MEMORANDUM

APR 17 1991

TO: Joseph Goliszewski, Case Manager, BEECRA

THROUGH: Brian Sogorka, Section Chief, BEERA/ERU BS 4-17-91

FROM: Joseph Telafici, Technical Coordinator, BEERA/ERU JT 4-17-91

SUBJECT: Review of Revised Remedial Investigation Plan (RIP) dated January, 1991 and SP Addendum dated March 13, 1991 for Linde Gases of the Mid-Atlantic, Newark, Essex County, ECRA Case # 90254

Case Status: Newly assigned; Recently upgraded to HEC.

This is in response to your referral of 3/18/91.

Summary:

Sampling proposals are acceptable, with the additions and modifications noted below. Please note that additional information is required regarding some potential AEC's. HASP has been submitted, but is not site-specific. Emergency phone numbers and hospital routes are required.

Site History and Operations:

1919 - 1990: Acetylene manufacturing and cylinder packing; repacking of other gases from bulk tanks to small cylinders.

Depth to Groundwater: 1.5-9' below grade; flow assumed to be to the E, toward the Passaic River.

Comments:

1) Work Shed Dock

Compressor oils, ethylene glycol and 1,1,1-TCA were stored in this area. Applicant proposes removing all stained soil and stones and collecting post-ex samples at 0-6" and 18-24" for TPHC (both) and VO+15 (18-24" only).

This is acceptable.

2) QA Lab and Boiler Blowdown Discharge Pipes

Spent cylinder stripping solution was discharged into the concrete sump in this area. This sump had no outlet, as material was circulated to a closed-loop recycling system via a second pipe. Applicant proposes collecting one surficial sample on each accessible side of the pump and analyzing for PP metals.

Boiler Blowdown, previously reported as discharging to the sump, actually discharged to the ground. Applicant proposes to collect a sample directly below the former boiler blowdown discharge outlet, with analysis for TPHC and BN+15.

Sampling proposal at boiler blowdown is acceptable. At the sump, it is unclear whether the potential discharge of spent stripping solution is from overflow of the sump or leaking through cracks in the sump. Unless applicant can eliminate one or both of the possibilities (e.g. through photodocumentation of sump integrity), samples shall be collected at 0-6" and sump invert. Applicant shall also describe the constituents of the stripping solution; additional parameters may be required based on this information.

3) Propane Storage Pad

This pad exhibited a residue of glass bead/sand-like material used to remove paint and rust from empty cylinders prior to refurbishing. Applicant proposes to remove the material from the pad. No sampling is proposed.

Despite the possibility of metals in the paint removed from the cylinders, this is acceptable, since the material was stored on a concrete pad, the volume and mobility of the potential contamination is low, and the material is to be removed anyway.

4) Hard Goods Warehouse

Staining from leaking compressors is apparent on the floors in this area. Applicant proposes to steam clean the floors in this area to remove residual oil staining.

This is acceptable.

5) Hydrostatic Testing Water Sump/Pit

Water used in the USDOT-required hydrostatic testing of cylinders was discharged to this sump/pit before being discharged to Plum Creek under their NJPDES Permit. Applicant has cleaned out the sump/pit and reported it to be intact. Applicant proposes NFA.

This is acceptable, provided applicant provides photodocumentation of pit integrity.

6) Former Centrifugal Pump Location

The stained pad upon which this pump rested has been cleaned, and stained stone surrounding the pad removed. Applicant proposes to collect a sample at 0-6" on each accessible side of the pad and analyze it for TPHC.

This is acceptable, provided samples are collected at 0-6" below the crushed stone layer, and one sample, biased toward the highest TPHC concentration is analyzed for BN+15 and PP metals as well.

7) Paint Storage Room

Applicant has removed all the paint from this room. Applicant proposes steam cleaning of residual undried paint from room surfaces, and screening of the room with an OVA following cleaning to document the absence of vapors.

This is acceptable.

8) Acetylene Processing Area

Leaks from a series of compressors in this area has resulted in some local staining. Speedi-dry has been removed from the trench, and the trench observed to be intact. Applicant proposes steam cleaning of the trench to remove residual oil staining.

This is acceptable, provided applicant provides photodocumentation of trench integrity, and samples trench discharge point (if any) for TPHC, BN+15 and PP metals.

9) Generator Room Pit

This small pit had no outlet, but contained calcium carbide residue and some oil. The pit was cleaned out and found to be intact, Applicant proposes NFA, other than to fill the pit with cement.

This is acceptable, provided applicant provides photodocumentation of pit integrity.

10) Aboveground Waste Oil Tanks

Compressor lube oils and vacuum pump oils were collected in these tanks. The tanks and associated stained stones have been removed. Applicant proposes removal of any visually-contaminated soils and collection of sidewall and base post-ex samples for TPHC, BN+15 and PP metals.

This is acceptable.

11) Former Aboveground Acetone Tank

A portion of the piping to this tank (an unlabeled diagram, however, indicates that two tanks were present) remains under the building. Applicant proposes to pressure test this piping. If the piping passes the pressure test, it will be filled with concrete. If it fails, the piping will be removed and post-ex samples collected for acetone.

This is acceptable.

12) Exterior Staining at Generating Room

Surficial stained stone in this area has been removed. Applicant proposes to remove any visually stained soil and collect a post-ex sample for TPHC.

This is acceptable, provided sample is analyzed for BN+15 and PP metals as well.

13) Aboveground Lime Slurry Tanks

Some spillage of lime has occurred here during loading and unloading. However, since the lime is not a hazardous substance, and is a saleable commodity, NFA is proposed.

This is acceptable.

14) Lime Pond

Calcium hydroxide (carbide lime), a co-product of acetylene production, was "stored" on-site in the lime pond area during applicant's operations. Since the lime is not hazardous, and is a saleable commodity, NFA is proposed.

This is acceptable.

15) Buried Cylinders Near Lime Pond Area

Based on personnel reports, applicant conducted a magnetometer survey in two portions of the lime pond area to confirm or dismiss reports of buried cylinders on site. The survey indicated the possible presence of buried cylinders in Area 2. Applicant has since removed 1721 buried cylinders, along with four truckloads of construction debris, described as concrete rubble, wood and bricks, and tires. Cylinders were found at depths of 5 to 25 feet below grade; GW was encountered at 8 to 10 feet below grade. Applicant proposes installing three downgradient wells and one upgradient well to monitor potential impacts from the buried cylinder area. Analysis of GW samples is to be for acetone, PP metals and pH. Applicant proposes NFA for soils in this area.
Acceptability of GW proposal is deferred to case geologist.

Please note that it is difficult to determine which direction is downgradient (assumed east toward Passaic River) since Figure 1 does not contain a North arrow.

NFA proposal for soils is unacceptable. The presence of this material indicates what is essentially an illegal landfill practice, or at least very poor housekeeping. No rationale has been presented for limiting the magnetometer survey or the investigation to the areas presented. Simply because no hazardous substances were found in Area 2, this does not preclude the possibility of other areas of buried materials, nor of buried hazardous materials.

Furthermore, the northern half of the property was originally purchased from Atlantic Smelting and Refining Works in 1917, indicating the possible presence of furnace slag or cinders. This possibility in substantiated by the unlabeled diagram (see also Comment 11), which indicates that the road leading to Ave. R (Doremus Ave) consists of blast furnace slag and overlies fill with cinders. Also, the waste classification samples from the disposal of stained soil at the 8000-gallon fuel oil UST area showed high levels of PAH's, which are normally not found in fuel oil, but are typical of foundry fill.

Finally, the unlabeled diagram (see also Comment 11) indicates a large "lime dump" to the west of the facility buildings and a smaller one between the main "charging building" and the "carbide storage building" (see attached diagram).

Applicant shall:

a) perform a magnetometer survey across the entire south area of the property, and the additional lime dumps noted on the attached figure;

b) if any anomalies are found, place one test pit in the area of the anomaly, and collect one sample for TPHC, VO+15, BN+15, PP metals, and PCB's, BEFORE excavating the area. Logs shall be made of the material in the pit, and photographs shall be taken to further document the soil conditions;

c) on the portion of the current property formerly owned by Atlantic Smelting and Refining, place and log one boring or test pit per 2500 sq. ft. If any material described as slag, ash or cinders is noted, a sample of this material shall be collected and analyzed for pH, TPHC, BN+15 and PP metals.

16) Gas Cylinder Cleaning

Applicant used 1,1,1-trichloroethane for cleaning the exterior of cylinders. Cleaning was performed on concrete-floored areas using a rag wetted with the solvent. No spent solvents were generated. Applicant proposes NFA.

This is acceptable, provided applicant documents location of 1,1,1-TCA storage area. If the potential for discharges from this area exists, i.e. area is unpaved, or floor drains are

nearby, applicant shall collect a sample from the potential discharge point at 18-24" for VO+15.

17) 60-80 Yards of Contaminated Soil

Applicant states that only 20 yds. of soil from the excavation at the 8000-gallon #2 fuel oil UST and a simultaneous illegal dumping were temporarily staged on site. All soil was classified and disposed of properly, although no disposal manifests are available. Applicant proposes NFA.

This is acceptable, provided applicant or NJDEP personnel can verify proper staging of soil, and CM finds lack of disposal manifests acceptable.

18) Former 8000-gallon #2 Fuel Oil UST

This tank was removed in April 1986, along with all visually-contaminated soil. Applicant proposes to perform soil sampling as per the RIG for TPHC and BN+15 to confirm complete removal of contaminated soils.

This is acceptable, provided:

a) all samples are analyzed for TPHC;

b) if TPHC exceeds 1000 ppm sample shall be analyzed for VO+15 as well (analysis for BN+15 is not required);

c) samples are collected from below the tank invert in native soil (i.e. outside the former excavation). The August 1990 SP claimed that the tank invert was located at 3-4'. This is unlikely, given the tank dimensions, unless earth was mounded over the top of the tank. Applicant shall indicate if this was the case.

19) Sanitary and Industrial Wastewater Discharges

Prior to the mid-1960's sanitary discharges were made to an on-site septic system. Applicant claims that this system received only sanitary wastes. Non-contact cooling water, hydrostatic testing water and compressor cooling water were discharged to the ground and allowed to flow to Plum's Creek. Since these discharges contain no hazardous substances, applicant proposes NFA.

This is acceptable.

20) Additional Potential AEC's

a) Transformers

Applicant shall supply information regarding the PCB content and service history for all on-site transformers (past and present). Further sampling and/or remediation may be required based on this information.

b) Gasoline Pump

The unlabeled diagram (attached) indicates a gasoline pump adjacent to the "Garage Building." This building is no longer present, but would appear to lie to the east of the present Lime Slurry AST's. Applicant shall place and log test pits or perform a magnetometer survey at this area to determine whether any piping or a possible UST is present. Further sampling and/or remediation may be required based on this information.

cc: ~~Karen Pell (unassigned)~~ David Hagens T, BGWDC
attachments

January 1992

Remedial Investigation Report

Linde Gases of the Mid-Atlantic, Inc.
Newark, New Jersey

Prepared for:

Union Carbide Corporation

Linde Division

Somerset, New Jersey

ECRA CASE NO. 90254

Prepared by:

INTERNATIONAL TECHNOLOGY CORPORATION

Regional Office

165 Fieldcrest Avenue • Edison, New Jersey 08837

LIN-GAS 6 (D-46)

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1.0 Introduction

Linde Gases of the Mid-Atlantic, Inc. (Linde), a subsidiary of Union Carbide Corporation (UCC), ceased operations of the Newark, New Jersey facility in 1990. The cessation of operations required Linde to comply with the Environmental Cleanup Responsibility Act (ECRA), administered by the New Jersey Department of Environmental Protection and Energy (NJDEPE).

In June 1990, IT Corporation (IT) forwarded the Site Evaluation Submission (SES) to the NJDEPE on behalf of UCC. A facility inspection was completed by the NJDEPE in August 1990. Subsequent to the SES and the NJDEPE facility inspection, a remedial investigation plan (RIP) and a revised RIP, as requested by the NJDEPE, were submitted to the NJDEPE. A draft conditional Sampling Plan approval letter was received on May 6, 1991 from the NJDEPE. Subsequently, a final conditional Sampling Plan approval letter was received on October 15, 1991 from the NJDEPE.

IT has implemented a soil and groundwater investigation at the Linde Newark, New Jersey facility, based upon comments received in the May 6, 1991 draft letter and the October 15, 1991 NJDEPE final letter. This report, prepared for UCC, summarizes the results of this investigation.

2.0 Areas of Concern

The following sections discuss the areas of concern identified during the facility/site inspection. These areas were addressed by the sampling and analysis program performed at the Linde facility. Figure 1, located at the end of this document, shows the location of each area within the facility and the analytical results for the samples collected. Appendix C contains the Soil Sample Collection Logs depicting where soil samples were collected within each area. Appendix A, under separate cover, contains the complete laboratory analytical reports for the soil sampling.

2.1 Work Shed Dock

Stained stones in the area beneath and adjacent to the work shed dock, located behind the main building, were removed by excavation. The stained area on the dock was also cleaned. Excavation of soil beneath the stones was attempted, however, an 8' by 9' concrete pad was exposed beneath the gravel, at the proposed sampling location, adjacent to the work shed dock. The concrete pad, observed to be intact, precluded sampling in the proposed location. Appendix B contains photographs, Nos. 1 and 2, of the pad. Due to the presence of the concrete pad, no further actions for soil are proposed for this area.

2.2 Discharge Pipes Near Quality Assurance Laboratory and Boiler Blowdown

The receiving sump for the spent cylinder stripping solution discharge pipes, located near the quality assurance laboratory, has been dismantled. As stated earlier in a letter to the NJDEPE dated May 24, 1991, the sump was permanently dismantled during the 1986-1987 plant upgrade. Soil sampling, on each side of the sump was proposed and a sample at the sump invert was also required by the NJDEPE.

Five surficial soil samples SCSS-1, SCSS-2, SCSS-3, SCSS-4 and SCSS-5, were collected and analyzed for Priority Pollutants Metals (Metals). The analytical results of the Metals analyses was as follows; antimony, not detected to 15 ppm; arsenic, not detected to 6.4 ppm; beryllium, 0.83 ppm to 1.6 ppm; cadmium, 2.1 ppm to 9.4 ppm; chromium, 140 ppm to 940 ppm; copper, 84 ppm to 760 ppm; lead, 340 ppm to 3,700 ppm; mercury 0.77 ppm to 15 ppm; nickel, 42 ppm to 120 ppm; selenium was not detected; silver, 1.9 ppm to 5.8 ppm; thallium was not detected; and zinc, 220 ppm to 1,400 ppm. These analytical results indicate that the surrounding soil has not been significantly impacted by the use of this sump. However, elevated levels of lead and zinc are apparently related to past practices in this area. Remedial excavation, to remove soil with elevated concentrations of lead and zinc to a decreased concentration, is proposed for this area.

A surficial soil sample was collected at the point directly beneath the former boiler blowdown discharge. The sample was analyzed for total petroleum hydrocarbons (TPHC) and priority pollutant base/neutral organics plus 15 (B/N+15). There was 610 ppm TPHC detected in the sample and no B/N detected. These analytical results indicate that the surrounding soil has not been significantly impacted by the former boiler blowdown discharge. No further actions are proposed for this area.

2.3 Propane Storage Pad

Removal and disposal of the granular residue on the storage pad has been completed. Appendix B contains a photograph, No. 3, of the pad. No further actions are proposed for this area.

2.4 Hard Goods Warehouse

The areas of the Hard Goods warehouse, stained from the operation of compressors, have been steam cleaned under high pressure with a penetone and water solution. Appendix B contains photographs, Nos. 4, 5 and 6, of these areas. No further actions are proposed for this area.

2.5 Hydrostatic Testing Water Sump/Pit

The hydrostatic testing water sump/pit, formerly utilized to receive spent hydrostatic test water, has been cleaned and observed to be intact. Appendix B contains photographs, Nos. 7 and 8, of the sump/pit. No further actions are proposed for this area.

2.6 Former Centrifugal Pump Location

A centrifugal pump formerly operated on an exterior concrete pad. The pump has been removed off site. The concrete pad is located outdoors, adjacent to the acetylene processing area. The concrete pad has been cleaned and observed to be intact. Stained stones around the pad have been removed and one 0 to 6 inch surficial soil sample was collected from the only accessible side. Appendix B contains a photograph, No. 9, of the former centrifugal pump location.

The sample was analyzed for TPHC, Metals and B/N+15. Results of the TPHC analysis was 640 ppm and there were no B/N detected. The analytical results of the Metals analysis ranged from not detected to 360 ppm zinc. These analytical results indicate that the surrounding soil has not been significantly impacted by the use of the pump. No further actions are proposed for this area.

2.7 Paint Storage Room

All the paint previously stored in this room has been removed and the paint storage room was steam cleaned. Readings of the air in the room with an organic vapor analyzer after cleaning

were ranging from 5 ppm to 8 ppm. The residual vapors in this room are expected to dissipate over time. No further actions are proposed for this area.

2.8 Acetylene Processing Area

The acetylene processing area, stained from the operation of compressors, has been steam cleaned under high pressure with a Penetone and water solution. The trenches for the former compressor areas have been observed to be intact. Appendix B contains photographs, Nos. 10, 11, 12, 13, 14 and 15, of the trenches. No further actions are proposed for this area.

2.9 Generator Room Pit

The generator room pit had some calcium carbide residue and grease in it. The pit has been cleaned and observed to be intact. The pit has been filled with concrete. A diagram of the pit's construction is provided in Appendix D. No further actions are proposed for this area.

2.10 Aboveground Waste Oil Tanks

Six surficial soil samples were collected at the 0 to 6 inch interval in the area beneath the two former aboveground waste oil tank locations. Samples were analyzed for Metals, B/N+15 and TPHC.

Results of Metals analysis ranged from not detected to 3300 ppm chromium. Results of the B/N+15 analysis ranged from 11.49 ppm to 84.5 ppm total B/N. Results of TPHC analysis ranged from 590 ppm to 7000 ppm.

Based upon the analytical soil sample results, the soil in this area was removed by excavation. Approximately 40 cubic yards of soil was removed from this area. Appendix E contains a Soil Classification Log for this excavation. Appendix B contains photographs, Nos. 16 and 17, of the excavation.

Three postexcavation soil samples, WOPE-1, WOPE-2 and WOPE-3, were collected and analyzed for TPHC, Metals and B/N+15 to confirm the removal of contaminated soil. The TPHC results ranged from 90 ppm to 720 ppm. The B/N+15 results ranged from 3.50 ppm to 7.99 ppm total B/N. The Metals results ranged from not detected to 1,200 ppm chromium. Based upon the postexcavation soil sample analytical results and for safety reasons, the excavation was backfilled with clean soil. No further actions are proposed for this area.

2.11 Former Aboveground Acetone Storage Tank

A portion of the piping for the former aboveground acetone tank, which remains under the building, has been air pressure tested. The pressure test indicated that the pipe has no leaks. The pipe was sealed and capped at both ends. No further actions are proposed for this area.

2.12 Exterior Staining at Generator Room

Surficial stained stones were removed from this area. The surficial soil beneath the stained stones in this area was sampled and analyzed for TPHC, Metals and B/N+15. The TPHC analytical results were 1,900 ppm TPHC. The B/N+15 analytical results were 0.390 ppm total B/N. The Metals analytical results ranged from not detected to 140 ppm chromium.

These analytical results indicate that the staining has not significantly impacted this area. No further actions are proposed for this area.

2.13 Aboveground Lime Slurry Storage Tanks

Due to the non-hazardous nature of the carbide lime and the acetylene gas generation process itself, no actions have been implemented in this area, as agreed.

2.14 Lime Pond

The lime pond is not regarded as an area of environmental concern. No further actions have been implemented in this area, as agreed.

2.15 Buried Cylinders Near Lime Pond Area

Based upon an initial magnetometry survey, performed in a portion of the lime pond area, three large exploratory excavations, Areas 1, 2 and 2A, were previously completed. As documented earlier, approximately 1,700 cylinders were removed from these excavations. Figure 1 shows the locations of the three excavation areas.

An additional magnetometry survey was completed over the remaining Lime Pond area in the southern portion of the property. From the data generated from the second magnetometry survey, five additional exploratory excavations, Exploratory Excavations A, B, C, D and E, were completed. Figure 1 shows the locations of the exploratory excavations. Appendix E contains classification logs of the exploratory excavations. Appendix B contains photographs, Nos. 18, 19, 20, 21, 22 and 23, of the excavations.

From the five additional excavations, 442 cylinders were recovered. All of the recovered cylinders were removed from Excavation A. There were no cylinders found in Excavations B, C, D and E.

As a result of the initial and subsequent magnetometry surveys and all the exploratory excavations, the lime pond area has now been completely investigated for buried materials. Other than the buried acetylene gas cylinders and general debris, such as wood, glass, brick, tires, concrete and metal pipe, no other materials have been found. In particular, no drums or other indications of hazardous substances has been found.

In the area of the property near Avenue P, originally purchased from Atlantic Smelting and Refinery Works, ten additional exploratory test pits were completed. The test pits were placed in a 50 foot grid pattern to a depth ranging from 7.5 feet to 10 feet below grade.

There were no buried cylinders found or evidence of buried hazardous substances in any of the test pits. Appendix E contains the test pit classification logs detailing the subsurface of each test pit. Figure 1 shows the location of the test pits.

The groundwater in the area near the former lime pond, where cylinders were buried, is being further evaluated by a groundwater monitoring program. Monitoring Wells MW-4, MW-5, MW-6 and MW-7 were installed to evaluate the potential impact from the burial of gas cylinders in this area. Groundwater samples were collected from each of these monitoring wells and analyzed for acetone, metals, conductivity, Dissolved Oxygen, Total Dissolved Solids and pH.

Analytical groundwater sampling results from Monitoring Wells MW-4, MW-5, MW-6 and MW-7 are discussed under Section 3.3 of this report.

2.16 Gas Cylinder Cleaning

The process of cylinder exterior cleaning, documented in the January 1991 revised RIP, did not produce any wastewaters or spent solvents. As discussed in Section 2.1 of this report, the proposed sampling for this area was precluded by a concrete pad in the proposed sampling location. Therefore, no further actions, associated with cylinder cleaning, are proposed.

2.17 60-80 Cubic Yards of Oil Contaminated Soil

As stated in the January 1991 revised RIP, there was approximately 20 cubic yards, not 60 to 80 cubic yards, of soil staged which was eventually disposed of as a non-hazardous material. No further actions have been implemented for this area, as agreed.

2.18 Former 8,000 Gallon No. Two Fuel Oil Underground Storage Tanks

Six soil samples were collected from the area approximated to be the former 8,000 gallon fuel oil tank excavation. Samples were analyzed for TPHC and B/N+15.

Results of B/N+15 analysis ranged from not detected to 17.9 ppm total B/N. Results of TPHC analysis ranged from 1300 ppm to 130,000 ppm.

Based upon the results of the initial soil sampling round, removal of the soil in this area was performed. Complete access, however, to the former tank location was prevented by a four foot high concrete platform erected over the former tank location. The platform was removed,

to allow for access to excavate the soil at the former tank location, and the excavation was completed. Approximately 128 cubic yards of soil was removed from this area. Appendix B contains photographs, Nos. 24, 25, 26 and 27, of the excavation. Four confirmatory postexcavation soil samples, FOPE-1A, FOPE-2A, FOPE-3A and FOPE-4A, were collected and analyzed for TPHC.

The analytical TPHC results of the four postexcavation soil samples ranged from 110 ppm to 2200 ppm. One sample, FOPE-3A, had a concentration greater than 1,000 ppm TPHC and was also analyzed for priority pollutant volatile organics plus 15 (VO+15). The VO+15 analytical result of sample FOPE-3A was not detected. Based upon the VO+15 analytical results of postexcavation sample FOPE-3A, no further actions are proposed for soils in this area.

2.19 Sanitary and Industrial Wastewater Discharges

The sanitary sewer system, before and after connection with the local publicly owned treatment works (POTW), received sanitary sewage discharges only. No further actions have been implemented for sanitary and industrial wastewater discharges, as agreed.

2.20 Additional Potential Areas of Concern

2.20.1 Transformers

Sampling was performed to evaluate the impact, if any, from past and present transformers at the facility. At three locations, a former pole transformer, a former ground level transformer and a present ground level transformer, surficial soil samples were collected. Samples were analyzed for polychlorinated biphenyls (PCBs) and TPHC.

The results of the TPHC analyses ranged from 110 ppm to 1,200 ppm TPHC. The results of the PCB analyses ranged from 0.310 ppm to 1.8 ppm total PCBs. These analytical results indicate that the transformers have not significantly impacted the surrounding areas. No further actions are proposed regarding past or present transformers.

2.20.2 Gasoline Pump

An exploratory test pit excavation was completed in the area approximated to be the former gasoline pump location. There was no underground storage tank found. There was some metal piping found, however, it appeared to be discarded pipe buried underground. Judging by the amount of pipe found buried elsewhere on the facility property, the practice of burying pipe does not appear uncommon. This pipe did not appear to be associated with a pump/tank system. Furthermore, depth to groundwater in this area is approximately one foot below grade which also indicates that an underground pump/tank system was most likely aboveground.

Appendix E contains a log of the test pit excavation. No further actions are proposed for this area.

3.0 Groundwater

3.1 Installation of Monitoring Wells

The shallow groundwater monitoring program was initiated at this facility as seven groundwater monitoring wells were installed as per NJDEPE specifications. Figure 2 shows the location of all monitoring wells. Appendix F contains the monitoring well construction logs. Appendix G contains monitoring well boring logs. Appendix H contains monitoring well Form A- As-Built Certifications. Appendix I contains monitoring well Form B- Location Certifications.

3.2 Well Search

According to the well search completed in the vicinity of the facility, 208 wells are located within a half-mile radius. Well uses are either industrial or monitoring. Appendix J contains the well search information summary.

3.3 Groundwater Level Measurements and Sampling

Groundwater level measurements were taken on July 30, 1991 and November 15, 1991. Appendix K contains the monitoring well groundwater level measurements and the groundwater purge information. From the groundwater level measurements, the apparent groundwater flow direction is east-northeast toward the Passaic River. Figure 2 provides a groundwater contour map prepared from groundwater level measurements obtained on July 30, 1991. Figure 3 provides a groundwater contour map prepared from groundwater level measurements obtained on November 15, 1991.

Two complete rounds of groundwater samples were collected from all monitoring wells at the site. Groundwater sampling was performed on July 30, 1991 and November 15, 1991. Groundwater samples, collected from Monitoring Wells MW-1, MW-2 and MW-3, were analyzed for BN+15, TPHC and total dissolved solids (TDS). Groundwater samples, collected from monitoring wells MW-4, MW-5, MW-6 and MW-7, were analyzed for Metals, acetone and TDS. Conductivity, dissolved oxygen (DO) and pH were measured in all groundwater samples collected from all monitoring wells. Figures 2 and 3 provides the location of all monitoring wells and groundwater contours for the respective groundwater sampling events. Appendix K contains the monitoring well sampling field data for the respective groundwater sampling events. Appendix L, under separate cover, contains the laboratory analytical report with QA/QC support data for groundwater sampling.

3.3.1 First Groundwater Sampling Round

The B/N+15 analysis results of the groundwater samples, collected from MW-1, MW-2 and MW-3, indicate priority pollutant base/neutral organics (B/N) were not detected. The TPHC analysis results of groundwater samples, collected from MW-1, MW-2 and MW-3 were: not detected, 12 ppm and 3.2 ppm, respectively.

The Metals analysis results of groundwater samples, collected from MW-4, MW-5, MW-6 and MW-7, ranged from not detected to 0.48 ppm zinc. In MW-4, nickel, silver and zinc were detected at concentrations of 0.092 ppm, 0.023 ppm and 0.45 ppm, respectively. In MW-5, chromium, nickel and zinc were detected at concentrations of 0.025 ppm, 0.066 ppm and 0.037 ppm, respectively. In MW-6, chromium, nickel and zinc were detected at 0.012 ppm, 0.043 ppm and 0.48 ppm, respectively. In MW-7, chromium, silver and zinc were detected at 0.014 ppm, 0.011 ppm and 0.025 ppm, respectively. Results of acetone analysis in MW-4, MW-5, MW-6 and MW-7 were not detected with the exception of MW-4. At MW-4, 75 ppb acetone was detected. However, corresponding field and travel blanks each had 10 ppb and 11 ppb of Acetone, respectively. These analytical results are inconclusive regarding the source of acetone in the MW-4 groundwater sample.

Conductivity measurements from all monitoring wells ranged from 7500 umhos/cm to 320 umhos/cm. The DO measurements from all monitoring wells ranged from 7.1 mg/L to 12.6 mg/L. The TDS measurements from all monitoring wells ranged from 210 ppm to 3400 ppm. The pH measurements from all monitoring wells ranged from 7.1 to 12.6. Table 1 provides a summary of the groundwater sampling of July 30, 1991.

3.3.2 Second Groundwater Sampling Round

The B/N+15 analyses results of the groundwater samples, collected from MW-1 and MW-3 indicate B/N were not detected. The B/N+15 analysis results of MW-2 indicate 12 ppb total B/N was detected. The TPHC analyses results from MW-1 and MW-3 were not detected. The TPHC analysis result from MW-2 was 3.4 ppm.

The Metals analyses results of groundwater samples, collected from MW-4, MW-5, MW-6 and MW-7 ranged from not detected to 1.1 ppm zinc. In MW-4, chromium, lead, nickel and zinc were detected at concentrations of 0.015 ppm, 0.005 ppm, 0.10 ppm and 1.1 ppm, respectively. In MW-5, arsenic, chromium and zinc were detected at concentrations of 0.017 ppm, 0.031 ppm and 0.020 ppm, respectively. In MW-7 chromium was detected at a concentration of 0.036 ppm. Results of the acetone analyses in MW-5, MW-6 and MW-7 were not detected. The acetone analysis result from MW-4 was 100 ppb.

Conductivity measurements from all monitoring wells ranged from 7100 umhos/cm to 1900 umhos/cm. The DO measurements from all monitoring wells ranged from 0.06 mg/L to 2.4 mg/L. The TDS measurements from all monitoring wells ranged from 440 ppm to 3300 ppm. The pH measurements from all monitoring wells ranged from 6.4 to 12.3. Table 2 provides a summary of the groundwater sampling of November 15, 1991.

4.0 Conclusions and Recommendations

4.1 Areas of Concern

The facility areas of concern, discussed in this report, have been evaluated, including soil sampling, where applicable. For those areas with analytical results indicating the need for remediation, removal of contaminated soil was completed by excavation. A confirmatory postexcavation soil sampling program was performed in conjunction with soil removal/excavation. The former spent cylinder stripping solution sump area, where soil removal is proposed, will be addressed in the near future, as discussed earlier.

Some of the soil sampling analytical results indicate relatively low levels of petroleum hydrocarbons remain in the soil within particular site areas. However, the levels of petroleum hydrocarbons are consistent with the present industrial/commercial site use and the proposed future site use, including the site uses of the surrounding area.

As a result of this investigative/remedial effort, the areas of concern, excluding the former spent cylinder stripping solution sump area, have been adequately addressed. No further actions are recommended for these areas.

4.2 Groundwater

The analytical results of the two groundwater sampling rounds indicate that facility activities have not impacted shallow groundwater at the facility. This conclusion was reached when results of groundwater analytical parameters, utilized to evaluate groundwater, were compared to the pending NJDEPE draft cleanup standards. The specific analytical parameter results are near or below these standards, where a standard exists.

Specifically, at the fuel oil tank area, analytical results for the TPHC detected in MW-2 have decreased from 12 ppm to 3.4 ppm. The analtyical results for the TPHC detected in MW-3 have decreased from 3.2 ppm to not detected. The TPHC analytical results for MW-1, the third groundwater monitoring well in this area, have been not detected in both groundwater sampling rounds. The B/N+15 analyses results of the first groundwater sampling round indicate B/N were not detected in monitoring wells MW-1, MW-2 and MW-3. In the second groundwater sampling round, B/N were not detected in MW-1 and MW-3. In MW-2, 12 ppb total non-carcinogenic B/N were detected. Additionally, a remedial excavation, to remove petroleum hydrocarbon contaminated soil, has been completed subsequent to both groundwater sampling rounds. Therefore, the local source of petroleum hydrocarbons, which could potentially impact groundwater, has been removed.

In the lime pond area, results of Metals analyses were primarily below the respective cleanup standards. The only exceptions were 23 ppb of silver, detected in MW-4 in the first groundwater sampling round, and 17 ppb of arsenic, detected in the second groundwater sampling round. Acetone, which does not have a cleanup standard, was detected in MW-4 at 75 ppb and 100 ppb in the first and second sampling rounds, respectively. However, there are compounds similar in structure to acetone, such as methyl ethyl ketone (MEK) and methyl isolutyl ketone (MIBK) which have cleanup standards of 270 ppb and 350 ppb, respectively. The acetone analytical results are well below these cleanup standards.

Two complete groundwater sampling rounds have been implemented, one each on July 30, 1991 and November 15, 1991. The groundwater sampling analytical results indicate that facility activities have not significantly impacted shallow groundwater at this facility. This conclusion is based upon the following:

- the facility is located in a heavily industrialized area
- known point sources of contaminated soil have been removed
- where corresponding standards exists, results of analytical groundwater sampling parameters are near or below pending NJDEPE draft cleanup standards.

Therefore, based upon the above factors, no further actions are recommended for shallow groundwater at this site.

TABLE 1

GROUNDWATER SAMPLING OF
JULY 30, 1991
ANALYTICAL RESULTS SUMMARY

LINDE GASES OF THE MID-ATLANTIC, INC.
NEWARK, NEW JERSEY

SAMPLING LOCATION	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	FIELD BLANK	TRAVEL BLANK
PRIORITY POLLUTANT METALS (ppm)									
Antimony	NA	NA	NA	ND	ND	ND	ND	ND	NA
Arsenic	NA	NA	NA	ND	ND	ND	ND	ND	NA
Beryllium	NA	NA	NA	ND	ND	ND	ND	ND	NA
Cadmium	NA	NA	NA	ND	ND	ND	ND	ND	NA
Chromium	NA	NA	NA	ND	0.025	0.012	0.014	ND	NA
Copper	NA	NA	NA	ND	ND	ND	ND	ND	NA
Lead	NA	NA	NA	ND	ND	ND	ND	ND	NA
Mercury	NA	NA	NA	ND	ND	ND	ND	ND	NA
Nickel	NA	NA	NA	0.092	0.086	0.043	ND	ND	NA
Selenium	NA	NA	NA	ND	ND	ND	0.011	ND	NA
Silver	NA	NA	NA	0.023	ND	ND	ND	ND	NA
Thallium	NA	NA	NA	ND	ND	ND	ND	ND	NA
Zinc	NA	NA	NA	0.45	0.037	0.48	0.025		
PRIORITY POLLUTANT BASE/NEUTRAL ORGANICS (ppb)									
Di-n-butylphthalate	ND	ND	ND	NA	NA	NA	NA	21	NA
TOTAL PRIORITY POLLUTANT BASE NEUTRAL ORGANICS (ppb)	ND	ND	ND	NA	NA	NA	NA	21	NA
TOTAL NON-PRIORITY POLLUTANT BASE NEUTRAL ORGANICS (ppb)	76	192	381	NA	NA	NA	NA	32	NA
ACETONE (ppb)	NA	NA	NA	75	ND	ND	ND	10	11
TOTAL PETROLEUM HYDROCARBONS (ppm)	ND	12	3.2	NA	NA	NA	NA	ND	NA
CONDUCTIVITY (umhos/cm)	6000	1900	320	7500	2200	2200	1200	ND	NA
DISSOLVED OXYGEN (mg/L)	1.5	1.6	1.3	2.1	1.2	0.9	1.4	NA	NA
pH	12.4	11.9	9.8	12.6	7.4	7.1	9.3	4.0	N.A
TOTAL DISSOLVED SOLIDS (ppm)	1500	660	210	3400	1900	1500	1300	ND	N.A

1. "NA" signifies not analyzed.
2. "ND" signifies not detected.
3. Note analytical methodology as follows: Acetone – EPA Method 624; B/N+15 – EPA Method 625; TPH – Std. Methods 503B,C,&E

TABLE 2

GROUNDWATER SAMPLING OF
NOVEMBER 15, 1991
ANALYTICAL RESULTS SUMMARY

LINDE GASES OF THE MID-ATLANTIC, INC.
NEWARK, NEW JERSEY

SAMPLING LOCATION	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	FIELD BLANK	TRAVEL BLANK
PRIORITY POLLUTANT METALS (ppm)									
ANTIMONY	–	–	–	ND	ND	ND	ND	ND	–
ARSENIC	–	–	–	ND	0.017	ND	ND	ND	–
BERYLIUM	–	–	–	ND	ND	ND	ND	ND	–
CADMIUM	–	–	–	ND	ND	ND	ND	ND	–
CHROMIUM	–	–	–	0.015	0.031	0.021	0.036	ND	–
COPPER	–	–	–	ND	ND	ND	ND	ND	–
LEAD	–	–	–	0.005	ND	ND	ND	ND	–
MERCURY	–	–	–	ND	ND	ND	ND	ND	–
NICKEL	–	–	–	0.10	ND	ND	ND	ND	–
SELENIUM	–	–	–	ND	ND	ND	ND	ND	–
SILVER	–	–	–	ND	ND	ND	ND	ND	–
THALLIUM	–	–	–	ND	ND	ND	ND	ND	–
ZINC	–	–	–	1.1	0.020	0.024	ND	ND	–
PRIORITY POLLUTANT BASE/NEUTRAL ORGANICS (ppb)									
NAPHTHALENE	ND	12	ND	–	–	–	–	ND	–
TOTAL PRIORITY POLLUTANT BASE/NEUTRAL ORGANICS (ppb)	ND	12	ND	–	–	–	–	ND	–
TOTAL NON – PRIORITY POLLUTANT BASE/NEUTRAL ORGANICS (ppb)	159	120	67	–	–	–	–	ND	–
ACETONE (ppb)	–	–	–	100	ND	ND	ND	ND	ND
PETROLEUM HYDROCARBONS (ppm)	ND	3.4	ND	–	–	–	–	ND	–
CONDUCTIVITY (umhos/cm)	6000	1990	3500	7100	1900	2050	1900	–	–
DISSOLVED OXYGEN (mg/L)	0.2	2.15	2.4	1.8	0.06	1.2	5	–	–
pH	9.4	9.8	11.8	12.3	6.8	6.4	11.2	8.9	–
TOT. DISSOLVED SOLIDS (ppm)	2600	440	1200	3300	1400	1300	1600	16	–

"ND" Signifies not detected.
"–" Signifies not analyzed.

Analytical methods are as follows: Acetone – EPA Method 624
B/N + 15 – EPA Method 625
TPHC – Std. Methods 503 B, C, and E

ANALYTICAL QA/QC DATA PACKAGE
FOR
LINDE GASES

SAMPLE DATE: NOVEMBER 20, 1991

IT CORPORATION
165 FIELDCREST AVENUE
EDISON, NEW JERSEY

JANUARY 1992

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYTICAL SERVICES

CERTIFICATE OF ANALYSIS

Linde Gases
c/o IT Corporation
165 Fieldcrest Ave.
Edison, NJ 08837
Attn: Mr. Paul Dimakos

Date: January 13, 1991

NJ Lab Certification ID#: 12064

Job No.: 529342

P.O. Number: 529342

This is the revised Certificate of Analysis for the following samples:

Client Project ID: SOIL
Date Received: 11/20/91
Number of Samples: 9
Sample Type: SOIL

I Samples were labeled as follows:

SAMPLE IDENTIFICATION	LABORATORY #
POLE TRANS / SOIL	F1-11-209-01
NT-1 / SOIL	F1-11-209-02
NT-2 / SOIL	F1-11-209-03
NT-3 / SOIL	F1-11-209-04
OT-1 / SOIL	F1-11-209-05
OT-2 / SOIL	F1-11-209-06
OT-3 / SOIL	F1-11-209-07
STAINED EXT / SOIL	F1-11-209-08
FIELD BLANK	F1-11-209-09

Reviewed and Approved:

Ralph A. Kocsis
Project Manager

IT ANALYTICAL SERVICES
EDISON, NJ
(908) 225-2000

Company: Linde Gases
Date: January 13, 1991
Client Job No.: 529342

Work Order: F1-11-209

SAMPLE ID	POLE TRANS / SOIL	NT-1 / SOIL	NT-2 / SOIL	
SAMPLED	11/20/91	11/20/91	11/20/91	
TEST				UNITS
Petroleum Hydrocarbons	250 [43]	260 [40]	1200 [82]	mg/Kg Dry Wt.
Total Solids	92 [0.01]	99 [0.01]	97 [0.01]	Percent

ND indicates the parameter was not detected.
Detection limits are specified in [].

000007

IT ANALYTICAL SERVICES
EDISON, NJ
(908) 225-2000

Company: Linde Gases
Date: January 13, 1991
Client Job No.: [illegible]

SAMPLE ID	NT-3 / SOIL	OT-1 / SOIL	OT-2 / SOIL	
SAMPLED	11/20/91	11/20/91	11/20/91	
TEST				UNITS
Petroleum Hydrocarbons	690 [49]	110 [25]	300 [47]	mg/Kg Dry Wt.
Total Solids	82 [0.01]	80 [0.01]	85 [0.01]	Percent

ND indicates the paramater was not detected.
Detection limits are specified in [].

000008

IT ANALYTICAL SERVICES
EDISON, NJ
(908) 225-2000

Company: Linde Gases
Date: January 13, 1991
Client Job No.: 528342

SAMPLE ID	OT-3 / SOIL	STAINED EXT / SOIL	FIELD BLANK	
SAMPLED	11/20/91	11/20/91	11/20/91	
TEST				UNITS
Petroleum Hydrocarbons			ND [1.0]	mg/L
Petroleum Hydrocarbons	140 [24]	1900 [220]		mg/Kg Dry Wt.
Total Solids	85 [0.01]	91 [0.01]		Percent

ND indicates the parameter was not detected.
Detection limits are specified in [].

000009

IT ANALYTICAL SERVICES
EDISON, NJ
(908) 225-2000

Company: Linde Gases
Date: January 13, 1991
Client Job No.: [illegible]

TEST NAME: PCB's

SAMPLE ID: POLE TRANS / SOIL
SAMPLE DATE: 11/20/91
ANALYSIS DATE: 12/09/91

	Results in ug/Kg Dry Wt.	Detection Limit
Arochlor 1016	ND	36
Arochlor 1221	ND	36
Arochlor 1232	ND	36
Arochlor 1242	ND	36
Arochlor 1248	ND	36
Arochlor 1254	440	36
Arochlor 1260	ND	36

Comments: ND indicates the compound is not detected at the level indicated.

000010

IT ANALYTICAL SERVICES
EDISON, NJ
(908) 225-2000

Company: Linde Gases
Date: January 13, 1991
Client Job No.: 529342
Work Order: Fla11a208

TEST NAME: PCB's

SAMPLE ID: MT-1 / SOIL
SAMPLE DATE: 11/20/91
ANALYSIS DATE: 12/10/91

	Results in ug/Kg Dry Wt.	Detection Limit
Arochlor 1016	ND	34
Arochlor 1221	ND	34
Arochlor 1232	ND	34
Arochlor 1242	ND	34
Arochlor 1248	ND	34
Arochlor 1254	570	34
Arochlor 1260	ND	34

Comments: ND indicates the compound is not detected at the level indicated.

IT ANALYTICAL SERVICES
EDISON, NJ
(908) 225-2000

Company: Linde Gases
Date: January 13, 1991
Client Job No.: 528147
Work Order: Field 206

TEST NAME: PCB's

SAMPLE ID: MT-2 / SOIL
SAMPLE DATE: 11/20/91
ANALYSIS DATE: 12/10/91

	Results in ug/Kg Dry Wt.	Detection Limit
Arochlor 1016	ND	34
Arochlor 1221	ND	34
Arochlor 1232	ND	34
Arochlor 1242	ND	34
Arochlor 1248	ND	34
Arochlor 1254	310	34
Arochlor 1260	ND	34

Comments: ND indicates the compound is not detected at the level indicated.

000012

IT ANALYTICAL SERVICES
EDISON, NJ
(908) 225-2000

Company: [illegible] Gases
Date: January 13, 1991
Client Job No.: 529142

Work Order: [illegible]208

TEST NAME: PCB's

SAMPLE ID: MT-3 / SOIL
SAMPLE DATE: 11/20/91
ANALYSIS DATE: 12/10/91

	Results in ug/Kg Dry Wt.	Detection Limit
Arochlor 1016	ND	41
Arochlor 1221	ND	41
Arochlor 1232	ND	41
Arochlor 1242	ND	41
Arochlor 1248	ND	41
Arochlor 1254	1100	41
Arochlor 1260	ND	41

Comments: ND indicates the compound is not detected at the level indicated.

000013

Page: 4

IT ANALYTICAL SERVICES
EDISON, NJ
(908) 225-2000

Company: Linde Gases
Date: January 13, 1991
Client Job No.: 529142 Work Order: Fin11-208

TEST NAME: PCB's

SAMPLE ID: OT-1 / SOIL
SAMPLE DATE: 11/20/91
ANALYSIS DATE: 12/10/91

	Results in ug/Kg Dry Wt.	Detection Limit
Arochlor 1016	ND	42
Arochlor 1221	ND	42
Arochlor 1232	ND	42
Arochlor 1242	ND	42
Arochlor 1248	ND	42
Arochlor 1254	1200	42
Arochlor 1260	ND	42

Comments: ND indicates the compound is not detected at the level indicated.

IT ANALYTICAL SERVICES
EDISON, NJ
(908) 225-2000

Company: Linde Gases
Date: January 13, 1991
Client Job No.: 523342
Work Order: Fiella708

TEST NAME: PCB's

SAMPLE ID: OT-2 / SOIL
SAMPLE DATE: 11/20/91
ANALYSIS DATE: 12/10/91

	Results in ug/Kg Dry Wt.	Detection Limit
Arochlor 1016	ND	39
Arochlor 1221	ND	39
Arochlor 1232	ND	39
Arochlor 1242	ND	39
Arochlor 1248	ND	39
Arochlor 1254	1800	39
Arochlor 1260	ND	39

Comments: ND indicates the compound is not detected at the level indicated.

000015

Page: 1

IT ANALYTICAL SERVICES
EDISON, NJ
(908) 225-2000

Company: Linde Gases
Date: January 13, 1991
Client Job No.: 529342

Work Order: E1-11-209

TEST NAME: PCB's

SAMPLE ID: OT-3 / SOIL
SAMPLE DATE: 11/20/91
ANALYSIS DATE: 12/10/91

	Results in ug/Kg Dry Wt.	Detection Limit
Arochlor 1016	ND	390
Arochlor 1221	ND	390
Arochlor 1232	ND	390
Arochlor 1242	ND	390
Arochlor 1248	ND	390
Arochlor 1254	1100	390
Arochlor 1260	ND	390

Comments: ND indicates the compound is not detected at the level indicated.

000016

IT ANALYTICAL SERVICES
EDISON, NJ
(908) 225-2000

Company: Linde Gases
Date: January 13, 1991
Client Job No.: 5x7142

Work Order: P1-11-209

TEST NAME: **Priority Pollutant Metals**

SAMPLE ID: **STAINED EXT / SOIL**
SAMPLE DATE: 11/20/91
ANALYSIS DATE: 12/05/91

	Results in mg/Kg Dry Wt.	Detection Limit
Antimony	ND	2.2
Arsenic	ND	1.1
Beryllium	0.65	0.55
Cadmium	1.0	0.55
Chromium	140	1.1
Copper	55	2.2
Lead	110	11
Mercury	0.14-.44	0.11
Nickel	26	4.4
Selenium	ND	0.55
Silver	1.6	1.1
Thallium	ND	1.1
Zinc	130	2.2

Comments: ND indicates the compound is not detected at the level indicatud.

000017

IT ANALYTICAL SERVICES
EDISON, NJ
(908) 225-2000

Company: Linde Gases
Date: January 13, 1971
Client Job No.: 520242 Work Order No.: 1-300

TEST NAME: Base Neutrals

SAMPLE ID: STAINED EXT / SOIL
SAMPLE DATE: 11/20/91
ANALYSIS DATE: 11/21/91

Results in	ug/Kg Dry Wt.	Detection Limit
Acenaphthene	ND	360
Acenaphthylene	ND	360
Anthracene	ND	360
Benzidine	ND	360
Benzo(a)Anthracene	ND	360
Benzo(b)Fluoranthene	ND	360
Benzo(k)Fluoranthene	ND	360
Benzo(a)Pyrene	ND	360
Benzo(g,h,i)perylene	ND	360
bis(2-Chloroethyl)Ether	ND	360
bis(2-Chloroethoxy)Methane	ND	360
bis(2-Chloroisopropyl)Ether	ND	360
bis(2-Ethylhexyl)Phthalate	ND	360
4-Bromophenyl Phenyl Ether	ND	360
Butyl Benzyl Phthalate	ND	360
2-Chloronaphthalene	ND	360
4-Chlorophenyl Phenyl Ether	ND	360
Chrysene	ND	360
Dibenzo(a,h)anthracene	ND	360
Di-n-butylphthalate	ND	360
1,2-Dichlorobenzene	ND	360
1,3-Dichlorobenzene	ND	360
1,4-Dichlorobenzene	ND	360
3,3'-Dichlorobenzidine	ND	360
Diethylphthalate	ND	360
Dimethylphthalate	ND	360
2,4-Dinitrotoluene	ND	360
2,6-Dinitrotoluene	ND	360
Di-n-Octylphthalate	ND	360
1,2-Diphenylhydrazine	ND	360
Fluoranthene	ND	360
Fluorene	ND	360
Hexachlorobenzene	ND	360
Hexachlorobutadiene	ND	360

IT ANALYTICAL SERVICES
EDISON, NJ
(908) 225-2000

Company: Linde Gases
Date: January 13, 1991
Client Job No.: 529347
Work Orders: Finish708

TEST NAME: Base Neutrals

SAMPLE ID: STAINED EXT / SOIL
SAMPLE DATE: 11/20/91

Hexachloroethane	ND	360
Hexachlorocyclopentadiene	ND	360
Indeno(1,2,3-cd)pyrene	ND	360
Isophorone	ND	360
Naphthalene	ND	360
Nitrobenzene	ND	360
N-nitroso-dimethylamine	ND	360
N-Nitrosodipropylamine	ND	360
N-Nitrosodiphenylamine	ND	360
Phenanthrene	ND	360
Pyrene	390	360
1,2,4-Trichlorobenzene	ND	360

Comments: ND indicates the compound is not detected at the level indicated.

000019

IT ANALYTICAL SERVICES
EDISON, NJ
(908) 225-2000

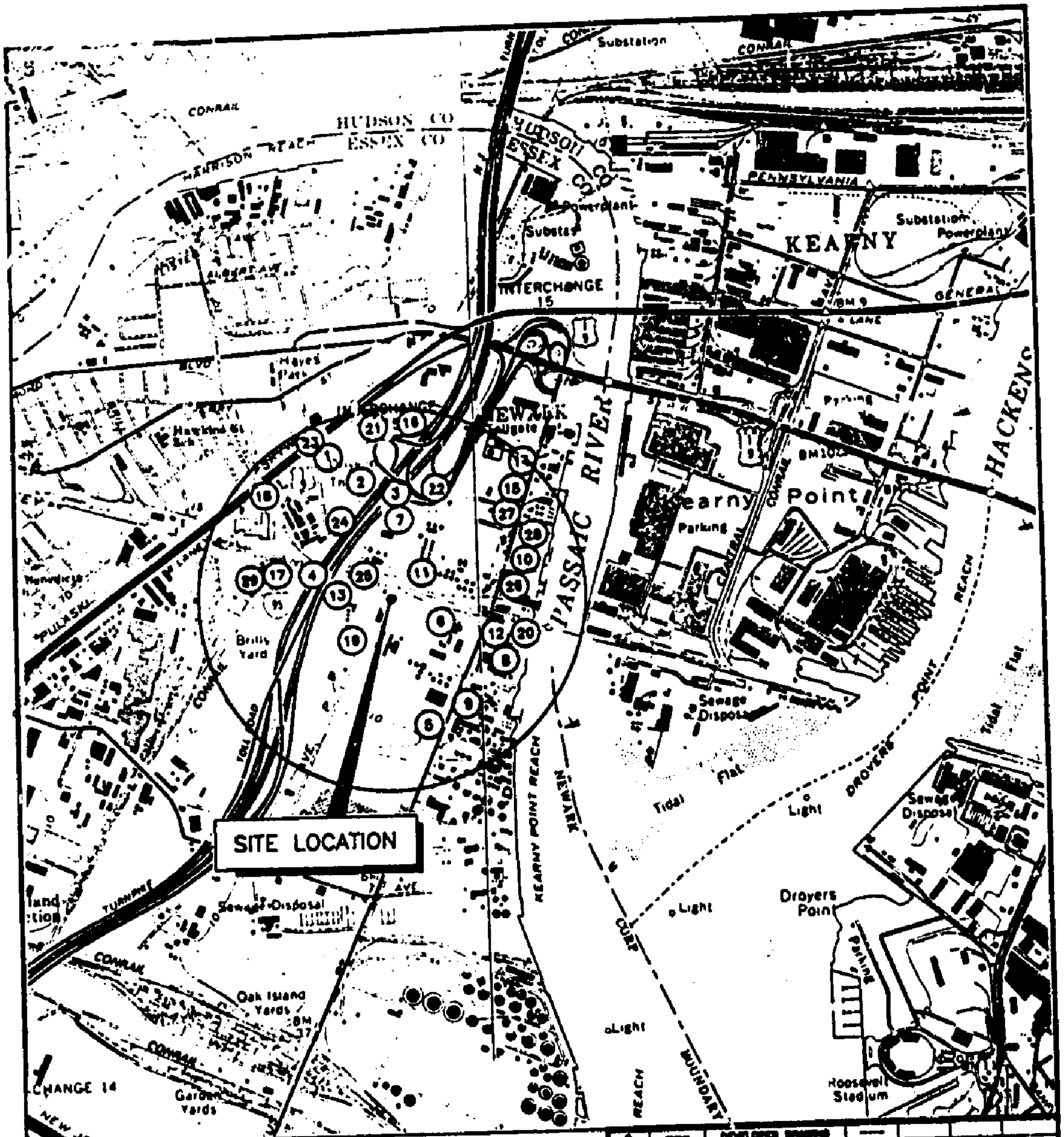
Company: Linde Gases
Date: January 17, 1991
Client Job No.: 529142
Work Order: Ellis208

TEST NAME: WBS Search Base Neutrals

SAMPLE ID: STAINED EXT / SOIL
SAMPLE DATE: 11/20/91

Tentatively Identified Compounds	Scan Number	Estimated Concentration (ug/Kg Dry Wt.)
Unknown	159	2300
Unknown Aldol	200	6100BA
Unknown	202	720
Unknown	216	390
Unknown	290	360
Unknown	308	1200
Unknown	334	760
Unknown	388	640
Unknown	950	190
Unknown	1369	100
Substituted Hexanedioic Ester	1448	1300

000020



SOURCE:
USGS 7.5 MINUTE TOPOGRAPHIC SERIES
ELIZABETH & JERSEY CITY, NJ QUADRANGLES

LEGEND:
① MONITOR WELL IDENTIFICATION NUMBER

0 2000 3?00
SCALE OF FEET

INTERNATIONAL TECHNOLOGY CORPORATION

APPROXIMATE WELL LOCATIONS
WITHIN 1/2 MILE RADIUS OF
LINDE GASES OF THE MID-ATLANTIC
NEWARK, NEW JERSEY
Prepared For:
UNION CARBIDE-LINDE DIVISION
IT PROJECT No. 529342

TIERRA-B-015110

Location #	Owner	Use	Number of Wells	Yield (gpm)	Casing Depth, (ft)	Total Depth, (ft)
1	Arkansas Company, Inc. 185 Foundry Street Newark, New Jersey	Industrial	1	65	72.75	400
2	Pfaff & Kendall 84 Foundry Street Newark, New Jersey	Industrial	1	2	86.5	200
3	Star Enterprise 910 Delancy Street Newark, New Jersey	Monitoring	10	NA	2.5	16
4	NL Spencer Kellogg, Inc. 1230 Avenue of the Americas New York, New York	Monitoring	13	NA	35	45
5	DuPont Chemical Exit 15E New Jersey Turnpike Newark, New Jersey	Monitoring	24	NA	28.5	38.5
6	Texaco Terminal 910 Delancy Street Newark, New Jersey	Monitoring	13	NA	5	15
7	Texaco Terminal 910 Delancy Street Newark, New Jersey	Monitoring	17	NA	5	17
8	New Jersey Turnpike Authority Route 18 Newark, New Jersey	Monitoring	1	NA	NA	15
9	McKesson Corporation 504-508 Doremus Avenue Newark, New Jersey	Monitoring	4	NA	38.5	48.5
10	Texaco Refining & Marketing Avenue A & 1st Street Newark, New Jersey	Monitoring	3	NA	1.5	5
11	Sun Refining & Marketing 1801 Market Street Newark, New Jersey	Monitoring	26	NA	3.5	10
12	Henry Borda, Inc. 128 Doremus Avnue Newark, New Jersey	Monitoring	9	2	5	12
13	Sun Chemical Corporation 185 Foundy Street Newark, New Jersey	Monitoring	8	NA	3	12.8
14	Getty Refining & Marketing 86 Doremus Avenue Newark, New Jersey	Monitoring	8	NA	NA	15

Location #	Owner	Use	Number of Wells	Yield (gpm)	Casing Depth, (ft)	Total Depth, (ft)
15	Essex Chemical Corporation 1401 Broad Street Clifton, New Jersey	Gas Monitoring	2	NA	7	25
16	Coca Cola Co. Bergen Street Jersey City, New Jersey	Domestic	1	20	100	650
17	New Jersey Turnpike Authority Route 18 Newark, New Jersey	Monitoring	1	NA	NA	18
18	Imperial Urban Renwal P.O. Box #282 Glendale, New Jersey	Monitoring	1	NA	10	18
19	Newark Housing Authority 57 Sussex Avenue Newark, New Jersey	Monitoring	2	NA	NA	30
20	Essex Chemical 351 Doremus Avenue Newark, New Jersey	Monitoring	6	NA	NA	10
21	New Jersey Turnpike Authority Route 18 Newark, New Jersey	Monitoring	8	NA	5	20
22	DuPont Chemical Exit 15E New Jersey Turnpike Newark, New Jersey	Monitoring	4	NA	13	15
23	Ablon Finishes 4 Waydell Street Newark, New Jersey	Industrial	1	NA	86	500
24	Federated Metal 150 Charles Street Newark, New Jersey	Monitoring	7	8-30	55	88
25	Celanese Chemical Newark Terminal Newark, New Jersey	Monitoring	16	NA	7	15
26	DuPont Chemical Exit 15E New Jersey Turnpike Newark, New Jersey	Monitoring	3	NA	14	41
27	Texaco Refining & Marketing Avenue A & 1st Street Newark, New Jersey	Monitoring	9	NA	5	15
28	NL Spencer Kellogg, Inc. 1230 Avenue of the Americas New York, New York	Monitoring	8	NA	30	40
29	Right "O" Way Trucking 58 St. Charles Place Newark, New Jersey	Monitoring	1	NA	12	22

"NA" signifies not available.

ECRA-002
12/87

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE MANAGEMENT
INDUSTRIAL SITE EVALUATION ELEMENT
CN 028, TRENTON, N.J. 08625

ENVIRONMENTAL CLEANUP RESPONSIBILITY ACT (ECRA)

INITIAL NOTICE

SITE EVALUATION SUBMISSION (SES)

This is the second part of a two-part application form. This information must be submitted within 45 days following any applicable situation as specified at N.J.A.C. 7:26B-1.5 or any triggering event as specified at N.J.A.C. 7:26B-1.6. Please refer to the instructions and N.J.A.C. 7:26B-3.2 before filling out this form. Answer all questions. Should you encounter any problems in completing this form, we recommend that you discuss the matter with a representative from the Element. Submitting incorrect or insufficient data may cause processing delays and possible postponement of your transaction. Please call (609) 633-7141 between the hours of 8:30 a.m. and 4:30 p.m. to request assistance.

PLEASE PRINT OR TYPE

Date June 13, 1990

1. Industrial Establishment

Name LINDE GASES OF THE MID - ATLANTIC, INC.

Address 360 Avenue P

City or Town Newark, New Jersey Zip Code 07105

Municipality Newark County Essex

A. Operational and Ownership History: *(Attach additional sheets if necessary)*

Name	Owner/ Operator	From	To	Current Address
Linde Gases	Union Carbide	1919	Present	360 Ave. P., Newark, NJ

B. Brief description of past operation(s) conducted on site *(Attach additional sheets if necessary)*:

Re-packing of atmospheric gases from bulk to small cylinders and the manufacturing of acetylene.

RCRA-002
12/87

2. List all federal and state environmental permits applied for, or received, or both, at this facility *(Attach additional sheets if necessary)*

Check here if no permits are involved ———

A. New Jersey Bureau of Air Pollution Control

Permit Number	Certificate Number	Date of Approval or Denial	Reason for Denial (If applicable)	Expiration Date
	080664	11/30/87		2/16/95
	030181	9/22/77		6/12/92
	030183	9/22/77		6/12/92
	030180	9/22/77		6/12/92
	030182	9/22/77		6/12/92

B. New Jersey Pollutant Discharge Elimination System (NJPDES)

Number	Discharge Activity	Date Issued or Denied	Expiration Date	Body of Water Discharged Into
None				

C. United State Environmental Protection Agency (EPA) Identification Number and copy of the most recent generator Annual Report prepared pursuant to the New Jersey Hazardous Waste Regulations. *(If applicable)*

ID # NJD080621881

Is a copy of the Annual Report attached? ____ Yes (See Attachment # ____) __x__ No *

*Exempt as small quantity generator

D. Resource, Conservation, Recovery Act (RCRA) Permit # ———

E. Bureau of Underground Storage Tank Registration Number(s) None

F. All other federal, state, local governmental permits.

Agency Issuing Permit	Permit No.	Date of Approval or Denial	Expiration Date
Div. of Fire & Life Safety, City of Newark - Calcium Carbide	82370	8/89	8/90
Dept. of Eng., City of Newark Hazardous Materials Facility	H2NP023	12/29/88	12/29/93
Div. of Permits and License Bugular & Robbery Alarm System	3157	4/10/90	4/10/91
NJ Dept. of Health Drug Certificate of Registration	0292		1/31/91
NJDEP Bureau of Pesticide Control Pesticide Dealer Business	40179	3/14/90	6/30/91

*See Attached Sheet (F continued)

F. (Continued)

Agency Issuing Permit	Permit No.	Approval or Denial	Expiration Date
US Department of Transportation Cylinder Requalification Facility	A419	7/19/89	7/19/84
US Food & Drug Administration	049413 2216485	8/03/89	7/31/90

3. Summary of Enforcement Actions for Violation of Environmental Laws or Regulations:

Check here if no enforcement actions are involved _____

A. Date of Action 10/28/87

Section of Law or Statute violated NJAC 7:27-8.3(a)

Type of Enforcement Action $200 fine levied

Description of the Violation Air pollution point source stack constructed before point source construction permit was issued for stack

How was the violation resolved? submitted $200 fine payment and filed for permit to construct stack

B. Date of Action 9/30/81

Section of Law or Statute violated violation of 40 cfr 112.0

Type of Enforcement Action notice of violation

Description of the Violation Failure to have and implement SPCC plan for 8,000 gallon storage tank

How was the violation resolved? Ultimately tank requiring SPCC plan was removed

4. Site Map

Is this map enclosed? XX Yes (See Attachment #_____) ____ No

If No, state the reason _____

(Attach additional pages, if necessary)

ECRA-032
12/...

5. Description of Operations:

Is this report enclosed? XX Yes (See Attachment # 1) ____ No

If No, state the reason _____

6. Description of Building Heating System:

A. How is the Industrial Establishment currently heated? (Oil, Gas, Electric) Gas

How long has the Industrial Establishment been heated by the above fuel/energy source: 3 years

B. Was the Industrial Establishment heated by fuel oil at any time: XX Yes ____ No

Is information on the decommissioning of underground fuel oil tanks included with item No. 14 of this form?

XX Yes ____ No If no, explain below: _____

C. Are the results of the Integrity Evaluation for Existing Underground Fuel Oil Tanks enclosed?

____ Yes (See Attachment #____) XX No If no, state the reason No testing conducted before tank removal was completed.

7. Summary of Industrial Establishment Wastewater Discharges of Sanitary and/or Industrial Waste:

A. Discharge Period From	To	Discharge Type	Treatment By
1988	Present	Non-Contact cooling water	Recycling
1919	1988	Non-Contact Cooling Water	Discharged to Plum Creek

B. If the Industrial Establishment discharges sanitary and/or industrial wastes to a publicly-owned treatment plant, provide the name/address of that facility.

Name Passaic Valley Sewage Commissioners Telephone # (201)344-1800

Street Address 600 Wilson Avenue

Municipality Newark, State N.J. Zip Code 07105

	Date(s) of Discharge	Nature of Discharge
1.	1983 to present	Sanitary sewage
2.		
3.		

8. Hazardous Substance and Waste Containment Description: *(Attach additional sheets if necessary)*

Type of Storage Unit	Date Installed	Area or Volumetric Capacity (include units)	Material Stored	Construction Type	Location Reference	Decommissioning or Sampling Reference
Aboveground Stg.Tank	May 1985	275 gallons	Waste Oil	Steel	See Fig.1	Not Applicable
Aboveground Stg.Tank	May 1988	550 gallons	Waste Oil	Steel	See Fig.1	Not Applicable
Drum	Not Applicable	101-1000 pds	(Monkey Dust) Waste Filter medium	Plastic lined fiber drum w/steel Overpack	See Fig 1	Not Applicable
Pad	1926	2,300 cylinders	Scrapped Acetylene cyl.	Concrete	See Fig1	Not Applicable
Outdoor Concrete Platform	NOT APPLICABLE	101-1000 pds	Chlorine	Steel Cyl.	No.11(Fig 1)	Not Applicable
Outdoor Concrete Platform	NOT APPLICABLE	101-1000 pds	Dimethylamine	Steel Cyl.	No.13(Fig1)	Not Applicable
Outdoor Concrete Platform	NOT APPLICABLE	101-1000 pds	Hydrogen Chloride	Steel Cyl.	No.20(Fig 1)	Not Applicable
Outdoor Concrete Platform	NOT APPLICABLE	11-1000 pds	Hydrogen Sulfide	Steel Cyl.	No.21(Fig 1)	Not Applicalbe

9. Hazardous Substance/Waste Inventory:

Material Name	Quantity (indicate units)	Location Reference	Storage Method Container Type/Size	Typical Annual Usage	To Remain on Site (Yes or No)
* Chlorine	101-1000 pds.	No.11(See Fig.1)	Cylinders-steel/150 pds.	101-1000 pds	No
* Dimethylamine	101-1000 pds.	No.13(See Fig.1)	Cylinders-steel/13 pds.	101-1000 pds	No
* Hydrogen Chloride	101-1000 pds	No.20(See Fig.1)	Cylinders-steel/60 pds	101-1000 pds	No
* Hydrogen Sulfide	11-100 pds	No.21(See Fig.1)	Cylinders-steel/65 pds	11-100 pds	No
* Methyl bromide	101-1000 pds	No.27(See Fig 1)	Cylinders-steel/100 pds	101-1000 pds	No
* Methylmercaptan	101-1000 pds	No.29(See Fig 1)	Cylinders-steel/1/2 pd	101-1000 pds	No
* Phosgene	11-100 pds	No.40(See Fig 1)	Cylinders-steel/120 pds	11-100 pds	No
* Trimethylamine	101-1000 pds	No.49(See Fig 1)	Cylinders-steel/13 pds	101-1000 pds	No

* Material temporarily stored for shipment, not used

8. Hazardous Substance and Waste Containment Description: *(Attach additional sheets if necessary)*

Type of Storage Unit	Date Installed	Area or Volumetric Capacity (include units)	Material Stored	Construction Type	Location Reference	Decommissioning or Sampling Reference
Outdoor Concrete Platform	NOT Applicable	101-1000 pds	Methylbromide	Steel cyl.	No.27(Fig 1)	Not Applicable
Outdoor Concrete platform	Not Applicable	101-1000 pds	Methylmercaptan	Steel cyl.	No.29(Fig 1)	Not Applicable
Outdoor Concrete platform	Not Applicable	11-100 pds	Phosgene	Steel cyl.	No.40(Fig 1)	Not Applicable
Outdoor Concrete platform	Not Applicable	101-1000 pds	Trimethylamine	Steel Cyl.	No.49(Fig 1)	Not Applicable
Outdoor Concrete platform	Not Applicable	11-100 pds	Propylene oxide	Steel Cyl.	No.81(Fig 1)	Not Applicable
BIN	Not Applicable	(Pds.-250,001-500,000)	Calcium carbide	Aluminum	See Fig 1	Not Applicable
BOTTLE	Not Applicable	11-100 pds	Ammonium hydroxide	Glass	QA Lab(Fig 1)	Not Applicable
BOTTLE	Not Applicable	11-100 pds	Potassium hydroxide	Glass	QA Lab(Fig 1)	Not Applicable

9. Hazardous Substance/Waste Inventory:

Material Name	Quantity (indicate units)	Location Reference	Storage Method Container Type/Size	Typical Annual Usage	To Remain on Site (Yes or No)
*Propylene oxide	11-100 pds	No.81 (See Fig 1)	Drum - steel/374 pds	11-100 pds	No
Calcium carbide	250,001-500,000 pds	See Fig 1	Bin - aluminum/2.5 ton	250,001-500,000 pds	YES
Ammonium hydroxide	11-100 pds	QA-Lab (See Fig.1)	Bottle-glass/500 ml	11-100 pds	YES
Potassium hydroxide	11-100 pds	QA-Lab (See Fig.1)	Bottle-glass/500 ml	11-100 pds	YES
Waste Oil	825 gallons	See Fig.1	Tanks-steel/275 gal 550 gal	2,000 gallons	NO
Waste Filter medium	101-1000 pds	See Fig.1	Drum-steel/55 gal	101-1000 pds	NO
**Scrapped Acetylene cyl.	Not Applicable	See Fig.1	Concrete pad-35'X60'	Not applicable	N

**One time disposal of 3,856 Acetylene cylinders
*Material temporarily stored for shipment, not used.

10. Discharge History of Hazardous Substances and Wastes:

A. Have there been any discharges of hazardous substances and wastes?
__X__ Yes (Complete Item B below) _____No (Go to Item 10C)

B. Summary of Discharges and Resolutions

Description of Discharge Event	Response and Resolutions
Small leakage from piping	Visually contaminated soil
associated with 8,000 gallon	removed for off site disposal.
No. 2 fuel oil underground	Post excavation sample analyzed
storage tank	for petroleum hydrocarbons was
	acceptable to NJDEP - See
	Attachment 2

C. Is this Industrial Establishment subject to Spill Prevention Control and Countermeasure (SPCC) per 40 CFR Part 112 or Discharge Prevention, Containment and Countermeasure (DPCC) Plan per NJAC 7:1E-4.1 requirements?

_____Yes __X__No A copy of the Plan(s) may be required at the discretion of the Department.

11. Sampling Plan Proposal

A. Is sampling proposed at the facility? _____Yes (See Attachment #_____) No__X__

If sampling is not proposed, please explain below. *(Attach additional sheets if necessary)*

Facility operations, acetylene production and bulk transfer of atmospheric gases, have not significantly impacted the environment

B. Is groundwater sampling proposed? _____Yes __X__No

Note: If groundwater sampling is proposed under the plan, you must complete ECRA Form 002A "Request for Hydrogeologic Assessment" and submit it with the application.

12. Decontamination/Decommissioning Plan

A. Is the facility Decontamination/Decommissioning Plan enclosed?

____Yes (See Attachment #_____) __X__No

B. If no, specify why decontamination/decommissioning is not considered necessary.

13. Historical Data on environmental quality at the Industrial Establishment

A. Were sampling results obtained on Environmental Quality for the Industrial Establishment?

__XX__Yes (See Attachment #2,3,4) ____No

B. If sampling results were obtained but are not part of this application, please explain below:

14. List any other information you are submitting or which has been formally requested by the Department

Description	Attachment #
8000 Gallon Underground Storage Tank decommissioning	2
NJDEP Facility Compliance Evaluation Inspection	3
Facility Asbestos Sampling Results	4

FEE CHECKLIST

Include below a breakdown of the total fee submitted with this application. (See N.J.A.C. 7:26B-1.10 for the appropriate fees.)

Item	Amount ($)
1. Initial Notice Review	
i. Without Sampling Plan	
ii. With Sampling Plan that includes only underground storage tank analysis without groundwater monitoring	
iii. With Sampling Plan other than ii. above or iv. below	
iv. With Sampling Plan that includes any groundwater monitoring	
2. Sampling Data Review	
3. Negative Declaration Review	
4. Cleanup Plan Review	
5. Oversight of Cleanup Plan Implementation	
TOTAL FEE ENCLOSED	$

ARE FEES ENCLOSED? __XX__YES

CERTIFICATIONS:

A. The following certification shall be signed by the highest ranking individual at the site with overall responsibility for that site or activity. Where there is no individual at the site with overall responsibility for that site or activity, this certification shall be signed by the individual having responsibility for the overall operation of the site or activity.

I certify under penalty of law that the information provided in this document is true, accurate and complete. I am aware that there are significant civil penalties for knowingly submitting false, inaccurate or incomplete information and that I am committing a crime of the fourth degree if I make a written false statement which I do not believe to be true. I am also aware that if I knowingly direct or authorize the violation of N.J.S.A. 13:1K-6 et seq., I am personally liable for the penalties set forth at N.J.S.A. 13:1K-6.

Typed/Printed Name JOHN R. CRANE Title OPERATIONS MANAGER

Signature [signature] Date 6-12-90

Sworn to and Subscribed Before Me
on this 12th
Date of June 19 90

[signature]
Notary MARY T. HALL
NOTARY PUBLIC OF NEW JERSEY
My Commission Expires Dec. 28, 1991

B. The following certification shall be signed as follows:

1. For a corporation, by a principal executive officer of at least the level of vice president;
2. For a partnership or sole proprietorship, by a general partner or the proprietor, respectively; or
3. For a municipality, State, Federal or other public agency, by either a principal executive officer or ranking elected official.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate and complete. I am aware that there are significant civil penalties for knowingly submitting false, inaccurate, or incomplete information and that I am committing a crime of the fourth degree if I make a written false statement which I do not believe to be true. I am also aware that if I knowingly direct or authorize the violation of N.J.S.A. 13:1K-6 et seq., I am personally liable for the penalties set forth at N.J.S.A. 13:1K-6.

Typed/Printed Name CARL R. Koch Title President

Signature [signature] Date 6-12-90

Sworn to and Subscribed Before Me
on this 12th
Date of June 19 90

[signature]
Notary MARY T. HALL
NOTARY PUBLIC OF NEW JERSEY
My Commission Expires Dec. 28, 1991

LOCATION/FUNCTION

The Newark plant sits on about 12 acres of property in the area known as the Ironbound section of Newark, just off of the New Jersey turnpike. The original plant was built in March 1919. The operations over these years have been everything from 3 shift - 7 days a week during wartime, with as many as 50 employees, to today's status of about 30 employees. This location services 10 Distributors, including a wholly-owned subsidiary that work directly out of the plant with 6 drivers and route trucks. The plant operation area is presently 24,200 sq. ft. of building space.

GAS PRODUCTS PUMPED

In the early days the plant was primarily generating Acetylene and recompressing Industrial grades of Oxygen and Nitrogen. Today's plant operations primarily consist of the transfer of bulk quantities of Oxygen, Liquid Propane, Nitrogen, Argon, Helium, Carbon Dioxide and Nitrous Oxide from bulk storage tanks into small cylinders. Acetylene is the only gas manufactured at the Newark New Jersey facility. The acetylene manufacturing process is briefly described below.

EMPLOYEES

This location employs 31 full time employees.

Plant Manager	1
Supervisor of Operations	3
Plant Engineer	1
Office Administrator	1
Distribution Coordinator	2
Lab Technician	2
Service Technician	3
High Pressure Pumpers	6
Repairers	1
Acetylene	4
Helium Filler	1

ENG/tp539-rpt

PASSAIC VALLEY SEWERAGE COMMISSIONERS
790 BROAD STREET
NEWARK, N. J. 07102

March 31, 1970

POLLUTIONS CORRECTED DURING 1969

The following is a report of pollutions which occurred in the Passaic River below the Great Falls, or one of its tributaries, which were corrected during the year 1969. Each report will show the source of pollution, the dates of pollution, and the river inspector assigned to the violation until it was eliminated.

BERGEN COUNTY

Central Volkswagen Inc., Maple Avenue & Route 208, Fairlawn, N.J.
December 3, to 12, 1969 (T. Costello)

Intermittent oily films in Diamond Brook were traced back to this firm. Upon checking, it was found that this company removed cosmoline from new vehicles in an area where the material went into a ditch which led to Diamond Brook. Upon being notified that this was a violation, the company made arrangements to have the cosmoline removed from the cars by a firm in Port Newark before being delivered to their distribution point in Fairlawn. Pollution eliminated December 12, 1969.

Curtiss-Wright Corporation, One Passaic Street, Woodridge, N.J.
December 3, 1968 to May 28, 1969. (J. Perrapato)

Intermittently throughout 1968, there were polluting discharges from the Curtiss-Wright Corp., to Felds Brook, a tributary of the Passaic River. Generally speaking the dicharges contained small amounts of oil. Upon being notified of the problem, the Plant Engineer explained that it was during filter changes that this occurred and that they would see to it that extra care was taken during these filter change times so that no oil would reach the Brook again.

However, on December 3, 1968, the oil was again detected in Felds Brook and traced back to this company. On December 10, 1968, Mr. Lubetkin informed this company that they were polluting, that they should make corrections immediately. On December 26, 1968, Mr. Lubetkin received a letter from Curtiss-Wright Corp., informing him that consultants were being brought in to review their present system, in order to make the necessary improvements to halt the pollution. The situation continued much the same and finally on March 12, 1969, Mr. Lubetkin again wrote to the Curtiss-Wright Corp.

Union Carbide Corporation, 351 Doremus Avenue, Newark, N. J.
June 3, 1969 (J. McLaughlin)

This company pumps a liquid lime slurry to an adjacent company, Chemline Corporation, for storage in their lagoon. The material is then trucked by tank trucks to the DuPont Company in Delaware, by Chemline Corporation. On the above date, the lagoon was full and material was overflowing its tanks into Plum Creek, a tributary of the Passaic River. The company was notified of the overflow and arrangements were made to clean out the pit, thus eliminating the violation.

HUDSON COUNTY

Alcan Aluminum Corporation, 1 Jacobus Avenue, Kearny, N.J.
September 22, 1969 (R. Bingham)

This company has a sump which collects floor waste and the company then pumps the material into the sanitary sewer. The Commissioners Inspector noticed that an overflow into the Passaic River from this company was discharging polluting material. The firm was contacted and we were informed that the condition was caused by the pump clogging. When the pump clogged, the material collected in the sump and overflowed into the Passaic River. At the direction of the Passaic Valley Sewerage Commissioners, the overflow to the river was sealed so that if in the future a pump failed, the material would show on the floor and repairs could be made immediately, instead of going undetected for a long period of time. This was completely sealed by October 6, 1969, thus eliminating the pollution.

Guard Coating Chemical Co., 58 John Hay Avenue, Kearny, N.J.
February 1968- May 15, 1969 (R. Bingham)

Sanitary and industrial waste flowed into Franks Creek, a tributary of the Passaic River, from this company. During February, 1968, it was noted, by the Commissioners, that Franks Creek contained polluting material and, together with the Health inspector of the Town of Kearny, investigations were made to determine the source and cause of the pollution. On February 14, 1968, by dyeing the toilets of industries along the ares, it was discovered that sewerage was coming from this company. Letters were sent by both the town of Kearny and the Passaic Valley Sewerage Commissioners to Guard Coating Chemical Co., directing to halt pollution at once. On April 5th., the Passaic Valley Sewerage Commissioners had received a letter from this company that they would hook-up

PRAXAIR

Praxair, Inc.
Industrial Avenue
P. O. Box 237
Keasbey, NJ 08832
Tel (908) 738-4000
Fax (908) 738-9586

March 5, 1997

VIA OVERNIGHT MAIL

Mr. Pat Evangelista
Emergency and Remedial Response Division
U.S. Environmental Protection Agency
290 Broadway, 19th Floor
New York, NY 10007-1866

Re: Diamond Alkali Superfund Site,
Passaic River Study Area

Dear Mr. Evangelista:

This letter responds to Mr. Caspe's December 24, 1996 section 104(e) letter request to Mr. Lichtenberger, CEO, Praxair, Inc. Praxair was provided an extension of time to answer and needed additional time since the identified facility was sold in 1995.

Praxair has provided below responses to the questions in Attachment A of Mr. Caspe's letter. Please be advised that Praxair's response herein is subject to the availability of records for the Newark facility, which is no longer owned by Praxair, and the recollection of some former employees at the Newark facility. The Newark facility transferred bulk quantities of gases, for example, oxygen, nitrogen, argon, helium, carbon dioxide, nitrous oxide, into cylinders. It also produced acetylene and lime, a co-product of acetylene production.

1. Union Carbide Corporation, its corporate predecessors, or Praxair, Inc., operated at the facility at 360 Avenue P, Newark, NJ (Newark facility) from 1919 to 1995. (In June 1992 Praxair, Inc., formerly Union Carbide Industrial Gases, Inc. (UCIG), a wholly owned subsidiary of Union Carbide Corporation (UCC), was spun off to shareholders of UCC as a separate, stand-alone corporation. Praxair owned the Newark facility and sold it in 1995.)

2. a) No. The Newark facility never had a permit issued pursuant to the Resource Conservation and Recovery Act.

   b) Yes. From 1980 to 1985 the Newark facility was issued permit No. NJ 0029211 which authorized the discharge of noncontact cooling water into Plum Creek. The Newark facility began recycling its discharge in 1986.

3. See Attachment #3.

849530001

4. a) Acetylene was manufactured at the Newark facility. The acetylene manufacturing process is briefly described below.

Acetylene was manufactured from the reaction of calcium carbide with water. This produces acetylene gas. Acetylene was made in a generator in which the calcium carbide was fed into water at a controlled rate. Higher purity acetylene was also made by filtering the gas through a medium consisting primarily of diatomaceous earth.

Acetylene was the only product, co-product or by-product that was a hazardous substance.

4. b.i) When calcium carbide mixed with water, acetylene was generated. Acetylene was pumped into cylinders for sale to customers.

4. b.ii) The finished product was acetylene. No other hazardous substances were generated.

4. b.iii) No.

5. See below.

5. a) John Crane, Operations Manager, oversaw the Newark facility operations.
W.A. Moran, Office Administrator, was responsible for managing corrosive material.
Alan Duva, Office Administrator, was responsible for cylinders.
Ralph Day, was responsible for managing 1,1,1 trichloroethane.
Antonio Cruz, Security Officer, was responsible for managing waste alkaline and flammable liquids.

5. b) Available records and conversations with former employees at the Newark facility reveal the following.

Haulers	**Disposal Site**
Cecos International	Cecos International 4879 Spring Grove Avenue Cincinnati, OH 45230
Safety-Kleen Corp.	Safety-Kleen Corp. 1200 Sylvan Street Linden, NJ 07036

849530002

Haulers	Disposal Site
Chemical Waste Management, Inc.	Chemical Waste Management of New Jersey Inc. 200 Lister Avenue Newark, NJ 07105
Horwith Trucking Inc. Chemical Waste Management Inc.	Chemical Waste Management Inc. Emelle Facility Alabama Highway 17 @ milemarker 163 Emelle, AL 35459

5. c) We are unable to ascertain all storage practices or all hazardous substances since the time operations commenced at the Newark facility. Available records reveal the following.

Storage Location	Material Stored	Material Storage Container
Outdoor Concrete Platform	Methyl bromide	Steel cylinder (cyl.)
Outdoor Concrete Platform	Methyl mercaptan	Steel cyl.
Outdoor Concrete Platform	Phosgene	Steel cyl.
Outdoor Concrete Platform	Trimethylamine	Steel cyl.
Outdoor Concrete Platform	Propylene oxide	Steel cyl.
	Calcium carbide	Aluminum bin
	Ammonium hydroxide	Glass bottle
	Potassium hydroxide	Glass bottle
	Residual acetone/acetylene	Steel cyl.
	Waste Filter Medium	55 gal. steel drum
	Propylene oxide	Steel drum

5. d) Waste was not treated on-site during the time of operations.

6. a) No process waste waters were generated at the Newark facility.

6. b.i) Floor drains did not connect to a sanitary sewer.

6. b.ii) There was no discharge from the drains.

6. c.i) Yes. Lime pond existed from 1919-1988.

6. c.ii) Un-lined.

6. c.iii) Calcium hydroxide, also known as lime.

6. c.iv) There was no discharge. Lime was sold through Chemline.

6. d.) The attached 1966 diagram identifies an on-site septic tank south of building #1.

7. a.) This information represents a typical annual usage at the Newark facility in the early 1980s. The amounts below reflect USAGE NOT GENERATION. These hazardous substances were raw materials or products except the waste filter medium which was sent as a waste off-site to a t,s,d, facility.

Material	Typical Annual Usage in Pounds
Propylene oxide	11 - 100
Calcium Carbide	250,001 - 500,000
Ammonium hydroxide	11 - 100
Potassium hydroxide	11 - 100
Waste filter medium	101 - 1,000
Chlorine	101 - 1,000
Dimethylamine	101 - 1,000
Hydrogen chloride	101 - 1,000
Hydrogen sulfide	11 - 100
Methyl bromide	101 - 1,000
Methyl mercaptan	101 - 1,000
Phosgene	11 - 100
Trimethylamine	101 - 1,000

7. b) No.

8. a) None.

8. b) None

9. a) Yes.

9. a.i) No.

849530004

9. a.ii) No.

9. b) We have no data concerning the past dates and duration. However, the flooding, when it occurred, was of Plum Creek, and probably caused by tidal overflows.

10. None.

11. See Attachment 11 for relevant documents. Documents that may have been material to this request were either discarded over the years or are no longer available because we no longer own the Newark facility. We are not able to identify documents no longer available and will not speculate as to their identity or the information contained in them.

12. a) Yes.

12. b) Attachment 12 contains a report prepared by consultants hired to address New Jersey's ECRA upon the transfer of the Newark facility from Union Carbide to Praxair, Inc.

13. a)

6/24/19	-	6.91 acres acquired from Atlanta Smeltoring & Refining
12/22/47	-	7.583 acres acquired from General Foods
4/14/52	-	.0115 acres acquired from Consolidated Products Co.
2/4/66	-	3.10 acres acquired from Celanese Corp.

Pieces of property sold off throughout the years to various parties. Remainder sold 12/27/95 to Newark Recycling & Composting Co., Inc.

13. b) Company owned.

13. c) Union Carbide and Carbon Corporation and its successor, Union Carbide Corporation.

13. d) Prest-O-Lite Company incorporated in 1913 for the purpose of manufacturing, selling, and dealing in acetylene and other gases.

Union Carbide Company, National Carbon, Prest-O-Lite, and Linde Air Products merged into Union Carbide and Carbon Corporation in 1917. Real estate at the Newark facility was purchased and a plant constructed in 1919 by Prest-O-Lite Company, a unit of Union Carbide and Carbon Corporation.

Prest-O-Lite was dissolved in 1951 and its assets were merged with the Linde Air Products Division.

14. a) Praxair, Inc.

14. b) H. W. Lichtenberger, Chairman of the Board
Praxair, Inc.
39 Old Ridgebury Road
Danbury, CT 06810-5113

14. c) Delaware -- Prentice-Hall Corporation System, Inc. (for both Delaware & New Jersey)

14. d) See attached.

14. e) Praxair, Inc. has no parent but has many subsidiaries and affiliates. The corporate structure of Praxair is not relevant to EPA's inquiry and this request for identification of "related companies" is overbroad, unduly burdensome, and not authorized under section 104(e). The Linde Division of Union Carbide Corporation (UCC) existed for decades. In 1989 UCC formed a wholly owned subsidiary, Union Carbide Industrial Gases, Inc. (UCIG), a division of which was Linde. UCIG changed its name to Praxair, Inc. in June 1992. On July 1, 1992 Praxair, Inc. was spun off to shareholders of UCC and became a stand alone, entirely separate corporation from UCC. UCC and Praxair, Inc. are unaffiliated with each other.

There is and was no relationship between Linde Air Products and UCIG or Praxair, Inc., although Linde Air Products Division was a former part of UCC.

14. f) See a) above.

14. g) We are unaware of the history of acquisitions by Union Carbide Corporation and, with respect to Praxair, Inc., maintain that this question is overly broad, burdensome, and not authorized by section 104(e).

14. h)

Date of Incorporation	**State**	**Agents of Service**
10/26/88 Union Carbide Industrial Gases, Inc.	Delaware	CT
6/5/92 Praxair, Inc.	Delaware	Prentice-Hall

14. i) See responses above.

849530006

15. Nick DiFranco, Manager, Environmental Affairs, Praxair, Inc., Industrial Highway, P.O. Box 237, Keasbey, NJ 08832.

John Crane, Operations Manager, Praxair, Inc., Industrial Highway, P.O. Box 237, Keasbey, NJ 08832.

Ed Debor, Vermont Records Center, Union Carbide Corporation, LaPorte Road, P.O. Box 489, Morrisville, VT 05661-0489.

Louise DuPlessis, Paralegal, Praxair, Inc., 39 Old Ridgebury Road, Danbury, CT 06810-5113.

Richard G. Tisch, Senior Group Counsel, Praxair, Inc., 39 Old Ridgebury Road, Danbury, CT 06810-5113.

In accordance with the Freedom of Information Act and enabling regulations, please provide the undersigned all documents in the possession of the United States Environmental Protection Agency (EPA) which relate to the EPA's conclusion stated on p.1 of Attachment A Request for Information to the December 24, 1996 letter from EPA to Mr. Lichtenberger that "EPA has information indicating that hazardous substances from the former Union Carbide - Linde Gas Division facility located at 360 Avenue P in Newark, New Jersey may have been discharged into the Passaic River."

Praxair, Inc. agrees to provide the cost for sending and copying such documents should such cost be authorized under 40 CFR Part 2 and not waived.

Very truly yours,

Nicholas A. DiFranco
Manager, Environmental Affairs

cc: Richard G. Tisch, Esq. (w/encls)

Freedom of Information Officer
U.S. Environmental Protection Agency
290 Broadway
New York, NY 10007 - 1866

849530007

ATTACHMENT 3

	Yes	No
2,3,7,8 tetrachlorodibenzo-p-dioxin or other dioxin compounds		X
Acetone	X	
Acetylene	X	
Ammonia	X	
Ammonium hydroxide	X	
Benzene		X
Calcium carbide	X	
Chlorine	X	
Dimethyl amine	X	
Ethyl benzene		X
Ethylene oxide	X	
Ferric chloride	X	
Hydrogen chloride	X	
Hydrogen sulfide	X	
Methanol	X	
Methyl bromide	X	
Methyl chloride	X	
Methyl mercaptan	X	
Monomethyl amine		X
Nitric oxide		X
Phosgene	X	
Phosphine		X
Polyaromatic Hydrocarbons		X
If "Yes", please list specific compounds		X
Potassium hydroxide	X	
Propylene oxide	X	
Toluene	X	
1,1,1-trichloroethane	X	
Trimethylamine	X	
Xylene	X	

849530008

	Yes	No
PCBs		X
Arsenic		X
Cadmium		X
Chromium		X
Copper		X
Lead		X
Mercury		X
Nickel		X
Silver		X
Zinc		X
Cyanide		X

849530009

ATTACHMENT 11

HAZARDOUS WASTE MANIFEST

(As Required By The Alabama Department of Environmental Management)

Please print or type. *(Form designed for use on elite (12-pitch) typewriter.)*

Form Approved. OMB No. 2050-0039. Expires 9-3

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. F J D 0 8 0 6 2 1 8 8 1 — Manifest Document No. 0 0 0

2. Page 1 of 1

Information in the shaded area is not required by Federal law.

3. Generator's Name and Mailing Address
Linde Gases of the MidAtlantic
360 Avenue P , Newark, NJ 07105

4. Generator's Phone (609) 778-6338

A. State Manifest Document Number: CWMA 604274

B. State Generator's ID: SAME

5. Transporter 1 Company Name: CHEMICAL WASTE MANAGEMENT, INC.

6. US EPA ID Number: I L D 0 9 9 2 0 2 6 8 1

C. State Transporter's ID: 810331

D. Transporter's Phone: (201) 465-212

7. Transporter 2 Company Name

8. US EPA ID Number

E. State Transporter's ID

F. Transporter's Phone

9. Designated Facility Name and Site Address
CHEMICAL WASTE MANAGEMENT, INC.
Emelle Facility
Alabama Highway 17 at Mile Marker 163
Emelle, Alabama 36459

10. US EPA ID Number: A L D 0 0 0 6 2 2 4 6 4

G. State Facility's ID

H. Facility's Phone: 205/652-9721

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	Waste No.
a. CWM 052291-2001 ADEM Non-RCRA Regulated Scrpp Acetylene Cylinders Hazard Class N/A UN/N/A CWM Profile Number H44741	0 0 1	D T	3 8 0 0 0	P	N/A
b. CWM Profile Number					
c. CWM Profile Number					
d. CWM Profile Number					

J. Additional Descriptions for Materials Listed Above
I certify that no absorbent has been added to the waste described on line 11a which would prohibit its being landfill per 3004 (c)
"ORIGINATED IN NEW JERSEY" LIC #NJ-729114

K. Handling Codes for Wastes Listed Above
a. c.
b. d.

15. Special Handling Instructions and Additional Information
Be advised that material may possibly release flammable gases and that transport should be directly to disposal site.

Work Order #: 910207026 Purchase Order #: 0829-841946-000C

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name | Signature | Month Day Year

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name: FRANK T. PARKS | Signature | Month Day Year

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name | Signature | Month Day Year

19. Discrepancy Indication Space

849530010

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.
Printed/Typed Name | Signature | Month Day Year

EPA Form 8700-22 (Rev. 9-86) Previous edition is obsolete.

GENERATOR NO. 1

TIERRA-B-015135

FRANK P/U 3001 849530011

Chemical Waste Management, Inc.
41-85 Doremus Avenue
Newark, New Jersey 07105
Telephone: (201) 465-2121

INVOICE No C 4205
P. C. No.

CUSTOMER CODE:

SOLD TO · CWM
· EMELLE, AL

PICK UP AT · UCC/LINDE GAS
· NEWARK, NJ

INVOICE DATE	YOUR ORDER NO	DATE ORDERED	PICK-UP DATE	SHIPPED VIA	TYPE TRUCK
			2/5/91	CWM	DUMP

VOLUME	TYPE WASTE
1 DUMP	H44741 EMPTY ACETYLENE CYLINDERS

WO # 910207026

WASTE DESTINATION	Standard Safety Procedures	
EMELLE		

TERMS - NET 10 DAYS

TO BE FILLED IN BY DRIVER

WASTE VOLUME & CODE NO. ACTUALLY PICKED UP

CONTAINERS ✓ ONE

NO.	WASTE CODE NO.	SIZE	CANS - PAILS	CARBOYS	BOXES	DRUMS

BULK

WASTE CODE NO.	GALLONS, POUNDS OR YARDS

RANDY O'NEIL 609-778-6338
CUST. REPRESENTATIVE TEL. NO.

Driver FRANK Trk. No. 1748 Trl. No. 3001

Left Terminal

In @ Cust. X 12:30 PM Out of Cust. X 2:30 PM

Breakdown Start Finish

In @ Destin. Out of Destin.

Date 2-05-91 X [signature]
CUSTOMER SIGNATURE

DRIVER IS NOT TO ACCEPT LOAD WITHOUT PROPER SIGNED BILL OF LADING.
DRIVER IS NOT TO ACCEPT IMPROPERLY LABELED DRUMS OR DRUMS THAT ARE IN POOR CONDITION

849530012

HAZARDOUS WASTE MANIFEST

(As Required By The Alabama Department of Environmental Management)

Please print or type. *(Form designed for use on elite (12-pitch) typewriter.)*

Form Approved. OMB No. 2050-0039. Expires 9-30-91

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. NJD062168100 — Manifest Document No.

2. Page 1 of 1 — Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
LINDE GASES OF THE MID ATLANTIC
360 AVENUE P, NEWARK, NEW JERSEY 07105

4. Generator's Phone ( )

A. State Manifest Document Number: CWMA 538157

B. State Generator's ID:

5. Transporter 1 Company Name: CHEMICAL WASTE MANAGEMENT INC — 6. US EPA ID Number: ILD099202681

C. State Transporter's ID: S-10331

D. Transporter's Phone: 201-465-2121

7. Transporter 2 Company Name — 8. US EPA ID Number

E. State Transporter's ID:

F. Transporter's Phone:

9. Designated Facility Name and Site Address
CHEMICAL WASTE MANAGEMENT, INC.
Emelle Facility
Alabama Highway 17 at Mile Marker 163
Emelle, Alabama 35459 — 10. US EPA ID Number: ALD000622464

G. State Facility's ID:

H. Facility's Phone: 205/652-9721

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a. NON RCRA REGULATED SCRAP ACETYLENE CYLINDERS HAZARD CLASS: N/A CWM Profile Number OAXH26781	001	DT	33640	P	N/A
b. CWM Profile Number					
c. CWM Profile Number					
d. CWM Profile Number					

J. Additional Descriptions for Materials Listed Above
" I CERTIFY THAT NO ABSORBENT GAS BEEN ADDED TO THE WASTE DESCRIBED ON LINE 11A WHICH WOULD PROHIBIT ITS BEING LANDFILL PER RCRA 3044 (c)".
ORIGINATED IN NEW JERSEY ADEM # 030690-0018

K. Handling Codes for Wastes Listed Above
a. c.
b. d.

15. Special Handling Instructions and Additional Information
BE ADVISED THAT THE MATERIAL MAY POSSIBLY RELEASE FLAMMABLE GASES AND THAT TRANSPORT SHOULD BE DIRECTLY TO THE DISPOSAL SITE.
Work Order #: 900726010 Purchase Order #: 0629-841946-0011

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment. OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

GENERATOR

Printed/Typed Name: LAMONT G. JONES — Signature: Lamont G Jones — Month 07 Day 24 Year 90

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name: [illegible] — Signature — Month Day Year

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name — Signature — Month Day Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name — Signature — Month Day Year

EPA Form 8700-22 (Rev. 9-86) Previous edition is obsolete. Generator No. 1

TIERRA-B-015137

VHW-001 (REV 9-84)

State of New Jersey
Department of Environmental Protection
Division of Waste Management
CN 028, Trenton, NJ 08625

849530013

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

Form Approved. OMB No. 2050-0039. Expires 9-30-88

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. | Manifest Document No. | 2. Page 1 of | Information in the shaded areas is not required by Federal law.*

3. Generator's Name and Mailing Address
Union Carbide Corporation Linde Division
360 Avenue P
Newark, N.J. 07105

A. State Manifest Document Number: NJA0266246

4. Generator's Phone (201) 589-7435

B. State Gen. ID

5. Transporter 1 Company Name: Cecos International

6. US EPA ID Number: N Y D 0 8 0 3 3 6 2 4 1

C. State Transporter 1 ID

7. Transporter 2 Company Name: Cecos International

8. US EPA ID Number

D. Transporter's Phone

9. Designated Facility Name and Site Address
Cecos International
4879 Spring Grove Avenue
Cincinnati, Ohio 45232

10. US EPA ID Number

E. State Transporter 2 ID

F. Transporter's Phone

G. State Facility's ID

H. Facility's Phone

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a. RQ CORROSIVE SOLID, FOR					
b.					
c.					
d.					

RECEIVED
NOV 18 1987
UNION CARBIDE CORP.
NEWARK, NEW JERSEY
PLANT #863

JRC | WCA | SWH | WAM
JAB | LGJ | | FILE

J. Additional Descriptions for Materials Listed Above

K. Handling Codes for Wastes Listed Above

a.	c.	a.	c.
b.	d.	b.	c.

15. Special Handling Instructions and Additional Information
Work Order # 29242 Product Code 11609 A A P

16. **GENERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.
If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name: W. A. MORAN | Signature: W. A. Moran | Month 11 Day 13 Year 87

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name: Tony Reno | Signature: Tony Reno | Date Month 11 Day 13 Year 87

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name: Tony Reno | Signature: Tony Reno | Date Month 11 Day 13 Year 87

19. Discrepancy Indication Space n/a add D002 F/a add D002, D009 per Walt Moran

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in item 19.

Printed/Typed Name: David E. Stair | Signature: David E. Stair | Date Month 11 Day 17 Year 87

NJA 0266246

3 - TSD MAIL TO - GENERATOR

GENERATOR — TRANSPORTER — FACILITY

Dept. of Environmental Protection, (609) 292-5560 (Day) (609) 292-7172 (Night). In case of emergency, call the state, the emergency occurred in and the

TIERRA-B-015138

VHW-001 (REV. 9/88)

State of New Jersey
Department of Environmental Protection
Division of Hazardous Waste Management
Manifest Section
CN 028, Trenton, NJ 08625

849530014

Please type or print in block letters. (Form designed for use on elite (12-pitch) typewriter.)

Form Approved. OMB No. 2050-0039. Expires 9-30-91

In case of an emergency or spill immediately call the state the emergency occurred in and the N.J. Dept. of Environmental Protection, (609) 292-5586 (Day) (609) 292-7172 (Night)

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. N J D 0 5 9 6 2 1 8 8 1 — Manifest Document No. 0 1 4 6 0

2. Page 1 of 1

Information in the shaded areas is not required by Federal law.

GENERATOR

3. Generator's Name and Mailing Address
LINDE GASES- MID ATLANTIC
UNION CARBIDE
380 AVENUE P, NEWARK, NJ 07105

4. Generator's Phone (201) 589-7435

5. Transporter 1 Company Name — 6. US EPA ID Number
CHEMICAL WASTE MANAGEMENT, INC. N J D 0 9 8 3 3 3 4 8 1

7. Transporter 2 Company Name — 8. US EPA ID Number

9. Designated Facility Name and Site Address — 10. US EPA ID Number
CHEMICAL WASTE MANAGEMENT OF NEW JERSEY, INC.
100 LISTER AVE.
NEWARK, NJ 07105 N J D 0 6 1 9 1 1 6 7 9 0

A. State Manifest Document Number: NJA 0785381

B. State Generator's ID: SAME

C. State Trans. ID: 8 1 1 0 3 3 1

D. Transporter's Phone (201) 465-4154

E. State Trans. ID

F. Transporter's Phone ( )

G. State Facility's ID: SAME

H. Facility's Phone (201) 465-9100

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number) HM		12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a.	X	HAZARDOUS WASTE SOLID, N.O.S. ORM-E NA9189 RQ D002	X X 6	D P	X 1 3 3 0	P	D 0 0 2
b.							
c.							
d.							

J. Additional Descriptions for Materials Listed Above
a. EMI 100T DEEP MONEY DUST (S,T) c.
b. d.

K. Handling Codes for Wastes Listed Above
a. S 0 1 c.
b. d.

15. Special Handling Instructions and Additional Information
A) D27859
WO#501460

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.
If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name: James A Baird — Signature: James A Baird — Month Day Year: 05 04 90

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name: [illegible] — Signature: [signature] — Month Day Year: 05 04 90

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name — Signature — Month Day Year

FACILITY

19. Discrepancy Indication Space
I. Added manifest document #.
11a. Added RQ information. All per phone conversation with James Baird on 5/4/90.

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.
Printed/Typed Name: J. Kyle Donald — Signature: [signature] — Month Day Year: 05 04 90

EPA Form 8700-22 (Rev. 9/88) Previous editions are obsolete.

3 — TSD MAIL TO - GENERATOR

SIGNATURE AND INFORMATION *MUST* BE LEGIBLE ON ALL COPIES

NJA 0785381

HAZARDOUS WASTE MANIFEST

(As Required By The Alabama Department of Environmental Management)

Please print or type. *(Form designed for use on elite (12-pitch) typewriter.)* Form Approved. OMB No. 2050-0039. Expires 9-30-91

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. N J D 0 8 0 6 2 1 8 8 1 1 0 0 0 0 C — Manifest Document No.

2. Page 1 of 1

Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
LINDE GASES OF THE MIDLANTIC
360 AVE. P NEWARK, N.J. 07105

4. Generator's Phone (609) 778-6338

A. State Manifest Document Number: CWMA 604275

B. State Generator's ID: SAME

5. Transporter 1 Company Name: HORWITH TRUCKINGIINC.

6. US EPA ID Number: P A D 0 6 4 0 3 5 8 1 9

C. State Transporter's ID: 57110

D. Transporter's Phone: 215-261-2220

7. Transporter 2 Company Name

8. US EPA ID Number

E. State Transporter's ID

F. Transporter's Phone

9. Designated Facility Name and Site Address
CHEMICAL WASTE MANAGEMENT, INC.
Emelle Facility
Alabama Highway 17 at Mile Marker 163
Emelle, Alabama 35459

10. US EPA ID Number: A L D 0 0 0 6 2 2 4 6 4

G. State Facility's ID

H. Facility's Phone: 205/652-9721

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	Waste No.
a. CWM 052291-2001 ADEM NON-RCRA REGULATED SCRAP ACETYLENE CYLINDERS HAZARD CLASS N/A UN-N/A CWM Profile Number H44741	0 0 1	D T	3 3 1 6 0	P	N/A
b. CWM Profile Number					
c. CWM Profile Number					
d. CWM Profile Number					

J. Additional Descriptions for Materials Listed Above
I certify that no absorbent has been added to the waste described on line 11a which would prohibit its being landfill per 3004 (c)
"ORIGINATED IN NEW JERSEY"

K. Handling Codes for Wastes Listed Above
a. 1 c.
b. d.

15. Special Handling Instructions and Additional Information
Be advised that material may possibly release flammable gases and that transport should be directly to disposal site.
Work Order #: 910208036 Purchase Order #: 0829-841946-000C

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

GENERATOR

Printed/Typed Name	Signature	Month Day Year
J. JOHN CRANE	John Crane	10 20 6 91

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month Day Year
GORDON BIRD	Gordon Bird	10 20 6 91

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month Day Year

FACILITY

19. Discrepancy Indication Space
849530015

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month Day Year
Tim CARROLL	Tim Carroll	10 20 91

EPA Form 8700-22 (Rev. 9-86) Previous edition is obsolete. GENERATOR No. 2 (Must Accompany Shipment)

HAZARDOUS WASTE MANIFEST

(As Required By The Alabama Department of Environmental Management)

(10)

Please print or type. (Form designed for use on elite (12-pitch) typewriter.) 331748 / 252001 Form Approved, OMB No. 2050-0039, Expires 9-30-91

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. N J D 0 8 0 6 2 1 8 8 1 0 0 0 C — Manifest Document No.

2. Page 1 of 1 — Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
Linde Gases of the MidAtlantic
360 Avenue P , Newark, NJ 07105

4. Generator's Phone (609) 778-6338

5. Transporter 1 Company Name — 6. US EPA ID Number
CHEMICAL WASTE MANAGEMENT, INC. I L D 0 9 9 2 0 2 6 8 1

7. Transporter 2 Company Name — 8. US EPA ID Number

9. Designated Facility Name and Site Address — 10. US EPA ID Number
CHEMICAL WASTE MANAGEMENT, INC.
Emelle Facility
Alabama Highway 17 at Mile Marker 163
Emelle, Alabama 35459 A L D 0 0 0 6 2 2 4 6 4

A. State Manifest Document Number: CWMA 604274
B. State Generator's ID: SAME
C. State Transporter's ID: S10331
D. Transporter's Phone: (201) 465-2121
E. State Transporter's ID:
F. Transporter's Phone:
G. State Facility's ID:
H. Facility's Phone: 205/652-9721

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt./Vol.	I. Waste No.
a. CWM 052291-2001 ADEM Non-RCRA Regulated Scrap Acetylene Cylinders Hazard Class N/A UN/N/A CWM Profile Number H44741	0 0 1	D T	3 8 0 0 0	P	N/A
b. CWM Profile Number					
c. CWM Profile Number					
d. CWM Profile Number					

J. Additional Descriptions for Materials Listed Above
I certify that no absorbent has been added to the waste described on line 11a which would prohibit its being landfill per 3004 (c)
"ORIGINATED IN NEW JERSEY" Lic. PLATE # T382LW

K. Handling Codes for Wastes Listed Above
a. L c.
b. d.

15. Special Handling Instructions and Additional Information
Be advised that material may possibly release flammable gases, and that transport should be directly to disposal site. In an event of an emergency contact Chemical Waste Management Inc. at (205) 652-9721
Work Order #: 910207026 Purchase Order #: 0829-841946-000C

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

GENERATOR — Printed/Typed Name: JOHN R CRANE — Signature: John Crane — Month Day Year: 10 21 91

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name: FRANK T. BARONE — Signature: Frank T. Barone — Month Day Year: 10 21 91

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name: — Signature: — Month Day Year:

FACILITY

19. Discrepancy Indication Space
Emergency # added per DC 15 VC 2/7/91

849530016

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in item 19.
Printed/Typed Name: Vanessa Giles — Signature: Vanessa Giles — Month Day Year: 10 29 91

4 Form 8700-22 (Rev. 9-86) Previous edition is obsolete. GENERATOR No. 2 (Must Accompany Shipment)

State of New Jersey
Department of Environmental Protection
Division of Hazardous Waste Management
Manifest Section
CN 028, Trenton, NJ 08625

849530017

Print in block letters. (Form designed for use on elite (12-pitch) typewriter.)

Form Approved. OMB No. 2050-0039. Expires 9-30-91

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. NJD008062181 Manifest Document No. 010019

2. Page 1 of 1 — Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
LINDE GASES OF THE MID-ATLANTIC, INC.
360 AVENUE P NEWARK, NJ 07105

A. State Manifest Document Number NJA 0949830

4. Generator's Phone (609) 778-6338

B. State Generator's ID SAME

5. Transporter 1 Company Name: CHEMICAL WASTE MANAGEMENT, INC.
6. US EPA ID Number: NJD089207681

C. State Trans. ID 511033

7. Transporter 2 Company Name
8. US EPA ID Number

D. Transporter's Phone (201) 465-4154

9. Designated Facility Name and Site Address
CHEMICAL WASTE MANAGEMENT OF NEW JERSEY, INC.
100 LISTER AVE.
NEWARK, NJ 07105
10. US EPA ID Number: NJD089216790

E. State Trans. ID

F. Transporter's Phone ( )

G. State Facility's ID

H. Facility's Phone (201) 465-9100

	HM	11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a.	X	WASTE ALKALINE LIQUID, N.O.S. CORROSIVE MATERIAL NA1719 "GUIDE 60"	X30	DF	XX172	G	D002
b.	X	WASTE FLAMMABLE LIQUID, N.O.S. (F005, D001) FLAMMABLE LIQUID UN1993 "GUIDE 27"	XX5	DF	XXX80	G	F003
c.	X	WASTE ACID LIQUID, N.O.S. CORROSIVE MATERIAL NA1760 "GUIDE 60"	X32	DF	XX160	G	D002
d.	X	WASTE FLAMMABLE LIQUID, N.O.S. (D001) FLAMMABLE LIQUID UN1993 "GUIDE 27"	XX2	DM	XX110	G	F003

J. Additional Descriptions for Materials Listed Above

a. W06010 (AMMONIUM HYDROXIDE, POTASSIUM HYDROXIDE) (C,L) LG-1-21,28,54,55,57-62

b. W06010 (XYLENE, ACETONE, TOLUENE) (I,L) LG-30,67-70 (F005, D001)

c. W06010 (HYDROCHLORIC ACID, SULFURIC ACID) (C,L) LG-22-27,31-51,56,63-66

d. U02000 (XYLENE) (I,L) CT1,2 (D001)

K. Handling Codes for Wastes Listed Above

a. | c. |
b. | d.

15. Special Handling Instructions and Additional Information
a-c) PACKAGED LAB CHEMICALS
SEE LISTS
WOA 50205 106552.1

BILL TECH SERVICES
MID ATLANTIC DIVISION
ACCT # 174-91

IN CASE OF EMERGENCY
CONTACT CHEMTREC AT
1-800-424-9300

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name: ANTONIO CRUZ (SECURITY OFFICER) Signature: [signature] Month Day Year: 10/15/91

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name: CAROLYN THIERFELDER Signature: [signature] Month Day Year: 10/15/91

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name Signature Month Day Year

19. Discrepancy Indication Space

Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.
Printed/Typed Name Signature Month Day Year

Form 8700-22 (Rev. 9/88) Previous editions are obsolete.

TSD MAIL TO - TSD'S STATE

SIGNATURE AND INFORMATION *MUST* BE LEGIBLE ON ALL COPIES

NJA0949830

State of New Jersey
Department of Environmental Protection
Division of Hazardous Waste Management
Manifest Section
CN 028, Trenton, NJ 08625

Please type or print in block letters. (Form designed for use on elite (12-pitch) typewriter.)

Form Approved. OMB No. 2050-0039. Expires 9-30-

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. NJ0 0 8 0 6 2 1 8 8 1 — Manifest Document No. 0 0 0 1 2 — 2. Page 1 of 1 — Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
LINDE GASES OF THE MID-ATLANTIC, INC.
360 AVENUE P NEWARK NJ 07105

A. State Manifest Document Number NJA 0949831

4. Generator's Phone (609) 778-6338

B. State Generator's ID SAME

5. Transporter 1 Company Name CHEMICAL WASTE MANAGEMENT, INC. — 6. US EPA ID Number I L 0 0 9 9 2 0 2 6 8 1

C. State Trans. ID S1 0 3 3 1

7. Transporter 2 Company Name — 8. US EPA ID Number

D. Transporter's Phone (201) 465-415

E. State Trans. ID

9. Designated Facility Name and Site Address
CHEMICAL WASTE MANAGEMENT OF NEW JERSEY, INC.
100 LISTER AVE.
NEWARK NJ 07105 — 10. US EPA ID Number NJ 0 0 8 9 2 1 6 7 9 0

F. Transporter's Phone ( )

G. State Facility's ID

H. Facility's Phone (201) 465-9100

	11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number) HM		12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a.	X	WASTE FLAMMABLE LIQUID, N.O.S. (F005, D001) FLAMMABLE LIQUID UN1993 "GUIDE 27"	X15	DM	XXX75	G	F003
b.	X	WASTE FLAMMABLE LIQUID, N.O.S. (F005, D001) FLAMMABLE LIQUID UN1993 "GUIDE 27"	XX3	DF	XXX15	G	F003
c.		NON REGULATED MATERIAL NON REGULATED	X13	DF	XXX65	G	X900
d.		NON REGULATED MATERIAL NON REGULATED	XX6	DF	XXX96	G	X900

J. Additional Descriptions for Materials Listed Above
a. WD6025 (XYLENE, TOLUENE) (I,L) UC1-6,8,9,11-16,21 (F005, D001)
b. WD6025 (XYLENE, TOLUENE) (I,L) UC7,10,17 (F005, D001)
c. WD6025 (L) UCR-24,25,27-31
d. WD6010 (L) LG29,52,53,71,72,73

K. Handling Codes for Wastes Listed Above
a. S01 c. S01
b. S01 d. S01

15. Special Handling Instructions and Additional Information
a-d) PACKAGED LAB CHEMICALS: SEE LISTS
BILL TECH SERVICES MID-ATLANTIC DIVISION ACCT # 174-91
IN CASE OF EMERGENCY CONTACT CHEMTREC AT 1-800-424-9300
WO# 302054 LOG 652H

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.
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Printed/Typed Name: ANTONIO CRUZ Safety Officer — Signature: Antonio Cruz — Month 01 Day 09 Year 91

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name: CAROLYN THIERFELDER — Signature: Carolyn Thierfelder — Month 01 Day 15 Year 91

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name — Signature — Month Day Year

19. Discrepancy Indication Space
849530018

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.
Printed/Typed Name: David Knutson — Signature — Month 01 Day 16 Year 91

EPA Form 8700-22 (Rev. 9/88) Previous editions are obsolete.

3 — TSD MAIL TO - GENERATOR

SIGNATURE AND INFORMATION *MUST* BE LEGIBLE ON ALL COPIES

GENERATOR — TRANSPORTER — FACILITY

In case of an emergency involving this waste, contact the N.J. Dept. of Environmental Protection, (609) 292-5900 (Day) (609) 292-7172 (Night)

TIERRA-B-015143

State of New Jersey
Department of Environmental Protection
Division of Hazardous Waste Management
Manifest Section
CN 028, Trenton, NJ 08625

Please type or print in block letters. (Form designed for use on elite (12-pitch) typewriter.)

Form Approved. OMB No. 2050-0039. Expires 9-30-91

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. NJD980621681 — Manifest Document No. 6[illegible]
2. Page 1 of 1 — Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
UNION CARBIDE
260 AVE P
NEWARK,
4. Generator's Phone ([illegible] 928-8[illegible] NJ 07105

A. State Manifest Document Number: NJA 1144205
B. State Generator's ID: SAME
C. State Trans. ID [illegible]
D. Transporter's Phone ([illegible]
E. State Trans. ID
F. Transporter's Phone ( )
G. State Facility's ID [illegible]
H. Facility's Phone (201-661-2006)

5. Transporter 1 Company Name: SAFETY-KLEEN CORP.
6. US EPA ID Number: ILD051060408
7. Transporter 2 Company Name
8. US EPA ID Number

9. Designated Facility Name and Site Address
SAFETY-KLEEN CORP.
1200 SYLVAN ST.
LINDEN, NJ 07036
10. US EPA ID Number: 0-006-35 / NJD002182897

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)

		HM	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a.	X	WASTE 1,1,1-TRICHLOROETHANE ORM_A UN2831 (FOOI)(ERG#74)	XX	DM	1 A 55	P	F 0 0 1
b.	X	PETROLEUM OIL COMBUSTIBLE LIQUID NA1270 (ERG#27) (NOT USEPA HAZARDOUS WASTE)(NJ X726)	XX	TL	XX 1/2	P	X 1 7 1 9
c.							
d.							

J. Additional Descriptions for Materials Listed Above
a.
b. NHDW
c.
d.

Handling Codes for Wastes Listed Above
a. T01 S02
b. T01 S02
c.
d.

15. Special Handling Instructions and Additional Information: 116-02-9263, INV.#M65081, WLLR 91-16
11a SAM#135808 CONTROL#0091247-5 11d SAM# CONTROL#
11b SAM#135807 CONTROL#0091244-8 EMERG. RESP. # 1-708-888-4660
11c SAM# CONTROL# SKDOT# A:0511 B:1092 C: D:

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.
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168746

Printed/Typed Name: RALPH DAY — Signature: Ralph Day — Month Day Year: 04/19/91

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name: MARK DeFederico — Signature — Month Day Year: 04/19/91

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name — Signature — Month Day Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.
849530019
Printed/Typed Name: [illegible] — Signature — Month Day Year: 4/22/91

EPA Form 8700-22 (Rev. 9/88) Previous editions are obsolete.

3 — TSD MAIL TO - GENERATOR

SIGNATURE AND INFORMATION MUST BE LEGIBLE ON ALL COPIES

GENERATOR

In and the N.J. Dept. of Environmental Protection. (609) 292-5580 (Day) (609) 292-7172 (Night)

NJA

TIERRA-B-015144

PAGE ___ OF ___

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
HAZARDOUS WASTE GENERATOR ANNUAL REPORT 1987
- REPORT FORM -

1. Generator Name: UCC LINDE DIVISION 2. EPA ID No.: NJD 080336241
3. Site Address: 360 AVENUE P NEWARK NEW JERSEY 07105
4. Transporter Name: CECOS INTERNATIONAL 5. EPA ID No.: NJD 080336241
6. TSD Facility Name: CECOS INTERNATIONAL 7. EPA ID No.: OHD 000816629
8. TSD Address: 4879 SPRING GROVE AVE. CIICINNATI OHIO 45230

9. A.) Waste Number	B.) Waste Description	C.) DOT Haz Class	D.) Total Quantity	E.) Units
D009-D002	CORROSIVE SOLID NOS	CORROSIVE MATERIAL UN 1759	880	P

NOTE: For each combination of transporter and TSD facility, list the total quantity manifested for each waste type.

849530020

PAGE ___ OF ___

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
HAZARDOUS WASTE GENERATOR ANNUAL REPORT 1987
- REPORT FORM -

1. Generator Name: UCC LINDE DIVISION 2. EPA ID No.: NJD 080621881
3. Site Address: 360 AVENUE P NEWARK NEW JERSEY 07105
4. Transporter Name: NEWARK DISPOSAL 5. EPA ID No.: 8138
6. TSD Facility Name: H.M.D.C. 7. EPA ID No.: 0907W
8. TSD Address: 1 De Korte PARK PLAZA LYNDHURST N.J. 07071

9. A.) Waste Number	B.) Waste Description	C.) DOT Haz Class	D.) Total Quantity	E.) Units
	ASBESTOS	ORN-C	74.1	Y

NOTE: For each combination of transporter and TSD facility, list the total quantity manifested for each waste type.

849530021

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
HAZARDOUS WASTE GENERATOR ANNUAL REPORT 1987
- WASTE SUMMARY FORM -

Generator Name: UNION CARBIDE CORP. LINDE DIVISION

EPA ID No.: N.J.D. 080621881

DIRECTIONS:

Please indicate below the total quantity of hazardous waste manifested during the 1987 report year for each unit of measure. Enter the units of measure as they appeared on the manifest(s). Do not convert one form of unit of measure to another.

0	G - Gallons (liquids only)
880	P - Pounds
0	T - Tons (2,000 lbs.)
74.1	Y - Cubic Yards
0	L - Liters (liquids only)
0	K - Kilograms
0	M - Metric Tons (1,000 kg)
0	N - Cubic Meters

*Enter zero (0) for units of measure which were not utilized.

849530022

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
HAZARDOUS WASTE GENERATOR ANNUAL REPORT 1984

I. EPA ID Number: NJD 080621881

II. Generator Name: Union Carbide Corporation Linde Division

III. _____ Check here if there was no hazardous waste manifested during the report year.

III B. ✓ Check here if the company is considered a small quantity generator.

IV. Contact Person: John R. Crane

V. Phone Number: 201-598-7435

VI. Annual total of waste generated (Attachment)

VII. Company information verification (Attachment)

VIII. Certification

I certify that the information given in this annual report is true, accurate and complete.

John R. Crane		2-12-85
(Print or type name)	(Signature)	(Date)

849530023

COPY AS SNT 2/25/82

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF HAZARDOUS WASTE
GENERATOR'S ANNUAL REPORT
FOR YEAR OF 1981

1. GENERATOR'S NAME UNION CARBIDE CORP.- LINDE DIVISION 2. EPA ID NO. NJD080621881

3. ADDRESS 360 AVE P NEWARK, N.J. 07105

4. TRANSPORTER'S NAME N/A 5. EPA ID NO. N/A

6. ADDRESS N/A

7. FACILITY'S NAME N/A 8. EPA ID NO. N/A

9. ADDRESS N/A

10. MANIFEST NO.	DESCRIPTION OF WASTE	DOT HAZ.CLASS	QUANTITY	UNITS	EPA WASTE TYPE	REJECTE

* - PLACE AN "*" UNDER THE REJECTED COLUMN FOR THOSE MANIFESTS REJECTED BY FACILITY.

849530024

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
HAZARDOUS WASTE GENERATOR ANNUAL REPORT 1987
- REPORT FORM -

1. Generator Name: UCC UNDE DIJISION 2. EPA ID No.: NJD080621881
3. Site Address: 360 AVE P NEWARK, N.J. 07105
4. Transporter Name: Cecos International 5. EPA ID No.: NYD080336241
6. TSD Facility Name: Cecos International 7. EPA ID No.: OHD000816629
8. TSD Address: 4879 Spring Grove Ave, Cincinnati, OHIO 45230

9. A.) Waste Number	B.) Waste Description	C.) DOT Haz Class	D.) Total Quantity	E.) Units
D009-D02	CORROSIVE SOLID NOS	CORROSIVE MATERIAL UN1759 NO LABEL	880	P

E: For each combination of transporter and TSD facility, list the total quantity manifested for each waste type.

849530025

Disposal
CASOTA
044-2555
10 L

MENT OF ENVIRONMENTAL PROTECTION
E GENERATOR ANNUAL REPORT 1987
- REPORT FORM -

DIVISION

3. Site Address: 360 AVE P NEWARK, N.J. 07105
2. EPA ID No.: NJD.080621881
4. Transporter Name: Newark Disposal
5. EPA ID No.: 8138
6. TSD Facility Name: Hackensack HMDC Balan-Bypass
7. ~~EPA~~ DEP ID No.: 0907W
8. TSD Address: 1 Dakota Park Plaza Lyndhurst 07071

9. A.) Waste Number	B.) Waste Description	C.) DOT Haz Class	D.) Total Quantity	E.) Units
	WASTE Asbestos	DRN-C NO LABEL NO UN Number	2000	Cu. FT.

HACKENSACK MEADOWLANDS
DEVELOPMENT COMMISSION
460-1700 -
998-7900 · DAN BALAN
Dep# 0907W
EPA #
CHK'S.

NOTE: For each combination of transporter and quantity manifested for each waste type.

849530026

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
HAZARDOUS WASTE GENERATOR ANNUAL REPORT 1987
- WASTE SUMMARY FORM -

Generator Name: UNION CARBIDE CORP LINDE DIVISION

EPA ID No.: NJD. 080621881

DIRECTIONS:

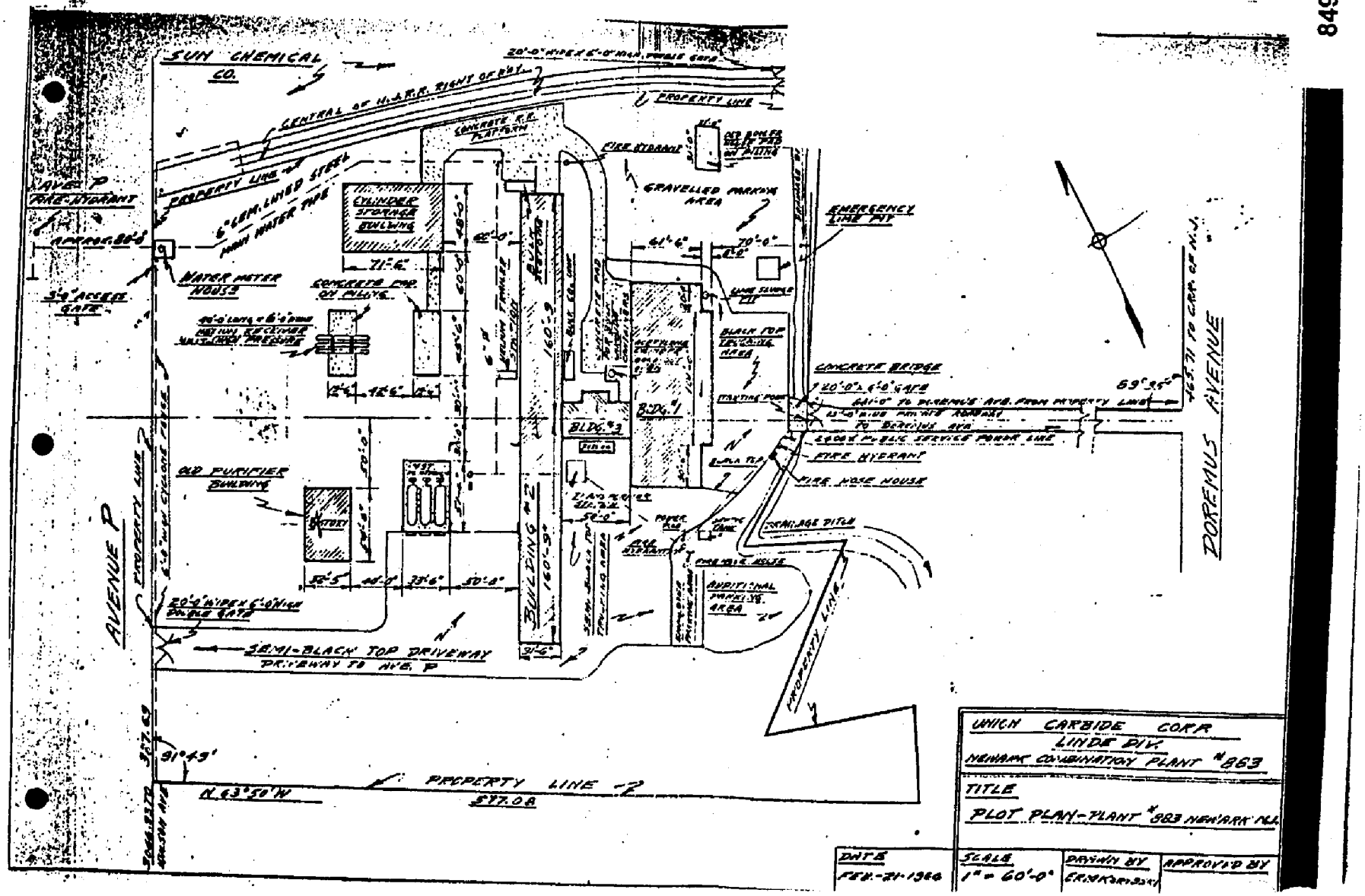
Please indicate below the total quantity of hazardous waste manifested during the 1987 report year for each unit of measure. Enter the units of measure as they appeared on the manifest(s). Do not convert one form of unit of measure to another.

0	G - Gallons (liquids only)
880	P - Pounds
0	T - Tons (2,000 lbs.)
74.1	Y - Cubic Yards
0	L - Liters (liquids only)
0	K - Kilograms
0	M - Metric Tons (1,000 kg)
0	N - Cubic Meters

*Enter zero (0) for units of measure which were not utilized.

849530027

ATTACHMENT 6. d)



849530028

ATTACHMENT 12.

INTERNATIONAL TECHNOLOGY CORPORATION

REMEDIAL INVESTIGATION REPORT
PRAXAIR, INC.
NEWARK, NEW JERSEY
ISRA CASE NO. 90254

RESPONSIVE TO THE NEEDS OF ENVIRONMENTAL MANAGEMENT

849530029

REMEDIAL INVESTIGATION REPORT
PRAXAIR, INC.
NEWARK, NEW JERSEY
ISRA CASE NO. 90254

PREPARED FOR:

PRAXAIR, INC.
LINDE DIVISION
P.O. BOX 44
TONAWANDA, NEW YORK 14151-0044

PREPARED BY:

IT CORPORATION
165 FIELDCREST AVENUE
EDISON, NEW JERSEY 08837

PROJECT NO. 529342

SEPTEMBER 1993

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List of Appendices

1.0 Introduction

Linde Gases of the Mid-Atlantic, Inc. (Linde) ceased operations of its Newark, New Jersey facility in 1990. Linde formerly was a subsidiary of Union Carbide Industrial Gases, Inc. (UCIG), which in turn was a subsidiary of Union Carbide Corporation. The cessation of operations required Linde to comply with the Environmental Cleanup Responsibility Act (ECRA), as amended and supplemented by the Industrial Site Recovery Act (ISRA), effective July 1, 1993. ISRA is administered by the New Jersey Department of Environmental Protection and Energy (NJDEPE).

A final conditional sampling plan approval letter was received on October 15, 1991 from the NJDEPE. IT Corporation (IT) implemented a soil and groundwater investigation at the Linde Newark, New Jersey facility and submitted a summary report to the NJDEPE in January 1992, on behalf of Linde.

On April 3, 1992, the NJDEPE issued a comment letter in response to the January 1992 report. Subsequent to receipt of the April 3, 1992 letter, a meeting/site walk was held at the Linde Newark, New Jersey facility on May 18, 1992. Attendees of the meeting, representing the NJDEPE, Linde and IT, discussed the various areas of environmental concern of the property, and related issues following a site walk. Subsequent to the May 18, 1992 meeting/site walk, the NJDEPE issued a conditional approval letter dated June 29, 1992. This letter outlined the agreed upon course of action for the respective areas of environmental concern at the property.

In June 1992, Linde's parent company UCIG changed its name to Praxair, Inc. and was spun-off from Union Carbide Corporation.

IT implemented a soil and groundwater investigation in response to the June 29, 1992 NJDEPE approval letter. A Remedial Investigation Report (RIR) was submitted to the NJDEPE in September 1992. The RIR summarized the results of this investigation and concluded with a no further action proposal.

In January 1993, the NJDEPE issued a comment letter to the September 1992 RIR stating certain Praxair proposals for no further action were unacceptable. As a result, a meeting was held between the NJDEPE, Praxair and IT on April 19, 1993. This meeting resulted in a consensus for a future course of action regarding the remaining areas of environmental concern. This consensus was confirmed in Praxair's May 5, 1993 letter to the NJDEPE.

In July 1993, Praxair submitted a RIR summarizing the results of the investigation completed according to the consensus reached and documented in the May 5, 1993 Praxair letter to the NJDEPE.

As requested, the NJDEPE completed an expedited review of the July 1993 RIR to facilitate immediate action by Praxair, if any. Comments from the NJDEPE were received by telephone on August 3, 1993 and documented in Praxair's letter to the NJDEPE dated August 4, 1993. Appendix A contains a copy of the August 4, 1993 Praxair letter to the NJDEPE.

As a result of NJDEPE input, it was established that the only remaining area of environmental concern at this site was the lime pond area. Therefore, Praxair was able to immediately implement further remedial action in this area.

This September 1993 RIR, prepared for Praxair, summarizes the results of the additional remedial action in the lime pond area. These actions were implemented as a result of the NJDEPE verbal comments received on August 3, 1993.

2.0 Lime Pond Area

The lime pond area is in the southern portion of the property. The entire area is estimated to be 4.5 to 5.0 acres, approximately half of the property's estimated 10 acres. Figure 1 shows the facility site plan depicting the lime pond area within the property.

Because of the historic backfilling of the lime pond area with soil from a non-documented/unknown source, Praxair conducted random sampling to initially characterize the area. Five soil samples, LP-1 through LP-5, were collected and analyzed for full priority pollutants plus forty (PP+40) and total petroleum hydrocarbons (TPHC). Sampling of the backfill soil was completed in July 1992.

Results of the soil sample PP+40 and TPHC analyses indicated the fill used in this area is consistent with the surrounding industrial area and the anticipated future non-residential property use. Primarily, there were limited metals and polynuclear aromatic hydrocarbons detected in the fill material samples, indicating there were no exorbitant levels of hazardous substances in the fill. The remaining fractions of the PP+40 analyses were either not detected or exhibited insignificantly low concentrations of contaminants. The TPHC analytical results ranged from 1,000 to 8,200 parts per million (ppm). The results also gave no indication that this area has been utilized as a repository for hazardous substances.

Based upon the meeting discussions with the NJDEPE, it was agreed that additional soil sampling was needed to more fully characterize this large area.

Utilizing EPA methodology outlined in EPA's July 1991 publication *A Guide: Methods for Evaluating the Attainment of Cleanup Standards for Soil and Solid Media,* (EPA Publication 9355.4-04FS), Praxair determined that 50 soil samples would be an appropriate number of samples for this area. To best characterize the area, 25 locations were evenly laid out in a grid formation over the 400 by 500-foot area. Figure 2 shows the 25 soil sampling locations in the lime pond area. Two samples were collected at each location, one at the surficial six-inch interval and the second at the 1.5 to 2.0 foot interval below existing grade. Based upon the analytical results of the initial five investigative samples, the 50 soil samples were analyzed for arsenic, chromium, copper, lead, zinc and the priority pollutant polynuclear aromatic hydrocarbons (PAHs).

Analytical results in the grid soil sampling program indicated elevated levels of lead, arsenic, and benzo(a)pyrene (BaP) in surficial soil in exceedence of NJDEPE soil cleanup guidance. The average lead concentration of all samples was 2,330 ppm with concentrations ranging from 13 ppm to 28,000 ppm. The average concentration of arsenic was 15.3 ppm with concentrations ranging from 0.91 ppm to 60 ppm. The average concentration of BaP was 1.48 ppm with concentrations ranging from not detected to 22 ppm.

On August 3, 1993, Praxair held discussions with the NJDEPE regarding the July 1993 RIR and possible remedial alternatives for this area. These discussions resulted in revised site-specific soil cleanup guidance of 1,200 ppm for lead and less than 20 ppm for arsenic. Additionally, a consensus was reached with the NJDEPE for removal of lime pond area "hot spot" locations by excavation with confirmatory postexcavation soil sample analyses utilizing the revised soil cleanup guidance.

Lead, arsenic and BaP were the only remaining contaminants exhibiting elevated concentrations at several sample points. Remedial excavations were completed at locations with these elevated contaminant concentrations. Figure 2 shows the original soil sampling locations where remedial excavations were completed. The remedial excavations progressed in stages based upon confirmatory postexcavation soil sample analytical results. Initial excavations were completed on August 5, 1993 at previous soil sampling locations LP-8, LP-11, LP-14, LP-17, LP-18, LP-19, LP-21, LP-23, LP-24, LP-25, LP-27 and LP-30. Some locations required removal of additional soil. Therefore, excavations were continued at locations LP-14, LP-17, LP-19, LP-23, LP-24, LP-25, LP-27 and LP-30 on August 14, 1993 and again at locations LP-14, LP-24, and LP-27 on August 24, 1993. Final excavations were completed on September 8, 1993 at location LP-14 only. Appendix B contains copies of the excavation classification logs. Appendix C contains copies of the postexcavation soil sample collection logs.

The cumulative data for postexcavation soil sampling analytical results of all excavations was evaluated following the August 24, 1993 excavations. At this point it was determined that average lead concentrations were 1,164.4 ppm and average arsenic concentrations were 14.3 ppm. These average concentrations are below the NJDEPE revised site-specific soil cleanup guidance of 1,200 ppm for lead and less than 20 ppm for arsenic.

From 41 sample data points, generated as of the August 24, 1993 excavations, the average BaP concentration was reduced to 1.28 ppm. The initial grid sampling analytical results of 50 data points had a 44% rate of not detected for BaP. Furthermore, this area consists of a non-process

related/historical fill. Based upon these factors, Praxair believed a larger data base would confirm the historical fill condition and provide greater confidence in the final average concentration. As a result, postexcavation soil samples were collected for BaP analysis at previously excavated locations. Postexcavation soil samples were initially collected at these excavations for confirmatory analyses of lead and arsenic, but these samples had not been analyzed for BaP.

Results of the additional BaP soil sample analyses indicate the average BaP concentration in the lime pond area is 1.44 ppm. Table 1 attached provides a summary of the latest existing soil sampling analytical data for the lime pond area with average arsenic, lead and BaP concentrations, respectively. Average concentrations are calculated from both the remaining unexcavated grid soil sampling locations of May 1993 and final confirmatory postexcavation soil sample analytical results.

3.0 Conclusions and Recommendations

Historically the lime pond area was utilized for the temporary storage of lime, a co-product of the acetylene gas production at the Newark, New Jersey plant. The lime was removed from this area and sold for various beneficial environmental uses including wastewater treatment. Following the cessation of acetylene gas production operations, this area was back-filled with local fill materials whose source remains unknown at the present time. This back-filling took place during the 1960s. As a result, this fill material was investigated by means of a representative grid soil sampling program. The investigative soil sampling program revealed the presence of minimal contamination consistent with the heavily industrialized surrounding area. However, a limited amount of elevated contamination ("hot spots") was present within the lime pond area and removal of the hot spots was completed by remedial excavation. Approximately 138 cubic yards of contaminated historical fill material was removed by excavation in the lime pond area. Postexcavation soil sample analytical results indicate average contaminant concentrations have been reduced significantly in the lime pond area. Specifically, average concentrations of arsenic, lead and BaP have been reduced from 15.3 ppm, 2,330 ppm and 1.48 ppm to 14.3 ppm, 1,164.4 ppm and 1.44 ppm, respectively.

BaP hot spots of 22 ppm and 13 ppm have been removed. The highest concentration of BaP in the lime pond area has been reduced from 22 ppm to 9.9 ppm. The median sample concentration of BaP is 0.97 ppm. That is, of the 85 data points, 42 are above 0.97 ppm and 42 are below 0.97 ppm. In 71 of the 85 data points, BaP was detected. These statistics indicate that BaP is pervasive throughout the lime pond area and further support the conclusion that BaP is present within the historical fill material and not present due to any plant process discharge or related activity. No historical process at the Newark plant would account for the direct production of BaP. Further attemps by Praxair to reduce the average BaP concentration would require an onerous cleanup effort, above and beyond the intent of the hot spot excavations. Praxair contends such a cleanup would seem futile due to the continuous off-site sources of BaP.

It is documented[1] that BaP is not produced on a commercial scale in the United States. BaP is, in fact, known to be a by-product of combustion of fossil fuels including coal, gasoline, fuel oil and diesel fuel.[2] Appendix D contains copies of the reference material sources for further information.

Praxair believes that the presence of BaP in the lime pond fill material is a historic fill condition, the result of the cumulative effect of decades of fossil fuel combustion in the Newark area which continues even today.

Coal combustion was especially prevalent in the Newark industrial area, where the Praxair site is located. Gasoline and diesel fuel combustion have been and continue to be prevalent in the area. Currently, ongoing operations, in the immediate vicinity of the Praxair site, burn fossil fuels. The New Jersey Turnpike, located less than 200 yards from the property, has been in continuous operation for over 40 years.

The NJDEPE is utilizing the conservative non-residential surficial soil cleanup guidance of 0.66 ppm for BaP. In conjunction with the suspected carcinogenicity of BaP, NJDEPE determined this cleanup guidance using the BaP potency factor for EPA's 1983 health effects assessment of BaP[3]. By comparison with other organic compounds with better documented toxicities, however, BaP appears to be less of a human health threat in either the ingestion or inhalation scenario. Benzene, a known carcinogen for example, currently has a non-residential surficial soil cleanup guidance of 13 ppm.

NJDEPE's policy utilizes the proposed soil cleanup standards as guidance on a case by case basis. In this case, the BaP is pervasive in the lime pond area in relatively low concentrations. As stated above, Praxair has completed the removal of hot spots with confirmatory postexcavation soil sample analyses. Groundwater sampling analytical data collected during this

---

[1] Marshall Sittig, Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2nd, ed., (Park Ridge, NJ: Noyes Publications, 1985), pp. 118-119.

[2] "Sixth Annual Report on Carcinogens Summary 1991," U.S. Dept. of Health and Human Services, 1991, pp. 327-333.

"Toxicological Profile for Benzo(a)pyrene," ATSDR, Atlanta, GA, May 1990, p. 73.

[3] "Technical Basis and Background for Cleanup Standards for Contaminated Sites," NJDEPE, January 24, 1992, p. 20.

ISRA investigation indicate there have been no impacts to groundwater from facility operations, nor is there any indication of BaP in groundwater.

Praxair's research indicates that the source of BaP in the lime pond area is not from a direct Praxair plant process, but most likely is a by-product of fossil fuel combustion accumulated over an extensive period. Arguably the low concentrations of BaP, the lack of an on-site source, and the ongoing off-site sources of BaP call for NJDEPE's flexible application of its guidance in this case. In further support, Praxair reiterates the future use of the entire facility property will remain non-residential and the property will be deed noticed as such.

Based on the foregoing, no further actions are proposed for the lime pond area.

TABLE 1

LIME POND AREA
INVESTIGATIVE AND
POSTEXCAVATION
SOIL SAMPLING

ANALYTICAL RESULTS
SUMMARY

PRAXAIR, INC. FACILITY
NEWARK, NEW JERSEY

SAMPLE IDENTIFICATION	LP-6A	LP-6B	LP-7A	LP-7B	LP-8 A	LP-8 B	LP-8 C	LP-8 D	LP-8 E	LP-9A	LP-9B	LP-10A	LP-10B
SAMPLE DATE	05/26/93	05/26/93	05/26/93	05/26/93	8/5/93	8/5/93	8/5/93	8/5/93	8/5/93	05/26/93	05/26/93	05/26/93	05/26/93
SAMPLE DEPTH BELOW GRADE	0 to 0.5'	1.5 to 2.0'	0 to 0.5'	1.5 to 2.0'	1.5 to 2.0'	1.5 to 2.0'	1.5 to 2.0'	1.5 to 2.0'	2.0 to 2.5'	0 to 0.5'	1.5 to 2.0'	0 to 0.5'	1.5 to 2.0'
Arsenic	15	20	11	16	13	11	8.6	24	11	7.1	4.4	15	0.91
Lead	930	1000	1000	170	1300	1200	1000	1900	1200	530	490	1100	13
Benzo(a)Pyrene	0.48	0.58	1.5	1.05	3.2	9.9	3.6	1.2	2.4	ND	ND	1.2	ND
(Alternative BaP sample date)					9/8/93	9/8/93	9/8/93	9/8/93	9/8/93				

"ND" indicates compound is not detected above the detection limit

"NA" indicates sample was not analyzed for this parameter.

TABLE 1

LIME POND AREA
INVESTIGATIVE AND
POSTEXCAVATION
SOIL SAMPLING

ANALYTICAL RESULTS
SUMMARY

PRAXAIR, INC. FACILITY
NEWARK, NEW JERSEY

SAMPLE IDENTIFICATION	LP-11									LP-14			
	A	B	C	D	E	LP-12A	LP-12B	LP-13A	LP-13B	A-4	B-3	C-3	D-4
SAMPLE DATE	8/5/93	8/5/93	8/5/93	8/5/93	8/5/93	05/26/93	05/26/93	05/26/93	05/26/93	6/24/93	8/24/93	8/24/93	8/24/93
SAMPLE DEPTH BELOW GRADE	1.5 to 2.0'	1.5 to 2.0'	1.5 to 2.0'	1.5 to 2.0'	2.0 to 2.5'	0 to 0.5'	1.5 to 2.0'	0 to 0.5'	1.5 to 2.0'	3.0 to 3.5'	3.0 to 3.5'	3.0 to 3.5'	3.0 to 3.5'
Arsenic	NA	NA	NA	NA	NA	21	0.61	7.9	21	NA	NA	NA	19.8
Lead	2300	1100	830	820	1400	2300	17	590	570	NA	NA	NA	NA
Benzo(a)Pyrene	0.54	0.45	0.71	0.46	0.94	ND	ND	0.7	4	1.06	1.6	0.76	0.62
(Alternative BaP sample date)	9/8/93	9/8/93	9/8/93	9/8/93	9/8/93					9/8/93			9/8/93

"ND" indicates compound is not detected above the detection limit.

"NA" indicates sample was not analyzed for this parameter.

TABLE 1

LIME POND AREA
INVESTIGATIVE AND
POSTEXCAVATION
SOIL SAMPLING

ANALYTICAL RESULTS
SUMMARY

PRAXAIR, INC. FACILITY
NEWARK, NEW JERSEY

SAMPLE IDENTIFICATION	LP-14 E-4	LP-15A	LP-15B	LP-16A	LP-16B	LP-17 A	LP-17 B-2	LP-17 C	LP-17 D	LP-17 E-2	LP-18 A	LP-18 B	LP-18 C
SAMPLE DATE	8/24/93	05/26/93	05/26/93	05/26/93	05/26/93	8/5/93	8/14/93	8/5/93	8/5/93	8/14/93	8/5/93	8/5/93	8/5/93
SAMPLE DEPTH BELOW GRADE	3.5 to 4.0'	0 to 0.5'	1.5 to 2.0'	0 to 0.5'	1.5 to 2.0'	1.5 to 2.0'	2.5 to 3.0'	1.5 to 2.0'	1.5 to 2.0'	3.0 to 3.5'	1.5 to 2.0'	1.5 to 2.0'	1.5 to 2.0'
Arsenic	NA	11	5.5	9.9	11	22	17	23	25	17	24	17	29
Lead	NA	550	220	1000	1000	1500	1450	2400	1900	NA	1400	1500	2200
Benzo(a)Pyrene	5.9	1.02	1.8	ND	ND	0.45	0.63	0.43	0.21	1.6	1.3	0.97	0.86
(Alternative BaP sample date)	9/8/93					9/8/93	9/8/93	9/8/93	9/8/93	9/8/93	9/8/93	9/8/93	9/8/93

"ND" indicates compound is not detected above the detection limit.

"NA" indicates sample was not analyzed for this parameter.

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TABLE 1

LIME POND AREA INVESTIGATIVE AND POSTEXCAVATION SOIL SAMPLING

ANALYTICAL RESULTS SUMMARY

PRAXAIR, INC. FACILITY NEWARK, NEW JERSEY

SAMPLE IDENTIFICATION	LP-18 D	LP-18 E	LP-19 A-2	LP-19 B	LP-19 C	LP-19 D	LP-19 E	LP-20A	LP-20B	LP-21 A	LP-21 B	LP-21 C	LP-21 D
SAMPLE DATE	8/5/93	8/5/93	8/14/93	8/5/93	8/5/93	8/5/93	8/5/93	05/26/93	05/26/93	8/5/93	8/5/93	8/5/93	8/5/93
SAMPLE DEPTH BELOW GRADE	1.5 to 2.0'	2.0 to 2.5'	1.5 to 2.0'	1.5 to 2.0'	1.5 to 2.0'	1.5 to 2.0'	2.0 to 2.5'	0 to 0.5'	1.5 to 2.0'	1.5 to 2.0'	1.5 to 2.0'	1.5 to 2.0'	1.5 to 2.0'
Arsenic	11	20	NA	NA	NA	NA	NA	11	ND	NA	NA	NA	NA
Lead	1600	1300	440	1800	2000	1900	770	780	80	1100	670	970	1400
Benzo(a)Pyrene	4.1	1.4	1.8	3.2	4.7	1.2	3.4	0.73	ND	0.59	0.59	0.49	1.09
(Alternative BaP sample date)	9/8/93	9/8/93	9/8/93	9/8/93	9/8/93	9/8/93	9/8/93			9/8/93	9/8/93	9/8/93	9/8/93

"ND" indicates compound is not detected above the detection limit.

"NA" indicates sample was not analyzed for this parameter.

TABLE 1

LIME POND AREA
INVESTIGATIVE AND
POST EXCAVATION
SOIL SAMPLING

ANALYTICAL RESULTS
SUMMARY

PRAXAIR, INC. FACILITY
NEWARK, NEW JERSEY

SAMPLE IDENTIFICATION	LP-21 E	LP-22A	LP-22B	LP-23 A-2	LP-23 B	LP-23 C	LP-23 D	LP-23 E	LP-24 A	LP-24 B	LP-24 C	LP-24 D-3	LP-24 E-3
SAMPLE DATE	8/5/93	05/27/93	05/27/93	8/14/93	8/5/93	8/5/93	8/5/93	8/5/93	8/5/93	8/5/93	8/5/93	8/24/93	8/24/93
SAMPLE DEPTH BELOW GRADE	2.0 to 2.5'	0 to 0.5'	1.5 to 2.0'	1.5 to 2.0'	1.5 to 2.0'	1.5 to 2.0'	1.5 to 2.0'	2.0 to 2.5'	1.5 to 2.0'	1.5 to 2.0'	1.5 to 2.0'	8.0 to 8.5'	8.0 to 8.5'
Arsenic	NA	14	12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	1200	1300	1500	23	1400	770	880	900	NA	NA	NA	NA	NA
Benzo(a)Pyrene	0.68	ND	ND	0.059	0.33	0.33	9.2	1.03	1.4	0.72	1.4	3	3
(Alternative BaP sample date)	9/8/93			9/8/93	9/8/93	9/8/93	9/8/93	9/8/93					

'ND' indicates compound is not detected above the detection limit.

'NA' indicates sample was not analyzed for this parameter.

TABLE 1

LIME POND AREA INVESTIGATIVE AND POSTEXCAVATION SOIL SAMPLING

ANALYTICAL RESULTS SUMMARY

PRAXAIR, INC. FACILITY NEWARK, NEW JERSEY

SAMPLE IDENTIFICATION	LP-25 A-2	LP-25 B	LP-25 C	LP-25 D-2	LP-25 E	LP-26A	LP-26B	LP-27 A	LP-27 B-2	LP-27 C-2	LP-27 D	LP-27 E	LP-28A
SAMPLE DATE	8/14/93	8/5/93	8/5/93	8/14/93	8/5/93	05/27/93	05/27/93	8/5/93	8/24/93	8/24/93	8/5/93	8/5/93	05/27/93
SAMPLE DEPTH BELOW GRADE	1.5 to 2.0'	1.5 to 2.0'	1.5 to 2.0'	1.5 to 2.0'	2.0 to 2.5'	0 to 0.5'	1.5 to 2.0'	1.5 to 2.0'	1.5 to 2.0'	1.5 to 2.0'	1.5 to 2.0'	1.5 to 2.0'	0 to 0.5'
Arsenic	NA	NA	NA	NA	NA	13	14	NA	NA	NA	NA	NA	18
Lead	2300	2000	2000	1000	1400	1200	1500	1200	NA	1030	1900	2200	900
Benzo(a)Pyrene	2.7	1.3	1.8	1.5	3.2	ND	ND	1.3	0.66	1.7	1.06	4.4	2
(Alternative BaP sample date)	9/8/93	9/8/93	9/8/93	9/8/93	9/8/93			9/8/93		9/8/93	9/8/93	9/8/93	

"ND" indicates compound is not detected above the detection limit.

"NA" indicates sample was not analyzed for this parameter.

TABLE 1

LIME POND AREA
INVESTIGATIVE AND
POSTEXCAVATION
SOIL SAMPLING

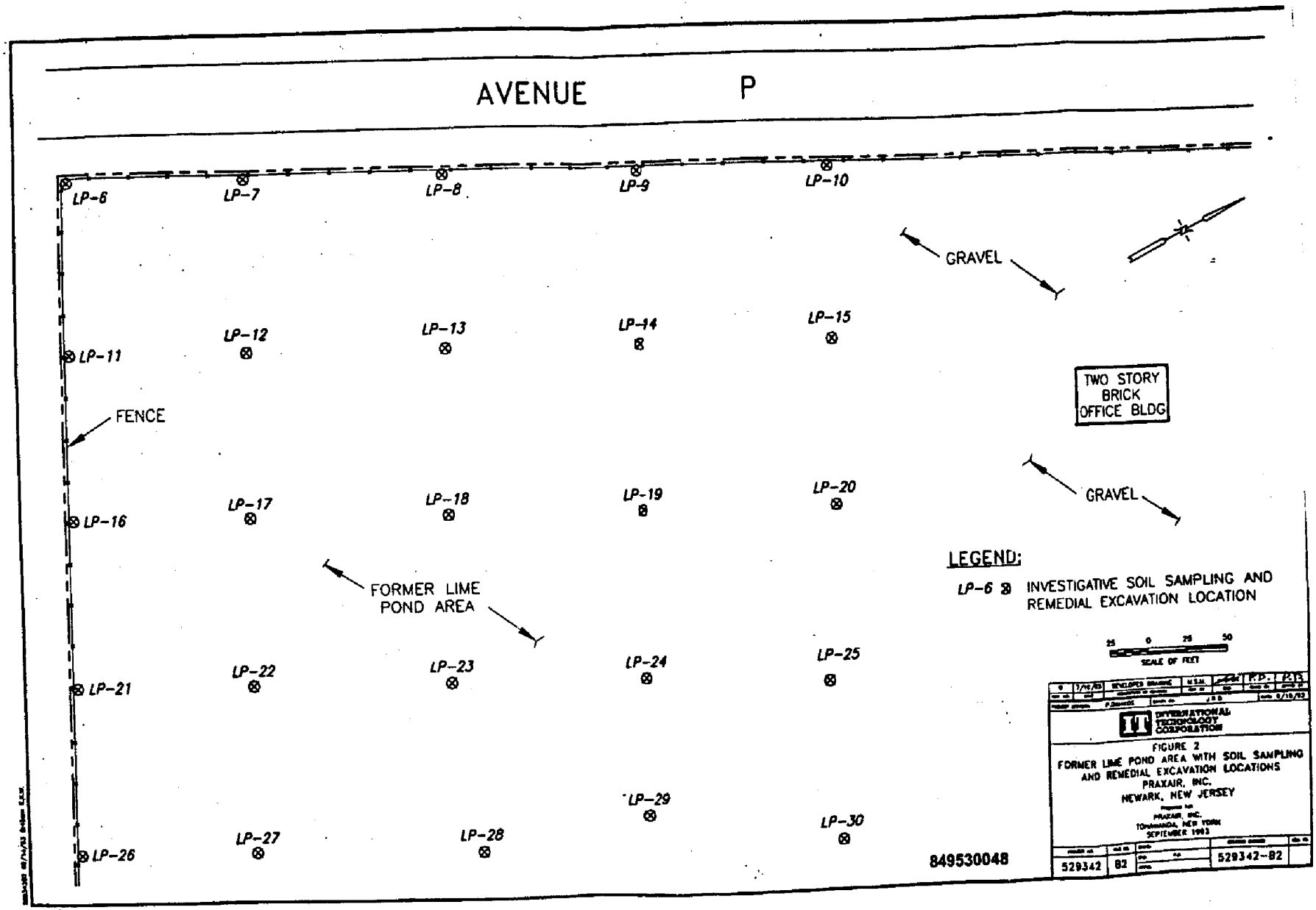
ANALYTICAL RESULTS
SUMMARY

PRAXAIR, INC. FACILITY
NEWARK, NEW JERSEY

SAMPLE IDENTIFICATION	LP-28B	LP-29A	LP-29B	LP-30 A-2	LP-30 B	LP-30 C	LP-30 D	LP-30 E-2	Total Sample Points	AVERAGE CONC. (ppm)
SAMPLE DATE	05/27/93	05/27/93	05/27/93	8/14/93	8/5/93	8/5/93	8/5/93	8/14/93		
SAMPLE DEPTH BELOW GRADE	1.5 to 2.0'	0 to 0.5'	1.5 to 2.0'	2.5 to 3.0'	1.5 to 2.0'	1.5 to 2.0'	1.5 to 2.0'	3.o to 3.5'		
Arsenic	15	4.9	7.5	14	17	20	9.2	32	47	14.283
Lead	920	280	850	NA	NA	NA	NA	NA	69	1164.4
Benzo(a)Pyrene (Alternative BaP sample date)	ND	ND	0.76	NA	1.2	0.86	1	0.83	85	1.445

"ND" indicates compound is not detected above the detection limit.

"NA" indicates sample was not analyzed for this parameter.


AVENUE P
LP-6
LP-7
LP-8
LP-9
LP-10
GRAVEL
LP-11
LP-12
LP-13
LP-14
LP-15
TWO STORY BRICK OFFICE BLDG
FENCE
LP-16
LP-17
LP-18
LP-19
LP-20
GRAVEL
FORMER LIME POND AREA
LEGEND:
LP-6 INVESTIGATIVE SOIL SAMPLING AND REMEDIAL EXCAVATION LOCATION
25 0 25 50
SCALE OF FEET
LP-21
LP-22
LP-23
LP-24
LP-25
LP-29
LP-26
LP-27
LP-28
LP-30
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INTERNATIONAL TECHNOLOGY CORPORATION
FIGURE 2
FORMER LIME POND AREA WITH SOIL SAMPLING AND REMEDIAL EXCAVATION LOCATIONS
PRAXAIR, INC.
NEWARK, NEW JERSEY
PRAXAIR, INC.
TONAWANDA, NEW YORK
SEPTEMBER 1993
529342
B2
529342-B2

APPENDIX A

PRAXAIR LETTER TO NJDEPE

PRAXAIR

Praxair, Inc.
Industrial Avenue
P.O. Box 237
Keasbey, NJ 08832
Tel (908) 738-4000
Fax (908) 738-9586

August 4, 1993.

Joseph Goliszewski, Case Manager
New Jersey Department of Environmental
Protection and Energy
Division of Responsible Party Site Remediation
Bureau of Environmental Evaluation and Cleanup
Responsibility Assessment
CN 028
Trenton, NJ 08625-0028

Re: Linde Gases of the Mid-Atlantic, Newark, New Jersey Facility
ISRA Case No. 90254

Dear Mr. Goliszewski,

This is to memorialize our telephone conference of August 3, 1993 in which we discussed the progress of the Newark site remediation. Our conference call consisted of Paul Dimakos of IT Corporation, yourself and myself.

As we understand, there are three remaining issues to be resolved.

- Chromium in blast furnace cinder slag as exhibited in the waste oil tank Area Of Concern (AOC)
- Metals contamination in the cylinder stripping sump AOC.
- Metals contamination in the lime pond.

The chromium in the cinder slag material has been addressed through slag sampling and a literature search documenting the presence of chromium in slag material to be predominantly in the trivalent form. You indicated that the Remedial Investigative Report (RIR) submitted on July 23, 1993 contains sufficient supporting documentation for the DEPE to grant a No Further Action request for the waste oil tank AOC and other slag related AOC, provided these areas are addressed by an Engineering Control, which already exists by way of the gravel cover, and by an Institutional Control in the form of a deed notice that the area remains non-residential.

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The metals contamination in the cylinder stripping sump AOC has been resolved by hot spot removal with post excavation sampling. We believe that upon review of the RIR, the DEPE will agree with the No Further Action request.

The lime pond area, therefore, remains the one last AOC to be resolved. In the July 24, RIR Praxair proposed a proactive strategy to remediate this area through hot spot removal and lime treatment. This proposal was intended to be a starting point for discussion with the DEPE to determine whether such actions are a reasonable approach to resolving this AOC.

You indicated that hot spot removal and lime treatment are reasonable and acceptable to the DEPE. You further indicated that under the historic fill provisions of ISRA the lime pond area may only require hot spot removal provided the average concentration of contaminants of concern are within levels acceptable to the DEPE. In the case of lead and arsenic, which are two of the contaminants of concern, you indicated, and we understood, that DEPE would accept average concentrations of less than 20 ppm for arsenic, and up to 1200 ppm for lead.

We also understood that under these conditions the lime pond area would necessarily be subject to an Institutional Control in the form of a deed notice that this area remain non-residential.

Based on this telephone discussion Praxair will proceed with lime pond hot spot removal. However we do not wish to discount the possibility that lime treatment may be necessary if we cannot demonstrate through post excavation sampling that the average concentrations of lead and arsenic cannot be reduced to the stated acceptable levels.

Thank you for your efforts in expediting technical review of the RIR in time for our phone discussion. We greatly appreciate your help and assistance in bringing this case that much closer to completion.

Very truly yours,

N. A. DiFranco
Manager, Environmental Affairs

NAD/mm

cc: P. Dimakos

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APPENDIX B

TEST PIT CLASSIFICATION LOGS

INTERNATIONAL TECHNOLOGY CORPORATION

TEST PIT CLASSIFICATION LOG

PROJECT NAME Praxair - Newark TEST PIT NO. LP - 8 PAGE 1 OF 1

PROJECT NUMBER 529342 001 APPROX. ELEV. _____ DATE August 5, 1993

FIELD ENG./GEO Paul Schatz

LOCATION Newark, New Jersey

EQUIPMENT USED Case 580 Tire Mounted Backhoe

PIT DIMENSIONS: 6' (LENGTH) x 7' (WIDTH) x 2' (DEPTH) = 84 ft³ (VOLUME)

GROUNDWATER LEVEL DATA		
DATE	ACTUAL TIME	DEPTH
NOT ENCOUNTERED		X

DEPTH (ft)	SAMPLE NO. AND TYPE	DESCRIPTION	U.S.C.S. SYMBOL	REMARKS
1		Brown, f. c. SAND, tr. silt, tr. f.c. gravel, some debris (bricks, concrete and asphalt) (Fill-dry)		
2		Excavation terminated at 2.0 feet		
3				
4				
5				

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INTERNATIONAL TECHNOLOGY CORPORATION

TEST PIT CLASSIFICATION LOG

PROJECT NAME Praxair - Newark TEST PIT NO. LP - 11 PAGE 1 OF 1

PROJECT NUMBER 529342 001 APPROX. ELEV. _____ DATE August 5, 1993

FIELD ENG./GEO Paul Schatz

LOCATION Newark, New Jersey

EQUIPMENT USED Case 580 Tire Mounted Backhoe

PIT DIMENSIONS: 6' (LENGTH) x 7' (WIDTH) x 2' (DEPTH) = 84 ft³ (VOLUME)

GROUNDWATER LEVEL DATA		
DATE	ACTUAL TIME	DEPTH
NOT ENCOUNTERED		X

DEPTH (ft)	SAMPLE NO. AND TYPE	DESCRIPTION	U.S.C.S. SYMBOL	REMARKS
1		Brown, f.c. SAND, tr. silt, tr. f.c. gravel and lime, tr. debris (bricks and glass and plastic) (Fill)		
2		Excavation terminated at 2.0 feet		
3				
4				
5				

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INTERNATIONAL TECHNOLOGY CORPORATION

TEST PIT CLASSIFICATION LOG

PROJECT NAME Praxair - Newark TEST PIT NO. LP - 14 PAGE 1 OF 1

PROJECT NUMBER 529342 001 APPROX. ELEV. _____ DATE September 8, 1993

FIELD ENG./GEO Paul Schatz

LOCATION Newark, New Jersey

EQUIPMENT USED Case 580 Tire Mounted Backhoe

PIT DIMENSIONS: 11' (LENGTH) X 11' (WIDTH) X 4.5' (DEPTH) = 545 ft³ (VOLUME)

GROUNDWATER LEVEL DATA		
DATE	ACTUAL TIME	DEPTH
	NOT ENCOUNTERED	X

DEPTH (ft)	SAMPLE NO. AND TYPE	DESCRIPTION	U.S.C.S. SYMBOL	REMARKS
1		Dark brown-black, f.c. SAND, some silt, tr. f.c. gravel, tr. ash tr. debris (glass, wood, metal, plastic) (Fill)		
2				
3				
4				
5		Excavation terminated at 4.5 Feet		

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INTERNATIONAL TECHNOLOGY CORPORATION

TEST PIT CLASSIFICATION LOG

PROJECT NAME Praxair - Newark TEST PIT NO. LP - 17 PAGE 1 OF 1

PROJECT NUMBER 529342 001 APPROX. ELEV. _____ DATE August 14, 1993

FIELD ENG./GEO Paul Schatz

LOCATION Newark, New Jersey

EQUIPMENT USED Case 580 Tire Mounted Backhoe

PIT DIMENSIONS: 10.5' (LENGTH) X 6' (WIDTH) X 3' (DEPTH) = 189 ft³ (VOLUME)

GROUNDWATER LEVEL DATA		
DATE	ACTUAL TIME	DEPTH
NOT ENCOUNTERED		X

DEPTH (ft)	SAMPLE NO. AND TYPE	DESCRIPTION	U.S.C.S. SYMBOL	REMARKS
1		Brown, f.c. silty SAND, tr. f.c. gravel, tr. debris (bricks, wires, pipes, plastic, glass) (Fill-dry)		
2				
3				
4		Excavation terminated at 3.0 feet		
5				

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TIERRA-B-015181

INTERNATIONAL TECHNOLOGY CORPORATION

TEST PIT CLASSIFICATION LOG

PROJECT NAME Praxair - Newark TEST PIT NO. LP - 18 PAGE 1 OF 1

PROJECT NUMBER 529342 001 APPROX. ELEV. _____ DATE August 5, 1993

FIELD ENG./GEO Paul Schatz

LOCATION Newark, New Jersey

EQUIPMENT USED Case 580 Tire Mounted Backhoe

PIT DIMENSIONS: 6' (LENGTH) x 7' (WIDTH) x 2' (DEPTH) = 84 ft³ (VOLUME)

GROUNDWATER LEVEL DATA		
DATE	ACTUAL TIME	DEPTH
NOT ENCOUNTERED		X

DEPTH (ft)	SAMPLE NO. AND TYPE	DESCRIPTION	U.S.C.S. SYMBOL	REMARKS
1		Brown, f.c. SAND, tr. silt, tr. f.c. gravel tr. debris (wood, glass, plastic, concrete) (Fill-dry)		
2		Excavation terminated at 2.0 Feet		
3				
4				
5				

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TIERRA-B-015182

INTERNATIONAL TECHNOLOGY CORPORATION

TEST PIT CLASSIFICATION LOG

PROJECT NAME Praxair - Newark TEST PIT NO. LP - 19 PAGE 1 OF 1

PROJECT NUMBER 529342 001 APPROX. ELEV. _____ DATE August 14, 1993

FIELD ENG./GEO Paul Schatz

LOCATION Newark, New Jersey

EQUIPMENT USED Case 580 Tire Mounted Backhoe

PIT DIMENSIONS: 10' (LENGTH) x 8' (WIDTH) x 2' (DEPTH) = 160 ft³ (VOLUME)

GROUNDWATER LEVEL DATA		
DATE	ACTUAL TIME	DEPTH
NOT ENCOUNTERED		X

DEPTH (ft)	SAMPLE NO. AND TYPE	DESCRIPTION	U.S.C.S. SYMBOL	REMARKS
1		Grey-brown, silty, SAND, some f.c. gravel, tr. debris (plastic, bricks, bottles) (Fill-dry)		
2		Excavation terminated at 2.0 Feet		
3				
4				
5				

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TIERRA-B-015183

INTERNATIONAL TECHNOLOGY CORPORATION

TEST PIT CLASSIFICATION LOG

PROJECT NAME Praxair - Newark TEST PIT NO. LP - 21 PAGE 1 OF 1

PROJECT NUMBER 529342 001 APPROX. ELEV. _____ DATE August 5, 1993

FIELD ENG./GEO Paul Schatz

LOCATION Newark, New Jersey

EQUIPMENT USED Case 580 Tire Mounted Backhoe

PIT DIMENSIONS: 6' (LENGTH) x 7' (WIDTH) x 2' (DEPTH) = 84 ft³ (VOLUME)

GROUNDWATER LEVEL DATA		
DATE	ACTUAL TIME	DEPTH
	NOT ENCOUNTERED	X

DEPTH (ft)	SAMPLE NO. AND TYPE	DESCRIPTION	U.S.C.S. SYMBOL	REMARKS
1		Brown, f.c. SAND, tr. silt, tr. f.c. gravel, tr. debris (plastic, glass, wood) (Fill-dry)		
2		Excavation terminated at 2.0 feet		
3				
4				
5				

849530059

488-5-87

INTERNATIONAL TECHNOLOGY CORPORATION

TEST PIT CLASSIFICATION LOG

PROJECT NAME Praxair - Newark TEST PIT NO. LP - 23 PAGE 1 OF 1

PROJECT NUMBER 529342 001 APPROX. ELEV. _____ DATE August 19, 1993

FIELD ENG./GEO Paul Schatz

LOCATION Newark, New Jersey

EQUIPMENT USED Case 580 Tire Mounted Backhoe

PIT DIMENSIONS: 10' (LENGTH) X 8' (WIDTH) X 2' (DEPTH) = 160 ft³ (VOLUME)

GROUNDWATER LEVEL DATA		
DATE	ACTUAL TIME	DEPTH
NOT ENCOUNTERED		X

DEPTH (ft)	SAMPLE NO. AND TYPE	DESCRIPTION	U.S.C.S. SYMBOL	REMARKS
1		Brown, silty f.c. SAND, tr. f.c. gravel, tr. debris (wood, brick, concrete, plastic, glass) (Fill-dry)		
2		Excavation terminated at 2.0 feet		
3				
4				
5				

849530060

INTERNATIONAL TECHNOLOGY CORPORATION

TEST PIT CLASSIFICATION LOG

PROJECT NAME Praxair - Newark TEST PIT NO. LP - 24 PAGE 1 OF 1

PROJECT NUMBER 529342 001 APPROX. ELEV. _____ DATE August 24, 1993

FIELD ENG./GEO Paul Schatz

LOCATION Newark, New Jersey

EQUIPMENT USED Case 580 Tire Mounted Backhoe

PIT DIMENSIONS: 9.5' (LENGTH) X 12' (WIDTH) X 12' (DEPTH) = 1,368 ft³ (VOLUME)

GROUNDWATER LEVEL DATA		
DATE	ACTUAL TIME	DEPTH
8/24/93	10:50	8.5'
NOT ENCOUNTERED		

DEPTH (ft)	SAMPLE NO AND TYPE	DESCRIPTION	U.S.C.S. SYMBOL	REMARKS
1		Brown, silty f.c. SAND, tr. f.c. gravel, tr. debris (glass, plastic, wood, brick) (Fill - dry)		
2				
3				
4				
5				
12		Excavation terminated at 12.0 feet		

849530061

INTERNATIONAL TECHNOLOGY CORPORATION

TEST PIT CLASSIFICATION LOG

PROJECT NAME Praxair - Newark TEST PIT NO. LP - 25 PAGE 1 OF 1

PROJECT NUMBER 529342 001 APPROX. ELEV. _____ DATE August 5, 1993

FIELD ENG./GEO Paul Schatz

LOCATION Newark, New Jersey

EQUIPMENT USED Case 580 Tire Mounted Backhoe

PIT DIMENSIONS: 8' (LENGTH) x 9' (WIDTH) x 2' (DEPTH) = 144 ft³ (VOLUME)

GROUNDWATER LEVEL DATA		
DATE	ACTUAL TIME	DEPTH
NOT ENCOUNTERED		X

DEPTH (ft)	SAMPLE NO. AND TYPE	DESCRIPTION	U.S.C.S. SYMBOL	REMARKS
1		Brown, silty f.c. SAND, tr. f.c. gravel, tr. debris (brick, bottles, pottery) (Fill - dry)		
2		Excavation terminated at 2.0 feet		
3				
4				
5				

849530062

INTERNATIONAL TECHNOLOGY CORPORATION

TEST PIT CLASSIFICATION LOG

PROJECT NAME Praxair - Newark TEST PIT NO. LP - 27 PAGE 1 OF 1

PROJECT NUMBER 529342 001 APPROX. ELEV. _____ DATE August 24, 1993

FIELD ENG./GEO Paul Schatz

LOCATION Newark, New Jersey

EQUIPMENT USED Case 580 Tire Mounted Backhoe

PIT DIMENSIONS: 35' (LENGTH) x 8.5' (WIDTH) x 2' (DEPTH) = 595 ft³ (VOLUME)

GROUNDWATER LEVEL DATA		
DATE	ACTUAL TIME	DEPTH
8/24/93	11:05	3 feet
NOT ENCOUNTERED		

DEPTH (ft)	SAMPLE NO. AND TYPE	DESCRIPTION	U.S.C.S. SYMBOL	REMARKS
1		Black-brown-grey, f.c. SAND, tr. silt, tr. f.c. gravel, tr. debris (wood, glass, plastic, brick, piper) (Fill)		
2		Excavation terminated at 2.0 feet		
3				
4				
5				

849530063

INTERNATIONAL TECHNOLOGY CORPORATION

TEST PIT CLASSIFICATION LOG

PROJECT NAME Praxair - Newark TEST PIT NO. LP - 30 PAGE 1 OF 1

PROJECT NUMBER 529342 001 APPROX. ELEV. _____ DATE August 14, 1993

FIELD ENG./GEO. Paul Schatz

LOCATION Newark, New Jersey

EQUIPMENT USED Case 580 Tire Mounted Backhoe

PIT DIMENSIONS: 9' (LENGTH) X 8' (WIDTH) X 3' (DEPTH) = 216 ft^3 (VOLUME)

GROUNDWATER LEVEL DATA		
DATE	ACTUAL TIME	DEPTH
8/24/93	12:15	2.5 feet
NOT ENCOUNTERED		

DEPTH (ft)	SAMPLE NO. AND TYPE	DESCRIPTION	U.S.C.S. SYMBOL	REMARKS
1		Brown, f.c. SAND, some silt, tr. f.c. gravel, tr. debris (brick, glass, wood) tr. ash (Fill-moist)		
2				
3		Excavation terminated at 3.0 feet		
4				

849530064

488-5-87

APPENDIX C

SAMPLE COLLECTION LOGS

INTERNATIONAL TECHNOLOGY CORPORATION

DATE	9/8 and 9/8/93
TIME	
PAGE	1 OF 1
PAGE	
PROJECT NO.	529342

SAMPLE COLLECTION LOG

PROJECT NAME Praxair - Newark

SAMPLE NO. LP - 8 A, B, C, D and E

SAMPLE LOCATION LP - 8

SAMPLE TYPE Soil - Grab

COMPOSITE ____ YES x NO

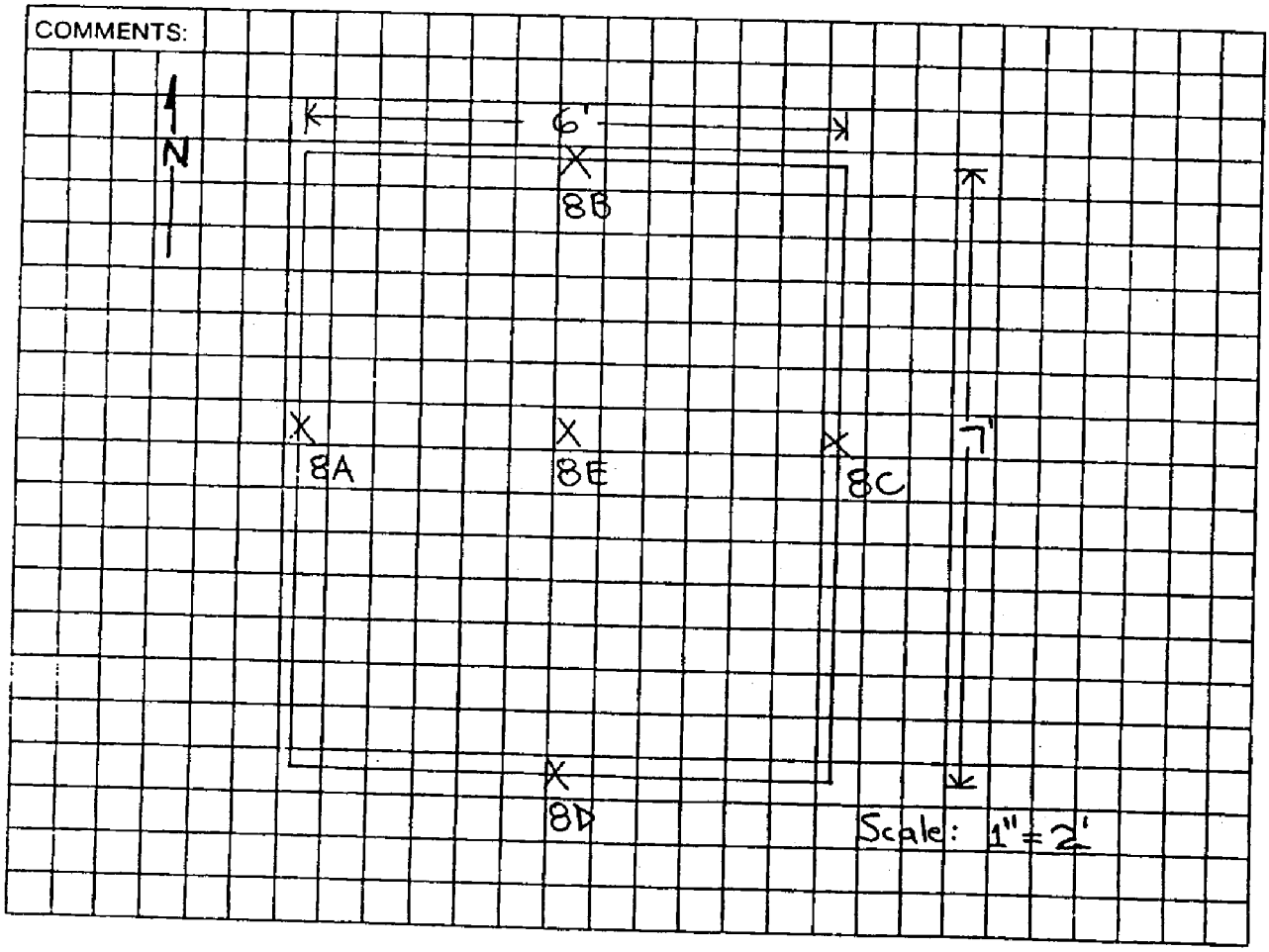
COMPOSITE TYPE ____

DEPTH OF SAMPLE 1.5 to 2.0 feet (A thru D) 2.0 to 2.5 feet (E)

WEATHER Sunny, 85°F

CONTAINERS USED	AMOUNT COLLECTED
8 oz. glass	8 oz.

COMMENTS:



PREPARED BY: Paul Dimakos

849530066

COMMENTS: (Continued)

DATE	
TIME	
PAGE ____ OF ____	
PAGE	
PROJECT NO.	

PREPARED BY: _____

LEGEND

1. A SAMPLE COLLECTION LOG IS TO BE COMPLETED FOR EACH SAMPLE.
2. ALWAYS COMPLETE BOTH SIDES. IF SECOND SIDE IS NOT USED, DRAW A LINE THROUGH IT AND MARK N/A. FILL IN CONTROL BLOCK AND PREPARED BY
3. ALL ENTRIES ON LOG ARE TO BE COMPLETED, IF NOT APPLICABLE MARK N/A.
4. DATE: USE MONTH/DAY/YEAR; I.E., 10/30/85
5. TIME: USE 24-HOUR CLOCK; I.E., 1835 FOR 6:35 P.M.
6. PAGE: EACH SAMPLE TEAM SHOULD NUMBER PAGE _____ OF _____ FOR THE DAY'S ACTIVITIES FOR ALL SHEETS PREPARED ON A SINGLE DAY. I.E., IF THERE ARE A TOTAL OF 24 PAGES (INCLUDING FRONT AND BACK) NUMBER 1 OF 24, 2 OF 24, ETC.
7. SAMPLE LOCATION: USE BORING OR MONITORING WELL NUMBER, GRID LOCATION (TRANSECT), SAMPLING STATION I.D., OR COORDINATE TO PHYSICAL FEATURES WITH DISTANCES. INCLUDE SKETCH IN COMMENT SECTION IF NECESSARY.
8. SAMPLE TYPE: USE THE FOLLOWING - SOIL; WATER (SURFACE OR GROUND); AIR (FILTERS, TUBES, AMBIENT, PERSONNEL); SLUDGE; DRUM CONTENTS; OIL; VEGETATION; WIPE; SEDIMENT.
9. COMPOSITE TYPE: I.E., 24-HOUR, LIST SAMPLE NUMBERS IN COMPOSITE. SPATIAL COMPOSITE.
10. DEPTH OF SAMPLE: GIVE UNITS. WRITE OUT UNITS SUCH AS INCHES, FEET. DON'T USE ' OR ".
11. WEATHER: APPROXIMATE TEMPERATURE, SUN AND MOISTURE CONDITIONS.
12. CONTAINERS USED: LIST EACH CONTAINER TYPE AS NUMBER, VOLUME, MATERIAL (E.G., 2 - 1L GLASS, 4 - 40 ML GLASS VIAL; 1 - 400 ML PLASTIC, 1 - 3 INCH STEEL TUBE; 1 - 8 OZ. GLASS JAR)
13. AMOUNT COLLECTED: VOLUME IN CONTAINERS (E.G. 1/2 FULL).

849530067

125-10-85

INTERNATIONAL TECHNOLOGY CORPORATION

DATE	9/8/93 and 08059 3
TIME	
PAGE	1 OF 1
PAGE	
PROJECT NO.	529342

SAMPLE COLLECTION LOG

PROJECT NAME Praxair - Newark

SAMPLE NO. LP - 11A, B, C, D, and E

SAMPLE LOCATION LP - 11

SAMPLE TYPE Soil - Grab

COMPOSITE ____ YES x NO

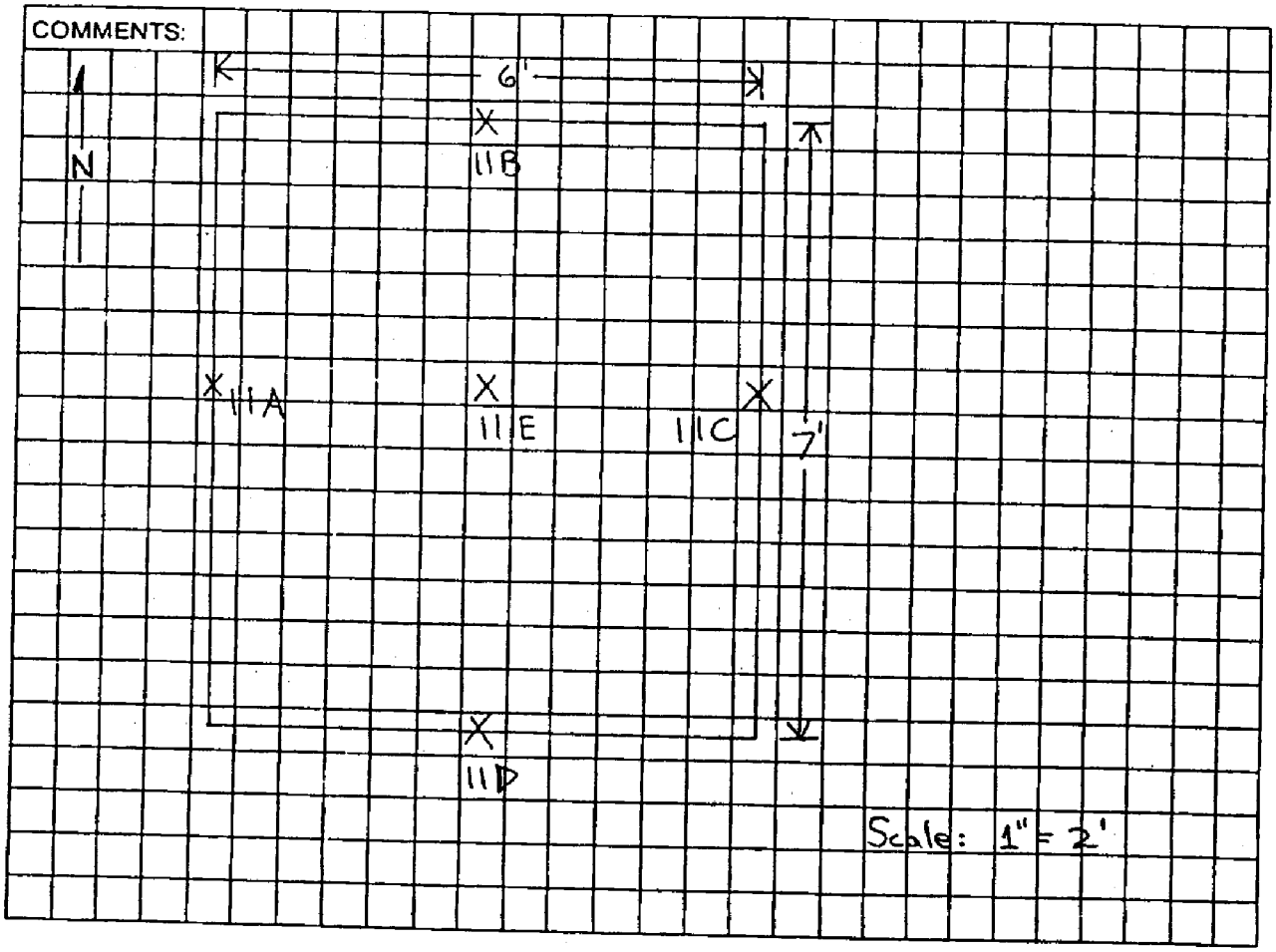
COMPOSITE TYPE ____

DEPTH OF SAMPLE 1.5 to 2.0 feet (A thru D)
2.0 to 2.5 feet (E)

WEATHER Sunny, 85°F

CONTAINERS USED	AMOUNT COLLECTED
8 oz. glass	8 oz.

COMMENTS:



PREPARED BY: Paul Dimakos

849530068

COMMENTS: (Continued)

DATE	
TIME	
PAGE ____ OF ____	
PAGE	
PROJECT NO.	

PREPARED BY: _____

LEGEND

1. A SAMPLE COLLECTION LOG IS TO BE COMPLETED FOR EACH SAMPLE.
2. ALWAYS COMPLETE BOTH SIDES. IF SECOND SIDE IS NOT USED, DRAW A LINE THROUGH IT AND MARK N/A. FILL IN CONTROL BLOCK AND PREPARED BY.
3. ALL ENTRIES ON LOG ARE TO BE COMPLETED. IF NOT APPLICABLE MARK N/A.
4. DATE: USE MONTH/DAY/YEAR; I.E., 10/30/85
5. TIME: USE 24-HOUR CLOCK; I.E., 1835 FOR 6:35 P.M.
6. PAGE: EACH SAMPLE TEAM SHOULD NUMBER PAGE _____ OF _____ FOR THE DAY'S ACTIVITIES FOR ALL SHEETS PREPARED ON A SINGLE DAY. I.E., IF THERE ARE A TOTAL OF 24 PAGES (INCLUDING FRONT AND BACK) NUMBER 1 OF 24, 2 OF 24, ETC.
7. SAMPLE LOCATION: USE BORING OR MONITORING WELL NUMBER, GRID LOCATION (TRANSECT), SAMPLING STATION I.D., OR COORDINATE TO PHYSICAL FEATURES WITH DISTANCES. INCLUDE SKETCH IN COMMENT SECTION IF NECESSARY.
8. SAMPLE TYPE: USE THE FOLLOWING - SOIL; WATER (SURFACE OR GROUND); AIR (FILTERS, TUBES, AMBIENT, PERSONNEL); SLUDGE; DRUM CONTENTS, OIL; VEGETATION; WIPE; SEDIMENT.
9. COMPOSITE TYPE: I.E., 24-HOUR. LIST SAMPLE NUMBERS IN COMPOSITE. SPATIAL COMPOSITE.
10. DEPTH OF SAMPLE: GIVE UNITS. WRITE OUT UNITS SUCH AS INCHES, FEET. DON'T USE ' OR ".
11. WEATHER: APPROXIMATE TEMPERATURE, SUN AND MOISTURE CONDITIONS.
12. CONTAINERS USED: LIST EACH CONTAINER TYPE AS NUMBER, VOLUME, MATERIAL (E.G., 2 - 1L GLASS; 4 - 40 ML GLASS VIAL; 1 - 400 ML PLASTIC 1 - 3 INCH STEEL TUBE; 1 - 8 OZ. GLASS JAR)
13. AMOUNT COLLECTED: VOLUME IN CONTAINERS (E.G. 1/2 FULL).

849530069

125-10-85

8/24/93
and

INTERNATIONAL TECHNOLOGY CORPORATION

DATE	0	9	0	8	9	3
TIME						
PAGE 1 OF 1						
PAGE						
PROJECT NO. 529342						

SAMPLE COLLECTION LOG

PROJECT NAME Praxair - Newark

SAMPLE NO. LP - 14 A-4, B-3, C-3, D-4, and E-4

SAMPLE LOCATION LP - 14

SAMPLE TYPE Soil - Grab

COMPOSITE ____ YES x NO

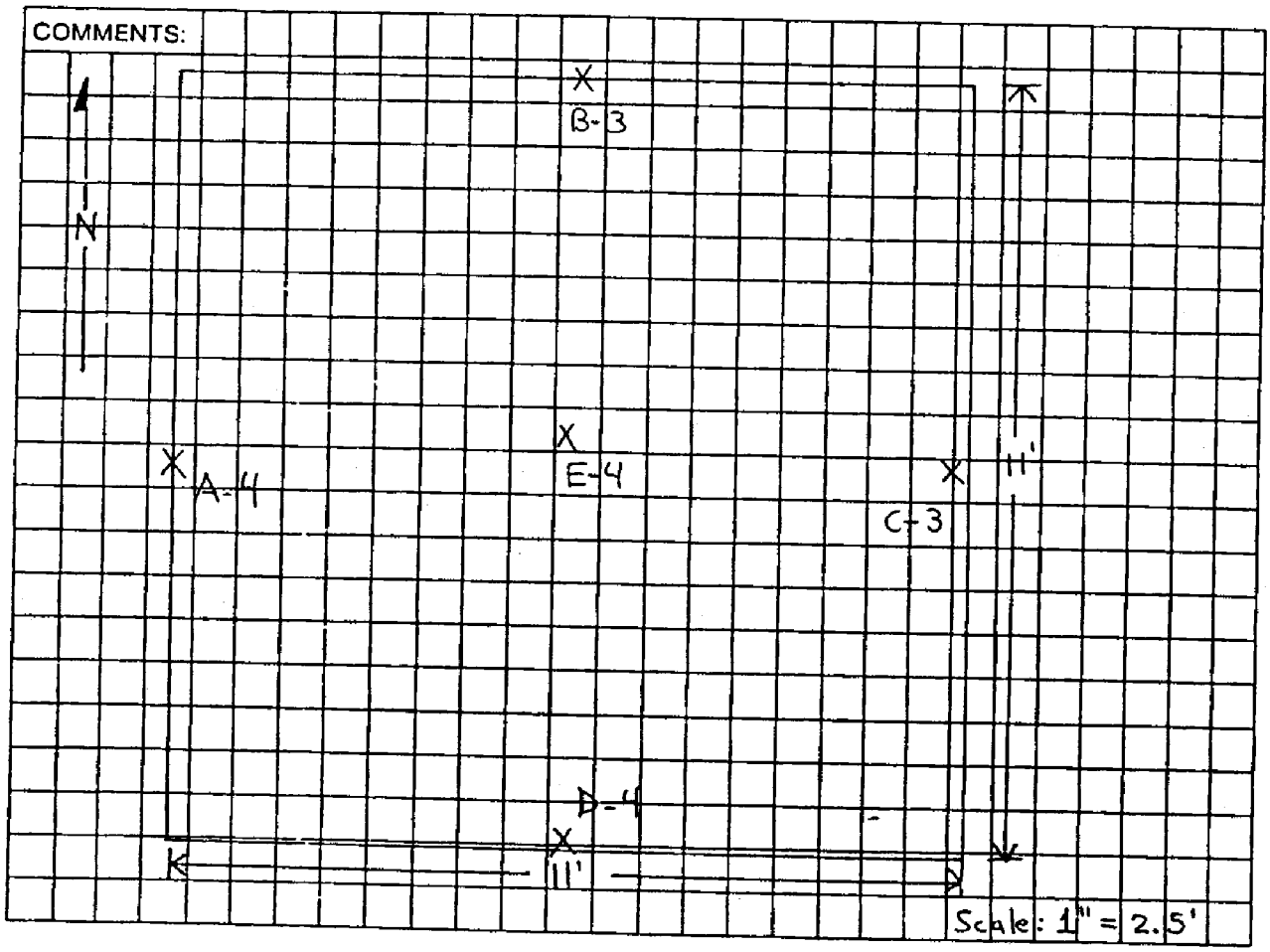
COMPOSITE TYPE

DEPTH OF SAMPLE 3.0 to 3.5 feet (B-3, C-3)
4.0 to 4.5 feet (A-4, D-4, E-4)

WEATHER Overcast, 60°F

CONTAINERS USED	AMOUNT COLLECTED
8 oz. glass	8 oz.

COMMENTS:



PREPARED BY: Paul Dimakos

849530070

COMMENTS: (Continued)

DATE	
TIME	
PAGE ____ OF ____	
PAGE	
PROJECT NO.	

PREPARED BY: _____

LEGEND

1. A SAMPLE COLLECTION LOG IS TO BE COMPLETED FOR EACH SAMPLE.
2. ALWAYS COMPLETE BOTH SIDES. IF SECOND SIDE IS NOT USED, DRAW A LINE THROUGH IT AND MARK N/A. FILL IN CONTROL BLOCK AND PREPARED BY.
3. ALL ENTRIES ON LOG ARE TO BE COMPLETED, IF NOT APPLICABLE MARK N/A.
4. DATE: USE MONTH/DAY/YEAR; I.E., 10/30/85
5. TIME: USE 24-HOUR CLOCK; I.E., 1835 FOR 6:35 P.M.
6. PAGE: EACH SAMPLE TEAM SHOULD NUMBER PAGE _____ OF _____ FOR THE DAY'S ACTIVITIES FOR ALL SHEETS PREPARED ON A SINGLE DAY. I.E., IF THERE ARE A TOTAL OF 24 PAGES (INCLUDING FRONT AND BACK) NUMBER 1 OF 24, 2 OF 24, ETC.
7. SAMPLE LOCATION: USE BORING OR MONITORING WELL NUMBER, GRID LOCATION (TRANSECT), SAMPLING STATION I.D., OR COORDINATE TO PHYSICAL FEATURES WITH DISTANCES. INCLUDE SKETCH IN COMMENT SECTION IF NECESSARY.
8. SAMPLE TYPE: USE THE FOLLOWING - SOIL; WATER (SURFACE OR GROUND); AIR (FILTERS, TUBES, AMBIENT, PERSONNEL); SLUDGE; DRUM CONTENTS; OIL; VEGETATION; WIPE; SEDIMENT.
9. COMPOSITE TYPE: I.E., 24-HOUR, LIST SAMPLE NUMBERS IN COMPOSITE, SPATIAL COMPOSITE.
10. DEPTH OF SAMPLE: GIVE UNITS, WRITE OUT UNITS SUCH AS INCHES, FEET. DON'T USE ' OR ".
11. WEATHER: APPROXIMATE TEMPERATURE, SUN AND MOISTURE CONDITIONS.
12. CONTAINERS USED: LIST EACH CONTAINER TYPE AS NUMBER, VOLUME, MATERIAL (E.G., 2 - 1L GLASS; 4 - 40 ML GLASS VIAL; 1 - 400 ML PLASTIC; 1 - 3 INCH STEEL TUBE; 1 - 8 OZ. GLASS JAR).
13. AMOUNT COLLECTED: VOLUME IN CONTAINERS (E.G. 1/2 FULL).

849530071

125-10-85

8/5/93
8/14/93
and

INTERNATIONAL TECHNOLOGY CORPORATION

DATE	0	9	0	8	9	3
TIME						
PAGE 1 OF 1						
PAGE						
PROJECT NO. 529342						

SAMPLE COLLECTION LOG

PROJECT NAME Praxair - Newark

SAMPLE NO. LP - 17 A, B-2, C, D and E-2

SAMPLE LOCATION LP - 17

SAMPLE TYPE Soil - Grab

COMPOSITE ____ YES __x__ NO

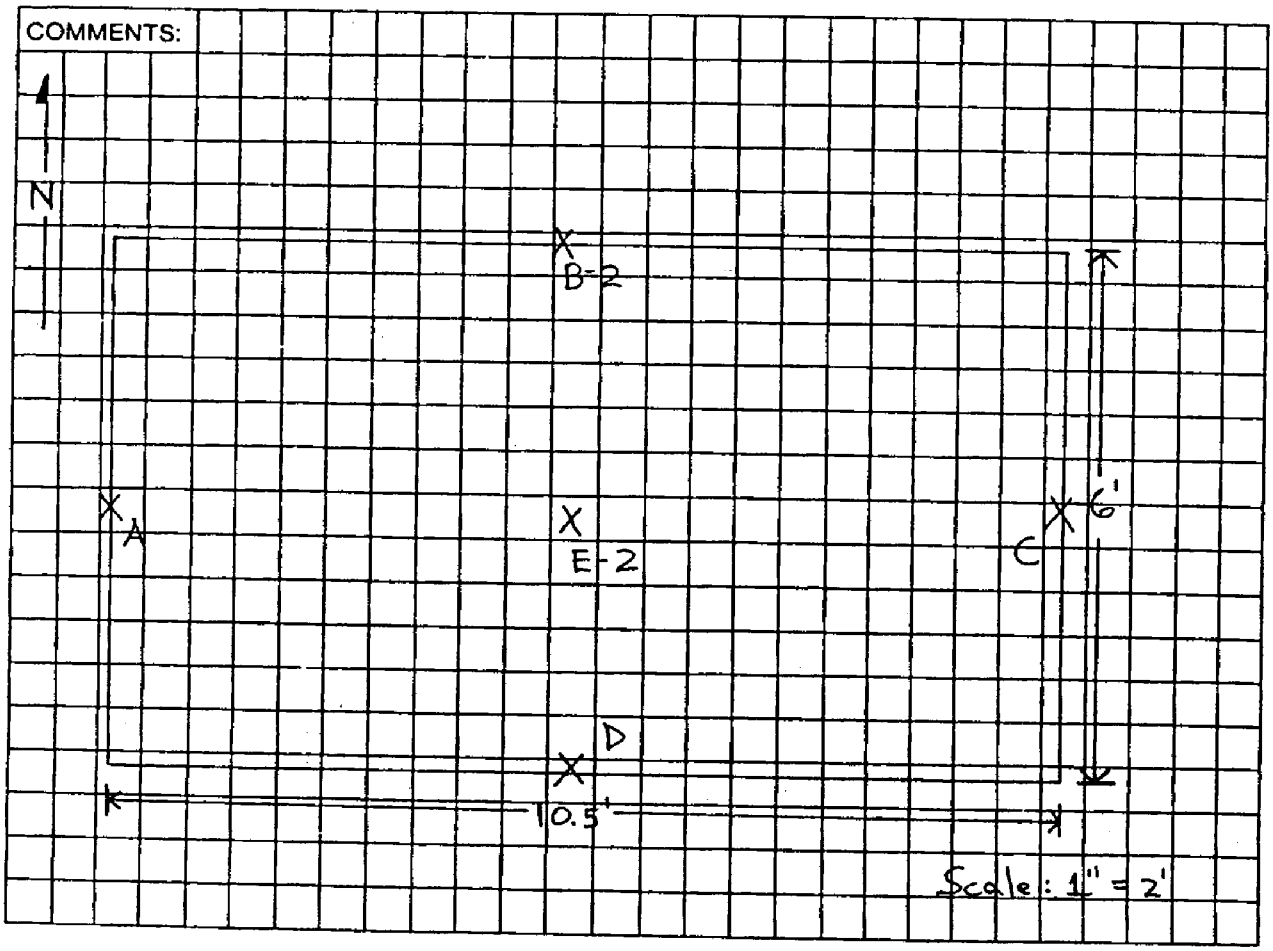
COMPOSITE TYPE ____

DEPTH OF SAMPLE 1.5 to 2.0 feet (A, C and D)
2.5 to 3.0 feet (B-2)
3.0 to 3.5 feet (E-2)

WEATHER ____

CONTAINERS USED	AMOUNT COLLECTED
8 oz. glass	8 oz.

COMMENTS:



PREPARED BY: Paul Dimakos

849530072

COMMENTS: (Continued)

DATE	
TIME	
PAGE ____ OF ____	
PAGE	
PROJECT NO.	

PREPARED BY: _____

LEGEND

1. A SAMPLE COLLECTION LOG IS TO BE COMPLETED FOR EACH SAMPLE.
2. ALWAYS COMPLETE BOTH SIDES. IF SECOND SIDE IS NOT USED, DRAW A LINE THROUGH IT AND MARK N/A. FILL IN CONTROL BLOCK AND PREPARED BY.
3. ALL ENTRIES ON LOG ARE TO BE COMPLETED, IF NOT APPLICABLE MARK N/A.
4. DATE: USE MONTH/DAY/YEAR; I.E., 10/30/85
5. TIME: USE 24-HOUR CLOCK; I.E., 1835 FOR 6:35 P.M.
6. PAGE: EACH SAMPLE TEAM SHOULD NUMBER PAGE _____ OF _____ FOR THE DAY'S ACTIVITIES FOR ALL SHEETS PREPARED ON A SINGLE DAY. I.E., IF THERE ARE A TOTAL OF 24 PAGES (INCLUDING FRONT AND BACK) NUMBER 1 OF 24, 2 OF 24, ETC.
7. SAMPLE LOCATION: USE BORING OR MONITORING WELL NUMBER, GRID LOCATION (TRANSECT), SAMPLING STATION I.D., OR COORDINATE TO PHYSICAL FEATURES WITH DISTANCES. INCLUDE SKETCH IN COMMENT SECTION IF NECESSARY.
8. SAMPLE TYPE: USE THE FOLLOWING - SOIL; WATER (SURFACE OR GROUND); AIR (FILTERS, TUBES, AMBIENT, PERSONNEL); SLUDGE; DRUM CONTENTS; OIL; VEGETATION; WIPE; SEDIMENT.
9. COMPOSITE TYPE: I.E., 24-HOUR, LIST SAMPLE NUMBERS IN COMPOSITE, SPATIAL COMPOSITE.
10. DEPTH OF SAMPLE: GIVE UNITS, WRITE OUT UNITS SUCH AS INCHES, FEET, DON'T USE ' OR ".
11. WEATHER, APPROXIMATE TEMPERATURE, SUN AND MOISTURE CONDITIONS.
12. CONTAINERS USED: LIST EACH CONTAINER TYPE AS NUMBER, VOLUME, MATERIAL (E.G., 2 - 1L GLASS; 4 - 40 ML GLASS VIAL; 1 - 400 ML PLASTIC 1 - 3 INCH STEEL TUBE; 1 - 8 OZ. GLASS JAR)
13. AMOUNT COLLECTED: VOLUME IN CONTAINERS (E.G. 1/2 FULL).

849530073

125-10-85

INTERNATIONAL TECHNOLOGY CORPORATION

8/5/93 and

DATE	0	9	0	8	9	3
TIME						
PAGE 1 OF 1						
PAGE						
PROJECT NO. 529342						

SAMPLE COLLECTION LOG

PROJECT NAME Praxair - Newark

SAMPLE NO. LP - 18 A, B, C, D and E

SAMPLE LOCATION LP - 18

SAMPLE TYPE Soil - Grab

COMPOSITE ____ YES x NO

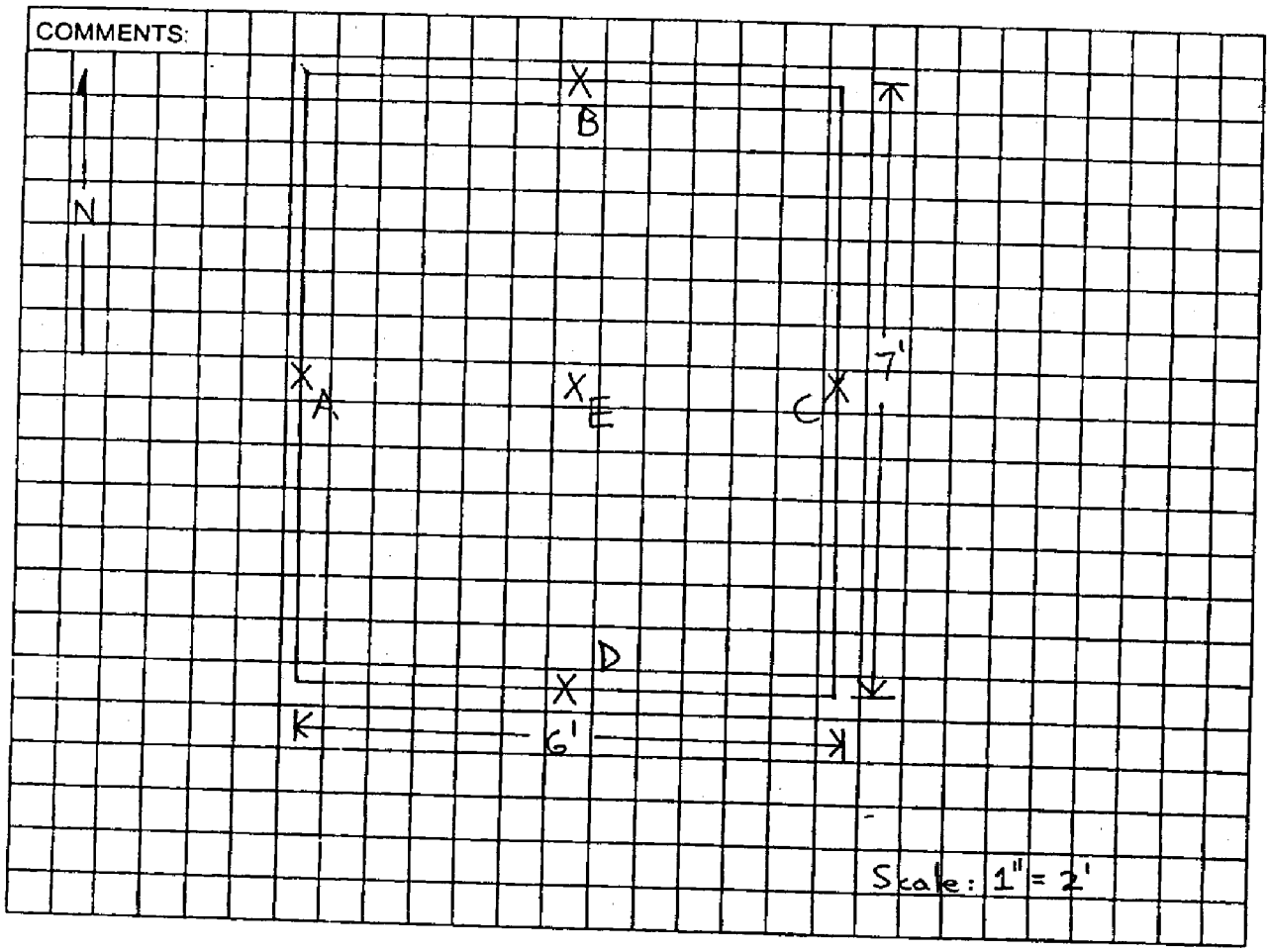
COMPOSITE TYPE ____

DEPTH OF SAMPLE 1.5 to 2.0 feet (A thru D) 2.0 to 2.5 feet (E)

WEATHER ____

CONTAINERS USED	AMOUNT COLLECTED
8 oz. glass	8 oz.

COMMENTS:



PREPARED BY: Paul Dimakos

849530074

COMMENTS:
(Continued)

DATE	
TIME	
PAGE ____ OF ____	
PAGE	
PROJECT NO.	

PREPARED BY: _____

LEGEND

1. A SAMPLE COLLECTION LOG IS TO BE COMPLETED FOR EACH SAMPLE.
2. ALWAYS COMPLETE BOTH SIDES. IF SECOND SIDE IS NOT USED, DRAW A LINE THROUGH IT AND MARK N/A. FILL IN CONTROL BLOCK AND PREPARED BY.
3. ALL ENTRIES ON LOG ARE TO BE COMPLETED. IF NOT APPLICABLE MARK N/A.
4. DATE: USE MONTH/DAY/YEAR; I.E., 10/30/85
5. TIME: USE 24-HOUR CLOCK; I.E., 1835 FOR 6:35 P.M.
6. PAGE: EACH SAMPLE TEAM SHOULD NUMBER PAGE ____ OF ____ FOR THE DAY'S ACTIVITIES FOR ALL SHEETS PREPARED ON A SINGLE DAY, I.E., IF THERE ARE A TOTAL OF 24 PAGES (INCLUDING FRONT AND BACK) NUMBER 1 OF 24, 2 OF 24, ETC.
7. SAMPLE LOCATION: USE BORING OR MONITORING WELL NUMBER, GRID LOCATION (TRANSECT), SAMPLING STATION I.D., OR COORDINATE TO PHYSICAL FEATURES WITH DISTANCES. INCLUDE SKETCH IN COMMENT SECTION IF NECESSARY.
8. SAMPLE TYPE: USE THE FOLLOWING - SOIL; WATER (SURFACE OR GROUND); AIR (FILTERS, TUBES, AMBIENT, PERSONNEL); SLUDGE; DRUM CONTENTS; OIL; VEGETATION; WIPE; SEDIMENT.
9. COMPOSITE TYPE: I.E., 24-HOUR, LIST SAMPLE NUMBERS IN COMPOSITE, SPATIAL COMPOSITE.
10. DEPTH OF SAMPLE: GIVE UNITS. WRITE OUT UNITS SUCH AS INCHES, FEET. DON'T USE ' OR ".
11. WEATHER: APPROXIMATE TEMPERATURE, SUN AND MOISTURE CONDITIONS.
12. CONTAINERS USED: LIST EACH CONTAINER TYPE AS NUMBER, VOLUME, MATERIAL (E.G., 2 - 1L GLASS; 4 - 40 ML GLASS VIAL; 1 - 400 ML PLASTIC; 1 - 3 INCH STEEL TUBE; 1 - 8 OZ. GLASS JAR)
13. AMOUNT COLLECTED: VOLUME IN CONTAINERS (E.G. 1/2 FULL).

849530075

125-10-85

8/5/93
8/14/93
and

INTERNATIONAL TECHNOLOGY CORPORATION

DATE	0	9	0	8	9	3
TIME						
PAGE 1 OF 1						
PAGE						
PROJECT NO. 529342						

SAMPLE COLLECTION LOG

PROJECT NAME Praxair - Newark

SAMPLE NO. LP - 19 A-2, B, C, D and E

SAMPLE LOCATION LP - 19

SAMPLE TYPE Soil - Grab

COMPOSITE ____ YES x NO

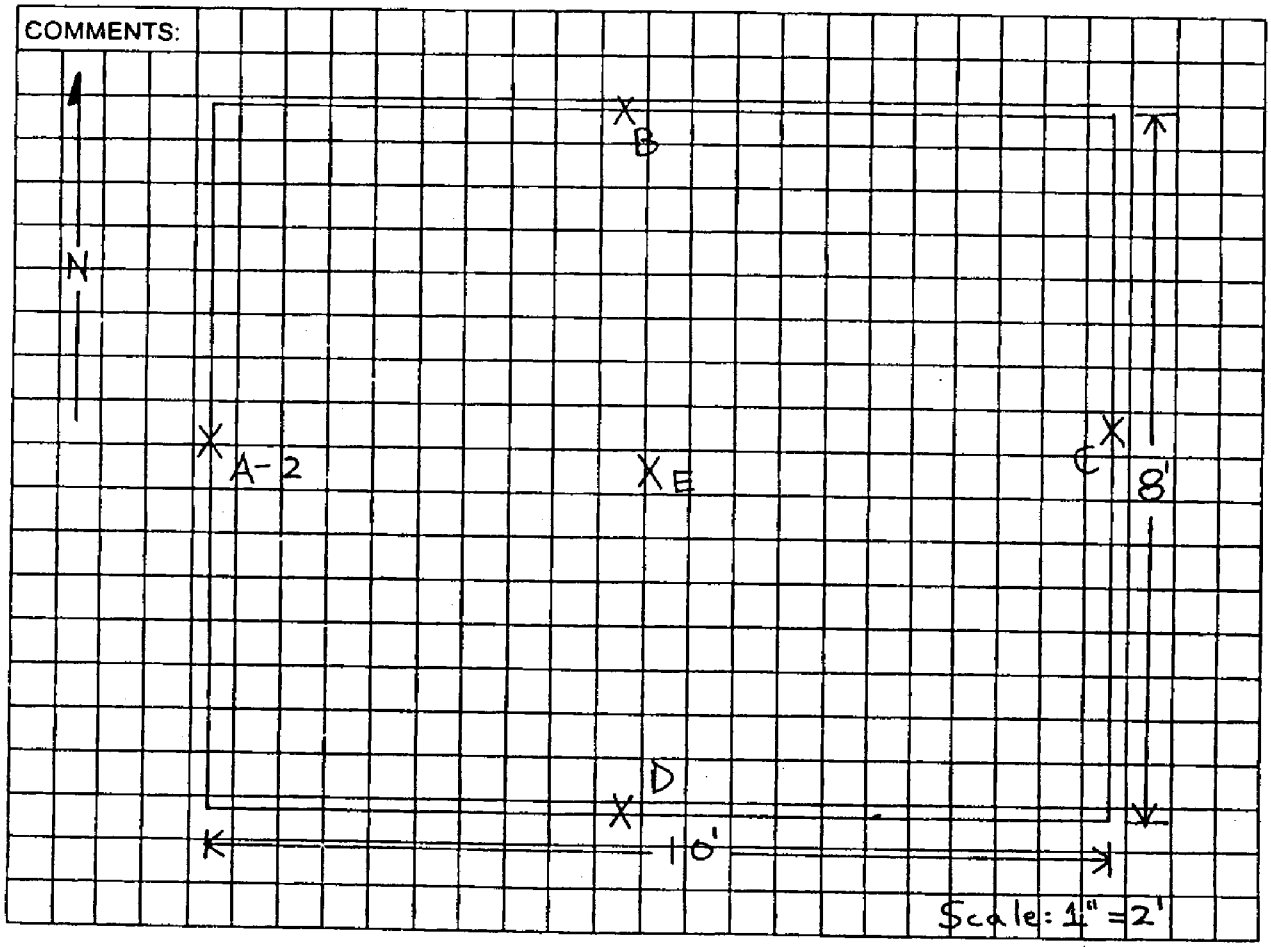
COMPOSITE TYPE ____

DEPTH OF SAMPLE 1.5 to 2.0 feet (A thru D) 2.0 to 2.5 feet (E)

WEATHER ____

CONTAINERS USED	AMOUNT COLLECTED
8 oz. glass	8 oz.

COMMENTS:



PREPARED BY: Paul Dimakos

849530076

COMMENTS: (Continued)

DATE	
TIME	
PAGE ____ OF ____	
PAGE	
PROJECT NO.	

PREPARED BY: _____

LEGEND

1. A SAMPLE COLLECTION LOG IS TO BE COMPLETED FOR EACH SAMPLE.
2. ALWAYS COMPLETE BOTH SIDES. IF SECOND SIDE IS NOT USED, DRAW A LINE THROUGH IT AND MARK N/A. FILL IN CONTROL BLOCK AND PREPARED BY.
3. ALL ENTRIES ON LOG ARE TO BE COMPLETED. IF NOT APPLICABLE MARK N/A.
4. DATE: USE MONTH/DAY/YEAR; I.E., 10/30/85
5. TIME: USE 24-HOUR CLOCK; I.E., 1835 FOR 6:35 P.M
6. PAGE: EACH SAMPLE TEAM SHOULD NUMBER PAGE _____ OF _____ FOR THE DAY'S ACTIVITIES FOR ALL SHEETS PREPARED ON A SINGLE DAY. I.E., IF THERE ARE A TOTAL OF 24 PAGES (INCLUDING FRONT AND BACK) NUMBER 1 OF 24, 2 OF 24, ETC.
7. SAMPLE LOCATION: USE BORING OR MONITORING WELL NUMBER, GRID LOCATION (TRANSECT), SAMPLING STATION I.D., OR COORDINATE TO PHYSICAL FEATURES WITH DISTANCES. INCLUDE SKETCH IN COMMENT SECTION IF NECESSARY.
8. SAMPLE TYPE: USE THE FOLLOWING - SOIL; WATER (SURFACE OR GROUND); AIR (FILTERS, TUBES, AMBIENT, PERSONNEL); SLUDGE; DRUM CONTENTS, OIL; VEGETATION, WIPE; SEDIMENT.
9. COMPOSITE TYPE: I.E., 24-HOUR, LIST SAMPLE NUMBERS IN COMPOSITE, SPATIAL COMPOSITE.
10. DEPTH OF SAMPLE: GIVE UNITS. WRITE OUT UNITS SUCH AS INCHES, FEET. DON'T USE ' OR ".
11. WEATHER: APPROXIMATE TEMPERATURE, SUN AND MOISTURE CONDITIONS.
12. CONTAINERS USED: LIST EACH CONTAINER TYPE AS NUMBER, VOLUME, MATERIAL (E.G., 2 - 1L GLASS; 4 - 40 ML GLASS VIAL; 1 - 400 ML PLASTIC, 1 - 3 INCH STEEL TUBE; 1 - 8 OZ. GLASS JAR)
13. AMOUNT COLLECTED: VOLUME IN CONTAINERS (E.G. 1/2 FULL).

849530077

125-10-85

INTERNATIONAL TECHNOLOGY CORPORATION

8/5/93 and

DATE	0	9	0	8	9	3
TIME						
PAGE 1 OF 1						
PAGE						
PROJECT NO. 529342						

SAMPLE COLLECTION LOG

PROJECT NAME Praxair - Newark

SAMPLE NO. LP - 21 A, B, C, D and E

SAMPLE LOCATION LP - 21

SAMPLE TYPE Soil - Grab

COMPOSITE ____ YES x NO

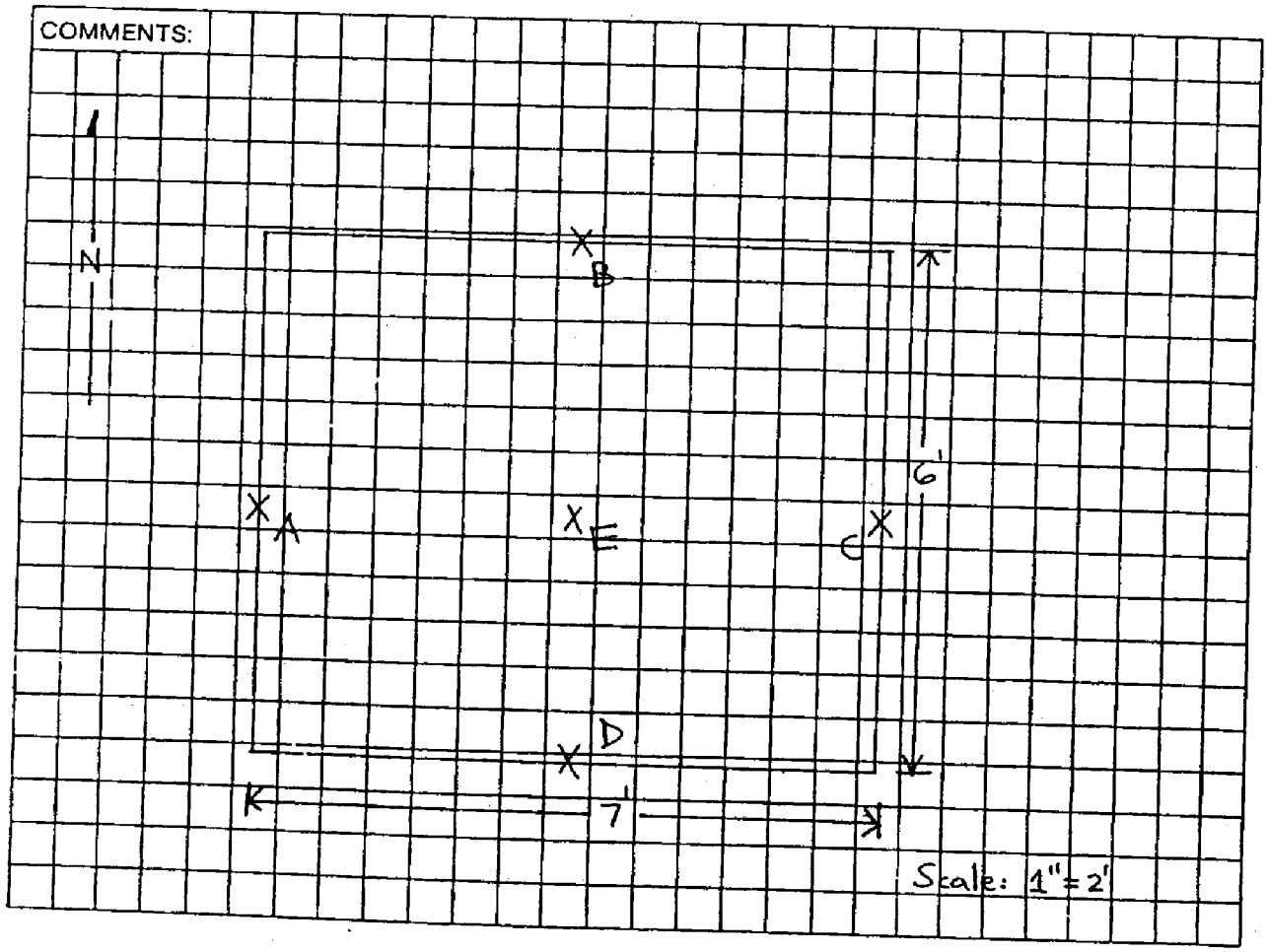
COMPOSITE TYPE

DEPTH OF SAMPLE 1.5 to 2.0 feet (A thru D) 2.0 to 2.5 feet (E)

WEATHER

CONTAINERS USED	AMOUNT COLLECTED
8 oz. glass	8 oz.

COMMENTS:



PREPARED BY: Paul Dimakos

849530078

COMMENTS:
(Continued)

DATE	
TIME	
PAGE ____ OF ____	
PAGE	
PROJECT NO.	

PREPARED BY: _____

LEGEND

1. A SAMPLE COLLECTION LOG IS TO BE COMPLETED FOR EACH SAMPLE.
2. ALWAYS COMPLETE BOTH SIDES. IF SECOND SIDE IS NOT USED, DRAW A LINE THROUGH IT AND MARK N/A. FILL IN CONTROL BLOCK AND PREPARED BY.
3. ALL ENTRIES ON LOG ARE TO BE COMPLETED, IF NOT APPLICABLE MARK N/A.
4. DATE: USE MONTH/DAY/YEAR; I.E., 10/30/85
5. TIME: USE 24-HOUR CLOCK; I.E., 1835 FOR 6:35 P.M.
6. PAGE: EACH SAMPLE TEAM SHOULD NUMBER PAGE _____ OF _____ FOR THE DAY'S ACTIVITIES FOR ALL SHEETS PREPARED ON A SINGLE DAY I.E., IF THERE ARE A TOTAL OF 24 PAGES (INCLUDING FRONT AND BACK) NUMBER 1 OF 24, 2 OF 24, ETC.
7. SAMPLE LOCATION: USE BORING OR MONITORING WELL NUMBER, GRID LOCATION (TRANSECT), SAMPLING STATION I.D., OR COORDINATE TO PHYSICAL FEATURES WITH DISTANCES. INCLUDE SKETCH IN COMMENT SECTION IF NECESSARY.
8. SAMPLE TYPE: USE THE FOLLOWING - SOIL; WATER (SURFACE OR GROUND); AIR (FILTERS, TUBES, AMBIENT, PERSONNEL); SLUDGE; DRUM CONTENTS; OIL; VEGETATION; WIPE; SEDIMENT.
9. COMPOSITE TYPE: I.E., 24-HOUR, LIST SAMPLE NUMBERS IN COMPOSITE, SPATIAL COMPOSITE.
10. DEPTH OF SAMPLE: GIVE UNITS. WRITE OUT UNITS SUCH AS INCHES, FEET. DON'T USE ' OR ".
11. WEATHER: APPROXIMATE TEMPERATURE, SUN AND MOISTURE CONDITIONS.
12. CONTAINERS USED: LIST EACH CONTAINER TYPE AS NUMBER, VOLUME, MATERIAL (E.G., 2 - 1L GLASS; 4 - 40 ML GLASS VIAL; 1 - 400 ML PLASTIC, 1 - 3 INCH STEEL TUBE; 1 - 8 OZ. GLASS JAR)
13. AMOUNT COLLECTED: VOLUME IN CONTAINERS (E.G. 1/2 FULL).

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INTERNATIONAL TECHNOLOGY CORPORATION

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DATE	0 9	0 8	9 3
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PAGE 1 OF 1			
PAGE			
PROJECT NO. 529342			

SAMPLE COLLECTION LOG

PROJECT NAME Praxair - Newark

SAMPLE NO. LP - 23 A2, B, C, D and E

SAMPLE LOCATION LP - 23

SAMPLE TYPE Soil - Grab

COMPOSITE ____ YES x NO

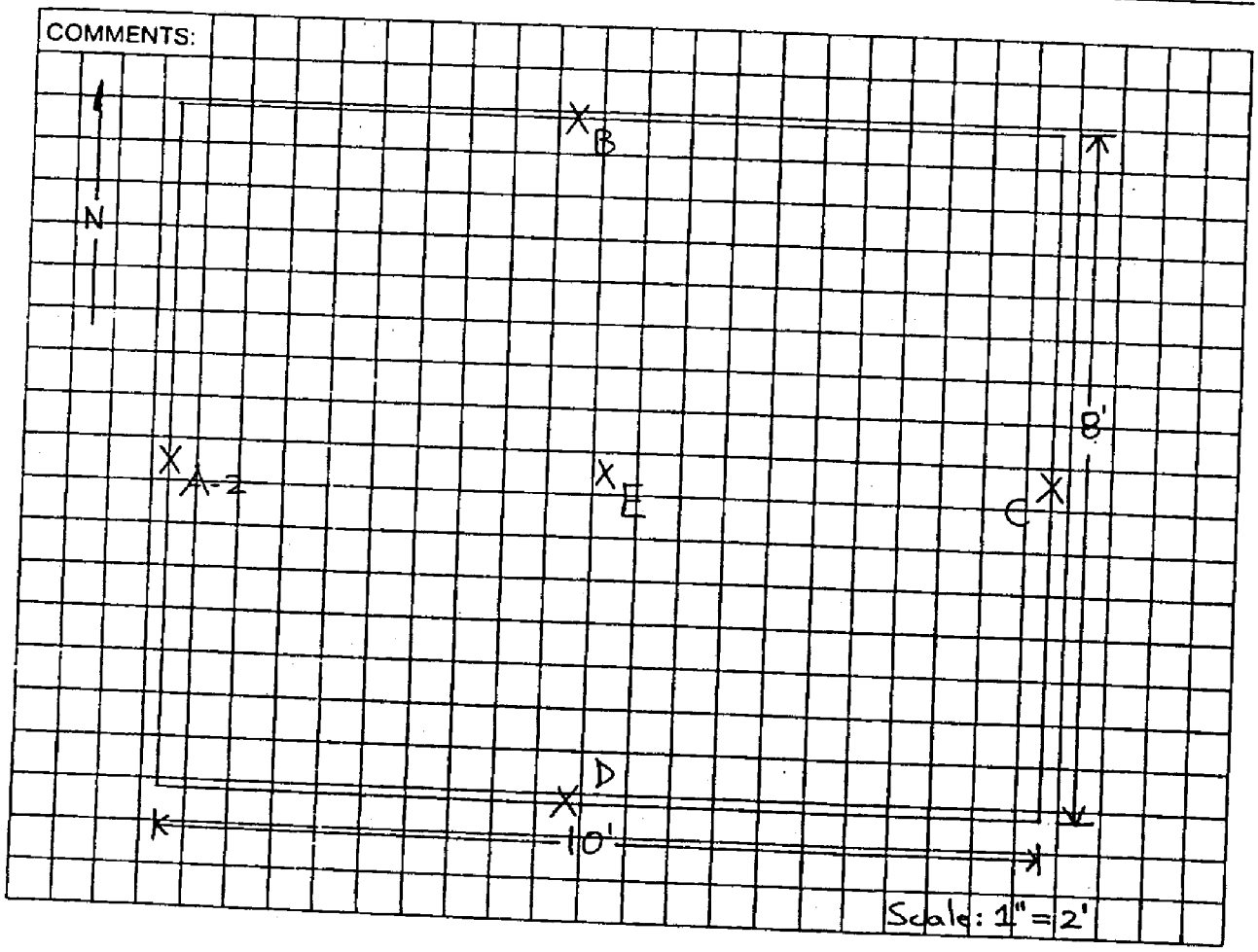
COMPOSITE TYPE ____

DEPTH OF SAMPLE 1.5 to 2.0 feet (A-2, B thru D) 2.0 to 2.5 feet (E)

WEATHER ____

CONTAINERS USED	AMOUNT COLLECTED
8 oz. glass	8 oz.

COMMENTS:



PREPARED BY: Paul Dimakos

849530080

COMMENTS: (Continued)

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PROJECT NO.	

PREPARED BY: _____

LEGEND

1. A SAMPLE COLLECTION LOG IS TO BE COMPLETED FOR EACH SAMPLE.
2. ALWAYS COMPLETE BOTH SIDES. IF SECOND SIDE IS NOT USED, DRAW A LINE THROUGH IT AND MARK N/A. FILL IN CONTROL BLOCK AND PREPARED BY.
3. ALL ENTRIES ON LOG ARE TO BE COMPLETED. IF NOT APPLICABLE MARK N/A.
4. DATE: USE MONTH/DAY/YEAR; I.E., 10/30/85
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9. COMPOSITE TYPE: I.E., 24-HOUR, LIST SAMPLE NUMBERS IN COMPOSITE, SPATIAL COMPOSITE.
10. DEPTH OF SAMPLE: GIVE UNITS, WRITE OUT UNITS SUCH AS INCHES, FEET, DON'T USE ' OR ".
11. WEATHER: APPROXIMATE TEMPERATURE, SUN AND MOISTURE CONDITIONS.
12. CONTAINERS USED: LIST EACH CONTAINER TYPE AS NUMBER, VOLUME, MATERIAL (E.G., 2 - 1L GLASS; 4 - 40 ML GLASS VIAL; 1 - 400 ML PLASTIC, 1 - 3 INCH STEEL TUBE; 1 - 8 OZ. GLASS JAR).
13. AMOUNT COLLECTED: VOLUME IN CONTAINERS (E.G. 1/2 FULL).

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DATE	0	8	2	4	9	3
TIME						
PAGE 1 OF 1						
PAGE						
PROJECT NO. 529342						

SAMPLE COLLECTION LOG

PROJECT NAME Praxair - Newark

SAMPLE NO. LP - 24

SAMPLE LOCATION LP - 24

SAMPLE TYPE Soil - Grab

COMPOSITE ____ YES x NO

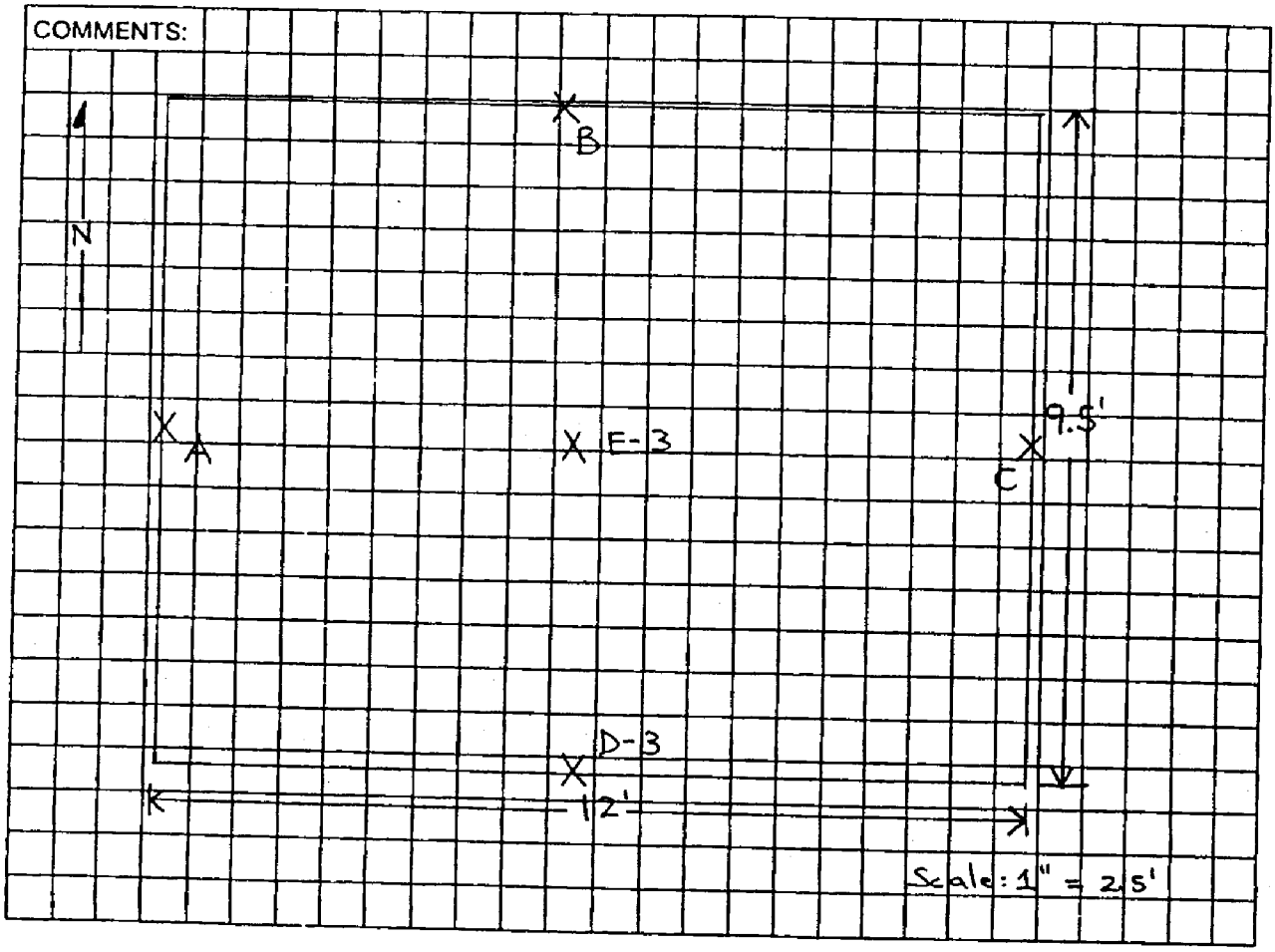
COMPOSITE TYPE 1.5 to 2.0 feet (A thru C)

DEPTH OF SAMPLE 8.0 to 8.5 feet (D and E)

WEATHER

CONTAINERS USED	AMOUNT COLLECTED
8 oz. glass	8 oz.

COMMENTS:



PREPARED BY: Paul Dimakos

849530082

COMMENTS: (Continued)

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PAGE ____ OF ____	
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PROJECT NO.	

PREPARED BY: _____

LEGEND

1. A SAMPLE COLLECTION LOG IS TO BE COMPLETED FOR EACH SAMPLE.
2. ALWAYS COMPLETE BOTH SIDES. IF SECOND SIDE IS NOT USED, DRAW A LINE THROUGH IT AND MARK N/A. FILL IN CONTROL BLOCK AND PREPARED BY.
3. ALL ENTRIES ON LOG ARE TO BE COMPLETED. IF NOT APPLICABLE MARK N/A.
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9. COMPOSITE TYPE: I.E., 24-HOUR, LIST SAMPLE NUMBERS IN COMPOSITE, SPATIAL COMPOSITE.
10. DEPTH OF SAMPLE: GIVE UNITS, WRITE OUT UNITS SUCH AS INCHES, FEET. DON'T USE ' OR ".
11. WEATHER: APPROXIMATE TEMPERATURE, SUN AND MOISTURE CONDITIONS.
12. CONTAINERS USED: LIST EACH CONTAINER TYPE AS NUMBER, VOLUME, MATERIAL (E.G., 2 - 1L GLASS; 4 - 40 ML GLASS VIAL; 1 - 400 ML PLASTIC; 1 - 3 INCH STEEL TUBE; 1 - 8 OZ. GLASS JAR).
13. AMOUNT COLLECTED: VOLUME IN CONTAINERS (E.G. 1/2 FULL).

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8/14/93 and

INTERNATIONAL TECHNOLOGY CORPORATION

DATE	0	9	0	8	9	3
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PAGE 1 OF 1						
PAGE						
PROJECT NO. 529342						

SAMPLE COLLECTION LOG

PROJECT NAME Praxair - Newark

SAMPLE NO. LP - 25 A-2, B, C, D-2 and E

SAMPLE LOCATION LP - 25

SAMPLE TYPE Soil - Grab

COMPOSITE ____ YES x NO

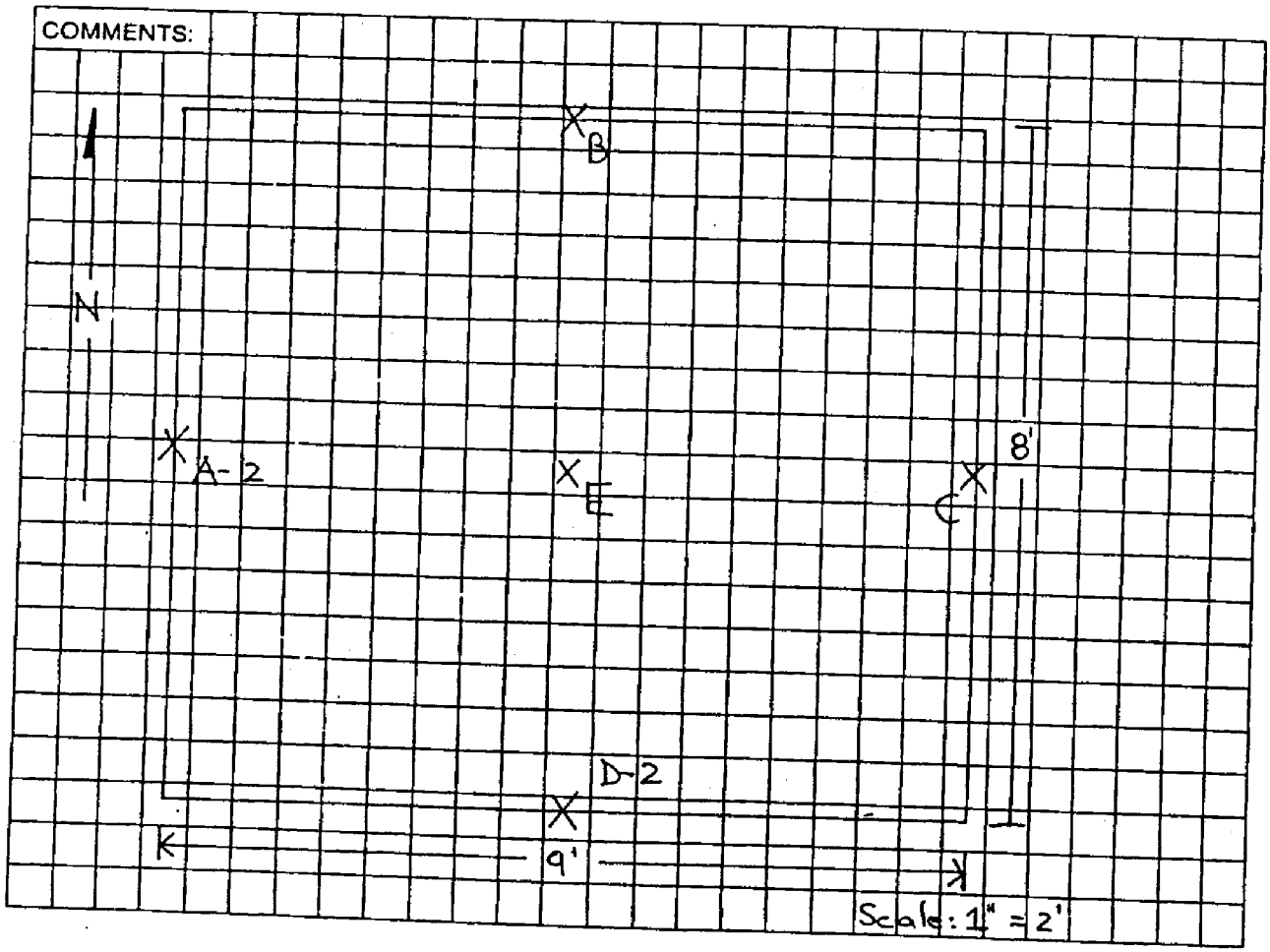
COMPOSITE TYPE ____

DEPTH OF SAMPLE 1.5 to 2.0 feet (A-2, B, C, D-2) 2.0 to 2.5 feet (E)

WEATHER ____

CONTAINERS USED	AMOUNT COLLECTED
8 oz. glass	8 oz.

COMMENTS:



PREPARED BY: Paul Dimakos

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COMMENTS: (Continued)

DATE	
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PAGE ____ OF ____	
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PREPARED BY: _____

LEGEND

1. A SAMPLE COLLECTION LOG IS TO BE COMPLETED FOR EACH SAMPLE.
2. ALWAYS COMPLETE BOTH SIDES. IF SECOND SIDE IS NOT USED, DRAW A LINE THROUGH IT AND MARK N/A. FILL IN CONTROL BLOCK AND PREPARED BY.
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9. COMPOSITE TYPE: I.E., 24-HOUR, LIST SAMPLE NUMBERS IN COMPOSITE, SPATIAL COMPOSITE.
10. DEPTH OF SAMPLE: GIVE UNITS, WRITE OUT UNITS SUCH AS INCHES, FEET. DON'T USE ' OR ".
11. WEATHER: APPROXIMATE TEMPERATURE, SUN AND MOISTURE CONDITIONS.
12. CONTAINERS USED: LIST EACH CONTAINER TYPE AS NUMBER, VOLUME, MATERIAL (E.G., 2 - 1L GLASS; 4 - 40 ML GLASS VIAL; 1 - 400 ML PLASTIC; 1 - 3 INCH STEEL TUBE; 1 - 8 OZ. GLASS JAR)
13. AMOUNT COLLECTED: VOLUME IN CONTAINERS (E.G. 1/2 FULL).

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8/24/93
and

INTERNATIONAL TECHNOLOGY CORPORATION

DATE	0	9	0	8	9	3
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PAGE 1 OF 1						
PAGE						
PROJECT NO. 529342						

SAMPLE COLLECTION LOG

PROJECT NAME Praxair - Newark

SAMPLE NO. LP - 27 A, B-2, C-2, D and E

SAMPLE LOCATION LP - 27

SAMPLE TYPE Soil - Grab

COMPOSITE ____ YES x NO

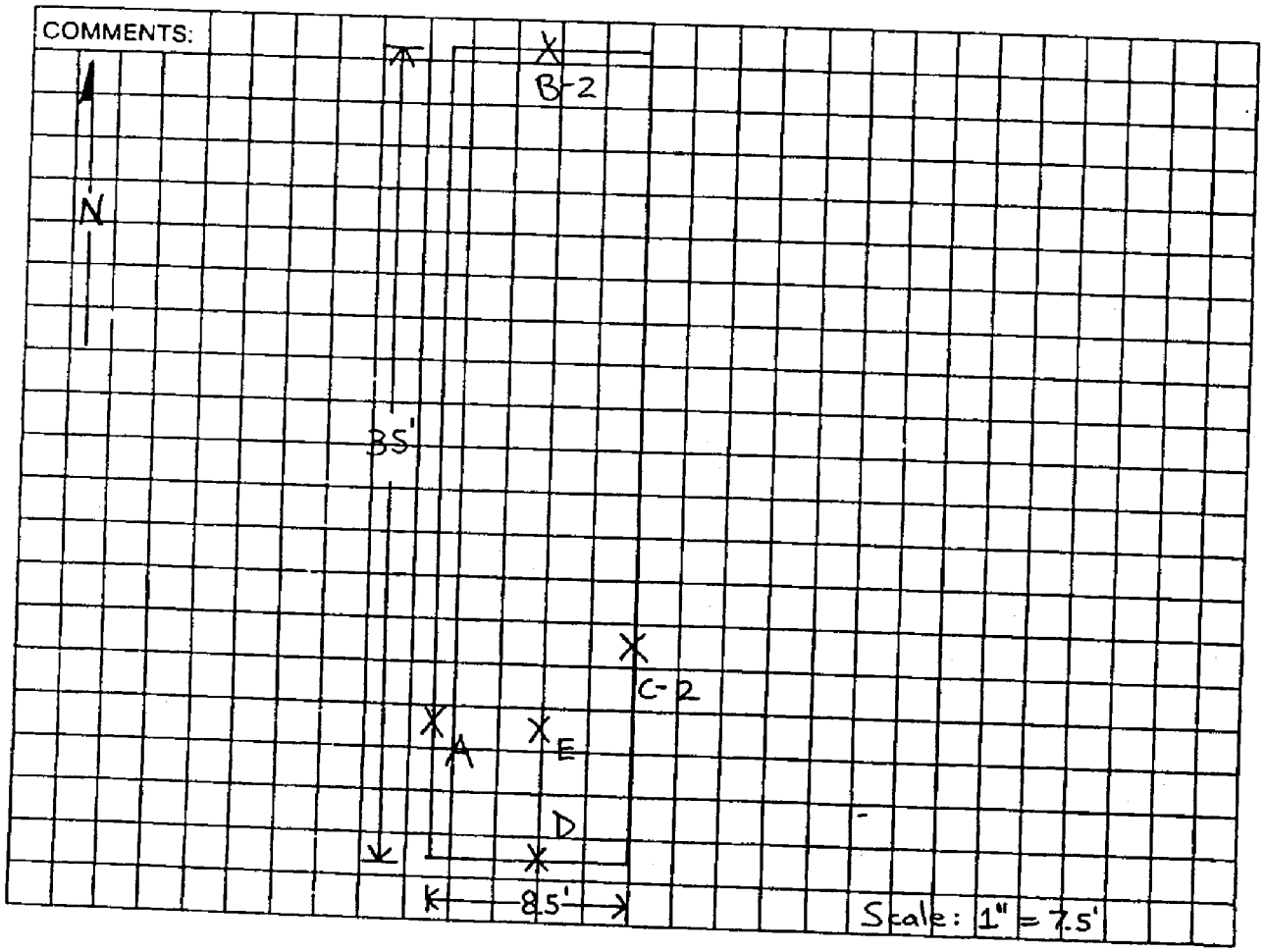
COMPOSITE TYPE 1.5 to 2.0 feet (A, B-2, C-2, D)

DEPTH OF SAMPLE 2.0 to 2.5 feet (E)

WEATHER ____

CONTAINERS USED	AMOUNT COLLECTED
8 oz. glass	8 oz.

COMMENTS:



PREPARED BY: Paul Dimakos

849530086

COMMENTS: (Continued)

DATE	
TIME	
PAGE ____ OF ____	
PAGE	
PROJECT NO.	

PREPARED BY: _____

LEGEND

1. A SAMPLE COLLECTION LOG IS TO BE COMPLETED FOR EACH SAMPLE.
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9. COMPOSITE TYPE: I.E., 24-HOUR, LIST SAMPLE NUMBERS IN COMPOSITE, SPATIAL COMPOSITE.
10. DEPTH OF SAMPLE: GIVE UNITS. WRITE OUT UNITS SUCH AS INCHES, FEET. DON'T USE ' OR ".
11. WEATHER: APPROXIMATE TEMPERATURE, SUN AND MOISTURE CONDITIONS.
12. CONTAINERS USED: LIST EACH CONTAINER TYPE AS NUMBER, VOLUME, MATERIAL (E.G., 2 - 1L GLASS; 4 - 40 ML GLASS VIAL; 1 - 400 ML PLASTIC; 1 - 3 INCH STEEL TUBE; 1 - 8 OZ. GLASS JAR).
13. AMOUNT COLLECTED: VOLUME IN CONTAINERS (E.G. 1/2 FULL).

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INTERNATIONAL TECHNOLOGY CORPORATION

8/14/93 and

DATE	0	9	0	8	9	3
TIME						
PAGE 1 OF 1						
PAGE						
PROJECT NO. 529342						

SAMPLE COLLECTION LOG

PROJECT NAME Praxair - Newark

SAMPLE NO. LP - 30 A-2, B, C, D and E-2

SAMPLE LOCATION LP - 30

SAMPLE TYPE Soil - Grab

COMPOSITE ____ YES x NO

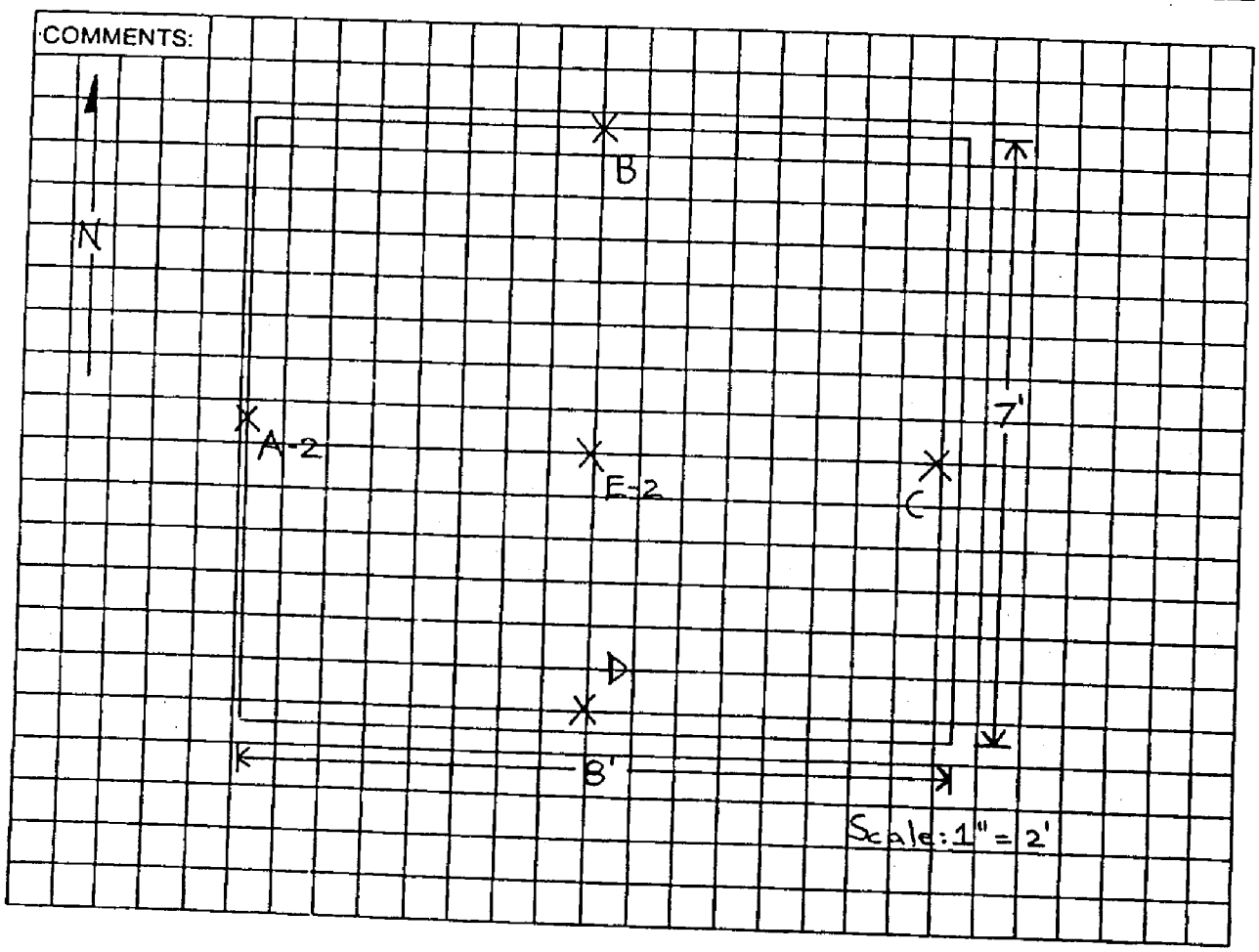
COMPOSITE TYPE ____

DEPTH OF SAMPLE 1.5 to 2.0 feet (B, C, D); 2.5 to 3.0 feet (A-2); 3.0 to 3.5 feet (E-2)

WEATHER ____

CONTAINERS USED	AMOUNT COLLECTED
8 oz. glass	8 oz.

COMMENTS:



PREPARED BY: Paul Dimakos

849530088

COMMENTS: (Continued)

DATE	
TIME	
PAGE ____ OF ____	
PAGE	
PROJECT NO.	

PREPARED BY: _____

LEGEND

1. A SAMPLE COLLECTION LOG IS TO BE COMPLETED FOR EACH SAMPLE.
2. ALWAYS COMPLETE BOTH SIDES. IF SECOND SIDE IS NOT USED, DRAW A LINE THROUGH IT AND MARK N/A. FILL IN CONTROL BLOCK AND PREPARED BY.
3. ALL ENTRIES ON LOG ARE TO BE COMPLETED, IF NOT APPLICABLE MARK N/A.
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10. DEPTH OF SAMPLE: GIVE UNITS. WRITE OUT UNITS SUCH AS INCHES, FEET. DON'T USE ' OR ".
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12. CONTAINERS USED: LIST EACH CONTAINER TYPE AS NUMBER, VOLUME, MATERIAL (E.G., 2 - 1L GLASS; 4 - 40 ML GLASS VIAL; 1 - 400 ML PLASTIC 1 - 3 INCH STEEL TUBE; 1 - 8 OZ. GLASS JAR)
13. AMOUNT COLLECTED: VOLUME IN CONTAINERS (E.G. 1/2 FULL).

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APPENDIX D

BaP REFERENCE MATERIAL

Handbook of Toxic and Hazardous Chemicals and Carcinogens

Second Edition

Marshall Sittig

np

Library of Congress Catalog Card Number: 84-22755
ISBN: 0-8155-1009-8
Printed in the United States

Published in the United States of America by
Noyes Publications
Mill Road, Park Ridge, New Jersey 07656

10 9 8 7 6 5 4

Library of Congress Cataloging in Publication Data
Sittig, Marshall.
Handbook of toxic and hazardous chemicals and carcinogens.

Bibliography: p.
Includes index.
1. Poisons--Dictionaries. 2. Hazardous substances--Dictionaries. 3. Carcinogens--Dictionaries. I. Title.
RA1193.S58 1985 615.9'02 84-22755
ISBN 0-8155-1009-8

In April 19
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toxic effects such

Potential Exposure: Workers in organic synthesis of pharmaceuticals, dyestuffs, rubber chemicals. Used as a solvent and chemical intermediate.

Permissible Exposure Limits in Air: No standards set.

Permissible Concentration in Water: No criteria set. Biological effects reviewed (A-36).

Routes of Entry: Inhalation, ingestion, skin absorption.

Harmful Effects and Symptoms: Toxic when ingested or inhaled.

Personal Protective Methods: Wear long rubber gloves, overalls and apron (A-38).

Respirator Selection: Use self-contained breathing apparatus.

Disposal Method Suggested: (1) Mix with calcium hypochlorite and flush to sewer with water or (2) incinerate.

References

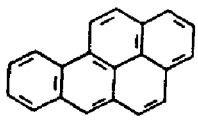
(1) Sax., N.I., Ed., *Dangerous Properties of Industrial Materials Report, 1*, No. 8, 40-42, New York, Van Nostrand Reinhold Co. (1981).
(2) See Reference (A-60).
(3) Sax, N.I., Ed., *Dangerous Properties of Industrial Materials Report, 3*, No. 4, 40-42, New York, Van Nostrand Reinhold Co. (1983).

BENZO[a] PYRENE

See "Polynuclear Aromatic Hydrocarbons" also.

- Carcinogen (EPA-CAG) (IARC) (1)
- Hazardous Waste Constituent (EPA)

Description: $C_{20}H_{12}$ with the structure



forms yellowish crystals melting at 179°C.

Code Numbers: CAS 50-32-8

DOT Designation: —

Synonyms: 3,4-Benzpyrene.

Potential Exposure: Benzo(a)pyrene [B(a)P] is a polycyclic aromatic hydrocarbon (PAH) that has no commercial-scale production.

B(a)P is produced in the United States by one chemical company and distributed by several specialty chemical companies in quantities from 100 mg to 5 g for research purposes.

Although not manufactured in great quantity, B(a)P is a by-product of combustion. It is estimated that 1.8 million pounds per year are released from stationary sources, with 96% coming from: (1) coal refuse piles, outcrops, and

abandoned coal mines; (2) residential external combustion of bituminous coal; (3) coke manufacture; and (4) residential external combustion of anthracite coal.

Human exposure to B(a)P can occur from its presence as a by-product of chemical production. The number of persons exposed is not known. Persons working at airports in tarring operations, refuse incinerator operations, power plants, and coke manufacturers may be exposed to higher B(a)P levels than the general population. Scientists involved in cancer research or in sampling toxic materials may also be occupationally exposed. The general population may be exposed to B(a)P from air pollution, cigarette smoke, and food sources. B(a)P has been detected in cigarette smoke at levels ranging from 0.2 to 12.2 μg per 100 cigarettes. B(a)P has been detected at low levels in foods ranging from 0.1 to 50 ppb.

Permissible Exposure Limits in Air: 0.2 mg/m^3 8-hr TWA (coal tar pitch volatiles) (OSHA). ACGIH (1983/84) designates Benzo(a)pyrene as an industrial substance suspect of carcinogenic potential for man with no TWA value set.

Permissible Concentration in Water: Water quality criteria document for PAH published in final 11/2/80. Total PAH addressed. A concentration of PAH 2.8 ng/ℓ is estimated to limit a cancer risk to one in a million (EPA).

Harmful Effects and Symptoms: B(a)P has produced tumours in all of the nine species for which data are reported following different administrations including oral, skin and intratracheal routes. It has both a local and a systemic carcinogenic effect. In sub-human primates, there is convincing evidence of the ability of B(a)P to produce local sarcomas following repeated subcutaneous injections and lung carcinomas following intratracheal instillation. It is also an initiator of skin carcinogenesis in mice, and it is carcinogenic in single-dose experiments and following prenatal exposure.

In skin carcinogenesis studies in mice, B(a)P was consistently found to produce more tumours in a shorter period of time than did other polycyclic aromatic hydrocarbons, with the possible exception of DB(a,h)A. In a dose-response study involving subcutaneous injection in mice, the minimal dose at which carcinogenicity was detected was higher for B(a)P than for DB(a,h)A and for MC. However, the latent periods were shorter for B(a)P than for DB(a,h)A. In studies using intratracheal administration, B(a)P appeared to be less effective than 7H-dibenzo(c,g)carbazole in the hamster (1).

No epidemiological studies on the significance of B(a)P exposure to man are available, and studies are insufficient to prove that B(a)P is carcinogenic for man. However, coal-tar and other materials which are known to be carcinogenic to man may contain B(a)P. The substance has also been detected in other environmental situations.

References

(1) IARC Monographs on the *Evaluation of Carcinogenic Risk of Chemicals to Man*, vol. 3, IARC, Lyon, France, pp 91-136 (1973).
(2) See Reference (A-62). Also see reference (A-64).
(3) United Nations Environment Programme, *International Register of Potentially Toxic Chemicals*, Geneva, Switzerland (1979).
(4) United Nations Environment Programme, *IRPTC Legal File 1983*, Vol. I, pp VII/121-22, Geneva, Switzerland, International Register of Potentially Toxic Chemicals (1984).

Sixth Annual Report on

Carcinogens

Summary 1991

U.S. DEPARTMENT OF
HEALTH AND HUMAN SERVICES
Public Health Service

Prepared for the
NATIONAL INSTITUTE OF
ENVIRONMENTAL HEALTH SCIENCES
Research Triangle Park, NC 27709

By
Technical Resources, Inc.
Rockville, MD 20852
Under Contract Number
N01 ES 3 5025

CONTENTS

* For the purpose of this Report, "known carcinogens" are defined as those substances for which the evidence from human studies indicates that there is a causal relationship between exposure to the substance and human cancer.

** For the purpose of this Report, substances "which may reasonably be anticipated to be carcinogens" are defined as those for which there is a limited evidence of carcinogenicity in humans or sufficient evidence of carcinogenicity in experimental animals.

management of these fires can greatly reduce possible human exposure (EPA ORD, 1984). EPA estimated that about 12 million persons within 12 miles of three existing and nine projected commercial incinerators may possibly be exposed to releases of polychlorinated biphenyls in the air. In 1977, NIOSH estimated that 12,000 workers had potential occupational exposure as a result of polychlorinated biphenyls in the work environment (NIOSHb, 1977b).

REGULATIONS

The CPSC received a petition to declare sewage sludge products containing polychlorinated biphenyls hazardous substances. CPSC did not take action based on an anticipated EPA determination on this matter. EPA regulates polychlorinated biphenyls under the Clean Water Act (CWA), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), Resource Conservation and Recovery Act (RCRA), Superfund Amendments and Reauthorization Act (SARA), and Toxic Substances Control Act (TSCA). EPA has established water quality criteria and a toxic pollutant effluent standard under CWA. These chemicals are subject to reporting requirements under CWA, CERCLA, and SARA. EPA established a statutory reportable quantity (RQ) of 10 lb for polychlorinated biphenyls under CERCLA but lowered the final RQ to 1 lb for these chemicals and specifically for seven commercial mixtures of them. EPA banned the use of these chemicals in pesticides under FIFRA. Certain specific disposal practices of sludges containing polychlorinated biphenyls are prohibited under RCRA. Based upon carcinogenicity, EPA published a Maximum Contaminant Level Goal (MCLG) of zero and a maximum contaminant level (MCL) of 0.0005 mg/l for these chemicals under the Safe Drinking Water Act (SDWA). Under TSCA, EPA banned manufacturing, processing, and distribution of polychlorinated biphenyls and promulgated marketing and disposal rules. EPA has established a polychlorinated biphenyl Spill Cleanup Policy under TSCA. Under the Clean Air Act (CAA), EPA assessed air pollution sources of polychlorinated biphenyls and is considering the need for regulation of emissions from incinerators, the only source for which controls may be essential. FDA regulates polychlorinated biphenyls under the Food, Drug, and Cosmetic Act (FD&CA), establishing tolerances for polychlorinated biphenyls in several foods and in feeds for food-producing animals. The tolerances are 1.5 ppm (fat basis) in milk and manufactured dairy products, 3 ppm (fat basis) in poultry, 0.3 ppm in eggs, 0.2 ppm in finished animal feed, 2 ppm in animal feed components of animal origin, 2 ppm in fish and shellfish (edible portion), and 0.2 ppm in infant and junior foods. FDA established action

levels of 3 ppm (fat basis) in red meat and 10 ppm in paper food-packaging material. NIOSH has recommended a ceiling exposure of 1.0 $\mu g/m^3$ in the workplace. OSHA adopted permissible exposure limits (PELs) of 1 mg/m^3 as an 8-hr time-weighted average (TWA) for chlorodiphenyls containing 42% chlorine and 0.5 mg/m^3 as an 8-hr TWA for chlorodiphenyls containing 54% chlorine. These standards were adopted by OSHA for toxic effects other than cancer. OSHA also regulates polychlorinated biphenyls under the Hazard Communication Standard and as chemical hazards in laboratories.

POLYCYCLIC AROMATIC HYDROCARBONS, 15 LISTINGS

CARCINOGENICITY

There is sufficient evidence for the carcinogenicity of the following polycyclic aromatic hydrocarbons (PAHs) in experimental animals: benz[a]anthracene (56-55-3), benzo[b]fluoranthene (205-99-2), benzo[j]fluoranthene (205-82-3), benzo[k]fluoranthene (207-08-9), benzo[a]pyrene (50-32-8), dibenz[a,h]acridine (226-36-8), dibenz[a,j]acridine (224-42-0), dibenz[a,h]anthracene (53-70-3), 7H-dibenzo[c,g]carbazole (194-59-2), dibenzo[a,e]pyrene (192-65-4), dibenzo[a,h]pyrene (189-64-0), dibenzo[a,i]pyrene (189-55-9), dibenzo[a,l]pyrene (191-30-0), indeno[1,2,3-cd]pyrene (193-39-5), and 5-methylchrysene (3697-24-3) (IARC V.3, 1973; IARC V.32, 1987; IARC S.7, 1987).

When administered by gavage, benz[a]anthracene induced papillomas of the forestomach in mice. In another gavage study, benz[a]anthracene induced lung adenomas and hepatomas in mice. When administered topically, benzo[a]anthracene induced skin papillomas in mice. When administered by a single subcutaneous injection, benz[a]anthracene induced sarcomas in adult mice and pulmonary adenomas and adenocarcinomas in newborn mice. When administered by bladder implantation, benz[a]anthracene induced local carcinomas in mice (IARC V.3, 1973).

When administered topically, benzo[j]fluoranthene induced skin papillomas and carcinomas in female mice. When injected directly into the pulmonary tissues of female rats, benzo[j]fluoroanthene and benzo[k]fluoranthene induced squamous cell carcinomas. When administered topically, benzo[k]fluoranthene was active as an initiator of skin tumors in female mice. When administered by subcutaneous injection, benzo[k]fluoranthene induced local sarcomas in mice of both sexes (IARC V.32, 1983).

When administered by gavage, benzo[a]pyrene induced malignant and benign forestomach tumors in mice and hamsters and mammary tumors in female rats. When administered in the diet, benzo[a]-

pyrene increased the incidence of forestomach tumors and induced lung adenomas in mice. When administered topically, benzo[a]pyrene induced skin carcinomas and papillomas in mice, rats, guinea pigs, and rabbits. When administered by inhalation, benzo[a]pyrene induced tracheal papillomas and carcinomas in hamsters and squamous cell carcinomas of the lung in rats. When administered by intratracheal instillation, benzo[a]pyrene induced lung tumors in rats, tracheobronchial tumors in hamsters, and squamous carcinomas of the lung in two of six subhuman primates. When administered by subcutaneous injection, benzo[a]pyrene induced local sarcomas in rats, hamsters, guinea pigs, newts, subhuman primates, and adult mice; hepatomas and lung adenomas were produced in newborn mice. When administered by intraperitoneal injection, benzo[a]-pyrene induced abdominal fibrosarcomas in mice of both sexes and mammary and uterine carcinomas in rats. When administered by intravenous injection, benzo[a]pyrene induced mammary carcinomas in female rats. When administered by intrabronchial implantation, benzo[a]-pyrene induced local tumors in rats. When administered by subcutaneous or intraperitoneal injections to mice at the 11th, 13th, and 15th day of pregnancy, benzo[a]pyrene increased the incidence of lung adenomas and initiated skin carcinogenesis in the offspring (IARC V.3, 1973).

When administered topically, benzo[b]fluoranthene induced skin tumors in mice (IARC V.3, 1973). When administered by subcutaneous injection, benzo[b]fluoranthene induced local sarcomas in mice. When administered topically, dibenz[a,h]acridine induced skin tumors. When administered by intravenous injection, dibenz[a,h]-acridine increased the incidence of lung tumors in mice (IARC V.3, 1973).

When administered topically, dibenz[a,j]acridine induced skin tumors in mice. When administered by subcutaneous injection, dibenz[a,j]-acridine induced local sarcomas and increased the incidence of lung tumors in mice (IARC V.3, 1973).

When administered in the diet, dibenz[a,h]anthracene induced squamous cell carcinomas and papillomas of the forestomach in mice. When administered as an olive oil emulsion in place of the drinking water, dibenz[a,h]anthracene induced alveologenic carcinomas of the lung and hemangioendotheliomas in mice of both sexes and mammary carcinomas in female mice. When administered by intratracheal injection, dibenz[a,h]anthracene induced lung squamous cell carcinomas in rats. When administered by subcutaneous injection, dibenz[a,h]anthracene induced local sarcomas in rats, guinea pigs, pigeons, fowl, adult mice, and newborn mice; the incidence of lung adenomas was increased in newborn mice. When injected directly into lung tissues, dibenz[a,h]-

anthracene induced lung adenomas. When injected into the kidney of frogs, dibenz[a,h]anthracene induced renal adenocarcinomas. (IARC V.3, 1973).

7H-Dibenzo[c,g]carbazole induced subcutaneous injection site tumors in rats. When administered by gavage, 7H-dibenzo[c,g]carbazole induced forestomach papillomas and carcinomas and benign and malignant hepatomas in mice. When administered by intratracheal injection, 7H-dibenzo[c,g]carbazole induced respiratory tract tumors in hamsters (IARC V.3, 1973).

When administered topically, dibenzo[a,e]pyrene, dibenzo[a,h]-pyrene, dibenzo[a,i] pyrene, and 5-methylchrysene induced skin tumors in mice. Dibenzo[a,h]pyrene also induced skin tumors in rats. These four compounds and dibenzo[a,l]-pyrene induced local sarcomas in mice when administered by subcutaneous injection (IARC V.3, 1973).

An IARC Working Group concluded that there were no adequate data available to evaluate the carcinogenicity of PAHs in humans (IARC V.3, 1973; IARC V.32, 1983). However, there are a number of epidemiologic and mortality studies that show increased incidences of cancer in humans exposed to mixtures of PAHs (ATSDR, 1987b). Mortality studies have demonstrated that exposure to coke oven emissions, which contain a variety of PAHs, caused increased incidences of lung and genitourinary cancer mortality in coke oven workers (see Coke Oven Emissions, p. 791) (IARC V.34, 1984; Lloyd, 1971; Redmond et al., 1972). Workers exposed to creosote containing numerous PAHs developed skin tumors (see Soots, Tars, and Minerals Oils, p. 796). Exposures to other chemical mixtures that contain PAHs, such as cigarette smoke, coal tar, coal tar pitch, and bitumens, have been associated with increased incidences of lung cancer in humans. Dermal exposure to coal tar and shale oils containing PAHs have been associated with increased incidences of skin tumors in humans (IARC V. 35, 1985; 1985; ATSDR, 1987b).

PROPERTIES

The 15 PAHs listed occur as needles, plates, crystals, leaflets, or prisms ranging from colorless to pale yellow to golden yellow. Four of the 15 PAHs, benz[a]anthracene, dibenzo[a,i]pyrene, indeno[1,2,3-cd]pyrene, and 5-methylchrysene, show fluorescence ranging from greenish yellow to brilliant bluish violet to brown. Solubility characteristics vary for each PAH, but in general they are slightly soluble to insoluble in ethanol, and are soluble to slightly soluble in acetic acid, benzene, and acetone. Several PAHs are soluble in toluene, xylene, 1,4-dioxane, and other organic solvents. Some of the PAHs are soluble in mineral and/or olive oil, and dibenz[a,h]anthracene is soluble in cyclohexane. PAHs are insoluble in diethyl ether and petroleum ether, and most are insoluble in water. When heated to

decomposition, benzo[a]pyrene emits acrid smoke, and benzo[j]fluoranthene, benzo[k]fluoranthene, dibenz[a,h]anthracene, and 5-methylchrysene emit acrid smoke and irritating fumes. Dibenz[a,h]acridine, dibenz[a,j]acridine, and 7H-dibenzo[c,g]carbazole emit toxic nitrogen oxide (NOx) fumes when heated to decomposition.

USE

Twelve of the 15 PAHs are used only in biochemical, biomedical, laboratory, and/or cancer research. There are no known uses or applications for the remaining three PAHs, dibenzo[a,h]pyrene, dibenzo-[a,l]pyrene, and 5-methylchrysene (IARC V.32, 1983).

At least 8 of the 15 PAHs are present in coal tar which is used as a fuel in the steel industry in open-hearth and blast furnaces. Coal tar is also used in the clinical treatment of skin disorders such as eczema, dermatitis, and psoriasis. Coal tar is distilled to produce a variety of coal tar products including coal tar pitch and creosote. At least 6 of the 15 PAHs are present in coal tar pitch which is used primarily as a binder for aluminum smelting electrodes in the aluminum reduction process. Coal tar pitch is also used in roofing, surface coatings, for pitch coke production, and a variety of other applications (IARC V.35, 1985). At least 2 of the 15 PAHs are found in creosote which is used to preserve railroad ties, marine pilings, and telephone and telegraph poles. Some creosote is used for fuel by steel producers (NIOSHa, 1977). At least 3 of the 15 PAHs are present in bitumens and asphalt which are used for paving roads, for sound- and water-proofing, and coating pipes.

PRODUCTION

Eight of the 15 PAHs are not produced for commercial use in the United States (IARC V.32, 1983). The remaining seven PAHs, benz[a]-anthracene, benzo[b]-fluoranthene, benzo[k]fluoranthene, benzo[a]py-rene, dibenz[a,h]anthra-cene, di-benzo[a,e]pyrene, and indeno[1,2,3-cd]pyrene, are produced primarily for research purposes. The 1979 TSCA Inventory reported one producer with no stated volumes of benz[a]anthra-cene and dibenz[a,h-]anthracene in 1977 (TSCA, 1979). Indeno[1,2,3-cd]pyrene is listed in the TSCA Inventory, but production and import volumes are not given. Analytical grade indeno[1,2,3-cd]-pyrene is produced by one domestic company for use in laboratory investigations (Chem Sources, 1986). The TSCA Inventory reported one U.S. manufacturer of benzo[a]pyrene with a CBI Aggregate production of less than 1 million lb. Several specialty chemical companies distribute benz[a]anthra-cene for research purposes in quantities ranging from 1 to 5 g.Benzo[b]fluoranthene is available from some specialty chemical firms in quantities of 25 to 100 mg. Dibenz-[a,h]anthracene and benzo[a]-pyrene are also available from some specialty chemical companies in quantities of

100-500 mg and 100-1,000 mg, respectively. Benzo[k]fluoranthene is produced in the United States by one company for use as a research chemical (TSCA, 1979; Chem Sources, 1986).

All 15 PAHs form as a result of incomplete combustion of organic compounds. The primary source of PAHs in air is the incomplete combustion of wood and fuel for residential heating. The PAHs are found in gasoline or diesel motor vehicle exhaust, by-products of open fires or refuse burning, coal tar, coal tar pitch, coke tars or coke oven emissions, creosote, mineral oils, bitumens, industrial smoke and soot, cigarette and cigar tobacco and smoke, tar, or smoke condensates, and charcoal-broiled foods. Benzo[a]anthracene is found in gasoline and diesel exhaust, cigarette smoke and smoke condensate, amino acid, fatty acid, and carbohydrate pyrolysis products, coal tar and coal tar pitch, asphalt, soot and smoke, wood smoke, coal combustion emissions, commercial solvents, waxes, mineral oil, and creosote. Benzo[b]fluoranthene is found in gasoline exhaust, tobacco leaves, cigarette smoke, carbohydrates, amino acid and fatty acid pyrolysis products, coal tar, and soot. Benzo[j]fluoranthene is found in cigarette smoke, gasoline exhaust, coal smoke, oil heat emissions, used motor oils, crude oils, and coal tar. Benzo[k]fluoranthene is found in cigarette smoke, gasoline exhaust, coal and oil combustion emissions, coal tar, lubricating oils, used motor oils, and crude oils. Benzo[a]pyrene is found in gasoline and diesel exhaust, cigarette smoke and smoke conden-sate, pyrolysis products of carbohy-drates, amino acids, and fatty acids, coal tar and coal tar pitch, soot and smoke, petroleum asphalt, creosote oil, shale oil, and commercial solvents. Dibenz[a,h]acridine is found in cigarette smoke condensate, coal combustion emissions, petroleum refinery incinerator emissions, and coal tar pitch. Dibenz[a,j]acridine is found in gasoline exhaust, cigarettes and cigarette smoke condensates, coal combustion stack effluents, petroleum refinery incinerator effluents, and coal tar pitch. Dibenz[a,h]anthracene is found in gasoline exhaust, cigarette smoke condensate, soot, and coal tar. 7H-Dibenzo[c,g]carbazole is found in cigarette tar. Dibenzo[a,e]pyrene is found in fossil fuels, tobacco smoke, and gasoline exhaust. Dibenzo[a,h]-pyrene may be found in engine exhaust, cigarette tar, and coal tar pitch. Dibenzo[a,i]pyrene may be found in automobile exhaust, cigarette smoke, and coal tar. Dibenzo[a,l]-pyrene is found in fossil fuels, cigarette smoke, and coal gasification products. Indeno[1,2,3-cd]pyrene is found in automobile and diesel exhaust, cigarette smoke condensate, benzene and pyrene pyrolysis products, soot, coal tar and coal tar pitch, and petroleum asphalt. 5-Methylchrysene is found in gasoline exhaust and tobacco smoke. Other sources of incidentally generated

PAHs include coal and coal combustion, petroleum refinery incinerators, forest fires, incomplete combustion of diesel and kerosene, soot, and marijuana smoke, volcanoes, shale oil, and crude oil (IARC V.32, 1983; Kirk-Othmer V.11, 1980; ATSDR, 1989).

Production data for tar, tar pitch, creosote, mineral oils, and coke which contain various PAHs are included in their respective profiles in this Annual Report (see Coke Oven Emissions, p. 791, and Soots, Tars, and Mineral Oils, p. 796).

EXPOSURE

The primary routes of potential human exposure to PAHs are inhalation of polluted air, wood smoke, and tobacco smoke, as well as ingestion of contaminated water, foodstuffs, and foods normally containing microgram quantities of PAHs. Foods found to contain minute quantities of benz[a]anthracene, benzo[j]fluoranthene, benzo[a]pyrene, dibenz[a,h]anthracene, or indeno-[1,2,3-cd]pyrene include: smoked, barbecued, or charcoal-broiled foods, vegetables and vegetable oils, margarines, roast coffee and coffee powders, fresh sausages, cereals, grains, flour, breads, meats, seafood, fruits, processed foods, and beverages. Potential human exposure may also occur through ingestion of drinking water, surface water, rain water, sewage water, subterranean water, and sea water contaminated by certain PAHs (IARC V.32, 1983). PAHs have been detected at low levels in some drinking water supplies as well as in fresh and sea water in the United States (IARC V.34, 1984). Inhalation of dust, soot, or vehicle exhaust contaminated by PAHs is another route of possible exposure. Potential human exposure to PAHs may also occur by dermal contact with PAH-containing products such as creosote-treated wood products, asphalt roads, or coal tar. Consumers may be exposed to PAHs that are present in dermatological preparations containing coal tar (IARC V.35, 1985). PAHs do not usually enter the body through the skin under normal conditions; however, small amounts could enter the body if there is contact with products or oils containing high concentrations of PAHs.

Benzo[a]pyrene occurs as a product of combustion, with stationary sources releasing an estimated 1.8 million lb per year. The sources for 96% of the benzo[a]pyrene released are coal refuse piles, outcrops, abandoned coal mines, coke manufacture, and residential external combustion of bituminous and anthracite coals (Kirk-Othmer V.11, 1980). The monitoring of several air pollution sources of dibenz[a,h]acridine showed concentrations of 17 mg/1,000 m^3 in coal combustion stack effluents, 0.01 mg/1,000 m^3 in air polluted by coal tar pitch, < 0.12-0.7 mg/1,000 m^3 in petroleum refinery incinerator effluents, and 0.01 µg/100 cigarettes smoked in cigarette smoke condensate (IARC V.3, 1973). Dibenz[a,j]acridine has been detected in concentrations of 2 mg/1,000 m^3 in

coal combustion stack effluents, 0.15-1.8 mg/1,000 m^3 in petroleum refinery incinerator effluents, 0.001 mg/1,000 m^3 in air polluted by coal tar pitch, up to 300 µg/kg in automobile exhaust, and 0.27 µg/100 cigarettes smoked. Benzo[b]fluoranthene has been detected in a fixed bed gasifier of a coal gasification plant at a concentration of 140 µg/g. It has also been found in cigarette smoke at 4-22 ng/cigarette smoked. Benz[a]anthracene and dibenz[a,h]anthracene have been detected in cigarette smoke at concentrations of 20-70 ng/cigarette smoked and 4 ng/cigarette smoked, respectively (IARC V.32, 1983). 7H-Dibenzo[c,g]carbazole is found in cigarette tar in concentrations of 0.07 µg/100 cigarettes smoked (IARC V.3, 1973).

There is potential occupational exposure to PAHs for workers at coal tar production plants, coking plants, coal gasification sites, smoke houses, foundries, aluminum production plants, bitumen and asphalt production plants, road and roof tarring operations, municipal incineration sites, other facilities that burn carbonaceous materials, and in kitchens where high-temperature fryers and broilers are used (ATSDR, 1987b). The National Occupational Exposure Survey (1981-1983) estimated that 28 workers potentially were exposed to benz[a]anthracene through actual use of the compound; 896 total workers, including 299 females, potentially were exposed to benzo[a]pyrene through actual use of the compound (NIOSH, 1984). The National Occupational Hazard Survey, conducted by NIOSH from 1972 to 1974, estimated that about 210,000 workers were potentially exposed to dibenzo[a,h]pyrene, dibenzo[a,i]-pyrene, and indeno[1,2,3-cd]pyrene from inhalation of asphalt volatiles, coal tar pitch volatiles, and coke oven emissions. An unspecified additional number of workers may possibly have been exposed to PAHs by combustion products from fuel oil, diesel fuel, kerosene, and wood (NIOSH, 1976).

The U.S. Department of Agriculture estimated that about 100 commercial thermal and dip-treatment workers have consistently high potential inhalation exposure to creosote, which contains benz[a]anthracene, benzo[a]pyrene, and dibenz[a,h]-anthracene. About 4,000 commercial pressure-treatment workers were estimated to have occasional high potential inhalation exposure to creosote. Skin contact with creosote was classified as minimal, except among maintenance workers, who were estimated to have occasional high potential exposure (IARC V.35, 1985). The National Occupational Hazard Survey estimated that 2 million workers were potentially exposed to bitumens and 33,000 were potentially exposed to bitumen fumes in the workplace. The majority of the workers potentially exposed to bitumens are employed in highway and street construction, roofing and sheet-metal operations, and steel mills (NIOSH, 1976).

REGULATIONS

The Carcinogen Assessment Group at EPA has designated most of the PAHs as potential carcinogens. As a result, EPA regulates the PAHs under the hazardous waste disposal rule of the Resource Conservation and Recovery Act (RCRA). The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) has established reportable quantities (RQs) for most of the PAHs. Water quality criteria set by the Clean Water Act (CWA) also address all PAHs. EPA has included some PAHs on a list of priority hazardous chemicals subject to reporting requirements under the Superfund Amendments and Reauthorization Act (SARA). There have been few attempts to develop occupational exposure standards for specific PAHs. However, for coal tar products, NIOSH recommended a workplace standard of 0.1 mg/m^3 as a 10-hr time-weighted average (TWA). OSHA indirectly limits exposure to PAHs by requiring that occupational exposure to coal tar pitch volatiles not exceed 0.2 mg/m^3 as an 8-hr TWA. In another attempt to minimize the risk of workplace exposure to PAHs, OSHA promulgated a permissible exposure limit (PEL) of < 0.15 mg/m^3 as an 8-hr TWA for coke oven emissions. OSHA also regulates PAHs under the Hazard Communication Standard and as chemical hazards in laboratories.

PROCARBAZINE HYDROCHLORIDE
CAS No. 366-70-1

CARCINOGENICITY

There is sufficient evidence for the carcinogenicity of procarbazine hydrochloride in experimental animals (NCI 19, 1979; IARC V.26, 1981; IARC S.4, 1982; IARC S.7, 1987). The generic name procarbazine is used interchangeably with procarbazine hydrochloride in the literature, and since only procarbazine hydrochloride is produced, it was assumed to be procarbazine hydrochloride under study. When administered by repeated intraperitoneal injection, procarbazine hydrochloride induced olfactory neuroblastomas, adenocarcinomas of the mammary gland, and malignant lymphomas, lymphocytic type, in rats of both sexes, and olfactory neuroblastomas in mice of both sexes and uterine adenocarcinomas in female mice. When administered by gavage, the compound induced leukemia and benign tumors of the lung in mice of both sexes and adenocarcinomas or carcinomas of the mammary gland in female rats but not in male rats. When administered by repeated intravenous injections, the compound induced three renal sarcomas and two intra-abdominal spindle cell sarcomas in male rats. Male and female monkeys, including Rhesus, cynomolgus and African green monkeys, were given procarbazine hydrochloride by subcutaneous, intervenous, and oral routes. Rhesus monkeys developed acute myelogenous leukemia. Cynomolgus monkeys had leukemia or lymphoma, and multiple hemangiosarcomas. The rarity of neoplasms, and in particular leukemias (none in control monkeys in that colony), strongly suggests that procarbazine induced the tumors.

An IARC Working Group reported that there were no adequate data available to evaluate the carcinogenicity of procarbazine hydrochloride in humans as no epidemiologic study of procarbazine as a single agent was available. In various combinations with other chemotherapeutic agents given for Hodgkin's disease, procarbazine use has repeatedly been shown to lead to the appearance of acute nonlymphocytic leukemia. These combinations usually also include nitrogen mustard, an alkylating agent which is also a potent animal carcinogen, and these many obervations do not permit conclusions about the independent effect of either drug.

PROPERTIES

Procarbazine hydrochloride is a white-to-pale yellow crystalline powder with a slight odor. It is soluble but unstable in water and aqueous solutions. When heated to decomposition, it emits very toxic fumes of nitrogen oxides (NOx). It is available in the United States as a USP grade containing 98.5%-100.5% active ingredient.

USE

Procarbazine hydrochloride is used in human medicine as an antineoplastic agent. It is used in combination with other antineoplastic agents to treat Hodgkin's disease and is also used to treat malignant melanoma, non-Hodgkin's lymphoma, and small-cell carcinomas of the lung (IARC V.26, 1981). FDA approved its use in 1969, indicating that the drug should be used as an adjunct to standard therapy.

PRODUCTION

The USITC identified two U.S. producers of procarbazine hydrochloride in 1988, but no production data were reported (USITC, 1989). The USITC reported that two U.S. companies produced an unknown quantity of procarbazine hydrochloride in 1986 (USITC, 1987). No other production, import, or export data were available. The 1979 TSCA Inventory reported no production data for procarbazine or its hydrochloride (TSCA, 1979).

EXPOSURE

The primary routes of potential human exposure to procarbazine hydrochloride are ingestion, inhalation, and dermal contact. For patients receiving the drug, the usual initial dose of procarbazine hydrochloride is 2-4 mg/kg body weight daily given orally in divided doses for 1 week, then 4-6 mg/kg body weight daily, until signs of bone marrow depression occur. After bone marrow recovery, treatment is resumed at a

PB90-258245

TOXICOLOGICAL PROFILE FOR BENZO(A)PYRENE

Agency for Toxic Substances and Disease Registry, Atlanta, GA

May 90

U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
NTIS

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5. MANUFACTURE, IMPORT, USE, AND DISPOSAL

5.1 OVERVIEW

B[a]P is on the Toxic Substances Control Act (TSCA) Chemical Inventory (EPA 1979b), which lists chemicals (as defined by TSCA) that have been manufactured, imported, or processed for a commercial purpose in the United States since January 1, 1975. Data from the TSCA inventory indicates that the aggregate production of B[a]P is <1 million lb. B[a]P also occurs in fossil fuels and as a result of the incomplete combustion of fuel and wood. B[a]P is available as a research chemical from some specialty chemical firms. B[a]P and other polycyclic aromatic hydrocarbons are found in coal tar and in the creosote oils and pitches formed from the distillation of coal tars. Coal tar pitch is primarily used as a binder for electrodes. Creosote is primarily used as a wood preservative. Coal tar is also used as a therapeutical treatment for skin diseases (e.g., psoriasis). PAHs are also found in limited amounts in bitumens and asphalt.

5.2 PRODUCTION

The primary current source of B[a]P in air is combustion of wood for residential heating (EPA 1985). The production of B[a]P from this source is a consequence of incomplete combustion and uncontrolled release into the air. As a product of combustion, an estimated 1.8 million lb of B[a]P is released from stationary sources. The sources for 96% of this amount are refuse piles, outcrops, abandoned coal mines, coke manufacture, and residential external combustion of bituminous and anthracite coal.

Crude coal tar is produced as a by-product in the formation of coke from coal. Hot gases and vapors that are released from the conversion of coal to coke are collected in a scrubber that condenses these gases into ammonia, water, crude tar, and other by-products. A typical coke oven produces 80% coke, 12% coke-oven gas, 3% coal tar, and 1% crude benzene. The coal tar is then distilled to yield a number of chemical oils, creosote, and coal tar pitch. The coal tar pitch residue is 40.5% of the crude tar; creosote is ~11.5%. Heavy and light creosote also make up a small percentage of distillate (NIOSH 1977). Coal tar contains ~30 mg/kg B[a]P; coal tar pitch contains ~10 mg/kg B[a]P; and creosote oil contains <0.01 mg/kg B[a]P (EPA 1985).

As of 1981, the world output of crude coal tar was 1.8×10^7 metric tons; 1.4×10^7 metric tons was of coke-oven origin. In 1980, the U.S. production of crude tar was 2.4×10^6 metric tons. Creosote oil production in the United States in 1981 was estimated to be 5.1×10^5 metric tons. The coal tar pitch production in the United States in 1974 was estimated to be 1×10^6 metric tons (McNeil 1983).

Bitumens and asphalt are derived from crude oils. Asphalt is a mixture of bitumen with mineral materials (IARC 1985). Bitumen samples have been reported to contain between 0.1 and 27 mg/kg B[a]P (IARC 1985).

5.3 IMPORT

In 1985, the United States imported a total of almost 12 million gal of creosote oil from the Netherlands, France, West Germany, and other countries and almost 185 million lb of coal tar pitch, blast furnace tar, and oil-gas tar from Canada, Mexico, West Germany, Asian countries, Australia, and other countries (USDOC 1986).

5.4 USE

B[a]P has some use as a research chemical. It is available from some specialty chemical firms in quantities of 100 mg to 1 g (Aldrich Chemical Co. 1986).

Coal tar pitch is removed from the tar still as a residue. The rate of feeding and firing of the still regulates the viscosity of the tar. Coal tar pitch is primarily used as a binder for electrodes in the aluminum reduction process; it is used to bind the carbon electrodes used in the reduction pots (NIOSH 1977). In North America, coal tar pitch is also used as the adhesive in membrane roofs (McNeil 1983).

Almost 99% of creosote produced is sold to wood preservation plants; from 0.1 to 0.2% is sold to individual customers (NIOSH 1977). Creosote is used in the preservation of railroad ties, marine pilings, and telephone and telegraph poles. Some creosote is also consumed as fuel by steel producers (NIOSH 1977).

Coal tar is also used in the clinical treatment of skin disorders (e.g., eczema, dermatitis, and psoriasis). The use of dermatological coal tar preparations is extensive (NIOSH 1977).

Bitumens and asphalt are primarily used for paving roads, waterproofing and roofing, electrical insulation, sound insulation, and pipe coating (IARC 1985).

5.5 DISPOSAL

Following small input of B[a]P from coal-tar creosote, 0.36 mg/L B[a]P has been found in water raw discharge from timber product industries in 1978 (EPA 1985).

Total B[a]P wastewater discharge in 1978 from coke-making operations was reported as 3 metric tons (EPA 1985).

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State of Delaware

Office of Secretary of State

I, MICHAEL RATCHFORD, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY THE ATTACHED IS A TRUE AND CORRECT COPY OF THE CERTIFICATE OF RESTATED CERTIFICATE OF INCORPORATION OF "UNION CARBIDE INDUSTRIAL GASES INC." FILED IN THIS OFFICE ON THE FIFTH DAY OF JUNE, A.D. 1992, AT 10 O'CLOCK A.M.

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DEPARTMENT OF STATE
OFFICE OF THE SECRETARY OF STATE
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Michael Ratchford, Secretary of State

AUTHENTICATION: *3474791

DATE: 06/05/199

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STATE OF DELAWARE
SECRETARY OF STATE
DIVISION OF CORPORATIONS
FILED 10:00 AM 06/05/1992
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RESTATED
CERTIFICATE OF INCORPORATION
of

UNION CARBIDE INDUSTRIAL GASES INC.

The undersigned certify that they are the Vice President and the Assistant Secretary, respectively, of Union Carbide Industrial Gases Inc. a corporation organized and existing under the laws of the State of Delaware (the "Corporation"), and do hereby certify as follows:

The date of filing of the original Certificate of Incorporation of the Corporation with the Secretary of State of the State of Delaware was October 26, 1988. The original name of the Corporation was "Union Carbide Industrial Gases Inc."

This Restated Certificate of Incorporation has been duly adopted in accordance with the applicable provisions of Sections 228, 242 and 245 of the General Corporation Law of the State of Delaware.

The text of the Certificate of Incorporation of the Corporation, as amended and restated, shall read in its entirety as follows:

ARTICLE I

NAME

The name of the Corporation is Praxair, Inc.

ARTICLE II

REGISTERED OFFICE

The address of its registered office in the State of Delaware is 1209 Orange Street, in the City of Wilmington, County of New Castle. The name of the registered agent at such address is The Corporation Trust Company.

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ARTICLE III

PURPOSE; DURATION

The nature of the business or purposes to be conducted or promoted by the Corporation is to conduct any lawful business, to exercise any lawful purpose and power and to engage in any lawful act or activity for which corporations may be organized under the General Corporation Law of the State of Delaware, as the same may be amended from time to time. The Corporation is to have perpetual existence.

ARTICLE IV

CAPITALIZATION

The total number of shares of stock which the Corporation shall have authority to issue is 525,000,000 shares, with a par value of $.01 each, amounting in the aggregate to $5,250,000. Said shares shall consist of 25,000,000 shares of preferred stock and 500,000,000 shares of common stock.

A. Preferred Stock

1. The preferred stock of the Corporation may be issued from time to time in one or more series of any number of shares, provided that the aggregate number of shares issued and not cancelled in any and all such series shall not exceed the total number of shares of preferred stock hereinabove authorized.

2. Authority is hereby vested in the Board of Directors from time to time to authorize the issuance of one or more series of preferred stock and, in connection with the creation of such series, to fix by resolution or resolutions providing for the issuance of shares thereof the characteristics of each such series including, without limitation, the following:

(a) the maximum number of shares to constitute such series, which may subsequently be increased or decreased (but not below the number of shares of that series then outstanding) by resolution of the Board of Directors, the distinctive designation thereof and the stated value thereof if different than the par value thereof;

(b) whether the shares of such series shall have voting powers, full or limited, or no voting powers, and if any, the terms of such voting powers;

(c) the dividend rate, if any, on the shares of such series, the conditions and dates upon which such dividends shall be payable, the preference or relation which such dividends shall bear to the dividends payable on any other class or classes or on any other series of capital stock and whether such dividend shall be cumulative or non-cumulative;

(d) whether the shares of such series shall be subject to redemption by the Corporation, and, if made subject to redemption, the times, prices and other terms, limitations, restrictions or conditions of such redemption;

(e) the relative amounts, and the relative rights or preference, if any, of payment in respect of shares of such series, which the holders of shares of such series shall be entitled to receive upon the liquidation, dissolution or winding-up of the Corporation;

(f) whether or not the shares of such series shall be subject to the operation of a retirement or sinking fund and, if so, the extent to and manner in which any such retirement or sinking fund shall be applied to the purchase or redemption of the shares of such series for retirement or to other corporate purposes and the terms and provisions relative to the operation thereof;

(g) whether or not the shares of such series shall be convertible into, or exchangeable for, shares of any other class, classes or series, or other securities, whether or not issued by the Corporation, and if so convertible or exchangeable, the price or prices or the rate or rates of conversion or exchange and the method, if any, of adjusting same;

(h) the limitations and restrictions, if any, to be effective while any shares of such series are outstanding upon the payment of dividends or the making of other distributions on, and upon the purchase, redemption or other acquisition by the Corporation of, the Common Stock (as defined below) or any other class or classes of stock of the Corporation ranking junior to the shares of such

series either as to dividends or upon liquidation, dissolution or winding-up;

(i) the conditions or restrictions, if any, upon the creation of indebtedness of the Corporation or upon the issuance of any additional stock (including additional shares of such series or of any other series or of any other class) ranking on a parity with or prior to the shares of such series as to dividends or distribution of assets upon liquidation, dissolution or winding-up; and

(j) any other preference and relative, participating, optional or other special rights, and the qualifications, limitations or restrictions thereof, as shall not be inconsistent with law, this Article IV or any resolution of the Board of Directors pursuant hereto.

B. Common Stock

1. The common stock of the Corporation may be issued from time to time in one or more series of any number of shares, provided that the aggregate number of shares issued and not cancelled in any and all such series shall not exceed the total number of shares of common stock hereinabove authorized. Without limiting the generality of the foregoing, shares of a series of common stock consisting of 300,000,000 shares, or such larger number of shares as the Board of Directors shall from time to time fix by resolution or resolutions, may be issued from time to time by the Board of Directors. Shares of this series shall be designated, and are hereinafter called, "Common Stock." Each share of common stock of the Corporation outstanding as of June 5, 1992, shall be reclassified as one share of this series.

The holders of record of the Common Stock shall be entitled to the following rights:

(a) to vote at all meetings of stockholders of the Corporation, and such holders shall have one vote at all such meetings in respect of each share of Common Stock held of record by them;

(b) subject to the prior rights of the holders of all classes or series of stock at the time outstanding having prior rights as to dividends, to receive when, if and as declared by the Board of Directors out of the assets of the Corporation legally available therefor, such

dividends as may be declared by the Corporation from time to time to holders of Common Stock; and

(c) subject to the prior rights of the holders of all classes or series of stock at the time outstanding having prior rights as to distribution of assets upon liquidation, dissolution or winding-up, to receive the remaining assets of the Corporation upon liquidation, dissolution or winding-up.

2. Authority is hereby vested in the Board of Directors from time to time to authorize the issuance of shares of common stock in one or more additional series, and, in connection with the creation of such series, to fix by resolution or resolutions providing for the issuance of shares thereof the characteristics of each such additional series including, without limitation, the following:

(a) the maximum number of shares to constitute such series, which may subsequently be increased or decreased (but not below the number of shares of that series then outstanding) by resolution of the Board of Directors, and the distinctive designation thereof;

(b) whether the shares of such series shall have voting powers, full or limited, or no voting powers, and if any, the terms of such voting powers;

(c) the dividend rate, if any, on the shares of such series, the conditions and dates upon which such dividends shall be payable and the preference or relation which such dividends shall bear to the dividends payable on any other class or classes or on any other series of capital stock;

(d) whether the shares of such series shall be subject to redemption by the Corporation, and, if made subject to redemption, the times, prices and other terms, limitations, restrictions or conditions of such redemption;

(e) whether or not the shares of such series shall be convertible into, or exchangeable for, shares of any other class, classes or series, or other securities, whether or not issued by the Corporation, and if so convertible or exchangeable, the price or prices or the rate or rates of conversion or exchange and the method, if any, of adjusting same; and

(f) any other rights, and the qualifications, limitations or restrictions thereof, as shall not be inconsistent with law, this Article IV or any resolution of the Board of Directors pursuant hereto.

ARTICLE V

BOARD OF DIRECTORS

A. Number, Tenure and Qualifications of Directors; Removal. 1. The business and affairs of the Corporation shall be managed by or under the direction of a Board of Directors consisting of such number of directors as is determined from time to time by resolution adopted by affirmative vote of a majority of the entire Board of Directors; provided, however, that in no event shall the number of directors be less than three. The directors shall be divided into three classes, designated Class I, Class II and Class III. Each class shall consist, as nearly as may be possible, of one-third (1/3) of the total number of directors constituting the entire Board of Directors. By unanimous written consent of the Board of Directors, the initial classes shall be elected as follows: Class I directors shall be elected for a one-year term, Class II directors for a two-year term and Class III directors for a three-year term. At each succeeding annual meeting of stockholders, successors to the class of directors whose term expires at that annual meeting shall be elected for three-year terms. If the number of directors is changed, any increase or decrease shall be apportioned among the classes so as to maintain the number of directors in each class as nearly equal as possible, and any additional director of any class elected to fill a vacancy resulting from an increase in such class shall hold office for a term that shall coincide with the remaining term of that class, but in no case will a decrease in the number of directors shorten the term of any incumbent director. A director shall hold office until the annual meeting for the year in which his or her term expires and until his or her successor shall be elected and shall qualify, subject, however, to prior death, resignation, retirement, disqualification or removal from office. Except as otherwise required by law, any vacancy on the Board of Directors that results from an increase in the number of directors and any other vacancy occurring in the Board of Directors shall be filled by a majority of the directors then in office, even if less than a quorum, or by a sole remaining director. Any director elected to fill a vacancy not resulting from an increase in the number of directors shall have the same remaining term as that of his or her predecessor.

2. Any director, or the entire Board of Directors, may be removed from office only for cause and only by the affirmative vote of not less than a majority of the votes entitled to be cast by the holders of all the then outstanding shares of Voting Stock (as defined in Article VII, Section C), voting together as one class; provided, however, that if a proposal to remove a director is made by or on behalf of an Interested Person (as defined in Article VII, Section C) or a director who is not an Independent Director (as defined in Article VII, Section C), then such removal shall require the affirmative vote of not less than a majority of the votes entitled to be cast by the holders of all the then outstanding shares of Voting Stock, voting together as one class, excluding Voting Stock beneficially owned by such Interested Person.

3. Notwithstanding the foregoing, whenever the holders of any one or more classes or series of stock issued by the Corporation shall have the right, voting separately by class or series, to elect directors, the election, term of office, filling of vacancies and other features of such directorships shall be governed by the terms of this Restated Certificate of Incorporation applicable thereto, as amended, and such directors so elected shall not be divided into classes pursuant to this Article V, Section A unless expressly provided by such terms.

B. Additional Authority of Board. In furtherance and not in limitation of the powers conferred by statute, the Board of Directors is expressly authorized:

1. To make, alter, amend or repeal the By-laws of the Corporation. The holders of shares of Voting Stock shall, to the extent such power is at the time conferred on them by applicable law, also have the power to make, alter, amend or repeal the By-laws of the Corporation, provided that any proposal by or on behalf of an Interested Person or a director who is not an Independent Director to make, alter, amend or repeal the By-laws shall require approval by the affirmative vote described in Article VII, Section A, unless either (a) such action has been approved by a majority of the Board of Directors prior to such Interested Person first becoming an Interested Person or (b) prior to such Interested Person first becoming an Interested Person, a majority of the Board of Directors has approved such Interested Person becoming an Interested Person and, subsequently, a majority of the Independent Directors has approved such action.

2. To authorize and cause to be executed mortgages and liens upon the real and personal property of the Corporation.

3. To set apart out of any of the funds of the Corporation available for dividends a reserve or reserves for any proper purpose and to abolish any such reserve in the manner in which it was created.

4. By a majority of the whole Board of Directors, to designate one or more committees, each committee to consist of one or more of the directors of the Corporation. The Board of Directors may designate one or more directors as alternate members of any committee, who may replace any absent or disqualified member at any meeting of the committee. The By-laws may provide that in the absence or disqualification of a member of a committee, the member or members thereof present at any meeting and not disqualified from voting, whether or not he or they constitute a quorum, may unanimously appoint another member of the Board of Directors to act at the meeting in the place of any such absent disqualified member. Any such committee, to the extent provided in the resolution of the Board of Directors, or in the By-laws of the Corporation, shall have and may exercise all the powers and authority of the Board of Directors in the management of the business and affairs of the Corporation, and may authorize the seal of the Corporation to be affixed to all papers which may require it; but no such committee shall have the power or authority in reference to amending the Restated Certificate of Incorporation (except that a committee may, to the extent authorized in the resolution or resolutions providing for the issuance of shares of stock adopted by the Board of Directors as provided in Article IV hereof, fix the designations and any of the preferences or rights of such shares relating to dividends, redemption, dissolution, any distribution of assets of the Corporation or the conversion into, or the exchange of such shares for, shares of any other class or classes or any other series of the same or any other class or classes of stock of the Corporation or fix the number of shares of any series of stock or authorize the increase or decrease of the shares of any series), adopting an agreement of merger or consolidation, recommending to the stockholders the sale, lease or exchange of all or substantially all of the Corporation's property and assets, recommending to the stockholders a dissolution of the Corporation or a revocation of a

dissolution, or amending the By-laws of the Corporation; and, unless the resolution or By-laws expressly so provide, no such committee shall have the power or authority to declare a dividend, to authorize the issuance of stock or to adopt a certificate of ownership and merger pursuant to Section 253 of the General Corporation Law of the State of Delaware.

5. When and as authorized by the stockholders in accordance with statute, to sell, lease or exchange all or substantially all of the property and assets of the Corporation, including its goodwill and its corporate franchises, upon such terms and conditions and for such consideration, which may consist in whole or in part of money or property including shares of stock in, and/or other securities of, any other corporation or corporations, as the Board of Directors shall deem expedient and for the best interests of the Corporation.

C. In addition to any other considerations which the Board of Directors may lawfully take into account, in determining whether to take or to refrain from taking corporate action on any matter, including proposing any matter to the stockholders of the Corporation, the Board of Directors may take into account the long-term as well as the short-term interests of the Corporation and its stockholders (including the possibility that these interests may be best served by the continued independence of the Corporation), customers, employees and other constituencies of the Corporation and its subsidiaries, including the effect upon communities in which the Corporation and its subsidiaries do business. In so evaluating any such determination, the Board of Directors shall be deemed to be performing their duties and acting in good faith and in the best interests of the Corporation within the meaning of Section 145 of the General Corporation Law of the State of Delaware, or any successor provision.

D. Nomination and Election of Directors. Subject to the rights of holders of any class or series of stock having a preference over the Common Stock as to dividends or upon liquidation, dissolution or winding-up, nominations for the election of directors may be made by the Board of Directors or a committee or person appointed by the Board of Directors or by any stockholder entitled to vote in the election of directors generally. However, any stockholder entitled to vote in the election of directors generally may nominate one or more persons for election as directors at an annual meeting only

pursuant to the Corporation's notice of such meeting or if written notice of such stockholder's intent to make such nomination or nominations has been received by the Secretary of the Corporation not less than sixty nor more than ninety days prior to the first anniversary of the preceding year's annual meeting; provided, however, that in the event that the date of the annual meeting is advanced by more than thirty days or delayed by more than sixty days from such anniversary, notice by the stockholder to be timely must be so received not earlier than the ninetieth day prior to such annual meeting and not later than the close of business on the later of (1) the sixtieth day prior to such annual meeting or (2) the tenth day following the day on which notice of the date of the annual meeting was mailed or public disclosure thereof was made by the Corporation, whichever first occurs. For purposes of calculating the first such notice period following adoption of this Restated Certificate of Incorporation, the first anniversary of the 1992 annual meeting shall be deemed to be May 15, 1993. Each such notice shall set forth: (a) the name and address of the stockholder who intends to make the nomination and of the person or persons to be nominated; (b) a representation that the stockholder is a holder of record of stock of the Corporation entitled to vote at such meeting and intends to appear in person or by proxy at the meeting to nominate the person or persons specified in the notice; (c) a description of all arrangements or understandings between the stockholder and each nominee and any other person or persons (naming such person or persons) relating to the nomination or nominations; (d) the class and number of shares of the Corporation which are beneficially owned by such stockholder and the person to be nominated as of the date of such stockholder's notice and by any other stockholders known by such stockholder to be supporting such nominees as of the date of such stockholder's notice; (e) such other information regarding each nominee proposed by such stockholder as would be required to be included in a proxy statement filed pursuant to the proxy rules of the Securities and Exchange Commission; and (f) the consent of each nominee to serve as a director of the Corporation if so elected.

In addition, in the event the Corporation calls a special meeting of stockholders for the purpose of electing one or more directors, any stockholder entitled to vote in the election of directors generally may nominate one or more persons for election as directors at a special meeting only pursuant to the Corporation's notice of meeting or if written notice of such stockholder's intent to make such nomination or nominations, setting forth the information and complying with the

form described in the immediately preceding paragraph, has been received by the Secretary of the Corporation not earlier than the ninetieth day prior to such special meeting and not later than the close of business on the later of (i) the sixtieth day prior to such special meeting or (ii) the tenth day following the day on which notice of the date of the special meeting was mailed or public disclosure thereof was made by the Corporation, whichever comes first.

No person shall be eligible for election as a director of the Corporation unless nominated in accordance with the procedures set forth in this Article V, Section D. The presiding officer of the meeting shall, if the facts warrant, determine and declare to the meeting that a nomination was not made in accordance with the procedures prescribed by this Article V, Section D, and if he or she should so determine, the defective nomination shall be disregarded.

Elections of directors need not be by written ballot unless the By-laws of the Corporation shall so provide.

ARTICLE VI

STOCKHOLDERS

A. Meetings of Stockholders; Books. Meetings of the stockholders may be held within or without the State of Delaware, as the By-laws may provide. Any action required or permitted to be taken by the stockholders of the Corporation must be effected at a duly called annual or special meeting of such stockholders and may not be effected by a consent in writing by any such holders. Subject to the rights of holders of any class or series of stock having a preference over the Common Stock as to dividends or upon liquidation, dissolution or winding-up, special meetings of the stockholders of the Corporation may be called only by the Board of Directors pursuant to a resolution approved by a majority of the entire Board of Directors. The books of the Corporation may be kept (subject to any provision contained in the statutes) outside the State of Delaware at such place or places as may be designated from time to time by the Board of Directors or in the By-laws of the Corporation.

Except as otherwise required by law or by this Restated Certificate of Incorporation, the holders of not less than a majority in voting power of the shares entitled to vote at any meeting of stockholders, present in person or by proxy,

shall constitute a quorum, and the act of the holders of a majority in voting power of the shares present in person or by proxy and entitled to vote on the subject matter shall be deemed the act of the stockholders. If a quorum shall fail to attend any meeting, the presiding officer may adjourn the meeting to another place, date or time. If a notice of any adjourned special meeting of stockholders is sent to all stockholders entitled to vote thereat, stating that it will be held with one-third (1/3) in voting power of the shares entitled to vote thereat constituting a quorum, then except as otherwise required by law, one-third (1/3) in voting power of the shares entitled to vote at such adjourned meeting, present in person or by proxy, shall constitute a quorum, and, except as otherwise required by law or this Restated Certificate of Incorporation, all matters shall be determined by the holders of a majority in voting power of the shares present in person or by proxy and entitled to vote on the subject matter.

B. Proposals of Stockholders. At any meeting of the stockholders, only such business shall be conducted as shall have been properly brought before such meeting. To be properly brought before an annual meeting, business must be (1) specified in the notice of meeting (or any supplement thereto) given by or at the direction of the Board of Directors, (2) otherwise properly brought before the meeting by or at the direction of the Board of Directors or (3) otherwise properly brought before the meeting by a stockholder. For business to be properly brought before an annual meeting by a stockholder, the stockholder must have given timely notice thereof in writing to the Secretary of the Corporation. To be timely, a stockholder's notice must be received not less than sixty days nor more than ninety days prior to the first anniversary of the preceding year's annual meeting; provided, however, that in the event that the date of the annual meeting is advanced by more than thirty days or delayed by more than sixty days from such anniversary, notice by the stockholder to be timely must be so received not earlier than the ninetieth day prior to such annual meeting and not later than the close of business on the later of (1) the sixtieth day prior to such annual meeting or (2) the tenth day following the date on which notice of the date of the annual meeting was mailed or public disclosure thereof was made, whichever first occurs. For purposes of calculating the first such notice period following adoption of this Restated Certificate of Incorporation, the first anniversary of the 1992 annual meeting shall be deemed to be May 15 1993. Each such notice shall set forth as to each matter the stockholder proposes to bring before the annual

meeting: (a) a brief description of the business desired to be brought before the annual meeting and the reasons for conducting such business at the meeting, (b) the name and address, as they appear on the Corporation's books, of the stockholder proposing such business, (c) the class, series and number of shares of the Corporation which are beneficially owned by the stockholder and (d) any material interest of the stockholder in such business. To be properly brought before a special meeting, business must be (i) specified in the notice of meeting (or any supplement thereto) given by or at the direction of the Board of Directors or (ii) otherwise properly brought before the meeting by or at the direction of the Board of Directors.

No business shall be conducted at any meeting of the stockholders except in accordance with the procedures set forth in this Article VI, Section B. The presiding officer of the meeting shall, if the facts warrant, determine and declare to the meeting that business was not properly brought before the meeting and in accordance with the provisions of this Article VI, Section B, and if he or she should so determine, any such business not properly brought before the meeting shall not be transacted. Nothing herein shall be deemed to affect any rights of stockholders to request inclusion of proposals in the Corporation's proxy statement pursuant to Rule 14a-8 under the Securities Exchange Act of 1934, as amended (the "Exchange Act").

ARTICLE VII

BUSINESS TRANSACTIONS

A. In addition to any affirmative vote required by law or this Restated Certificate of Incorporation or the By-laws of the Corporation, and except as otherwise expressly provided in Section B of this Article VII, a Business Transaction (as hereinafter defined) with, or proposed by or on behalf of, any Interested Person (as hereinafter defined) or any Affiliate (as hereinafter defined) of any Interested Person or any person who thereafter would be an Affiliate of such Interested Person shall require approval by the affirmative vote of not less than two-thirds (2/3) of the votes entitled to be cast by holders of all the then outstanding Voting Stock, voting together as one class, excluding Voting Stock beneficially owned by such Interested Person. Such affirmative vote shall be required notwithstanding the fact that no vote may be required, or that a lesser percentage may be specified, by law or in any agreement with any national securities exchange or otherwise.

B. The provisions of Section A of this Article VII shall not be applicable to any particular Business Transaction, and such Business Transaction shall require only such affirmative vote, if any, as is required by law or by any other provision of this Restated Certificate of Incorporation or the By-laws of the Corporation, or any agreement with any national securities exchange, if either (1) the Business Transaction shall have been approved by a majority of the Board of Directors prior to such Interested Person first becoming an Interested Person or (2) prior to such Interested Person first becoming an Interested Person, a majority of the Board of Directors shall have approved such Interested Person becoming an Interested Person and, subsequently, a majority of the Independent Directors (as hereinafter defined) shall have approved the Business Transaction.

C. The following definitions shall apply with respect to this Article VII:

1. The term "Affiliate" shall mean a person that directly, or indirectly through one or more intermediaries, controls, or is controlled by, or is under common control with, a specified person.

2. A person shall be a "beneficial owner" of any Capital Stock (a) which such person or any of its Affiliates beneficially owns, directly or indirectly; (b) which such person or any of its Affiliates has, directly or indirectly, (i) the right to acquire (whether such right is exercisable immediately or subject only to the passage of time or the occurrence of one or more events), pursuant to any agreement, arrangement or understanding or upon the exercise of conversion rights, exchange rights, warrants or options, or otherwise, or (ii) the right to vote pursuant to any agreement, arrangement or understanding; provided, however, that a person shall not be deemed the beneficial owner of any security if the agreement, arrangement or understanding to vote such security arises solely from a revocable proxy or consent solicitation made pursuant to and in accordance with the Exchange Act, and is not also then reportable on Schedule 13D under the Exchange Act (or a comparable or successor report); or (c) which is beneficially owned, directly or indirectly, by any other person with which such person or any of its Affiliates has any agreement, arrangement or understanding for the purpose of acquiring, holding, voting or disposing of any shares of Capital Stock (except to the extent permitted by the proviso of clause (b)(ii) above). For the purposes of determining whether a

person is an Interested Person pursuant to paragraph (6) of this Section C, the number of shares of Capital Stock deemed to be outstanding shall include shares deemed beneficially owned by such person through application of this paragraph (2) of Section C, but shall not include any other shares of Capital Stock that may be issuable pursuant to any agreement, arrangement or understanding, or upon exercise of conversion rights, warrants or options, or otherwise.

3. The term "Business Transaction" shall mean any of the following transactions when entered into by the Corporation or a subsidiary of the Corporation with, or upon a proposal by or on behalf of, any Interested Person or any Affiliate of any Interested Person:

(a) any merger or consolidation of the Corporation or any subsidiary with (i) any Interested Person, or (ii) any other corporation which is, or after such merger or consolidation would be, an Affiliate of an Interested Person;

(b) any sale, lease, exchange, mortgage, pledge, transfer or other disposition (in one transaction or a series of transactions), except proportionately as a stockholder of the Corporation, to or with the Interested Person of assets of the Corporation (other than Capital Stock (as hereinafter defined)) or of any subsidiary of the Corporation which assets have an aggregate market value equal to ten percent (10%) or more of the aggregate market value of all the outstanding stock of the Corporation;

(c) any transaction that results in the issuance of shares or the transfer of treasury shares by the Corporation or by any subsidiary of the Corporation of any Capital Stock or any capital stock of such subsidiary to the Interested Person, except (i) pursuant to the exercise, exchange or conversion of securities exercisable for, exchangeable for or convertible into stock of the Corporation or any such subsidiary which securities were outstanding prior to the time that the Interested Person became such, (ii) pursuant to a dividend or distribution paid or made, or the exercise, exchange or conversion of securities exercisable for, exchangeable for or convertible into stock of the Corporation or any such subsidiary which security is distributed, pro rata to all holders of a class or series of stock of the Corporation subsequent

to the time the Interested Person became such, (iii) pursuant to an exchange offer by the Corporation to purchase stock made on the same terms to all holders of said stock, (iv) any issuance of shares or transfer of treasury shares of Capital Stock by the Corporation, provided, however, that in the case of each of clauses (ii) through (iv) above there shall be no increase of more than one percent (1%) in the Interested Person's proportionate share of the Capital Stock of any class or series or of the Voting Stock or (v) pursuant to a public offering or private placement by the Corporation to an Institutional Investor;

(d) any reclassification of securities, recapitalization or other transaction involving the Corporation or any subsidiary of the Corporation which has the effect, directly or indirectly, of (i) increasing the proportionate share of the stock of any class or series, or securities convertible into the stock of any class or series, of the Corporation or of any such subsidiary which is owned by the Interested Person, except as a result of immaterial changes due to fractional share adjustments or as a result of any purchase or redemption of any shares of stock not caused, directly or indirectly, by the Interested Person or (ii) increasing the voting power, whether or not then exercisable, of an Interested Person in any class or series of stock of the Corporation or any subsidiary of the Corporation;

(e) the adoption of any plan or proposal by or on behalf of an Interested Person for the liquidation or dissolution of the Corporation; or

(f) any receipt by the Interested Person of the benefit, directly or indirectly (except proportionately as a stockholder of the Corporation), of any loans, advances, guarantees, pledges, tax benefits or other financial benefits (other than those expressly permitted in subparagraphs (a) through (e) above) provided by or through the Corporation or any subsidiary.

4. The term "Capital Stock" shall mean all capital stock of the Corporation authorized to be issued from time to time under Article IV of this Restated Certificate of Incorporation.

5. The term "Independent Directors" shall mean the members of the Board of Directors who are not Affiliates or

representatives of, or associated with, an Interested Person and who were either directors of the Corporation prior to any person becoming an Interested Person or were recommended for election or elected to succeed such directors by a vote which includes the affirmative vote of a majority of the Independent Directors.

6. The term "Institutional Investor" shall mean a person that (a) has accquired, or will acquire, all of its securities of the Corporation in the ordinary course of its business and not with the purpose nor with the effect of changing or influencing the control of the Corporation, nor in connection with or as a participant in any transaction having such purpose or effect, including any transaction subject to Rule 13d-3(b) under the Exchange Act, and (b) is a registered broker dealer; a bank as defined in Section 3(a)(6) of the Exchange Act; an insurance company as defined in, or an investment company registered under, the Investment Company Act of 1940; an investment advisor registered under the Investment Advisors Act of 1940; an employee benefit plan or pension fund subject to the Employee Retirement Income Security Act of 1974 or an endowment fund; a parent holding company, provided that the aggregate amount held directly by the parent and directly and indirectly by its subsidiaries which are not persons specified in the foregoing subclauses of this clause (b) does not exceed one percent (1%) of the securities of the subject class; or a group, provided that all the members are persons specified in the foregoing subclauses of this clause (b).

7. The term "Interested Person" shall mean any person (other than the Corporation, any subsidiary, any profit-sharing, employee stock ownership or other employee benefit plan of the Corporation or any subsidiary or any trustee of or fiduciary with respect to any such plan when acting in such capacity) who (a) is the beneficial owner of Voting Stock representing ten percent (10%) or more of the votes entitled to be cast by the holders of all then outstanding shares of Voting Stock; (b) has stated in a filing with any governmental agency or press release or otherwise publicly disclosed a plan or intention to become or consider becoming the beneficial owner of Voting Stock representing ten percent (10%) or more of the votes entitled to be cast by the holders of all then outstanding shares of Voting Stock and has not expressly abandoned such plan, intention or consideration more than two years prior to the date in question; or (c) is an Affiliate of the Corporation and at any time within the two-year period immediately prior to the date in question was the beneficial owner of Voting Stock

representing ten percent (10%) or more of the votes entitled to be cast by holders of all then outstanding shares of Voting Stock.

8. The term "person" shall mean any individual, corporation, partnership, unincorporated association, trust or other entity.

9. The term "subsidiary" means any company of which a majority of the voting securities are owned, directly or indirectly, by the Corporation.

10. The term "Voting Stock" shall mean Capital Stock of any class or series entitled to vote in the election of directors generally.

D. A majority of the Independent Directors shall have the power and duty to determine, on the basis of information known to them after reasonable inquiry, for the purposes of (1) this Article VII, all questions arising under this Article VII including, without limitation (a) whether a person is an Interested Person, (b) the number of shares of Capital Stock or other securities beneficially owned by any person; and (c) whether a person is an Affiliate of another; and (2) this Restated Certificate of Incorporation, the question of whether a person is an Interested Person. Any such determination made in good faith shall be binding and conclusive on all parties.

E. Nothing contained in this Article VII shall be construed to relieve any Interested Person from any fiduciary obligation imposed by law.

ARTICLE VIII

LIMITED LIABILITY; INDEMNIFICATION

A. Limited Liability. No person shall be personally liable to the Corporation or its stockholders for monetary damages for breach of fiduciary duty as a director, provided, however, that the foregoing shall not eliminate or limit the liability of a director (1) for any breach of the director's duty of loyalty to the Corporation or its stockholders, (2) for acts or omissions not in good faith or which involve intentional misconduct or a knowing violation of law, (3) under Section 174 of the General Corporation Law of the State of Delaware or (4) for any transaction from which the director derived an improper personal benefit. If the General

Corporation Law of the State of Delaware is amended hereafter to authorize corporate action further eliminating or limiting the personal liability of directors, then the liability of a director of the Corporation shall be eliminated or limited to the fullest extent permitted by the General Corporation Law of the State of Delaware, as so amended. Any amendment, repeal or modification of this Article VIII, Section A shall not adversely affect any right or protection of a director of the Corporation existing hereunder with respect to any act or omission occurring prior to such amendment, repeal or modification.

B. Indemnification. Each person who is or was a director or officer of the Corporation, and each such person who is or was serving at the request of the Corporation as a director or officer of another corporation, or of a partnership, joint venture, trust or other enterprise, including service with respect to employee benefit plans maintained or sponsored by the Corporation (including the heirs, executors, administrators and estate of such person) shall be indemnified and advanced expenses by the Corporation to the fullest extent permitted from time to time by the General Corporation Law of the State of Delaware or any other applicable laws as presently or hereafter in effect. The Corporation may, to the extent authorized in the By-laws of the Corporation or from time to time by the Board of Directors, grant rights to indemnification and to the advancement of expenses to any employee or agent of the Corporation to the fullest extent of the provisions of this Article with respect to the indemnification and advancement of expenses of directors and officers of the Corporation. Without limiting the generality or the effect of the foregoing, the Corporation may enter into one or more agreements with any person which provide for indemnification greater or different than that provided in this Article VIII, Section B. Any amendment, repeal or modification of this Article VIII, Section B shall not adversely affect any right or protection existing hereunder or pursuant hereto immediately prior to such amendment, repeal or modification.

ARTICLE IX

AMENDMENTS

The Corporation reserves the right to amend, alter, change or repeal any provision contained in this Restated Certificate of Incorporation, in the manner now or hereafter prescribed by statute, and all rights conferred upon stockholders herein are granted subject to this reservation; provided,

however, that notwithstanding any other provisions of this Restated Certificate of Incorporation or the By-laws of the Corporation (and notwithstanding the fact that a lesser percentage or separate class vote may be specified by law, this Restated Certificate of Incorporation or the By-laws of the Corporation), any proposal by or on behalf of an Interested Person or a director who is not an Independent Director to amend, alter, change or repeal any provision of paragraph 2 of Section A of Article V, Article VII, or Article VIII or to adopt any provision inconsistent with any of such provisions, shall require approval by the affirmative vote described in Section A of Article VII unless either (1) such action has been approved by a majority of the Board of Directors prior to such Interested Person first becoming an Interested Person or (2) prior to such Interested Person first becoming an Interested Person, a majority of the Board of Directors has approved such Interested Person becoming an Interested Person and, subsequently, a majority of the Independent Directors has approved such action.

IN WITNESS WHEREOF Union Carbide Industrial Gases Inc. has caused this Restated Certificate of Incorporation to be duly executed in its corporate name this 5th day of June, 1992.

Union Carbide Industrial Gases Inc.

By: David H. Chapfetz
Vice President

(CORPORATE SEAL)

Assistant Secretary

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