NORTHWEST COALITION for
ALTERNATIVES to PESTICIDES
P.O. BOX 1393 EUGENE, OREGON 97440 (503) 344-5044

FREEDOM OF INFORMATION ACT REQUEST

Susan Lawrence/Therese Murtagh
Information Services Section
EPA (TS-757C)
401 M Street SW
Washington DC 20460

January 5, 1988

Dear Susan,

Under the Freedom of Information Act, our organization requests all analytical procedures for detecting glyphosate (active ingredient of Roundup and Rodeo; Monsanto) in water, soil, foliage, tissue, blood and urine.

As indicated in the enclosed letter from the Oregon Department of Agriculture, NCAP has been informed that "these methods are currently proprietary to the manufacturer of glyphosphate [sic], Monsanto Company."

Under the Federal Insecticide, Fungicide and Rodenticide Act 7 USC 136h(d)(1), "All information concerning the...methodology...of any test...performed on or with a registered...pesticide...and any information concerning...the behavior of such pesticide in the environment, including...studies on...fate in the environment...shall be available for disclosure to the public."

As this information will be used in the public interest in order to inform people of the risks inherent in public use of Roundup or Rodeo, we request a waiver of fees.

Sincerely,

Mary H. O'Brien

Mary H. O'Brien
Information Coordinator, NCAP

Copy August 29, 19

KILLER OR COINCIDENCE?

Controversy has arisen in several locations where groups of concerned citizens and experts have attempted to link a rising cancer rate with the spraying of a herbicide.

By Keith Schneider

Please read -.
May have bearing on
Dead Pigeon River
(also - Note Bowater implications
They've been going at it for
25 years NOW.

CANCER CLUSTERS 1981 - PUBLISHED

Sent to Gay Nebb - HARTFORD.

In the southwestern corner of North Carolina's Cherokee County, near the Tennessee Valley Authority's massive Hiwassee Dam, Route 294 twists through the mountains for nine miles before it reaches Alma and Jimmy Chapman's house. For most of her life, 51-year-old Alma Chapman considered the mountains that overshadow her home benevolent guardians, protecting the peace and isolation of the state's westernmost county. In winter, the majestic peaks of the Snowbird Mountains are covered with snow. In spring, deep streams boil off the steep slopes, filling the mighty Hiwassee River to the top of its banks.

But now, Alma Chapman has come to distrust the mountains' protection. She and others maintain that Cherokee County's 19,000 residents are victims of an ecological horror story. For years the county's cancer death rate was well below the state and national averages, but recently that rate has soared. In 1973, only 26 of the 181 people who died in Cherokee died of cancer, according to state figures. That year Cherokee ranked 50th among North Carolina's 100 counties in deaths due to cancer. In 1976 the story was much the same: 27 of 161 deaths were caused by cancer, according to state statistics, and Cherokee ranked 54th among all North Carolina counties. But by 1979, the situation changed abruptly. More than one death in four — 45 of 174 — was due to cancer, and according to state statistics, Cherokee's cancer death rate was the state's fourth highest. In 1980, the high cancer death rate continued: 46 of 171 persons who died in Cherokee died of cancer. The cancer death rate in 1981 moderated somewhat — 34 of 160 deaths.

"I know something's wrong here," says Alma Chapman. "This is a bad area. About every time you turn around now, somebody's dying of cancer." Mrs. Chapman and other county residents believe they know what is causing their problem. The streams, they believe, may be carrying a potent poison out of the forests and contaminating springs and wells from which most people there draw their water. That "poison" is a powerful agricultural chemical called picloram, manufactured only by Dow Chemical Company, and contained in a line of broadleaf-weed and woody-brush killers marketed by Dow under the trade name Tordon.

Their suspicions have caused a debate that is being echoed in corporate offices and medical labs, in Washington, D. C., and among affected residents of other towns and counties across the country. Is picloram a carcinogen, as its opponents fear, or as safe as its manufacturer and users claim? And if it is safe, what does the circumstantial evidence against it mean?

Picloram entered the American marketplace in 1963. It is one of the four major products sold by Dow's agricultural chemicals division, which had revenues last year exceeding $550 million.

Millions of pounds of Tordon are poured on the land each year. The chemical has emerged as one of the popular herbicides nationwide.

Railroads use it to keep roadbeds clear. State transportation departments apply it to shoulders and medians. Electric power companies spray it from helicopters on rights-of-way to hold down weeds. The U. S. Forest Service and some of America's paper companies use Tordon to trim pine stands of uneconomical hardwoods. Farmers spread it on fence lines.

Since 1979, Tordon's use has increased dramatically. That year, the Environmental Protection Agency (EPA) suspended the use of 2,4,5-T, a chemical contained in Agent Orange, because it was linked to miscarriages in Oregon women. Since its suspension, the many users of 2,4,5-T have found Tordon to be an effective substitute.

Half a cup of Tordon will kill a century-old oak in less than a month.

Keith Schneider has received a grant from the Fund for Investigative Journalism to continue his research into pesticide registration and chemical-company influence in Washington.

Fifteen pounds can keep an acre of pastureland clear of brush and weeds for up to three years. Because of the toxicity of Tordon products to plants, the EPA, which registers more than 2,000 pesticides, classifies Tordon as one of 37 "restricted-use" pesticides. Tordon can be lawfully applied only by trained applicators with a special-use permit. Fear that the chemical is also toxic for humans has made it the target of environmental concerns. In recent months health researchers and environmentalists across the country claim to have linked picloram to a host of serious health disorders including cancer, birth defects, respiratory difficulties, joint abnormalities and brain damage. It is a linkage that Dow Chemical refutes.

The application of Tordon has special meaning for the South. No Southern state escapes the annual Tordon drenching. In 1979, according to a report prepared for the EPA by a California-based consulting group, nearly 700,000 pounds of Tordon were used on 135,000 acres throughout the Southeast. The primary users were paper companies preparing their clear-cut areas for new seedlings.

International Paper Company uses 160,000 pounds of Tordon on 8,000 acres of timberlands, most of which are in the South. The Tennessee Valley Authority (TVA) annually sprays 43,000 pounds of Tordon to clear 160 miles of transmission lines and 1,000 acres of woodlands in seven Southern States. Each year the Forest Service uses almost 49,000 pounds of picloram on 77,000 acres of national forest, much of it in the South.

Instructions on Tordon containers specifically state Tordon should not be used where groundwater flows less than 10 feet below the surface or within half a mile of streams used for irrigation or household purposes. "Do not allow Tordon to contaminate water used for drinking, irrigation or other domestic purposes," warns the label.

North Carolina officials are particularly interested in the Cherokee County situation because there is hardly anywhere in the county that is more than half a mile from a stream or spring, or where groundwater is not less than 10 feet from the surface. Authorities are also interested in the startling rise in the number of cancer deaths and the furor over the suspected role of Tordon in the local health problem. The North Carolina Department of Human Resources has assembled a task force of epidemiologists and toxicologists to study the perceived cancer crisis and to test for the presence of picloram. The task force, which will be led by Dr. Greg Smith, 31, was expected to arrive in Cherokee in mid-July. State health officials have suggested that the increase in the county's cancer death rate may be attributable to other factors — better reporting of mortality statistics in recent years and an increase in the area's population of retired residents. The task force will explore these possibilities.

Some local residents, however, have not been so reluctant to jump to conclusions; they suspect picloram.

The first time Mrs. Chapman saw a helicopter spraying was in mid-May 1966. The chopper came up over the ridge across Route 294 and roared along the summit trailing a fine mist of herbicide from booms jutting out from each side like wings. Periodically since then, Mrs. Chapman and many other residents of the Hiwassee Dam district have sighted other helicopters spraying Tordon in their area. Some of the helicopters sprayed the TVA's power line right-of-way, which begins at the dam and continues west to the Tennessee border. Other copters were spraying under contract to Bowater Southern Paper Company, applying Tordon to their large timber tracts in the district.

TVA officials confirm the company has used Tordon on their power line rights-of-way since 1965. The last time helicopters sprayed the rights-of-way was in the late spring of 1981. Clarence Streetman, a spokesman for Bowater, also confirmed the use of Tordon but refused to outline where the company sprayed, in which

Photography by Barry Hecht

? RESULTS

PLEASE NOTE

years they sprayed or how much Tordon was used. "I'm not sure that would do us any good," he said. Both TVA and Bowater maintain picloram will not harm human health.

But there is no doubt in Mrs. Chapman's mind that the Tordon sprayings caused the health problems she and her husband, Jimmy, have experienced in the last 16 years. Immediately after the first spraying, she says, Jimmy suddenly was covered by painful blisters from head to toe. Days later he began having trouble breathing. After he had been hospitalized for two weeks in Atlanta, perpelexed physicians diagnosed his case as emphysema, an unusual condition for a man of 35 who was not a heavy smoker. Throughout the 1970's, Jimmy's health complaints mounted. They were a variety of mysterious ailments physicians could not solve. More recently, Jimmy has been told he has skin cancer and in mid-June he returned from the hospital after surgery on his prostate. Six years ago Mrs. Chapman was struck with a rare cancer called squamous carcinoma, which grew at the base of her tongue. She was told by her doctors such a cancer was one of 30 known cases nationwide.

Her ordeal has lasted six years. She's endured radiation treatments that caused her to lose more than 50 pounds and she's had several operations, including two last winter to replace her jawbone with one manufactured from plastic.

"This all started after they sprayed that first time," she says. "This stuff can kill big timber. It can kill fish. You know, a lot of us are sure it will kill people, too. It's strange what's going on here."

Local leaders, including some area physicians, say there is no cancer scare. "Determining the incidence of cancer is a complex issue," says Dr. Judith LittleJohn, a 34-year-old internist who lives in Murphy (population 2,100), the county seat. "I don't feel it's being treated that way right now. It's been distorted." Still, as the weeks go by, more and more residents are convinced the number of people dying from cancer in Cherokee is far more than the state figures indicate.

In the Hiwassee Dam district, people are beginning to compare notes on the number of cancer victims. Last winter Elaine Voyles, a grandmother who lives close to the dam, compiled a list of cancer victims from the community, dating back to 1972, with over 80 names on it. Only 12 of those people are still living. What's more, says Mrs. Voyles, the number of new victims appears to be increasing. Between January 1980 and January 1982, 17 people from 140 families in the district were stricken with cancer. In the Hiwassee Dam School two teachers have skin cancer. A child who just finished the first grade has lung cancer.

In the Warne section, midway between Murphy and Hayesville, four people died of cancer last year. In the Peachtree area, seven miles south of Murphy, residents say they can count more than a dozen cancer victims since 1980.

One of the most recent victims in the Peachtree area is Arvel Stiles, 57, who worked on a U.S. Forest Service crew for 16 years, injecting Tordon into hardwoods with a dangerous-looking tool called an injector gun. Forest Service officials contend using injector tools to apply Tordon in wooded areas is ecologically safer than spraying. Stiles says using the tool is a messy process. "You can't work with it without getting it all over you," he says. "It's spilled on the ground. I've had it splatter in my mouth. You get used to it." On April 25, surgeons removed a cancerous growth from his back, leaving a saucer-sized scar. As he convalesces, Stiles often sits on his porch. From there he can see a half dozen houses through the trees. Every house, he says, contains someone who has cancer or who has died of cancer within the past two years. "It's cancer all the time now," he says. "It's awful bad."

And in a 200-family section of the Hanging Dog community, west of Murphy, residents report that 18 people were struck by cancer between January 1980 and January 1982. Six people died during the two-year period, including a 25-year-old man. "This used to be a paradise," says Helen Dockery, 49, who lost both her breasts to cancer a year ago. "But no more. Everybody's sick. Every other house has got cancer, nearly."

Although the latest figures released by state officials show that Cherokee County's cancer death rate appears to have moderated in 1981 — with 34 of 160 deaths due to cancer — some residents believe the most recent statistics show that many cancer deaths are going unreported. Frank

KILLER?

(Continued from page 9)

Rose, 43, a funeral home director in Murphy, began an inquiry in mid-June, after becoming concerned about the wide gap between what he was seeing and what local officials were saying. Rose determined that of the last 100 funerals at his mortuary, 28 deaths were due to cancer. He also noted apparent discrepancies between what he knew about how some people died and what was written on the death certificates by physicians. "Some of those people I knew personally," he says. "It would say on the death register they died of a coronary occlusion, and not note the fact they had cancer for the last two years."

Colin Ingram, a technical writer who lives in the Hanging Dog community, has begun to map cancer deaths in Cherokee between 1977 and 1981. There are already 158 names on the list, he says. "I want to compare them with what the state said the cause of death was. We're going to show that cancer deaths here are underreported by at least 50 percent."

Wendell Mullison, a retired Dow researcher retained by the company as a consultant, insists that picloram is not responsible for any health problems. "Picloram is completely safe for humans," he says. "You know, table salt is three times more toxic."

Another Dow spokesman, Robert W. Charlton, defended the continued use of Tordon, saying, "We feel it's safe."

In a recent news release, Charlton wrote: "Both the National Cancer Institute and the Environmental Protection Agency have reviewed toxicology studies on Tordon and concluded that the herbicide does not cause cancer in laboratory mice and rats."

Indeed, the EPA has joined the company in maintaining picloram is safe. "We have no current evidence that picloram is posing health risks or unreasonable adverse effects to human health or the environment," reads an EPA statement released on May 12, "although more data is needed on long-term effects to support this conclusion."

EPA's conclusion, however, is based on a series of cancer research reports now being seriously questioned by environmentalists and health researchers.

The first two studies were performed by Industrial Bio-Test Laboratories of Northbrook, Illinois, at one time the nation's largest chemical testing firm. Last summer Dr. Joseph Calandra, the lab's former president, and three of his assistants were indicted by the federal government for falsifying data, fabricating test results and substituting fresh test animals when animals died during tests. Industrial Bio-Test was shut down. Almost 200 of its research studies concerning pesticides now used on a wide variety of products were found to be so deficient as to be considered invalid. The Bio-Test studies on picloram were among that group.

The EPA, late last year, directed Dow to repeat the picloram cancer research studies, according to William Burnam, deputy chief of the agency's Toxicology Branch. Dow's studies will not be finished and ready for review until 1985.

The other major picloram research was conducted by Gulf South Research Institute in New Iberia, Louisiana. Gulf South pathologists found "neoplastic nodules" of the liver in female rats fed picloram, but they classified them as "benign tumors." In 1977, the same year Gulf South finished its cancer research on picloram, under contract to the National Cancer Institute (NCI), the EPA audited the lab. The investiga-

Dave Merrill

tors found "improper feeding techniques," "possible cross contamination of diets with other substances being treated concurrently in the same room," "improper recording of age of animals at death," "questionable animal-identification and record-keeping practices," and "discrepancies between raw data and final report." The most serious deficiency, according to the auditors, was the last one.

Gulf South's classification was disputed by the NCI's Data Evaluation Risk Assessment Subgroup, a committee of 10 eminent scientists from around the country including researchers from the Massachusetts Institute of Technology, the Mayo Clinic and the University of Texas. The committee filed a report with NCI that said, "The conclusion drawn in the [Gulf South] report on the carcinogenicity of picloram was inordinately conservative." They suggested the study be repeated. They also wrote: "Picloram should be regarded as a carcinogen since the liver lesions, if not malignant, are at least a step in the pathogenesis of cancer."

The findings of the NCI group are supported by the research of Dr. Melvin D. Reuber, a 51-year-old pathologist from Columbia, Maryland. In 1979, Dr. Reuber, then director of the Experimental Pathology Laboratory at the Frederick Cancer Research Center in Maryland, reviewed hundreds of tissue slides that had been prepared by Gulf South for their picloram study under contract for NCI; he also reviewed slides prepared by Dow. In an article published last year in the prestigious *Journal of Toxicology and Environmental Health*, Dr. Reuber wrote that where Gulf South and Dow pathologists had found no malignancies, he found dozens, cancers that spread throughout the bodies of rats fed both large and small doses of picloram.

For 10 years Dr. Reuber was regarded as one of the nation's finest experimental pathologists. Between 1973 and 1978 he was the EPA's primary expert witness in hearings to ban five carcinogenic chemicals from the marketplace. But with the coming of the Reagan administration, charges Dr. Reuber, a new myopia engulfed the EPA and the NCI.

Last year, after Dr. Reuber spoke out against the use of malathion in California to kill Mediteranean fruit flies because he considered the chemical carcinogenic, Dr. M. G. Hanna Jr., director of the Frederick Center, decided Dr. Reuber had spoken once too often. In a scathing letter of admonishment, that has since been published and distributed nationwide, Dr. Hanna accused Dr. Reuber of "creating controversies that have both scientific and economic impact." Dr. Hanna charged Dr. Reuber with "carelessness and lack of professional expertise."

Dr. Reuber defends himself by saying the political changes within EPA and NCI finally caught up with a cancer researcher who was costing the petrochemical industry millions of dollars. "Dow and Shell and Du Pont have been gunning for me for a long time," he says. Dr. Reuber has filed a $7-million lawsuit against officials of NCI and Litton Industries — a Litton subsidiary owns the Frederick Center — charging they conspired with petrochemical industry leaders to "ruin him professionally." "There's no doubt in my mind that picloram is a carcinogen," says Dr. Reuber. "If you look at the tissue slides from the rodents fed picloram, any pathologist could see it causes malignant tumors."

Dow has responded to Dr. Reuber's charge by saying "Dr. Reuber's opinion is suspect," because it is "at odds with" positions taken by NCI and EPA and therefore "can only be considered a minority opinion."

Yet Dr. Reuber's findings have the full support of Dr. Adrian Gross, a senior science adviser in the EPA's Pesticide and Toxic Substances division. "If the dangers of picloram rest on his perception, I would trust his perception," Dr. Gross says. "He's a man of considerable knowledge. A few pathologists agree with him and they're the cream of the crop."

Despite EPA's official position that picloram is not a
not dangerous to
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Last March, EPA and D
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a classified report, since made lic under the Freedom of Information Act, the researchers said picloram is "a potentially harmful herbicide once it enters surface and groundwater systems," and they recommended "the use of picloram be discontinued." Between 1965 and the end of 1970, 5.24 million gallons of Agent White were poured on the jungles of Vietnam. In 1971, after the report was delivered to military officials, Agent White's use in Vietnam was halted.

Two years later, at the end of 1973, a team of researchers from the National Academy of Sciences (NAS) went to Vietnam and interviewed more than 30 Montagnard tribesmen from three provinces that had been sprayed 12 times between August 1968 and June 1969, according to an NAS study published in 1974.

"The interview subjects consistently reported that illness occurred among people who lived in or near sprayed areas," said the report. "The most common symptoms were abdominal pains and diarrhea, with vomiting, respiratory symptoms and rashes also frequently reported. Some respondents said there were unusually high numbers of deaths, particularly among children, following the spraying."

More recently, picloram has been accused of causing similar health disorders here at home.

— In Augusta, Georgia, nine members of three families living along Turner Drive have sued Dow and the Georgia Power Company, charging that applications of Tordon 10K pellets, used to clear a power line right-of-way abutting their property, leached picloram into their well between 1976 and 1979. According to their attorney, John C. Bell Jr., a research team from the University of Georgia tested samples of water taken from the well a year after the last Tordon application and found high concentrations of picloram. (Tordon 10K is composed of 10 percent picloram and 90 percent inert ingredients.) The medical difficulties suffered by the three families since the Tordon application have included kidney cancer, gynecological problems, kidney, bladder and skin ailments, they charge.

Other Tordon-related suits have been filed in Cusseta, Alabama, and Otis, Oregon, against the chemical's users and manufacturer. In the Cusseta action, Dr. Jesse Bidanset, an associate professor at St. Johns University in New York and one of the country's leading forensic toxicologists, was hired by plaintiff Mark Alley to test the soil and water around his house 14 months after it had been sprayed with Tordon 101. Although EPA scientists claim that Tordon breaks down between one and a half to 11 months in warm climates, Dr. Bidanset found concentrations so high that he estimates it will take 20 years or more for picloram to leach out of the soil.

Dr. Ruth Shearer, a molecular geneticist and former program director for cancer research at the Issaquah (Washington) Health Research Center, another facility funded by NCI, has been one of picloram's most persistent investigators. She has been studying the low-level toxic effects of picloram poisoning for the past two years as a private consultant. Her research has yielded these results:

— In Page, West Virginia, Dr. Shearer found a woman whose Christmas tree farm had been doused with a mixture of picloram and Krenite, another herbicide. Within 45 minutes of the spraying, her skin started to burn, her eyes watered, and she developed a hacking cough that became chronic. In medical tests she was found to have a swollen thyroid. Her joints swelled and stiffened. She sued Appalachian Power Company, and her case is pendng.

— Near Butte, Montana, a part of Montana's tax-supported program for weed control, a 45-year-old man was applying Tordon 101 to weeds along the road in front of his house. The state sold the herbicide to the man but failed to notify him of its restricted-use classification or the dangers associated with applying Tordon. Without protective gear, the man sprayed an area adjacent to his home. Friends rushed him to a hospital in Butte when he complained of headache, nausea and dizziness. Doctors were unable to diagnose his condition. Later, the man's joints swelled. Boillike lumps appeared on his skin. His muscles twitched and ached.

— In Tellico Plains, Tennessee, just 60 miles west of Cherokee County, Dr. Shearer interviewed members of the Ernest West family. The Wests recently sued Dow and the U.S. Forest Service for $14 million, charging that Tordon was carried off the nearby mountain slopes by heavy rains and poisoned the family spring in 1978. Within a short time, three of the Wests' horses died. After that, West and 10 other

Very close To us— He LOST suit.

embers of his family began suffering from an assortment of disabling health problems, says his attorney, Ward Whelchel of Knoxville. Wests' 8-year-old granddaughter experienced convulsions, tremors in her hands and legs indicating brain damage, and disturbing personality changes.

Dow and the Forest Service investigated the complaint and vigorously deny any responsibility for the family's health problems. Says U.S. Department of Agriculture attorney Judith Curry, who is handling the case for the Forest Service: "We are quite sure their problems did not result from our applications of Tordon 101 in that area."

Some people in Monroe County, Tennessee, where Tellico Plains is located, aren't so sure. The West case and several other incidents involving picloram sprayed on private property in the area prompted the Monroe County Board of Commissioners to ban the use of Tordon in the county July 22, 1980. Nevertheless, Bowater Southern Paper Company, which owns 11,000 acres in Monroe, and the Forest Service continue to use Tordon there. "If our policy of timber management calls for use of a chemical, we will use that chemical despite any ban," says Bruce Jewell, a spokesman for the Cherokee National Forest.

Monroe County's efforts are similar to other municipal and state governments around the country. Officials in Wisconsin and Oakland, California, have suspended Tordon's use in some areas, and public and private inquiries into the advisability of using it are underway in Maryland, Maine and Minnesota. This summer, two Congressional committee investigations of picloram's approval by EPA were convened in Washington.

Dr. Ruth Shearer, though, has come to a different conclusion: "What I'm seeing with picloram poisonings are patterns of chronic symptoms. The EPA says it's safe, basing their assumption on a group of nonsense reports. They ignore these cases around the country. They allow the company to conduct its own research. All I know is that picloram is very dangerous stuff." ■

← CLOWNS OF THE DEVIL.

WHO REPRESENTS WHO OR SPY VS. SPY ??

← DO I SEE A FAMILIARITY HERE?

REGARDLESS OF IT BEING PICLORAM OR GLYPHOSATE (& INERTS) YOU WILL SOON SEE CHAOS IN THE EPA SYSTEM AS MORE & MORE JOIN THE FORCES.

LINCOLN SAID "RIGHT MAKES MIGHT" AND GOD PROTECT US.

AMEN.

Hartford, Tenn., residents, standing above the polluted Pigeon River, hold photographs of relatives who have died of cancer.

Hartford residents fear Pigeon River dioxin

See "Cherokee County" cancer clusters

By JERRY KAUFFMAN
News-Sentinel correspondent

HARTFORD, Tenn. — They call their town Widowville.

"It's a sad joke," says Postmistress Mary Woodey. "There are more widows here than any community I ever heard of. Just about everybody here seems to have relations that have died of cancer."

Until last year, Woodey said, the people of Hartford accepted the cancer deaths as "something that just happened."

But stories about pollution in the Pigeon River caused the community to take a second look. Many are beginning to wonder whether the river that has played a central role in their lives for generations may be slowly poisoning them.

Woodey and a few other town women compiled a list of friends and relatives in the town who have died of cancer in the past 20 years. The tally came to 167 — in a town with a stable population of about 500 people for the last 20 years.

> *"You get to where it doesn't matter, if you figure you'll get cancer no matter what you do. I know I'll get it. That's just how it is."*
>
> **Debbie Frazier**
> Hartford, Tenn., resident

Hartford is located in Cocke County, between Waterville, N.C., and Newport, Tenn. It is a picturesque town nestled at the base of the Great Smoky Mountains. Three stores with gas pumps, a single school and a double handful of clapboard houses line the Pigeon's banks.

Everyone seems to know everyone else.

They know who is getting married and who is having a baby.

They also know who is dying of cancer.

"There were all sorts of cancer, for men and women both," Woodey said. "The ages went from people in their 30s to people in their 50s." She said most lived on or near the river or fished in its branches.

Margaret Jenkins' husband, Joel, died of kidney cancer. Charley Levitts' mother died of uterine cancer. Dorothy Frazier's father died of prostate and bone cancer. The same year she was diagnosed with cervical cancer. Dorothy survived, but her husband, Ben, died of pancreatic cancer in December.

Then there were the Cagle women. All five of them.

Woodey doesn't claim the informal survey is scientific or even completely reliable. However, she and the other people of Hartford believe it reveals a cause for concern. They want someone to do some testing.

They think the fish they used to eat from the river may have been contaminated. Those who live on the river have quit using their wells because they fear the water table is contaminated.

After taking the survey, Woodey and Gay Webb, a member of an environmental group called the Dead Pigeon River Council, relayed their fears to the state Water Quality Control office in Knoxville and asked that wells be tested. Webb said that, after months of residents' waiting, one

Please see CANCER, page A8

about the deaths of her parents, Denzel and Wilma Cates, who died within 30 days of each other and now rest under a common headstone, above center. Above right, Ernestine Cagle counts the names of the five Cagle men who died of cancer. Left, Betty Jean Cagle teaches math in the Hartford Elementary School. The well for the school is within 150 yards of the Pigeon River bank.

Photos by Michael Patrick
News-Sentinel staff

> *"We didn't believe the doctors knew what they were talking about when they said both our parents had cancer. They were both active; mama went to the doctor every year for a checkup and dad never got sick."*
>
> **Sharon McGaha**
> Hartford, Tenn., resident

factory workers.

However, Dr. Renata Kimborough, who specializes in dioxin research for the EPA in Washington, said dioxin has "never been directly connected" with cancer in humans.

"Many people get cancer, and, while we have been able to identify other carcinogenic chemicals through research on workers, we haven't been able to do that with dioxin."

If the people in Hartford "are very upset, it might be useful to go in and conduct a study" to set their minds at ease, she said.

That's exactly what a group of doctors in Newport plans to do.

Drs. Michael Hood and Stephen Gore plan to establish a study of Hartford through the National Institutes of Health.

The study will involve researching medical records of cancer patients from Hartford and having the townspeople fill out questionnaires, Hood said. Then the number of patients with possibly environmentally linked cancer will be compared to a nearby population on a non-polluted river.

"They will have the same lifestyles, the same diet and the same genes," Hood said. "It will be a valid study."

In the meantime, the people of Hartford wait and worry.

Wilma Cates was 49 years old in October 1986 when she learned she had breast and lymphatic cancer. She lived six months. Her husband, Denzel, was told he had bone cancer just six weeks after his wife was diagnosed. He developed three different kinds of cancer before he died 30 days after his wife. He was 52.

"We didn't believe the doctors knew what they were talking about when they said both our parents had cancer," said daughter Sharon McGaha. "They were both active; mama went to the doctor every year for a checkup and dad never got sick."

McGaha; her sister, Denaie; and brother Jeff are still learning to accept the loss of both parents. It's been eight months, but the door to the parents' bedroom remains closed.

However, if painful memories can be partially shut away by a locked door, suspicion and worry cannot.

Denaie Cates' son has nightmares about his grandfather's death. If he gets a sore throat, he is certain he is going to die, his mother said.

Dorothy Frazier's 28-year-old daughter, Debbie, does not care any more. With tears streaming down her face she said: "You get to where it doesn't matter, if you figure you'll get cancer no matter what you do. I know I'll get it. That's just how it is."

EE

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A3

TELEVISION

Not all smiles

There's a serious side to Vanna White/ **B5**

SPORTS

Thriller

Vols nip Gators with 2 seconds left/ **C1**

THURSDAY MORNING

e Knoxville News-Sentinel

FEBRUARY 25, 1988

85 Cents

new of Pigeon dioxin, group says

rs

"covered up" knowledge of dioxin contamination in the Pigeon River.

The Dead Pigeon River Council said it will ask a congressional oversight committee to investigate the agency's handling of a wastewater permit for Champion International's paper mill in nearby Canton, N.C.

Fran Ketterman said she and other members of the council have been told by EPA Water Management Director Bruce Barrett and EPA Atlanta Division Director Lee Dehines that the agency knows there is dioxin in Champion's effluent and that there "has been for 80 years."

Considered by some scientists to be the most potent carcinogenic the EPA has ever identified, dioxin has caused cancer in laboratory animals. It is believed by some experts to cause cancer in humans.

Council members said they are considering filing a lawsuit against the EPA for starting compromise permit conferences with Champion and Tennessee officials on Feb. 15, one week before the deadline for public input on the permit.

The Pigeon River flows past the Champion plant in Canton, N.C., and enters Tennessee in Cocke County before emptying into Douglas Lake.

Ketterman said the council will ask for a federal investigation to find out if the Pigeon River was included in a 1986 EPA dioxin survey of paper mills and the waterways in which they discharge waste.

Tennessee officials have said that Champion, one of the oldest [illegible] country, should have been included in the survey. EPA officials say it was not.

However, Ketterman and council Co-chairman Nelson Ross contend the EPA took water samples from the nearby French Broad River and Cataloochee Creek. They say this makes them suspect the Pigeon River was tested and the results supressed.

"It is a very big 'why,' " Ross said. "

Please see DIOXIN, page A

Bearan says

days in jail and a $1,000 fine.

Dioxin

Continued from page A1

wish I could say I don't believe this, but it would not surprise me to find out the Pigeon had been included in the testing."

Champion uses a paper bleaching process that has been shown at other mills to create dioxin as a by-product. EPA has taken fish samples from the Pigeon River to test for dioxin, but the agency says tests are not completed.

However, Ketterman said both Barrett and Dehines during separate telephone conversations the past week told her they knew the Pigeon River had been contaminated with dioxins. They added, however, that "shutting Champion down would set a precedent that the 80 other paper mills in the country that use the same process would have to follow," she said.

She said Barrett told her that dioxin has "been in the river for 80 years and that a few more years won't matter."

Champion has "generally agreed" to change its bleaching process to another process, Dehines said Wednesday. Paul Davis, deputy director of Tennessee Water Quality Control, said earlier this week that the alternate process "gets rid of most of the chlorine in the bleaching process and reduces the dioxin hazard by about 75 percent."

Ketterman said Dehines told her that 17 senators and the governors of South Carolina, Georgia, Florida and Alabama have contacted him. He said the EPA "has to do what is right for most of the people."

"Mr. Dehines said that in this case most of the people are in Canton, and that there are 20,000 people in the Southeast alone whose income depends on paper mills. He asked what I would do if I were in his shoes."

Barrett was on leave Wednesday and could not be reached for comment. However, Dehines agreed he had made comments about political pressure and dioxin contamination in the Pigeon River. He said they were not made in the way Ketterman represented.

"We know that, because of the kind of mill that Champion is and the bleaching process used, that very likely dioxin is in some of the sludge and effluent, but the sampling results are not in yet so we don't know for certain."

Dehines said because dioxin is a toxic pollutant, and because both Tennessee and North Carolina laws prohibit the discharge of toxins into any river, the issue "probably should have been addressed a long time ago. The states allowed Champion to do this for a long, long time. The EPA just entered into it," he said.

The Dead Pigeon River Council revealed the past fall that EPA had done a study of paper mills in 1986 and found dioxin outside five of them. However, the council feels the issue might never have been made public if they had not brought it up. Ketterman and Ross said they first learned about the dioxin study from the enviromental group Greenpeace instead of from federal and state officials studying the waterway.

"It was never mentioned to us, even though we had had a private meeting with Champion officials. When Oliver Blackwell (operations manager for Champion) found out we had released the information about dioxins to the press, he became very upset and accused us of wanting to see the mill shut down."

Ross believes the American paper industry as a whole and the federal government are "trying to downplay" the hazards of dixcin.

Dioxin has been a matter of controversy in the Agent Orange cases brought by Vietnam veterans, the destruction of dioxin-contaminated Times Beach, Mo., and at Love Canal where a chemical dump was blamed for cancer and birth

At Bowater, producing newsprint is only part of the story. Bowater Southern is involved in a variety of activities that keeps the company at the forefront of progress in the forest products industry.

WOODLANDS:

To ensure a base supply of wood fiber for the Calhoun mill, Hiwassee Land Company, the company's woodlands organization, manages some 579,000 acres of forest land in a five-state region. About 344,000 acres of forest land are in Tennessee with the remainder in Georgia, Alabama, Mississippi and North Carolina. This land is managed to produce nearly half of the mill's wood needs, with the balance purchased from other landowners. Bowater spends $1 million a week for wood delivered to the mill.

Hiwassee Land Company employees more than 50 professional foresters, including three assigned to work with other landowners to encourage sound forestry practices.

Company lands are generally accessible to the public for hunting, hiking and other outdoor recreational activities. Four choice natural sites in Tennessee have been set aside as "Pocket Wilderness" areas, and the company has built and maintains hiking trails into and through these areas.

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rivate group investigating
emedies for river pollution

AMDEN (AP) — A Tennessee Valley
hority task force studying river pollution
vasting time and money while mussels
catfish continue to die at an alarming
, members of a private environmental
up say.

They should disband," John Bates said
urday, referring to the Kentucky Rese-
Water Resources Task Force. Bates is a
ginia ecologist who is studying the rese-
for the Tennessee Department of Health
Enviornment.

Bates said the 15-member government
k force formed by the TVA has ignored
recommendations about pollution in the
nessee River. And he said the task force
vasting time and taxpayers' money dupli-
ng a study that was already done at the
e.

The task force has spent more than
0,000 studying the problem in the past
r, but has developed no conclusions.

Bates told coalition members that mussels
catfish have been dying in large num-
s in the Kentucky Lake and Tennessee
er for unknown reasons. The deaths have
sed concern among residents, fishermen,
vironmentalists and river-dependent
inesses.

The mussels and fish may be dying in the river from an AIDS-like disease caused by lingering traces of pesticides and herbicides, Bates said. Acquired immune deficiency syndrome is an affliction in which a virus attacks the human immune system, leaving victims susceptible to a wide variety of infections and cancers.

Members of the Kentucky Lake Coalition met in Camden on Saturday and discussed initiating their own study of pollution and possibly filing a lawsuit to stop further contamination of the waterways.

About 40 members of the coalition agreed to meet against Oct. 10 to appoint six committees to look into solutions to poor water quality.

The group believes the task force, formed by the TVA at the urging of U.S. Sen. James Sasser, D-Tenn., is unwilling to find problems that could embarrass the six governmental agencies involved.

Bates said TVA has sprayed tons of herbicides around the Kentucky Lake Resevoir, which stretches from the Pickwick Dam to Kentucky Dam. He said many of the herbicides used have been known to contain dioxin, which he called the most dangerous man-made compound known.

Governor told about Tennessee River problems

CAMDEN (AP) — Gov. Ned McWherter vowed to do something about all those dead mussels and sick fish in the Tennessee River, but said he isn't sure just yet what it will be.

"I obviously do not know the answer to these problems with the river," McWherter told about two dozen area residents Monday. "If I did I'd do something

already done it. Maybe none of you knows exactly what to do or you would tell us."

The residents, most of whom work as fishermen or in other businesses linked to the river, said mussel kills and continuing catches of diseased or dying fish over the past two years have threatened their way of life.

"People are afraid to eat the

Petit, who added that scientists have found no evidence that fish from the river are a health hazard.

McWherter met with area residents while on a three-day visit to northwest Tennessee.

"We're going to do everthing we can to clean the water up," McWherter vowed.

But he acknowledged that

how such a cleanup should be done or what if anything needs to be cleaned.

Some area residents believe the river problems are caused by herbicide pollution while others blame natural causes such as droughts and low oxygen in the water.

McWherter was scheduled to wrap up his tour today with a

versity of Tennessee at Martin John Bates, an environmen consultant who has worked various government and priva groups involved with the Tenn see River, said mud taken fro the river contains unidentifi toxic chemicals.

He asked the TVA to sto spraying herbicides on river ve etation until further tests can b

These articles appeared the same day our story ran only way in the back of the Paper.

Reason why I cancelled TVA's inspection.

- type him in
- entertaining
- clear basis of
Politics??

Greenpeace

My forest woods have changed.
They cry in anguish now -
I feel their desperation
as I gaze up between the
branches into the sun.
The stench of herbicide
Reeks from their hearts.
Like afflicted soldiers defeated
in combat, they totter in the
wind.
Why, they scream, what have
we done so wrong - exist?
The persimmons, paw-paws
and acorns lay rotting in the
muck.
The children suffer for the
parents sins.
Is not their Creator also ours?
Will we not reap what we sow?
The trees resound - Save the Children!

BERNADINE AZIZ
© OCT 5, 1987.

Published in AMERICAN HERITAGE ANATHOLOGY - MARCH, 1988

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Bowater nets record 1987 sales

Bowater Inc., the parent company of Bowater Southern Paper Co. in Calhoun, has reported record sales and earnings for 1987, according to information released by the company.

Net income reached the $81 million mark on sales of $1.2 billion, which compares with the 1986 net income of $49.4 million on sales of $920 million. The 1987 net income represents $2.12 per fully diluted share.

"By any measure, 1987 was a fine year for Bowater — a year of fruition as many of our recent investments began to yield substantial returns," company chairman and chief executive officer A.P. Gammie said. "As planned, we strengthened the company's balance sheet."

Record net income of $29.6 million, or 77 cents per fully diluted share, for the fourth quarter of 1987 compares to $13.9 million, or 43 cents a share, for the last quarter of 1986 on sales of $349.2 and $255.8 million, respectively. The results of Star Forms Inc. acquired late in December 1986 are included only in the 1987 results.

Newsprint prices recovered sharply and the company's mills ran at high efficiencies, according to the statement issued by Bowater. Coated paper consumption continued to grow faster than expected and two price increases were obtained in the second half of the year as available new capacity was fully absorbed. Aided by a weakened dollar and good demand, market pulp prices continued to escalate.

The addition of Star Forms more than doubled the company's business in computer papers and this segment returned to profitability despite a fourth quarter write-off to cover costs of the reorganization.

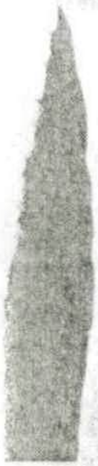
"We enter 1988 with strong markets, higher prices, costs under good control and excellent prospects for the year ahead," Gammie said.

'By any measure, 1987 was a fine year for Bowater — a year of fruition as many of our recent investments began to yield substantial returns. As planned, we strengthened the company's balance sheet.'

A.P. Gammie

*

Bowater Inc. is the largest U.S. manufacturer of newsprint and a major producer of coated publication papers.



rla Keller
he Board
, chief of

AFTER OUR STORY WAS COVERED, THEY DEVELOPED SOME "BAD" PUBLICITY. THEY'VE RECENTLY PUBLISHED THESE IN OUR LOCAL PAPER.

INTERNATIONAL TECHNOLOGY CORPORATION

INVOICE

Field Analytical and Sampling

To: Gilreath & Associates
707 Gay Street, SW
P.O. Box 1270
Knoxville, TN. 37901

Attn: Gary A. Davis

Invoice No.: 4841-01
Date : 10-28-87
Project No.: 480041
A/R No. : KS28050

Aziz Residence

October 1987

Direct Labor:

Sr. Field Sampling Specialist 6.0 hrs. @ $77.00	$ 462.00	
	Total Labor:	$ 462.00

Direct Expenses:

Travel - J. Ragsdale	34.21	
Handling (20%)	6.84	
	Total Expenses:	$ 41.05
	INVOICE TOTAL:	**$ 503.05**

Remit to: IT Corporation
Environmental Projects Group
Dept. L515P
Pittsburgh, PA 15264

TO INSURE PROPER CREDIT, PLEASE RETURN A COPY OF THIS INVOICE WITH PAYMENT.

ONE OF 3 TESTS WE CONDUCTED w/ WATER TEST.
Hydrocarbon showed N.D.
Both Picloram TESTS botched, Finally THEY SAID - N.D.

10/25

(2) ps: Monson* is no good. Talked to him today Advisory Board for Northwestern Study!

(i.e. Monsanto sponsored "ongoing"(!) Krummich Plant—study: conflict of interest)

study author Dan Y HRYHORCHUK!

this is only a dim approximation of spelling swear to god some Eastern European @ Northwestern or U. of I., Chicago.

The 1994 Dioxin Reassessment

Mark Guy
Spring, 1995

(* he said he knew Bill Coffey quite well, and had not heard of his death...)

(1)

Carol —

~~[redacted]~~ document

is the intro + conclusion (+ biblio)

sections of dioxin paper

I wrote for ~~[redacted]~~ Policy + Law class

Men are so quick to blame the gods: they say that we devise their misery. But they themselves -- in their depravity -- design grief greater than the griefs that fate assigns.

The Odyssey, Book I

After more than two decades of intense scrutiny by scientists, policy makers, regulated interests and the public, dioxin is among the best characterized and most infamous toxins of environmental interest. The history of dioxin cuts a wide swath across the American landscape, including some of the more famous environmental disasters such as Love Canal and Times Beach. It also forces us to reexamine, sometimes in excruciating detail, our war policies in Vietnam. (IOM, chap. 2; Schuck, chap. 1) Ultimately the problem of dioxin points to the heart of our industrial and economic system, implicating, among many others, chlorine chemistry and the process of incineration.

The problem facing society and the implications for policy development in dealing with dioxin could not be more compelling. Widespread contamination of the general population and the food supply is now well documented. (EPA, 1994a, 74-88; EPA, 1994b, 34-39) Despite some rather well orchestrated attempts in the media to linguistically "detoxify" dioxin (ERF, #346; Monk), there is convincing evidence of a broad range of toxic human responses including carcinogenicity, reproductive and developmental effects, and immunotoxicity, among others. (EPA, 1994a, 36-61) Despite this growing body of knowledge, large data gaps in our scientific understanding remain. In a certain crude respect, the media show mirrored scientific controversy that is inevitably involved in such complex and politically volatile issues. Revelations pertaining to dioxin epitomize Rosenbaum's assertion that:

> ... scientific research also disrupts the regulatory process by illuminating unanticipated environmental hazards, by exposing a scope and complexity to environ-

> mental pollution not previously understood, and by raising obstructive and politically devisive questions about the accuracy of scientific data upon which existing regulations have been predicated. (Rosenbaum, 10)

This is not to say that the classic refuge of scoundrels, that "more study is needed," is an appropriate policy response. It is important to note that this escape mechanism always carries with it the often unexpressed qualifier, "before anything more is done." Dioxin, ultimately, presents us with the most lasting and intractable problem in environmental policy: What to do in the arena of public policy when dealing with a lack of absolute scientific certainty.

The EPA has responded to dioxin at one point or another under many of the major environmental statutes, as amended, including: the Clean Air and Water Acts, (CAA, CWA); the Resource Conservation and Recovery Act (RCRA); the Comprehensive Emergency Response, Compensation and Liability Act (CERCLA or Superfund); the Toxic Substances Control Act (TOSCA); the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) and; the Safe Drinking Water Act (SDWA). (Silbergeld and deFur, 52) Other federal agencies have been involved as well, most notably the Centers for Disease Control (CDC), the Food and Drug Administration (FDA) and the Occupational Safety and Health Administration (OSHA). Individual states have also had to grapple with the problem in one form or another.

There has been an enormous amount of legislative and administrative activity surrounding the investigation of Agent Orange as well, which is still ongoing. (IOM, 1994, chap. 1) All of this activity is not without its price:

> It has been estimated that the US government has spent billions of dollars studying [dioxin]. Globally the costs associated with study, abatement, and remediation (as well as litigation in the United States surrounding human exposure to [dioxin]) must certainly exceed many billions more. (Zook and Rappe, 80)

The Reassessment

The recently released draft dioxin reassessment of the EPA is a broad undertaking, and in some ways precedent setting for that agency, especially the "open door" policy of the process. Realizing the enormous political volatility of the dioxin issue, the EPA threw open the process to outside input from beginning to end, including public meetings and peer review panels *before* the draft was completed. Portions of the draft were pre-released for review as well. All this was prelude to the more usual process of public comment and peer review that is now ongoing after the draft release in September, 1994.

What is not new about the reassessment is its grounding in what has now become standard operating procedure for the agency: It is ultimately an attempt to consolidate the best available science to ascertain all relevant health and exposure criteria for the purposes of risk assessment. As the document's 2000 page length testifies, this was no small undertaking. Though the reassessment is still in draft form, and will be for at least a year, some policy effects are already visible, most notably in proposed municipal and medical waste incinerator rules aimed, at least in part, to curb dioxin emissions. (FR 59, 9/20/94, 48198-48261; FR 60, 2/27/95, 10654-10691)

In broader terms, the reassessment points to some of the strengths and weaknesses of risk assessment as the basis for policy formulation. Risk assessment and cost-benefit analysis -- launched by Reagan's newly appointed EPA administrator William Ruckelhaus at the height of the Reagan backlash against environmental controls (and safety and health regulations in general), (Proctor, 83) -- did serve useful administrative and political purposes.

> Risk assessment provided a common denominator -- human health risk -- by which the administrator could rationalize and defend the administrative decisions he or she must ultimately make across these many mandates and constituencies. Lacking any unified framework or criteria in statutes, the administrator in effect used risk

> assessment to create such a framework, justified by the common-sense virtues of reasonableness, consistency, and scientific objectivity ... At least as important as its managerial value, however, was its political value: it gave the EPA's administrator a powerful new way to control the agenda of regulatory debates. (Andrews, 217)

The dioxin reassessment in many ways represents the fullest fruition of the EPA ideal of risk assessment; dioxin, however, presents a peculiar and somewhat overwhelming set of problems.

The first problem is the widespread extent of contamination. The EPA states flatly that "the dioxin-like compounds have been found in all media and all parts of the world." (EPA, 1994b, 14) The second (and more significant for policy formulation) is the enormous number of sources, which the EPA groups into four general categories: 1) Industrial/Municipal processes; 2) Chemical manufacturing/processing sources; 3) Combustion and incineration sources, and 4) Reservoir sources. (EPA, 1994b, 14-15)

A further complication is the fact that the most sensitive endpoints for dioxin are not cancer -- the usual yardstick in risk assessment -- but immunological, developmental and reproductive toxicity. (EPA, 1994a, 44-50) Finally, ecosystem and non-human species risk has only begun to be addressed. (Silbergeld and deFur, 54; EPA, 1994d)

The EPA's traditional "command and control" tools can be effective to some extent in alleviating environmental loading and human exposure from point sources, such as incinerators and pulp and paper mills, but there is a growing antagonism to these "end-of-the-pipe" solutions emanating from the environmental movement. Especially troubling are the well known problems the EPA has with insufficient to minimal monitoring and enforcement (Russel, 243-274), or stated even more forcefully, the EPA's "pathological cycle of regulatory failure." (Lazarus, cited in Rosenbaum, 123)

This paper presents an overview of what is currently known about dioxin -- taking note of some current policy stances -- with reference to the turbulent and disturbing

history of the scientific advances which led us up to the current "turning point in the political history of dioxin." (Commoner, 1)

The Environmentalist Challenge

This new "turning point" for dioxin is in fact a continuation of the powerful and controversial themes developed in Samuel Epstein's *The Politics of Cancer*:

> 'More science' was not what was needed...'while much is known about the science of cancer, its prevention depends largely, if not exclusively, on political action.' (Proctor, 60)

There is a profound and openly hostile anti-corporate rhetoric coming from the grass-roots and social-justice segments of the environmental movement. The call for a "chlorine ban" by Greenpeace is an unapologetic manifestation of this, since chlorine accounts for "over 100 billion dollars" of the chemical industry's productive activities. (Chem. & Eng. News, May10, 1993, 11-12) In broad terms this can be understood as a call for the more general principle of pollution prevention through source elimination -- "zero tolerance" -- and a move away from exclusive reliance on the "bean counting" of risk assessment as the basis for policy formulation. (Greenpeace)

These environmental "nanogram mafia" (Wall Street Journal, June 29, 1993, A-18) are now joined by a broadening circle of environmental, social and health organizations, including: the Sierra Club; the US Public Interest Group; the International Joint Commission on the Great Lakes; the Natural Resources Defense Council; the American Public Health Association ; the National Wildlife Federation; the Union of American Hebrew Congregations; and the National Women's Health Network, along with scores of smaller groups. (Zook and Rappe, 94; ERF, #363) While stopping short of calling for a chlorine ban, Physicians for Social Responsibility and the Environmental Defense Fund jointly call for a "phase-out" of dioxin modeled on the lead poisoning prevention program. (PSR, 9)

Unfortunately, bureaucratic inertia and a legacy of incremental policy making would argue against expecting the dramatic and sweeping changes envisioned by the environmentalists. When you add to this a hostile Congress and the enormous economic stakes, it appears fairly certain we can look forward to some tightening of the screws, but not a dismantling of the machine.

The gauntlet is down, however, and the environmental movement is justifiably proud that it has caused a major shift in thinking (Montague), centered around the "core values" of ecology, human health and sustainability. (Paehlke, 351-5) Some implications to this challenge will be explored in the conclusion.

Dioxin and dioxin-like substances represent the most perilous chemical threat to the health and biological integrity of human beings and the environment.

Barry Commoner, Keynote Address at the Second Citizen's Conference on Dioxin

Policy Creep and a Vision for the Future

Despite being bolstered by arguably the most extensive regulatory environmental and health apparatus in the world, the EPA has proved to be particularly impotent when attempting to regulate certain industrial commodities of toxic interest, such as asbestos and formaldehyde. (Proctor, 110-122; Shapiro, 225-228). While the proposal for a "chlorine ban" by Greenpeace and others attempts to cut through the Gordon's knot of a seemingly endless list of dioxin sources and contaminated products, it is unlikely that without Congressional or Presidential leadership the EPA will be able to engineer a major change in policy direction. In fact, with a beleaguered President clinging to office and a ferociously hostile Congress, it would be an accomplishment if the EPA is able to continue acting under its *current* mandates.

The EPA is currently pursuing a broad patchwork of actions to address the dioxin problem, principally under its Clean Air and Water programs, its Hazardous Waste programs, and its Pesticide programs. To appreciate the complexity of this undertaking, it will be helpful to look again at the broad number of sources under consideration.

Combustion and Incineration Sources

This is clearly the category that is the most significant: "This assessment proposes the hypothesis that the primary mechanism by which dioxin-like compounds enter the terrestrial food chain is via atmospheric deposition." (EPA, 1994a, 13). The major contributors are:

medical waste incinerators, municipal waste incinerators, cement kilns and industrial wood burning. Other processes include metallurgical processes such as high temperature steel production, smelting operations, and scrap metal recovery furnaces; and the burning of sewage sludge, and the burning of coal, wood, petroleum products and used tires for power and energy generation. (EPA, 1994b, 15).

Chemical Manufacturing/Processing Sources

Dioxin-like compounds can be formed from the manufacture of chlorine and chlorinated compounds such as herbicides, dyes, specialty chemicals, solvents and plastics, especially polyvinyl chloride (PVC) and its precursors, vinyl chloride and ethylene dichloride. (EPA, 1994b, 15; Greenpeace, 9; "Barbie has a body burden").

Industrial/Municipal Sources

Dioxin-like compounds are created during chlorination of naturally occurring phenolic compounds such as those present in wood pulp. Chlorine bleaching in the manufacture of bleached pulp and paper has resulted in dioxins in paper products as well as in liquid and solid wastes from this industry.(EPA, 1994b, 15).

Reservoir Sources

The persistent and hydrophobic nature of dioxin causes it to accumulate in soils, sediments and organic matter and to persist in waste disposal sites. Releases may occur naturally from sediments via volatilization or via operations which disturb them such as dredging. Aerial deposition and accumulation on leaves may lead to releases during forest fires or leaf composting operations. (EPA, 1994b, 15).

Incinerators

We will focus some final comments on the most offensive class of dioxin sources: incinerators. The emphasis on incineration as a waste management solution accelerated in the early eighties, during the Reagan era of lax environmental control. Congress, as well, contributed with the RCRA amendments of 1984, which essentially banned the landfilling of liquid hazardous wastes, and helped to accelerate the growth of an industry (Dower, 165-168). The "waste-to-energy" myth -- which is still with us -- had appeared in the early 1970's, with the promise of turning a liability into a product: it sounded too good to be true, and it was.

Medical and municipal waste incinerators are by far the two largest sources cited in the 1994 reassessment, and elsewhere, contributing on the order of 90-95% of total dioxin emissions from all known US sources (Zook and Rappe, 84; EPA, 1994b, 14-18). Completely omitted from the EPA calculations, oddly, are dioxin estimations for incinerator ash. This is an omission that will hopefully be corrected during the draft review. It took a recent Supreme Court ruling (in a suit brought by the Environmental Defense Fund) to finally get the EPA to acknowledge that the ash from incinerators was a hazardous waste, as defined and governed by RCRA. (NYT, May 3, 1994, 1). This is due to heavy metal loading as well as dioxin.

With this in mind, the recently proposed rules for municipal waste combustors (MWC) and medical waste incinerators are a welcome relief, and long overdue (FR 59, 9/20/94, 48198-48261; FR 60, 2/27/95, 10654-10691). The current state of medical waste incineration is especially appalling, as evidenced by the fact that the EPA anticipates that fully 80% of the current units (approximately 5000) will not continue to operate after the new rules are in place.

Even here, however, the EPA has missed a golden opportunity. The proposed standards for dioxin emissions are fully five to twenty times higher than current guidelines in Europe:

> Available technology for reduction of PCDD/F from combustion sources can lower emissions to below 100 pg. TEQ per cubic meter of released stack gas. This limit is a current regulatory guideline in several European countries. (Zook and Rappe, 93).

The proposed rule for medical incinerators is 1,900 pg/dry standard cubic meter (dscm) and 500 pg/dscm and 1000 pg/dscm for small and large MWC, respectively. (FR 60, 2/27/95, 10659; FR 59, 9/20/94, 48233). These maximum achievable control standards (MACT) are obviously not as maximum as they could be. The reason is the EPA's insistence on the use of dry scrubbers and baghouse filters, as opposed to the

European controls of "multiple stage wet scrubbers followed by an activated carbon filter." (Volland, 10).

This has potentially significant implications for mercury as well as dioxin emissions. The Clean Air Act is the only statute where the EPA would have, at least theoretically, the ability to ignore costs in the setting of standards. The EPA's continued insistence on the problematical solution of dry scrubber/baghouse filters technology is a disappointment.

Fire at the Grass-Roots

Beyond dickering over numbers and the minutiae of control technologies, however, is the larger question of direction and vision. Environmentalists, in an ironic twist, owe a large debt of thanks to the incinerator industry. Incinerators are notoriously unreliable and dirty, and it was largely because of this that a significant portion of the grass-roots movement was spawned. Incinerators represent a clear and localized target for opposition -- an ideal NIMBY objective -- and an increasingly educated and nationalized network of activists has grown up around these fights. The anti-incinerator movement has been successful, by some estimates, in stopping over 280 proposed projects. (Connett). In light of the recent revelations concerning dioxin emissions from these facilities, it was worth the effort.

A New Way of Thinking

The International Joint Commission (US-Canada), in its Seventh Biennial Report, questioned whether:

> we ... want to continue attempts to **manage** persistent toxic substances after they have been produced or used, or ... **eliminate** and **prevent** their existence in the ecosystem in the first place ... Since it seems impossible to eliminate discharges of these chemicals ..., a policy of **banning** or **sunsetting** their manufacture, distribution, storage, use and disposal appears to be the only alternative" (emphasis in original). (IJC, 26).

Montague has defined these principles as:

1) Eliminate persistent toxic substances
2) Adopt the principle of precautionary action
3) Adopt a weight-of-evidence approach
4) End reliance on risk assessment and numerical standards
5) Adopt the principle of reverse onus. (Montague)

One of the principal problems for risk assessment with respect to dioxin, as it is traditionally practiced, is the question of incremental exposures. Rosenbaum's hyperbolic admonition that "this brings into question the entire regulatory system of using animal data for human health exposure assessment" misses the point. (Rosenbaum, 170-172). It also harks back to the anti-environmental frenzy whipped up during the Reagan era when this argument was first made. (Proctor, chap. 4). If dioxin only affected one or a few species of test animal, this argument might appear to have more credibility; but dioxin in fact has produced similar toxic effects in all test animals of both species. (see Appendix) Dioxin appears to affect the class of *vertebrates*, generally. (Commoner, 5). Humans, of course, may be inferred to have more or less sensitivity to certain toxic effects than certain species, but to imply that humans are somehow immune is to leave the realm of science altogether. The larger point that Rosenbaum misses is that the process of risk assessment itself, and not the use of animal testing, is what is brought into question.

With background exposure already contributing a 1 in a 1000 to a 1 in 10,000 risk for cancer (even ignoring the non-cancer risks for a moment), it appears a logical non-sequitur to propose that an additional incremental risk, such as from an incinerator, is justified. There is good reason to be profoundly distrustful of a process that has so wrapped itself in the mantle of "science" that it has locked itself into a logical paradox. With the proposed Times Beach incinerator, for instance, the risk from the release of *more* dioxin into the environment is somehow less than one in a million for the most highly exposed "receptors." (EPA, Times Beach, ES-4). The rationale for this is found on the

next page, where the Executive Summary states that the dioxin emitted from this point source would be less than one twentieth of "background" concentrations. This of course begs the question of how the "background" got there in the first place, and further could be used as a rationale for continued emissions from essentially *all* sources.

It is apparent that the "political action" necessary to effect satisfactory changes may ultimately be pointing to a deeper and more profound challenge: the need for more social control over the basic modes of production.

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[redacted]NNESSEE DEPARTMENT OF HEALTH AND ENVIRONMENT

OFFICE CORRESPONDENCE

FROM	TO	DATE
CRS	CJS	

DATE: February 10, 1988

TO: Craig Stannard

FROM: Cathy Stoecker CRS

SUBJECT: Bernadine Aziz Well

Sample Ø400 (CW-39) was received by the Environmental Laboratory September 3, 1987. Requested analyses were glyphosate, priority pollutant pesticides, atrazine, silvex, 2,4-D, and 2,4,5-T.

please note

Glyphosate analysis is not routinely performed by this laboratory; and we do not have equipment necessary to perform Method 140 - Revision A - Glyphosate.*

Because glyphosate has a structure similar to that of silvex (i.e., an acid functional group), it was decided that this same methodology would be most likely to work. Therefore, 500 ml of the sample was acidified to pH 2 with sulfuric acid and extracted by shaking the same three times with aliquots of ethyl ether. The extracts were put into a Kurderna-Danish apparatus and concentrated to 1 ml. The extract was then transferred to methanol for HPLC analysis. The analysis was performed on a Water Model 6000 HPLC equipment with two Model 440 Absorbance Detectors. Chromatographic conditions were as follows:

column - Alltech C_{18}
mobile phase - 70% Methanol, 30% water buffered to pH 4 with Acetic Acid
flow - 0.6 ml/min.
detectors - λ_1 = 254 nm λ_2 = 280 nm scale 0.01 AFS

FROM	DATE

TO

*Federal Register, Vol. 50, No. 193, Friday, October 4, 1985 (40721-40722).

CS/B0028041

PH-0001
SR 3/77

12.3 In the internal standardization method, the gas chromatographic response of the sample extract is quantified by the addition of a known internal standard; this response is compared to response of a

$$\text{milligram/liter} = \frac{(IS)\ (KF)\ (Ai)}{(Vs)\ (Ais)}$$

where

IS = Internal standard amount (milligrams)
Ai = Area of the pesticide component in extract injected.
Vs = Volume of wastewater sample extracted (liters)
Ais = Area of the internal standard in the extract injected
KF = Calibration factor of the pesticide component

$$KF = \frac{(Cc)\ (Ais)}{(A)\ (Cis)}$$

where

Cc = Amount of the pesticide component in the calibration sample (milligrams).
Cis = Amount of internal standard in the calibration sample (milligrams).
Ais = Area of the internal standard in the calibration sample.
A = Area of the pesticide component in the calibration sample.

12.4 Report results in milligrams per liter (mg/L) or micrograms per liter (μg/L) without correction for recovery data.

TABLE 1.—CHROMATOGRAPHIC CONDITIONS

Instrumentation Operation Parameters

I. The following operating parameters are used with the Hewlett-Packard Model 7600:

Operation Mode	Dual Column.
Detector	Flame Ionization.
Column-oven, programmed temperature	130 °C–250 °C at 4 °C/min.
Injection port temperature	230 5°C.
Detector temperature	270 5°C.
Helium flowrate	75 mL/min.
Hydrogen flowrate	50 mL/min.
Air flowrate	500 mL/min.
Range	10^3.
Attenuation	1.
Chart Speed	¼ inch/min.

II. The following operating parameters are used with the Varian Model 2800:

Operation Mode	Single Column.
Detector	Alkali Flame Ionization
Column-oven, programmed temperature	170 °C–250 °C at 8 °C/min.
Injection port temperature	230 °C.
Detector temperature	270 °C.
Helium flowrate	65 mL/min.
Hydrogen flowrate	24 mL/min.
Air flowrate	250 mL/min.
Range	10^{-11}.
Injection Volume	2 μL.
Attenuation	Variable.
Chart Speed	40 cm/hr.

TABLE 2.—RETENTION TIMES

Parameter	Retention time (min)
Condition I:	
THIMET (phorate)	6.7
COUNTER (terbufos)	9.5
CYTROLANE (mephosfolan)	22.5
Internal Standard	28.3
Condition II:	
THIMET (phorate)	3.3
COUNTER (terbufos)	4.3
CYTROLANE (mephosfolan)	12.3

Method 140–Revision A–Glyphosate

1. Scope and Application

1.1 This method covers the determination of glyphosate.

Parameter	Storet No.	CAS No.
Glyphosate	39941	1071-83-6

1.2 This is a high-performance liquid chromatographic (HPLC) method applicable to the determination of the compound listed above in industrial effluent.

1.3 The method detection limit (MDL) is 5 ug/L with 5% of full-scale deflection. The MDL for a specific wastewater may differ from that given, depending upon the nature of interferences in the sample matrix.

2. Summary of Method

2.1 A known volume of glyphosate industrial effluent is applied to a Bio-Rad prefilled AG50W–X8 column. The column effluent is injected via an auto injector onto the primary column packed with a cation exchange resin but used in an anion exclusion mode. A heart cut from this column is then switched onto a strong anion exchange column where the analytical separation is accomplished. The eluent from this column is air segmented, a buffered ninhydrin solution is added and heated. Detection and quantification is made with a visible spectrophotometer at 570 nm. The post column detector employs the Technicon Auto Analyzer system.

2.2 This method provides a selected cleanup procedure to aid in the elimination of interferences which may be encountered.

3. Interferences

3.1 Equipment used in this analysis (columns, filters, glassware, etc.) should be limited to trace glyphosate analysis only. This will eliminate any possibility of residual contamination at these low levels.

3.2 There are no known interferences for this method. Ammonia, as well as primary and secondary amines have a significant response with ninhydrin. However, these are eliminated in the manual cleanup step. Other amino acids are eliminated in the primary column.

3.3 An 0.04–0.06% NaOCl solution is prepared and used to wash the glassware to remove any traces of glyphosate which might be present. Be sure to rinse the glassware with copious amounts of deionized water.

4. Safety

4.1 The toxicity or carcinogenicity of each reagent used in this method has not been precisely defined; however, each chemical compound must be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be reduced to the lowest possible level by whatever means available. The laboratory is responsible for maintaining a current awareness file of OSHA regulations regarding the safe handling of the chemicals specified in this method. A reference file of material data handling sheets should also be made available to all personnel involved in the chemical analysis.

4.2 Primary standards of toxic compounds should be prepared in a hood, especially when classified or tentatively classified as known or suspected human or mammalian carcinogens.

4.3 For those compounds classified as potential explosives, the following precautions must be followed:

(a) Use only a well-ventilated hood—do not breath vapors

SUBMITTED TO TENN ORGANICS TWO WEEKS AFTER MINE WAS CONDUCTED SUPPOSED TO BE PROPRIETARY TO MONSANTO

Use a safety screen
(c) Use mechanical pipetting aids
(d) Do not heat above 90 °C—EXPLOSION may result
(e) Avoid grinding surfaces, ground glass joints, sleeve bearings, glass stirrers—EXPLOSION may result
(f) Store away from alkali metals—EXPLOSION may result
(g) Solutions may decompose rapidly in the presence of solid materials such as copper powder, calcium chloride, and boiling chips.

5. Apparatus/Equipment

5.1 Two Du Pont 8800 Pump Modules
5.2 Sample Injector—Waters Intelligent Sample Processor (WISP) 701B
5.3 Technicon Proportioning Pump III
5.4 Technicon Single Channel Colorimeter Equipped with 2.0×50 mm Flow Cell and 570 nm Filters
5.5 Technicon Oil Bath Cartridge Kit, Type A
5.6 Electronic Filter—Spectrum 1021 Filter and Amplifier
5.7 Strip Chart Recorder, 0–100 mV span
5.8 Column-Switching Valve, Air Actuated, Six Port, Valco Model ACF–6–UHPa–N60
5.9 Digital Valve Sequence Programmer (DVSP), Valco Model DVSP–4
5.10 Millipore Solvent Filtering Apparatus—Type GS, 0.22 micron Filters
5.11 An appropriate computer data handling system
5.12 Technicon Mixing Coils and Tees—See Reactor Flow Diagram for Catalog Numbers
5.13 Du Pont Zorbax SAX Column, 150 x 4.6 mm I.D.
5.14 HPLC Primary Column Consisting of:
(a) SS Tubing, 150 x 4.6 mm I.D.
(b) Column Packing, Bio-Rad AG50W–X8, Hydrogen Form, 200–400 Mesh
(c) Bottom Drilled Swagelok Fittings with 15 micron Pore Size Bed Supports
5.15 Bio-Rad Prefilled Econo-Columns, AG50W–X8, 100–200 Mesh (#731–6213)
5.16 Gilson Pipetman Continuously Adjustable Digital Pipette, 0.5–5 mL (#P–5000)
5.17 Standard Laboratory Glassware
5.18 Disposable Pasteur Pipettes, 5.75" (Fisher, 13–678–6A)

6. Reagents

6.1 Sulfuric Acid, 98% (Fisher, A–300)
6.2 Phosphoric Acid, 85% (Fisher, A–242)
6.3 Potassium Phosphate Monobasic (Mallinckrodt, 7100)
6.4 Methanol, HPLC Grade (Fisher, A–452)
6.5 Dimethylsulfoxide (Pierce, 20687)
6.6 Ninhydrin (Pierce, 21001)
6.7 Lithium Acetate pHix Buffer, *4M* Li^+, pH 5.20 (Pierce, 27203)
6.8 Hydrindantin Dihydrate (Pierce, 24000)
6.9 Brij 35, 30% (Fisher, CS–285–2)
6.10 Acetone (Fisher, A–18)
6.11 Argon
6.12 Sodium Hypochlorite (4–6%, Fisher, So–S–290)
6.13 Sodium Hydroxide, 2.5 *N* (Fisher, So–S–414)

7. Calibration

7.1 Establish HPLC operating parameters equivalent to those indicated in Table 1.
7.2 Calibration Procedure
7.2.1 Prepare a 1000 ppm standard by dissolving 0.1±0.0001 grams of analytical grade glyphosate in deionized water (not mobile phase) and diluting to the mark in a 100 mL volumetric flask. This could be stored in the refrigerator.
7.2.2 Prepare a 10 ppm standard by pipetting 1.00 mL of the 1000 ppm glyphosate standard into a 100 mL volumetric flask. Fill the volumetric flask to the mark with deionized water.
7.2.3 A series of working standards (20–200 ppb) is prepared weekly by appropriate dilutions with 0.05 *M* sulfuric acid of the 10 ppm standard. If needed, 5 and 10 ppb standards can be prepared by appropriate dilutions with 0.05 *M* sulfuric acid of the 100 ppb standard.
7.2.4 A series of external standards bracketing the expected levels of glyphosate in the samples to be analyzed is prepared. These external standards are used to prepare a calibration curve for quantifying glyphosate in the samples being analyzed.

8. Quality Control

8.1 The Agency requires that each laboratory operate a formal quality control program. The minimum requirements of this program consists of an initial demonstration of laboratory capability and the analysis of spiked samples as a continuing check on performance. The laboratory is required to maintain performance records to define the quality of data generated.
(a) Before performing any analysis, the analyst must demonstrate the ability to generate acceptable accuracy and precision. This ability is established as described below.
(b) In recognition of the rapid advances occurring in chromatography, the analyst is permitted certain options to improve the separations or lower the cost of measurements. Each time such modifications to the method are made, the analyst is required to repeat the accuracy and precision procedure.
(c) The laboratory must spike and analyze minimum of 10% of all samples to monitor continuing laboratory performance.
8.2 To establish the ability to generate acceptable accuracy and precision, the analyst must perform the following operations:
(a) Select a representative spike concentration for each compound to be measured.
(b) Add the known amount of standard to each of a minimum of four 1000-ml aliquots of reagent water. A representative waste-water may be used in place of the reagent water, but one or more additional aliquots must be analyzed to determine background levels, and the spike level must exceed twice the background level for the test to be valid.
(c) Calculate the average percent recovery (R) and the pooled coefficient of variation ($\bar{C}_v$) of the percent recovery for the results. Wastewater background corrections must be made before R and $\bar{C}_v$ calculations are performed.
(d) Using average recovery and standard deviation for each method parameter as given in Section 14, compare these values to R and $\bar{C}_v$. If the data are not comparable, review potential problem areas and repeat the test.
8.3 The analyst must calculate method performance criteria and define the performance of the laboratory for each spike concentration and parameter being measured.
(a) Calculate upper and lower control limits for method performance as follows:

Upper Control Limit (UCL)=$R+3\bar{C}_v$
Lower Control Limit (UCL)=$R-3\bar{C}_v$

where R and s are calculated as noted above. The UCL and LCL can be used to construct control charts that are useful in observing trends in performance.
(b) The laboratory must develop and maintain separate accuracy statements of laboratory performance for wastewater samples. An accuracy statement for the method is defined as $R\pm\bar{C}_v$. The accuracy statement should be developed by the analysis of four aliquots of wastewater, following by the calculation of R and $\bar{C}_v$. Alternatively, the analyst may use four wastewater data points gathered through the requirement for continuing quality control. The accuracy statements should be updated regularly.
8.4 The laboratory is required to collect in duplicate a portion of its samples to monitor spike recoveries. The frequency of spiked sample analysis must be at least 10% of all samples or one spiked sample per month, whichever is greater. One aliquot of the sample must be spiked and analyzed. If the recovery for a particular parameter does not fall within the control limits for method performance, the results reported for that parameter in all samples processed as part of the same set must be qualified. The laboratory should monitor the frequency of data qualified to ensure that it remains at or below 5%.
8.5 Before processing any samples, the analyst must demonstrate through the

of a 1-liter aliquot of reagent water that all glassware and reagents interferences are under control. Each time a set of samples is extracted or there is a change in reagents, a laboratory reagent blank must be processed as a safeguard against laboratory contamination.

8.6 It is recommended that the laboratory adopt additional quality assurance practices for use with these methods. The specific practices that are most productive depend upon the needs of the laboratory and the nature of the samples. Field duplicates may be analyzed to monitor the precision of the sampling technique. When doubt exists over the identification of a peak on a chromatogram, confirmatory techniques such as gas chromatography with a dissimilar column, specific element detector, or mass spectrometer must be used. Whenever possible, the laboratory should perform analysis of quality control materials and participate in relevant performance evaluation studies.

9. Sample Collection, Preservation and Handling

9.1 Grab samples must be collected in glass containers. Conventional sampling practices should be followed; however, the bottle must not be prerinsed with the sample before collection. Composite samples should be collected in refrigerated glass containers in accordance with program requirements. Automatic sampling equipment must be as free as possible of plastic tubing and other potential sources of contamination.

9.2 The sample is adjusted to pH<2 with sulfuric acid. If the sample is not analyzed the same day or it is shipped to another location, samples should be frozen in addition to adjusting the pH.

9.3 All samples must be extracted within 7 days and completely analyzed within 40 days of extraction.

10. Sample Extraction

10.1 Adjust sample pH to 4–6. Remove top and tip of Bio-Rad Econo-Column. Let any liquid in column drain out. Fill column reservoir with deionized water and let it run through column. Fill column reservoir a second time with deionized water and let it run through column. Once column is drained, draw 3 mL of sample into Gilson Pipetman and transfer to top of column. Let sample run through column collecting the eluent in a vial. When sample has completely run through column, place 2.0 mL of deionized water (use Gilson Pipetman) on top of the column and run this through the column, collecting eluent in the same vial. When all 5 mL of eluent has been collected, add one drop of sulfuric acid (98%) and mix thoroughly. Sample pH should now be <1.3. Transfer to sample vial using disposable Pasteur pipette. Sample is now ready for the HPLC. Dischard used Econo-Column.

10.2 Care must be taken during the sample pretreatment to prevent contamination of the samples with glyphosate. For this reason, disposable pipette tips and columns are employed in this method to minimize cross contamination.

10.3 A water blank should be included in the sample pretreatment and HPLC analysis to ensure the absence of glyphosate contamination via sample manipulation.

11. Cleanup and Separation

11.1 A sample cleanup using the Bio-Rad prefilled AG50W–X8 column will eliminate cationic species (metals, amines), which will bind to the primary column.

11.2 The automated *in-situ* sample cleanup via primary anion exclusion column eliminates strong organic acids and anions from being introduced to the analytical column and ninhydrin system.

12. Liquid Chromatography

12.1 Table 1 summarizes the recommended operating conditions for the liquid chromatography.

12.2 Calibrate the system as described in Section 7.

12.3 *Packing the Primary Column*

12.3.1 Dimension—15 cm x 6.35 mm O.D. x 4.0 mm I.D.

12.3.2 Packing Material AG50W–X8, mesh H^+ form (Bio-Rad, 142–1461).

12.3.3 Packing Procedure:

(1) Prepare a slurry of AG50W–X8 in HPLC mobile phase (Sulfuric acid, pH-3) (Section 8.2). Decant the free suspension and let stand in mobile phase overnight.

(2) Place bed support in end fitting and insert one end of column. Tighten nut and ferrule onto end fitting.

(3) Attach vacuum aspirator to end fitting and turn on vacuum. Fill column from open end with slurry of AG50W–X8 until column is completely filled.

(4) Attach end fitting with bed support, nut, and ferrule on open end.

(5) Connect to LC pump and run buffer to settle packing.

(6) Open column on inlet end and check to see if there is a void. If there is, repeat steps 3–5 until packing material is packed tight and no voids remain in column.

12.4 Preparation of Reagents

12.4.1 HPLC Mobile Phase—Primary Column

Add sulfuric acid to 3.8 L deionized water until the pH is adjusted to 3.0. Filter/degas the mobile phase through a millipore 0.22 micron filter before use.

12.4.2 HPLC Mobile Phase—Analytical Column

Dilute 160 mL methanol with deionized water to 3.8 L total volume. Add 9.5 g potassium phosphate monobasic and adjust pH to 2.3 with phosphoric acid. Filter/degas the mobile phase through a millipore 0.22 micron filter before use.

12.4.3 Ninhydrin Solution

Combine 1000 mL of DMSO, 800 mL of deionized water and 400 mL of 4.0 *M* (pH 5.2) lithium acetate. Bubble argon through this solution for approximately 15 minutes. Then add 32 g of ninhydrin, stirring until dissolved. Into a separate beaker, weigh 1.6 g of hydrindantin and add 100 mL of DMSO. Add a few mL of the ninhydrin solution and stir several minutes. Decant liquid into ninhydrin solution taking care to not let any solid hydrindantin get into the ninhydrin solution. To remaining solids in the beaker, add 50 mL DMSO and a few mL of the ninhydrin solution and stir. Decant off the liquid into the ninhydrin solution. To the remaining solids in the beaker, add 50 mL DMSO and a few mL of ninhydrin solution. Stir until all remaining solids are dissolved. Add this to the ninhydrin solution. Continue stirring and bubbling argon through the ninhydrin solution for an additional 15 minutes.

12.4.4 Wetting Solution for Auto Analyzer

Add 10 mL of Brij to 990 mL of deionized water. Stir until completely mixed and then add 1–2 mL of sulfuric acid (98%).

12.4.5 0.5 *M* Sulfuric Acid Solution. Add sulfuric acid (98%) to 3.8 L deionized water until the pH is adjusted to 1.3.

12.5 Construction of Ninhydrin Reactor. Refer to Figure 1.

12.6 Interfacing between WISP and DVSP—Refer to Figure 2.

12.7 Interfacing between DVSP and Six Port Valve solenoid—Refer to Figure 3. DVSP sequence timing is set as follows:

Sequence	Time (Minutes)
1	5.0
2	2.0

12.8 Interfacing Between Colorimeter and Spectrum—Refer to Figure 4.

12.9 Configuration of Column Switching Instrumentation—Refer to Figure 5.

12.10 Alternate-injections between standard and sample throughout the analysis.

12.11 A typical chromatogram of 50 µg/l glyphosate in a 102 sump sample is shown in Figure 6. The peak height of glyphosate standard is given in Figure 7.

12.12 Peak heights of standards are measured. A calibration curve is prepared.

12.13 The amount of glyphosate in the samples is obtained from the calibration curve.

13. Calculations

13.1 The actual concentration of glyphosate in a waste sample is calculated from the µg/L glyphosate given the calibration curve times the total volume collected from the Bio-Rad Econocolumn (5) divided by the volume of waste sample added to the Bio-Rad column (3).

µg/L (ppb) glyphosate =
(ppb glyphosate from calibration curve) (5/3)

14. Method Performance

14.1 The method was validated over the range of 5–210 ppb glyphosate.

14.2 If the glyphosate concentration in the sample is greater than 200 ppb, then the appropriate sample dilution should be made before the sample is run through the manual cleanup column and not after the cleanup column. All sample dilutions should be made with deionized water.

14.3 The sensitivity of the method is 1.5 mV/ppb glyphosate.

14.4 The detection limit is 5 µg/L glyphosate.

14.5 The pooled coefficient of variation (CV) for the analytical method in the range of 5–210 ppb glyphosate was 0.023. The correlation coefficient was 0.9992.

14.6 The lifetime of the primary column has not been determined. During this work, the primary column was repacked once a week. No column deterioration was noticed over this one-week period.

14.7 The response to glyphosate should be optimized for each system. This can be done by varying the times on the DVSP, retaining the two-minute width for the heart cut.

14.8 When working with samples that are known to be in the 5–40 ppb range, it is recommended that standards only in the range of 5–60 ppb be used. This will effectively eliminate any contamination in the WISP due to syringe and needle carryover of standards.

14.9 It was found that glyphosate recovery from the Bio-Rad Econo-Columns was dependent upon the pH of the sample. At a pH of 6, the average glyphosate recovery (R) was 99%. At a pH of 1.8, the average recovery (R) was 85%. This is why samples must be pH adjusted to between 4 and 6 before being run through the Bio-Rad columns.

14.10 *Advantage*

This column-switching, HPLC/post-column reactor method gives a procedure that is sensitive to glyphosate at the parts-per-billion level. Use of the post-column reactor makes this method selective for primary and secondary amines. The multicolumn approach eliminates many of the problems caused by the varied sample matrices which may be encountered. These include widely varying ionic strength and strong organic acids that are ninhydrin active.

14.11 *Disadvantages*

Use of post-column reactor increases the analysis time and the complexity of the procedure. The method is not completely automatd. A manual cleanup column must be used. This introduces additional sources of error.

15. References

15.1 "Automated Method for the Determination of Glyphosate in Industrial Effluents via Column Switching Technique," Standard Test Method, Monsanto Agricultural Products Co., St. Louis, MO.

15.2 Letter to Mr. G.M. Jett, USEPA from Mr. D.E. Cayard, Monsanto Agricultural Products Co., April 8, 1983.

TABLE 1.—CHROMATOGRAPHIC CONDITIONS

HPLC operation conditions for both columns:	
Buffer flow rate	0.6 mL/min.
WISP:	
Operation parameters injection volume.	1.0 mL.
Run time	30 min.
Number of injections	1.
Analysis time	40 min.
Detector	Normal, Std. Cal. 2.00.
Electronic filter:	
Cutoff frequency	0.01.
Attenuation	2.0.
Recorder	Chart speed—0.25 cm/min.
Primary column	15 cm x 4.6 mm AG 50W-X8, 200–400 mesh, H+ form.
Analytical column	15 cm x 4.6 mm Du Pont SAX.
Mobile phase	9.5, KH_2PO_4, 4 percent methanol, pH 2.3 with 85 percent H_3PO_4 dissolved in 4L of water.

BILLING CODE 6560-50-M

IF THE STATE DEPT OF H&E HAS TEST (OR FACIMILIE)
WHY DOESN'T THE EPA???

NORTHWEST COALITION for
ALTERNATIVES to PESTICIDES
P.O. BOX 1393 EUGENE, OREGON 97440 (503) 344-5044

OREGON PUBLIC RECORDS ACT REQUEST

1/5/88

Bob Buchannan
Oregon Dept. of Agriculture
635 Capitol NE
Salem, OR 97310-0110

Dear Bob,

Enclosed is a letter I recently received from Michael Wehr regarding the ability of laboratories to test for the presence of glyphosate (revealed ingredient of Roundup, Rodeo) in water and other matrices. Michael Wehr indicates that "these methods are currently proprietary to the manufacturer of glyphosphate [sic], Monsanto Company. Through a signed agreement with Monsanto, we are one of only a few laboratories in the United States that has these methods available for our usage."

Under the Oregon Public Records Act (ORS 192.420, 192.440), NCAP requests a copy of this signed agreement. This is extremely important to the citizens of Oregon: apparently Roundup and Rodeo can be sprayed in Oregon without any citizen access to independent laboratory testing for the subsequent presence of glyphosate (the only revealed ingredient in Rodeo or Roundup) in their water, soil, foliage, tissues, blood or urine. The terms of the agreement by which Monsanto lets a laboratory know how to test for glyphosate are of utmost significance to the public.

As an example of this problem, the enclosed copy of a U.S. Environmental Protection Agency report to a citizen in Tennessee ← re who was concerned about the presence of pesticides in her drinking water indicates the EPA does not know of any appropriate method for testing for glyphosate.

Thank you for your attention to this request.

Sincerely,

Mary H. O'Brien

Mary H. O'Brien
NCAP Information Coordinator

for the period _____ to _____ 19__

Observer _____

Date	PRECIPITATION				New Snowfall		Snow on Ground		Weather and Remarks
	Began	Ended	Gage Rdg. Time CST EST	Amt.	Depth (in.)	Melted Sample	Depth (in.)	Melted Sample	
				0			89	60	
				0			90	66	
				0			93	66	
				0			92	67	
				0			95	68	
				0			95	70	
				0			92	69	
				0			96	69	
				0			96	70	
				0			98	69	
				0			97	72	
				0			96	73	
				0			94	72	
				0			92	69	
				0			95	67	
				0			96	72	

PREPARED BY	
DATE	2/17/88

Ms. Cathy Stoeker
TN Dept of Health & Environment
630 Ben Allen Rd.
Nashville, TN 37219-5402

RE: PUBLIC RECORDS REQUEST
AZIZ - ORGANIC ANALYSIS - #400
DATE: 9-3-87 to 10-9-87

Dear Ms. Stoecker,

Pursuant to the Tennessee Public Records Act, T.C.A. §§10-7-503, 506, I am requesting:

1. Your master copies on methods used for all tests conducted but especially your procedures from set up to withdrawal on the chemical, GLYPHOSATE. (NOT JUST THE PRINT-OUT REPORT)
   a. you told me there was NO "official" method at time of testing but that EPA had sent an "official" method about two weeks after mine was done.
2. The official EPA Method on Glyphosate testing - and date received.
   ... when & how the method you used

PREPARED BY	
DATE	

a. con't.
differs from the more up dated method that EPA Dart.
3. Actual peak head-out from Chromatography done.
4. Any internal memos and writings and documentation you may keep as you conducted the experiments.
5. Any further information you may have received from either or both- EPA and Craig Stannard with the Chattanooga Basin Office regarding my file.

I was hoping our conversation was a lightening and meaningful. I have a 5 year old beautiful little girl and a very dear 8 year old son. Both of my children were literally soaked in supposedly "safe water" well over the limits. This does as well as about 9 other children may - greatly jeopardized & not hatred because of this chemical being misused.

I appeal to you from the deepest part of my heart to keep that in mind as you review my file copies.

Sincerely,

Bettie