, SPENT FILTERS AND FILTER AIDS, SPENT DESSICANTS, WASTEWATER, WASTEWATER TREAT-MENT SLUDGES, SPENT CATALYSTS, AND WASTES LISTED IN 40CFR261.32) 49FR5308 02/10/84

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.32 EPA HAZARDOUS WASTE NO. K082: EMISSION CONTROL DUST OR SLUDGE FROM PAINT MANUFACTURING. (T)

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.32 EPA HAZARDOUS WASTE NO. K079: WATER OR CAUSTIC CLEANING WASTES FROM EQUIPMENT AND TANK CLEANING FROM PAINT MANUFACTURING. (T)

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.32 EPA HAZARDOUS WASTE NO. K081: WASTEWATER TREATMENT SLUDGES FROM PAINT MANUFACTURING. (T)

15CFR399.2, SUPPLEMENT 1 - COMMODITY INTERPRETATION 24: CHEMICALS
VALIDATED LICENSE REQUIRED FOR EXPORT TO LIBYA, NORTH KOREA, VIETNAM, KAMPUCHEA, OR CUBA
45FR85942 12/30/80
46FR23942 04/29/81
47FR143 01/05/82
47FR41512 09/21/82
47FR51060 11/18/82
47FR58124 12/29/82

EPA HAS PROPOSED THAT MANUFACTURERS AND PROCESSORS OF DICHLOROMETHANE TEST THE CHEMICAL FOR HEALTH AND ENVIRONMENTAL EFFECTS
46FR30300 06/05/81

40CFR122, APPENDIX D - NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT APPLICATION TESTING REQUIREMENTS
TABLE II - ORGANIC TOXIC POLLUTANTS IN EACH OF FOUR FRACTIONS IN ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROSCOPY (GS/MS)
48FR14153 04/01/83

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)
40CFR261.31 EPA HAZARDOUS WASTE NO. F024: WASTES, INCLUDING BUT NOT

CLEANOUT WASTES FROM THE PRODUCTION OF CHLORINATED ALIPHATIC HYDRO
CARBONS, HAVING CARBON CONTENT FROM ONE TO FIVE, UTILIZING FREE RADICAL
CATALYZED PROCESSES. (THIS LIST DOES NOT INCLUDE LIGHT ENDS, SPENT
FILTERS AND FILTER AIDS, SPENT DESSICANTS, WASTEWATER, WASTEWATER TREAT-
MENT SLUDGES, SPENT CATALYSTS, AND WASTES LISTED IN 40CFR261.32)
49FR5308 02/10/84

MEDICAL SURVEILLANCE REQUIRED
EKG RECOMMENDED IF EMPLOYEE TO WEAR FULL-FACE RESPIRATOR
GENERAL MEDICAL HISTORY
40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES
CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES
MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES
TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR
30 YEARS
48FR30187 08/22/83
33FR33225 08/30/33 (EFFECTIVE DATE CORRECTION)
PHYSICIAN EXAMINATION

INDUSTRIAL HISTORY
PRE-PLACEMENT AND ANNUAL EXAMS
MEDICAL WARNING FOR REFUSAL OF MEDICAL EXAMINATION
RESPIRATORY HISTORY
COMPLETE BLOOD COUNT
BLOOD CHEMISTRY
14 BY 17 CHEST P.A. X-RAY
URINALYSIS
VISION TEST
SPECIAL ATTENTION TO SKIN
LIVER FUNCTION
KIDNEY FUNCTION
CARDIOVASCULAR DISEASE
DIFFERENTIAL BLOOD CELL MORPHOLOGY
CARBOXYHEMOGLOBIN DETERMINATION WHEN EXPOSED
CENTRAL NERVOUS SYSTEM EXAMINATION
PULMONARY FUNCTIONS
CHRONIC RESPIRATORY DISEASE
COMPLETE BLOOD COUNT
RENAL AND LIVER FUNCTIONS
MEDICAL WARNING FOR REFUSAL OF MEDICAL EXAMINATION

CERTIFICATIONS
HEALTH STATUS CLASSIFICATION

OSHA RESPIRATOR CERTIFICATION 29CFR1910.134

DEPARTMENT OF TRANSPORTATION IF OPERATES HEAVY EQUIPMENT

NUCLEAR REG. 0041

EMPLOYEE HAZARDOUS MATERIALS EDUCATION RECEIPT

EMPLOYEE MEDICAL RECORDS RECEIPT

TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE
REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL
SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT
ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR 30 YEARS.
CONTACT: JACK P. MCCARTHY, OFFICE OF TOXIC SUBSTANCES,
EPA (800)424-1404. 48FR30170 8/22/83

MEDICAL WARNING REQUIRED FOR MEDICAL EXAM REFUSAL SIGNED

SPECIAL DIAGNOSTIC TESTS
BLOOD CHEMISTRY
CENTRAL NERVOUS SYSTEM DEPRESSION -- OBTAIN BLOOD GLUCOSE AND RECTAL TEMPERATURE
URINE HEMOGLOBIN
SUBSTANCE TERATOGENIC IN ANIMAL STUDIES
SEE NIOSH 'REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES' FOR REFERENCES
SERUM BICARBONATE
BLOOD LACTIC ACID

LEAKS AND SPILL PROCEDURES

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DEPARTMENT OF TRANSPORTATION HAZARD CLASS
49CFR172.101 HAZARDOUS MATERIALS TABLE

ORM-A

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS
49CFR172.101 (SUBJECT TO ADDITIONAL LABELING REQUIREMENTS OF 49CFR172.402)

NONE

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INTERGOVERNMENTAL MARITIME ORGANIZATION HAZARD CLASS
49CFR172.102 OPTIONAL HAZARDOUS MATERIALS TABLE

CLASS 6.1-POISONOUS (TOXIC) SUBSTANCE

INTERGOVERNMENTAL MARITIME ORGANIZATION LABELING SPECIFICATIONS FOR DOMESTIC AND EXPORT SHIPMENTS
49CFR172.102

ST. ANDREWS CROSS

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FOLLOWING INFORMATION FROM BUREAU OF EXPLOSIVES "EMERGENCY HANDLING OF HAZARDOUS MATERIALS":

IF MATERIAL ON FIRE OR INVOLVED IN FIRE:
* EXTINGUISH FIRE USING AGENT SUITABLE FOR TYPE OF SURROUNDING FIRE (MATERIAL ITSELF DOES NOT BURN OR BURNS WITH DIFFICULTY)
* USE WATER IN FLOODING QUANTITIES AS FOG
* USE ALCOHOL FOAM OR CO2 OR DRY CHEMICAL EXTINGUISHERS

IF MATERIAL IS NOT ON FIRE AND IS NOT INVOLVED IN FIRE:
* KEEP SPARKS, FLAMES AND OTHER IGNITION SOURCES AWAY
* KEEP MATERIAL OUT OF WATER SOURCES AND SEWERS

PERSONNEL PROTECTION:
* AVOID BREATHING DUST/VAPORS/FUMES FROM MATERIAL
* KEEP UPWIND
* AVOID BODILY CONTACT WITH MATERIAL
* WEAR BOOTS, PROTECTIVE GLOVES AND GAS TIGHT GOGGLES

* WASH AWAY ANY MATERIALS WHICH MAY HAVE CONTACTED THE BODY WITH
COPIOUS AMOUNTS OF WATER OR SOAP AND WATER
* WEAR SELF-CONTAINED BREATHING APPARATUS WHEN FIGHTING FIRES INVOLVING
THIS MATERIAL
* IF CONTACT WITH MATERIAL ANTICIPATED, WEAR FULL PROTECTIVE CLOTHING

NOTE
THIS MATERIAL LISTED AS HAZARDOUS SUBSTANCE, AS DEFINED IN
SECTION 101(14) OF THE COMPREHENSIVE ENVIRONMENTAL RESPONSE,
COMPENSATION, AND LIABILITY ACT (CERCLA) OF 1980, PURSUANT TO
ONE OR MORE OF THE FOLLOWING:

- FEDERAL WATER POLLUTION CONTROL ACT (FWPCA) SECTION 311
(B)(2)(A)
- SOLID WASTE DISPOSAL ACT SECTION 3001 40CFR261
- CLEAN WATER ACT (CWA) SECTION 307(A) 40CFR129
- CLEAN AIR ACT (CAA) SECTION 112 40CFR61
- TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 7
- COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND
LIABILITY ACT (CERCLA) SECTION 102

EPA HAZARDOUS WASTE NUMBER U080
DICHLOROMETHANE
40CFR260 HAZARDOUS WASTE MANAGEMENT SYSTEM: GENERAL

PROVIDES DEFINITIONS OF TERMS, GENERAL STANDARDS, AND OVERVIEW
INFORMATION APPLICABLE TO 40CFR PARTS 260-265
45FR76075 11/17/80
45FR76630 11/19/80
45FR86960 12/31/80
46FR2348 01/09/81
46FR27476 05/20/81
46FR35247 07/07/81
47FR32349 07/26/82
47FR41563 09/21/82
48FR2511 01/16/83
48FR14293 04/01/83

40CFR261 IDENTIFICATION AND LISTING OF HAZARDOUS WASTE

IDENTIFIES THOSE SOLID WASTES WHICH ARE SUBJECT TO REGULATION
AS HAZARDOUS WASTES UNDER 40CFR PARTS 262-265, 270, 271, AND 124
AND WHICH ARE SUBJECT TO THE NOTIFICATION REQUIREMENTS OF SEC-
TION 3010 OF THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)
AND IDENTIFIES ONLY SOME OF THE MATERIALS WHICH ARE HAZARDOUS
WASTES UNDER SECTIONS 3007 AND 7003 OF RCRA
45FR33119 05/19/80 46FR27477 05/20/81
45FR72037 10/30/80 46FR29708 06/03/81
45FR74892 11/12/80 46FR34587 07/02/81
45FR76620 11/19/80 46FR35247 07/07/81
45FR76623 11/19/80 46FR47429 09/25/81
45FR78529 11/25/80 46FR56588 11/11/81
45FR78531 11/25/80 47FR36097 08/18/82
45FR80287 12/04/80 48FR14293 04/01/83
46FR4618 01/16/81 48FR14294 04/01/83
46FR4619 01/16/81 48FR15257 04/08/83
46FR27476 05/20/81 48FR30115 06/30/83

40CFR262 STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS FOR GENERATORS OF HAZARDOUS WASTE
45FR33142 05/19/80
45FR78529 11/25/80
45FR86970 12/31/80
45FR86973 12/31/80
47FR1251 01/11/82

40CFR270 EPA ADMINISTERED PERMIT PROGRAMS: THE HAZARDOUS WASTE PERMIT PROGRAM

ESTABLISHES PROVISIONS FOR THE HAZARDOUS WASTE PERMIT PROGRAM UNDER SUBTITLE C OF THE SOLID WASTE DISPOSAL ACT, AS AMENDED BY THE RESOURCE CONSERVATION AND RECOVERY ACT
48FR14228 04/01/83
48FR30113 06/30/83
48FR30114 06/30/83

40CFR271 REQUIREMENT FOR AUTHORIZATION OF STATE HAZARDOUS WASTE PROGRAMS

SPECIFICS THE PROCEDURES EPA WILL FOLLOW IN APPROVING, REVISING, AND WITHDRAWING APPROVAL OF STATE PROGRAMS AND THE REQUIREMENTS STATE PROGRAMS MUST MEET TO BE APPROVED BY THE ADMINISTRATOR UNDER SECTION 3006(B) OF RCRA
48FR14248 04/01/83
48FR30114 06/30/83
48FR30115 06/30/83

CAS NUMBER
75-09-2

REGISTRY TOXIC CHEMICALS NUMBER
PA8050000

BULLETINS
08 23 82 CLEARED IN A PRELIMINARY STUDY BY THE COFFEE MFG ASSOCIATION AS A NON CARCINOGENIC SOLVENT FOR REMOVAL OF CAFFEINE
6 30 82 NAT INSTITUTE FOR ENVIRONMENTAL SCIENCES RELEASES STUDY SHOWING SIGNIFICANT TUMOR DEVELOPMENT AT 5000 PPM LEVELS EXPOSURE

SPECIAL INFORMATION
WHEN INVOLVED IN A FIRE MAY EVOLVE EXTREMELY TOXIC FUMES (PHOSGENE).
TYPE WHAT INFORMATION YOU REQUIRE:
/ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND), /HELP/, OR /NONE/.

CHEMICAL PROFILE

Trichloroethylene

TRICHLOROETHYLENE

FORMULA
C2HCL3

SYNONYMS
TRICHLOROETHENE
DOW-TRI
NCI-C04546
CHLORYLEN
CECOLENE
TRILENE
TCE
UN 1710

PERMISSIBLE EXPOSURE LIMIT
100 PPM OSHA TWA - 200 PPM OSHA CEILING
300 PPM OSHA 5 MINUTE PEAK
50 PPM ACGIH TWA - 200 PPM ACGIH STEL
100 PPM NIOSH RECOMMENDED TWA
150 PPM NIOSH RECOMMENDED 10 MINUTE CEILING
INDEFINITE HUMAN CARCINOGEN (IARC) - ANIMAL CARCINOGEN (IARC)
POSITIVE CARCINOGEN IN MICE (NCI) - NEGATIVE CARCINOGEN IN RATS (NCI)
EXPERIMENTAL CARCINOGEN (NTP)
ANIMAL TERATOGEN (RTEC) - POSITIVE MUTAGEN (RTEC)
ODOR THRESHOLD 50 PPM
REPORTABLE QUANTITIES - 1 LB CWA 307(A)
TOXICITY 1 - IGNITABILITY 1 - REACTIVITY 0 - PERSISTENCE 2

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATION
1000 PPM
OSHA/NIOSH

PHYSICAL DESCRIPTION
COLORLESS LIQUID, CHLOROFORM-LIKE ODOR

CHEMICAL AND PHYSICAL PROPERTIES
MOLECULAR WEIGHT: 131
BOILING POINT AT 1 ATM, F: 188F
SOLUBILITY IN WATER, G/100 G WATER AT 20C: 0.1%
FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF OC: 90F
VAPOR PRESSURE AT 20C MM HG: 58MM
MELTING POINT, F: -123F
UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: 90%
LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: 12.5%
MINIMUM EXPLOSIVE CONCENTRATION FOR A DUST IN AIR: AUTOIGN 788F
SPECIFIC GRAVITY 1.4649

INCOMPATIBILITIES
ACTIVE METALS
BARIUM
LITHIUM
SODIUM
MAGNESIUM
TITANIUM

PERSONAL PROTECTIVE EQUIPMENT
PREVENT SKIN CONTACT
WEAR IMPERVIOUS CLOTHING
WEAR GLOVES
WEAR FACESHIELD (8 INCH MINIMUM)

WEAR SPLASH/DUST PROOF GOGGLES

PLACE CONTAMINATED CLOTHING IN CLOSED CONTAINER UNTIL LAUNDERED OR DISCARDED

INFORM PERSONS HANDLING CONTAMINATED CLOTHING OF HAZARDOUS PROPERTIES OF SUBSTANCE
WEAR IMPERVIOUS BOOTS

GOGGLES
PREVENT ANY POSSIBILITY OF EYE CONTACT

WASHING CHEMICALS FROM THE SKIN
IMMEDIATELY WHEN SKIN BECOMES CONTAMINATED

ROUTINE CHANGING OF WORK CLOTHING
NOT APPLICABLE

CLOTHING REMOVAL FOLLOWING ACCIDENTAL CONTAMINATION
IMMEDIATELY IF IT IS CONTAMINATED

SPECIFIC EMERGENCY PROVISIONS
EYE-WASH FOUNTAIN WITHIN IMMEDIATE WORK AREA WHERE EMPLOYEES' EYES MAY BE EXPOSED TO SUBSTANCE
QUICK DRENCHING FACILITIES WITHIN IMMEDIATE WORK AREA WHERE EMPLOYEES MAY BE EXPOSED TO SUBSTANCE
NO FOOD OR DRINK IN WORK AREA
WATER FOUNTAIN PROHIBITED IN WORK AREA
CLOSED SYSTEM IF SUBSTANCE TO BE USED

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

500 PPM
- CHEMICAL CARTRIDGE RESPIRATOR WITH AN ORGANIC VAPOR CARTRIDGE
- SELF-CONTAINED BREATHING APPARATUS
- SUPPLIED-AIR RESPIRATOR

,000 PPM
- CHEMICAL CARTRIDGE RESPIRATOR
  WITH AN ORGANIC VAPOR CARTRIDGE
  WITH A FULL FACE-PIECE
- GAS MASK
  WITH AN ORGANIC VAPOR CANISTER
  (CHIN-STYLE OR FRONT- OR BACK-MOUNTED CANISTER)
- SUPPLIED-AIR RESPIRATOR
  WITH A FULL FACE-PIECE
- SELF-CONTAINED BREATHING APPARATUS
  WITH A FULL FACE-PIECE

ESCAPE
- GAS MASK
  WITH AN ORGANIC VAPOR CANISTER
  (CHIN-STYLE OR FRONT- OR BACK-MOUNTED CANISTER)
- SELF-CONTAINED BREATHING APPARATUS

FIREIFGHTING
- SELF-CONTAINED BREATHING APPARATUS
  WITH A FULL FACE-PIECE
  OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

ROUTE OF ENTRY INTO BODY
- INHALATION
- INGESTION
- SKIN OR EYE CONTACT

SYMPTOMS
- HEADACHE
- VERTIGO
- VISUAL DISTURBANCE
- TREMORS
- SOMNOLENCE
- DERMATITIS
- NAUSEA
- VOMITING
- CARDIAC ARRHYTHMIA
- PARESTHESIAS
- NARCOSIS
- ANESTHESIA
- LIVER DAMAGE
- IRRITABILITY
- CENTRAL NERVOUS SYSTEM DISTURBANCE

FIRST AID PROCEDURES FOLLOWING EXPOSURE

IF THIS CHEMICAL GETS INTO THE EYES, IMMEDIATELY WASH THE EYES WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING THE LOWER AND UPPER LIDS. GET MEDICAL ATTENTION IMMEDIATELY. CONTACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH THIS CHEMICAL.

IF THIS CHEMICAL GETS ON THE SKIN, IMMEDIATELY WASH CONTAMINATED SKIN WITH SOAP OR MILD DETERGENT & WATER. IF THIS CHEMICAL SOAKS CLOTHING, IMMEDIATELY REMOVE CLOTHING & WASH SKIN WITH SOAP OR MILD DETERGENT & WATER. GET MEDICAL ATTENTION PROMPTLY.

IF THIS CHEMICAL GETS ON SKIN, IMMEDIATELY FLUSH CONTAMINATED SKIN WITH WATER. IF THIS CHEMICAL PENETRATES CLOTHING, IMMEDIATELY REMOVE THE CLOTHING AND FLUSH THE SKIN WITH WATER. GET MEDICAL ATTENTION PROMPTLY.

WHEN THIS CHEMICAL HAS BEEN SWALLOWED AND PERSON IS CONSCIOUS, IMMEDIATELY GIVE PERSON LARGE QUANTITIES OF WATER. AFTER WATER HAS BEEN SWALLOWED, TRY TO GET THE PERSON TO VOMIT BY HAVING HIM TOUCH THE BACK OF HIS THROAT WITH HIS FINGER. DO NOT MAKE AN UNCONSCIOUS PERSON VOMIT. GET MEDICAL ATTENTION IMMEDIATELY.

VOLATILE AND GASEOUS ANESTHETICS:

EMERGENCY TREATMENT - ESTABLISH AIRWAY AND MAINTAIN RESPIRATION. REMOVE ANESTHETIC BY FORCED VENTILATION.

FURTHER TREATMENT - MAINTAIN BLOOD PRESSURE BY INTRAVENOUS SALINE OR BLOOD TRANSFUSION. MAINTAIN BODY WARMTH. MAINTAIN ADEQUATE AIRWAY BY REMOVING SECRETIONS FROM TRACHEA BY CATHETER SUCTION. PREVENT HYPOXIA. IF HYPERTHERMIA OCCURS, LOWER BODY TEMPERATURE BY APPLICATION OF WET TOWELS. FOR MALIGNANT HYPERTHERMIA, GIVE DANTROLENE SODIUM, 1 MG/KG, EVERY FIFTEEN MINUTES, INTRAVENOUSLY TO A TOTAL OF 10 MG/KG, AND PROCAINAMIDE. 15 MG/KG, INTRAVENOUSLY, OVER TEN MINUTES. GIVE ICED NORMAL SALINE INTRAVENOUSLY AT A RATE OF 1 LITER EVERY TEN MINUTES FOR THIRTY MINUTES. LAVAGE STOMACH, URINARY BLADDER, RECTUM, AND PERITONEUM WITH ICED SALINE. TREAT ACIDOSIS WITH INTRAVENOUS SODIUM BICARBONATE. MONITOR SERUM TOTAL BASE, SERUM POTASSIUM, AND ARTERIAL PH AND TREAT APPROPIATELY. MAINTAIN URINE OUTPUT AT 1-2 LITERS DAILY WITH FUROSEMIDE AND MANNITOL. AFTER FIRST DAY, GIVE DANTROLENE, 1 MG/KG ORALY DAILY, FOR THREE DAYS.

(MEDICATION MUST BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL)

SPECIAL TREATMENT - TREAT LIVER DAMAGE.

(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

GASTRIC LAVAGE - GIVE PATIENT GLASS OF WATER PRIOR TO PASSING OF STOMACH TUBE. LAY PATIENT ON ONE SIDE, WITH HEAD LOWER THAN WAIST. IMMOBILIZE A STRUGGLING PATIENT WITH A SHEET OR BLANKET. MEASURE DISTANCE ON TUBE FROM MOUTH TO EPIGASTRIUM, MARK TUBE WITH INDELIBLE MARKING OR TAPE. REMOVE DENTURES AND OTHER FOREIGN OBJECTS FROM MOUTH. OPEN MOUTH, USE GAG IF NECESSARY. EXTEND HEAD BY LIFTING THE CHIN. PASS TUBE OVER TONGUE AND TOWARD BACK OF THROAT WITHOUT EXTENDING HEAD OR NECK. IF OBSTRUCTION IS MET BEFORE THE MARK ON TUBE REACHES LEVELS OF TEETH, DO NOT FORCE, BUT REMOVE TUBE AND REPEAT PROCEDURE UNTIL TUBE PASSES TO MARK. PLACE END OF TUBE IN GLASS OF WATER. IF TUBE IS OBSTRUCTED WHEN INTRODUCED ABOUT HALFWAY TO THE MARK, IT MAY HAVE ENTERED TRACHEA.

AFTER TUBE IS PLACED IN STOMACH, ASPIRATE FIRST TO REMOVE STOMACH CONTENTS BY IRRIGATION SYRINGE. SAVE STOMACH CONTENTS FOR EXAMINATION, AND REPEAT INTRODUCTION AND WITHDRAWAL OF 100-300 ML WARM WATER UNTIL AT LEAST 3 LITERS OF CLEAR RETURN ARE OBTAINED. USE ACTIVATED CHARCOAL AT BEGINNING OF LAVAGE TO AID IN POISON INACTIVATION. LEAVE 50 GRAMS OF CHARCOAL SUSPENDED IN WATER IN THE STOMACH. IF INTRODUCTION AND REMOVAL OF LAVAGE FLUID BY GRAVITY REQUIRES MORE THAN FIVE MINUTES, ASSIST WITH ASEPTO SYRINGE. PREVENT ASPIRATION WITH CUFFED ENDOTRACHEAL TUBE. AVOID GIVING LARGE QUANTITIES OF WATER.

MASSAGE OF EPIGASTRIUM WHILE STOMACH TUBE IS BEING ASPIRATED MAY AID IN POISON REMOVAL.

IF PATIENT COMATOSE, INTUBATE TRACHEA WITH CUFFED ENDOTRACHEAL TUBE. SUCCINYLCHLORINE MAY BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL TO EASE INSERTION OF TRACHEAL CATHETER PRIOR TO PASSAGE OF STOMACH TUBE.
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

PULMONARY EDEMA - RELIEVE ANXIETY. GIVE MORPHINE SULFATE, 10 MG, TO DECREASE RATE OF RAPID, INEFFICIENT RESPIRATION. GIVE 40% OXYGEN BY FACE MASK. USE INTERMITTENT POSITIVE-PRESSURE OXYGEN RESUSCITATOR FOR SHORT PERIODS. GIVE AMINOPHYLLINE, 0.5 G, INTRAVENOUSLY, TO RELIEVE ASSOCIATED BRONCHIAL CONSTRICTION. TREAT EDEMA CAUSED BY MORPHINE OR MORPHINE ANALOGS BY GIVING NALOXONE AND OXYGEN.
(MEDICATION MUST BE GIVEN BY QUALIFIED MEDICAL PERSONNEL)
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

LIVER DAMAGE - REMOVE FROM EXPOSURE TO ALL CHEMICALS AND DRUGS. MAINTAIN COMPLETE BED REST. AVOID ANESTHESIA OR SURGICAL PROCEDURES. AVOID DEHYDRATION OR OVERHYDRATION. IF VOMITING SEVERE AND ORAL FLUIDS NOT RETAINED, REPLACE VOMITUS WITH AN EQUAL QUANTITY OF 100% DEXTROSE IN NORMAL SALINE. IN RENAL FUNCTION ADEQUATE, GIVE 1 LITER OF 5% DEXTROSE OR INVERT SUGAR IN NORMAL SALINE PLUS 1-3 LITERS OF 10% DEXTROSE OR INVERT SUGAR IN DISTILLED WATER INTRAVENOUSLY EVERY TWENTY-FOUR HOURS.
(DREISBACH, HANDBOOK OF POISONING, 11TH ED.)

ORGANS
RESPIRATORY SYSTEM
SKIN
HEART
LIVER
KIDNEYS
CENTRAL NERVOUS SYSTEM

STATUS OF REGULATORY ENFORCEMENT
OSHA STANDARD 29CFR1910.1200 HAZARD COMMUNICATION
REQUIRES CHEMICAL MANUFACTURERS AND IMPORTERS TO ASSESS THE HAZARDS OF CHEMICALS WHICH THEY PRODUCE OR IMPORT, AND ALL EMPLOYERS HAVING WORKPLACES IN THE MANUFACTURING DIVISION, STANDARD INDUSTRIAL CLASSIFICATION CODES 20 THROUGH 39, TO PROVIDE INFORMATION TO THEIR EMPLOYEES CONCERNING HAZARDOUS CHEMICALS BY MEANS OF HAZARD COMMUNICATION PROGRAMS INCLUDING LABELS, MATERIAL SAFETY DATA SHEETS, TRAINING, AND ACCESS TO WRITTEN RECORDS
48FR53280 11/25/83

FOLLOWING OSHA STANDARDS APPLICABLE TO SUBSTANCES LISTED 29CFR1910, OTHERWISE ADVISE:

OSHA STANDARD 29CFR1910.1000 AIR CONTAMINANTS
TABLE Z-2

OSHA STANDARD 29CFR1910.134 RESPIRATORY PROTECTION

OSHA STANDARD 29CFR1910.20 ACCESS TO EMPLOYEE EXPOSURE AND MEDICAL RECORDS

OSHA STANDARD 29CFR1910.132 PERSONAL PROTECTIVE EQUIPMENT

OSHA STANDARD 29CFR1910.141 SANITATION

OSHA STANDARD 29CFR1910.151 MEDICAL SERVICES AND FIRST AID

OSHA STANDARD 29CFR1910.133 EYE AND FACE PROTECTION

40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT ALLEGED TO HAVE BEEN CAUSED BY A SUBSTANCE OR MIXTURE. EPA MAY INSPECT AND REQUIRE REPORTING OF SUCH RECORDS.
43FR33178 08/22/83

OSHA STANDARD 1910.106 FLAMMABLE AND COMBUSTIBLE LIQUIDS

SUBSTANCE LISTED TOXIC SUBSTANCES CONTROL ACT INVENTORY

SUBSTANCE LISTED AS TOXIC POLLUTANT UNDER CLEAN WATER ACT (CWA) SECTION 307(A)

40CFR116 DESIGNATION OF HAZARDOUS SUBSTANCES
DESIGNATED AS HAZARDOUS SUBSTANCE IN ACCORDANCE WITH SECTION 311(B)(2)(A) OF THE FEDERAL WATER POLLUTION CONTROL ACT, AS AMENDED. INCLUDES ANY ISOMERS AND HYDRATES, AS WELL AS ANY SOLUTIONS AND MIXTURES CONTAINING THIS SUBSTANCE.
43FR10747 03/13/78
43FR27532 06/26/78
44FR10266 02/16/79 (AMENDMENT)
44FR10268 02/16/79 (AMENDMENT)
44FR65400 11/13/79 (AMENDMENT)
44FR66602 11/20/79 (AMENDMENT)

40CFR261.33(F) DISCARDED COMMERCIAL CHEMICAL PRODUCTS, OFF-SPECIFICATION SPECIES, CONTAINERS, AND SPILL RESIDUES THEREOF
COMMERCIAL CHEMICAL PRODUCT OR MANUFACTURING CHEMICAL INTERMEDIATE IDENTIFIED AS TOXIC WASTE UNLESS OTHERWISE DESIGNATED.
45FR33084 05/19/80

49CFR172.101 TABLES OF HAZARDOUS MATERIALS, THEIR DESCRIPTION, PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER REQUIREMENTS
DESIGNATED IN HAZARDOUS MATERIALS TABLE AS HAZARDOUS MATERIAL FOR THE PURPOSE OF TRANSPORTATION.
41FR15996 04/15/76
45FR34588 05/22/80 (AMENDMENT)
45FR46420 07/10/80 (AMENDMENT)
45FR62080 09/18/80 (AMENDMENT)
45FR74649 11/10/80 (AMENDMENT)
46FR17739 03/19/81 (AMENDMENT)
46FR19235 03/30/81 (AMENDMENT)

49CFR172.102 TABLES OF HAZARDOUS MATERIALS, THEIR DESCRIPTION, PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER REQUIREMENTS
DESIGNATED IN OPTIONAL HAZARDOUS MATERIALS TABLE WITH ALTERNATIVES TO CORRESPONDING REQUIREMENTS IN 49CFR172.101 FOR INTERNATIONAL SHIPMENTS AS AUTHORIZED BY 49CFR171.12
41FR15996 04/15/76
46FR29393 06/01/81 (AMENDMENT)
46FR32250 06/22/81 (AMENDMENT)

THIS SUBSTANCE TESTED FOR CARCINOGENESIS BY THE NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES (NIEHS)

THIS SUBSTANCE TESTED FOR REPRODUCTIVE/DEVELOPMENTAL TOXICITY BY THE FOOD AND DRUG ADMINISTRATION (FDA)

SOURCE/EXPOSURE ASSESSMENT COMPLETED/PUBLISHED CLEAN AIR ACT (CAA)

CONTROL TECHNOLOGY DEVELOPMENT COMPLETED/PUBLISHED SAFE DRINKING WATER ACT (SDWA)

SOURCE/EXPOSURE ASSESSMENT COMPLETED/PUBLISHED CLEAN AIR ACT (CAA)

TEST METHOD DEVELOPMENT COMPLETED/PUBLISHED SAFE DRINKING WATER ACT (SDWA)

RISK ASSESSMENT IN DEVELOPMENT/PROGRESS SAFE DRINKING WATER ACT (SDWA)

REGULATION PROMULGATED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR260

TECHNICAL ASSISTANCE DATA COMPLETED/PUBLISHED CLEAN WATER ACT (CWA) SECTION 311

PREREGULATORY ASSESSMENT COMPLETED/PUBLISHED CLEAN WATER ACT (CWA)

REGULATION PROMULGATED CLEAN WATER ACT (CWA) SECTION 311 40CFR117

RISK DOCUMENTATION/ASSESSMENT COMPLETED/PUBLISHED CLEAN WATER ACT (CWA)

SUBSTANCE LISTED HAZARDOUS
STATE OF CALIFORNIA ADMINISTRATIVE CODE
TITLE 22. SOCIAL SECURITY
DIVISION 4. ENVIRONMENTAL HEALTH
CHAPTER 30. MINIMUM STANDARDS FOR MANAGEMENT OF HAZARDOUS AND EXTREMELY HAZARDOUS WASTES

SUBSTANCES LISTED APPENDIX A - CONSENT DECREE LIST OF INDUSTRIES AND TOXIC POLLUTANTS. SETTLEMENT AGREEMENT BETWEEN U.S. EPA AND NATIONAL RESOURCES DEFENSE COUNCIL, ET AL U.S. DISTRICT COURT DISTRICT OF COLUMBIA, JUNE 7, 1976. SITE 8ERC2120, DDC 1976. MODIFIED MARCH 9, 1979, SITE 12ERC1833, DDC 1979 AND AGAIN ON OCTOBER 26, 1982.

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)
40CFR261.31 EPA HAZARDOUS WASTE NO. F001: SPENT HALOGENATED
SOLVENT USED IN DEGREASING AND SLUDGES FROM RECOVERY OF THIS
SOLVENT IN DEGREASING OPERATIONS. (T)
SENATE BILL 5.757 WOULD DIRCECT EPA TO REVIEW, BY 7/1/85,
DISPOSAL OF WASTES CONTAINING THIS SUBSTANCE TO DETERMINE
WHETHER IT SHOULD BE BANNED FROM LAND DISPOSAL

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)
40CFR261.31 EPA HAZARDOUS WASTE NO. F002: SPENT HALOGENATED
SOLVENT AND STILL BOTTOMS FROM RECOVERY OF THIS SOLVENT.(T)
SENATE BILL 5.757 WOULD DIRECT EPA TO REVIEW, BY 7/1/85,
DISPOSAL OF WASTES CONTAINING THIS SUBSTANCE TO DETERMINE
WHETHER IT SHOULD BE BANNED FROM LAND DISPOSAL

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)
CFR261.32 EPA HAZARDOUS WASTE NO. K030: COLUMN BOTTOMS OR
HEAVY ENDS FROM THE COMBINED PRODUCTION OF TRICHLOROETHYLENE
AND PERCHLOROETHYLENE. (T)

NATIONAL TOXICOLOGY PROGRAM (NTP) DATA INADEQUATE TO DETERMINE
CARCINOGENICITY OF THIS SUBSTANCE IN MALE F344/N RATS

NATIONAL TOXICOLOGY PROGRAM (NTP) HAS DETERMINED THIS SUBSTANCE
NOT CARCINOGENIC FOR FEMALE F344/N RATS

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)
40CFR261.31 EPA HAZARDOUS WASTE NO. F024: WASTES, INCLUDING BUT NOT
LIMITED TO, DISTILLATION RESIDUES, HEAVY ENDS, TARS, AND REACTOR
CLEANOUT WASTES FROM THE PRODUCTION OF CHLORINATED ALIPHATIC HYDRO-
CARBONS, HAVING CARBON CONTENT FROM ONE TO FIVE, UTILIZING FREE RADICAL
CATALYZED PROCESSES. (THIS LIST DOES NOT INCLUDE LIGHT ENDS, SPENT
FILTERS AND FILTER AIDS, SPENT DESSICANTS, WASTEWATER, WASTEWATER TREAT-
MENT SLUDGES, SPENT CATALYSTS, AND WASTES LISTED IN 40CFR261.32)
49FR5308 02/10/84

NATIONAL TOXICOLOGY PROGRAM (NTP) HAS DETERMINED THIS SUBSTANCE
CARCINOGENIC FOR B6C3F1 MICE OF EITHER SEX

40CFR122, APPENDIX D - NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
PERMIT APPLICATION TESTING REQUIREMENTS
TABLE II - ORGANIC TOXIC POLLUTANTS IN EACH OF FOUR FRACTIONS IN
ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROSCOPY (GS/MS)
48FR14153 04/01/83

EDICAL SURVEILLANCE REQUIRED
GENERAL MEDICAL HISTORY
INDUSTRIAL EXPOSURE HISTORY

RESPIRATORY HISTORY
PRE-PLACEMENT AND ANNUAL EXAMS
WITH EMPHASIS ON:
RENAL AND LIVER FUNCTIONS
BLOOD CHEMISTRY
COMPLETE BLOOD COUNT
WITH EMPHASIS ON:
PULMONARY FUNCTIONS
WITH EMPHASIS ON:
CENTRAL NERVOUS SYSTEM TESTS, PERIPHERAL NEUROPATHY
WITH EMPHASIS ON:
ELECTROCARDIOGRAM
WITH EMPHASIS ON:
SKIN EXAM
VISION TEST
URINALYSIS
ATTENTION TO SMOKING, ALCOHOL, MEDICATION & EXPOSURE TO
CARCINOGENS

WITH EMPHASIS ON:
14 BY 17 CHEST P.A. X-RAY

CERTIFICATIONS
HEALTH STATUS CLASSIFICATION

OSHA RESPIRATOR CERTIFICATION 29CFR1910.134

DEPARTMENT OF TRANSPORTATION IF OPERATES HEAVY EQUIPMENT

NUCLEAR REG. 0041

EMPLOYEE HAZARDOUS MATERIALS EDUCATION RECEIPT

EMPLOYEE MEDICAL RECORDS RECEIPT

TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE
REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL
SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT
ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR 30 YEARS.
CONTACT: JACK P. MCCARTHY, OFFICE OF TOXIC SUBSTANCES,
EPA (800)424-1404. 48FR38178 8/22/83

MEDICAL WARNING REQUIRED FOR MEDICAL EXAM REFUSAL SIGNED
BY EMPLOYEE

SPECIAL DIAGNOSTIC TESTS
URINE TRICHLOROETHYLENE METABOLITES >20 MG/DAY

LEAKS AND SPILL PROCEDURES

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DEPARTMENT OF TRANSPORTATION (DOT) HAZARD CLASS -
49CFR172.101 HAZARDOUS MATERIALS TABLE:

ORM-A

DEPARTMENT OF TRANSPORTATION (DOT) LABELING REQUIREMENT(S)
49CFR172.101 (SUBJECT TO ADDITIONAL LABELING REQUIREMENTS OF
49CFR172.402):

NONE

****

INTERGOVERNMENTAL MARITIME ORGANIZATION (IMO) HAZARD CLASS -
49CFR172.102 OPTIONAL HAZARDOUS MATERIALS TABLE:

POISON B

INTERGOVERNMENTAL MARITIME ORGANIZATION (IMO)
LABELING SPECIFICATIONS FOR DOMESTIC AND EXPORT SHIPMENTS
49CFR172.102:

ST. ANDREWS CROSS

****

FOLLOWING DATA FROM BUREAU OF EXPLOSIVES -
EMERGENCY HANDLING OF HAZARDOUS MATERIALS

IF MATERIAL ON FIRE OR INVOLVED IN FIRE:

* EXTINGUISH FIRE USING AGENT SUITABLE FOR TYPE OF FIRE

IF MATERIAL IS NOT ON FIRE AND IS NOT INVOLVED IN FIRE:

* KEEP MATERIAL OUT OF WATER SOURCES AND SEWERS

* BUILD DIKES TO CONTAIN FLOW AS NECESSARY

PERSONAL DANGER SITUATION PROTECTION:

* KEEP UPWIND

* WEAR BOOTS, PROTECTIVE GLOVES AND GAS TIGHT GOGGLES

* WASH AWAY ANY MATERIALS WHICH MAY HAVE CONTACTED THE BODY WITH COPIOUS AMOUNTS OF WATER OR SOAP AND WATER

* AVOID BREATHING VAPORS OR DUST

LAND SPILL

* DIG A PIT, POND, LAGOON, HOLDING AREA TO CONTAIN LIQUID OR SOLID MATERIAL

* AVOID BODILY CONTACT WITH MATERIAL

* ABSORB BULK LIQUID WITH FLY ASH OR CEMENT POWDER

WATER SPILL

* IF DISSOLVED, APPLY ACTIVATED CARBON AT 10 TIMES SPILLED AMOUNT AT 10PPM OR GREATER CONCENTRATION

* REMOVE TRAPPED MATERIAL WITH SUCTION HOSES

* USE MECHANICAL DREDGES OR LIFTS TO REMOVE IMMOBILIZED MASSES OF POLLUTION AND PRECIPITATES

AIR SPILL

* APPLY WATER SPRAY TO KNOCK DOWN VAPORS

* COMBUSTION PRODUCTS INCLUDE CORROSIVE OR TOXIC VAPORS

WASTE

THIS MATERIAL LISTED AS HAZARDOUS SUBSTANCE, AS DEFINED IN SECTION 101(14) OF THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT (CERCLA) OF 1980, PURSUANT TO ONE OR MORE OF THE FOLLOWING:

- FEDERAL WATER POLLUTION CONTROL ACT (FWPCA) SECTION 311 (B)(2)(A)
- SOLID WASTE DISPOSAL ACT SECTION 3001 40CFR261
- CLEAN WATER ACT (CWA) SECTION 307(A) 40CFR129
- CLEAN AIR ACT (CAA) SECTION 112 40CFR61
- TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 7
- COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT (CERCLA) SECTION 102

40CFR260 HAZARDOUS WASTE MANAGEMENT SYSTEM: GENERAL

PROVIDES DEFINITIONS OF TERMS, GENERAL STANDARDS, AND OVERVIEW INFORMATION APPLICABLE TO 40CFR PARTS 260-265

45FR76075 11/17/80
45FR76630 11/19/80
45FR86968 12/31/80
46FR2348 01/09/81
46FR27476 05/20/81
46FR35247 07/07/81
47FR32349 07/26/82
47FR41563 09/21/82
48FR2511 01/16/83
48FR14293 04/01/83

40CFR261 IDENTIFICATION AND LISTING OF HAZARDOUS WASTE

IDENTIFIES THOSE SOLID WASTES WHICH ARE SUBJECT TO REGULATION AS HAZARDOUS WASTES UNDER 40CFR PARTS 262-265, 270, 271, AND 124 AND WHICH ARE SUBJECT TO THE NOTIFICATION REQUIREMENTS OF SECTION 3010 OF THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) AND IDENTIFIES ONLY SOME OF THE MATERIALS WHICH ARE HAZARDOUS WASTES UNDER SECTIONS 3007 AND 7003 OF RCRA

45FR33119 05/19/80
45FR72037 10/30/80
45FR74892 11/12/80
45FR76620 11/19/80
45FR76623 11/19/80
45FR78529 11/25/80
45FR78531 11/25/80
45FR80287 12/04/80
46FR4618 01/16/81
46FR4619 01/16/81
46FR27476 05/20/81
46FR27477 05/20/81
46FR29708 06/03/81
46FR34587 07/02/81
46FR35247 07/07/81
46FR47429 09/25/81
46FR56589 11/11/81
47FR36097 08/18/82
48FR14293 04/01/83
48FR14294 04/01/83
48FR15257 04/08/83
48FR30115 06/30/83

40CFR262 STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS FOR GENERATORS OF HAZARDOUS WASTE

45FR33142 05/19/80
45FR78529 11/25/80
45FR86970 12/31/80
45FR86973 12/31/80
47FR1251 01/11/82
48FR3981 01/28/83
48FR14294 04/01/83
48FR13028 04/29/83

40CFR263 STANDARDS APPLICABLE TO TRANSPORTERS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS WHICH APPLY TO PERSONS TRANSPORTING HAZARDOUS WASTE WITHIN THE UNITED STATES IF THE TRANSPORTATION REQUIRES A MANIFEST UNDER 40CFR262

45FR33151 05/19/80
45FR86968 12/31/80
48FR14294 12/31/80

40CFR264 STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE

45FR33221 05/19/80 47FR17989 04/27/82
45FR76075 11/17/80 47FR19995 05/10/82
45FR86968 12/31/80 47FR27532 06/24/82
45FR86970 12/31/80 47FR27533 06/24/82
45FR86974 12/31/80 47FR28627 07/01/82
46FR2848 01/12/81 47FR32349 07/26/82
46FR2849 01/12/81 47FR32350 07/26/82
46FR2866 01/12/81 47FR32356 07/26/82
46FR2867 01/12/81 47FR32357 07/26/82
46FR7678 01/23/81 47FR32359 07/26/82
46FR27480 05/20/81 47FR32361 07/26/82
46FR35249 07/07/81 47FR32365 07/26/82
46FR55112 11/06/81 47FR32384 07/26/82
46FR57285 11/23/81 47FR30447 07/13/82
47FR953 01/08/82 48FR2511 01/19/83
47FR8306 02/25/82 48FR3982 01/28/83
47FR15047 04/07/82 48FR14294 04/01/83
47FR15059 04/07/82 48FR14295 04/01/83
47FR16554 04/16/82 48FR30115 06/30/83
47FR16556 04/16/82

40CFR265 INTERIM STATUS STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE DURING THE PERIOD OF INTERIM STATUS

45FR33232 05/19/80 47FR12318 03/22/82
45FR76075 11/17/80 47FR15064 04/07/82
45FR78529 11/25/80 47FR16558 04/16/82
45FR86968 12/31/80 47FR27533 06/24/82
45FR86970 12/31/80 47FR28627 07/01/82
45FR86974 12/31/80 47FR30447 07/13/82
46FR2875 01/12/81 47FR32367 07/26/82
46FR7680 01/23/81 47FR32368 07/26/82
46FR27480 05/20/81 47FR32369 07/26/82
46FR35249 07/07/81 48FR2511 01/19/83
46FR56596 11/17/81 48FR3982 01/28/83
47FR1255 01/11/82 48FR14295 04/01/83
47FR8306 02/25/82 48FR30115 06/30/83

40CFR267 INTERIM STANDARDS FOR OWNERS AND OPERATORS OF NEW HAZARDOUS WASTE LAND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS THAT DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE FOR NEW LAND DISPOSAL FACILITIES
46FR12429 02/13/81

40CFR270 EPA ADMINISTERED PERMIT PROGRAMS: THE HAZARDOUS WASTE PERMIT PROGRAM

ESTABLISHES PROVISIONS FOR THE HAZARDOUS WASTE PERMIT PROGRAM UNDER SUBTITLE C OF THE SOLID WASTE DISPOSAL ACT, AS AMENDED BY THE RESOURCE CONSERVATION AND RECOVERY ACT
48FR14228 04/01/83
48FR30113 06/30/83
48FR30114 06/30/83

40CFR271 REQUIREMENT FOR AUTHORIZATION OF STATE HAZARDOUS WASTE PROGRAMS

SPECIFIES THE PROCEDURES EPA WILL FOLLOW IN APPROVING, REVISING, AND WITHDRAWING APPROVAL OF STATE PROGRAMS AND THE REQUIREMENTS STATE PROGRAMS MUST MEET TO BE APPROVED BY THE ADMINISTRATOR UNDER SECTION 3006(B) OF RCRA
48FR14248 04/01/83
48FR30114 06/30/83
48FR30115 06/30/83

CAS NUMBER
79-01-6

REGISTRY TOXIC CHEMICALS NUMBER
KX4550000

BULLETINS
NTP BEGINS NEW BIOASSAY WITH THIS SUBSTANCE UNDER PAPANICOLAOU CANCER INST, DIRECTOR OF STUDY DR F BOCK. PREVIOUS STUDY PRODUCED INCONCLUSIVE CARCINOGENICITY RESULTS AND CONSIDERABLE UNREST IN BOTH THE SCIENTIFIC AND BUSINESS COMMUNITIES
05 06 83 US./CALIF. FILE SUIT TO CLEAN UP STRINGFELLOW SITE.

SPECIAL INFORMATION
SUB. FOUND AT THE INDIAN BEND WASH, SCOTTSDALE-TEMPE-PHOENIX,ARIZ--TUCSON INT.AIRPORT,TUCSON ARIZ--HOLLINGSWORTH SOLDERLESS TERMINAL CO.,FT.LAUDERDALE,FLA--DICO CO.,DES MOINES,IOWA--PARROT ROAD DUMP,NEW HAVEN,IND--ACME SOLVENT RECLAIMING, INC.,MORRISTOWN,ILL--CHARLEVOIX MUNICIPAL WELL FIELD,CHARLEVOIX,MICH--CHEM CENTRAL,KENTCO.,MICH--CLARE WATER SUPPLY,CLARE,MICH--ELECTROVOICE, BUCHANAN,MICH--GRAND TRAVERSE OVERALL SUPPLY CO,GREILICKVILLE,MICH--HEDELUM IND.,OSCODA, MI--K AND L

TYPE WHAT INFORMATION YOU REQUIRE:
/ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND), /HELP/, OR /NONE/.

CHEMICAL PROFILE

1,1-Dichloroethylene

CHEMICAL NAME
VINYLIDENE CHLORIDE

FORMULA
C2H2CL2

SYNONYMS
1,1-DICHLOROETHYLENE
1,1-DCE
SCONATEX
VDC
NCI-C54262
VINYLIDINE CHLORIDE
UN 1303
1,1-DICHLOROETHENE
ETHYLENE, 1,1-DICHLORO-
ETHENE, 1,1-DICHLORO-
VINYLIDENE CHLORIDE(II)

PERMISSIBLE EXPOSURE LIMIT
5 PPM ACGIH TWA
20 PPM ACGIH STEL
INDEFINITE HUMAN CARCINOGEN (IARC)
ANIMAL CARCINOGEN (IARC)
INDEFINITE CARCINOGEN IN RATS/MICE (NCI-CG-TR-228, 82)
NEGATIVE CARCINOGEN IN RATS/MICE (NCI-CG-TR-228, 82)
ANIMAL TERATOGEN (RTEC)
POSITIVE MUTAGEN (RTEC)
REPORTABLE QUANTITIES -- 5000 LB CWA 311(B)(4) -- 1 LB CWA 307(A)
1 LB RCRA 3001
CERCLA HAZARD RATINGS - TOXICITY 2 - IGNITABILITY 3 -- REACTIVITY 2 --
PERSISTENCE 0

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATION
200 MG/KG ORAL--RAT
LD50

PHYSICAL DESCRIPTION
LIQUID GAS

CHEMICAL AND PHYSICAL PROPERTIES
MOLECULAR WEIGHT: 97
BOILING POINT AT 1 ATM, F: 88.8F
SOLUBILITY IN WATER, G/100 G WATER AT 20C: 2250 MG/L AT 77 F
FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF OC): 3 F
VAPOR PRESSURE @ 20 C, MMHG: 600 MM AT 77 F
MELTING POINT, F: -187.6F
UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: 16.0%
LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: 7.3%
AUTOIGNITION TEMPERATURE: 1058 F
VAPOR DENSITY (AIR=1): 3.4

INCOMPATIBILITIES
STRONG OXIDIZERS
STRONG ACIDS
STRONG BASES

PERSONAL PROTECTIVE EQUIPMENT
NO NIOSH/OSHA DATA; RECOMMEND
PREVENT REPEATED OR PROLONGED SKIN CONTACT
WEAR IMPERVIOUS CLOTHING
WEAR GLOVES
WEAR FACESHIELD (8 INCH MINIMUM)

PLACE CONTAMINATED CLOTHING IN CLOSED CONTAINERS FOR STORAGE UNTIL LAUNDERED OR DISCARDED

IF CLOTHING IS TO BE LAUNDERED, INFORM PERSON PERFORMING OPERATION OF CONTAMINANT'S HAZARDOUS PROPERTIES

— — —

ACGIH "GUIDELINES FOR SELECTION OF CHEMICAL PROTECTIVE CLOTHING" INDICATES THE FOLLOWING MATERIALS AND PROTECTIVE RATINGS BY INDEPENDENT VENDORS AGAINST VINYLIDENE CHLORIDE:

EXCELLENT/GOOD:

NONE INDICATED

FAIR/GOOD:

CHLORINATED POLYETHYLENE

GOGGLES

NO STANDARD REQUIREMENT, BUT ADVISE EYE PROTECTION TO PREVENT ANY POSSIBILITY OF EYE CONTACT

WASHING CHEMICALS FROM THE SKIN

NO STANDARD REQUIREMENT, BUT ADVISE WASHING PROMPTLY WHEN SKIN BECOMES CONTAMINATED

ROUTINE CHANGING OF WORK CLOTHING

NO STANDARD REQUIREMENT, BUT ADVISE CHANGING IF THERE IS ANY POSSIBILITY THAT CLOTHING MAY BE CONTAMINATED

CLOTHING REMOVAL FOLLOWING ACCIDENTAL CONTAMINATION

NO STANDARD REQUIREMENT, BUT ADVISE REMOVING PROMPTLY IF IT IS NON-IMPERVIOUS AND CONTAMINATED

SPECIFIC EMERGENCY PROVISIONS

NO NIOSH/OSHA DATA, ADVISE:

EYE-WASH FOUNTAIN WITHIN IMMEDIATE WORK AREA WHERE EMPLOYEES' EYES MAY BE EXPOSED TO SUBSTANCE

QUICK DRENCHING FACILITIES WITHIN IMMEDIATE WORK AREA WHERE EMPLOYEES MAY BE EXPOSED TO SUBSTANCE

EATING AND SMOKING SHOULD NOT BE PERMITTED IN IMMEDIATE WORK AREA

WATER FOUNTAIN PROHIBITED IN WORK AREA

CLOSED SYSTEM IF SUBSTANCE TO BE USED

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

10 PPM

- TYPE 'C' SUPPLIED-AIR RESPIRATOR
- SUPPLIED-AIR RESPIRATOR
  WITH HALF-MASK
  OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE
- AUXILIARY SELF-CONTAINED BREATHING APPARATUS
- CHEMICAL CARTRIDGE RESPIRATOR
  WITH AN ORGANIC VAPOR CANISTER
  PROVIDING PROTECTION AGAINST SPECIFIC COMPOUND OF CONCERN

PPM

- POWERED AIR-PURIFYING RESPIRATOR
  WITH A FULL FACE-PIECE, HELMENT, OR HOOD
  PROVIDING PROTECTION AGAINST SPECIFIC COMPOUND OF CONCERN
- GAS MASK
  (CHIN-STYLE OR FRONT- OR BACK-MOUNTED CANISTER)
  PROVIDING PROTECTION AGAINST SPECIFIC COMPOUND OF CONCERN

100 PPM
- TYPE 'C' SUPPLIED-AIR RESPIRATOR
- SUPPLIED-AIR RESPIRATOR
  WITH A FULL FACE-PIECE
- AUXILIARY SELF-CONTAINED BREATHING APPARATUS
- SELF-CONTAINED BREATHING APPARATUS
  WITH A FULL FACE-PIECE
  OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE
- TYPE 'C' SUPPLIED-AIR RESPIRATOR
- SUPPLIED-AIR RESPIRATOR
  WITH A FULL FACE-PIECE
  OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

1000 PPM
- TYPE 'C' SUPPLIED-AIR RESPIRATOR
- SUPPLIED-AIR RESPIRATOR
  WITH A FULL FACE-PIECE
- AUXILIARY SELF-CONTAINED BREATHING APPARATUS
- TYPE 'C' SUPPLIED-AIR RESPIRATOR
- SUPPLIED-AIR RESPIRATOR
  WITH HALF-MASK
- AUXILIARY SELF-CONTAINED BREATHING APPARATUS

>3600 PPM
- SELF-CONTAINED BREATHING APPARATUS
  WITH A FULL FACE-PIECE
  OPERATED IN PRESSURE-DEMAND, POSITIVE-PRESSURE, OR CONTINUOUS-FLOW
  MODE

FIREFIGHTING
- SELF-CONTAINED BREATHING APPARATUS
  WITH A FULL FACE-PIECE
  OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

ROUTE OF ENTRY INTO BODY
- INHALATION
- SKIN ABSORPTION
- INGESTION
- SKIN OR EYE CONTACT

SYMPTOMS
- SKIN IRRITATION
- MUCOUS MEMBRANE IRRITATION
- CONJUNCTIVITIS
- WEIGHT LOSS
- NARCOSIS
- CENTRAL NERVOUS SYSTEM DEPRESSION
- MAMMARY ADENOCARCINOMA
- DERMATITIS
- CARDIAC ARRHYTHMIA
- BONE DEGENERATION
- LIVER DAMAGE
- KIDNEY DAMAGE
- LYMPHATIC SYSTEM DEGENERATION

FIRST AID PROCEDURES FOLLOWING EXPOSURE

IF THIS CHEMICAL GETS INTO THE EYES, IMMEDIATELY WASH THE EYES WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING THE LOWER AND UPPER LIDS. GET MEDICAL ATTENTION IMMEDIATELY. CONTACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH THIS CHEMICAL.

IF THIS CHEMICAL GETS ON THE SKIN, IMMEDIATELY WASH CONTAMINATED SKIN WITH SOAP OR MILD DETERGENT & WATER. IF THIS CHEMICAL SOAKS CLOTHING, IMMEDIATELY REMOVE CLOTHING & WASH SKIN WITH SOAP OR MILD DETERGENT & WATER. GET MEDICAL ATTENTION PROMPTLY.

IF A PERSON BREATHES IN LARGE AMOUNTS OF THIS CHEMICAL, MOVE THE EXPOSED PERSON TO FRESH AIR AT ONCE. IF BREATHING HAS STOPPED PERFORM ARTIFICIAL RESPIRATION. KEEP THE AFFECTED PERSON WARM AND AT REST. GET MEDICAL ATTENTION AS SOON AS POSSIBLE.

IF THIS HALOGENATED HYDROCARBON HAS BEEN SWALLOWED, REMOVE BY GASTRIC LAVAGE OR EMESIS. MAINTAIN BLOOD PRESSURE BY ADMINISTERING 5% GLUCOSE INTRAVENOUSLY. DO NOT GIVE STIMULANTS. GET FURTHER MEDICAL TREAT-MENT IMMEDIATELY.
(DREISBACH - HANDBOOK OF POISONING, 11TH ED.)

ORGANS

CENTRAL NERVOUS SYSTEM
LIVER
RESPIRATORY SYSTEM
SKIN
SKELETAL
REPRODUCTIVE SYSTEM

STATUS OF REGULATORY ENFORCEMENT

OSHA STANDARD 29CFR1910.1200 HAZARD COMMUNICATION
REQUIRES CHEMICAL MANUFACTURERS AND IMPORTERS TO ASSESS THE HAZARDS OF CHEMICALS WHICH THEY PRODUCE OR IMPORT, AND ALL EMPLOYERS HAVING WORKPLACES IN THE MANUFACTURING DIVISION, STANDARD INDUSTRIAL CLASS-IFICATION CODES 20 THROUGH 39, TO PROVIDE INFORMATION TO THEIR EMPLOYEES CONCERNING HAZARDOUS CHEMICALS BY MEANS OF HAZARD COMMUNICATION PROGRAMS INCLUDING LABELS, MATERIAL SAFETY DATA SHEETS, TRAINING, AND ACCESS TO WRITTEN RECORDS
48FR53280 11/25/83

FOLLOWING OSHA STANDARDS APPLICABLE TO SUBSTANCES LISTED 29CFR1910, OTHERWISE ADVISE:

OSHA STANDARD 29CFR1910.1000 AIR CONTAMINANTS
TABLE Z-1

OSHA STANDARD 29CFR1910.94 VENTILATION

OSHA STANDARD 29CFR1910.134 RESPIRATORY PROTECTION

OSHA STANDARD 29CFR1910.20 ACCESS TO EMPLOYEE EXPOSURE AND MEDICAL RECORDS

OSHA STANDARD 29CFR1910.132 PERSONAL PROTECTIVE EQUIPMENT

OSHA STANDARD 29CFR1910.141 SANITATION

OSHA STANDARD 29CFR1910.151 MEDICAL SERVICES AND FIRST AID

OSHA STANDARD 29CFR1910.133 EYE AND FACE PROTECTION

40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT ALLEGED TO HAVE BEEN CAUSED BY A SUBSTANCE OR MIXTURE. EPA MAY INSPECT AND REQUIRE REPORTING OF SUCH RECORDS.
48FR38178 08/22/83

A CRITERIA DOCUMENT FOR OCCUPATIONAL EXPOSURE TO THIS SUBSTANCE HAS BEEN PUBLISHED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

SUBSTANCE LISTED TOXIC SUBSTANCES CONTROL ACT INVENTORY

40CFR116 DESIGNATION OF HAZARDOUS SUBSTANCES
DESIGNATED AS HAZARDOUS SUBSTANCE IN ACCORDANCE WITH SECTION 311(B)(2)(A) OF THE FEDERAL WATER POLLUTION CONTROL ACT, AS AMENDED. INCLUDES ANY ISOMERS AND HYDRATES, AS WELL AS ANY SOLUTIONS AND MIXTURES CONTAINING THIS SUBSTANCE.
43FR10747 03/13/78
43FR27533 06/26/78
44FR10266 02/16/79 (AMENDMENT)
44FR10268 02/16/79 (AMENDMENT)
44FR65400 11/13/79 (AMENDMENT)
44FR66602 11/20/79 (AMENDMENT)

49CFR172.101 TABLES OF HAZARDOUS MATERIALS, THEIR DESCRIPTION, PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER REQUIREMENTS
DESIGNATED IN HAZARDOUS MATERIALS TABLE AS HAZARDOUS MATERIAL FOR THE PURPOSE OF TRANSPORTATION.
41FR15996 04/15/76
45FR34580 05/22/80 (AMENDMENT)
45FR46420 07/10/80 (AMENDMENT)
45FR62080 09/18/80 (AMENDMENT)
45FR74649 11/10/80 (AMENDMENT)
46FR17739 03/19/81 (AMENDMENT)
46FR19235 03/30/81 (AMENDMENT)

49CFR172.102 TABLES OF HAZARDOUS MATERIALS, THEIR DESCRIPTION, PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER REQUIREMENTS
DESIGNATED IN OPTIONAL HAZARDOUS MATERIALS TABLE (UNDER N.O.S. CATEGORY) WITH ALTERNATIVES TO CORRESPONDING REQUIREMENTS IN 49CFR172.101 FOR INTERNATIONAL SHIPMENTS.
41FR15996 04/15/81
46FR29393 06/01/81 (AMENDMENT)
46FR32250 06/22/81 (AMENDMENT)

TECHNICAL ASSISTANCE DATA COMPLETED/PUBLISHED CLEAN WATER ACT (CWA) SECTION 311

REGULATION PROMULGATED CLEAN WATER ACT (CWA) SECTION 311
40CFR117

SOURCE/EXPOSURE ASSESSMENT COMPLETED/PUBLISHED CLEAN AIR ACT (CAA)

REGULATION PROMULGATED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR260

SUBSTANCE LISTED HAZARDOUS
STATE OF CALIFORNIA ADMINISTRATIVE CODE
TITLE 22. SOCIAL SECURITY
DIVISION 4. ENVIRONMENTAL HEALTH
CHAPTER 30. MINIMUM STANDARDS FOR MANAGEMENT OF HAZARDOUS AND EXTREMELY HAZARDOUS WASTES

SUNSTANCE SUBJECT TO REQUIREMENTS OF GENERAL INDUSTRY SAFETY ORDER (GISO) 5194 OR TITLE 8 OF CALIFORNIA ADMINSTRATIVE CODE AND DIVISION 5, CHAPTER 2.5 OF CALIFORNIA LABOR CODE

SUBSTANCES LISTED APPENDIX A -- CONSENT DECREE LIST OF INDUSTRICS AND TOXIC POLLUTANTS. SETTLEMENT AGREEMENT OETWEEN U.S. EPA AND NATIONAL RESOURCES DEFENSE COUNCIL, ET AL U.S. DISTRICT COURT DISTRICT OF COLUMBIA, JUNE 7, 1976. SITE 8ERC2120, DDC 1976. MODIFIED MARCH 9, 1979, SITE 12ERC1833, DDC 1979 AND AGAIN ON OCTOBER 26, 1982.

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.32 EPA HAZARDOUS WASTE NO. K020: HEAVY ENDS FROM THE DISTILLATION OF VINYL DICHLORIDE IN VINYL CHLORIDE MONOMER PRODUCTION. (T)

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.32 EPA HAZARDOUS WASTE NO. K019: HEAVY ENDS FROM THE DISTILLATION OF ETHYLENE DICHLORIDE IN ETHYLENE CHLORIDE PRODUCTION. (T)

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.32 EPA HAZARDOUS WASTE NO. K029: WASTE FROM THE PRODUCT STEAM STRIPPER IN THE PRODUCTION OF 1,1,1-TRICHLOROETHANE. (T)

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.32 EPA HAZARDOUS WASTE NO. K073: CHLORINATED HYDRO-CARBON WASTE FROM THE PURIFICATION STEP OF THE DIAPHRAM CELL PROCESS USING GRAPHITE ANODES IN CHLORINE PRODUCTION. (T)

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.31 EPA HAZARDOUS WASTE NO. F024: WASTES, INCLUDING BUT NOT LIMITED TO, DISTILLATION RESIDUES, HEAVY ENDS, TARS, AND REACTOR CLEANOUT WASTES FROM THE PRODUCTION OF CHLORINATED ALIPHATIC HYDRO-CARBONS, HAVING CARBON CONTENT FROM ONE TO FIVE, UTILIZING FREE RADICAL CATALYZED PROCESSES. (THIS LIST DOES NOT INCLUDE LIGHT ENDS, SPENT FILTERS AND FILTER AIDS, SPENT DESSICANTS, WASTEWATER, WASTEWATER TREAT-MENT SLUDGES, SPENT CATALYSTS, AND WASTES LISTED IN 40CFR261.32) 49FR5308 02/10/84

15CFR399.2. SUPPLEMENT 1 -- COMMODITY INTERPRETATION 24: CHEMICALS VALIDATED LICENSE REQUIRED FOR EXPORT TO LIBYA, NORTH KOREA, VIETNAM, KAMPUCHEA, OR CUBA
45FR85942 12/30/80
46FR23942 04/29/81
47FR140 01/05/82
47FR41512 09/21/82
47FR51860 11/18/82
47FR58124 12/29/82

TOXIC SUBSTANCE CONTROL ACT (TSCA) SECTION 8(E) INITIAL EVALUATION OF SUBSTANTIAL RISK SUBMITTED TO EPA, 1982

SUNSTANCE LISTED COMMONWEALTH OF VIRGINIA STATE BOARD OF HEALTH HAZARDOUS WASTE MANAGEMENT REGULATIONS UNDER AUTHORITY OF THE CODE OF VIRGINIA, AS AMENDED, CHAPTER 6, TITLE 32.1, ARTICLE 3. SOLID WASTE MANAGEMENT

OGC-003476

THIS SUBSTANCE TESTED FOR MUTAGENESIS/GENETIC TOXICITY
BY THE NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES
(NIEHS)

MEDICAL SURVEILLANCE REQUIRED
NO EXAM REQUIRED UNLESS EMPLOYEE TO WEAR FULL FACE-PIECE RESPIRATOR
ATTENTION TO SMOKING, ALCOHOL, MEDICATION, AND EXPOSURE TO CARCINOGENS
GENERAL MEDICAL HISTORY
40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES
CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES
MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES
TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR
30 YEARS
43FR38187 08/22/83
30FR38225 08/30/03 (EFFECTIVE DATE CORRECTION)
RESPIRATORY HISTORY
PRE-PLACEMENT AND ANNUAL EXAMS
PHYSICIAN EXAMINATION

INDUSTRIAL HISTORY
VISION TEST

HISTORY OF HEPATITIS, BLOOD TRANSFUSIONS, HOSPITALIZATION
BLOOD CHEMISTRY
COMPLETE BLOOD COUNT
CHRONIC RESPIRATORY DISEASE
LIVER FUNCTION
ELECTROCARDIOGRAM
URINALYSIS

14 BY 17 CHEST P.A. X-RAY
ALKALINE PHOSPHATASE
GGTP
SGOT
SGPT
DIRECT BILIRUBIN
DIRECT BILIRUBIN
LDH

CERTIFICATIONS
NUCLEAR REG. 0041

HEALTH STATUS CLASSIFICATION

OSHA RESPIRATOR CERTIFICATION 29CFR1910.134

DEPARTMENT OF TRANSPORTATION IF OPERATES HEAVY EQUIPMENT

EMPLOYEE HAZARDOUS MATERIALS EDUCATION RECEIPT

EMPLOYEE MEDICAL RECORDS RECEIPT

TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE
REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL
SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT
ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR 30 YEARS.
CONTACT: JACK P. MCCARTHY, OFFICE OF TOXIC SUBSTANCES,
EPA (800)424-1404. 43FR38178 8/22/83

MEDICAL WARNING REQUIRED FOR MEDICAL EXAM REFUSAL SIGNED BY EMPLOYEE

SPECIAL DIAGNOSTIC TESTS
NONE IN COMMON USE

LEAKS AND SPILL PROCEDURES

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DEPARTMENT OF TRANSPORTATION HAZARD CLASS
49CFR172.101 HAZARDOUS MATERIALS TABLE

FLAMMABLE LIQUID

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS
49CFR172.101 (SUBJECT TO ADDITIONAL LABELING REQUIREMENTS OF 49CFR172.402)

FLAMMABLE LIQUID

****

INTERGOVERNMENTAL MARITIME ORGANIZATION HAZARD CLASS
49CFR172.102 OPTIONAL HAZARDOUS MATERIALS TABLE

(INHIBITED)
CLASS 3.1-INFLAMMABLE LIQUIDS

INTERGOVERNMENTAL MARITIME ORGANIZATION LABELING SPECIFICATIONS FOR DOMESTIC AND EXPORT SHIPMENTS
49CFR172.102

FLAMMABLE LIQUID

****

FOLLOWING INFORMATION FROM BUREAU OF EXPLOSIVES "EMERGENCY HANDLING OF HAZARDOUS MATERIALS":

IF MATERIAL ON FIRE OR INVOLVED IN FIRE:
* DO NOT EXTINGUISH FIRE UNLESS FLOW CAN BE STOPPED
* USE WATER IN FLOODING QUANTITIES AS FOG
* SOLID STREAMS OF WATER MAY BE INEFFECTIVE
* COOL ALL AFFECTED CONTAINERS WITH FLOODING QUANTITIES OF WATER
* APPLY WATER FROM AS FAR A DISTANCE AS POSSIBLE
* USE ALCOHOL FOAM OR CO2 OR DRY CHEMICAL EXTINGUISHERS

IF MATERIAL IS NOT ON FIRE AND IS NOT INVOLVED IN FIRE:
* KEEP SPARKS, FLAMES AND OTHER IGNITION SOURCES AWAY
* KEEP MATERIAL OUT OF WATER SOURCES AND SEWERS
* BUILD DIKES TO CONTAIN FLOW AS NECESSARY
* ATTEMPT TO STOP LEAK IF WITHOUT HAZARD
* USE WATER SPRAY TO KNOCK DOWN VAPORS

PERSONNEL PROTECTION:
* AVOID BREATHING DUST/VAPORS/FUMES FROM MATERIAL
* KEEP UPWIND
* AVOID BODILY CONTACT WITH MATERIAL
* WEAR BOOTS, PROTECTIVE GLOVES AND GAS TIGHT GOGGLES
* WASH AWAY ANY MATERIALS WHICH MAY HAVE CONTACTED THE BODY WITH COPIOUS AMOUNTS OF WATER OR SOAP AND WATER
* DO NOT HANDLE BROKEN PACKAGES WITHOUT PROTECTIVE EQUIPMENT

* U.S. COAST GUARD REQUIRES 24 HOUR ADVANCE NOTICE TO CAPTAIN OF THE PORT WHEN THIS SUBSTANCE IS SCHEDULED TO ARRIVE AT PORT

WASTE
SUBSTANCE IS GAS AT NORMAL PRESSURE AND TEMPERATURE BELOW 95 F. CLASSIFIED AS SOLID AND/OR HAZARDOUS WASTE ONLY IF CONTAINED.
THIS MATERIAL LISTED AS HAZARDOUS SUBSTANCE, AS DEFINED IN SECTION 101(14) OF THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT (CERCLA) OF 1980, PURSUANT TO ONE OR MORE OF THE FOLLOWING:

- FEDERAL WATER POLLUTION CONTROL ACT (FWPCA) SECTION 311 (B)(2)(A)
- SOLID WASTE DISPOSAL ACT SECTION 3001 40CFR261
- CLEAN WATER ACT (CWA) SECTION 307(A) 40CFR129
- CLEAN AIR ACT (CAA) SECTION 112 40CFR61
- TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 7
- COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT (CERCLA) SECTION 102

EPA HAZARDOUS WASTE NUMBER U078
1,1-DICHLOROETHYLENE
40CFR260 HAZARDOUS WASTE MANAGEMENT SYSTEM: GENERAL

PROVIDES DEFINITIONS OF TERMS, GENERAL STANDARDS, AND OVERVIEW INFORMATION APPLICABLE TO 40CFR PARTS 260-265
45FR76075 11/17/80
45FR76630 11/19/80
45FR86968 12/31/80
46FR2048 01/09/81
46FR27476 05/20/81
46FR35247 07/07/81
47FR32349 07/26/82
47FR41563 09/21/82
48FR2511 01/16/83
48FR14293 04/01/83

40CFR261 IDENTIFICATION AND LISTING OF HAZARDOUS WASTE

IDENTIFIES THOSE SOLID WASTES WHICH ARE SUBJECT TO REGULATION AS HAZARDOUS WASTES UNDER 40CFR PARTS 262-265, 270, 271, AND 124 AND WHICH ARE SUBJECT TO THE NOTIFICATION REQUIREMENTS OF SECTION 3010 OF THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) AND IDENTIFIES ONLY SOME OF THE MATERIALS WHICH ARE HAZARDOUS WASTES UNDER SECTIONS 3007 AND 7003 OF RCRA

45FR33119 05/19/80
45FR72037 10/30/80
45FR74892 11/12/80
45FR76620 11/19/80
45FR76623 11/19/80
45FR78529 11/25/80
45FR78531 11/25/80
45FR80287 12/04/80
46FR4618 01/16/81
46FR4619 01/16/81
46FR27477 05/20/81
46FR29703 06/03/81
46FR34587 07/02/81
46FR35247 07/07/81
46FR47429 09/25/81
46FR56530 11/11/81
47FR36097 08/18/82
48FR14293 04/01/83
48FR14294 04/01/83
48FR15257 04/08/83

40CFR262 STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS FOR GENERATORS OF HAZARDOUS WASTE
45FR33142 05/19/80
45FR78529 11/25/80
45FR86970 12/31/80
45FR86973 12/31/80
47FR1251 01/11/82
48FR3981 01/28/83
48FR14294 04/01/83
48FR13020 04/29/83

40CFR263 STANDARDS APPLICABLE TO TRANSPORTERS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS WHICH APPLY TO PERSONS TRANSPORTING HAZARDOUS WASTE WITHIN THE UNITED STATES IF THE TRANSPORTATION REQUIRES A MANIFEST UNDER 40CFR262
45FR33151 05/19/80
45FR86968 12/31/80
48FR14294 12/31/80

40CFR264 STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE
45FR33221 05/19/80 47FR17989 04/27/82
45FR76075 11/17/80 47FR19995 05/10/82
45FR86968 12/31/80 47FR27532 06/24/82
45FR86970 12/31/80 47FR27533 06/24/82
45FR86974 12/31/80 47FR28627 07/01/82
46FR2848 01/12/81 47FR32349 07/26/82
46FR2849 01/12/81 47FR32350 07/26/82
46FR2866 01/12/81 47FR32356 07/26/82
46FR2867 01/12/81 47FR32357 07/26/82
46FR7673 01/23/81 47FR32359 07/26/82
46FR27480 05/20/81 47FR32361 07/26/82
46FR35249 07/07/81 47FR32365 07/26/82
46FR55112 11/06/81 47FR32384 07/26/82
46FR57235 11/23/81 47FR30447 07/13/82
47FR953 01/08/82 48FR2511 01/19/83
47FR3306 02/25/82 48FR3982 01/28/83
47FR15047 04/07/82 48FR14294 04/01/83
47FR15059 04/07/82 48FR14295 04/01/83
47FR16554 04/16/82 48FR30115 06/30/83
47FR16556 04/16/82

40CFR265 INTERIM STATUS STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE DURING THE PERIOD OF INTERIM STATUS

45FR33232 05/19/80 47FR12318 03/22/82
45FR76075 11/17/80 47FR15064 04/07/82
45FR78529 11/25/80 47FR16558 04/16/82
45FR86968 12/31/80 47FR27533 06/24/82
45FR86970 12/31/80 47FR28627 07/01/82
45FR86974 12/31/80 47FR30447 07/13/82
46FR2875 01/12/81 47FR32367 07/26/82
46FR7680 01/23/81 47FR32368 07/26/82
46FR27480 05/20/81 47FR32369 07/26/82
46FR35249 07/07/81 48FR2511 01/19/83
46FR56596 11/17/81 48FR3932 01/28/83
47FR1255 01/11/82 48FR14295 04/01/83
47FR8306 02/25/82 48FR30115 06/30/83

40CFR267 INTERIM STANDARDS FOR OWNERS AND OPERATORS OF NEW HAZARDOUS WASTE LAND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS THAT DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE FOR NEW LAND DISPOSAL FACILITIES
46FR12429 02/13/81

40CFR270 EPA ADMINISTERED PERMIT PROGRAMS: THE HAZARDOUS WASTE PERMIT PROGRAM

ESTABLISHES PROVISIONS FOR THE HAZARDOUS WASTE PERMIT PROGRAM UNDER SUBTITLE C OF THE SOLID WASTE DISPOSAL ACT, AS AMENDED BY THE RESOURCE CONSERVATION AND RECOVERY ACT
48FR14228 04/01/83
48FR30113 06/30/83
48FR30114 06/30/83

40CFR271 REQUIREMENT FOR AUTHORIZATION OF STATE HAZARDOUS WASTE PROGRAMS

SPECIFICS THE PROCEDURES EPA WILL FOLLOW IN APPROVING, REVISING, AND WITHDRAWING APPROVAL OF STATE PROGRAMS AND THE REQUIREMENTS STATE PROGRAMS MUST MEET TO BE APPROVED BY THE ADMINISTRATOR UNDER SECTION 3006(B) OF RCRA
48FR14248 04/01/83
48FR30114 06/30/83
48FR30115 06/30/83

CAS NUMBER
75-35-4

REGISTRY TOXIC CHEMICALS NUMBER
KV9275000

BULLETINS
09 07 82 SUBSTANCE NOT CARCINOGENIC IN ORAL RAT TEST BY NAT TOX PROGRAM. FURTHER TESTS PLANNED FOR INHALATION.

SPECIAL INFORMATION
TYPE WHAT INFORMATION YOU REQUIRE:
/ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND), /HELP/, OR /NONE/.

CHEMICAL PROFILE

1,1,1-Trichloroethane

CHEMICAL NAME
METHYL CHLOROFORM

FORMULA
C2H3CL3

SYNONYMS
1,1,1-TRICHLOROETHANE
AEROTHENE TT
NCI-C04626
SOLVENT 111
CHLOROETHENE NU
CHLOROTHENE
INHIBISOL
UN 2831
ETHANE, 1,1,1-TRICHLORO-
CHLOROETHENE
CHLOROFORM, METHYL
CHLOROTHANE NU
METHYLTRICHLOROMETHANE
SOLVENT 111
ALPHA-TRICHLOROETHANE
CHLOROTHENE (INHIBITED)
CHLOROTHENE NU
CHLOROTHENE VG
CHLORTEN
METHYLCHLOROFORM

PERMISSIBLE EXPOSURE LIMIT
350 PPM OSHA TWA
350 PPM ACGIH TWA
450 PPM ACGIH STEL
350 PPM NIOSH RECOMMENDED 15 MINUTE CEILING
INDEFINITE ANIMAL CARCINOGEN (IARC)
NEGATIVE CARCINOGEN IN RATS/MICE (NCI)
EXPERIMENTAL CARCINOGEN (NTP)
ANIMAL TERATOGEN (RTEC)
POSITIVE MUTAGEN (RTEC)
REPORTABLE QUANTITIES -- 1 LB CWA 307(A) -- 1 LB RCRA 3001
CERCLA HAZARD RATINGS -- TOXICITY 2 -- IGNITABILITY 0 -- REACTIVITY 2 --
PERSISTENCE 3

TOXICOLOGY: METHYL CHLOROFORM IS A NERVOUS SYSTEM DEPRESSANT. ACUTE POISONING FROM INHALATION OR INGESTION SENSITIZES THE HEART TO EPINEPHRINE, AND MAY MILDLY DAMAGE THE KIDNEYS AND LIVER.

EYE IRRITATION RESULTS FROM LIQUID OR VAPOR CONTACT. REPEATED SKIN CONTACT CAUSES DERMATITIS.

NO SYSTEMIC INJURY HAS OCCURRED FROM CHRONIC EXPOSURE.

THE THRESHOLD LIMIT VALUE WAS SET TO PREVENT TOXIC EFFECTS.

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATION
1000 PPM
OSHA/NIOSH

PHYSICAL DESCRIPTION
COLORLESS LIQUID, MILD CHLOROFORM ODOR

CHEMICAL AND PHYSICAL PROPERTIES
MOLECULAR WEIGHT: 133
BOILING POINT AT 1 ATM, F: 165 F
SOLUBILITY IN WATER, G/100 G WATER AT 20C: 0.07%
FLASH POINT, CLOSED CUP, F (OR OPEN CUP IF 0C): 184 F
VAPOR PRESSURE @ 20 C, MMHG: 100 MM
MELTING POINT, F: -36 F
UPPER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: 10.5%
LOWER EXPLOSIVE LIMIT IN AIR, % BY VOLUME: 8.0%
AUTOIGNITION TEMPERATURE: 4.6
SPECIFIC GRAVITY: 1.325
VAPOR DENSITY (AIR=1): 999 F
ODOR THRESHOLD: 20 PPM

INCOMPATIBILITIES
ACTIVE METALS
CAUSTICS
STRONG OXIDIZERS
ALUMINUM POWDER
MAGNESIUM
SODIUM
POTASSIUM

PERSONAL PROTECTIVE EQUIPMENT
FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

PREVENT REPEATED OR PROLONGED SKIN CONTACT
WEAR IMPERVIOUS CLOTHING
WEAR GLOVES
WEAR FACESHIELD (8 INCH MINIMUM)

-- -- --

ACGIH "GUIDELINES FOR SELECTION OF CHEMICAL PROTECTIVE CLOTHING" INDICATES THE FOLLOWING MATERIALS AND PROTECTIVE RATINGS BY INDEPENDENT VENDORS AGAINST UNSUBSTITUTED ALIPHATIC HALOGEN COMPOUNDS:
EXCELLENT/GOOD:
VITON
FLUORINATED ETHYLENE PROPYLENE POLYMER OR POLYTETRAFLUOROETHYLENE

FAIR/POOR:
NATURAL RUBBER
NEOPRENE
NEOPRENE/NATURAL RUBBER
NITRILE RUBBER
POLYETHYLENE
CHLORINATED POLYETHYLENE
POLYVINYL CHLORIDE

FAIR/GOOD:
BUTYL RUBBER
NEOPRENE/STYRENE-BUTADIENE RUBBER
NITRILE/POLYVINYL CHLORIDE
POLYURETHANE
STYRENE-BUTADIENE RUBBER

A WIDE VARIATION IN RATINGS IS INDICATED FOR POLYVINYL ALCOHOL

GOGGLES
FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

PREVENT ANY POSSIBILITY OF EYE CONTACT

WASHING CHEMICALS FROM THE SKIN
FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

PROMPTLY WHEN SKIN BECOMES WET

ROUTINE CHANGING OF WORK CLOTHING
NOT APPLICABLE

CLOTHING REMOVAL FOLLOWING ACCIDENTAL CONTAMINATION
FOLLOWING INFORMATION FROM NIOSH/OSHA "OCCUPATIONAL HEALTH GUIDELINES FOR CHEMICAL HAZARDS":

PROMPTLY IF IT IS NON-IMPERVIOUS AND CONTAMINATED

SPECIFIC EMERGENCY PROVISIONS

EYE-WASH FOUNTAIN WITHIN IMMEDIATE WORK AREA WHERE EMPLOYEES' EYES MAY BE EXPOSED TO SUBSTANCE
QUICK DRENCHING FACILITIES WITHIN IMMEDIATE WORK AREA WHERE EMPLOYEES MAY BE EXPOSED TO SUBSTANCE

RESPIRATOR SELECTION (UPPER LIMIT DEVICES PERMITTED)

500 PPM
- CHEMICAL CARTRIDGE RESPIRATOR
  WITH AN ORGANIC VAPOR CARTRIDGE
- SUPPLIED-AIR RESPIRATOR
- SELF-CONTAINED BREATHING APPARATUS

1000 PPM
- CHEMICAL CARTRIDGE RESPIRATOR
  WITH AN ORGANIC VAPOR CARTRIDGE
  WITH A FULL FACE-PIECE
- GAS MASK
  WITH AN ORGANIC VAPOR CANISTER
  (CHIN-STYLE OR FRONT- OR BACK-MOUNTED CANISTER)
- SUPPLIED-AIR RESPIRATOR
  WITH A FULL FACE-PIECE, HELMENT, OR HOOD
- SELF-CONTAINED BREATHING APPARATUS
  WITH A FULL FACE-PIECE

ESCAPE
- GAS MASK
  WITH AN ORGANIC VAPOR CANISTER
  (CHIN-STYLE OR FRONT- OR BACK-MOUNTED CANISTER)
- SELF-CONTAINED BREATHING APPARATUS

FIREFIGHTING
- SELF-CONTAINED BREATHING APPARATUS
  WITH A FULL FACE-PIECE
  OPERATED IN PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE

ROUTE OF ENTRY INTO BODY
- INHALATION
- INGESTION
- SKIN OR EYE CONTACT

SYMPTOMS
- VOMITING
- TREMORS
- JAUNDICE
- TENDERNESS
- DERMATITIS
- MONOCYTOSIS
- HYPOTENSION
- NAUSEA
- ABDOMINAL CRAMPS
- LIVER DAMAGE
- KIDNEY DAMAGE
- CENTRAL NERVOUS SYSTEM DEPRESSION
- CARDIAC ARRHYTHMIA
- UNCONSCIOUSNESS
- HEADACHE
- DIZZINESS
- REPRODUCTIVE EFFECTS IN EXPERIMENTAL ANIMALS

FIRST AID PROCEDURES FOLLOWING EXPOSURE

IF THIS CHEMICAL GETS INTO THE EYES, IMMEDIATELY WASH THE EYES WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING THE LOWER AND UPPER LIDS. GET MEDICAL ATTENTION IMMEDIATELY. CONTACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH THIS CHEMICAL.

IF THIS CHEMICAL GETS ON SKIN, PROMPTLY WASH CONTAMINATED SKIN WITH SOAP OR MILD DETERGENT AND WATER. IF THIS CHEMICAL SOAKS CLOTHING, PROMPTLY REMOVE CLOTHING AND WASH SKIN WITH SOAP OR MILD DETERGENT AND WATER. GET MEDICAL ATTENTION PROMPTLY.

IF A PERSON BREATHES IN LARGE AMOUNTS OF THIS CHEMICAL, MOVE THE EXPOSED PERSON TO FRESH AIR AT ONCE. IF BREATHING HAS STOPPED PERFORM ARTIFICIAL RESPIRATION. KEEP THE AFFECTED PERSON WARM AND AT REST. GET MEDICAL ATTENTION AS SOON AS POSSIBLE.

WHEN THIS CHEMICAL HAS BEEN SWALLOWED, IMMEDIATELY GET MEDICAL ATTENTION. IF MEDICAL ATTENTION IS NOT IMMEDIATELY AVAILABLE, GET THE AFFECTED PERSON TO VOMIT BY HAVING HIM TOUCH THE BACK OF HIS THROAT WITH HIS FINGER OR BY GIVING HIM SYRUP OF IPECAC AS DIRECTED ON PACKAGE. THIS NON-PRESCRIPTION DRUG SHOULD BE KEPT WITH EMERGENCY MEDICAL SUPPLIES IN THE WORKPLACE AND IS AVAILABLE AT MOST DRUG COUNTERS. DO NOT MAKE AN UNCONSCIOUS PERSON VOMIT.

ORGANS
- LIVER
- KIDNEYS
- CENTRAL NERVOUS SYSTEM
- RESPIRATORY SYSTEM

OSHA STANDARD 29CFR1910.1200 HAZARD COMMUNICATION
REQUIRES CHEMICAL MANUFACTURERS AND IMPORTERS TO ASSESS THE HAZARDS OF CHEMICALS WHICH THEY PRODUCE OR IMPORT, AND ALL EMPLOYERS HAVING WORKPLACES IN THE MANUFACTURING DIVISION, STANDARD INDUSTRIAL CLASSIFICATION CODES 20 THROUGH 39, TO PROVIDE INFORMATION TO THEIR EMPLOYEES CONCERNING HAZARDOUS CHEMICALS BY MEANS OF HAZARD COMMUNICATION PROGRAMS INCLUDING LABELS, MATERIAL SAFETY DATA SHEETS, TRAINING, AND ACCESS TO WRITTEN RECORDS
48FR53280 11/25/83

FOLLOWING OSHA STANDARDS APPLICABLE TO SUBSTANCES LISTED 29CFR1910, OTHERWISE ADVISE:

OSHA STANDARD 29CFR1910.1000 AIR CONTAMINANTS
TABLE Z-1

OSHA STANDARD 29CFR1910.94 VENTILATION

OSHA STANDARD 29CFR1910.134 RESPIRATORY PROTECTION

OSHA STANDARD 29CFR1910.20 ACCESS TO EMPLOYEE EXPOSURE AND MEDICAL RECORDS

OSHA STANDARD 29CFR1910.132 PERSONAL PROTECTIVE EQUIPMENT

OSHA STANDARD 29CFR1910.141 SANITATION

OSHA STANDARD 29CFR1910.151 MEDICAL SERVICES AND FIRST AID

OSHA STANDARD 29CFR1910.133 EYE AND FACE PROTECTION

40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT ALLEGED TO HAVE BEEN CAUSED BY A SUBSTANCE OR MIXTURE. EPA MAY INSPECT AND REQUIRE REPORTING OF SUCH RECORDS.
48FR30170 08/22/83

SUBSTANCE LISTED TOXIC SUBSTANCES CONTROL ACT INVENTORY

SUBSTANCE LISTED AS TOXIC POLLUTANT UNDER CLEAN WATER ACT (CWA) SECTION 307(A)

40CFR116 DESIGNATION OF HAZARDOUS SUBSTANCES
DESIGNATED AS HAZARDOUS SUBSTANCE IN ACCORDANCE WITH SECTION 311(B)(2)(A) OF THE FEDERAL WATER POLLUTION CONTROL ACT, AS AMENDED. INCLUDES ANY ISOMERS AND HYDRATES, AS WELL AS ANY SOLUTIONS AND MIXTURES CONTAINING THIS SUBSTANCE.
43FR10747 03/13/78
43FR27533 06/26/78
44FR10266 02/16/79 (AMENDMENT)
44FR10268 02/16/79 (AMENDMENT)
44FR65400 11/13/79 (AMENDMENT)
44FR66602 11/20/79 (AMENDMENT)

40CFR261.33(F) DISCARDED COMMERCIAL CHEMICAL PRODUCTS, OFF-SPECIFICATION SPECIES, CONTAINERS, AND SPILL RESIDUES THEREOF
COMMERCIAL CHEMICAL PRODUCT OR MANUFACTURING CHEMICAL INTERMEDIATE IDENTIFIED AS TOXIC WASTE UNLESS OTHERWISE DESIGNATED.
45FR33084 05/19/80

PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER RE-
QUIREMENTS
  DESIGNATED IN HAZARDOUS MATERIALS TABLE AS HAZARDOUS MATER-
IAL FOR THE PURPOSE OF TRANSPORTATION.
41FR15996 04/15/76
45FR34588 05/22/80 (AMENDMENT)
45FR46420 07/10/80 (AMENDMENT)
45FR62080 09/18/80 (AMENDMENT)
45FR74649 11/10/80 (AMENDMENT)
46FR17739 03/19/81 (AMENDMENT)
46FR19235 03/30/81 (AMENDMENT)

49CFR172.102 TABLES OF HAZARDOUS MATERIALS, THEIR DESCRIPTION,
PROPER SHIPPING NAME, CLASS, LABEL, PACKAGING, AND OTHER RE-
QUIREMENTS
  DESIGNATED IN OPTIONAL HAZARDOUS MATERIALS TABLE WITH ALTER-
NATIVES TO CORRESPONDING REQUIREMENTS IN 49CFR172.101 FOR IN-
TERNATIONAL SHIPMENTS AS AUTHORIZED BY 49CFR171.12
41FR15996 04/15/76
46FR29393 06/01/81 (AMENDMENT)
46FR30250 06/22/81 (AMENDMENT)

40CFR122, APPENDIX D -- NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
PERMIT APPLICATION TESTING REQUIREMENTS
TABLE II - ORGANIC TOXIC POLLUTANTS IN EACH OF FOUR FRACTIONS IN
ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROSCOPY (GS/MS)
48FR14153 04/01/83

MONITORING/LEVELS MEASUREMENT COMPLETED/PUBLISHED ENERGY
RESEARCH AND DEVELOPMENT ACT (ERDA)

TECHNICAL ASSISTANCE DATA COMPLETED/PUBLISHED FEDERAL
INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT (FIFRA)

MONITORING/LEVELS MEASUREMENT COMPLETED/PUBLISHED CLEAN WATER
ACT (CWA)

REGULATION PROMULGATED RESOURCE CONSERVATION AND RECOVERY ACT
(RCRA) 40CFR260

SOURCE/EXPOSURE ASSESSMENT COMPLETED/PUBLISHED CLEAN AIR
ACT (CAA)

PREREGULATORY ASSESSMENT COMPLETED/PUBLISHED TOXIC SUBSTANCES
CONTROL ACT (TSCA)

REGULATION PROMULGATED CLEAN WATER ACT (CWA) SECTION 311
40CFR117

CONTROL TECHNOLOGY DEVELOPMENT COMPLETED/PUBLISHED SAFE
DRINKING WATER ACT (SDWA)

SOURCE/EXPOSURE ASSESSMENT COMPLETED/PUBLISHED CLEAN AIR
ACT (CAA)

TEST METHOD DEVELOPMENT COMPLETED/PUBLISHED SAFE DRINKING WATER
 CT (SDWA)

SUBSTANCES LISTED APPENDIX A -- CONSENT DECREE LIST OF
INDUSTRIES AND TOXIC POLLUTANTS. SETTLEMENT AGREEMENT BETWEEN
U.S. EPA AND NATIONAL RESOURCES DEFENSE COUNCIL, ET AL
U.S. DISTRICT COURT DISTRICT OF COLUMBIA, JUNE 7, 1976.
SITE DERC2120, DDC 1976. MODIFIED MARCH 9, 1979, SITE
12ERC1330, DDC 1979 AND AGAIN ON OCTOBER 26, 1982.

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.31 EPA HAZARDOUS WASTE NO. F001: SPENT HALOGENATED SOLVENT USED IN DEGREASING AND SLUDGES FROM RECOVERY OF THIS SOLVENT IN DEGREASING OPERATIONS. (T)
SENATE BILL 5.757 WOULD DIRECCT EPA TO REVICW, BY 7/1/85, DISPOSAL OF WASTES CONTAINING THIS SUBSTANCE TO DETERMINE WHETHER IT SHOULD BE BANNED FROM LAND DISPOSAL

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.31 EPA HAZARDOUS WASTE NO. F002: SPENT HALOGENATED SOLVENT AND STILL BOTTOMS FROM RECOVERY OF THIS SOLVENT.(T)
SENATE BILL 5.757 WOULD DIRECT EPA TO REVICW, BY 7/1/85, DISPOSAL OF WASTES CONTAINING THIS SUBSTANCE TO DETERMINE WHETHER IT SHOULD BE BANNED FROM LAND DISPOSAL

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.32 EPA HAZARDOUS WASTE NO. K028: SPENT CATALYST FROM THE HYDROCHLORINATOR REACTOR IN THE PRODUCTION OF 1,1,1-TRI-CHLOROETHANE. (T)

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.32 EPA HAZARDOUS WASTE NO. K029: WASTE FROM THE PRODUCT STEAM STRIPPER IN THE PRODUCTION OF 1,1,1-TRICHLOROETHANE. (T)

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.32 EPA HAZARDOUS WASTE NO. K095: DISTILLATION BOTTOMS FROM THE PRODUCTION OF 1,1,1-TRICHLOROETHANE.

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.32 EPA HAZARDOUS WASTE NO. K096: HEAVY ENDS FROM THE HEAVY ENDS COLUMN FROM THE PRODUCTION OF 1,1,1-TRICHLOROETHANE.

SUNSTANCE SUBJECT TO REQUIREMENTS OF GENERAL INDUSTRY SAFETY ORDER (GISO) 5194 OR TITLE 8 OF CALIFORNIA ADMINSTRATIVE CODE AND DIVISION 5. CHAPTER 2.5 OF CALIFORNIA LABOR CODE

REGULATION IN DEVELOPMENT/PROGRESS COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT (CERCLA) SECTION 101

WATER QUALITY CRITERIA COMPLETED/PUBLISHED CLEAN WATER ACT (CWA) SECTION 304(A) 45CFR231

WATER QUALITY CRITERIA DOCUMENT COMPLETED/PUBLISHED CLEAN WATER ACT (CWA) SECTION 304(A)

SUBSTANCE LISTED RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) 40CFR261.31 EPA HAZARDOUS WASTE NO. F024: WASTES, INCLUDING BUT NOT LIMITED TO, DISTILLATION RESIDUES, HEAVY ENDS, TARS, AND REACTOR CLEANOUT WASTES FROM THE PRODUCTION OF CHLORINATED ALIPHATIC HYDRO-CARBONS, HAVING CARBON CONTENT FROM ONE TO FIVE, UTILIZING FREE RADICAL CATALYZED PROCESSES. (THIS LIST DOES NOT INCLUDE LIGHT ENDS, SPENT FILTERS AND FILTER AIDS, SPENT DESSICANTS, WASTEWATER, WASTEWATER TREAT-MENT SLUDGES, SPENT CATALYSTS, AND WASTES LISTED IN 40CFR261.32) 49FR5308 02/10/84

MEDICAL SURVEILLANCE REQUIRED
EKG RECOMMENDED IF EMPLOYEE TO WEAR FULL-FACE RESPIRATOR
GENERAL MEDICAL HISTORY
40CFR717 RECORDS AND REPORTS OF ALLEGATIONS THAT CHEMICAL SUBSTANCES CAUSE SIGNIFICANT ADVERSE REACTIONS TO HEALTH OR THE ENVIRONMENT
TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR 30 YEARS
48FR38187 08/22/83
38FR38225 03/30/83 (EFFECTIVE DATE CORRECTION)
PHYSICIAN EXAMINATION

INDUSTRIAL HISTORY
PRE-PLACEMENT AND ANNUAL EXAMS
MEDICAL WARNING FOR REFUSAL OF MEDICAL EXAMINATION
RESPIRATORY HISTORY
LIVER FUNCTION
BLOOD CHEMISTRY
COMPLETE BLOOD COUNT
VISION TEST
URINALYSIS
PULMONARY FUNCTIONS
PERIODIC EXAM FOLLOWING EXPOSURE
RENAL AND LIVER FUNCTIONS
BLOOD PRESSURE
LYMPHATIC SYSTEM

CERTIFICATIONS
HEALTH STATUS CLASSIFICATION

NUCLEAR REG. 0041

OSHA RESPIRATOR CERTIFICATION 29CFR1910.134

DEPARTMENT OF TRANSPORTATION IF OPERATES HEAVY EQUIPMENT

EMPLOYEE HAZARDOUS MATERIALS EDUCATION RECEIPT

EMPLOYEE MEDICAL RECORDS RECEIPT

TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 8(C) RULE REQUIRES MANUFACTURERS AND CERTAIN PROCESSORS OF CHEMICAL SUBSTANCES AND MIXTURES TO KEEP RECORDS OF SIGNIFICANT ADVERSE REACTIONS TO EMPLOYEE HEALTH FOR 30 YEARS.
CONTACT: JACK P. MCCARTHY, OFFICE OF TOXIC SUBSTANCES, EPA (800)424-1404. 48FR38178 8/22/83

MEDICAL WARNING REQUIRED FOR MEDICAL EXAM REFUSAL SIGNED BY EMPLOYEE

SPECIAL DIAGNOSTIC TESTS
NONE IN COMMON USE

LEAKS AND SPILL PROCEDURES

DEPARTMENT OF TRANSPORTATION HAZARD CLASS
49CFR172.101 HAZARDOUS MATERIALS TABLE

ORM-A

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS
49CFR172.101 (SUBJECT TO ADDITIONAL LABELING REQUIREMENTS OF
49CFR172.402)

NONE

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INTERGOVERNMENTAL MARITIME ORGANIZATION HAZARD CLASS
49CFR172.102 OPTIONAL HAZARDOUS MATERIALS TABLE

CLASS 6.1-POISONOUS (TOXIC) SUBSTANCE

INTERGOVERNMENTAL MARITIME ORGANIZATION LABELING SPECIFICATIONS FOR
DOMESTIC AND EXPORT SHIPMENTS
49CFR172.102

ST. ANDREWS CROSS

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FOLLOWING INFORMATION FROM BUREAU OF EXPLOSIVES "EMERGENCY HANDLING OF
HAZARDOUS MATERIALS":

IF MATERIAL ON FIRE OR INVOLVED IN FIRE:
* DO NOT EXTINGUISH FIRE UNLESS FLOW CAN BE STOPPED
* USE WATER IN FLOODING QUANTITIES AS FOG
* SOLID STREAMS OF WATER MAY BE INEFFECTIVE
* COOL ALL AFFECTED CONTAINERS WITH FLOODING QUANTITIES OF WATER
* APPLY WATER FROM AS FAR A DISTANCE AS POSSIBLE
* USE ALCOHOL FOAM OR CO2 OR DRY CHEMICAL EXTINGUISHERS

IF MATERIAL IS NOT ON FIRE AND IS NOT INVOLVED IN FIRE:
* KEEP SPARKS, FLAMES AND OTHER IGNITION SOURCES AWAY
* KEEP MATERIAL OUT OF WATER SOURCES AND SEWERS
* BUILD DIKES TO CONTAIN FLOW AS NECESSARY
* USE WATER SPRAY TO KNOCK DOWN VAPORS

PERSONNEL PROTECTION:
* KEEP UPWIND
* WEAR FULL PROTECTIVE CLOTHING (FIREMANS GEAR INADEQUATE)
* AVOID BODILY CONTACT WITH MATERIAL
* WEAR SELF-CONTAINED BREATHING APPARATUS WHEN FIGHTING FIRES INVOLVING
THIS MATERIAL
* DO NOT HANDLE BROKEN PACKAGES WITHOUT PROTECTIVE EQUIPMENT
* WASH AWAY ANY MATERIALS WHICH MAY HAVE CONTACTED THE BODY WITH
COPIOUS AMOUNTS OF WATER OR SOAP AND WATER
* AVOID BREATHING DUST/VAPORS/FUMES FROM MATERIAL

WASTE
THIS MATERIAL LISTED AS HAZARDOUS SUBSTANCE. AS DEFINED IN
SECTION 101(14) OF THE COMPREHENSIVE ENVIRONMENTAL RESPONSE,
COMPENSATION, AND LIABILITY ACT (CERCLA) OF 1980, PURSUANT TO
ONE OR MORE OF THE FOLLOWING:

(B)(2)(A)
- SOLID WASTE DISPOSAL ACT SECTION 3001 40CFR261
- CLEAN WATER ACT (CWA) SECTION 307(A) 40CFR129
- CLEAN AIR ACT (CAA) SECTION 112 40CFR61
- TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTION 7
- COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT (CERCLA) SECTION 102

EPA HAZARDOUS WASTE NUMBER U226
1,1,1-TRICHLOROETHANE
40CFR260 HAZARDOUS WASTE MANAGEMENT SYSTEM: GENERAL

PROVIDES DEFINITIONS OF TERMS, GENERAL STANDARDS, AND OVERVIEW INFORMATION APPLICABLE TO 40CFR PARTS 260-265
45FR76075 11/17/80
45FR76630 11/19/80
45FR86968 12/31/80
46FR2348 01/09/81
46FR27476 05/20/81
46FR35247 07/07/81
47FR32349 07/26/82
47FR41563 09/21/82
48FR2511 01/16/83
48FR14293 04/01/83

40CFR261 IDENTIFICATION AND LISTING OF HAZARDOUS WASTE

IDENTIFIES THOSE SOLID WASTES WHICH ARE SUBJECT TO REGULATION AS HAZARDOUS WASTES UNDER 40CFR PARTS 262-265, 270, 271, AND 124 AND WHICH ARE SUBJECT TO THE NOTIFICATION REQUIREMENTS OF SECTION 3010 OF THE RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) AND IDENTIFIES ONLY SOME OF THE MATERIALS WHICH ARE HAZARDOUS WASTES UNDER SECTIONS 3007 AND 7003 OF RCRA
45FR33119 05/19/80 46FR27477 05/20/81
45FR72037 10/30/30 46FR29708 06/03/31
45FR74892 11/12/80 46FR34587 07/02/81
45FR76620 11/19/80 46FR35247 07/07/81
45FR76623 11/19/80 46FR47429 09/25/81
45FR78529 11/25/80 46FR56538 11/11/81
45FR78531 11/25/80 47FR36097 08/18/82
45FR80287 12/04/80 48FR14293 04/01/83
46FR4610 01/16/81 48FR14294 04/01/83
46FR4619 01/16/81 48FR15257 04/08/83
46FR27476 05/20/81 48FR30115 06/30/83

40CFR262 STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE

ESTABLISHES STANDARDS FOR GENERATORS OF HAZARDOUS WASTE
45FR33142 05/19/80
45FR78529 11/25/80
45FR86970 12/31/80
45FR86973 12/31/80
47FR1251 01/11/82
48FR3981 01/28/83
48FR14294 04/01/83
48FR13028 04/29/83

40CFR263 STANDARDS APPLICABLE TO TRANSPORTERS OF HAZARDOUS WASTE

HAZARDOUS WASTE WITHIN THE UNITED STATES IF THE TRANSPORTATION REQUIRES A MANIFEST UNDER 40CFR262
45FR33151 05/19/80
45FR86968 12/31/80
48FR14294 12/31/80

40CFR264 STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE

45FR33221 05/19/80 47FR17989 04/27/82
45FR76075 11/17/80 47FR19995 05/10/82
45FR86968 12/31/80 47FR27532 06/24/82
45FR86970 12/31/80 47FR27533 06/24/82
45FR86974 12/31/80 47FR28627 07/01/82
46FR2848 01/12/81 47FR32349 07/26/82
46FR2849 01/12/81 47FR32350 07/26/82
46FR2866 01/12/81 47FR32356 07/26/82
46FR2867 01/12/81 47FR32357 07/26/82
46FR7678 01/23/81 47FR32359 07/26/82
46FR27480 05/20/81 47FR32361 07/26/82
46FR35249 07/07/81 47FR32365 07/26/82
46FR55112 11/06/81 47FR32384 07/26/82
46FR57285 11/23/81 47FR30447 07/13/82
47FR953 01/08/82 48FR2511 01/19/83
47FR8306 02/25/82 48FR3982 01/28/83
47FR15047 04/07/82 48FR14294 04/01/83
47FR15059 04/07/82 48FR14295 04/01/83
47FR16554 04/16/82 48FR30115 06/30/83
47FR16556 04/16/82

40CFR265 INTERIM STATUS STANDARDS FOR OWNERS AND OPERATORS OF HAZARDOUS WASTE TREATMENT, STORAGE, AND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS WHICH DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE DURING THE PERIOD OF INTERIM STATUS

45FR33232 05/19/80 47FR12318 03/22/82
45FR76075 11/17/80 47FR15064 04/07/82
45FR78529 11/25/80 47FR16558 04/16/82
45FR86968 12/31/80 47FR27533 06/24/82
45FR86970 12/31/80 47FR28627 07/01/82
45FR86974 12/31/80 47FR30447 07/13/82
46FR2875 01/12/81 47FR32367 07/26/82
46FR7680 01/23/81 47FR32368 07/26/82
46FR27480 05/20/81 47FR32369 07/26/82
46FR35249 07/07/81 48FR2511 01/19/83
46FR56596 11/17/81 48FR3982 01/28/83
47FR1255 01/11/82 48FR14295 04/01/83
47FR8306 02/25/82 48FR30115 06/30/83

40CFR267 INTERIM STANDARDS FOR OWNERS AND OPERATORS OF NEW HAZARDOUS WASTE LAND DISPOSAL FACILITIES

ESTABLISHES MINIMUM NATIONAL STANDARDS THAT DEFINE THE ACCEPTABLE MANAGEMENT OF HAZARDOUS WASTE FOR NEW LAND DISPOSAL FACILITIES
46FR12429 02/13/81

40CFR270 EPA ADMINISTERED PERMIT PROGRAMS: THE HAZARDOUS WASTE PERMIT PROGRAM

ESTABLISHES PROVISIONS FOR THE HAZARDOUS WASTE PERMIT PROGRAM
UNDER SUBTITLE C OF THE SOLID WASTE DISPOSAL ACT, AS AMENDED BY
THE RESOURCE CONSERVATION AND RECOVERY ACT
48FR14228 04/01/83
48FR30113 06/30/83
48FR30114 06/30/83

CAS NUMBER
71-55-6

REGISTRY TOXIC CHEMICALS NUMBER
KJ2975000

BULLETINS

SPECIAL INFORMATION
POTENTIAL CARCINOGENS SUCH AS VINYLIDENE CHLORIDE MAY BE PRESENT AS
AN IMPURITY IN TECHNICAL GRADES
(DREISBACH)
DECOMPOSES WHEN HEATED EVOLVING HIGHLY TOXIC FUMES (PHOSGENE AND
HYDROGEN CHLORIDE).
TYPE WHAT INFORMATION YOU REQUIRE:
/ALL/, SPECIFIC INFORMATION (BY 4-LETTER COMMAND), /HELP/, OR /NONE/.