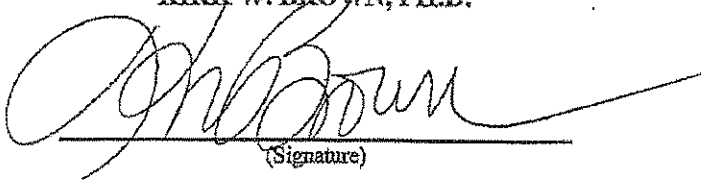
IN THE CIRCUIT COURT OF
HARRISON COUNTY, WEST VIRGINIA

LENORA PERRINE, CAROLYN HOLBERT, WAUNONA MESSINGER, REBECCAH MORLOCK, ANTHONY BEEZEL, MARY ELLEN MONTGOMERY, MARY LUZADER, TRUMAN R. DESIST, LARRY BEEZEL, and JOSEPH BRADSHAW, individuals residing in West Virginia, on behalf of themselves and all others similarly situated, Plaintiffs, vs. E.I. DU PONT DE NEMOURS AND COMPANY, a Delaware corporation doing business in West Virginia, MEADOWBROOK CORPORATION, a dissolved West Virginia corporation, MATTHIESSEN & HEGELER ZINC COMPANY, INC., a dissolved Illinois Corporation formerly doing business in West Virginia, NUZUM TRUCKING COMPANY, a West Virginia corporation, T. L. DIAMOND & COMPANY, INC., a New York corporation doing business in West Virginia, and JOSEPH PAUSHEL, an individual residing In West Virginia, Defendants.	)	Case No. 04-C-296-2

EXPERT REPORT
OF
KIRK W. BROWN, PH.D.



(Signature)

November 11, 2005

TABLE OF CONTENTS

INDEX OF TABLES

INDEX OF FIGURES

INDEX OF APPENDICES

EXECUTIVE SUMMARY

I have been asked by counsel to review the site information, associated documents and field data concerning the former DuPont smelter and the associated widespread contamination of arsenic, cadmium, lead and zinc (toxic metals) in buildings and soils in Harrison County, West Virginia. Specifically, I was asked to assess the source and extent of toxic metal-laden dust contamination at properties in the communities of Spelter, Meadowbrook, Lambert's Run, Seminole, Smith's Chapel, Erie, Hepzibah, Gypsy, Haywood, and Lumberport (the Communities), as well as provide a remediation cost for the cleanup of the impacted properties. I have reviewed documents gathered independently and provided by counsel and offer my opinions in this report. As fully developed in the body of this expert report, my opinions are:

1. The former DuPont smelter is the principal source of arsenic, cadmium, lead, and zinc in the contaminated soils, house dust, river sediments, and surface water in the class certification area.

2. The toxic metals from the smelter have impacted all properties and homes within the class certification area.

3. The impacted soils and homes within the class certification area require remediation to reduce the exposure of the residents to the metals from the site.

4. The estimated cost to remediate all of the impacted soils and homes within the class certification area is $180,000,000.

Based on my review of the available information and field data collected from the Communities, it is clearly evident that the homes and soils within the class certification area are contaminated with elevated concentrations of toxic metals. At each of the locations where dust was sampled, the measured concentration of one or more of the toxic metals in the homes exceeded two times the average background concentration of the metals in the soil. Further, in many cases, the concentrations of metals in the dust within the homes exceeded one or more of the risk-based standards for soils set by Region III EPA and the State of West Virginia. Soil sampling results indicate widespread enrichment of metals in the soil that can be directly attributed to the emissions from the smelter. As such, all properties within the class certification

area have been impacted by the metal containing wastes from the smelter facility. The presence of toxic metal concentrations in the homes in 2005, approximately four years after closure of the plant, indicates an ongoing source of contamination and exposure to the residents. These toxic metals would not be present at the observed concentrations in the soils and homes were it not for the activities of the former DuPont smelter.

1.0 INTRODUCTION

I have been retained by the firm of Levin, Papantonio, Thomas, Mitchell, Echsner, & Proctor on behalf of the plaintiffs in this matter to provide my professional opinions concerning the need for remediation and restoration of the properties including soils and homes within the class certification boundary, the extent of the impact of the toxic metals, the extent of remediation needed, and the remediation costs. I reserve the right to update my analysis as other witnesses, including opposing experts, provide additional data for my review.

1.1 Personal Background/Qualifications

From 1970 through 2001, I was employed as a Professor of Soil and Crop Sciences in the Soil and Crop Sciences Department, Texas A&M University, College Station, Texas. My educational background includes a Bachelor of Science degree in Agronomy from Delaware Valley College (1962), Masters of Science degree in Agronomy/Plant Physiology from Cornell University (1964), and Doctor of Philosophy degree from University of Nebraska (1969). My résumé is attached as Appendix 1. It includes my complete list of publications.

While a member of the faculty at Texas A&M University, I have conducted numerous research efforts. As a result of this research, I have authored or co-authored more than 190 scientific articles including numerous articles dealing with the disposal and treatment of waste materials, including Resource Conservation and Recovery Act ("RCRA") hazardous wastes and metals including arsenic, cadmium, lead and zinc contained therein and the problems arising therefrom. I have conducted numerous research projects for the U.S. Environmental Protection Agency ("USEPA") on the fate and transport of contaminants, including RCRA hazardous wastes and Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA") hazardous substances, in the environment.

I have conducted research in a national center funded by the USEPA to study the fate of hazardous substances in the environment. I taught courses in Soil Physics which include topics on the movement of air, water, and other fluids in the soil, and a graduate course on the land disposal of wastes, which includes consideration of the principles and practices applicable to the fate, mobility, and clean-up of contaminated sites. Students in these classes included engineers,

soil scientists, chemists, and geologists. I have served on hundreds of advanced degree committees in these and related disciplines.

I founded K. W. Brown and Associates, Inc. in February 1980, and served as President through January 2000. In January 2000, SI Group, LP (SI Group) purchased the consulting interests of K. W. Brown and Associates, Inc. and I am currently retained as a principal consultant to this firm. Through these years of consulting, I have been employed by numerous private and public clients. My expertise has been utilized for site assessments, data review and interpretation, the study of fate and transport of contaminants in the environment, air dispersion of dust, waste management activities, and other related environmental matters. I have also reviewed and interpreted a large quantity of analytical data for soils, dust, air, and water, as well as borings logs, field logs, technical reports, and other information related to the environmental conditions of a site. As a consultant, I have evaluated or analyzed numerous waste disposal and landfill sites including the following: Laurel Park Landfill, Beacon Heights Landfill, Lone Pine Landfill, Ft. Bend County Landfill, and Sinton Landfill, among others. In addition, I have also worked on the following Superfund sites: Hardage Criner, Love Canal Landfill, Lowrey Landfill, Montana Pole, National Gypsum, Riley Tar, Sharon Steel, Metal Bank of America, Sikes Pits, Turtle Bayou, Tar Creek, and the West Dallas Lead Site.

1.2 Prior Expert Testimony

A list of cases in which I have rendered opinions during the last four years is included in Appendix 2.

1.3 Compensation

My company is being compensated at customary rates for its work in these cases. My hourly rate of compensation is $300 per hour for non-testimony time and $350 per hour for testimony time.

1.4 Exhibits

I may use as exhibits any document contained or referred to in this report, or supplements to this report, including but not limited to the appendices; any document needed as foundation

for or illustration of my testimony; any document listed as an exhibit or provided in discovery by Plaintiffs or any other party; any document considered by any of the Plaintiffs' or any other party's experts; or any document needed to respond to or to rebut testimony on behalf of Defendants or any other party. I reserve the right to provide lists of exhibits as permitted by the Federal Rules of Civil Procedure and the Scheduling Orders in this case.

1.5 Reservation Of Rights

I reserve the right to supplement or modify opinions expressed herein upon which I expect to testify, to add to or modify the bases and reasons for my opinions and supplement the exhibits that I may use at trial for any of the following reasons: (1) to respond to expert reports, including but not limited to rebuttal reports, conducted for Defendants or for any other party; (2) to respond to new information; (3) to respond to information obtained in discovery, including but not limited to depositions and interviews; and (4) as permitted by Rule 26 Fed. R. Civ. P.

2.0 DATA OR OTHER INFORMATION CONSIDERED

This report was developed as a result of discovery of data, which I have obtained or has been provided to me by counsel (Appendix 3), and field data from the Communities and the site. The opinions I have formed in this case are based on my education and experience listed in Section 1.0, as well as the information listed in Appendix 3.

3.0 SITE BACKGROUND

3.1 Site History and Operations

The former DuPont smelter began operations in 1911 and continued through 2001. The smelter is situated in the northeast portion of Harrison County, roughly seven miles north of Clarksburg, West Virginia, on the banks of the West Fork River in the unincorporated town of Spelter (Figure 1). The smelter is bounded by the West Fork River bluff on the north, west, and southwest sides and abandoned rail lines on the north and east.

The smelter began operating as a primary zinc smelter in 1911. Slab zinc was produced in 8 horizontal retort coal-fired furnaces from 1916 through 1930. In 1929, sixteen vertical retort

furnaces were constructed and became operational in 1930. In 1951, the plant was upgraded and modernized with numerous modifications. Upgrading and modernization continued through the 1960s including the construction of a 175-foot stack in 1964 (Morrison, 1964). In 1971, the smelter was converted into a secondary smelting facility and continued to operate until 2001.

Site restoration activities included demolishing the smelter and most onsite buildings along with removing the debris for off-site disposal (W-C Diamond, 2000). Additional dust containing toxic metals was released to the air during demolition and remedial activities. On-site excavation removed contaminated soils and debris, which were placed on the smelting operation tailings pile. The pile's dimensions, as measured in August of 1971, were approximately 40 feet deep by 600 feet wide by 2,600 feet long for a total volume of approximately 2,300,000 cubic yards of waste materials. The tailings pile with the excavated waste materials was capped in 2003.

3.2 Adjacent Communities

The towns of Spelter, Meadowbrook, and Erie adjoin the smelter with the communities of Gypsy, Seminole, Lumberport, Lambert's Run, Smith Chapel, and Haywood located upriver and downriver of the smelter. These communities consist primarily of residential dwellings with a small component of commercial facilities. Based on the statistics provided in the June 2000 Site Characterization Report (W-C Diamond, 2000), an estimated 3000 residents live within one mile of the smelter. Many of the homes in the northeast portion of Harrison County date back to 1910 and have been exposed to contaminated dust from the smelter and the facilities' tailings pile throughout their existence.

3.3 Air Emissions and Compliance Violations

Following the passage of the Clean Air Act in 1970 and in response to numerous citizen complaints, the West Virginia Air Pollution Control Commission (WVAPCC) began conducting routine inspections of the smelter facility. As part of these inspections in the early 1970s, the facility was cited for stack and baghouse emissions in excess of allowable limits. In response to these citations, the WVAPCC issued an order to the facility requiring the submittal of a pollution abatement schedule on September 15, 1972 and again on October 25, 1974 to prevent the

reoccurrence of statutory air pollution (Evans, 10/25/74; Evans, 10/31/74). Emission problems from the furnace and stack continued through the 1970s with inspection reports indicating non-compliance with emission levels (Lee, 2/11/76; Pellerite, 6/16/76). A formal Notice of Violations was issued to the facility for the smoke emissions from the retort furnace building on May 25, 1977 and September 11, 1978 (Pellerite, 5/25/77; Evans, 9/11/78). These violations of emission limits continued through 1979 and culminated with the issue of a Cease and Desist Order from the WVAPCC on March 26, 1980 (Beard, 3/26/80). Following resolution of the order, emissions violations continued on an infrequent basis through 1986 (Cunningham, 2/19/85; Pride, 5/5/86) and continuing emissions problems plagued the facility until the plant closed in 2001 (Downie, 2/2/96). Based on the documents available, a minimum of 17 notices of violations was issued to the facility from 1977 through 1985. A summary listing of the notices of violations is provided in Appendix 5.

The inspection reports prepared for the WVAPCC detail the characteristics of the emissions from the retort furnaces as light to dense white smoke, comprised of zinc oxides and other materials (Lee, 4/21/75; Pride, 9/11/84; Pride, 10/9/84; Huss, 8/26/74; Pellerite, 4/18/75). The smoke plumes were noted to trail from the stack at distances up to 1/4 mile on days with light or calm wind conditions (Mullins, 10/6/75) indicating the off-site dispersion of particulates to the surrounding communities. Given the prevalence and frequency of air emission violations, the smelter emitted metal contaminated dust and produced residue materials throughout the neighboring communities for over 90 years.

3.4 Waste Pile Burning

The large tailings pile located along the western and southwest perimeter of the site, was actively burning or smoldering for extended periods from the late 1960's through 1977. In 1967, the citizens of Erie petitioned the West Virginia Air Pollution Board and the West Virginia Natural Resources Department for relief from the dust and smoke emitted by the burning pile (Moore, 7/12/67). At the time of the petition, the residents of Erie were concerned about the damages to plant and human life as well as damages to the outside and inside of homes in the area due to the dust and smoke from the burning pile (Moore, 7/12/67). From March 1968 to June 1971, numerous citizens lodged complaints with the WVAPCC seeking an end to the

burning of the pile (Letter to Beard, 3/19/68; Byrd, 2/12/70a; Byrd, 2/12/70b; Beard, 4/11/68; Beard, 2/27/70; Hickman, 6/16/71). At times, emissions from the pile combined with local weather conditions forced a shut down of Route 19 between Clarksburg and Lumberport (Beard, 2/27/70). On June 22, 1971, the WVAPCC issued a Cease and Desist Order to the facility requiring the smoldering pile to be extinguished (WVAPCC, 1971). The resulting remedial action resolved the problems with air emissions from the smoldering pile until 1974, when complaints were again lodged due to the re-ignition of the pile and the emission of dust and smoke (Evans, 10/25/74; Evans, 10/31/74; Huss, 8/26/74; Beard, 8/15/74). Citations and notices of violation throughout 1976 and 1977 also noted the smoldering pile (Lee, 2/11/76; Pellerite, 6/16/76, Pellerite, 5/24/77; Pellerite, 5/25/77). In response to the May 5, 1977 notice of violations, the pile was extinguished and no further references were made to the burning of the pile. However, prior to the final control of the waste pile fire, high concentrations of dust particulates containing toxic metals were emitted at times to the air and dispersed throughout the class certification area for a period of more than 10 years. A summary of complaints and inspection reports is provided in Appendix 6.

3.5 Waste Characterization and Composition

The Department of Commerce has classified the primary and secondary zinc smelting industries as SIC codes 333 and 334, respectively. Pyrometallurgical primary zinc processing uses heat to separate desired metals from undesirable materials. These processes capitalize on the differences between constituent oxidation potentials, melting points, vapor pressures, densities, and/or miscibility when melted and include drying, calcining, roasting, sintering, retorting, and smelting (USEPA, 1995). When the ore is heated, waste materials including particulate air emissions of zinc and other volatile metals and toxic metal laden tailings are produced.

Secondary zinc processing produces a wide variety of air emissions and solid-phase wastes. Air emissions consist of particulates, zinc fumes with other metals, flux fumes, and smoke generated by the incomplete combustion of grease, rubber, and plastics in zinc scrap. Solid-phase wastes include slag, which contains metals such as aluminum, arsenic, copper, iron, and lead (USEPA, 1995).

An estimated three million tons of tailings material, which was produced at the facility, was disposed of in the tailings pile that covers approximately 50 acres in the south and southeastern portions of the site. The highest point of the tailings pile is just over 120 feet from the base of the pile (W-C Diamond, 2000). The tailings pile is mainly composed of silt and sand-sized particles but includes waste particles up to three inches in diameter (W-C Diamond, 2000).

An investigation of the site by the US Department of Health and Human Services and the Agency for Toxic Substances and Disease Registry in 1995 indicated elevated concentrations of toxic metals in the tailings pile. Lead concentrations in the tailings pile ranged from 400 to 6,100 milligrams per kilogram (mg/Kg). Arsenic and cadmium concentrations ranged from 320 to 3,500 mg/Kg and 4.2 to 1,400 mg/Kg, respectively. Zinc concentrations ranged from 23,000 mg/Kg to 55,000 mg/Kg (ATSDR, 1996). As part of the remedial investigation (RI) conducted in 2001, dust samples from the main smelter building were analyzed and found to contain arsenic, cadmium, lead, and zinc at elevated concentrations. The concentration of arsenic ranged from 17.7 mg/Kg to 74.0 mg/Kg, cadmium ranged from 97.8 mg/Kg to 3,830 mg/Kg, lead ranged from 440 mg/Kg to 20,500 mg/Kg, and zinc ranged from 180,000 mg/Kg to 571,000 mg/Kg.

3.6 On-site Pond Sediments and Water Quality

Two retention ponds are located in the northern portion of the facility, measuring approximately 300 feet by 150 feet and 150 feet by 150 feet. These ponds captured fine-grained, water-borne solids produced by the smelting and processing operations. Water baths were used to quench waste products from the smelting operations. Solids were removed from the bath by a screw auger assembly and transported to the tailings pile. The fine particles unable to be removed with the auger were transported in slurry form to the retention ponds where the fine particles eventually settled to the bottom of the pond. The sediments in the ponds have the consistency of unconsolidated silts. From test pits excavated during the remedial activities, the depth of the fine particulate material within the basins ranged from 10 to 15 feet (W-C Diamond, 2000).

The maximum concentrations of metals in the pond sediments were 80 mg/Kg for arsenic, 82 mg/Kg for cadmium, 840 mg/Kg for lead, and 130,000 mg/Kg for zinc. Using the maximum observed concentration of metals in the sediments and the soil to water partition coefficients provided by EPA Region III (USEPA, 2005), the concentration of arsenic in the water of the pond was 2.76 milligrams per liter (mg/l), the concentration of cadmium in the water of the pond was 1.09 mg/l, the concentration of lead in the water of the pond was 13.55 mg/l, and the concentration of zinc in the water of the pond was 65 mg/l.

3.7 Surface Water Runoff and Contamination of the West Fork River

Surface runoff water samples were collected by the West Virginia Department of Environmental Protection (WVDEP) as part of a March 1995 site investigation. Analysis of the water samples determined that concentrations of cadmium and lead in the water samples exceeded the allowable Toxicity Characteristic Leachate Procedure (TCLP) contaminant levels for both cadmium and lead (USEPA Region III AO, 1997). As such, the surface runoff water samples were characterized as hazardous wastes under the Resource Conservation and Recovery Act (42 USC §6901, 40 CFR §261.24).

During a joint site inspection between the USEPA and the WVDEP in July 1996, several eroded areas were observed on the surface of the waste pile adjacent to the West Fork River. Surface water sampling results from these eroded areas which were described in the report as "washout areas" indicated that the surface water from the springs and seeps at the base of the waste pile had low pH and elevated levels of zinc and cadmium (Hando, 1996). Two sediment samples collected from the West Fork River immediately adjacent to the washout areas contained lead at greater than 4,000 mg/Kg. Leachability testing of the two sediment samples determined the leachable lead content of 11.4 mg/l in one sample (Hando, 1996). The results of these investigations led to the recommendations by the WVDEP for determination of imminent and substantial endangerment to public health and the environment at the smelter facility (Downie, 1996).

A water quality assessment conducted by Advance Technology Systems, Inc. (ATS) in May of 1998 identified zinc as a contaminant of concern in the 30 miles of the West Fork River located downstream of Clarksburg. The ATS report identified the source of the zinc load to the

river as the former DuPont smelter facility in Spelter. The water quality assessment stated that the toxicity of zinc to aquatic life was the likely cause for the disappearance of Corbicula sp. and other mollusks as well as both emergent and submersed aquatic plants in the West Fork River downstream of Spelter (ATS, 1998).

Two washout areas and numerous seeps along the western edge of the waste pile were identified in the Preliminary Exposure Assessment (W-C Diamond, 1998) as potential sources for surface water runoff and contamination of the West Fork River. During my site visit in August 2005, I observed that portions of the tailings pile facing the West Fork River were devoid of vegetation and had been eroded. Since portions of the bluff face of the tailings pile are not vegetated, metals from the waste pile transported by surface runoff water will continue to reach the river. Given the history of the waste pile, wastes from the smelter have significantly contaminated the West Fork River.

3.8 Wind Dispersion and Transport

Wind is a major factor in transporting and dispersing the emitted dust from the smelter and the tailings pile. Wind also acts as a scouring agent, dislodging fine particulates containing toxic metals from the tailings pile for transport. Particulates emitted from the smelter stack, baghouse, and retort buildings as well as the waste pile are blown as dust onto the properties and into homes throughout the class certification area. As a result of this wind blown dust, the homes and properties, including accessible surfaces such as indoor floors, furniture, play areas and toys, patios, driveways, railings, plants, lawns and bare soils are contaminated with toxic metals from the site.

In a 1985 publication on air dispersion and transport of dust, Cowherd and coworkers (1985) illustrate the principal that air dispersion and transport is on the order of thousands of meters. Dust from a 10 meter by 10 meter *flat* source can be distantly dispersed at low wind speeds, thereby impacting areas as much as two miles away from the source. The tailings pile at the site is over 2000 times this area with an elevation in excess of 100 feet above the surrounding floodplain. As such, the tailings pile would have a far greater deposition impact zone than a 10 meter by 10 meter source area, extending well beyond the limits of the class certification area. Cowherd and coworkers (1985) further demonstrate the relationship between particle size and

the distance transported from the source. For very small particles, such as the dust emitted from the stack and baghouse, the distance for particle transport is much greater than that for larger sized particles.

A wind rose diagram showing the direction and frequency of wind speeds for the weather station at Clarksburg, West Virginia is presented in Figure 2. Based on the wind rose diagram, the predominant wind direction is from the west-southwest; however, during most years, the wind blows from all points of the compass at wind speeds ranging from calm to approximately 20 miles per hour. As such, all homes and properties within the class certification area have been and will continue to be impacted by wind blown dust from the site.

4.0 SOIL SAMPLING RESULTS

Soil sampling was conducted in the class certification area during February and June 2005 by Dr. George Flowers. As part of his assessment, Dr. Flowers collected 1,068 shallow surface soil samples from representative locations within the 1,500 acre class certification area and completed a series of eight shallow soil borings within the town of Spelter to determine the maximum depth of metal contamination in the soils. As indicated in his report, Dr. Flowers determined the average soil background concentration of metals were 8.8 mg/Kg for arsenic, 0.5 mg/Kg for cadmium, 25 mg/Kg for lead, and 88 mg/Kg for zinc. Soil sampling locations are shown in Figure 3 and a summary of the soil analytical data is presented in Table 1.

4.1 Comparison with Soil Background Levels

Based on the site investigation conducted by Dr. Flowers (2005), approximately 62% of the soil sample locations had arsenic levels that exceeded the average soil background concentration of 8.8 mg/Kg for arsenic and approximately 10% of the soil samples had concentrations of arsenic greater than twice the average soil background concentration (17.6 mg/Kg). The area associated with arsenic concentrations greater than 17.6 mg/Kg is approximately 33 acres (See Figure 4).

Approximately 85% of the soil sample locations had cadmium and lead concentrations in excess of the average soil background concentrations of 0.50 mg/Kg for cadmium and 25 mg/Kg

for lead. For cadmium, the percentage of samples with concentrations greater than twice the average soil background concentration (1.0 mg/Kg) was 69% with a corresponding area of approximately 1300 acres (See Figure 5). For lead, the percentage of samples with concentrations greater than twice the average soil background concentration (50.0 mg/Kg) was 59%. The area corresponding to soil concentrations in excess of 50.0 mg/Kg of lead is approximately 1100 acres (See Figure 6).

A total of 1,010 soil samples (approximately 95%) contained concentrations of zinc, which exceeded the average soil background concentration of 88 mg/Kg for zinc. Approximately 79% of the soil samples had concentrations of zinc greater than twice the average soil background concentration (176 mg/Kg). The area associated with zinc concentrations greater than 176 mg/Kg is approximately 1,270 acres (See Figure 7).

Arsenic concentrations greater than the average soil background level were found in one of the shallow soil borings at a depth of 36 inches. For cadmium, the concentrations in the soil exceeding the average soil background concentration were found to a depth of 36 inches in six of the shallow soil borings. The concentration of zinc exceeded average soil background level at the 36 inch depth in five of the eight shallow soil borings. The concentrations of lead in excess of the average soil background concentration were found between the soil surface and 22 inches below ground surface. However, a majority of the soil contaminated with metals is contained within the top 6 inches of the soil profile.

5.0 HOUSE DUST SAMPLING RESULTS

SI Group conducted indoor dust sampling events in June and August 2005. The results from these two sampling events were reported in "Preliminary Report, Dust Sampling in Spelter, West Virginia, June 2005" and "Dust Sampling in Harrison County, West Virginia, June and August 2005". The dust sampling locations are illustrated in Figure 8.

Four different types of dust samples were collected from a total of 74 property locations during the two sampling events. The types of dust samples included bulk attic dust samples; bulk living space dust samples; area specific, living area dust wipe samples; and wipe living space

dust samples. Bulk attic dust samples were collected from 58 of the 74 properties. A total of 61 bulk living space dust samples were collected from 59 of the 74 properties.

Area specific, living area wipe samples were collected from either windowsills or floors in the living space. A standardized template was used for collection of samples from floors and windowsill sample areas were measured following sample collection. Area specific, living area wipe samples were collected from 17 of the 74 properties.

A total of 90 wipe samples of dust were collected from the living space at 71 of the 74 sampling locations. All wipe living space dust samples were analyzed to provide a dry weight concentration of metals in the dust and a concentration of metals in the mineral portion of the dust.

Analytical results of the bulk attic dust samples are summarized in Table 2. Table 3 presents a summary of the analytical results for the bulk living space dust samples. All bulk dust sample results were compared to the average soil background concentrations (Flowers, 2005) and the WVDEP residential standards for metals in soil. The arsenic, cadmium, and lead results from the area specific wipe samples and the wipe samples of dust from the living space were compared with the dust sample results presented in the National Human Exposure Assessment Survey (NHEXAS) conducted by the USEPA, Office of Research and Development from 1995 to 1997 and 40 CFR 745.

5.1. Bulk Attic Dust Samples

Bulk dust samples were collected from 58 sampling locations, where the attic was accessible. Laboratory analyses were performed for arsenic, cadmium, lead, and zinc, and the results were compared with the average background soil concentration and the WVDEP risk-based exposure levels for metals in soil.

The concentration of arsenic in 54 of 58 bulk samples of dust from the attics exceeded the average background soil concentration of 8.8 mg/Kg for arsenic. The concentration of arsenic in all 58 bulk samples of dust from the attics exceeded the WVDEP limit of 0.39 mg/Kg. The arsenic concentrations ranged from 5 mg/Kg to 227 mg/Kg.

The concentration of cadmium in all 58 bulk samples of dust from the attics exceeded the average background soil concentration of 0.50 mg/Kg. The concentration of cadmium in 28 of the 58 bulk samples of dust from the attics exceeded the WVDEP limit of 37 mg/Kg. The cadmium concentrations ranged from 1.5 mg/Kg to 2,280 mg/Kg.

The concentration of lead in 57 of 58 bulk samples of dust from the attics exceeded the average background soil concentration of 25 mg/Kg. The concentration of lead in 47 of the 58 bulk samples of dust from the attics exceeded the WVDEP limit of 400 mg/Kg. The lead concentrations ranged from 22.6 mg/Kg to 15,000 mg/Kg.

The concentration of zinc in all 58 bulk samples of dust from the attics exceeded the average background soil concentration of 88 mg/Kg. The concentration of zinc in 18 of the 58 bulk samples of dust from the attics exceeded the WVDEP limit of 23,000 mg/Kg. The zinc concentrations ranged from 856 mg/Kg to 220,000 mg/Kg.

5.2 Bulk Living Space Dust Samples

A total of 61 bulk samples of dust were collected from the living space in 59 locations. Laboratory analyses were performed for arsenic, cadmium, lead, and zinc, and the results were compared with the average background soil concentration and the WVDEP risk-based exposure levels for metals in soil.

The concentration of arsenic in 45 of 61 bulk samples of dust from the living spaces exceeded the average background soil concentration of 8.8 mg/Kg. The concentration of arsenic in all 61 bulk samples of dust from the living spaces exceeded the WVDEP limit of 0.39 mg/Kg. The arsenic concentrations ranged from 3 mg/Kg to 140 mg/Kg.

The concentration of cadmium in all 61 bulk samples of dust from the living spaces exceeded the average background soil concentration of 0.50 mg/Kg. The concentration of cadmium in three of the 61 bulk samples of dust from the living spaces exceeded the WVDEP limit of 37 mg/Kg. The cadmium concentrations ranged from 2.4 mg/Kg to 140 mg/Kg.

The concentration of lead in all 61 bulk samples of dust from the living spaces exceeded the average background soil concentration of 25 mg/Kg. The concentration of lead in 12 of the

61 bulk samples of dust from the living spaces exceeded the WVDEP limit of 400 mg/Kg. The lead concentrations ranged from 28.7 mg/Kg to 3,800 mg/Kg.

The concentration of zinc in all 61 bulk samples of dust from the living spaces exceeded the average background soil concentration of 88 mg/Kg. The concentration of zinc in one of the 61 bulk samples of dust from the living spaces exceeded the WVDEP limit of 23,000 mg/Kg. The zinc concentrations ranged from 282 mg/Kg to 60,700 mg/Kg.

5.3 Area Specific Dust Wipe Samples

Area specific wipe samples of dust were collected from the living space of 17 sampling locations. A total of 18 wipe samples were collected which included 13 wipe samples collected from floors and 5 wipe samples collected from windowsills. Laboratory analyses were performed for arsenic, cadmium, lead, and zinc to determine the metal loading rate of the dust and the ratio of metals in the living space dust.

The concentration of arsenic in the 18 area specific wipe samples ranged from 1.8 micrograms per square foot ($\mu g/ft^2$) to 9.1 $\mu g/ft^2$. The concentration in each of the 18 area specific wipe samples exceeded the median arsenic loading rate of 0.26 $\mu g/ft^2$ and the 95th percentile loading rate of 1.6 $\mu g/ft^2$ presented in the USEPA NHEXAS survey.

The concentration of cadmium in the 18 area specific wipe samples ranged from 0.1 $\mu g/ft^2$ to 15.8 $\mu g/ft^2$. The concentration in each of the 18 area specific wipe samples exceeded the median cadmium loading rate of 0.0 $\mu g/ft^2$ and four of the 18 area specific samples exceeded the 95th percentile loading rate of 4.5 $\mu g/ft^2$ presented in the USEPA NHEXAS survey.

The concentration of lead in 5 of the 13 area specific samples of dust from the floors of residences exceeded the USEPA limit of 40 $\mu g/ft^2$. The lead concentrations in the floor dust ranged from 2.07 $\mu g/ft^2$ to 698 $\mu g/ft^2$.

None of the area specific samples of dust from the windowsills contained dust lead concentrations in excess of the USEPA limit of 250 $\mu g/ft^2$. The lead concentrations in the windowsill dust ranged from 34.2 $\mu g/ft^2$ to 213 $\mu g/ft^2$.

The concentration of zinc in the 18 area specific wipe samples ranged from 36.1 $\mu g/ft^2$ to 4764 $\mu g/ft^2$. The concentrations of zinc in the dust were not compared to the USEPA NHEXAS survey since the EPA survey did not report levels of zinc for any of the media sampled.

5.4 Wipe Living Space Dust Samples

The concentration of arsenic in wipe living space samples of dust ranged from 0.38 mg/Kg to 154 mg/Kg. The concentration of arsenic in 41 of 90 samples of dust from wipe in living space samples exceeded the average background soil concentration of 8.8 mg/Kg for arsenic.

The concentration of cadmium in wipe living space samples of dust ranged from 0.04 mg/Kg to 35.1 mg/Kg. The concentration of cadmium in 73 of 90 samples of dust from wipe in living space samples exceeded the average background soil concentration of 0.50 mg/Kg for cadmium.

The concentration of lead in wipe living space samples of dust ranged from 1.40 mg/Kg to 3,200 mg/Kg. The concentration of lead in 56 of 90 samples of dust from wipe in living space samples exceeded the average background soil concentration of 25 mg/Kg for lead.

The concentration of zinc in wipe living space samples of dust ranged from 61 mg/Kg to 118,300 mg/Kg. The concentration of zinc in 87 of 90 samples of dust from wipe in living space samples exceeded the average background soil concentration of 88 mg/Kg for zinc.

6.0 INDOOR AIR QUALITY SAMPLING RESULTS

Air particulate samples were collected by SI Group during the dust sampling events in June and August 2005. Particulate samples were collected through the use of personal air samplers worn by field personnel during dust sampling. Analyses of the particulate samples were performed for arsenic, cadmium, lead, and zinc, in order to determine the concentration of toxic metals in the indoor ambient air and compare the air-borne metal concentrations with the USEPA National Ambient Air Quality Standards. The results from these sampling events are summarized in Table 4.

6.1 Comparison to NAAQ Standards

The concentration of arsenic exceeded the National Ambient Air Quality (NAAQ) standard of 0.00041 micrograms per cubic meter ($\mu g/m^3$) in 37 of the 74 sampled locations. The arsenic concentrations ranged from 0.0 ug/m^3 to 5.2 ug/m^3 with the concentration of arsenic in 86 out of 145 samples reported as below detection limit. The concentration of cadmium in 19 of the 74 sampled locations exceeded the NAAQ standard of 0.00099 ug/m^3. The cadmium concentrations ranged from 0.0 ug/m^3 to 5.7 ug/m^3 with the concentration of cadmium in 120 out of 145 samples reported as below detection limit. The concentration of lead in 29 of the 74 sampled locations exceeded the NAAQ standard of 1.5 ug/m^3. The lead concentrations ranged from 0.0 ug/m^3 to 44.67 ug/m^3 with the concentration of lead in 48 out of 145 samples reported as below detection limit. Zinc was detected in 69 of the 74 sampled locations. However, the concentrations of zinc did not exceed the NAAQ standard of 1,100 ug/m^3.

6.2 Comparison to On-site Air Sampling During Remediation

Beginning on September 26, 1998 and ending on December 10, 1998, Corporate Remediation Group conducted high volume air sampling at the site during remediation. Arsenic, cadmium, lead, and zinc, as well as total suspended particulates (TSP) concentrations were determined for each sample collected from September 26 to November 30, 1998. Standard high volume air samplers equipped with 8" by 10" glass fiber filters (GFF) were utilized in both upwind and downwind locations (W-C Diamond, 1999). The maximum concentrations of arsenic, cadmium, lead, zinc, and TSP were found to be 0.0184 ug/m^3, 0.0636 ug/m^3, 0.166 ug/m^3, 37.1 ug/m^3, 91.8 ug/m^3, respectively, with the maximum concentrations of only arsenic and cadmium in excess of the respective NAAQ standards (W-C Diamond, 1999).

The concentration of arsenic in the air samples collected by SI Group exceeded the maximum concentration reported by the Corporate Remediation Group for arsenic at 37 of the 74 sample locations. The maximum reported concentration for arsenic by SI Group was 5.2 ug/m^3. For cadmium, of the 74 locations sampled by SI Group, 19 had concentrations of cadmium greater than the maximum concentration reported by the Corporate Remediation Group. The highest level of cadmium found by SI Group was 5.7 ug/m^3. For lead, SI Group samples exceeded the maximum value collected by Corporate Remediation Group at 61 of the 74 sample

locations. The highest level of lead found by SI Group was 44.67 ug/m^3. Zinc values measured by SI Group exceeded the maximum value collected by Corporate Remediation Group at 13 of the 74 sample locations. The maximum reported concentration for zinc by SI Group was 533 ug/m^3.

7.0 FINGERPRINT OF WASTES

The metal ore processed by the facility when it was operated as a primary zinc smelter contained arsenic, cadmium, lead, and zinc as constituents of the ore. The waste materials produced by the roasting, sintering, retorting, and smelting processes and disposed in the tailings pile also contained these metals. Arsenic, cadmium, lead, and zinc were metals of concern in the waste produced during the period when the facility was operated as a secondary zinc smelter. For the soil and dust samples collected from the class certification area, all samples contained concentrations of each of the four metals. As such, the qualitative fingerprint of metals was present throughout the class certification area.

From a quantitative perspective, the concentrations of all four metals in the soil and house dust were detected at enriched concentrations relative to the average background concentrations in the soil. The relative ratios of metal concentrations in the waste materials and on-site dust samples are similar to and consistent with the bulk dust samples collected from the attics at the sampled residences. Further, the relative ratio of metal concentrations in the tailings pile materials is strongly correlated to the metal concentrations in the indoor dust samples collected in the nearby community of Spelter.

7.1 Comparison throughout Class Area

For the dust samples, the ratio of metals contained in the house dust was used to assess the commonality of the source of the dust for all of the homes. As shown in Figure 9, the ratio of zinc to cadmium in the bulk attic dust was uniform with distance from the smelter facility indicating that the zinc and cadmium concentrations in the dust were correlated. Similarly, the ratio of lead to arsenic in the bulk attic dust remained reasonably constant throughout the class certification area (Figure 10). These ratios of metals remained consistent in spite of the decrease

in concentration in the dust with increasing distance from the facility. The data used to prepare the ratio with distance plots is included in Appendix 6.

Using the ratios of zinc to lead (Zn:Pb) and zinc to cadmium (Zn:Cd), the composition of the dust in the attics at these homes did not differ statistically from the composition of the dust in the indoor living spaces, nor did the correlation of dust samples vary with location within the class certification area. Similarly, the ratio of zinc to arsenic (Zn:As) in the bulk attic dust samples was correlated with the dust samples from the indoor living spaces, indicating that the contamination was from the same source. These ratios were consistent throughout the class certification area.

8.0 OPINIONS AND BASIS OF OPINIONS

8.1 Source of Contamination

It is my opinion to a reasonable degree of scientific certainty that the former DuPont smelter is the principal source of arsenic, cadmium, lead, and zinc in the contaminated soils, house dust, river sediments, and surface water in the class certification area. The smelter released large volumes of both air emissions and solid wastes with high concentrations of arsenic, cadmium, lead, and zinc to the environment. Elevated concentrations (above background soils levels) of at least one of the four metals were found at each of the locations where dust was sampled. Elevated concentrations (above background soils levels) of zinc and lead were found in 95% and 85%, respectively of the soil samples. Elevated concentrations of zinc were found in the samples of river water collected downstream of the site and elevated concentrations of arsenic, cadmium, and lead were found in the river sediments.

Elevated concentrations of zinc and cadmium were found in the house dust and soils at concentrations far in excess of background soil levels and national averages. The concentrations of both zinc and cadmium in the house dust samples decrease with distance from the smelter as would be expected from wind blown particulates from a point source. The ratio of zinc to cadmium in the dust samples remains constant with distance from the smelter indicating that the source of the zinc and cadmium in the dust can only be from the smelter.

The smelter is the only source of zinc within the class certification area capable of producing the mass loading present in the river (ATS, 1998) and the homes and properties within the class certification area. No other source of metals can contribute the observed concentrations of zinc in the soils and house dust; much less contribute the mass of zinc observed in the river. The cumulative loadings of all metals from sources such as the coal fired power plant near Lumberport, strip mining activities in the region, the presence of lead based paint, the background soil concentrations and normal household activities can not account for the observed concentrations of toxic metals in the soil and house dust within the class area.

8.2 Area-wide Impact

It is my opinion to a reasonable degree of scientific certainty that the toxic metals from the smelter have impacted all properties and homes within the class certification area. The wind rose diagram from the Clarksburg weather station indicates metal contaminated dust and particulates are transported in all directions from the smelter. Based on the soil data provided by Dr. Flowers, greater than 95% of the soil samples collected from the class certification areas are enriched above the background concentration for one or more of the metals. The aerial distribution of the enriched soil samples includes greater than 85% of the class certification area. Further, the bulk attic dust samples collected from all sample locations had concentrations of cadmium and zinc, which are greater than two times the background soil levels. Furthermore, the consistency of the metals ratios for Zn:Cd and Pb:As with distance from the smelter clearly indicates that the metals in each ratio pair are from the same source and the impact of metals is present throughout the class certification area and beyond the boundaries of the class. As a result of the consistency of these ratios, all properties within the class certification area have been impacted by the emissions from the site.

8.3 Necessity for Remediation

It is my opinion to a reasonable degree of scientific certainty that the impacted soils and homes within the class certification area require remediation to reduce the exposure of the residents to the metals from the site. The level of remediation for each home within the class certification area will be dependent on the level of exposure for the residents. The impacted soil, contaminated at concentrations greater than the site specific clean up levels, should be removed

and disposed of at an appropriate waste facility. After the removed soil has been replaced with clean fill soil and re-graded, confirmation testing should be done to ensure that all impacted soils have been removed.

8.4 Remediation Cost

It is my opinion to a reasonable degree of scientific certainty that the estimated cost to remediate all of the impacted soils and homes within the class certification area is $180,000,000. The cost estimate for soil clean up and removal is based on the removal of the top six inches of the soil profile and replacement with clean fill with the associated site work at a unit cost of $60 per cubic yard. The estimated cost for home remediation was based on a median cost for replacement of fixtures and furnishings, dust abatement, and restoration of living areas at a cost of $35,000 per house.

TABLES

TABLE 1. SUMMARY OF SOIL SAMPLE ANALYTICAL DATA

	As	Cd	Pb	Zn
N	1068	1068	1068	1068
Mean	11.3	5.5	123	1000
Std. Deviation	10.5	13.4	204	2242
Median	9.8	2.2	66	390
Minimum	1	0.105	2.8	22
Maximum	280	240	2400	32000
5th Percentile	4.60	0.25	17	86.35
95th Percentile	21.7	21	420	3730
Background Soil Concentrations (Flowers, 2005)	8.8	0.50	25	88
Number Greater than Background	658	908	907	1010
Percent	62	85	85	95
Number Greater than 2X Background	104	735	634	848
Percent	10	69	59	79

TABLE 2. SUMMARY OF BULK ATTIC SAMPLE ANALYTICAL DATA

	As	Cd	Pb	Zn
N	61	61	61	61
Mean	41	189	2457	24741
Std. Deviation	37	378	2800	39756
Median	30	31	1700	5160
Minimum	5.0	1.5	22.6	856
Maximum	227	2280	15000	220000
5th Percentile	6.8	4.7	206	1090
95th Percentile	96	610	5780	97400
Background Soil Concentrations (Flowers, 2005)	8.8	0.50	25	88
Number Greater than Background	56	61	60	61
Percent	92	100	98	100
Number Greater than 2X Background	40	61	60	61
Percent	66	100	98	100

TABLE 3. SUMMARY OF BULK DUST SAMPLE ANALYTICAL DATA

	As	Cd	Pb	Zn
N	61	61	61	61
Mean	21	14	396	3481
Std. Deviation	22	24	678	7801
Median	14	8	150	1650
Minimum	3	1	14	282
Maximum	140	140	3800	60700
5th Percentile	4	3	39	701
95th Percentile	60	30	1960	7620
Background Soil Concentrations (Flowers, 2005)	8.8	0.50	25	88
Number Greater than Background	45	61	60	61
Percent	74	100	98	100
Number Greater than 2X Background	25	60	57	61
Percent	41	98	93	100

TABLE 4. SUMMARY OF AIR SAMPLE ANALYTICAL DATA

	As	Cd	Pb	Zn
N	145	145	145	145
Mean	0.340	0.148	1.734	36.148
Std. Deviation	0.695	0.673	4.622	89.478
Median	0.000	0.000	0.500	7.580
Minimum	0.000	0.000	0.000	0.000
Maximum	5.2	5.7	44.7	533.0
5th Percentile	0.000	0.000	0.000	0.000
95th Percentile	1.600	0.368	7.974	220.120
EPA National Ambient Air Quality Standards	0.00041	0.00099	1.5	1100
Number Greater than NAAQ Standards	59	25	32	0
Percent	41	17	22	0
Maximum On-Site Air Sampling Concentration	0.0184	0.0636	0.166	37.1
Number Greater Max On-Site Air Sampling Conc.	59	25	88	24
Percent	41	17	61	17

FIGURES

Figure 1. Site Location

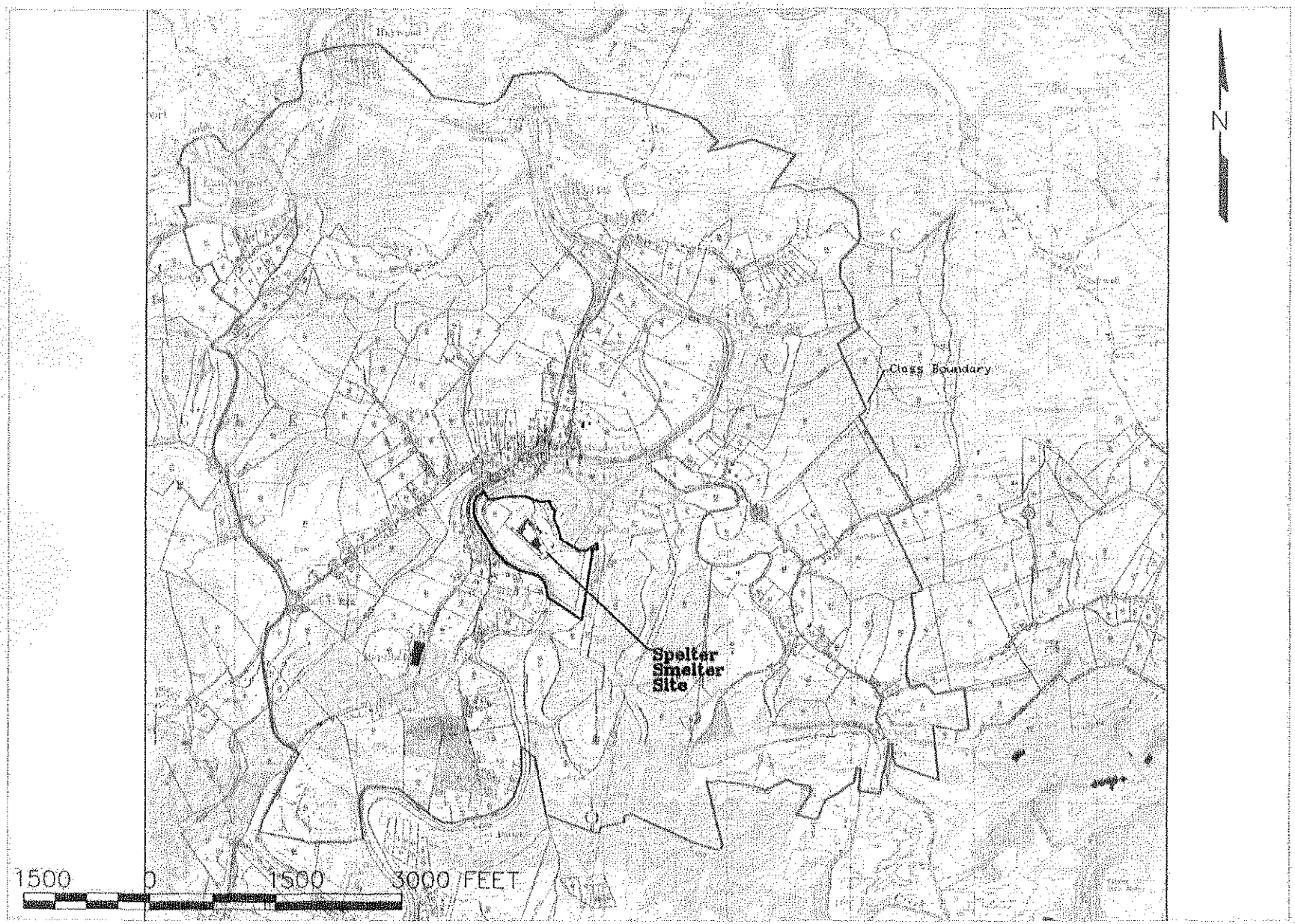


Figure 2.

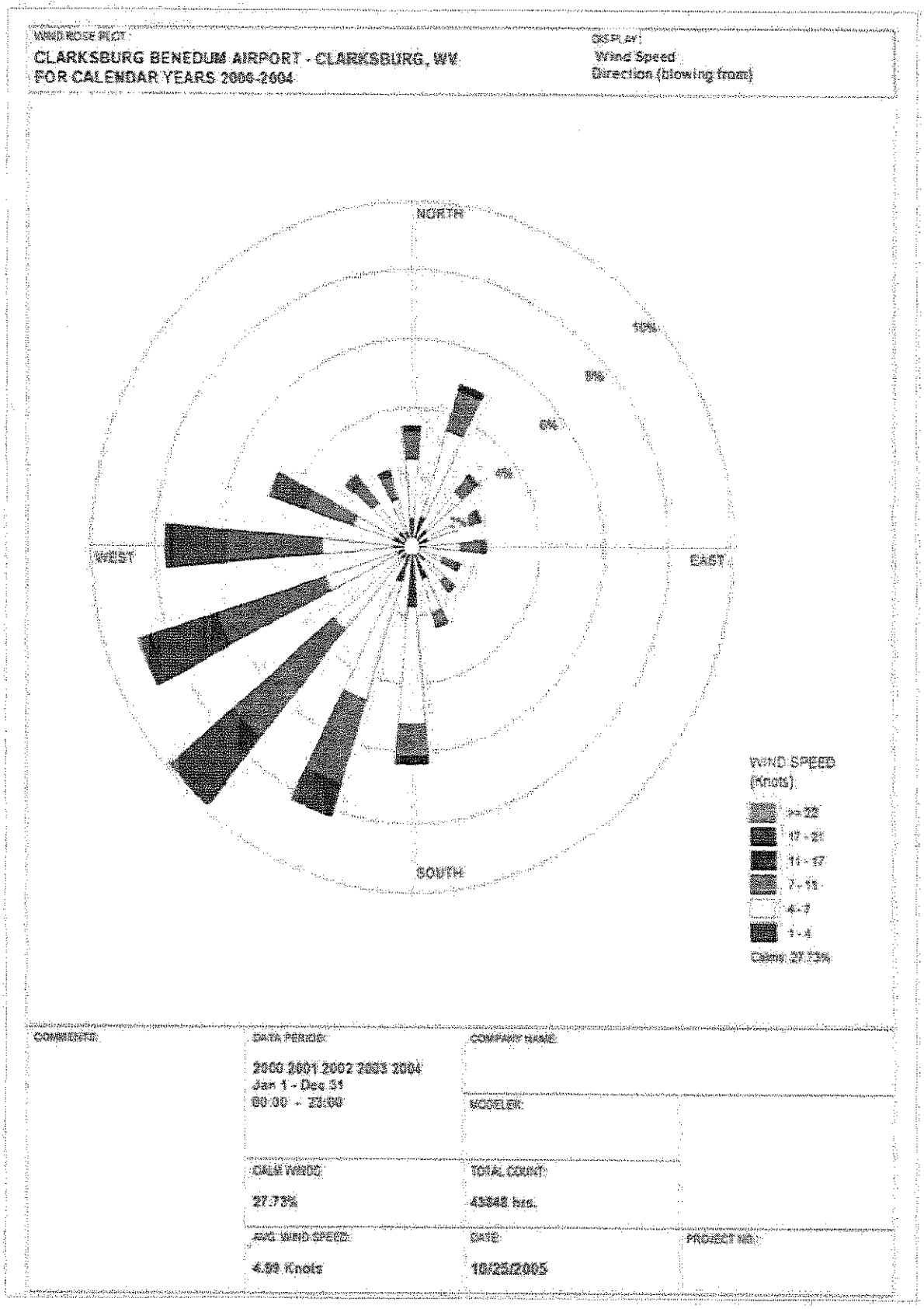

WIND ROSE PLOT:
CLARKSBURG BENEDUM AIRPORT - CLARKSBURG, WV
FOR CALENDAR YEARS 2000-2004
DISPLAY:
Wind Speed
Direction (blowing from)
NORTH
EAST
SOUTH
WEST
10%
8%
6%
4%
WIND SPEED
(Knots)
>= 22
17 - 21
11 - 17
7 - 11
4 - 7
1 - 4
Calms: 27.73%
COMMENTS:
DATA PERIOD:
2000 2001 2002 2003 2004
Jan 1 - Dec 31
00:00 - 23:00
COMPANY NAME:
MODELER:
CALM WINDS:
27.73%
TOTAL COUNT:
43848 hrs.
AVG WIND SPEED:
4.59 Knots
DATE:
10/25/2005
PROJECT NO.:

Figure 3. Soil Sampling Locations

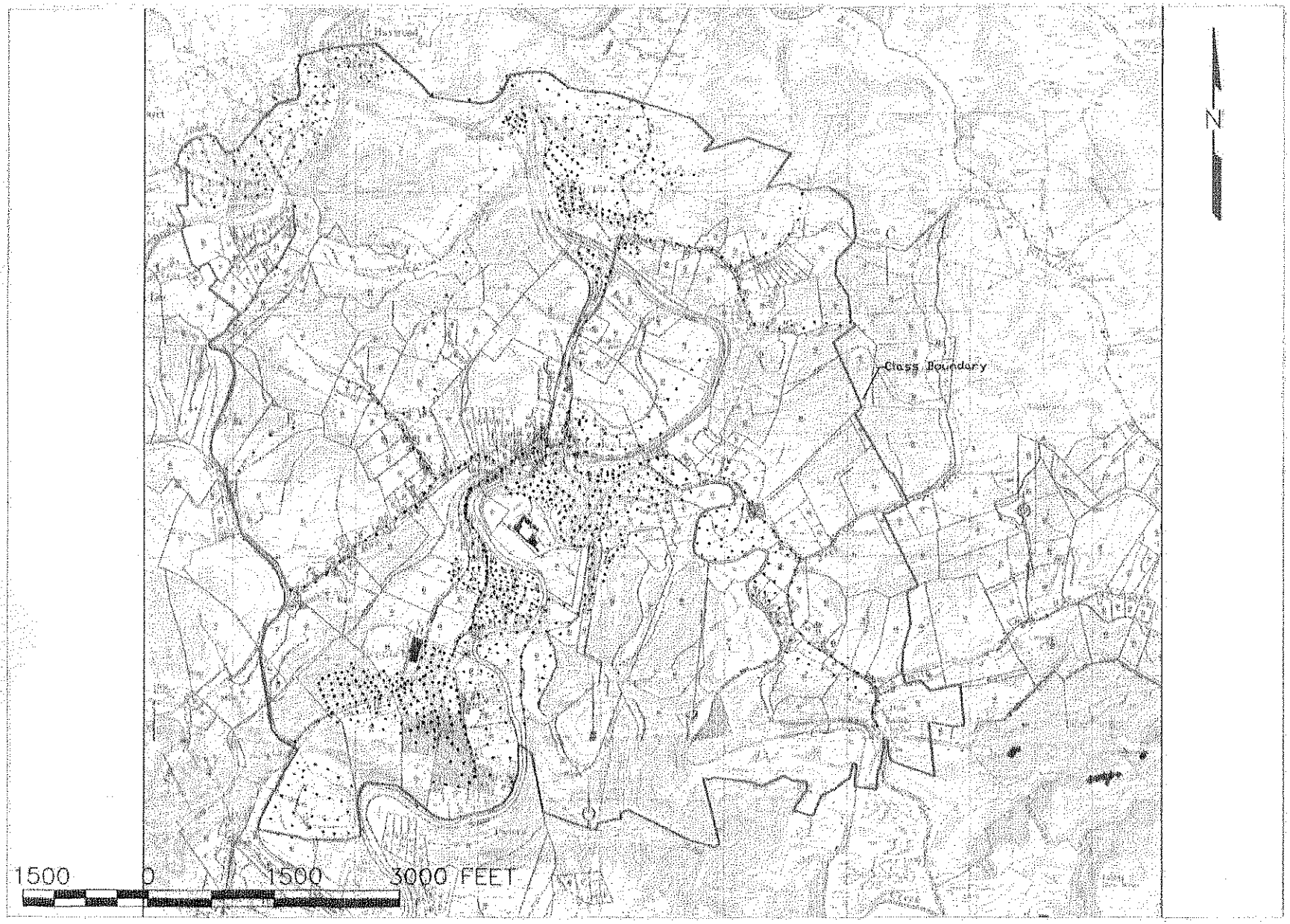


Figure 4. Soil Areas with Arsenic Concentrations Twice Background Levels

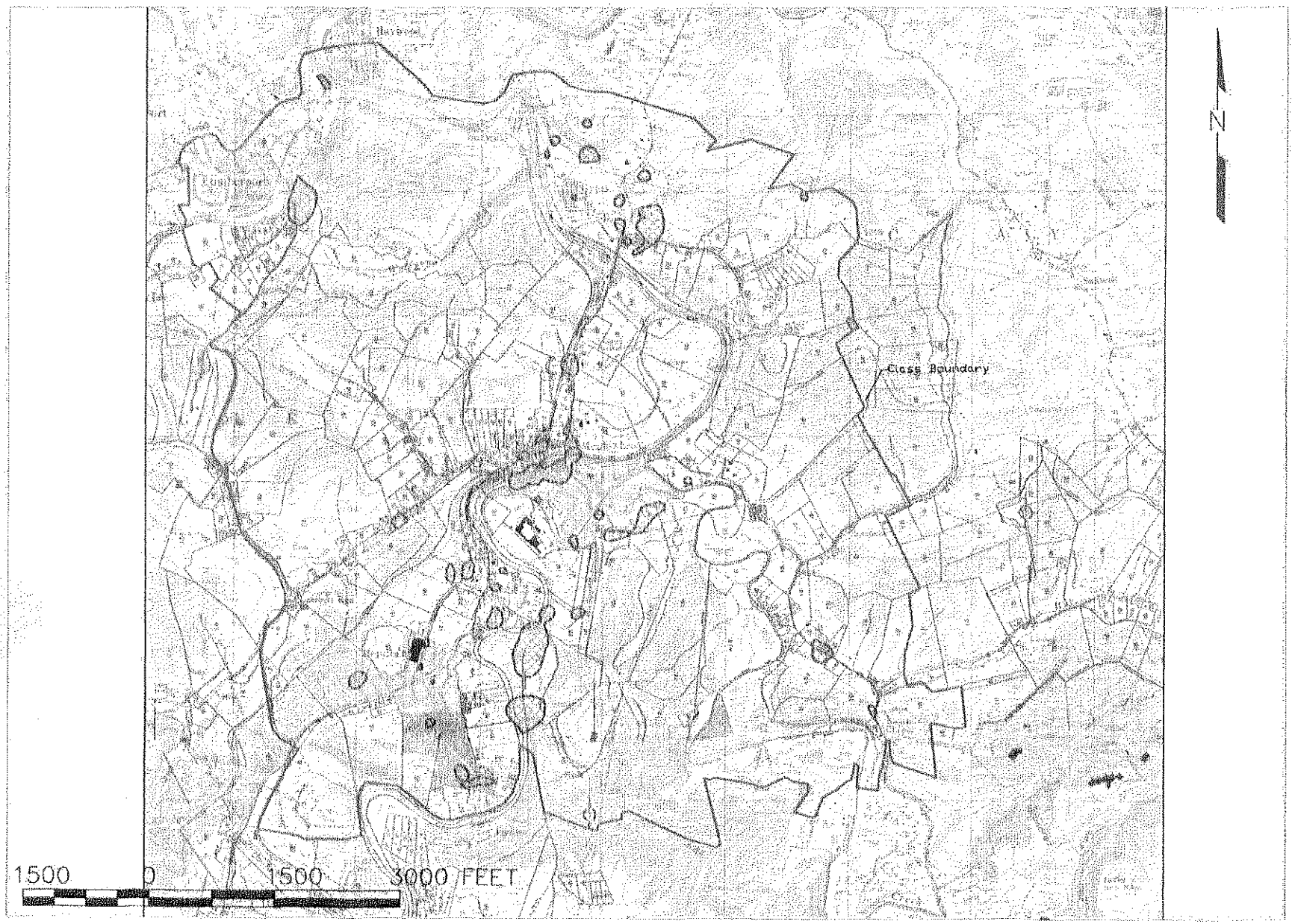


Figure 5. Soil Areas with Cadmium Concentrations Twice Background Levels

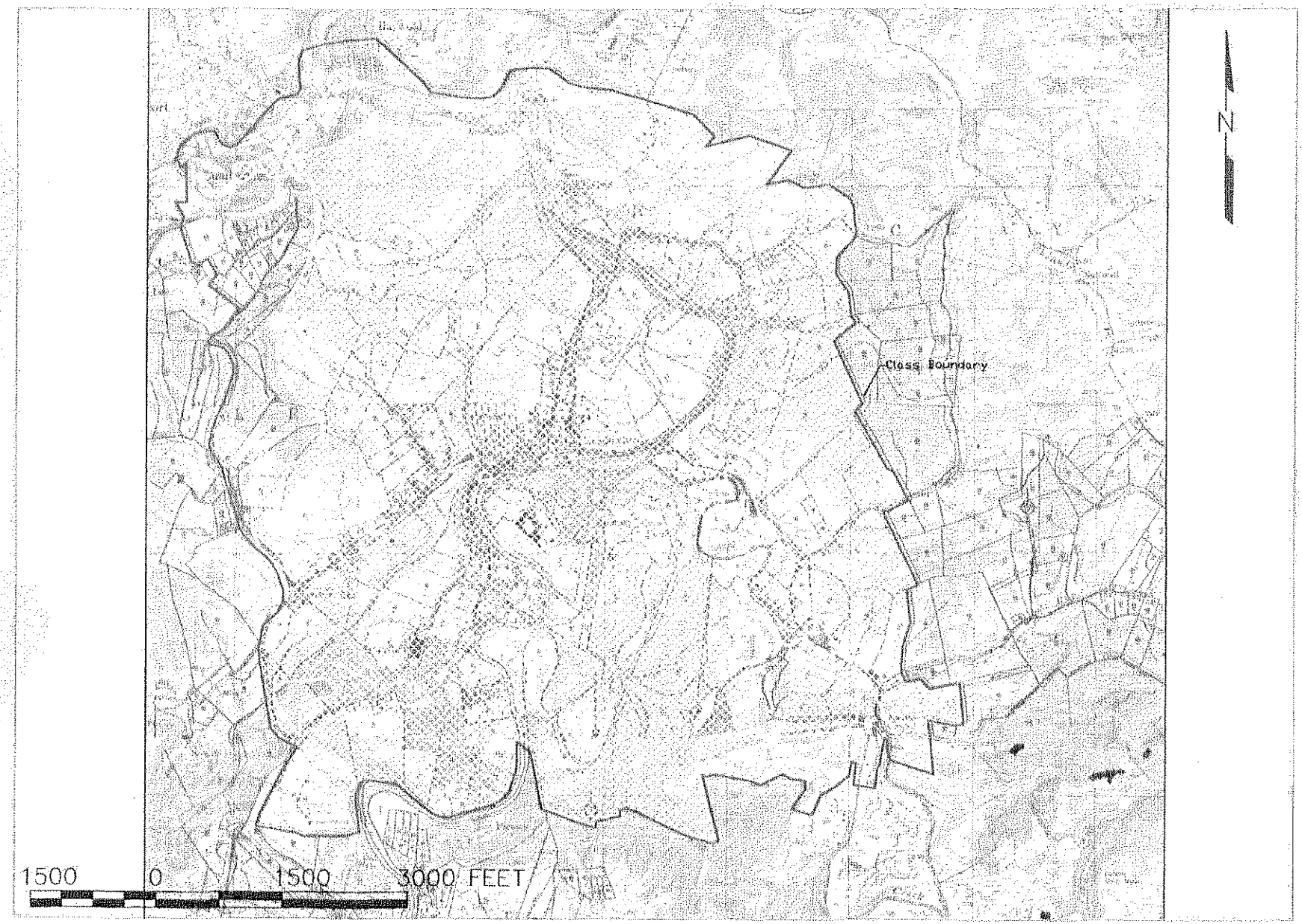


Figure 6. Soil Areas with Lead Concentrations Twice Background Levels

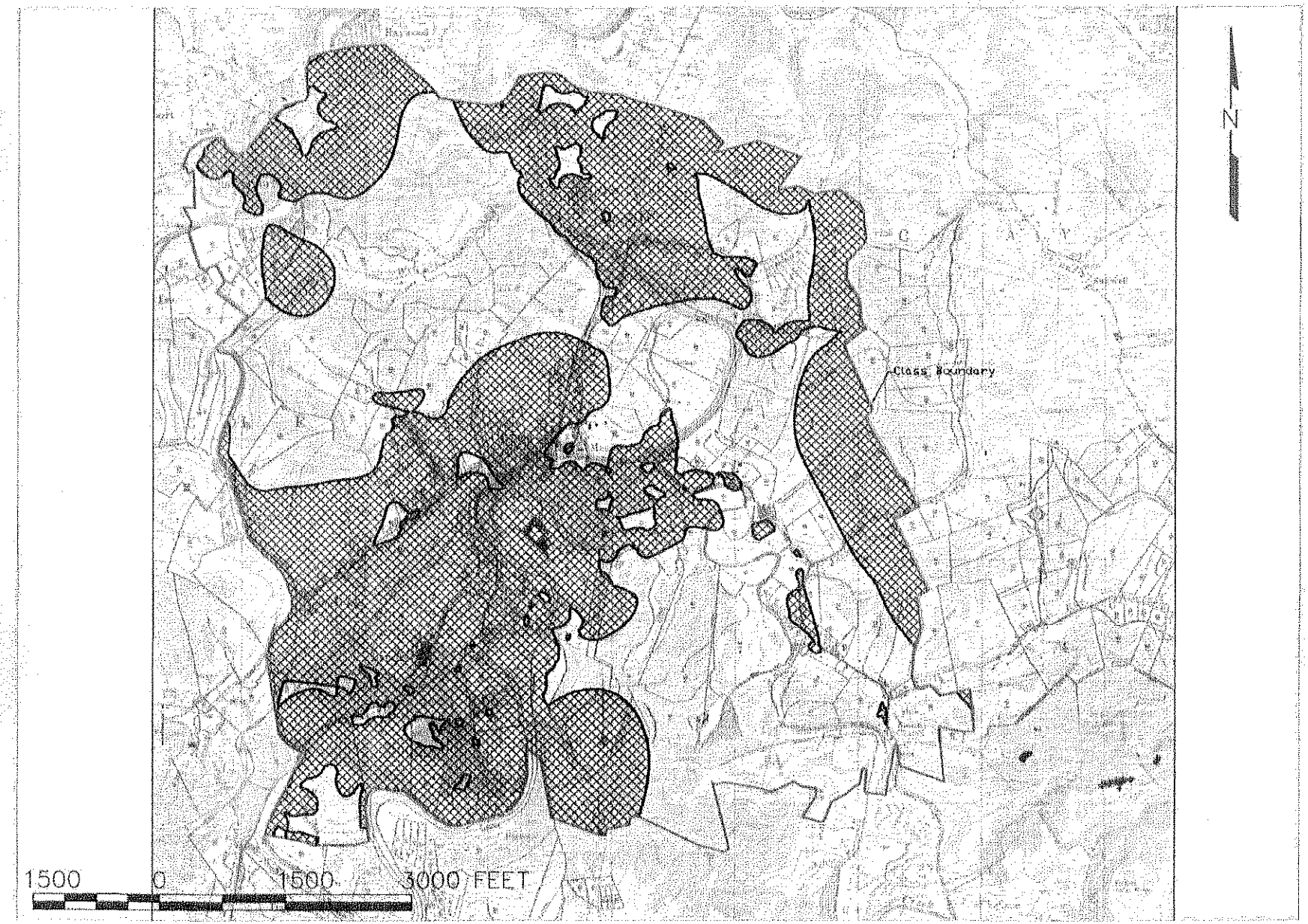


Figure 7. Soil Areas with Zinc Concentrations Twice Background Levels

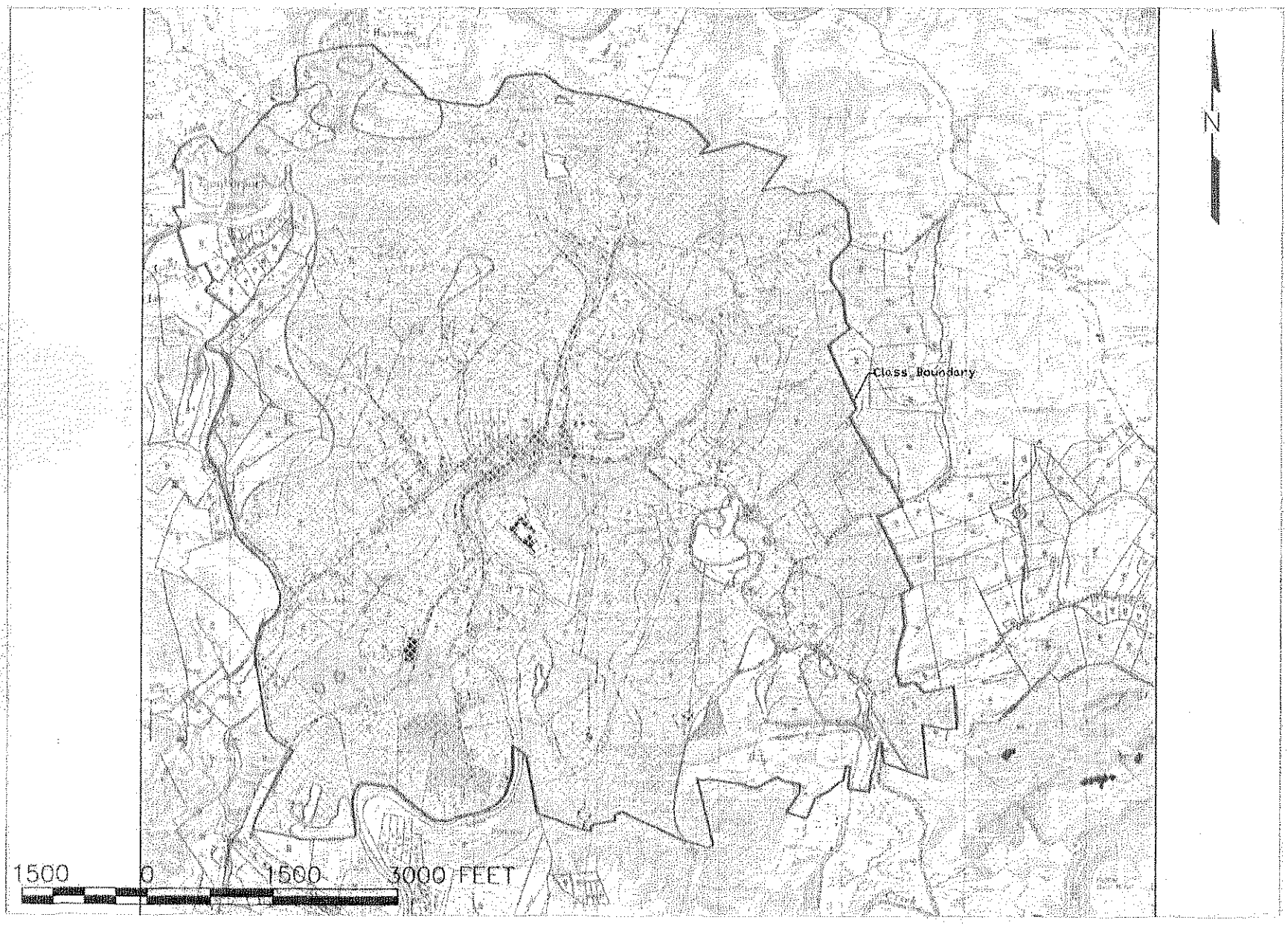


Figure 8. Dust Sampling Locations

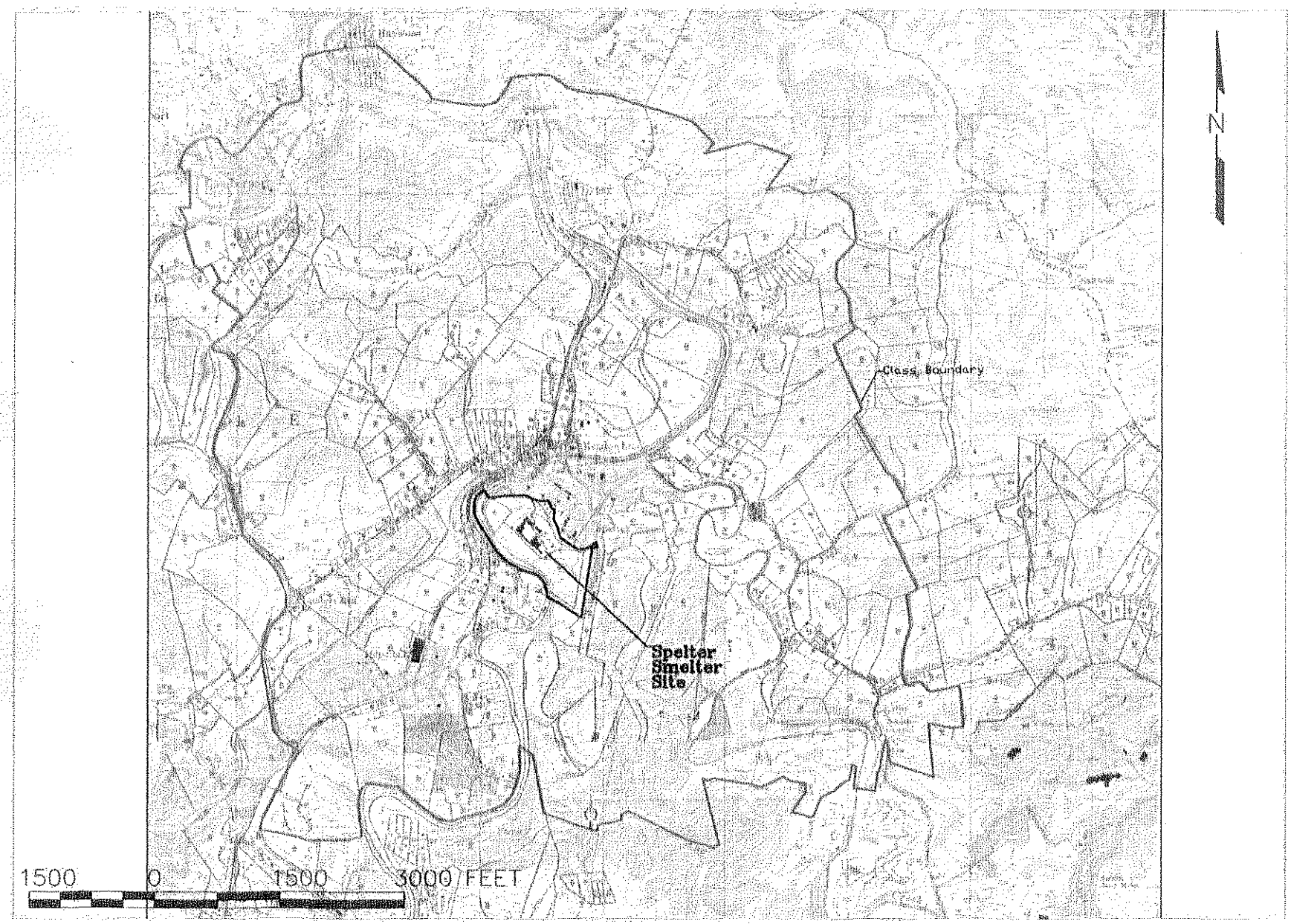


Figure 9. Attic Bulk Dust Zn:Cd Ratio vs. Distance from Smelter

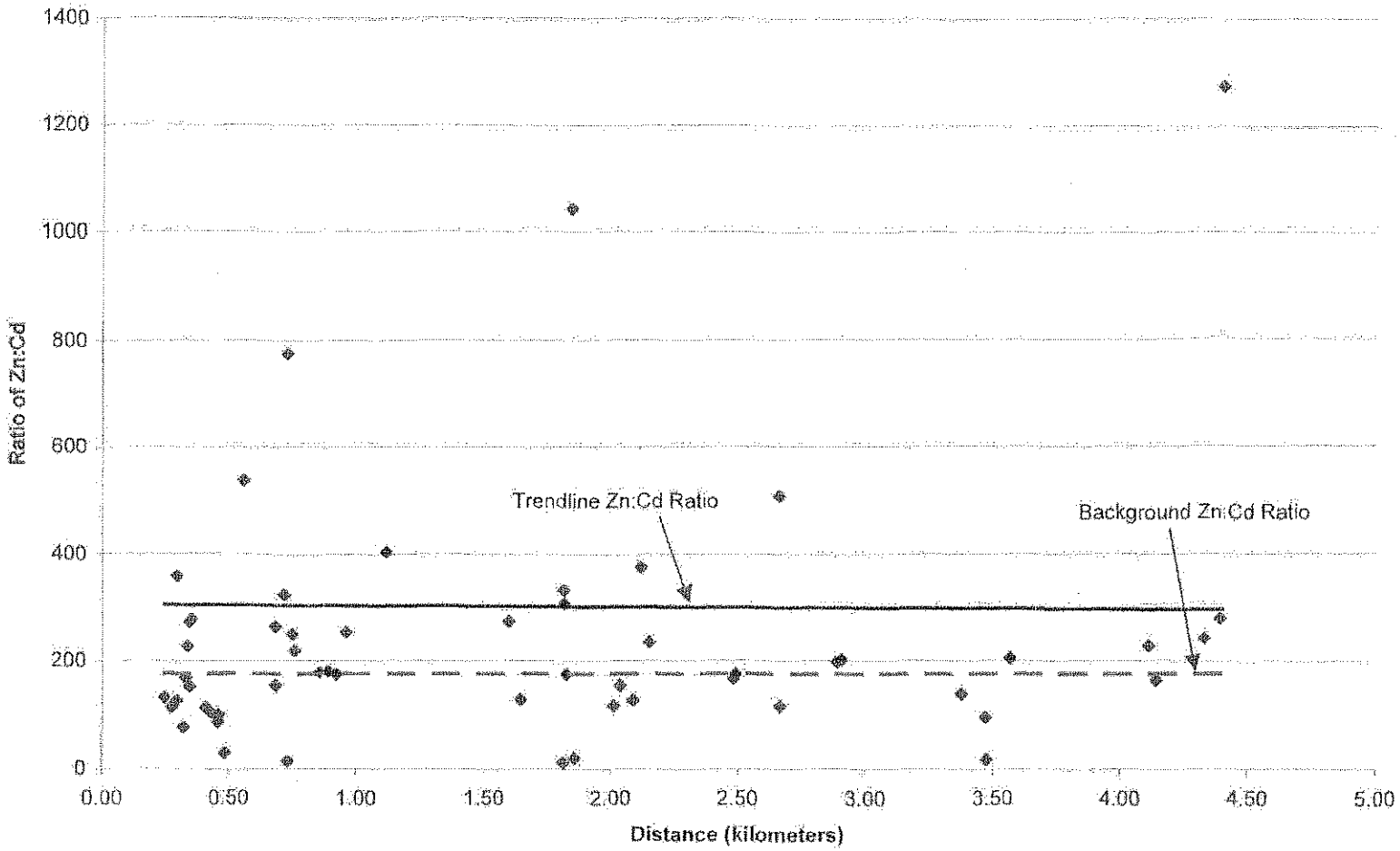
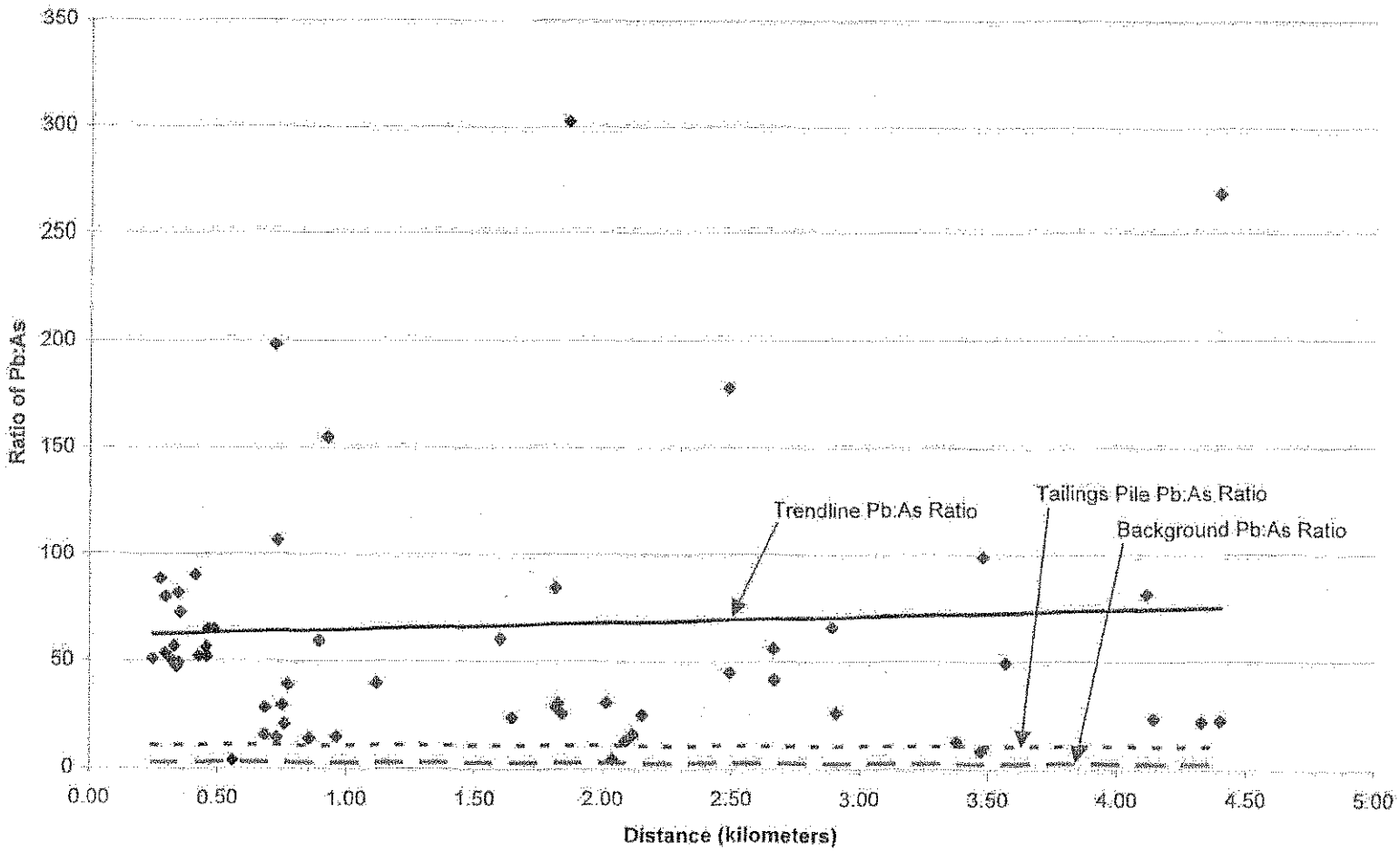


Figure 10. Attic Bulk Dust Pb:As Ratio vs. Distance from Smelter



APPENDIX 1

Kirk W. Brown, Ph.D.

Biographical Data

Principal Consultant; SI Group, LP
Born: July 3, 1940; Bethlehem, PA
Citizenship: U.S.A.
Social Security Number: 171-32-2297
Marital Status: Married No. of Children: 3

Education

Ph.D., Agronomy, University of Nebraska, 1969
M.S., Agronomy/Plant Physiology, Cornell University, 1964
B.S., Agronomy, Delaware Valley College, 1962

Areas of Expertise

Fate and Movement of Salt, Oil, Metals, Organic Chemicals, Gases, Nutrients, Pesticides and Pathogens in Soil and Groundwater Environments; Remediation of Metal and Organic Chemical Contaminated Soils and Groundwater; Leachability and Translocation of Metals in the Soil Profile; Fixation and Stabilization of Metals in the Environment; Characteristics of Hazardous and Municipal Wastes; Industrial Waste Stream Identification; Classification and Fingerprinting of Waste Materials; Disposal of Municipal, Industrial, and Hazardous Waste by Land Treatment and Landfilling; Land Treatment of Sewage Sludge, Industrial Wastewater and Sludge; Bioremediation of Polluted Soils; Vapor Extraction of Soils; Toxicity and Risk-based Assessment of Soil Contaminants to Plants and Animals; Flux of Volatile Chemicals from the Soil Surface; Influence of Chemicals on the Permeability of Landfill Liners; Sources and Transport of Methane; Composting of Municipal and Hazardous Waste; Design and Operation of Septic Systems; Nonpoint Source Pollution; Expansive Properties of Clay Soils; Soil Solution Sampling; Fate of Mutagenic Compounds in Soil; Mold and Fungal Growth; Reclamation of Drastically Disturbed Lands; Aerial Photo Interpretation; Soil Use and Suitability Classification; Agricultural Water Use Efficiency; Crop Water Stress; Golf Green and Athletic Field Construction; Use of Windbreaks; Soil Crusting; Gas Movement in Soil.

Academic

Professor Emeritus, Soil and Crop Sciences, Texas A&M University, 2001-Present.
Professor, Soil and Crop Sciences, Texas A&M University, 1981-2001.
Associate Professor, Soil and Crop Sciences, Texas A&M University, 1973-1981.
Assistant Professor, Soil and Crop Sciences, Texas A&M University, 1970-1973.
Visiting Scientist, Center of Plant Physiological Research, Wageningen, Netherlands, August, 1969-July, 1970.
Research Assistant, University of Nebraska, June, 1965-December, 1969.
Teaching Assistant, Cornell University, September, 1964-June, 1965.

COURSES TAUGHT

Soil Physics (Undergraduate Course No. 445) 1970-2001.

The practical aspects of soil texture, structure, water management, as well as the theoretical aspects of soil water potentials, and the movement of water, ions, gas, and heat in the soil.

Advanced Soil Physics (Graduate Course No. 617) 1970-1988.

An in-depth study of the physical properties of soil including basic principles which regulate the dynamics of soil, water and ion movement, soil aeration, and soil thermal relationships. Equations describing these processes are presented and references to current literature are provided for outside reading.

Reclamation of Drastically Disturbed Lands (Graduate Course No. 615) 1979-1986.

Concepts influencing the reclamation, revegetation, and establishment of a stable ecological system on lands that have been drastically disturbed by strip mining, severe erosion, or toxic waste contamination.

Land Disposal of Wastes (Graduate Course No. 616) 1987-2001.

The theoretical and practical aspects of the land treatment and landfilling of a wide range of municipal, industrial, and hazardous wastes. Emphasis has been placed on the fate and mobility of various waste constituents in the soil and the influence of soil physical and chemical properties on constituent fate.

Short Courses Taught

Soil Science Institute (One month course) 1984, 1986, 1992, 1993
Land Treatment of Industrial Waste - Chemical Engineering Society, 1982, 1983.
Landfill Liner Design, University of Texas - 1986, 1987.

Society Memberships

American Society of Agronomy, 1970-2001
Soil Science Society of America, 1970-2001
American Chemical Society, 1970-2001
International Society of Soil Science, 1970-2001

Editorial Board

Environmental Engineering Science, formerly Hazardous Waste and Hazardous Materials. 1989-2001.

Reviewed Papers For

Soil Science Society of America Proceeding; Soil Science, Journal of Environmental Quality; Environmental Engineering Science, formerly Hazardous Waste and Hazardous Materials; ATSDR; American Petroleum Institute; Water, Air & Soil Pollution; Waste Management & Research, Water Pollution Control Federation; Water Research; Waste Management; Journal of Hazardous Materials; Archives of Environmental Contamination and Toxicology.

Elected Positions

Chairman, ASA Section A5, 1989-90
General program chairman for ASA meetings, 1973
Chairman, ASA Section A3, 1972

Committee Appointments

National Academy of Sciences, National Research Council Committee on Environmental Technologies Subcommittee on Landfills (1995-1998).
EPA Review for Risk Assessment for Petroleum Industry Hazardous Waste Listing Determination (Sept 1995).
Environmental Geosciences Advisory Committee of the American Geological Institute representing the Soil Science Society of America (1993-2000).
National Academy of Sciences (NRC) Committee on Remedial Action Priorities for Hazardous Waste Sites (1991-1994).
Texas Natural Resource Conservation Commission Committee on rules on Wastewater Treatment Plant Sludge, Water Treatment Plant Sludge and Septic Tank Sludge Disposal (1992-1993).
Texas Water Commission Committee to Develop Regulations on the Land Application of Sewage Sludge (1992-93).
Faculty of Toxicology Executive Committee, Texas A&M University (1990-93).
Texas Governor's Infrastructure Committee on Free Trade (1991).
Oklahoma Corporation Commission on Land Application of Oil Field Drilling Waste (1990-1991).
Texas Department of Health Ad Hoc Committee for Revising the Construction Standards for On-Site Sewage Facilities (1989-90).
EPA Hazardous Waste Center Review Panel (1988).

National Science Foundation, Environmental Engineering Div., Review Panel (1987-1995).
Texas Dept. of Health Septic Disposal Regulations Revision Panel (1987).
Advisory Panel to Chicot Aquifer Management Project (Louisiana). McNeese State University, LA (1987-1990).
ASA Editorial Committee "Reaction and Movement of Organic Chemicals in Soils" 1987.
Advisory Panel to U.S. Congressional Office of Technology Assessment (OTA) on An Assessment of the Effectiveness of the EPA in Identifying, Prioritizing and Cleaning Up Hazardous Waste Sites (1987-1995).
Organizing Committee for SSSA Workshop on Utilization, Treatment and Disposal of Waste on Land (1985).
Panel to Write Research Needs for Hazardous Wastes Treatment and Disposal for National Science Foundation. Drexel University, PA (1986).
EPA Technical Advisory Panel on the Adequacy of Ground Water Monitoring at Hazardous Waste Landfills (1985).
Panel to Write the Mutagenicity Sample Preparation Protocol for EPA (1984).
EPA Panel to Review the Acceptability of Landfill Disposal of Sewage Sludge (1984).
Office of Water Regulations and Standards Committee on Municipal Sludge Landfilling to Advise EPA on the Pollutants which should be Regulated for Various Disposal Options and the Methods or Procedures to be Used for Regulating such Pollutants (1984).
Advisory Panel to U.S. Congressional Office of Technology Assessment (OTA) to Determine the Effectiveness of Current Programs to Clean Up Uncontrolled Hazardous Waste Sites (1983-84).
EPA Science Review Panel for Environmental Engineering Research Grants (1982-1998).
United States Environmental Protection Agency Land Treatment Task Force (1981-1985).

Significant Reports Resulting from Committee Assignments

National Research Council. 1999. "Groundwater & Soil Cleanup, Improving Management of Persistent Contaminants".
National Research Council. 1994. "Ranking Hazardous Waste Sites".
Office of Technology Assessment, Congress of the United States of America. 1989. "Coming Clean, Superfund Problems Can be Solved".
Office of Technology Assessment, Congress of the United States of America. 1985. "Superfund Strategy".

University Committees

Texas A&M University Environmental Safety and Health Committee (1987-90).
Council of Principal Investigators, Texas A&M University (1986-1990).
Texas Agricultural Experiment Station 5-Year Planning Board.
Texas A&M University Faculty Forum (1979-82).
Texas Agricultural Experiment Station Grant Support Committee (1976-77).

Awards

Texas A&M University College of Agriculture Award for Excellence in Teaching (1995)
Texas A&M University System Award for Excellence in Graduate Teaching (1988)
ASA Environmental Quality Research Award (1988)
Fellow - Soil Science Society of America (1987)
Fellow - American Society of Agronomy (1986)
Distinguished Alumni Award, Delaware Valley College (1986)
Superior Achievement Award for Research, Soil and Crop Sciences Department, Texas A&M University (1986)
Pollution Engineering Magazine Award of Merit for Outstanding Editorial Contribution "The Case for Aboveground Landfills" (1984)

Books Authored

Hazardous Waste Land Treatment. 1983. Butterworth Publishers, 10 Tower Office Park, Woburn, MA 01801.
Reactions and Movement of Organic Chemicals in Soils. 1989. Sawhney, B. L. and K. W. Brown. SSSA/ASA Publishers, SSSA Special Publication No. 22, 494 pgs.

Professional Experience Outside the United States

Visiting Scientist at Center of Plant Physiological Research, Wageningen (1969-70).

Kirk W. Brown

Testimony Before Legislative Bodies

Texas House of Representatives - Environmental Affairs Committee, April 1987. Testified on the need for legislation to set up a waste management plan for the state.

Texas Governor's Taskforce on Oil Spills, February 1985. Testified on the fate of oil spill debris and disposal technology options.

Texas Governor's Taskforce on Hazardous Waste, November 1984. Testified on the effectiveness of landfills for disposal technology.

Texas Governor's Taskforce on Hazardous Waste, June 1984. Testified on the impact of organic chemicals on the permeability of soils.

U.S. House of Representatives - Science and Technology Committee, November 1982. Testified on the adequacy of EPA's liquid management system to protect groundwater at hazardous waste landfills.

Texas House of Representatives - Environmental Affairs Committee, April, 1982. Testified on the impact of organic chemicals on the permeability of clay liners.

Consulting

Founder and President of K. W. Brown and Assoc., Inc., (1980- 1991). Chief technical consultant to K. W. Brown Environmental Services (1991-1999) and SI Group, LP (2000-Present). Past consulting activities have included assignments with a variety of industries, state, and federal government agencies, including General Motors Corporation, Minnesota Mining & Manufacturing, WR Grace, Union Pacific Railroad, Chevron, Shell, Exxon, Texaco, Arco, Sunoco, El Paso Products, New York Attorney General's Office, Illinois Attorney General's Office, Minnesota Attorney General's Office, Michigan Pollution Control Administration, U.S. EPA, U.S. Army Corps of Engineers, and U.S. Dept. of Justice.

Consulting activities have included consultations on the cleanup and disposal of wastes, the impacts of hazardous waste on the environment, the design of hazardous waste landfills and solid waste management units, and the fate and mobility of chemicals in the soil, groundwater, and air, as well as, providing expert testimony at permit hearings, mediation hearings, civil suits, and before legislative bodies on these topics. My expertise has been utilized for site assessments, data review and interpretation, the study of fate and transport of contaminants in the environment, waste management activities, historical landfill operations, and other related environmental matters. I have reviewed and interpreted a large quantity of analytical data for air, soils and groundwater, as well as borings logs, field logs, technical reports, and other information related to the environmental conditions of a site. I have prepared and reviewed remedial action plans for hundreds of sites including sites contaminated with metals, organic chemicals, pesticides, biological pathogens and petroleum production wastes. I have designed and implemented remedial actions at numerous hazardous waste sites under the auspices of both state and federal regulatory authorities.

As a consultant, I have evaluated or analyzed hazardous substances in industrial waste streams from numerous industries including the lumber and paper industries, the printing industry, chemical manufacturing, petroleum processing and refining, plastics and rubber products industry, leather tanning and finishing, metal smelting and finishing, electric utilities, and the electronic components manufacturing industry, among others. I have conducted extensive research on the hazardous substances contained in municipal and household waste with a special emphasis on the fate and mobility of these constituents in the environment after disposal in municipal solid waste landfills. I have provided evaluations and assessments for numerous waste disposal and landfill sites including the following: Love Canal Landfill, Lowrey Landfill, Helen Kramer Landfill, Junker Landfill, Lemberger Landfill, Laurel Park Landfill, Beacon Heights Landfill, RCA-Buzby Landfill, Lone Pine Landfill, Ft. Bend County Landfill, and Sinton Landfill, among others. In addition, I have also provided expert testimony for civil actions involving the following Superfund sites: Hardage Criner, Montana Pole, National Gypsum, Brio/Dixie Oil Processors, Sikes' Pits, Turtle Bayou, Metal Bank of America, Tar Creek, and the West Dallas Lead Site.

Guest Lectures

Dewatering of confined dredge spoil areas. In: *Second International Symposium on Dredging Technology*. BHRA Fluid Engineering, Cranfield, Bedford, England. Paper G1:1-24. (1977).

Revegetation of drastically disturbed lands. Texas A&M Lignite Symposium. April 17-18. (1980).

Impact of surface mining on water quality. Texas A&M Lignite Symposium, April 17-18, 1980.

Factors influencing the biodegradation of API separator sludges applied to soils. Presented at the Seventh Annual Research Symposium at Philadelphia, PA. March 16-18, 1981.

Land treatment of industrial hazardous wastes. Presented at a Symposium and Workshop on Hazardous Waste Management. Louisiana State University, November 16-20, 1981.

Effect of organic chemicals on clay liner permeability. A review of the literature. Presented at the Sixth Annual Research Symposium at Philadelphia, PA. 1981.

Land disposal of oily wastes. Brest, France. August, 1982.

Influence of organic liquids on the permeability of clay soils. Harwell, Great Britain. July, 1982.

Use of sewage effluent for irrigation. Adelaide, Australia. June, 1982.

Influence of organic liquids on the integrity of liners to pits, ponds, lagoons and landfills. Waste Water Analysts Assoc., Houston, TX. November, 1982

Reclamation of strip mined lands. Sierra Club, Austin, TX. November, 1982.

Waste disposal on range land. Range Science Department, Texas A&M University. College Station, TX. November, 1982.

The politics of hazardous waste disposal. Political Science Department, Texas A&M University. College Station, TX. October, 1982.

The treatment and disposal of hazardous, industrial and toxic waste. American Society of Civil Engineers, Austin, TX. September, 1982.

Effect of organic fluids on the permeability of clay soil liners. Presented at the Eighth Annual Research Symposium at Ft. Mitchell, Ky. March 8-10, 1982.

The fate of mutagenic compounds when hazardous wastes are land treated. Presented at the Eighth Annual Research Symposium at Ft. Mitchell, Ky. March 8-10, 1982.

The influence of chemicals on the permeability of clay liners. Presented at Hazardous Waste Conference, Chicago, Ill. June 28-29, 1983.

Cleanup of chemicals spilled on soils. Presented at the Texas Agricultural Extension Service Conference, Houston, Texas. June 23, 1983.

The reclamation of strip mined land. Presented at Texas Environmental Coalition in Austin, Texas Jan. 22, 1983.

The influence of selected organic liquids on the permeability of clay liners. In: D. W. Shultz (ed). Land Disposal, Incineration, and Treatment of Hazardous Waste. Proceedings of the 9th Annual Research Symposium at Ft. Mitchell, Ky. May 2-4, 1983.

Panel on land treatment of sewage sludge. EPA Workshop on Sewage Disposal, Denver, CO. March 1983.

Land disposal of hazardous liquids. Waste Management Conference, Houston, TX. February 1983.

Alternatives to land disposal of waste. Dept. of Agriculture Seminar, University of Houston. Sept. 10, 1984.

How to write a successful research proposal. Soil Science Graduate Seminar, Soil & Crop Sciences Dept, Texas A&M University, Sept. 19, 1984.

The advantages of above ground disposal. Waste Tech Conference, Houston, October 30, 1984.

Potential groundwater implications of surface storage of toxic substances. Groundwater Symposium, Gunter Hotel, San Antonio, Texas. October 30, 1984.

Clean up of spills; Alternative disposal methods. Geotechnical Engineering for Waste Disposal Symposium, University of Texas, Austin. November 2, 1984.

The properties of soils and containment of waste. Environmental Engineering Seminar, Civil Engineering Dept., Texas A&M University, College Station, 1984.

Carbon dioxide flux at the earth's surface. Texas A&M University, College Station, February 1984.

Above ground landfills in hazardous waste management schemes. National Conference and Exhibition on Hazardous Waste and Environmental Emergencies. Houston, Texas, March 1984.

Fate of mutagens applied to soil. Environmental Toxicology and Pharmacology Seminar. Texas A&M University, College Station, March, 1984.

Permeability of compacted soils to solvents mixtures and petroleum products. Presented at the Tenth Annual Research Symposium at Cincinnati, Ohio, April 1984.

Simulation of Potential Rainfall Conservation from Two Cross-Diked Furrow Bed Designs. Texas A&M University, College Station. February 1984.

The soil scientist as a consultant. Soil Science Graduate Seminar, Panel Discussion. Soil & Crop Sciences Dept, Texas A&M University, Sept. 12, 1984.

Land disposal of hazardous waste. Agricultural Engineering Dept. Graduate Seminar, Agricultural Engineering Dept., Texas A&M University, Sept. 13, 1984.

Geotechnical engineering for waste disposal projects. University of Austin, Texas, October 1985.

Monitoring the unsaturated zone. Presented at the National Specialty Conference. Land Treatment: A Hazardous Waste Management Alternative, April 16-18, 1985, Austin, Texas.

Ability of sorbents to retain liquids in landfills, 10th Annual American Organization of Analytical Chemists' Spring Workshop, Dallas, Texas April, 9-11, 1985.

Geotechnical engineering for waste disposal projects. University of Austin, Texas, October 1986.

Potential health effects of hazardous waste contaminants in groundwater. Public Health Grand Rounds, University of Pittsburgh Graduate School of Public Health. January 23, 1986.

Geotechnical engineering for waste disposal projects. University of Texas, Austin, October 1986.

Influence of organic liquids on the hydraulic conductivity of soils. University of Cambridge, United Kingdom. September 9-11, 1987.

Design and construction of the growth media in golf greens, Montreal, Canada, 1987.

Groundwater pollution problems associated with fertilizers, pesticides, and leaking storage tanks. Pro Show, Dallas, November 1987.

Mutagenic testing of hazardous waste sites. Southwest Environmental Mutagenic Society, Houston, November 1987.

The use of lime for waste disposal and treatment of hazardous waste contaminated sites. National Lime Association, Phoenix, AZ, April 1987.

A soil scientist as an expert witness - Presented to the Soil Survey and Land Resource Workshop. February 19, 1988.

Guest lecture to Rio Brazos Audubon Society - May 2, 1988.

Presentation to the Texas Association of Milk, Food and Environmental Sanitarians, June, 1988.

Guest lecture to Range Science Ecology and Land Use class. Dept. of Range Science, Texas A&M University, Nov. 18, 1988.

Hazardous Waste: A general overview. Agricultural Engineering, Environmental and Water Resources Engineering and Texas Water Resources Institute Seminar, Texas A&M University, College Station, TX. January 1989.

The need for community recycling. Environmental Organization, Civil Engineering Dept., Texas A&M University, College Station, TX. February 1989.

Superfund sites: The problems and the solutions. Industrial Hygiene Seminar, Texas A&M University, College Station, TX. February 1989.

Hazardous waste disposal on the Gulf Coast Texas. Texas ASA Annual Meeting. Galveston, Galveston County, Texas, February 1989.

New technologies for liners - Presented at the Conference on Prevention and Treatment of Groundwater and Soil Contamination in Petroleum Exploration and Production. Calgary, Alberta, Canada, May 9-12, 1989.

Guest Lecture to Range Science Ecology and Land Use Class: Dept. of Range Science, Texas A&M University, College Station, TX. Oct. 4, 1989.

Ongoing and future research in the geowaste area. Presented to the Geo Waste Group Meeting, Civil Engineering Dept. Texas A&M University, Nov. 1, 1989.

Waste disposal: where do we go from here? Presented to the MSC Great Issues: Environmental Symposia. Texas A&M University, College Station. Nov. 7, 1989.

Innovative technologies from the 1990s in environmental matters. Presentation to South Texas College of Law Environmental Law Symposium, January 17, 1990.

Waste disposal, past, present, and future. Presented at the seminar entitled "Disposing of Hazardous Materials". MSC, Texas A&M University, College Station, TX January 1990.

Panel discussion session at Vertisol Management Workshop: International Collaboration in Research, Training and Extension. Texas A&M University, College Station, June 25-29, 1990.

Municipal waste disposal - where do we go from here. Presentation to Texas Environmental Action Coalition, Texas A&M University, College Station, TX. Sept. 5, 1990.

Presentation to the Texas Section of American Society of Agricultural Engineers, College Station, TX. October 11, 1990.

Presentation on golf green construction at Canadian Golf Superintendents Association Conference, Montreal, Canada. Dec. 11, 1990.

Environmental Soil Science and Technology. Presentation to the 1991 Texas Agric. Experiment Station Conference - Environmental Soil Science Session, College Station, TX. January 1991.

Movement of pesticides to groundwater. Presentation to the Texas Association of Agricultural Consultants. Austin, Texas, January 21, 1991.

Movement of pesticides to groundwater. Presentation to the Texas Agricultural Extension Service Conference for Producers, Austin, TX, January 25, 1991.

Pesticide rinsate disposal options. Presentation to the Research Center Administrators Society meeting, Dallas, Texas February 3-5, 1991.

Movement of pesticides to groundwater. Presentation to the Texas Agricultural Extension Service Conference for Grounds Keepers. Round Rock, Texas, February 21, 1991.

Liners for Hazardous Waste Sites. Presented at the Hazardous Waste Management Division's Lecture Series. U.S. Environmental Protection Agency, Region 6, 1445 Ross Ave., Suite 1200, Dallas, TX. 1991.

Decontamination of polluted soils. Presented at the Second International Conference on the Biogeochemistry of Trace Elements, Taipei, Taiwan, Republic of China. Sept. 5-10, 1993.

Using plants to reclaim contaminated sites. Crop Science Seminar. Soil & Crop Sciences Dept., Texas A&M University, College Station, TX, October 24, 1994.

Vadose zone modeling of the fate and movement of volatile contaminants, Geological Society of America, South-central Section Conference, Austin, TX, March 12, 1996.

Banning of liquid wastes from landfills - development of the technical data and the regulations, South Texas Environmental Conference, Corpus Christi, TX, March 29, 1996.

The science behind RCRA/CERCLA enforcement (Part II), Science For Environmental Attorneys, Denver CO, November 6, 1997.

Scientific Publications

1. Allen, L. H. and K. W. Brown. 1965. Shortwave radiation in a corn crop. Agron. J. 57:575-580.
2. Brown, K. W. and W. Covey. 1966. The energy budget evaluation of the micrometeorological transfer processes within a corn field. Agri. Meteoro. 3:73-96.
3. Brown, K. W. and L. J. Wright. 1967. Comparison of momentum and energy balance method of computing vertical transfer within a crop. Agron. J. 59:427-432. C701.
4. Brown, K. W. and N. J. Rosenberg. 1968. Errors in sampling and infrared analysis of CO_2 in air and their influence in determination of net photosynthetic rate. Agron. J. 60:309-311.
5. Brown, K. W. 1969. A model of the photosynthesizing leaf. Phys. Plant 22:620-637.
6. Brown, K. W. and N. J. Rosenberg. 1969. Computer program for plotting time dependent meteorological data. Agric. Meteoro. 6:463-464.
7. Brown, K. W. and N. J. Rosenberg. 1970. Concentration of CO_2 in the air above a sugar beet field. Mo. Weather Rev. 98:75- 82.
8. Brown, K. W. and N. J. Rosenberg. 1970. The influence of leaf age, illumination and upper and lower surface differences on stomatal resistance of sugar beet (Beta vulgaris) leaves. Agron. J. 62:20-24.
9. Brown, K. W. and N. J. Rosenberg. 1970. The effect of windbreaks and soil water potential on stomatal diffusion resistance and photosynthetic rate of sugar beets (Beta vulgaris). Agron. J. 62: 4-8.
10. Brown, K. W. and N. J. Rosenberg. 1970. Energy and CO_2 balance of an irrigated sugar beet (Beta vulgaris) field in the Great Plains. Agron. J. 63:207-213.
11. Brown, K. W. and N. J. Rosenberg. 1970. Shading inverted pyranometers and measurements of radiation reflected from an alfalfa crop. Water Res. Res. 6:1782-1786.
12. Rosenberg, N. J. and K. W. Brown. 1970. Improvements in the van Bavel-Myer automatic weighing lysimeter. Water Res. Res. 6:1227-1229.
13. Briggs, W. W., A. R. Edison, J. D. Eastin, K. W. Brown, J. W. Marenville, and M. D. Clegg. 1971. Photosynthesis light sensor and meter. Ecology 52:125-131.
14. Brown, K. W. and N. J. Rosenberg. 1971. Turbulent transport and energy balance as affected by a windbreak in an irrigated sugar beet (Beta vulgaris) field. Agron. J. 53:351-355.
15. Brown, K. W. and N. J. Rosenberg. 1971-2. Shelter-effects on micro-climate, growth and water use by irrigated sugar beets in the Great Plains. Agric. Meteoro. 9:241-263.
16. Brown, K. W. and N. J. Rosenberg. 1973. A resistance model to predict evapotranspiration and its application to a sugar beet field. Agron. J. 65:341-347.

17. Duble, R. L. and K. W. Brown. 1973. Environmental concerns for the golf superintendent. USGA Green Section Record. 11:10-13.
18. Brown, K. W. 1974. Calculations of evapotranspiration from crop surface temperature. Agric. Meteoro. 14:199-209.
19. Holder, C. B. and K. W. Brown. 1974. Evaluation of simulated seedling emergence through rainfall induced soil crusts. Soil Sci. Soc. Amer. Proc. 38:705-710.
20. Brown, K. W., C. J. Gerard, B. W. Hipp and J. T. Ritchie. 1974. A procedure for placing large undisturbed monoliths in lysimeters. Soil Sci. Soc. Amer. Proc. 38:981-983.
21. Rosenberg, N.J. and K. W. Brown. 1974. "Self-checking" psychrometer system for gradient and profile *determinations near the ground. Agric. Meteoro. 13: 215-226.*
22. Spotts, J. W. and K. W. Brown. 1975. A technique for installing induction coils in a profile with minimum soil disturbance. Soil Sci. Soc. Amer. Proc. 39: 1006-1007.
23. Jordan, W. R., K. W. Brown and J. C. Thomas. 1975. Leaf age as a determinant in stomatal control of water loss from cotton during water stress. Plant Physiol. 56:595-599.
24. Brown, K. W. and R. L. Duble. 1975. Physical characteristics of soil mixtures used for golf green construction. Agron. J. 67:647-652.
25. Brown, K. W. 1975. A device for isolating soil columns with minimum disturbance. Soil Sci. Soc. Amer. Proc. 39:1008-1009.
26. Brown, K. W. and N. J. Rosenberg. 1975. Annual windbreaks boosts yields. Crop and Soils Magazine. p. 8-11. Apr-May, 1975.
27. Brown, K. W. 1976. Chapter II. 3. Sugar beet and potatoes. In: Vegetation and the Atmosphere. (J. L. Monteith, ed.). Academic Press, NY. p. 65-86.
28. Thomas, J. C., K. W. Brown and W. R. Jordan. 1976. Stomatal response to leaf water potential as affected by preconditioning water stress in the field. Agron. J. 68:706-708.
29. Deuel, L. E., Jr., K. W. Brown, F. C. Turner, D. G. Westfall and J. D. Price. 1976. Persistence of Propanil, DCA, and TCAB in soil and water under flooded rice culture. JEQ 6:127.
30. Brown, K. W., W. R. Jordan and J. C. Thomas. 1976. Water stress induced alteration in the stomatal response to leaf water potential. Phys. Plant. 37:1-5.
31. Chaudhari, K. G., K. W. Brown, and C. B. Holder. 1976. Reduction of crust impedance to emergence by the addition of manure. Soil Sci. 122:216-222.
32. Deuel, L. E., Jr., F. C. Turner, K. W. Brown and J. D. Price. 1977. Persistence and factors affecting dissipation of molinate under flooded rice culture. JEQ 7:373-377.
33. Brown, K. W. 1977. Chapter 19. Shrinking and swelling of clay, clay strength and other bulk properties of clay soils and clays. In Minerals in Soil Environments. (J. B. Dixon and S. B. Weed eds.). Soil Sci. Soc. of Amer., pp. 680-707, Madison, WI.
34. Brown, K. W., R. L. Duble and J. C. Thomas. 1977. Nitrogen losses from golf green, USGA Green Section Record. 15:5-7.
35. Brown, K. W., F. C. Turner, J. C. Thomas and M. E. Keener. 1977. Water balance of flooded rice paddies. J. of Agr. Water Use 1:277-291.
36. Deuel, L. E. Jr., K. W. Brown, J. D. Price and F. C. Turner. 1977. Persistence of carbofuran and its metabolities, 3-keto and 3-hydroxy carbofuran, under flooded rice culture, JEQ 8:23-26.
37. Brown, K. W., R. L. Duble and J. C. Thomas. 1977. Influence of management and season on fate of N applied to golf greens. Agron. J. 69:667-671.
38. Brown, K. W. and L. J. Thompson. 1977. Dewatering of Confined Dredge Spoil Areas. Second International Symposium on Dredging Technology. 2-4, November, 1977, Texas A&M University pp. G1-1-G1-24.
39. Shive, J. B. and K. W. Brown. 1978. Quaking and gas exchange in cottonwood (Populus deltoides, Marsh) leaves. Plant Physiol. 61: 331-333.
40. Duble, R. L., J. C. Thomas and K. W. Brown. 1978. Arsenic pollution from underdrainage and runoff from golf greens. Agron. J. 70:71-74.
41. Duble, R. L., K. W. Brown and J. C. Thomas. 1978. Increase fertilizer efficiency and reduce nutrient loss. Golf Superintendent 46:28-31.
42. Jones, S. G., K. W. Brown, L. E. Deuel and K. C. Donnelly. 1978. Influence of rainfall on the retention of sludge heavy metals by the leaves of forage crops. JEQ 8:69-72.

43. Brown, K. W. and J. C. Thomas. 1978. Uptake of nitrogen by grass from septic fields in three soils. Agron. J. 70:1037-1040.
44. Brown, K. W., D. C. Anderson, S. G. Jones, L. E. Deuel, Jr., and J. D. Price. 1979. The relative toxicity of four pesticides in tap water and water from flooded rice paddies. Int. J. Env. Studies. 141:49-54.
45. Brown, K. W., H. W. Wolf, K. C. Donnelly and J. F. Slowey. 1979. The movement of fecal coliform and coliphage below septic lines. JEQ 8:121-125.
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47. Brown, K. W. and D. C. Anderson. 1980. Effect of organic chemicals on clay liner permeability: A Review of the Literature. In: D.W. Shultz (ed.). Disposal of Hazardous Waste. Proceedings of the 6th Annual Research Symposium at Chicago, Illinois. EPA-600/9-80-010. pp. 123-134.
48. Brown, K. W. and L. E. Deuel. 1980. Revegetation of Drastically Disturbed Lands. Texas A&M Lignite Symposium, April 17-18, 1980. pp. 19.0-19.8
49. Brown, K. W., L. E. Deuel, Jr. and J. C. Thomas. 1980. Optimization of land cultivation parameters. In: D.W. Shultz (ed). Disposal of Hazardous Waste. Proceedings of the 6th Annual Research Symposium at Chicago, Illinois. EPA- 600/9-80-010. pp. 254-259.
50. Brown, K. W. and C. B. Holder. 1980. The relationship between oxygen and water uptake by roots of intact bean plants. Soil Sci. Soc. Amer. J. 44:21-25.
51. Brown, K. W., S. G. Jones, and K. C. Donnelly. 1980. The influence of simulated rainfall on residual bacteria and virus on grass treated with sewage sludge. JEQ 9(2):261-265.
52. Brown, K. W. and J. C. Thomas. 1980. The influence of the sand layer on available water retention in a golf green. USGA Green Section Record 18(6):5-7.
53. Brown, K. W. and J. C. Thomas. 1980. The influence of water stress preconditioning on dark respiration. Physiologia Plantarium. 49:205-209.
54. Brown, K. W., J. C. Thomas and A. Almodares. 1980. The necessity of the two-inch sand layer in greens construction. USGA Green Section Record 18(6):1-4.
55. Brown, K. W., L. J. Thompson, K. W. Launius and L. E. Deuel, Jr. 1980. Physical properties of dredged materials. Soil Sci. 129(2):95-106.
56. Turner, F. T., K. W. Brown, and L. E. Deuel. 1980. Nutrients and associated ion concentrations in Irrigation Return Flow from Flooded Rice Fields. JEQ 9(2):256-260.
57. Deuel, L. E. and K. W. Brown. 1980. Impact of surface mining on water quality. Texas A&M Lignite Symposium, April 17-18, 1980. pp. 16.1-16.5.
58. Anderson, D. C., and K. W. Brown. 1981. Organic leachate effects on the permeability of clay liners. In: Proceedings of the 7th Annual Research Symposium at Philadelphia, PA. EPA-600/9-81-002b, pp. 119-130.
59. Anderson, D. C., K. W. Brown, and J. Green. 1981. Organic leachate effects on the permeability of clay liners. In: National Conference on Management of Uncontrolled Hazardous Waste Sites held at Washington, D.C. EPA 600/9-81-002B. pp. 223-229.
60. Brown, K. W., K. C. Donnelly, J. C. Thomas and L. E. Deuel, Jr. 1981. Factors influencing the biodegradation of API separator sludges applied to soils. In: D. W. Shultz (ed.). Land Disposal: Hazardous Waste. Proceedings of the 7th Annual Research Symposium at Philadelphia, PA. EPA- 600/9-81-002B. pp. 188-199.
61. Donnelly, K. C. and K. W. Brown. 1981. The development of laboratory and field studies to determine the fate of mutagenic compounds from land applied hazardous waste. In: D. W. Shultz (ed.). Land Disposal: Hazardous Waste. Proceedings of the 7th Annual Research Symposium at Philadelphia, PA., EPA-600/9-81-002B. pp. 224-239.
62. Huddleston, R. L., J. E. Rucker, K. W. Brown and L. E. Deuel. 1982. Evaluation of subsurface effects of long-term landfarming. In: D. W. Shultz (ed.). Land Disposal: Hazardous Waste. Proceedings of the 8th Annual Research Symposium at Ft. Mitchell, Ky. EPA-600/9-82-002, pp. 398- 446.
63. Anderson, D., K. W. Brown and J. Green. 1982. Effect of organic fluids on the permeability of clay soil liners. In: D. W. Shultz (ed.). Land Disposal: Hazardous Waste. Proceedings of the 8th Annual Research Symposium at Ft. Mitchell, Ky. EPA-600/9-82-002. pp. 179-190.
64. Brown, K. W. 1982. Irrigation of recreational turf with sewage effluent. In: 7th National Turf Conference, S. Australia, June 6-11, 1982. pp. 73-83.

65. Brown, K. W. 1982. Quality of irrigation flow from flooded rice paddies. pp. 139-175. Proceedings of the Workshop on Agrichemicals and Estuarine Productivity. Duke University Marine Laboratory, Beaufort, North Carolina.
66. Brown, K. W., L. E. Deuel, F. C. Turner, and J. D. Price. 1982. Quality of irrigation return flow from flooded rice paddies. pp. 153-166. Proc. of National Conference on Irrigation Return Flow Quality Management. Colorado State University, Fort Collins, Co.
67. Brown, K. W., H. Brawand, J. C. Thomas and G. B. Evans. 1982. Impact of simulated land treatment with oily sludges on ryegrass emergence and yield. Agronomy J. 74:257-261.
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69. Brown, K. W., K. C. Donnelly and B. Scott. 1982. The fate of mutagenic compounds when hazardous wastes are land treated. In: D. W. Shultz (ed.). Land Disposal: Hazardous Waste. Proceedings of the 8th Annual Research Symposium at Ft. Mitchell, Ky. EPA-600/9-82-002, pp. 383-397.
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71. Brown, K. W., J. C. Thomas and R. L. Duble. 1982. Nitrogen source effect on nitrate and ammonium leaching and runoff losses from greens. Agronomy J. 74(6):947-950.
72. Brown, K. W. 1983. Land Treatment of Hazardous Wastes. Chapter 36, pp. 449-474. In: Environment and Solid Wastes. Characterization, Treatment, and Disposal. C. W. Francis and S. I. Auerbach (eds.). Butterworths/Ann Arbor Science Book, Woburn, MA.
73. Brown, K. W. and L. E. Deuel, Jr., and J. C. Thomas. 1983. Land Treatability of Refinery and Petrochemical Sludges. Project Summary. EPA-600/S2-83-074.
74. Brown, K. W. and L. E. Deuel, Jr. 1983. An Evaluation of Subsurface Conditions at Refinery Land Treatment Sites. Project Summary. EPA-600/S2-83-096.
75. Donnelly, K. C., K. W. Brown, and B. Scott. 1983. pp. 59-78. The Use of Short-Term Bioassays to Monitor the Environmental Impact of Land Treatment of Hazardous Wastes. (Waters, M. D., S. S. Sandhu, J. Lewtas, L. Claxton, and N. Chernoff and S. Nesnow (eds.). The Application of Short Term Bioassays in the Fractionation and Analysis of Complex Environmental Mixtures. Plenum, New York.
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77. Brown, K. W. and D. C. Anderson. 1983. Effects of Organic Solvents on the Permeability of Clay Liners. United States Environmental Protection Agency, EPA-600/2-83-016. 153 p.
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Grant Projects:

"An investigation of the maximum infiltration rate and the necessity of a sand layer in artificially constructed golf green." 1971-1972. Funded by the United States Golf Association Greens Section for $3,000. Final Report submitted December, 1972-1973.

"An investigation of the return flow from irrigated land." 1972- 1973. Funded by OWRR for $31,200. Final Report submitted September, 1974.

"Fate of metals applied in sewage to land wastewater disposal sites." 1973-1974. Funded by the U. S. Army Medical Corps for $137,780. Final Report submitted June, 1975.

"Nutrient and pesticide retention in golf greens built to USGA Green Section specifications." 1972-1975. Funded by the U. S. Golf Association, Green Section for $21,000. Final Report submitted October, 1975.

"An investigation of the feasibility of soil disposal of wastewater from Jefferson Chemical Co." 1975. Funded by the Jefferson Chemical Co. for $16,600. Final Report submitted October, 1975.

"The influence of Petro S on the infiltration rate and water holding capacity of soil." 1974-1975. Funded by the Petro-chemical Co., Inc. for $8,280. Final Report submitted December, 1975.

"The influence of trickle irrigation on the quality of irrigation return flow." 1973-1974. Funded by Office of Water Resources Research for $45,000. Final Report submitted March, 1976.

"Analysis of overburden cores TPPI fuel deposit." 1976. Funded by the Texas Power Pool, Inc. for $24,500. Final Report submitted February, 1977.

"Feasibility study of general crust management as a technique for increasing capacities of dredged material containment areas." 1975-1976. Funded by the U. S. Army Engineers Waterways Exp. Station, Corps of Engineers for $53,529. Final Report published April, 1977.

"Analysis of four overburden cores." 1977. Funded by the Paul Weir Co. for $5,600. Final Report submitted July, 1977.

"Accumulation and passage of pollutants in domestic septic tank disposal fields." 1973-1975. Funded by the U. S. Environmental Protection Agency for $294,864. Final Report submitted December, 1977.

"Development of management guidelines to prevent pollution by irrigation return flow from rice fields." 1972-1975. Funded by U. S. Environmental Protection Agency for $197,850. Final Report published April, 1978.

"Physiological model of plant growth and development of ecosystem simulation." 1975-1978. Funded by the National Science Foundation for $129,813. Final Report submitted June, 1978.

"Evaluate the feasibility of revegetating mixed overburden at the proposed Angelina County lignite site." 1977-1978. Funded by the Sunoco Energy Development Company for $46,031. Final Report submitted June, 1979.

"Characteristics of overburden material and revegetation analysis for the Southwest Electric Power Company Deposit." 1977- 1978. Funded by the Southwest Electric Power Company for $53,600. Final Report submitted July, 1979.

"The impact of surface lignite mining on surface and groundwater quality." 1978-1979. Funded by the Texas Energy Advisory Council for $61,022. Final Report submitted September, 1979.

"Analysis of groundwater quality and the probable quality of leachate, TMPA Fuel Deposit, Grimes County, Texas." 1977. Funded by the Municipal Power Agency for $20,205. Final Report submitted November, 1979.

"To investigate the feasibility of irrigation disposal of uranium stripping reclamation water." 1979. Funded by nine private companies for $9,869. Final Report submitted December, 1979.

"Statistical and biophysical modeling of Dendroctonus frontalis-Host tree dynamics: II. Physical models of Dendroctonies frontalis - Host tree systems." 1975-1979. Funded by the USFS-CSRS Expanded Southern Pine Beetle Program for $174,780. Final Report submitted December, 1979."

"Investigate the concentration of heavy metals and other parameters in lignite overburden cores from Grimes County." 1978. Funded by Texas Municipal Power Agency for $7,192. Final Report submitted.

"To investigate the feasibility of irrigation disposal of uranium stripping leach water. Phase II: Laboratory Study." 1979. Funded by Mobil Oil Corp. for $20,000. Final Report submitted January, 1980.

"To investigate the necessity of a sand layer between the top mixture and gravel layer in golf green construction." 1978-1979. Funded by the United States Golf Association, Greens Section for $3,220. Final Report submitted March, 1980.

"To develop a plan to minimize the volume of runoff water which must be treated and disposed of and to assess the feasibility of land disposal of the runoff water and sludge." 1979-1980. Funded by Texas Engineering Extension Service for $11,058.40. Final Report submitted April, 1980.

"Investigate the concentration of heavy metals and certain other physical and chemical properties - Gibbons Creek Lignite Mine." 1980. Funded by Texas Municipal Power Agency for $12,500. Final Report submitted April, 1980.

"Improved water and nutrient management through high-frequency irrigation." 1977-1980. Funded by Texas Water Resources Institute for $179,435. Work completed June, 1980.

"Environmental and safety aspects of the use of sulfur in highway pavements." 1980. Funded by the DOT-Federal Highway Administration for $38,951. Final Report submitted August, 1980.

"Root distribution of bermudagrass grown on reclaimed lignite spoil." 1980-1981. Funded by the Center for Energy and Mineral Research for $12,590. Final Report submitted August, 1981.

"A residual evaluation of the influence of chemicals on the permeability of soil clays." 1979-1980. Funded by the Environmental Protection Agency for $91,783. Report submitted December, 1981.

"Investigate the influence of organic matter quality and placement on the establishment of grass and the physical properties of golf green mixes." 1979-1981. Funded by the U. S. Golf Association, Green Section for $10,177. Final Report submitted February, 1982.

"Metal uptake by grasses grown on reclaimed lignite spoils." 1979-1980. Funded by the Center for Energy and Mineral Research for $13,100.

"Soil disposal of API pit wastes." 1977-1980. Funded by the Environmental Protection Agency for $184,104. Final report submitted in 1981.

"Evaluate subsurface landfarm contamination after long term use." 1980-1981. Funded by the American Petroleum Institute for $98,530. Final Report published in 1983.

"The use of bioassays to evaluate the environmental impact of land treatment of hazardous industrial wastes." 1980-1983. Funded by the Environmental Protection Agency for $383,732. Final Report published in 1985.

"A review and evaluation of the influence of chemicals on the permeability of soil clays." 1981. Funded by the Environmental Protection Agency for $339,056. Final report published in 1983.

"Quantify leak rates through holes in landfill liners" 1983-1985. Funded by Environmental Protection Agency for $232,769. Final report submitted in 1986.

"Efficiency of soil core and soil-pore liquid sampling systems". 1983-1985. Funded by Environmental Protection Agency for $101,766. Final report submitted in 1986.

"Completion of Field Investigation and an Evaluation of Mechanisms by which Organic Liquids Alter the Permeability of Clay Soils". 1984-1985. Funded by EPA for $59,000. Final report submitted in 1986.

"Mobility and Stability of Mutagenic Compounds in Municipal Sewage Sludge Amended Soil." 1984-1986. Funded by Environmental Protection Agency. for $281,800.

"Development of a Capillary Wick Unsaturated Zone Pore Water Sampler." 1985-1986. Funded by Environmental Protection Agency for $236,353.

"Evaluation of the Thickness of Clay Liners Required to Meet RCRA Requirements". Funded by Environmental Protection Agency. 1987-1989. First year funding $122,184.

"Development of a Pesticide Rinse Water Digester". 1986-88. Funded by Texas Water Resource Institute for $58,000.

"Determination of the optimum furrow dike size to minimize rainfall runoff". 1985. Funded by Texas Water Resource Institute for $17,500.

"In situ vapor extraction of volatile contaminants at Superfund sites" 1987-88. Funded by Texas Water Resource Institute for $40,000.

"Development of a comprehensive testing protocol to assess the hazard of an uncontrolled hazardous waste site". 1987-89. Funded by Environmental Protection Agency for $315,897.

"Evaluation of the Bacterial Mutagenicity and Chemical Characteristics of Municipal Landfill Leachate". 1988-1990. Sponsored by Texas Water Resource Institute, $47,500.

"Bioassay Directed Chemical Characterization of Hazardous Organic Chemicals in Waste Contaminated Environments". Funded by National Institute of Health, 1989-1992, $422,000.

"The Use of Short-Term Bioassays to Assess the Human Health Hazard of Uncontrolled Hazardous Waste Sites". Funded by National Institute of Health, 1989-1992, $607,000.

"In Situ Bioremediation of Hazardous Substances in the Vadose Zone". Funded by USEPA, 1988-1991, $341,164.

"Effectiveness of Multiple Liner Systems for Hazardous Waste Containment Facilities". Funded by USEPA, 1988-1991, $387,203.

"The Use of In-Vessel Composting as a Treatment Technology for Hazardous Waste Minimization". Funded by Gulf Coast Hazardous Substance Research Center, June 1, 1991-April 30, 1994, $107,471.

"Site Assessment." Funded by NIH for $334,.650 for first 3 years. 1992-1996.

"Demonstration of the Degradation of Toxic Organics in Composted Municipal Solid Waste." Funded by Texas Water Commission for $135,000 for two years, 1992-1994.

"A Preliminary Demonstration of the Use of In-Vessel Composting for Degradation of Waste Propellants." Sponsored by Day & Zimmermann, Inc. 1993. Funds amounted to $18,138.

Kirk W. Brown

"Water Use Efficiency and Wetting Patterns Associated with Directed Subsurface Irrigation." Sponsored by Texas-Israel Exchange Program through the Texas Department of agriculture 1995-1996 Funds amount to $27,770.

APPENDIX 2

COMPREHENSIVE LISTING OF TESTIMONY BY K. W. BROWN

	TRIAL TESTIMONY	DATE
19	Civil Action No. 95-CV-6400L, *Seneca Meadows, Plaintiff vs. ECI Liquidating, et al., Defendants* in the United States District Court, Western District of New York. This case involved claims against defendants concerning the disposal of hazardous substances in the Tantalo Landfill, Seneca Falls, New York. Retained by the Plaintiff.	6/21/05 to 6/23/05
18	Civil Action No. 01:01-CV-890; *Lyondell Chemical Company, et al., Plaintiffs v. Albemarle Corporation, et al., Defendants* in the United States District Court for the Eastern District Of Texas, Beaumont Division. This case involved the disposal of waste containing hazardous substances and groundwater contamination at the Turtle Bayou Superfund in Liberty County, Texas. Retained by ExxonMobil, Defendant.	4/18/05
17	Cause No. 03-001121-CV; *Joseph Paul Horlen, et al., Plaintiffs, v. Robert S. Smith and Robo Investments, Inc., Defendants* in the District Court of Brazos County, Texas, 361st Judicial District. Case involved the subsurface loss of water from a man-made lake within a residential subdivision and the subsequent undercutting of riverbank along the Brazos River. Retained by the Plaintiffs.	6/17/04
16	Civil Action No. 98-CV-0838S (F); *W.R. Grace & Co.-Conn., Plaintiff, V. Zotos International, Inc., Defendant* in the United States District Court Western District Of New York. Case involved the disposal of cosmetic waste at the Brewer Road Landfill in Waterloo County, and the contamination of groundwater as a result of these disposal practices. Retained by the Plaintiff.	5/17/04 to 5/21/04
15	Civil Action No. 95-2097 *Interfaith Community Organization, et al., Plaintiffs v. Honeywell International, Inc. et al., Defendants.* In the United States District Court for the District of New Jersey. This case involved claims against the defendants concerning disposal of chromium waste at the Roosevelt Drive-In Site in Jersey City, New Jersey. Retained by W.R. Grace & Co., W.R. Grace Ltd. and ECARG, Inc., Plaintiffs.	1/28/03 to 1/29/03
14	Case No. 80-1589; *United States of America, Plaintiff, vs. City of Philadelphia, Plaintiff-Intervenor, vs. Union Corporation Metal Bank of America, et al., Defendants, vs. Consolidated Edison Company of New York, et al., Third Party Defendants.* In the United States District Court for the Eastern District of Pennsylvania. This case involved claims against the defendants concerning the release of PCBs from the Metal Bank/Cottman Avenue Site to the Delaware River. Retained by the Defendants	08/29/02 to 09/05/02
13	Civil No. N-87-52 (PCD). *The B.F. Goodrich Company, et al., Plaintiffs v. Harold Murtha, et al., Defendants v. Risdon Corporation et al., Third Party Defendants.* In the United States District Court, District of Connecticut. Case involved characterization of hazardous substances in waste generated by industries, commercial establishments, and municipalities disposed at two landfills in Connecticut, Beacon Heights Landfills and Laurel Park Landfill, which were classified as Superfund sites. Retained by Plaintiffs Beacon Heights Coalition and Laurel Park Coalition.	01/05/98 to 01/09/98 and 01/12/98 to 01/13/98

12	Docket Nos. CV-96-0564091S and CV-96-0564092S; *Oxford Tire Supply, Inc., Plaintiff v. Commissioner of the Department of Revenue Services, Defendant.* In the Superior Court, Judicial District of Hartford/New Britain at Hartford, Connecticut. Case involved tax issues associated with handling of hazardous materials as defined by Connecticut tax regulation. Primary area of testimony was leaching of hazardous substances from rubber tire waste. Retained by Plaintiffs.	12/18/97
11	Civil Action No. 292CV00674(JBA); *The Companies for Fair Allocation Group v. Axil Corporation, et al.* In the United States District Court for the District of Connecticut. Case involved question of hazardous waste disposal by the Dynamics Corporation of America (Waring Division) at the Barkhamsted-New Hartford Landfill Superfund site in Barkhamsted, Connecticut. Retained by the Plaintiffs.	6/13–14/96
10	Civil Action No. 93-CV-0090-B; *KN Energy, Inc., et al., v. Sinclair Oil Corp., d/b/a/ Little America Refining Co.* United States District Court, District of Wyoming. Case involved study of hydrocarbon and metals groundwater plume, which had migrated from the area of a refinery and adjacent terminal to a nearby neighborhood in Wyoming. Work involved study of the origin of the plume. Retained by the Plaintiff.	6/6/95
9	Cause No. CA-94-CI-05270; *John Gibson Trustee v. Exxon Corporation.* District Court, 225th Judicial District, Bexar County, Texas. Suit involved claim by property owners adjacent to an old refinery for damages due to contaminant migration onto their property from previous waste disposal operations at the closed refinery. Retained by the Defendant.	2/17/95 2/21/95
8	Docket No. N-87-52 (PCD), All Cases; *The B.F. Goodrich Company, et al., Plaintiffs v. Harold Murtha, et al., Defendants v. Risdon Corporation et al., Third Party Defendants.* United States District Court for the District of Connecticut. Suit concerning the hazardous nature of waste disposed at the Beacon Heights Landfill Superfund site. Retained by the Plaintiff.	12/15–19/94
7	Case No. 390-37213-SAF-11 and Case No. 390-37214-SAF-11, jointly administered Chapter 11; In re: *National Gypsum Company v. Aancor Holdings, Inc.* Suit involved groundwater contamination associated with Rolling Knolls Landfill. Retained by the U.S.A.	5/18–20/92 6/1/92 6/24/92
6	Case No. CIV-86-1401-P; *The United States of America v. Royal N. Hardage, et al., Advance Chemical Company, et al., v. ABCO, et al.* United States District Court for the Western District of Oklahoma. Enforcement of ROD concerning remediation of hazardous waste site. Retained by the Plaintiff.	10/27/89
5	*The United States of America, the State of New York, and UDC-Love Canal, Inc., v. Occidental Chemical Corp., Occidental Chemical Holding Corp., Occidental Petroleum Investment Co., Occidental Petroleum Corp., City of Niagara Falls, Niagara County Health Department, and the Board of Education of the City of Niagara Falls, Love Canal Landfill Superfund site.* United States District Court for the Western District of New York. Testimony on the mobility of organic pollutants through clay. Retained by the Plaintiff.	3/20–21/89

4	Case No. 85-17210-C; *James L. Slaughter, et al., v. Farm and Home Savings, et al.*, and Case No. 86-48352; *Mike Fenimore, et al., v. Farm and Home Savings.* 151st Judicial District Court of Harris County, Texas. Case involved issues of land development and exposure to petrochemical wastes by residents in neighborhoods adjacent to the Brio/Dixie Oil Processors Superfund sites (Houston, Texas). Retained by the Plaintiffs.	12/6/89
3	*Barbara Lips v. Jacobs Oil Company.* Federal District Court in Corpus Christi. Testimony on the damages and reclamation results from oilfield drilling mud wastes. Retained by the Plaintiff.	1985
2	*Blaire v. Palmer Oil.* Texas District Court. Suit over the destruction of land resulting from oil exploration activities. (587091018) Retained by the Plaintiff.	
1	*Jarvis L. Smoak v. Arkansas Louisiana Gas Company.* In the Texas District Court of Marshall, Texas. Contamination of soil and loss of trees due to oil spill. Retained by the Defendant.	

DEPOSITION TESTIMONY

74	Cause No. 02-4162 JPG; *Chevron Environmental Management Company, Chevron Environmental Services Company, and Texaco Inc., Plaintiffs, v. Indian Refining I Limited Partnership (f/k/a Indian Refining Limited Partnership), et al, Defendants* in the United States District Court for the Southern District of Illinois. Case involved remediation and allocation of costs for the former Indian refinery in Lawrenceville, IL. Retained by the Plaintiff	8/3/05
73	Cause No. 02-4162 JPG; *Chevron Environmental Management Company, Chevron Environmental Services Company, and Texaco Inc., Plaintiffs, v. Indian Refining I Limited Partnership (f/k/a Indian Refining Limited Partnership), et al, Defendants* in the United States District Court for the Southern District of Illinois. Case involved remediation and allocation of costs for the former Indian refinery in Lawrenceville, IL. Retained by the Plaintiff	6/2/05
72	Civil Action No. 95-CV-6400L, *Seneca Meadows, Plaintiff vs. ECI Liquidating, et al., Defendants* in the United States District Court, Western District of New York. This case involved claims against defendants concerning the disposal of hazardous substances in the Tantalo Landfill, Seneca Falls, New York. Retained by the Plaintiff.	5/27/05
71	File No. C7-0310992; *State of Minnesota, Plaintiff, v. American Hardware Mutual Insurance Company, Defendants* in the District Court of Minnesota, Tenth Judicial District. Case involved the disposal of hazardous substances with industrial waste at Oak Grove and East Bethel Landfills and the contamination of groundwater as a result of these disposal practices. Retained by the Plaintiff.	4/21/05
70	Case No. 03-CV-327 (H) M; *Betty Jean Cole, et al., Plaintiffs, v. Asarco Incorporated, et al., Defendants* in the United States District Court for the Northern District of Oklahoma. Case involved an evaluation of the Tar Creek Superfund site and the subsequent assessment and evaluation of lead contamination and lead transport pathways in the communities of Picher and Cardin, Oklahoma, including the impacts of lead exposure to the children within these communities. Retained by the Plaintiffs.	12/7/04
69	Civil Action No. 01:01-CV-890; *Lyondell Chemical Company, et al., Plaintiffs v. Albemarle Corporation, et al., Defendants* in the United States District Court for the Eastern District Of Texas, Beaumont Division. This case involved the disposal of waste containing hazardous substances and groundwater contamination at the Turtle Bayou Superfund in Liberty County, Texas. Retained by ExxonMobil, Defendant.	7/8/04
68	Case No. 03-CV-327 (H) M; *Betty Jean Cole, et al., Plaintiffs, v. Asarco Incorporated, et al., Defendants* in the United States District Court for the Northern District of Oklahoma. Case involved an evaluation of the Tar Creek Superfund site and the subsequent assessment and evaluation of lead contamination and lead transport pathways in the communities of Picher and Cardin, Oklahoma, including the impacts of lead exposure to the children within these communities. Retained by the Plaintiffs.	6/30/04

67	Court File No. CT 02-016741; *State of Minnesota, by its Attorney General, Mike Hatch, Plaintiff, v. American Hardware Mutual Insurance Co., et al., Defendants* in the District Court of Minnesota, Fourth Judicial District. Case involved the disposal of hazardous substances with industrial waste at the WDE and St. Augusta Landfills and the contamination of groundwater as a result of these disposal practices. Retained by the Plaintiff.	2/24/04
66	Civil Action No. 98-CV-0838S (F); *W.R. Grace & Co.-Conn., Plaintiff, V. Zotos International, Inc., Defendant* in the United States District Court Western District Of New York. Case involved the disposal of cosmetic waste at the Brewer Road Landfill in Waterloo County, and the contamination of groundwater as a result of these disposal practices. Retained by the Plaintiff.	2/12/04
65	Case No. 00-01917 MRP (MANx); *Shell Chemical Co., et al., Plaintiffs, vs. The County of Los Angeles, et al., Defendants* in the United States District Court for the Central District of California; Case No. 00-1938 MRP (MANx); *Phillips Petroleum Co., et al., Plaintiffs, vs. The County of Los Angeles, et al., Defendants* in the United States District Court for the Central District of California; and Case No. 00-6420 MRP (MANx); *Atlantic Richfield Co., et al., Plaintiffs, vs. BKK Corporation, et al., Defendants* in the United States District Court for the Central District of California. These combined cases involved hazardous substances associated with municipal solid waste being deposited at Cal Compact Landfill. Retained by the Plaintiffs.	3/7/03
64	Court File No. MC00-001819; *State of Minnesota, by its Attorney General, Mike Hatch, Plaintiff, v. Employers Insurance of Wausau, A Mutual Company, et al., Defendants* in the District Court of Minnesota, Fourth Judicial District. Case involved the disposal of hazardous substances with industrial waste at the Oak Grove Landfill and East Bethel Landfill in Anoka County, and the contamination of groundwater as a result of these disposal practices. For the Plaintiff.	12/17/02
63	Case No. 80-1589; *United States of America, Plaintiff, vs. City of Philadelphia, Plaintiff-Intervenor, vs. Union Corporation Metal Bank of America, et al., Defendants, vs. Consolidated Edison Company of New York, et al., Third Party Defendants* in the United States District Court for the Eastern District of Pennsylvania. This case involved claims against the defendants concerning the release of PCBs from the Metal Bank/Cottman Avenue Site to the Delaware River. Retained by the Defendants	5/28/02
62	Civil Action No. H-98-0408 *United States of America, et al. vs. Atlantic Richfield Company, et al vs. Ashland, Inc., et al.*, in the United States District Court Southern District of Texas Houston Division. This case involved claims against defendants concerning waste disposal at Sikes Pit. Retained by the Defendant.	6/26//01 - 6/27/01
61	Civil Action No. 95-2097 *Interfaith Community Organization, et al. v. Honeywell International, Inc. et al.*, in the United States District Court for the District of New Jersey. This case involved claims against the defendants concerning disposal of chromium waste at the Roosevelt Drive-In Site in Jersey City, New Jersey. Retained by W.R. Grace & Co., W.R. Grace Ltd. and ECARG, Inc., Defendants.	6/20/01

60	Civil Action No. 5:97CV00894; *United States of America v. Chrysler Corp. et al.*, in the in the United States District Court for the Northern District of Ohio. This case involved claims against the defendants concerning disposal of hazardous substances in the Krejci Dump Site. Retained by Minnesota Mining Manufacturing Company, Defendant.	06/07/01
59	Civil Action No. G-96-493; *Janie Rivas, et al., vs. Monsanto Company, et al.*, in the United States District Court for the Southern district of Texas Galveston Division. This case involves modeling of emissions and air dispersion of hazardous substances emanating from petrochemical wastes processed and disposed of at the Brio/Dixie Oil Processors Superfund Sites in Houston, Texas and related exposures to children in adjacent neighborhoods. Retained by the Plaintiffs.	03/16/01
58	Case No. CIV-91-2067-PHX-PGR *Maurice McIntire, et al. vs. Motorola, Inc.*, in the United States District Court in and for the District of Arizona. This case involved a lawsuit by certain Phoenix residents concerning the VOC groundwater and ambient air plumes perpetrated by Motorola and the subsequent exposure of the litigants to the hazardous substances. This deposition involved waste management and waste handling.	5/31/00 - 6/2/00
57	Case No. 98-CV0726 *Connie Lolley Klostermann, et al vs. Ultramar Diamond Shamrock Corporation, et al.*, in the 212th Judicial District Court, Galveston County, Texas. This case involved a lawsuit by the landowner concerning property damage resulting from leaking storage tank contamination. Retained by Diamond Shamrock, Defendant.	5/26/00
56	Case No. 97-6222 MRP (MANx) *Commercial Realty Projects, Inc., and L.A. Metromall LLC, vs. Atlantic Richfield Company, et al.*, in the United States District Court in for the Central District of California. This case involved hazardous substances associated with municipal solid waste being deposited at Cal Compact Landfill. Retained by the Defendants.	3/6/00
55	Case No. 93-055257 *Ralph L. Nichols, Jr., et al. vs. Monsanto Company, et al.*, in the 125th Judicial District Court of Harris County, Texas. This case involved contaminant migration via air, surface water, and groundwater media from the Dixie Oil Processors Superfund Site to adjacent athletic field. Retained by the Plaintiffs.	1/28/00
54	Case No. CIV-91-2067-PHX-PGR *Maurice McIntire, et al. vs. Motorola, Inc.*, in the United States District Court in and for the District of Arizona. This case involved a lawsuit by certain Phoenix residents concerning the VOC groundwater and ambient air plumes perpetrated by Motorola and the subsequent exposure of the litigants to the hazardous substances.	12/6/99 - 12/8/99
53	Case No. 89-4340 (JBS) *United States vs. Helen Kramer et al.*, In the United States District Court for the District of New Jersey. This case involved hazardous substance deposition into Kramer Landfill (Superfund Site) by defendants. Retained by lawyers for the plaintiff.	10/6/99
52	Case No. 92-034865; *James E. Barnet, Sr., et al., vs. Monsanto Company, et al.* In the District Court of Harris County, Texas, 80th District Court. This case involved former workers' claims concerning exposure to hazardous chemicals. Retained by the Plaintiffs.	4/28/99

51	Case No. 95C-1065; *Lemberger Sites Remediation Group, Plaintiff, v. A.M. Richter & Sons Co., et al., and White Consolidated Industries, Inc., Defendants;* In the United States District Court Eastern District of Wisconsin. This case involved hazardous constituents in waste going to Lemberger Landfill (Superfund Site). Retained by the Plaintiff.	3/12/99
50	Case No. 98-459-A; *Lewie Byers; vs. Texaco Exploration and Production Inc. and Texaco Inc.* In the District Court of Smith County, Texas 7th Judicial District. This case involves claims of contamination due to releases of crude oil and fluids from oil field production activities. Retained by the Defendant.	1/22/99
49	C.A. No. G-96-493; *Janie Rivas, et al., vs. Monsanto Company, et al.; Defendant.* In the United States District Court for the Southern district of Texas Galveston Division. This case involves modeling of emissions and air dispersion of hazardous substances emanating from petrochemical wastes processed and disposed of at the Brio/Dixie Oil Processors Superfund Sites in Houston, Texas and related exposures to children in adjacent neighborhoods. Retained by the Plaintiffs.	12/30/98
48	Cause No. 95-044151; *Rebecca Johnson, et al., and On Behalf of All Those Similarly Situated, Plaintiffs, vs. Exxon Company, U.S.A., et al., Defendant.* In the 61st Judicial District Court, Harris County, Texas. Case involved claims of contamination to a neighborhood near Carver Elementary school that was built over covered pits where oil began to surface in 1995. Retained by the Defendant.	7/24/98
47	Case 75524; *Clarice Friloux, et al., Plaintiffs, vs. Campbell Wells Corporation, et al., Defendants.* In the 17th Judicial District Court, Parish of Lafourche, Louisiana. Case involved claims of offsite air migration of hazardous substances purportedly associated with a non-hazardous oilfield waste disposal facility. Retained by the Defendants.	5/21/98
46	Case No. 93-004644; *Mike Adalis, et. al., Plaintiffs, vs. Neighborhood Development Corporation, et al, Defendants.* In the District Court of Harris County, Texas, 269th Judicial District. Case involved claims of groundwater and related drinking water well contamination attributable to 50 year old oil well blowout. Retained by the defendant Exxon.	2/13/98 and 7/8/98
45	Civil Action No. 95-514875-CE; *Grand Trunk Western Railroad, Incorporated and Star Oil Company, Inc., Plaintiffs vs. Union Oil Company of California, Wynkoop Oil Company, Clement Wynkoop, Secory Oil Company and Lewis Secory, Defendants and Union Oil Company and Clement Wynkoop, Counter-Plaintiffs/Cross-Plaintiffs vs. Secory Oil Company and Lewis Secory.* Case involved modeling of the transport and fate of hydrocarbon fuels, which leaked from storage, tanks at a terminal and allegedly migrated onto adjoining properties of plaintiffs. Retained by the Defendants.	5/22/97 and 6/2/97 to 6/3/97
44	Case No. 93-03044, *James W. Allen, III and Victoria Ann Allen, et al. Monsanto Company, et. al.*, and Case No. 93-14478, Christopher Irwin and Jon H. Moore, et al., in the District Court of Harris County, Texas, 113th Judicial District. Case involved contaminant migration via air, surface water and groundwater media from the Dixie Oil Processors Superfund Site to adjacent children's athletic field. Retained by the Plaintiffs.	5/13/97

43	Civil Action 96C19S; *Junker Landfill v. United Waste.* In the U.S. District Court, Western District. Case involved study of hazardous substances in wastes generated by approximately 500 generators taken to Junker Landfill (Superfund Site). Retained by Plaintiffs.	2/28/97
42	Cause No. A99,534; Joann *McKnight Lambert v. Melvin B. Etheredge, et al.* In the 70th District Court, Ector County, Texas. Case involved study of subsurface moisture condition and moisture migration through house slab. Retained by Plaintiff, Lambert.	1/29/97
41	Case No.: 2:92-CV-111; *Commercial Union Insurance Co., et. al., v. Cannelton Industries, Inc.,* In the United States District Court for the Western District of Michigan. Case involved claim against insurance company for environmental remediation cost recovery associated with chromium contamination of St. Marys River due to a fire at an old tannery plant. Retained by Defendant.	9/5/96
40	Civil Action No. BC015575; *Atlantic Richfield Company and ARCO Chemical Company v. Aetna Casualty and Surety Company of America, et. al.;* Superior Court of the State of California for the County of Los Angeles. Case involved disputed claims for insurance coverage of environmental contamination at old refinery sites at Sand Springs, Oklahoma, and Prewitt, New Mexico. Retained by the Plaintiffs.	4/9/96 - 4/10/96
39	Civil Action No. 92-2-28065-5; *Aluminum Company of America and Northwest Alloys, Inc. v. Accident and Casualty Insurance Company, et al.* Superior Court of the State of Washington, In and For the County of King. Case involved disputed claims for insurance coverage of environmental contamination at three aluminum-manufacturing facilities across the country, and entailed extensive interpretation of historical aerial photographs of the facilities. Retained by the Plaintiffs.	2/5/96
38	Civil Action No. 85-17210-G; *David L. Smithson et al., v. Monsanto Company, et. al.,* District Courts, 11th Judicial District, Harris County, Texas; and Civil Action No. 93-045095; *Thuy Thi Diep, et al., v. Monsanto Company, et al.;* District Court, 55th Judicial District, Harris County, Texas. These consolidated cases involved the Brio Superfund Site and exposure of adjacent residents to hazardous chemicals in an old waste disposal site through air, soil, groundwater, surface water and drinking water pathways. Retained by Plaintiffs.	11/8/95
37	Civil Action No. 87-4263(JHR); *General Electric Company v. Buzby Brothers Materials Handling Company, et al.* United States District Court for the District of New Jersey. Case involved recovery from commercial and municipal transporters of wastes of the costs for remediation of groundwater contamination at the site of the RCA-Buzby Landfill (Superfund Site) near Voorhees, New Jersey. Retained by the Plaintiff.	6/13-14/96
36	Case No. 94-C-1025; *City and County of Denver et al., v. Alumet et al.* United States District Court for the District of Colorado. Case involving the Lowry Landfill Superfund site in Denver, Colorado, and the apportionment of remediation costs due to contamination from co-disposal of municipal and industrial wastes. Retained by the Defendants.	8/17/95

35	Cause No. 15,527; *Gary David Harding et al., v. Browning-Ferris Industries, Inc., et. al.*, District Court, 229th Judicial District, Duval County, Texas. Case involving personal injury and property damage from industrial waste migration from a landfill. Retained by the Plaintiffs.	6/22/95
34	Case No. 93-03674-CA; In Re: *Hipps Road Litigation.* Circuit Court of the Fourth Judicial Circuit In and For Duval County, Florida. Suit regarding contamination of drinking water wells from hazardous waste leaking from a landfill. Retained by the Plaintiffs.	5/26/95
33	Cause No. 94-1499-A; *Ardith Cavallo, et al., v. Star Enterprise, et al.* United States District Court for the Eastern District of Virginia; Alexandria Division. Retained by the Defendant.	5/5/95
32	Case No. CJ-92-3515-62; *N.C. Corff Partnership, Ltd., et al., v. Oxy USA, Inc.* Oklahoma County District Court. Retained by the Defendant.	4/26/95
31	Civil Action No. 93-CV-0090-B; *KN Energy, Inc. et al., v. Sinclair Oil Corporation, d/b/a/ Little America Refining Co.* United States District Court, District of Wyoming. Retained by the Plaintiff.	4/19/95
30	Cause No. CV-90-75-BU-PGH; *Atlantic Richfield Co. v. Torger L. Oaas et. al.*, United States District Court for the District of Montana, Butte Division. Retained by the Plaintiff.	11/7/94 11/11/94
29	Cause No. 92-032723; *Clear Creek Independent School District v. Farm & Home Savings Association, et. al.*, District Court 11th Judicial District, Harris County, Texas. Retained by the Plaintiffs.	10/5/94
28	Cause No. CW 93-39-BU-PGH; *Montana Resources, Inc. and Dennis R. Washington v. Atlantic Richfield Company.* United States District Court for the District of Montana, Butte Division. Retained by the Defendants.	9/9/94
27	Cause No. 31,692-S; *Frank J. Kramr, Individually and as Parents and next friends of Sarah Kramr, a minor, v. Eastern Pipeline Company.* District Court 329th Judicial District, Wharton County, Texas. Retained by the Plaintiffs.	9/7/94
26	Cause No. 85-17210-G; *Gary L. Abel, et al., and David L. & Angell R. Smithson v. Monsanto, et al.* District Court 151st Judicial District, Harris County. Suit concerning the Brio Superfund site. Retained by the Plaintiffs.	5/18/94
25	Case No. 92-CI-15104; *Lionel Laguna and wife, Celia Laguna v. Exxon Corporation United States of America.* District Court, 57th Judicial District, Bexar County, Texas. Retained by the Defendant.	12/10/93
24	Civil Action No. SA-92-CA-0616; *Jesse Sherrod, et al., v. U.S.A.* Western District Court of Texas, San Antonio Division. Suit regarding the alleged leakage of chlorinated solvents from an air force base to surrounding areas. Retained by the Plaintiffs.	4/9/93
23	Case No. 390-37213-SAF-11 and Case No. 390-37214-SAF-11, jointly administered Chapter 11; In re: *National Gypsum Company v. Aancor Holdings, Inc.* Retained by the U.S.	6/24/92 4/26–27/92 5/18–20/92

22	Cause No. 85-17210-F; *Andrea Acosta, et al., v. Farm & Home Savings Association.* District Court of Harris County, Texas. Suit concerning Brio (Houston, Texas) Superfund site. Retained by the Plaintiffs.	5/13/92
21	Civil Action No. CIV-91-655-W; *Larry and Judy Bentley v. Koch Gathering Systems, Inc.* Suit concerning the remediation of an oil spill. Retained by Koch.	2/21/92 1/16/92
20	Cause No. 90C0468; *Billy White, et. al., v. BP Chemicals, Inc. et. al.*, District Court of Brazoria County, Texas.	1/7/92
19	File No. 3-90-312; *Kenneth M. Anderson as Personal Representative of the Estate of Fred W. Hedberg v. City of Minnetonka et al.* United States District Court for the District of Minnesota, Third Division. Retained by the Plaintiff.	7/16/91
18	Consolidated Civil Action No. 83-C–2379; *United States of America v. Shell Oil Company*, consolidated with Civil Action No. 89–C–1646, *United States of America v. State of Colorado.* U.S. District Court for the State of Colorado. Retained by the U.S.A.	4/22–23/91
17	Case No. 485,475; *Billy Fred Platt and Paula Kay Callahan v. Bio-Gro Systems, Inc. and the City of Austin.* 353rd District Court, Travis County, Texas. Contamination to soil resulting from sewage sludge application. Retained by Mr. Platt.	3/28/91
16	Cause No. C88-0190-B consolidated with C89-0153-B; *Sinclair Oil Corporation v. James S. Scherer, et al., and United States of America v. Sinclair Oil Corporation.* United States District Court for the District of Wyoming. Suit concerning alleged contamination from refinery operations. Retained by the United States.	4/27/90
15	Case No. 63,993; *Lawrence and Verna Postier v. Laidlaw Waste Systems, Inc., et. al.*, 240th Judicial District Court for Fort Bend County, Texas. Personal injury as a result of methane gas migration from a landfill. Retained by the Plaintiff.	1/9/90 12/21/89
14	Cause No. 1-88-0141-W; *Watts and wife v. Koch Gathering Systems, Inc.* United States District Court, North Texas Division, Abilene. Suit concerning land damages resulting from an oil spill. Retained by Koch.	8/23/89
13	*The United States of America, the State of New York, and UDC-Love Canal, Inc., v. Occidental Chemical Corp., Occidental Chemical Holding Corp., Occidental Petroleum Investment Co., Occidental Petroleum Corp., City of Niagara Falls, Niagara County Health Department, and the Board of Education of the City of Niagara Falls, Love Canal Landfill.* United States District Court for the Western District of New York. Deposition on the mobility of organic pollutants through clay. Retained by the Plaintiff.	3/20–21/89
12	Case No. 85-17210-C; *James L. Slaughter, et al., v. Farm and Home Savings, et. al.*, and Case No. 86-48352; *Mike Fenimore, et al., v. Farm and Home Savings.* 151st Judicial District Court of Harris County, Texas. Damages and clean-up of Brio (Houston, Texas) Superfund site. Retained by the Plaintiffs.	1/13/89 11/11/88
11	Case No. CIV-86-1401-P; *The United States of America v. Royal N. Hardage, et al., Advance Chemical Company, et al., v. ABCO, et al.* United States District Court for the Western District of Oklahoma. Enforcement of ROD concerning remediation of hazardous waste site. Retained by the Plaintiff.	6/13/88 12/2/88

10	Case No. H-86-2629; *United States of America v. International Shoe Company.* RCRA compliance for solvent waste surface impoundment. Retained by the U.S.A.	3/5/88
9	*Joseph Edward Powell, et al., v. Pulte, et. al.*, District Court of Harris County, Texas. Vol. 1 No. 84-75865.	11/11/88
8	Case No. M-85-191-CA; *Sammy C. McElroy and wife, Kathleen Ann McElroy v. Getty Oil Company and Texaco, Inc.* United States District Court for the Eastern District of Texas, Marshall Division; and Case No. CA-93-54; *Sammy C. McElroy and wife, Kathleen Ann McElroy v. Halliburton Company.* District Court In and For Panola County, Texas. Fish kill resulting from acid drainages from dried pond bottom mud. Retained by the Defendant.	9/5/86 11/7/86
7	Case No. 84-1112-A; *Gary L. Overstreet and Glenda Ann Overstreet v. Texas Oil and Gas Corporation and Delhi Gas Pipeline Corporation.* 14th Judicial District Court of Dallas County, Texas. Suit concerning alleged sulfur contamination of soil, forage, and its potential impact on the productivity of dairy cattle. Retained by the Defendant.	5/2/86
6	Case No. 86-6-8186; *Mobil Producing Texas and New Mexico v. Burr Stafford, et al.* 24th Judicial District Court In and For Jackson County, Texas. Testimony on the damages to soil and crops caused by oil production activities. Retained by the Plaintiff.	3/11/86
5	Case No. 83-CV-1116; *Clifford and Sandra Schiesl, et al., and Orrin Hagen v. Uniroyal, Inc., and Waste Management of Wisconsin, Inc. v. City of Stoughton, et al., v. Richard H. Sundby, et al.* Circuit Court for the State of Wisconsin, Dane County. Contribution of municipal waste constituents to ground water contamination of the Hagen Landfill (Superfund Site) in Dane County, Wisconsin. Retained by Uniroyal.	10/17/86
4	*Bagwell Greenhouse v. Ball Seed Company.* Suit over loss of crops due to contaminated plant growth mixture. Retained by the Defendant.	
3	*French v. Voluntary Purchasing Groups, Inc.* Suit over the loss of cattle and the contamination of pasture land with arsenic. Retained by the Defendant.	
2	*Rader and Carpenter v. Texas-New Mexico Pipeline Company.* Damage to soil, trees, and pasture due to oil spill down creek channel. Retained by the Defendant.	3/11/88
1	*Stronglite Products Company v. Frit Industries.* Suit over the sale of products that contaminated plant growth mixture. Retained by the Plaintiff.	

REGULATORY HEARING TESTIMONY

26	Testimony at a hearing of the South Carolina Department of Health and Environmental Protection regarding the GSX landfill. Retained by the Opposition.	3/93 2/93
25	In the matter of the application of the North Texas Municipal Water District to Amend Solid Waste Permit No. 568A	2/15/93
24	Testimony at a hearing on a proposed permit amendment regarding the City of McKinney (TX) Landfill. Retained by the Opposition.	1/27/93
23	Testimony at hearings of the Public Utility Commission of Texas regarding the Lon C. Hill-Coleto Creek 345 kv Transmission Line. Retained by the Applicant.	6/1/92 5/92 1990
22	Testimony at a hearing to review an amendment to expand the City of Waco (TX) Landfill. Retained by the Opposition.	1/23/91
21	Testimony at hearing regarding the siting of the Cherokee County Landfill (TX) near an aquifer recharge area. Retained by the Opposition.	9/21–22/88
20	Testimony at permit hearing regarding the Green Valley Environmental Corporation Landfill in Greenup County, Kentucky, regarding suitable siting criteria for a landfill. Retained by opposing parties Clarence Clay, Janet Brown, et. al.	9/88
19	Application of Metropolitan Waste Systems for a Landfill.	7/27/88
18	Application of Laidlaw Waste Systems, Inc. before the Regional Pollution Control Facility Siting Committee of the McHenry County Board.	6/17/87
17	Testimony at a hearing of the Wayne County Board of Commissioners (IL) on operation and maintenance of landfills and associated problems that can impact the environment.	7/15–18/86
16	Testimony at a hearing of the McHenry County Board of Commissioners (IL) on the siting of a proposed landfill. Retained by the Opposition.	12/22/85
15	Testimony at a hearing to review a Browning-Ferris Industries municipal landfill (TX) permit application. Retained by the Tri-County Civic Association.	11/9/83
14	Testimony at an administrative hearing in Illinois on the criteria to be used to ban organic chemicals from landfills.	11/1/83
13	Testimony at hearings held by the Texas Railroad Commission regarding the Texas Municipal Power Agency. Retained by TMPA.	1980
12	Testimony at a permit hearing regarding a proposed Chemical Waste Management landfill in Lake Charles, Louisiana.	1978
11	Testimony at EPA hearing on Chemical Waste Management Part B application for hazardous waste site at Elmiel, Alabama. Comments on permit deficiencies. Retained by the Opposition.	

Comprehensive Listing of Testimony by K. W. Brown

10 Testimony at an administrative hearing on the location of a Florida landfill in deep sandy soils. Retained by Citizens for a Clean Environment.

9 Testimony at a hearing on the State of Florida's alternative landfill liner designs. Retained by MFM Environmental.

8 Testimony at a hearing of the Jefferson County Board of Commissioners (IL) on the siting of a proposed landfill. Retained by the Opposition.

7 Testimony at a hearing of the Iniquois County Board of Commissioners (IL) on the siting of a proposed municipal waste in water table. Retained by the Opposition.

6 Testimony at a permit hearing on the land treatment of industrial wastes at the Exxon Chemical-Rollins Environmental facility in Baton Rouge, Louisiana. Retained by Exxon and Rollins.

5 Testimony on pond design and assessment of offsite environmental risks at the USPCI facility in Oklahoma. Retained by USPCI.

4 Testimony at a hearing of the Texas Railroad Commission regarding revocation of a permit for drilling mud disposal operations which had overflowed onto adjacent soil. Retained by the Opposition.

3 Testimony at a hearing of the Texas Water Commission regarding the land treatment of industrial wastes by Conservation Services, Inc. Retained by the Applicant.

2 Testimony at a hearing of the Texas Water Commission concerning the Liberty Waste Disposal Company landfill to be located near Anahuac, Texas. Retained by the Opposition.

1 Testimony at a hearing of the Texas Water Commission regarding a zero discharge permit for the irrigation disposal of treated sewage effluent. Retained by Upland Industries.

LEGISLATIVE HEARING TESTIMONY

6	Testimony at a hearing of the Texas House of Representatives, Environmental Affairs Committee in April 1987, on the need for legislation to set up a waste management plan for the state.	4/87
5	Testimony at a hearing of the Texas Governor's Taskforce on Oil Spills in February 1985, on the fate of oil spill debris, and disposal technology options.	2/85
4	Testimony at a hearing of the Texas Governor's Taskforce on Hazardous Waste in November 1984, on the effectiveness of landfills for disposal technology.	11/84
3	Testimony at a hearing of the Texas Governor's Taskforce on Hazardous Waste in June 1984, on the impact of organic chemicals on the permeability of soils.	6/84
2	Testimony at a hearing of the U.S. House of Representatives, Science and Technology Committee in November 1982, on the adequacy of EPA's liquid management system to protect groundwater at hazardous waste landfills.	11/82
1	Testimony at a hearing of the Texas House of Representatives, Environmental Affairs Committee in April 1982, on the impact of organic chemicals on the permeability of clay liners.	4/82

EXPERT WITNESS REPORT/AFFIDAVITS

78	Cause No. L-02-0087-CV-A; *Betty Waldean Woelfel, et al., Plaintiffs, vs. Intercontinental Energy Corporation d/b/a IEC Corp. of Texas and Westinghouse Electric Company, L.L.C., Defendants* in the District Court of Live Oak County, Texas, 36th Judicial District. Case involved the remediation and release of land associated with the Lamprecht and Zamzow ISL Uranium mine sites. Supplemental Affidavit. Retained by Defendant Viacom.	8/8/05
77	Cause No. L-02-0087-CV-A; *Betty Waldean Woelfel, et al., Plaintiffs, vs. Intercontinental Energy Corporation d/b/a IEC Corp. of Texas and Westinghouse Electric Company, L.L.C., Defendants* in the District Court of Live Oak County, Texas, 36th Judicial District. Case involved the remediation and release of land associated with the Lamprecht and Zamzow ISL Uranium mine sites. Affidavit. Retained by Defendant Viacom.	7/29/05
76	Cause No. 02-4162 JPG; *Chevron Environmental Management Company, Chevron Environmental Services Company, and Texaco Inc., Plaintiffs, v. Indian Refining I Limited Partnership (f/k/a Indian Refining Limited Partnership), et al, Defendants* in the United States District Court for the Southern District of Illinois. Case involved remediation and allocation of costs for the former Indian refinery in Lawrenceville, IL. Affidavit. Retained by the Plaintiff	7/19/05
75	Case No. 03-CV-327 (H) M; *Betty Jean Cole, et al., Plaintiffs, v. Asarco Incorporated, et al., Defendants* in the United States District Court for the Northern District of Oklahoma. Case involved an evaluation of the Tar Creek Superfund site and the subsequent assessment and evaluation of lead contamination and lead transport pathways in the communities of Picher and Cardin, Oklahoma, including the impacts of lead exposure to the children within these communities. Affidavit. Retained by the Plaintiffs.	5/27/05
74	Civil Action No. 95-CV-6400L, *Seneca Meadows, Plaintiff vs. ECI Liquidating, et al., Defendants* in the United States District Court, Western District of New York. This case involved claims against defendants concerning the disposal of hazardous substances in the Tantalo Landfill, Seneca Falls, New York. Retained by the Plaintiff.	5/10/05
73	Cause No. 02-4162 JPG; *Chevron Environmental Management Company, Chevron Environmental Services Company, and Texaco Inc., Plaintiffs, v. Indian Refining I Limited Partnership (f/k/a Indian Refining Limited Partnership), et al, Defendants* in the United States District Court for the Southern District of Illinois. Case involved remediation and allocation of costs for the former Indian refinery in Lawrenceville, IL. Retained by the Plaintiff	5/2/05
72	File No. C7-0310992; *State of Minnesota, Plaintiff, v. American Hardware Mutual Insurance Company, Defendants* in the District Court of Minnesota, Tenth Judicial District. Case involved the disposal of hazardous substances with industrial waste at Oak Grove and East Bethel Landfills and the contamination of groundwater as a result of these disposal practices. Retained by the Plaintiff.	4/11/05

71	Cause No. C200300273 *Judy Miller, Stan Miller, Deanna Aureli, Brent Aureli, and Nicholas Aureli v Blue Haven Pool, Defendant* in the Texas Judicial Court of Johnson County. Case involved claims against the defendant regarding the installation of a swimming pool, and a broken septic sewer line. Retained by the Defendant.	11/22/04
70	Case No. 03-CV-327 (H) M; *Betty Jean Cole, et al., Plaintiffs, v. Asarco Incorporated, et al., Defendants* in the United States District Court for the Northern District of Oklahoma. Case involved an evaluation of the Tar Creek Superfund site and the subsequent assessment and evaluation of lead contamination and lead transport pathways in the communities of Picher and Cardin, Oklahoma, including the impacts of lead exposure to the children within these communities. Expert Rebuttal Report. Retained by the Plaintiffs.	10/28/04
69	Nos. 03-2760, 03-3037 & 03-3585; *Interfaith Community Organization, et al., Plaintiffs vs. Honeywell International Inc., et al., Defendants* in the United States Court of Appeals for the Third Circuit. This case involved claims against the defendants concerning disposal of chromium waste at the Roosevelt Drive-In Site in Jersey City, New Jersey. Affidavit. Retained by W.R. Grace & Co., W.R. Grace Ltd. and ECARG, Inc., Defendants.	6/25/04
68	Civil Action No. 01:01-CV-890; *Lyondell Chemical Company, et al., Plaintiffs v. Albemarle Corporation, et al., Defendants* in the United States District Court for the Eastern District Of Texas Beaumont Division. This case involved the disposal of waste containing hazardous substances and groundwater contamination at the Turtle Bayou Superfund in Liberty County, Texas. Supplemental Report. Retained by ExxonMobil, Defendant.	5/14/04
67	Case No. 94 CV 012385; *Employers Insurance of Wausau, A Mutual Company, Plaintiffs, v. Newell Co., Defendants* in the State of Wisconsin Circuit Court for Milwaukee County. Case involved characterization of waste streams and the hazardous constituent content of waste streams produced by the Newell Co. subsidiaries, as well as the disposal of hazardous constituents into municipal landfills by the Newell Co. subsidiaries. Expert Report. Retained by the Defendants.	5/3/04
66	Cause No. 03-001121-CV; *Joseph Paul Horlen, et al., Plaintiffs, v. Robert S. Smith and Robo Investments, Inc., Defendants* in the District Court of Brazos County, Texas, 361st Judicial District. Case involved the subsurface loss of water from a man-made lake within a residential subdivision and the subsequent undercutting of riverbank along the Brazos River. Affidavit. Retained by the Plaintiffs.	4/29/04
65	Case No. 03-CV-327 (H) M; *Betty Jean Cole, et al., Plaintiffs, v. Asarco Incorporated, et al., Defendants* in the United States District Court for the Northern District of Oklahoma. Case involved an evaluation of the Tar Creek Superfund site and the subsequent assessment and evaluation of lead contamination and lead transport pathways in the communities of Picher and Cardin, Oklahoma, including the impacts of lead exposure to the children within these communities. Expert Report. Retained by the Plaintiffs.	4/12/04

64	Cause No. 03-001121-CV; *Joseph Paul Horlen, et al., Plaintiffs, v. Robert S. Smith and Robo Investments, Inc., Defendants* in the District Court of Brazos County, Texas, 361st Judicial District. Case involved the subsurface loss of water from a man-made lake within a residential subdivision and the subsequent undercutting of riverbank along the Brazos River. Expert Opinion. Retained by the Plaintiffs.	3/5/04
63	Docket No. CWA-06-2003-4805; *BP Pipelines (North America) Inc., Respondent, v. United States Environmental Protection Agency Region 6.* Case involved the subsurface release of crude oil from a pipeline at a site near Mertzon, Texas. Declaration. Retained by the Respondent.	2/6/04
62	Civil Action No. 95-2097; *Interfaith Community Organization, et al., vs. Honeywell International Inc., et al.*, in the United States District Court for the District of New Jersey. This case involved claims against the defendants concerning disposal of chromium waste at the Roosevelt Drive-In Site in Jersey City, New Jersey. Affidavit. Retained by W.R. Grace & Co., W.R. Grace Ltd. and ECARG, Inc., Defendants.	1/9/04
61	Civil Action No. 01:01-CV-890; *Lyondell Chemical Company, et al., Plaintiffs v. Albemarle Corporation, et al., Defendants* in the United States District Court for the Eastern District Of Texas Beaumont Division. This case involved the disposal of waste containing hazardous substances and groundwater contamination at the Turtle Bayou Superfund in Liberty County, Texas. Expert Witness Report. Retained by ExxonMobil, Defendant.	12/19/03
60	File No. CT 02-016741; *State of Minnesota, by its Attorney General, Mike Hatch, Plaintiff, v. American Hardware Mutual Insurance Company, et al., Defendants* in the District Court of Minnesota, Fourth Judicial District. Case involved the breach of the asphalt seal in the Hazardous Waste Disposal Pit at the Waste Disposal Engineering Landfill in Anoka County contributed to the groundwater contamination in the vicinity of the site. Affidavit. Retained by the Plaintiff.	12/19/03
59	Civil Action No. 95-2097; *Interfaith Community Organization, et al., vs. Honeywell International Inc., et al.*, in the United States District Court for the District of New Jersey. This case involved claims against the defendants concerning disposal of chromium waste at the Roosevelt Drive-In Site in Jersey City, New Jersey. Affidavit. Retained by W.R. Grace & Co., W.R. Grace Ltd. and ECARG, Inc., Defendants.	12/3/03
58	Docket No. CWA-06-2003-4805; *BP Pipelines (North America) Inc., Respondent, v. United States Environmental Protection Agency Region 6.* Case involved the subsurface release of crude oil from a pipeline at a site near Mertzon, Texas. Expert Witness Report. Retained by the Respondent.	11/21/03
57	Civil Action No. 95-2097; *Interfaith Community Organization, et al., Plaintiffs vs. Honeywell International Inc., et al., Defendants* in the United States District Court for the District of New Jersey. This case involved claims against the defendants concerning disposal of chromium waste at the Roosevelt Drive-In Site in Jersey City, New Jersey. Declaration. Retained by W.R. Grace & Co., W.R. Grace Ltd. and ECARG, Inc., Defendants.	11/13/03

56	Civil Action No. 95-CV-6400L; *Seneca Meadows, Inc., et al., Plaintiffs, v. ECI Liquidating, Inc., et al., Defendants* in The United States District Court Western District Of New York. Case involved the disposal of industrial and domestic waste at the Tantalo Landfill in Seneca County. Expert Witness Report. Retained by the Plaintiff.	10/17/03
55	Civil Action No. 98-CV-0838S (F); *W.R. Grace & Co.-Conn., Plaintiff, V. Zotos International, Inc., Defendant* in the United States District Court Western District Of New York. Case involved the disposal of cosmetic waste at the Brewer Road Landfill in Waterloo County, and the contamination of groundwater as a result of these disposal practices. Declaration. Retained by the Plaintiff.	9/29/03
54	Court File No. MC00-001819; *State of Minnesota, by its Attorney General, Mike Hatch, Plaintiff, v. Employers Insurance of Wausau, A Mutual Company, et al., Defendants* in the District Court of Minnesota, Fourth Judicial District. Case involved the disposal of hazardous substances with industrial waste at the Oak Grove Landfill and East Bethel Landfill in Anoka County, and the contamination of groundwater as a result of these disposal practices. Affidavit. Retained by the Plaintiff.	2/5/03
53	Case No. 00-01917 MRP (MANx); *Shell Chemical Co., et al., Plaintiffs, vs. The County of Los Angeles, et al., Defendants* in the United States District Court for the Central District of California; Case No. 00-1938 MRP (MANx); *Phillips Petroleum Co., et al., Plaintiffs, vs. The County of Los Angeles, et al., Defendants* in the United States District Court for the Central District of California; and Case No. 00-6420 MRP (MANx); *Atlantic Richfield Co., et al., Plaintiffs, vs. BKK Corporation, et al., Defendants* in the United States District Court for the Central District of California. These combined cases involved hazardous substances associated with municipal solid waste being deposited at Cal Compact Landfill. Expert Witness Report. Retained by the Plaintiffs.	1/13/03
52	Cause No. 98-56362; *Browning-Ferris Industries, Inc., et al., Plaintiffs, v. Certain Underwriters at Lloyd's London, et al., Defendants* in the 80th Judicial District, District Court of Harris County, Texas. This case involved the disposal of waste containing hazardous substances and groundwater contamination at the Renner Landfill in Beaumont, Texas. Expert Witness Report. Retained by the Defendants.	1/03/03
51	Case No. 80-1589; *United States of America, Plaintiff, vs. City of Philadelphia, Plaintiff-Intervenor, vs. Union Corporation Metal Bank of America, et al., Defendants, vs. Consolidated Edison Company of New York, et al., Third Party Defendants* in the United States District Court for the Eastern District of Pennsylvania. This case involved claims against the defendants concerning the release of PCBs from the Metal Bank/Cottman Avenue Site to the Delaware River. Rebuttal Report. Retained by the Defendants.	8/23/02
50	Civil Action No. 98-CV-0696A (F); *Booth Oil Site Administrative Group, Plaintiffs, vs. Safety-Kleen Corp., et al., Defendants,* in the United States District Court for the Western District of New York. This case involved claims against the defendants concerning the release of contaminants during used oil-recycling operations at the Booth Oil facility in North Tonawanda, New York. Affidavit. Retained by the Plaintiffs.	05/02/02

49	Case No. 80-1589; *United States of America, Plaintiff, vs. City of Philadelphia, Plaintiff-Intervenor, vs. Union Corporation Metal Bank of America, et al., Defendants, vs. Consolidated Edison Company of New York, et al., Third Party Defendants* in the United States District Court for the Eastern District of Pennsylvania. This case involved claims against the defendants concerning the release of PCBs from the Metal Bank/Cottman Avenue Site to the Delaware River. Expert Witness Report. Retained by the Defendants.	8/23/01
48	Civil Action No. 1999-48287; *Tim Dyring et al., Plaintiffs, v. Rohm & Haas Texas, Inc., et al., Defendants* in the 125th District Court of Texas. This case involved claims against the defendants concerning the release of hazardous substances to the groundwater from waste materials disposed at the Charley Burch Site in South Montgomery County, Texas. Expert Witness Report. Retained by the Plaintiffs.	5/31/01
47	Civil Action No. 95-2097; *Interfaith Community Organization, et al., vs. Honeywell International Inc., et al.*, in the United States District Court for the District of New Jersey. This case involved claims against the defendants concerning disposal of chromium waste at the Roosevelt Drive-In Site in Jersey City, New Jersey. Expert Witness Report. Retained by W.R. Grace & Co., W.R. Grace Ltd. and ECARG, Inc., Defendants.	3/27/01
46	Civil Action No. G-96-493; *Janie Rivas, et al., vs. Monsanto Company, et al.*, in the United States District Court for the Southern District of Texas Galveston Division. This case involves modeling of emissions and air dispersion of hazardous substances emanating from petrochemical wastes processed and disposed of at the Brio/Dixie Oil Processors Superfund Sites in Houston, Texas and related exposures to children in adjacent neighborhoods. Expert Witness Report. Retained by the Plaintiffs.	3/2/01
45	Civil Action No. 5:97 CV00894; *United States of America vs. Chrysler Corporation, et al.*, in the United States District Court for the Northern District Of Ohio. This case involved claims against the defendants concerning disposal of hazardous substances in the Krejci Dump Site. Expert Witness Report. Retained by Minnesota Mining & Manufacturing Co., Defendant.	2/28/01
44	Civil Action No. H-98-0408 *United States of America, et al vs. Atlantic Richfield Company, et al vs. Ashland, Inc., et al.*, in the United States District Court Southern District of Texas Houston Division. This case involved claims against defendants concerning waste disposal at Sikes Pit. Expert Witness Report. Retained by ExxonMobil, Defendant.	2/15/01
43	Case No. 98-CV0726 *Connie Lolley Klostermann, et al vs. Ultramar Diamond Shamrock Corporation, et al.*, in the 212th Judicial District Court, Galveston County, Texas. This case involved a lawsuit by the landowner concerning property damage resulting from leaking storage tank contamination. Retained by Diamond Shamrock, Defendant.	5/19/00
42	Case No. 97-6222 MRP (MANx) *Commercial Realty Projects, Inc., and L.A. Metromall LLC, vs. Atlantic Richfield Company, et al.*, in the United States District Court in for the Central District of California. This case involved hazardous substances associated with municipal solid waste being deposited at Cal Compact Landfill. Retained by the Defendants.	5/8/00

41	Civil Action No. 95-CV-6400L, *Seneca Meadows vs. ECI Liquidating, et al.* This case involved claims against defendants concerning the disposal of hazardous substances in the Tantalo Landfill, Seneca Falls, New York. Retained by the Plaintiff.	4/18/00
40	Case No. 92-034865; *James E. Barnet, Sr., et al., vs. Monsanto Company, et al.* In the District Court of Harris County, Texas, 80th District Court. This case involved former workers' claims concerning exposure to hazardous chemicals. Retained by the Plaintiffs.	4/7/00
39	Case No. 97-6222 MRP (MANx) *Commercial Realty Projects, Inc., and L.A. Metromall LLC, vs. Atlantic Richfield Company, et al.*, in the United States District Court in for the Central District of California. This case involved hazardous substances associated with municipal solid waste being deposited at Cal Compact Landfill. Retained by the Defendant.	2/25/00
38	Civil Action No. 89-4340(JBS); *The United States v. Helen Kramer*; United States District Court District of New Jersey. This case involved claims against a defendant concerning the disposal of hazardous substances in the Kramer Landfill (Superfund Site). Retained by the Plaintiffs.	6/99
37	Civil Action No. G-96-494; *Thu Van Le, et al., v. Monsanto Co., et al.; Defendant.* In the United States District Court for the Southern District of Texas Galveston Division. This case involved modeling of emissions and air dispersion of hazardous substances emanating from petrochemical wastes processed and disposed of at the Brio/Dixie Oil Processors Superfund Sites in Houston, Texas and related exposures to children in adjacent neighborhoods. Retained by the Plaintiffs	2/5/99
36	Civil Action No. G-96-493; *Janie Rivas, et al., vs. Monsanto Company, et al.; Defendant.* In the United States District Court for the Southern district of Texas Galveston Division. This case involved modeling of emissions and air dispersion of hazardous substances emanating from petrochemical wastes processed and disposed of at the Brio/Dixie Oil Processors Superfund Sites in Houston, Texas and related exposures to children in adjacent neighborhoods. Retained by the Plaintiffs	2/5/99
35	Civil Action No. 95-2215; *Becton Dickinson Puerto Rico, Inc., et al., vs. Cheeseborough Pond's Manufacturing Company, et al.;* United States District Court For the District of Puerto Rico. This case involved claims against the defendant concerning the disposal of hazardous substances in the Juncos Landfill (Superfund Site). Retained by the Plaintiffs.	1/19/99 3/3/97 11/14/96
34	Case No. 95C-1065; *Lemberger Sites Remediation Group, Plaintiff, v. A.M. Richter & Sons Co., et al., and White Consolidated Industries, Inc., Defendants;* In the United States District Court Eastern District of Wisconsin. This case involved hazardous constituents in waste going to Lemberger Landfill (Superfund Site). Retained by the Plaintiff.	11/12/98
33	Case No. 98-459-A, *Lewie Byers, vs. Texaco Exploration and Production Inc. and Texaco, Inc.;* In the District Court of Smith County, Texas 7th Judicial District. This case involves claims of contamination due to releases of crude oil and fluids from oil field production activities. Retained by the Defendant.	4/30/99 2/29/99 1/29/99

32	Case No. 96-72483; *Minnesota Mining and Manufacturing (3M) Company, Plaintiff v. Howard W. Stein, Jr., Stein Enterprises, Inc. (f/k/a Stein's Flower Shop and Green Houses, Inc.), the Dow Chemical Company, and General Motors Corporation, Defendants.* In the United States District Court for the District of Michigan, Southern Division. Case involved evaluation of waste disposed at the Michigan Avenue Dumpsite by General Motors Corporation and Dow Chemical Company. Retained by the Plaintiff, 3M.	6/31/98 6/15/98
31	Case 75524; *Clarice Friloux, et al., Plaintiffs, vs. Campbell Wells Corporation, et. al., Defendants.* In the 17th Judicial District Court, Parish of Lafourche, Louisiana. Case involved claims of offsite air migration of hazardous substances purportedly associated with a non-hazardous oilfield waste disposal facility. Retained by the Defendants.	5/4/98 1/6/98
30	Civil Action No. 95-514875-CE; *Grand Trunk Western Railroad, Incorporated and Star Oil Company, Inc., Plaintiffs vs. Union Oil Company of California, Wynkoop Oil Company, Clement Wynkoop, Secory Oil Company and Lewis Secory, Defendants and Union Oil Company and Clement Wynkoop, Counter-Plaintiffs/Cross-Plaintiffs vs. Secory Oil Company and Lewis Secory.* Case involved modeling of the transport and fate of hydrocarbon fuels, which leaked from storage, tanks at a terminal and allegedly migrated onto adjoining properties of plaintiffs. Retained by the Defendants.	5/22/97 and 6/2/97 to 6/3/97
29	Court File No. 3-95-933. *Onan Corporation, Plaintiff and the State of Minnesota, and by its Attorney General, Hubert H. Humphrey, III, and by It Pollution Control Agency, Intervenors, v. Continental Insurance Company,* Defendant. In the United States District Court, District of Minnesota. Case involved time of Leachate travel through two Landfills in Minnesota, Oak Grove Landfill and WDE Landfill, and the impact of the Leachate on the groundwater. For the Intervenors.	6/18/97
28	Civil Action No. 96-C-00489-5; *Junker Landfill Trust, Plaintiff vs. United Waste Systems, Inc. et al., Defendants, and Junker Recycling, Inc., et. al., Defendants and Third Party Plaintiffs, vs. Garry Thompson, et al., Third Party Defendants*; and Civil Action No. 96-C-00489-5, *Landfill Remediation Trust, Plaintiff vs. Garry Thompson, et al., Defendants.* In the United States District Court for the Western District of Wisconsin. Case involved contamination of groundwater, surface water, soil gas, and soil at the Junker Landfill (Superfund Site) and the relationship of that contamination to the wastes from over 450 generators. Retained by Plaintiffs.	2/20/97 and 2/25/97
27	Case No. 61180; *Kenneth and Helen Songer, Plaintiffs vs. Billy and Mary Clement d/b/a Cecle Clement & Sons, and Harrison, Walker, Harper, Inc. and Joe Archer, d/b/a Archer Excavating.* In the District Court of Lamar County, Texas, 6th Judicial District. Case involved claims of air contamination (hazardous gases and particulates) from trucking and excavating operations. Retained by the Defendants.	7/1/97 and 10/31/97
26	Case No. 93-C-0314; *Hunt's Generator Committee, et al., Plaintiffs v. Allis Chalmers Corporation, et al.,* Defendants. In the United States District Court for the Eastern District of Wisconsin. Case involved identification of waste products and hazardous substances within those waste products, which were disposed at the Hunt's Disposal Landfill Site near Caledonia, Wisconsin. The wastes were generated by various classes of commercial establishments, institutions, retail shops, and dwellings.	4/14/97

25	Civil Action No. 94-1449-A; *Ardith Cavallo, Plaintiff vs. Star Enterprise, Texaco Refining & Marketing (East), Inc., and Saudi Refining, Inc., Defendants.* In the United States District Court, District of Eastern, Virginia. Case involved claim of property damage from hydrocarbons in the groundwater, which allegedly migrated to plaintiff's property from a fuel terminal in Fairfax, Virginia. Retained by the Defendants.	3/6/97
24	Case No. 93-004644; *Mike Adalis, et. al., Plaintiffs, vs. Neighborhood Development Corporation, et. al., Defendants.* In the District Court of Harris County, Texas, 269th Judicial District. Case involved claims of groundwater and related drinking water well contamination attributable to 50 year old oil well blowout. Retained by the defendant Exxon.	12/16/96
23	Case No. 2:92-CV-111; *Commercial Union Insurance Co., et al. v. Cannelton Industries, Inc.,* In the United States District Court for the Western District of Michigan. Case involved claim against insurance company for environmental remediation cost recovery associated with chromium contamination of St. Mary's River due to a fire at an old tannery plant. (587096012) Retained by Defendant.	9/5/96
22	Case No. 93-C-0324; *Hunt's Generator Committee, et al. v. Allis Chalmers Corporation, et al;* In the United States District Court, Eastern District of Wisconsin. Case involved identification of hazardous constituents in common household products found in the municipal solid waste from one city and disposed at the Hunt's Disposal Landfill Superfund Site at Caledonia, Wisconsin. (587096011) Retained by Plaintiff PRP Group.	8/21/96
21	Civil Action No. H-95-776; *Rodney and Brenda Kay Beaver A/N/F of Wesley Michael Beaver and Claude Paul Hargraves v. Monsanto Company;* In the United States District Court for the Southern District of Texas, Houston Division. Cause involved short-term exposure of children to toxic contaminants in air, soil, and drinking water at athletic facility located adjacent to waste disposal/processing sites (Dixie Oil Processors/Brio Superfund Sites). (587095020) Retained by the Plaintiffs.	5/24/96
20	Civil Action No. 87-4263(JHR); *General Electric Company v. Buzby Brothers Materials Handling Company, et al.* United States District Court for the District of New Jersey. Case involved recovery from commercial and municipal transporters of wastes of the costs for remediation of groundwater contamination at the site of the RCA-Buzby Landfill (Superfund Site) near Voorhees, New Jersey. (587094024) Retained by the Plaintiff.	9/28/95
19	Case No. 4-93-CV-193; *Cooper Industries, Inc., v. Abbott Laboratories, et al., in the U. S. District Court for the Western District of Michigan.* Case involving Sturgis (Michigan) Well Field Superfund Site and the apportionment of remediation costs as between plaintiff and 35 defendants for solvent contamination of groundwater. (587095007) Retained by the Plaintiffs.	8/14/95
18	Civil No. BC015575; *Atlantic Richfield Co. and ARCO Chemical Co., v. Aetna Casualty and Surety Co. of American.* Superior Court of the State of California. A Declaration of ARCO Garber, ARCO Sand Springs, and ARCO Prewitt. (587095012, 587095013, & 587095006))	10/17/95

17	Docket No. N-93-39-BU-PGH; *Montana Resources Inc., et al., v. Atlantic Richfield Co.* U.S. District Court for the District of Montana. (587094008) Retained by the Defendant.	6/14/94
16	Civil Action No. 94-C-1025; *The City and County of Denver, et. al., v. Alumet Partnership, et al., and Alumet Partnership, et al., v. City of Aurora.* U.S. District Court for the District of Colorado. (587095003) Retained by the Defendants.	5/31/95
15	Civil Action No. 94-1449-A; *Ardith Cavallo v. Star Enterprise, Texaco Refining & Marketing (East), Inc., and Saudi Refining, Inc.* United States District Court, District of Eastern Virginia. Expert Witness Report. (587095010) Retained by the Defendants.	4/24/95
14	Civil Action No. 93-CV-0080-B; *KN Energy, Inc. et al., v. Sinclair Oil Corporation d/b/a Little America Refining Company.* United States District Court, District of Wyoming. Expert Witness Report. (586094001) Retained by the Plaintiff.	2/15/95
13	Docket Nos. BUR-L-2533-92/01267-93; *Gouryeb v. Woodland Township Planning Board,* Superior Court of New Jersey, Law Division/Burlington County. Affidavit. (587095004) Retained by the Plaintiff.	12/1/94
12	Consolidated Civil Actions No. 90-75 BU-PGH; *ARCO v. Oaas, et al.,* and No. 91-82-BU-PGH, *United States v. Montana Pole and Treating Plant, et al.* United States District Court for the District of Montana, Butte Division. Expert Witness Report. (586093010) Retained by the Defendant/Third Party Plaintiff.	8/15/94 9/12/94
11	Civil Action No. 94-243-A; *William H. Ogden and Gay E. Tiffany v. Star Enterprise, et al.* United States District Court for the Eastern District of Virginia, Alexandria Division. Declaration. (587094001) Retained by the Defendants.	8/31/94
10	Civil No. 93-186; *United States v. Somerset Refinery, Inc.* United States District Court for the Eastern District of Kentucky. Expert Witness Report. (587094013) Retained by the U.S. Department of Justice.	8/26/94
9	Civil No. 93-381-A; *Brian Feikema et al., v. Texaco, Inc., et al.* United States District Court for the Eastern District of Virginia. Declaration. (587094001) Retained by the Defendants.	7/14/94 6/29/94
8	Case No. 89-135; *Citizens Asking For a Safe Environment, Inc., et al., v. South Carolina Department of Health and Environmental Control, et al.* In the Matter of the RCRA Permit Decision for GSX Services of SC, Inc. Pinewood Facility, Sumter County; SC, before the State of South Carolina Board of Health and Environmental Control. Retained by the Opposition.	3/94
7	File No. 89-135; *Citizens Asking For a Safe Environment, Inc., et al., v. South Carolina Department of Health and Environmental Control, et al.* United States District Court for the District of Minnesota, Third Division. Affidavit. Retained by the Plaintiff.	12/18/92
6	Affidavit and rebuttal affidavit regarding the proposed Lon C. Hill-Coleto Creek 345 kV transmission line. Retained by Central Power & Light.	10/21/91 8/90

5	File No. 3-90-312; *Kenneth M. Anderson as Personal Representative of the Estate of Fred W. Hedberg v. City of Minnetonka et al.* United States District Court for the District of Minnesota, Third Division. Retained by the Plaintiff.	7/16/91
4	Civil Action No. N–87–52 (both cases); *The B. F. Goodrich Company, et. al., v. Harold Murtha, et al., and Harold Murtha, et al., v. Risdon Corporation.* Circuit Court for the State of Connecticut. Contribution of municipal waste to environmental contamination associated with the Beacon Heights and Laurel Park Landfills (Superfund Sites). Retained by the Laurel Park and the Beacon Heights Coalitions.	6/29/90
3	Cause No. C88-0190-B consolidated with C89-0153-B; *Sinclair Oil Corporation v. James S. Scherer, et al., and United States of America v. Sinclair Oil Corporation.* United States District Court for the District of Wyoming. Suit concerning alleged contamination from refinery operations. Retained by the United States.	4/27/90
2	Case No. 80-4-CIV-7; *The United States of America v. Waste Industries, Inc., et al.* United States District Court for the Eastern District of North Carolina, Wilmington Division. Affidavit on leaking municipal landfill. Retained by the Plaintiff.	9/29/85
1	Affidavit and rebuttal affidavit regarding the proposed expansion of the Azusa Landfill (CA). (587095021) Retained by an *amicus curae* party.	

MEDIATION PRESENTATIONS AND ENVIRONMENTAL REPORTS

3	Report of "An Investigation and Assessment of the Texaco Sand Flat Unit," by Dr. Kirk W. Brown. Prepared for Wallace, King, Marraro, and Branson, LLC on behalf of Texaco Exploration and Production.	11/13/98
2	Report of "Evidence of Leachate Leaking from Azusa Landfill," by Dr. Kirk W. Brown. Prepared for Geoscience Support Services, Inc. for Metropolitan Water District of California.	
1	Cause No. 93-1235; *Adams, et al., v. RSR Corporation, et al.* 71st Judicial District Court; Harrison County, Texas. Retained by the Plaintiffs.	12/14/94

APPENDIX 3

DOCUMENTS RELIED UPON FOR PREPARATION OF THIS REPORT

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APPENDIX 4

Summary of Air Emission Notice of Violations

Date	Action
22-Jun-71	Cease and Desist Order issued
25-May-77	Notice of violations
6-Jun-77	Violations
11-Sep-78	Notice of violations
18-May-79	Notice of violations
27-Aug-79	Notice of violations
5-Sep-79	Notice of violations
18-Oct-79	Notice of violations
19-Oct-79	Notice of violations
23-Oct-79	Notice of violations
2-Nov-79	Notice of violations
9-Nov-79	Notice of alleged violations
28-Nov-79	Continuing violations resolutions
10-Mar-80	Notice of violations
14-Mar-80	Notice of violations
26-Mar-80	Cease and Desist Order issued
12-Nov-81	Notice of violation
3-Jun-82	Exceeding emissions limits
7-Jul-82	Notice of violations
29-Aug-84	Notice of violations

23-Jan-85	Violations
19-Feb-85	Violations

APPENDIX 5

Summary of Waste Pile Burning Complaints and Inspection Reports

Date	Action
July 12, 1967	Petition for help regarding burning refuse pile[299]
March 7, 1968	Letter complaining of burning waste pile[295]
April 11, 1968	Letter to US Rep. Arch Moore, Jr. discussing burning waste pile[296]
February 12, 1970	Letter and news article complaining of burning waste pile[292, 294]
February 27, 1970	Burning refuse pile is creating a traffic hazard[291]
May 13, 1970	Hot spots documented in residue pile[203]
July 31, 1970	Regulation VII General Metallurgical Plant Registration[306]
May 27, 1971	Pile was observed burning; pile consists of zinc compounds, carbon, and other materials [301]
June 16, 1971	Two different parts of the pile are observed smoking[290]
June 22, 1971	Cease and Desist Order Issued to Matthiessen & Hegeler Zinc, concerning the burning residue pile[200]
August 12, 1971	Dimensions and site location map of pile are recorded[301]
January, 1972	T.L. Diamond purchases Matthiessen & Hegeler Zinc[183]
January or February, 1974	Meadowbrook purchases residue waste pile[183]
August 15, 1974	Complaint of burning residue pile, chlorine and ammonia fumes[183,186]

August 26, 1974	Inspection finds residue pile not burning[183] Inspection finds residue pile not burning, but one hot spot present[185]
October 25, 1974	Inspection finds ~15% of the waste pile face is smoldering[184]
February 11, 1976	Waste pile noticed to be burning[271]
June 16, 1976	A small portion of the refuse area was found to be smoldering[272]
May 5, 1977	Inspection finds a portion of the southwest section of the subject refuse area is smoldering [274, 273]
August 13, 1980	Inspection held with Randolph Evans and others present. A number of potential problems are noted. The majority of the document is illegible.[373]
November 12, 1980	Inspection held with Randolph Evans and Joseph Paushel present. No progress had been made on the installation of control equipment on zinc dust furnaces, or holding pots. A number of other violations are sited for both improper equipment, procedures, and permits.[371]
November 18, 1980	Inspection held with Robert Pride, Paul Rader, Bill Taylor, Joe Paushel, Robert Norton, Brian Aus. The tailings pile was not observed to be smoldering, but due to several continued violation the inspection recommends a cease and desist order be issued. Most of the documents are illegible.[370,369]
February 23, 1981.	Inspection held with Randolph Evans, and Robert Pride present. Opacity of 100% observed from roof monitor of zinc retort and electric induction furnace building. Zinc refuse area burning, and several other continued violations are discussed. The inspection recommends a cease and desist order be issue as soon as possible.[366]

March 11, 1981	Inspection held with Randolph Evans, Robert Pride, Dean Bangor, and Joe Paushel present. Several areas were observed to be smoldering. Further need for improvement discussed with company president.[365]
April 9, 1981	Inspection held with Randolph Evans, Robert Pride, Joe Paushel present. Observation of rotary melter emissions, zinc classification equipment operating without and control equipment, emissions visible, A compliance schedule was requested. Dust emissions reported from the baghouse again. [359]
June 2, 1981	Follow-up inspection conducted to assess the progress of air pollution control equipment. Rudolph Evans, Dean Bangor, Joseph Paushel and Terry Miller present. Progress was minimal. 12 zinc retort furnaces operating with excessive emissions. [360]
September 16, 1981	Inspection held with Randolph Evans, Robert Pride, Gary Saunders, Dean Bangor, Joseph Paushel present. Bag house was not functional, emissions noted from furnaces, and tapping.[356]
March 3, 1982	Inspection held with Randolph Evans, William Klettner, Dean Bangor, and Joe Paushel present. Company has partially completed the ducting of air pollution control system to the same baghouse as the Alpine unit. Company still not in complete compliance. [347]
March 31, 1982	Inspection held with Randolph Evans, William Klettner, Dean Bangor, and Joe Pausel present.
April 20, 1983	Inspection by Robert Pride, Dean Bangor and Randolph Evans. Company is now in compliance. No violations were reported.[338]
August 8, 1984	Inspections was held. William Taylor and William Klettner were present. Several problems with retort furnaces, the rotary melter baghouse, and pulse air baghouse[329]
September 4, 1984	Complaint filed by the wife on an employee of the company stating he had become ill after working in the baghouse.[332]

September 6, 1984	Open burning reported at Meadowbrook.[331]
September 11, 1984	As inspection of the plant finds on evidence of open burning. Meadowbrook is having trouble with the baghouse and experiencing a high rate of failure due to moisture. [330]
January 18, 1985	Complaint received regarding excessive emissions. Emissions were the result of baghouse malfunction. Furnace was taken offline for repairs.[327]
February 5, 1985	Inspection pre-arranged to observe a tap on one of the retort furnaces and associated pollution control equipment. Robert Pride and Dean Bangor present. A tap of a retort furnace was observed, and emissions controlled, but excessive emissions were reported from zinc retort building[323, 322]
August 17, 1993	Inspection conducted. Plant is in compliance.[388]
August 20, 1996	Inspection conducted. Plant is in complinace.[387]
September 29, 1999	Inspection conducted. Possible crack in the neck vent of one retort furnace discovered. [386]
July 1, 2002	Inspection conducted. Plant is completely shut down.[392]

APPENDIX 6

			Attic Bulk Dust						Ratios					
Sample	X Coordinate	Y Coordinate	Distance (km)	As (mg/Kg)	Cd (mg/Kg)	Pb (mg/Kg)	Zn (mg/Kg)		Cd:As	Cd:Pb	Zn:As	Zn:Cd	Zn:Pb	Pb:As
1	556637	4354752	1.84	13.3	8.1	338	8450		0.609	0.024	635	1043	25	25
2	557318	4355321	1.12	5.4	2.7	214	1090		0.500	0.013	202	404	5	40
3	556610	4354819	2.01	11.2	50.0	342	5840		4.464	0.146	521	117	17	31
4	556475	4354596	2.04	118.0	18.3	508	2820		0.155	0.036	24	154	6	4
5	556273	4358031	3.57	17.0	14.5	842	2970		0.853	0.017	175	205	4	50
8	558771	4358053	2.89	12.7	11.9	836	2360		0.937	0.014	186	198	3	66
9	558370	4358563	3.38	34.8	15.5	445	2130		0.445	0.035	61	137	5	13
11	559008	4357258	2.15	5.1	9.2	128	2150		1.795	0.072	420	234	17	25
14	560251	4356881	2.49	35.2	22.1	1570	3890		0.628	0.014	111	176	2	45
15	557943	4355773	0.76	26.0	8.3	532	1820		0.319	0.016	70	219	3	20
16	557974	4355809	0.77	26.7	8.5	1040	34100		0.318	0.008	1277	4012	33	39
17	557594	4355584	0.92	19.6	23.1	3040	4050		1.179	0.008	207	175	1	155
18	557511	4355478	0.96	15.0	7.2	223	1820		0.480	0.032	121	253	8	15
19	558765	4358072	2.91	34.3	19.7	903	4000		0.574	0.022	117	203	4	26
20	559173	4357739	2.66	42.8	59.9	2390	30400		1.400	0.025	710	508	13	56
22	559153	4357750	2.66	58.2	138.0	2410	16100		2.371	0.057	277	117	7	41
23	562474	4354461	4.11	15.3	18.5	1250	4230		1.209	0.015	276	229	3	82
24	562498	4354423	4.14	30.0	25.7	711	4190		0.857	0.036	140	163	6	24
25	559000	4357224	2.12	13.7	4.7	219	1760		0.343	0.021	128	374	8	16
26	558994	4357195	2.09	97.2	62.4	1250	7950		0.642	0.050	82	127	6	13
28	556876	4359228	4.33	62.1	43.4	1380	10500		0.699	0.031	169	242	8	22
29	556916	4359320	4.40	13.8	1.5	312	1910		0.109	0.005	138	1273	6	23
30	556957	4359326	4.39	21.5	27.1	5780	7550		1.260	0.005	351	279	1	269
31	558035	4354789	0.56	6.1	1.9	23	1020		0.311	0.084	167	537	45	4
32	559089	4355486	0.73	14.6	10.5	206	8140		0.719	0.051	558	775	40	14
33	558181	4354768	0.48	29.4	34.6	1900	1010		1.177	0.018	34	29	1	65
34	560223	4355436	1.81	8.7	11.3	4030	3740		1.299	0.003	430	331	1	463
35	560225	4355415	1.81	65.3	148.0	5510	1810		2.266	0.027	28	12	0	84
36	560277	4355346	1.86	49.6	62.1	15000	1300		1.252	0.004	26	21	0	302
37	560240	4355317	1.82	10.3	5.0	293	1530		0.485	0.017	149	306	5	28
38	560244	4355368	1.83	18.0	18.8	547	3290		1.044	0.034	183	175	6	30
39	560721	4354238	2.48	17.1	30.9	3040	5160		1.807	0.010	302	167	2	178
41	558984	4355686	0.75	89.5	340.0	2630	84800		3.799	0.129	947	249	32	29
42	558986	4355655	0.73	51.7	199.0	5510	2970		3.849	0.036	57	15	1	107

			Attic Bulk Dust					Ratios					
Sample	X Coordinate	Y Coordinate	Distance (km)	As (mg/Kg)	Cd (mg/Kg)	Pb (mg/Kg)	Zn (mg/Kg)	Cd:As	Cd:Pb	Zn:As	Zn:Cd	Zn:Pb	Pb:As
45	556859	4352081	3.48	63.2	174.0	6270	3070	2.753	0.028	49	18	0	99
46	556844	4352094	3.47	14.6	9.0	125	856	0.616	0.072	59	95	7	9
47	558721	4355178	0.30	25.0	95.0	2000	34000	3.800	0.048	1360	358	17	80
48	558771	4355215	0.35	59.0	580.0	2900	88000	9.831	0.200	1492	152	30	49
49	558764	4355202	0.34	36.0	260.0	1700	59000	7.222	0.153	1639	227	35	47
50	557658	4353784	1.60	15.5	13.3	934	3630	0.858	0.014	234	273	4	60
51	557975	4354417	0.89	17.7	30.3	1050	5470	1.712	0.029	309	181	5	59
52	557988	4354451	0.86	15.2	14.5	212	2600	0.954	0.068	171	179	12	14
54	557230	4354055	1.65	79.8	78.1	1890	10000	0.979	0.041	125	128	5	24
58	558922	4354716	0.68	13.8	4.7	384	1240	0.341	0.012	90	264	3	28
59	558922	4354667	0.72	17.0	32.2	3370	10400	1.894	0.010	612	323	3	198
60	558696	4355550	0.45	227.0	2280.0	12800	220000	10.044	0.178	969	96	17	56
61	558722	4355534	0.46	95.9	1130.0	4970	97400	11.783	0.227	1016	86	20	52
63	558635	4355596	0.46	51.0	560.0	3300	56000	10.980	0.170	1098	100	17	65
64	558494	4355866	0.68	86.3	45.4	1320	7030	0.526	0.034	81	155	5	15
65	558715	4355328	0.32	96.0	1300.0	4800	100000	13.542	0.271	1042	77	21	50
66	558696	4355305	0.30	43.0	390.0	2300	49000	9.070	0.170	1140	126	21	53
67	558685	4355277	0.27	61.0	610.0	5400	69000	10.000	0.113	1131	113	13	89
68	558756	4355188	0.33	44.0	190.0	2500	32000	4.318	0.076	727	168	13	57
69	558667	4355235	0.25	45.0	540.0	2300	71000	12.000	0.235	1578	131	31	51
70	558506	4355522	0.35	66.0	360.0	5400	98000	5.455	0.067	1485	272	18	82
71	558387	4355595	0.41	61.0	610.0	5500	69000	10.000	0.111	1131	113	13	90
24A	558713	4355498	0.42	44.0	330.0	2300	35000	7.500	0.143	795	106	15	52
UMC	558631	4355472	0.35	73.0	350.0	5300	97000	4.795	0.066	1329	277	18	73
Background				8.8	0.5	25	88	0.057	0.020	10	176	3.52	2.84
Tailings Pile Average				1008.0	150.0	2414	41105	1.23	0.340	275.08	1722.43	43.76	10.72

Background data taken from Flowers, 2005.
Tailings pile average taken from WC Diamond, 2001.