

The Brimstone Battles

A Houston Chronicle Special Report

HoustonChronicle.com

Stories by [Jim Morris](#)

Photography by [Smiley N. Pool](#)



The red flag at the gate leading to an oil field near Pearsall, Texas, signifies the level of hydrogen sulfide danger at a well that caught fire after an explosion in July.

ADDITIONAL COVERAGE: **Deadly gas known for centuries still threatens the workplace**

Known variously over the years as swamp gas, stink damp, rotten-egg gas and hydrosulfuric acid, the compound has left a long and well-marked trail of anguish.

A sickening experience in the Kazakhstan oil fields

H2S exposure leaves engineer with severe debilitating illnesses

[Brimstone Team](#)

[Discussion Forum](#)

INTRODUCTION

An ancient poison and the price of progress

THE TOXIC BATTLEFIELDS

DENVER CITY: Death came from a cloud

A deadly cloud claimed the lives of nine people in 1975. What lessons have been learned?

- [Map: Sour gas in Texas](#)

HAWAII: Poison in Paradise

Residents fear their health and island paradise are threatened by industrial efforts to tap a volcano for geothermal energy.

- [Map: Volcanic reaction](#)

ALBERTA: Burden of the Beasts

Ranchers watch their livestock suffer, but industry says it's not to blame and government officials are seeking answers.

- [Map: Northern exposures](#)

EAST TEXAS: One Man's Stand

One man's crusade to protect the environment earns the ire of oil and gas companies.

HYDROGEN SULFIDE

A chronology of known effects through three centuries

LOST OPPORTUNITY

EPA had its chance to regulate hydrogen sulfide

Locales differ; but similar tales of frustration heard

- [H2S exposures \(15k chart\)](#)
- [Hard-hit cities \(46k map\)](#)

DANGER'S SHADOW

Foul air draws ire; state enforcement called ineffective

State's bid to tighten rule wilts under industry pressure

PORK BARRELS AND POLITICS

Panhandle residents not so wild about hog operations

Some firms tackle the problem - after a prod

New alarm over hydrogen sulfide

Researchers document lasting damage to human nervous system

THE BRIMSTONE BATTLES: A Houston Chronicle Special Report

[HoustonChronicle.com](#) [Chronicle News](#) [The Brimstone Battles](#) [Discussion Forum](#)

Deadly gas known for centuries still threatens the workplace

By JIM MORRIS

Copyright 1997 © 1997 Houston Chronicle

In the late 18th century, workers in the sewers of Paris were dying and falling ill with such frequency that a scientific commission was appointed to investigate what had become a national scandal.

It was determined that the hapless men were suffering from two distinct conditions. One was known as the *mitte*, a painful inflammation of the eyes and mucous membranes. The other, a form of asphyxia, was called the *plomb*.

Crude chemical analyses later confirmed that the agent in both cases was hydrogen sulfide (H₂S), a pungent gas given off through the decomposition of sulfur-bearing organic matter under anaerobic (oxygen-deficient) conditions.

Word about the substance traveled slowly, however, and those who heard in many cases did not respond. Two hundred years after the French commission completed its inquiry, hydrogen sulfide continues to kill and incapacitate workers under often-preventable circumstances.

"The stupid, stupid stuff I've seen," said John Rekus, an occupational health and safety consultant in suburban Baltimore. "Hydrogen sulfide is a known bad actor -- does anybody disagree? It's incontrovertible, like carbon monoxide."

Known variously over the years as swamp gas, stink damp, rotten-egg gas and hydrosulfuric acid, the compound has left a long and well-marked trail of anguish.

It felled tunnelers beneath the Thames in London in the early 19th century, Sicilian sulfur miners and West Texas oil-field workers in the early 20th.

On Jan. 4, 1924, the U.S. Public Health Service and the Bureau of Mines issued a joint warning -- identifying H₂S as "one of the most toxic of the gases" -- but the message went largely unheeded.

In the ensuing decades, hog farmers were found lying face down in manure pits, refinery workers beneath tangles of piping and vessels. Lethal exposures occurred on fishing boats and in wastewater-treatment plants, tanneries and paper mills.

By 1977, the National Institute for Occupational Safety and Health felt compelled to put out yet another alert. "Hydrogen sulfide is a nearly ubiquitous, acute acting toxic substance," NIOSH reported, estimating that 125,000 American workers were at risk of exposure. "It is a leading cause of sudden death in the workplace (and is) especially dangerous when it occurs in low-lying areas or confined workspaces ... "

At the close of the millennium, H₂S remains a stealthy and pernicious workplace threat. The most elementary mistakes -- inferior training, no atmospheric monitoring or respiratory protection -- are made time and again, as evidenced by these recent incidents:

- On July 12, three civilian workers died aboard the USS Harry Truman, a Navy aircraft carrier under construction at Newport News Shipbuilding in Virginia, after inhaling hydrogen sulfide and methane generated by sewage that had leaked into a pump room.

The shipyard was cited by the Occupational Safety and Health Administration for failing to educate the men about the potential hazards of confined spaces. It paid a \$6,300 OSHA penalty, an amount that "doesn't even slap (the shipyard) on the hand," said Arnold Outlaw, president of United Steelworkers of America Local 8888, which represented two of the dead men.

Shipyard spokeswoman Jerri Dickeski said, "We are very much dedicated to a safe working environment here. Even before the citation from OSHA we started retraining and doing refresher courses for our employees. We will continue that."

- On Sept. 5, 1996, a strikingly similar accident occurred at the Yorktown (Va.) Naval Weapons Station, 15 miles from Newport News. In this case four contract workers died after being exposed to sewage gases -- methane, hydrogen sulfide or both -- in a holding tank on a pier. "One person was overcome and fell," said Tom Pope, OSHA area director in Norfolk. "Three people went in after him and they were overcome."

The contractor, Qualicon Corp. of Virginia Beach, paid a \$125,000 OSHA penalty in March for seven confined-space violations. Qualicon also agreed to spend \$25,000 on a four-year training program.

Company owner Carl Edwards said that toxicological analyses performed on the victims indicated that the gas involved was methane -- although he could not rule out hydrogen sulfide.

"The deaths were due to drowning," Edwards said. "The question was what caused the initial loss of consciousness."

(Dickeski said that this incident was mentioned in a safety bulletin distributed at Newport News Shipbuilding several months before the shipyard's own workers were killed.)

- On Jan. 4, 1996, three men -- one of them a Mexican national who had been in the United States only three weeks -- suffocated in an oil "frac" tank in rural Scurry County, Texas.

The tank, owned by Drum Transport Services of Fluvanna, held sludge produced during the testing of an exploration well and was being cleaned with hydrogen sulfide-tainted wastewater from a nearby oil field. Signs warning of the chemical's presence were posted at the field.

Again, confined-space violations were found by OSHA, and again, the tragedy was compounded when one ill-equipped worker tried to save another.

Health and safety professionals cringe when they hear about such accidents.

"Every one of these deaths could be prevented," said Dick Lemen, a consultant in suburban Atlanta who spent 26 years with NIOSH. He outlined a common scenario:

A poorly trained worker is sent into an unventilated tank with no safety harness or respirator. The employer has not bothered to test the atmosphere inside the tank, although OSHA requires it. The worker goes down, as do several would-be rescuers.

"There's still a common acceptance in the U.S. workplace that fatalities and injuries and illnesses are sometimes the normal cost of doing business," said NIOSH director Linda Rosenstock.

NIOSH is trying to chip away at this fallacy by sending out print, video and online alerts about confined spaces and other hazards. These alerts are based on detailed case studies collected by the agency and 20 states under the Fatality Assessment and Control Evaluation (FACE) program.

"We don't think these are isolated events," Rosenstock said. "We think there's usually a causal chain of circumstances."

Consultant Rekus, a former Maryland workplace regulator who wrote *The Complete Confined Spaces Handbook*, is especially critical of companies that cut corners to save a few dollars.

"These days, there is simply no excuse for not doing continuous monitoring," Rekus said. "The technology has reached the point where you can get a monitor no bigger than a pocket radio for about \$1,500."

Such devices, he said, can detect hydrogen sulfide, carbon monoxide, methane and oxygen deficiencies. Most have alarms that sound when dangerous levels are reached.

"It is my position that we have wasted more money on rescue planning than we have spent on accident prevention," Rekus said.

Drum Transport appears to have failed on both counts. The accident early last year that killed Juan Guardado, Jerry McNew Jr. and the co-owner of the small oil-field trucking and disposal company, R.L. "Buddy" Drum, arose from a number of simple errors. These were brought to light in a wrongful-death lawsuit filed against Drum Transport, several well operators and a tank fabricator on behalf of Guardado's and McNew's survivors.

Buddy Drum's son, Max, who almost became the fourth casualty, testified in a deposition last April that none of the workers who entered the frac tank had an air monitor, a self-contained breathing apparatus (although the firm owned one) or a lifeline.

Max Drum acknowledged that the wastewater used to clean sludge from the bottom of the tank came from the Addison lease, where he had seen "poison gas" signs, and that no one had tested it. Questions also remain about the composition of the sludge.

Thirty-year-old Guardado was the first to collapse inside the oblong, 500-barrel tank. The others, valiantly but foolishly, went in to try to save him.

Guardado had come to West Texas from Aguas Calientes, Mexico, at the urging of his older brother, Arturo, who had worked on the Drums' cotton farm and in their trucking business for 17 years.

It was Arturo who first peered through a hole in the tank and saw the four stricken men. He smelled what he described as a "strong, stinky" odor -- the rotten-egg odor he associated with hydrogen sulfide.

Juan was lying motionless near the hole; his brother managed to pull out his upper body.

"He was bleeding from the nose and mouth," Arturo, 40, recalled in a recent interview. As he performed CPR, Arturo began to feel "kind of drunk, kind of dizzy" and was taken by ambulance to a Snyder hospital, where he spent the night.

He didn't learn of Juan's death until the following morning. "I don't think anybody told him about the danger," said Arturo, who still works for Max Drum. "Most of the time I am thinking about him."

McNew's widow, Cathy, has lost her nursing job and is struggling to raise three young children on Social Security and workers' compensation payments.

McNew and her husband -- a truck driver -- had just celebrated their second wedding anniversary when he died. His death, she has concluded, "was no accident. This should never have happened."

Drum declined comment through his attorney, John Simpson of Lubbock. During his deposition, Drum was asked by Houston attorney Glenn Douglas -- representing Juan Guardado's widow and three children in the wrongful-death action -- if he believed Drum Transport had followed OSHA's confined-space rules.

"No, sir," Drum replied.

Although Drum insisted that he never smelled hydrogen sulfide when he entered the tank, Snyder fire chief Terry McDowell, who was on the scene, reported that levels of the chemical just inside the top hatch ranged from 44 to 65 parts per million at least two hours after Juan Guardado first went down. (Death typically occurs at 500 ppm, and the OSHA-mandated exposure limit is 20 ppm).

Indeed, the helicopter crew that took off for a Snyder hospital with Buddy Drum had to return almost immediately because the fumes from his body were so potent.

The H2S accident at Drum Transport is the only fatal one among six reported last year to the Texas Railroad Commission, which regulates oil and gas exploration, production and transportation.

All told, hydrogen sulfide has killed 40 people -- 32 workers and eight members of the public -- and injured 156 in Texas since 1975, according to the Railroad Commission.

There have been numerous near-misses, among them a 14,000-ppm release in Moore County on July 13, 1996, a 50,000-ppm release in Howard County on April 1, 1995, and a release in

Bowie County on April 22, 1990, that ranged from 30,000 to 90,000 ppm and led to the evacuation of 1,500 people.

Ron Jones, a vice president with the American Petroleum Institute in Washington, said that the U.S. oil and gas industry has made "tremendous progress in addressing the acute, toxic hazards" of hydrogen sulfide. "The institute itself has done a lot of work on developing safety practices."

Additional regulation, Jones maintained, is unnecessary.

Nonetheless, OSHA last year selected H₂S as one of 20 chemical "candidates for reevaluation," with the idea of lowering the exposure limit.

And there is reason to believe that segments of the oil and gas industry are not as enlightened as Jones suggests. Stephen Cansler, a safety instructor with the University of Texas Petroleum Extension Service in Houston, is troubled by the indifference some of his students display toward hydrogen sulfide.

Cansler said that certain independent drillers -- unwilling to spend money on safety equipment and training -- are "just out and out lying to service companies" preparing to go into the field. "They just don't tell them that there's H₂S present."

As health and safety director for Houston-based Cameron, which manufactures, installs and repairs wellhead equipment around the world, Frank Perry abhors such behavior.

Perry speaks of hydrogen sulfide with evangelistic verve. He chaired an American National Standards Institute committee that developed a voluntary industry training standard for the chemical and has himself trained nearly 2,000 workers since 1975.

"We've got to get rid of this macho image in the oil patch, where people are actually working (around hydrogen sulfide) without appropriate personal protective equipment," Perry said. "Some of the old hands are kind of pooh-poohing the guys who are wearing it."

Reliable, pager-sized H₂S detectors with alarms are available for about \$300, he said, and yet it is not unusual to find an oil-field worker wearing an archaic lead acetate strip, which silently darkens when it reacts with the gas.

Such a strip is useful only insofar as it "gives the medical examiner some indication of the cause of death," Perry said. In industry parlance it is known as "autopsy tape."

Perry recently learned of a troubling new phenomenon. Because of downhole bacterial action, some previously "sweet" oil fields -- those containing little or no hydrogen sulfide -- have turned sour.

"They're starting to reopen some of these old wells," Perry said.

Although hydrogen sulfide is best known as a fast-acting killer, it can do substantial damage in sublethal doses.

Consider the case of Keith McCoy, who was rendered unconscious and nearly asphyxiated by

the gas at the Elf Atochem organic chemical plant in eastern Harris County on Nov. 9, 1995. Before the accident, McCoy was an unflagging worker, a volunteer member of the company fire brigade and hazardous-materials response team. Chemicals did not frighten him.

Today, at 40, McCoy shuffles about his Channelview home with the unsteady gait of an old man. He supports himself with a cane. He has trouble remembering the names of his four children. His vision is poor, his energy level low. He almost never gets a decent night's sleep.

His extremities are dangerously insensitive to pain. On one occasion, after a bit of yard work, his arms were covered with fire-ant bites. He felt nothing.

His thinking is so muddled that he must follow a "do and don't" list drawn up by his wife, Tammy, to get through the day.

"I was the type who went to work sick," McCoy said. "I still don't want to believe I'm hurt. I don't have any self-esteem anymore."

McCoy cannot independently recall what happened at Elf Atochem on that November morning two years ago. With the help of his wife, he gave the following account:

Shortly after 8 a.m., McCoy, who worked in plant maintenance, was assigned to drain lubricating oil from a compressor. Unaware that a malfunction in the compressor had allowed the oil to become contaminated with hydrogen sulfide, he opened a valve to drain it into a bucket and "all this stuff just came up and hit me in the face."

McCoy fell headlong into a pool of water on the concrete floor, breaking his nose. Minutes passed before anyone came to help him; by the time the first rescuer appeared, he had stopped breathing. CPR saved him.

Initially it appeared that McCoy would recover completely from his exposure, that the broken nose would be the worst of it. Then, in a couple of days, his memory began to fail. He drifted into a purgatory from which he has yet to emerge.

"He'd go in and out of consciousness," Tammy McCoy said. "In the hospital he didn't know his mother and dad. He didn't know me."

His children were strangers to him; his wife coached him with old family videos. "For a long time," she said, "he didn't think he was a part of our life."

In a lawsuit against Elf Atochem, the McCoy's allege that the accident was a result of the company's eagerness to keep the plant running after a longer-than-anticipated maintenance shutdown.

The McCoy's charge that hydrogen sulfide sensors were deactivated -- in some cases covered with rubber gloves -- so that alarms would not sound and bring work to a halt.

The day before the accident, they said, H₂S levels near the faulty compressor had pegged a meter designed to detect up to 1,600 ppm -- three times what is usually a lethal dose.

The McCoy's Houston-based attorney, Mark Lanier, summarized his view of Elf Atochem's

safety philosophy with an old maxim: "Kill a mule, find another. Kill a worker, hire another."

Plant manager Hank Williams was reluctant to discuss the McCoy's case at length. However, he said, "We take extreme precautions when handling this material. We do not take any chances with it."

Williams said that, to his knowledge, none of the 100 or so hydrogen sulfide sensors in the plant has ever been deactivated during his 10 years there. "They (the sensors) get immediate attention if we believe there's anything wrong with them," he said.

New Orleans safety consultant Chuck Simpson had his near-fatal brush with hydrogen sulfide in an oil field near Waynesboro, Miss., in 1982.

At the time, Simpson was a pump operator for the Western Company of North America. "As I was working on this (well), I could see vapors coming off the wellhead," he said. "At one point I had to stick my head into the vapors, and I immediately got a headache. It felt like two ballpeen hammers were slapped into my temples on either side."

Simpson complained to his supervisor and was ordered to keep working. A few minutes later he was caught in a noxious cloud that had billowed from the well.

Simpson's co-workers put him in the back of a pickup truck and raced to the hospital. He tried to leap out of the truck as it was moving. He vomited almost continuously.

"It was like the worst hangover you ever had, times ten," Simpson said. "It was a drunken feeling -- intense nausea, a lot of generalized pain."

In the emergency room, Simpson spotted a man he believed had caused the accident. "I chased him down the hall, dragging two IVs," Simpson said. "I was growling at him like a dog."

He spent a week in the hospital and, as far as he knows, experienced no lingering physiological effects. He did, however, suffer from anxiety attacks -- notably, a "paralyzing fear" of objects crashing into him -- for about three months following his exposure. And he had great difficulty concentrating.

Although acute hydrogen sulfide exposures such as McCoy's and Simpson's are harrowing for the victims and their families, much of the research in the past decade has focused on less-dramatic, low-dose exposures over time.

In 1990, two Finnish scientists speculated in the British Journal of Industrial Medicine that an excess of cardiovascular deaths they documented among pulp mill workers was associated with long-term exposures to hydrogen sulfide, sulfur dioxide and related substances.

Two years ago, David Richardson of the University of North Carolina School of Public Health reported in the American Journal of Industrial Medicine that a group of sewer workers chronically exposed to hydrogen sulfide appeared to have significantly lower lung functions than a control group of unexposed water-treatment plant workers.

And in a 1992 article in the Journal of Occupational Medicine and Toxicology, New Jersey

toxicologist Myron Mehlman reviewed a litany of hydrogen sulfide studies and concluded that chronic as well as acute exposures "can result in serious, permanent (or) long-lasting injuries," mainly affecting the central nervous system.

"I personally have no doubt about chronic effects," Mehlman said in an interview. "I have seen several individuals who were completely incapacitated after low-level exposures. They can't work, period."

[Back to top](#)

THE BRIMSTONE BATTLES: A Houston Chronicle Special Report

[HoustonChronicle.com](#) [Chronicle News](#) [The Brimstone Battles](#) [Discussion Forum](#)

An ancient poison and the price of progress

Pollution is often a byproduct of profit. And the deadly gas hydrogen sulfide worries geographically diverse communities because it is an unwelcome component of several profitable industries.

It lurks in West Texas oil and gas fields and East Texas gas processing plants, on Canadian ranchlands and a Hawaiian island where volcanic heat is tapped to generate electricity.

Hydrogen sulfide – H₂S in the shorthand of chemistry – kills instantly at its worst and can sicken at lesser strength. Even in tiny concentrations, it gives off a rotten-egg odor that can gag anyone unfortunate enough to get a whiff of it.

It is an inevitable result of our appetite for energy. And it is a source of sulfur, recognized so long for its valuable but volatile properties that the ancients called it brimstone – burning stone. They used it in descriptions of a fiery hell.

Hydrogen sulfide's risks cannot be eliminated, but they can be managed – for a price. It can cost millions of dollars to control, and communities that complain about H₂S exposures risk the ire of economically crucial companies.

Industries have the resources and power to bring political pressure against regulators – and have done so repeatedly when tighter hydrogen sulfide rules have been proposed.

The communities profiled in this section are separated by distance, culture and even flag. But they share a common enemy – a modern-day brimstone – hydrogen sulfide.

THE BRIMSTONE BATTLES: A Houston Chronicle Special Report

[HoustonChronicle.com](#) [Chronicle News](#) [The Brimstone Battles](#) [Discussion Forum](#)

Death came from a cloud

A silent killer took 9 lives in 1975. Could it happen again?

DENVER CITY—Faye Bernard has preserved the note, scribbled in the looping cursive of a teen-age girl.

"Moma [sic]: I'm gonna spend the night with Dee Dee," it reads. "Love, Clara."

This brief and, as it turned out, heartbreaking missive was written on Saturday, Feb. 1, 1975, by 14-year-old Clara Peevy. She was letting her mother, Faye, know that she'd be staying with a friend, Dee Dee Patton, at the Patton home.

The girls, whose budding social lives revolved around the Assembly of God church, were in high spirits. There had been a revival in the West Texas town all week, and 17-year-old Dee Dee had sung If That Isn't Love on Saturday evening.

"It sounded so pretty," Bernard, 72, said recently. "It was about the prettiest she'd ever sung."

By 5:15 a.m. Sunday, Clara Peevy, Dee Dee Patton, her parents and four relatives who had spent the night with them were dead, victims of hydrogen sulfide that leaked from Arco's Willard Unit Well No. 66, about 200 feet behind the house.

A neighbor, Tom Merrill, had called to warn them that a chemical cloud had sickened his wife and might be moving their way. Still groggy in the darkness, they had suffocated seconds after rushing outside on a chilly, damp and nearly windless morning.

Five bodies—including Clara's—were found in a car, two in a pickup truck and one on the ground.

A ninth victim—19-year-old Arco employee Steve Sparger, who was responding to the leak—was found in his pickup. The position of the truck in a ditch along County Road 330 suggested that Sparger had driven into the cloud and was trying to turn around when he died.



Faye Bernard, above, keeps a haunting reminder of the episode in her Bible: a final note from her daughter. An accidental release of hydrogen sulfide from this unremarkable-looking wellhead, right, killed nine people in 1975.





A concrete slab is all that remains of the Patton family home, near which eight people perished when hydrogen sulfide vapors escaped from an injection well in February 1975. A ninth victim died on a nearby road.

Almost 23 years after Texas' worst hydrogen sulfide accident, all that remains of the Patton house is a cracked concrete slab. There is no memorial, no indication of any sort that lives were lost on this spot three miles north of Denver City, although the "Christmas tree" structure of Well No. 66 remains.

Fleta Taylor, 70, lives about a mile from the well, as she did in 1975. She and her husband, Ben, were spared the effects of the gas, although he died of a heart attack three weeks later.

Taylor said that the Patton family seemed oblivious—as did most other people—to the sour gas wells (those containing at least 100 parts per million of hydrogen sulfide) that had been drilled all over Yoakum County.

Merrill, who barely got his wife and two children out of their home, told Taylor after the accident that "he could hear the Pattons crying out. Of course, they didn't last long." Melvin Reed, 65, was one of the volunteer firefighters on the scene. "I can still see it like it was yesterday," he said.

A crowd of onlookers—among them several timid rescue workers—had formed by the time the firefighters arrived at about 5:30 a.m., Reed said. The gas cloud was nearly stationary, rolling ever so slightly to the south.

Moving in from the north, Reed and fellow firefighter Gaylon Bruton went first to the home of Ed and Verna Bagwell, who were inside, asleep, with their three children.

"We woke them up," Reed said. "If we hadn't got to them when we did, we'd have lost five more."

Pressing south, Reed and Bruton met three Arco employees at the hissing well. Arco's Don Land closed the valve, burning his hands in the process. Each of the men was wearing a self-contained breathing apparatus, although Reed removed his mask moments later to appraise the gas level.

"Everybody told me, more or less, how damned stupid I was, and I guess they were right," said Reed, who avoided injury.

He and Bruton approached the Patton house from the west; Reed was the first to go inside, finding a dead poodle under one of the beds but no people.

"I got to hunting," Reed said. "I went over to the east side and that's when I saw people scattered all over out there."

J.C. Patton was lying on the ground near the pickup, "like someone had poled him with a baseball bat." Patton's wife, Glenda, was slumped over the wheel of the car, its engine still running and its headlights on.

When it was all over, Reed openly expressed his disgust with the skittish rescue workers, the reporters and photographers who had turned the tragedy into a "freak show" and the oil companies, which, he believed, had misled the people of Denver City about the dangers of subterranean hydrogen sulfide.

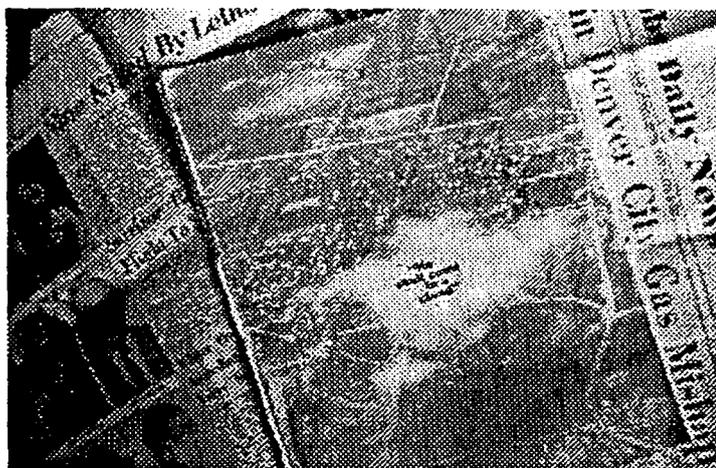
Not surprisingly, Reed—a welder who did contract work for Shell Oil—became something of a pariah in a town of 5,000 whose economy was almost wholly dependent on oil and gas.

"People treated me about like a bastard child at a family reunion," he said. "If this happens again, I'm gonna be one of them damned spectators."

Clinton Bowman, editor of the biweekly Denver City Press, remembers Feb. 2, 1975, as being drizzly and cold, "one of those mornings when the clouds were really low. It was like you were in the clouds."



Faye Bernard still visits the grave of her daughter, Clara Peevy, who was killed while spending the night with her friend Dee Dee Patton.



The back cover of a program from a revival meeting attended by Faye Bernard and her daughter eerily foreshadowed the coming tragedy. The program sits atop newspaper accounts of the incident.

Conditions were ideal for the accumulation of hydrogen sulfide, which is heavier than air and, in the absence of atmospheric circulation, seeps into low spots. All that was needed was a source.

It came in the form of a leak from Well No. 66 that, according to a meter at the nearby El Paso Natural Gas plant, began at 2:16 a.m.

The leak was caused by the failure of a stainless steel casting—called a wash nipple—that had been installed only five days earlier. Investigators

later determined that it was unsuitable for use on a well containing upward of 40,000 ppm of corrosive hydrogen sulfide.

"Company does not know how this nipple got into the operation," concludes a Feb. 21, 1975, report by the Texas Railroad Commission, which regulates the state's oil and gas wells and pipelines.

The gas vented for about five hours. Volunteer firefighters and the Arco employees who shut off the well and carried out evacuations were credited with preventing more deaths. Merrill, who worked for Shell, was praised for promptly warning the Pattons and calling Sparger in the Arco office.

Had he been equipped with a respirator, the youthful, athletic Sparger might have survived and saved at least some of the eight people in the Patton home.

"Steve Sparger was one of our big football players," said Bowman, who was teaching 11th-grade history at Denver City High School in 1975. "He was the starting fullback. He was a big, nice, likable young man."

Sparger graduated in May 1973 and, as was typical in Denver City, went straight to the oil fields. He was hired as a "computer observer" by Arco and had been married only 15 months when he died.

The two investigating agencies came down hard on Arco. The Occupational Safety and Health Administration cited the company for, among other things, failing to provide Sparger with respiratory protection and adequate training.

The Railroad Commission found that Arco's safety equipment at the well was not sensitive to small leaks and that the company had no written emergency plan.

A black-and-white photograph in the Feb. 6, 1975, edition of the Denver City Press shows the upshot of these lapses: A living room left in disarray by the Pattons and their house guests.

Two pairs of eyeglasses lie on a table in the foreground. In the background are a recliner—in its horizontal position, as if someone had been sleeping on it—and a cot covered with rumpled sheets.

By the winter of 1975, oil field workers had known for decades about "rotten-egg" gas, how it could smother you in a few breaths if the concentration was high enough, how it could make you do crazy things—things a raging drunk might do—if it didn't kill you.

To the public, however, hydrogen sulfide had seemed to pose no real threat until the "white hell" (as the Press depicted the cloud) claimed nine lives in the little town just east of the New Mexico line.

It was national news, an oddity amid a numbing succession of car wrecks, plane crashes and similarly mundane disasters. The Lubbock Avalanche-Journal, the biggest daily newspaper in the area, covered the story with particular vigor, to the great irritation of Press publisher Gene Snyder.

"They had a front-page story every day for a month after it happened," said Snyder, 68, who still runs the paper. "They kept it alive, and we were trying to forget."

The story's prominence served at least one purpose: it forced the Railroad Commission to re-examine and ultimately tighten its Rule 36, which deals with the handling of hydrogen sulfide.

Drillers and producers of sour gas wells were ordered to calculate worst-case releases, plan for emergencies and warn the public. Special conditions were placed on enhanced-recovery wells, like Arco's No. 66, into which waste gas is reinjected to force out hard-to-capture oil.

"Twenty-two years ago, you didn't see no signs around saying 'Poison gas,'" said Faye Bernard's husband, Roy, whom she married after her first husband, Burl Peevy, died in 1989.

Today, Denver City is teeming with such signs, some of which can be found on the lawns of nice homes in the center of town. The signs are so plentiful, in fact, that it's easy to see how one might come to ignore them, to grow complacent about the naturally occurring chemical that contaminates oil and gas in the Wasson Field.

"This whole county, they don't want to talk about this stuff," Melvin Reed said.

In a 1993 report to Congress, the U.S. Environmental Protection Agency identified 14 "major H₂S-prone areas" in 20 states. Four of these areas are in Texas.

From 1975 through 1996, 208 hydrogen sulfide incidents—significant releases from wells or pipelines that caused, or could have caused, death or injury—were reported to the Texas Railroad Commission.

On July 27, a sour well blew out southwest of San Antonio, near Pearsall. Workers on the drilling rig escaped injury, but the well burned wildly for eight days before it was capped, and hydrogen sulfide levels reached 71 ppm, enough to cause severe lung, eye and gastrointestinal maladies.

Had the blowout been mismanaged, or had it occurred in a less remote area, the outcome might have been different.

Could the Denver City tragedy be repeated? Railroad Commission Chairman Charles Matthews considers it unlikely.

"We have not had a single member of the general public killed (by hydrogen sulfide) since 1975," Matthews said. "That's a very good record."

This statistic gives little comfort to those who live near the Smackover and Pinnacle Reef natural gas formations in East Texas. Some Smackover wells have hydrogen sulfide concentrations in excess of 800,000 ppm—20 times that of Well No. 66.

The vast, deep reserves of gas in the Smackover and the Pinnacle Reef have attracted a host of exploration and production companies, some based as far away as Canada. Their wells and pipelines are going in near homes, schools and businesses, and some anxious people have organized in opposition.

They fear a recurrence of Denver City—or worse—and sense that the Railroad Commission is not taking the threat as seriously as it should.

Malakoff, a Henderson County town of 2,000, is in the thick of the Smackover play. It is also on the south side of Cedar Creek Lake, a popular retirement and recreation spot that draws crowds in the summer.

Malakoff City Administrator Jeff Looney is uneasy with the combination of sour gas production, retirees and weekend visitors.

A well blowout or a pipeline rupture on a Saturday in July could cause "mass hysteria," Looney said. "If people hear a siren, they're not going to know what's happening. We do not have the law-enforcement manpower to handle that kind of thing."

Bruce Shores regards the activity in East Texas from a unique perspective.

As principal of Malakoff Middle School, he worries about the evacuation of children in the event of a release.

As a native of Denver City, he has seen what can happen when something goes wrong. "I know the devastation that community felt," Shores said at a March 25 Railroad Commission hearing about a sour gas well near Malakoff. "I don't know if they have yet recovered."

Outwardly, at least, the town has moved on. The Press writes about the football exploits of the Denver City High Mustangs and the occasional act of vandalism. There are more wells pumping near Fleta Taylor's place today than there were when No. 66 sprang its infamous leak in 1975.

In her own subtle way, Faye Bernard has memorialized the events of that dank February morning almost 23 years ago. In addition to her daughter's last note and assorted newspaper clippings, she has kept a program distributed at the revival the night before the accident.

On one page is an aerial photograph of an unidentified town. Floating above the town are several white puffs, one of which is imprinted with an inspirational message: "He shall come in a cloud."

Religious woman that she is, Bernard prefers not to dwell on the irony.

[Back to top](#)

THE BRIMSTONE BATTLES: A Houston Chronicle Special Report

[HoustonChronicle.com](#) [Chronicle News](#) [The Brimstone Battles](#) [Discussion Forum](#)

Sour gas in Texas

"Sour gas," so called because it contains deadly hydrogen sulfide, is present in four large oil and natural gas formations in Texas. They are:

The map shows the state of Texas with four shaded regions representing sour gas basins. Callout boxes with arrows point to these basins: Denver City (northwest), San Andres (north), Smackover (northeast), and Edwards (south). Other locations marked on the map include Dallas, Henderson Co., Anderson Co., San Antonio, Houston, and Fusselman.

Source: Texas Railroad Commission

THE BRIMSTONE BATTLES: A Houston Chronicle Special Report

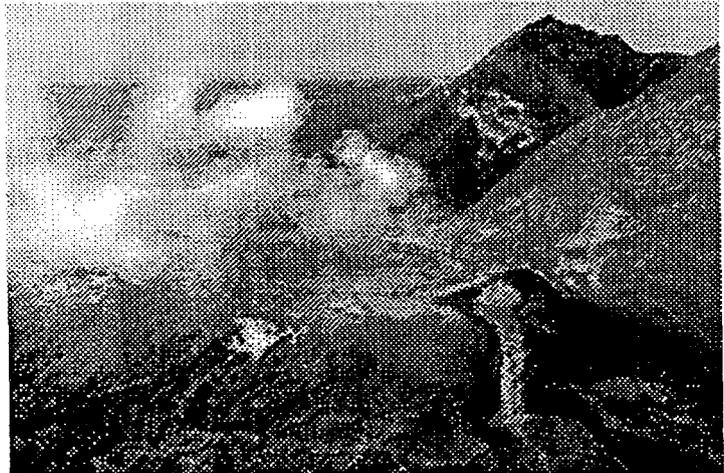
[HoustonChronicle.com](#) [Chronicle News](#) [The Brimstone Battles](#) [Discussion Forum](#)

Poison in Paradise

Residents says operators of geothermal power plant are committing sulfuric sacrilege in goddess' garden

PUNA DISTRICT, Hawaii—This is the realm of Pele, fitful goddess of Hawaii's volcanoes.

Those who have lived on the Big Island for some time cannot help but feel the presence of the impulsive deity, who, legend has it, does not take kindly to man-made intrusions. Believers go to the rim of the gaping Kilauea crater to make offerings to her and give thanks.



Lava flows from the Pu'u O'vo vent on the southern slope of Kilauea volcano on the island of Hawaii. Kilauea is one of the most active volcanoes in the world, emitting tens of thousands of tons of sulfur dioxide each year.

It was against this mystical backdrop that an enterprise known as Puna Geothermal Venture (PGV) began punching holes in Hawaii's black volcanic rock in 1990.

Disciples of Pele warned that such drilling was blasphemous and invited ruin. PGV nonetheless went forward, having committed to a \$130 million, 25-megawatt geothermal power plant that would produce electricity from subsurface heat, hastening development in one of the few relatively undisturbed pockets of the island.

Whether Pele exacted her revenge remains a matter of dispute. This, much, however, can be said:

Some residents of the lush and eclectic Puna District are convinced that hydrogen sulfide escaping from the PGV well field and power plant is making them ill.

And when a prominent Texas researcher came 4,000 miles to document the residents' symptoms in hopes of advancing knowledge about an insidious chemical, he caused an upheaval worthy of Hawaii's headstrong goddess.

"I've never encountered anything quite like it," said Dr. Marvin Legator, director of the Division of Environmental Toxicology at the University of Texas Medical Branch in Galveston.

Legator, 71, was accustomed to conflict, having often sided with community groups that had accused powerful corporations of environmental misdeeds and government agencies of

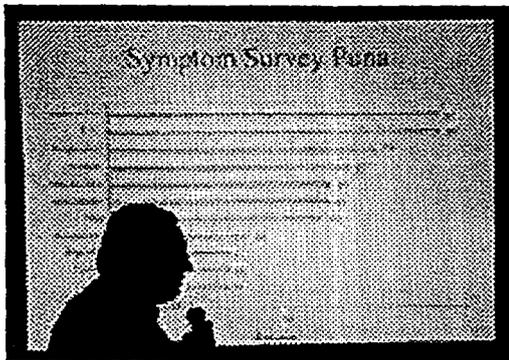
ineptitude.

Even by his standards, however, the official reception in Hawaii was chilly. It seemed that the only ones who wanted him here were the people of Leilani Estates, a rustic subdivision just south of the geothermal plant

Most government and business leaders were less than convivial; PGV was a pet project, blessed by luminaries such as U.S. Sen. Daniel Inouye, and Legator was in a position to spoil it. At one point, there was talk of undersea cables that would carry 500 megawatts of electricity to tourist-saturated Oahu and Maui. Inouye even sought federal funds for the project, but it went nowhere.

By the time Legator entered the picture in 1996, some of the Leilani Estates residents already had organized into a group called Puna Malama Pono (rough translation: Protect the Goodness of Puna).

They had complained for years about lethargy, dizziness, insomnia, vomiting, diarrhea—the very symptoms that are associated with chronic hydrogen sulfide exposures in the medical literature and that Legator himself had observed near a synthetic-rubber plant in the West Texas city of Odessa.



Researcher Marvin Legator explains a health survey of residents near the Puna Geothermal Venture during the Big Island Science Conference at the University of Hawaii.

Legator is among a handful of researchers intrigued with the effects of minuscule—and purportedly safe—levels of hydrogen sulfide on the human body over a period of months or years.

"It's so ubiquitous, and we've had so much misleading information out there about it," he said. "If you survive (an exposure), nothing's going to happen to you—that's the dominant theory held today.

"All the regulatory agencies still hold to that same crap. The whole house of cards collapses on them when you start talking about chronic, low-level

exposures, because that's where the problems are."

For Legator, Hawaii represented an unusual investigative opportunity: Here was an isolated population exposed over a period of years to generally small but quantifiable amounts of hydrogen sulfide from a known source.

In a 1981 report, three scientists at Lawrence Livermore National Laboratory in California concluded that "atmospheric releases of hydrogen sulfide constitute the most significant public health issue of geothermal energy production," and that carcinogenic and neurotoxic compounds such as benzene, arsenic, mercury and radon also could be released at levels of concern.

Two of Legator's research associates went on a scouting expedition to the Puna District in March 1996, conducting interviews with 69 people. Legator made his first visit at the beginning of this year and announced his preliminary findings—symptoms consistent with

hydrogen sulfide exposure—at a Jan. 9 news conference at the University of Hawaii at Hilo.

Legator thought he had made it clear that more work needed to be done. He realized that something was seriously amiss, however, when he read an article in the Jan. 12 edition of the Hawaii Tribune-Herald.

The headline was, "Official: Health Survey Bogus." The story quoted Bruce Anderson, deputy director of the state Department of Health in Honolulu, as saying that the results of any survey Legator conducted would be inherently biased because the subjects were rabidly anti-geothermal and had years to bone up on the effects of hydrogen sulfide.

The attacks didn't stop there. On March 26, a PGV official appealed to William Cunningham, chancellor of the University of Texas System in Austin.

"PGV is surprised and disappointed that the University of Texas would knowingly allow its fine name to be attached to a health survey of the type produced by Dr. Legator," wrote Jack Dean, the venture's vice president and general manager.

Dean did not respond to Chronicle interview requests. Legator said that he felt no pressure from either the university or the National Institute for Environmental Health Sciences—which funds research centers at UTMB and 25 other universities—to discontinue his work in Hawaii.

Still, he was so put off by the experience that he asked the Collegium Ramazzini, an international association of public-health researchers, to consider forming a defense committee for scientists browbeaten by industry.

Legator and his associates have not finished their analysis of the complete Puna District survey, given to 97 people who live near PGV and 58 members of a control group in Hilo, 20 miles away.

Nonetheless, Legator said that many members of the "exposed" group appear to have been impaired by hydrogen sulfide. "The vast majority—almost 90 percent—are showing neurotoxic effects," he said.

In an interview, Anderson said that Legator "essentially recruited individuals with known prejudices against geo-thermal power development in Hawaii.

Obviously, if you ask people who are upset about a development activity if they feel they've been affected, they're going to tell you they have.

"If there's a health problem down there, we're going to take action to address that concern," Anderson said. "If it means shutting down (PGV), so be it. But if (Legator) is alarming people needlessly, that's not a good situation either."

The saga in the Puna District began in December 1975, when the first well was drilled for the state-run Hawaii Geothermal Project, an experimental, three-megawatt power plant near Leilani Estates that went on line in 1981.

Almost from the start, residents complained about the rotten-egg stench, a sure sign that hydrogen sulfide was present.

However, when the state Health Department compared the one-year prevalence of illness in Leilani Estates with that in Hawaiian Beach Estates, a subdivision farther from the plant, it found no compelling differences—although it said that more of the Leilani Estates residents seemed to suffer from colds.

The experimental plant was closed in December 1989. But geothermal was far from dead on the Big Island.

Plans were made to drill into the East Rift Zone of the active Kilauea volcano. Transmission lines would slice through the towering Ohia trees of the Wao Kele O Puna (Green Forest of Puna), the last major rain forest in the United States.

Native Hawaiians and sympathetic environmentalists were enraged by what they considered to be the supreme act of sacrilege, a defilement of Pele herself.

"If no other place in the world is like this, it has to stay like this," said Palikapu Dedman, president of the Pele Defense Fund, which organized large protests against the undersea-cable project.

The 50-year-old Dedman is a fisherman and coffee grower who takes his religious beliefs seriously. He likens geothermal drilling in sacred areas to the sacking of a Christian church.

"Our religion is something you can see and feel," Dedman said as he crouched on the edge of the Kilauea crater, in what is now Hawaii Volcanoes National Park. Steam wafted from cracks in the earth around him—proof, he said, that the volcano is a living thing.

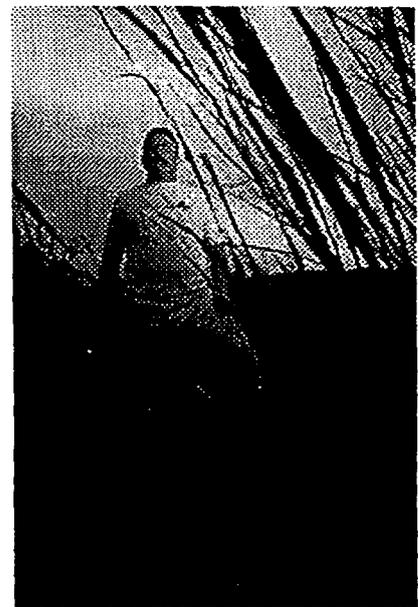
The first PGV well was drilled in late 1990, with the blessing of Inouye, the seasoned Democratic senator and World War II hero.

Inouye had made no secret of his fondness for geothermal energy. He extolled it on the floor of the Senate on June 27, 1990, noting that Hawaii depended on 130,000 barrels of imported oil per day and needed a cleaner, more reliable source of energy as insurance.

In a letter to the Geothermal Resources Council dated Oct. 7, 1991, Inouye declined an invitation to be the keynote speaker at the group's annual meeting but promised his continued support.

"Geothermal is the most technically and economically feasible and environmentally safe energy source Hawaii has at its disposal," the senator wrote. He failed to mention that a thundering well blowout at PGV had sent a plume of hydrogen sulfide into the Puna District four months earlier.

Wilson Goddard, a consulting engineer from Lucerne, Calif., who has conducted periodic



Palikapu Dedman, head of the Pele Defense Fund, calls geothermal drilling a sacrilege.

analyses of PGV since 1988, said that there is nothing inherently sinister about geothermal.

"If it's done right and in the right location, it can be benign," Goddard said. "Geothermal in Hawaii is a very powerful resource, with a very high percentage of hydrogen sulfide. The history of that (PGV) development, unfortunately, has not been good."

PGV is jointly owned by Ormat Energy Systems, an Israeli company with an office in Sparks, Nev., and Baltimore Gas & Electric.

The plant, whose output has risen from 25 to 30 megawatts, collects about 800,000 pounds of geothermal fluid (in essence, water heated by molten rock) per hour from two wells. The fluid is separated into steam, which is sent to a turbine to produce electricity, and brine, which is injected as waste into three other wells. Hydrogen sulfide levels in excess of 800 parts per million have been measured in the vapor from one of the wells.

Among the Leilani Estates residents who blame PGV for their poor health, few have suffered as much as the Harrisons, who moved here in 1986 from Southern California. Both Dru, 46, and Kate, 36, say that they are lethargic and have had cysts removed from their nasal passages. Like several other women in the neighborhood, Kate has had double menstrual cycles and sore, fibrous breasts. Dru often has blurred vision.



Brianna Harrison holds up her school journal account of her various ailments. With her, from left, are brother Tyler, sister Kaili and mother Kate.

The three Harrison children—Brianna, 11; Tyler, 8; and Kaili, 6—have experienced high fevers, abdominal pain and other baffling conditions. One morning not long ago, Kaili, who was born a month before the June 1991 well blowout, got out of bed and collapsed in a heap.

"She said, 'It feels like my legs aren't there, Dad,'" Dru Harrison said. He had to carry her for the better part of two days as she slowly regained her ability to walk. The family doctor attributed her temporary paralysis to viral cramping.

"Just to go through this over and over again with your children—you feel so powerless," said Kate Harrison.

Aurora Martinovich, 35, and her 11-year-old daughter Waiala live within 2,000 feet of the PGV fence in a neighborhood called Lanipuna Gardens. Another erstwhile Californian, Martinovich frets about emissions from the plant and has become one of its most vociferous critics.

"The state has invested so much money in seducing developers out here," she said. "They're prostituting Hawaii to the highest bidder."

Martinovich and the other Puna Malama Pono members have been mocked as counterculture ne'er-do-wells who oppose all economic development.

To be sure, they are an idiosyncratic lot, a blend of dark-skinned natives and pale refugees from the mainland. Marijuana plants occasionally can be spotted amid the region's ferns and papaya trees. Pahoā, the district's dominant town, is a colorful, slightly run-down hamlet evocative of the late 1960s.

"It's arrogance, a lot of it," Leilani Estates resident Geoff Last said of the geothermal boosters. "The lowlifes in Puna can't tell them what to do."

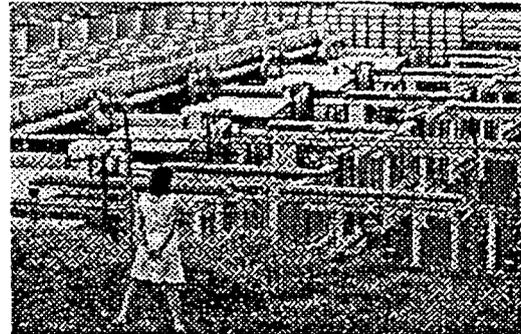
"They're trying to label this community a bunch of radicals," said an indignant Chantele Singleton, the UTMB outreach coordinator assisting Legator with his symptom survey.

Legator was encouraged to come to Hawaii by a colleague, Dr. Janette Sherman. An internist in Alexandria, Va., who for years saw patients in the islands, Sherman conducted a health survey of 71 people for a lawsuit filed against PGV by some of the Leilani Estates residents.

She noted in a 1993 report that many of the subjects complained of recurring ailments such as shortness of breath, swollen glands, nausea, vomiting and diarrhea.

Perhaps more significantly, 83 percent reported neuropsychiatric problems—depression, anxiety, sleeplessness—that had long been linked to hydrogen sulfide exposure. "This represents an epidemic!" Sherman wrote. "If this incidence were reported for a communicable disease, a state of emergency would be declared."

Legator submitted a study proposal—"Assisting a Community Exposed to Emissions from a Geothermal Plant"—to the environmental health sciences institute's Galveston center in March 1995 and was awarded a \$5,000 grant two months later.



Aurora Martinovich keeps an eye on the Puna Geothermal Venture from the fenceline. Among PGV's most vocal critics, Martinovich believes the plant is emitting unhealthy levels of hydrogen sulfide.



Graffiti painted on Pahoā-Pohoiki Road next to the Puna Geothermal Venture symbolizes the feelings of many of the plant's neighbors. Residents of the Leilani Estates subdivision blame their illnesses on hydrogen sulfide releases from the facility.

At a scientific conference at the University of Hawaii-Hilo in April, he explained the rationale behind his symptom survey: "It's nothing very much more than a physician taking a medical history so he knows where to go. It's a springboard for a more focused study."

Some attribute the Puna District illnesses to the island's naturally occurring volcanic gases.

"Emissions from the volcano make every other anthropogenic source pale by comparison," Anderson said.

Legator, however, noted that these gases consist primarily of sulfur dioxide, which affects the

body differently than hydrogen sulfide. The former tends to cause respiratory distress; the latter disrupts the central nervous system.

A 1996 report by U.S. Environmental Protection Agency suggested that PGV was a significant source of hydrogen sulfide. The agency published a list of 19 releases from the wells and the plant between February 1991 and May 1993; among these was a monstrous blowout of well KS-8 that began on June 12, 1991, and lasted 31 hours.

Goddard, the consultant, concluded that the blowout was PGV's doing, not an unavoidable act of nature, and well KS-8 was plugged.

During a 30-minute cleanout of well KS-9 on Feb. 8, 1993, hydrogen sulfide levels again soared, sickening two plant workers and five police officers off site.

In its report, the EPA criticized PGV's air monitoring and emergency planning and the state Health Department's supervision of these activities.

It noted that the EPA's San Francisco office had lodged a complaint against PGV for failing to report the 1991 and 1993 releases to the National Response Center, and that state and local officials had not received timely information about these incidents.

In an interview at his office in Hilo, Hawaii County Civil Defense Administrator Harry Kim expressed regret and revulsion over what he characterized as a government debacle.

"When I leave this job, the lowest low will be our failure to protect the people with regard to geothermal," Kim said.

The 1991 blowout "should not have happened, would not have happened if government had followed up on its responsibilities," Kim said. "This was a life-threatening situation, not an inconvenience."

Asked his opinion of Legator's health survey, he said: "The credibility of county government and state government on this issue is zero. That's why the University of Texas is here."

Things have been somewhat quieter at PGV the past few years. There have been no blowouts, although the plant's neighbors say that they still smell pungent odors—mainly at night—and worry about continuous, low-level hydrogen sulfide emissions.

"It's just there all the time," said Barbara Dettweiler, who lives with her husband, Al, about a half-mile away. "It literally dries up your throat and chokes you."

Adrian Barber was working in his Spartan office, just beyond the PGV fence, during the 1993 well-cleanout. He experienced what oil field workers call a "knockdown" from the hydrogen sulfide.

"There was no warning," said Barber, a British-born former rock 'n' roll record producer. "All of a sudden, the whole world turned vertical. It disoriented me; I'm crawling across this vertical surface to get to the door. I was vomiting. There was ringing in my ears."

Barber, president of Puna Malama Pono, is acerbic and fiercely protective of his adopted

home.

"We are the poorest island, and this is the poorest corner of that island," he said. Beneath the ground, however, lie pockets of 600-degree water with the potential to produce colossal amounts of energy.

Although the Puna District has not become the "industrial hell" Barber and his neighbors fearfully envisioned when the first PGV well was drilled seven years ago, they have not let down their guard.

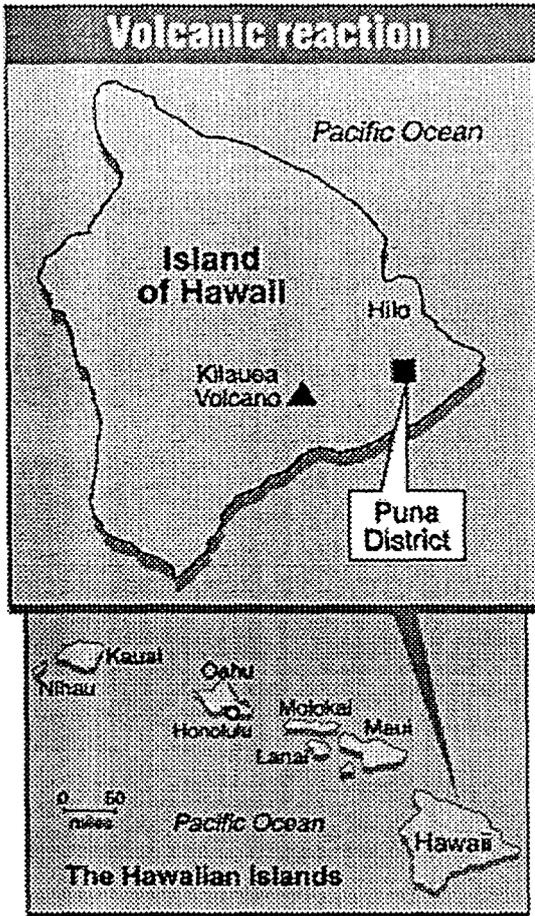
Some believe that if PGV suffers no more major mishaps, if Puna Malama Pono can be held at bay, the proposed 500-megawatt leviathan might be revived by the developers.

"They've got enough heat in this volcano to make many powerful men rich beyond their wildest dreams," Barber said.

[Back to top](#)

THE BRIMSTONE BATTLES: A Houston Chronicle Special Report

[HoustonChronicle.com](#) [Chronicle News](#) [The Brimstone Battles](#) [Discussion Forum](#)



THE BRIMSTONE BATTLES: A Houston Chronicle Special Report

[HoustonChronicle.com](#) [Chronicle News](#) [The Brimstone Battles](#) [Discussion Forum](#)

Burden of the beasts

Alberta ranchers wonder why their livestock suffer and die

ROCKY MOUNTAIN HOUSE, Alberta—It was a frigid spring afternoon, and country veterinarian Martha Kostuch had another biological riddle on her hands.

Before her, in a livestock trailer, lay a sick calf brought in by a rancher. The animal's belly was tight and swollen, and it was barely breathing.

Kostuch and an assistant worked frantically to relieve the calf's bloating, administering orally a green liquid called Dioctol. After a few minutes, it became evident that the animal could not be revived. Kostuch ended its misery with a lethal injection of sodium pentobarbital.

After 22 years here on the high plains of western Canada, Kostuch has come to expect, if not accept, such incidents. She has heard numerous reports of puzzling deaths, spontaneous abortions, birth defects, eye inflammation and listlessness among cattle. She has seen hardened ranchers cry.



Rocky Mountain House veterinarian Martha Kostuch works in vain to save a sick calf brought in by a rancher.



Ella Johnston walks past the skull of a dead cow — a reminder of a 1994 pipeline release. She and her husband say their herd suffers from a variety of illnesses, and skeletal remains are now common on their land near Caroline.

Many of the problems have occurred in areas of intensive oil and natural gas exploration, production and refining. To Kostuch and others in southwestern Alberta, this is no coincidence.

Many of the province's oil and gas fields are extremely sour-laced with hydrogen sulfide, sometimes released intact into the atmosphere but more often converted to sulfur dioxide through flaring. Both gases can play havoc with human and animal physiologies.

"No question, we're seeing chronic and acute effects," Kostuch said. She rattled them off: "Milky substance in the eyes. Difficulty breathing. Diarrhea. Neurological problems. Aggressive behavior. 'Dumb' calves that don't nurse. Poor heats. Uterine infections. Immune deficiencies."

The oil and gas industry rejects suggestions of a relationship between its operations and sickly cattle, noting that sulfur dioxide emissions are down and a recent study proved exculpatory.

"The broad public, by and large, doesn't have any burning issues with our industry," said David Pryce, manager of environment and operations for the Canadian Association of Petroleum Producers in Calgary.

In many ways, Alberta mirrors Texas with its last-frontier disposition, its agrarian roots, its vastness, its modern cities. Calgary could pass for Dallas, the rig-dotted plains near Edmonton for those near Amarillo.

There is, however, one notable difference: In Alberta, sour gas pollution is a pressing human and animal health issue, the subject of endless debate in government offices, university laboratories and small-town taverns.

In Texas, for the most part, it is still treated as an anomaly. For residents of East Texas, in the midst of a sour gas boom, Alberta's experience may be both instructive and unsettling.

The little town of Rocky Mountain House is at the center of a decades-old struggle between the province's two dominant economic forces, agriculture and energy. To the west lie the Canadian Rockies, to the south, north and east farms and ranches that, in many cases, have been in families for generations. Until sour oil and gas development began in earnest 30 or so years ago, rural Albertans had only the extremes of nature to fear. Now, they face something far more capricious.

Wayne and Ila Johnston say that they have had widespread illness in their herd of Angus cattle since 1993, when Shell Canada Ltd. began operating one of the world's largest sour gas processing plants near the town of Caroline, seven miles northwest of the Johnstons' 640 acres.

"They cough," Ila Johnston, 47, said of the animals. "They aren't doing good. The calves, when they come, are just kind of stupid."

Her 52-year-old husband described some of the deformed calves he had seen—one that was hairless, others with missing or extra limbs. A cluster of defects, he said, occurred after a Shell Canada gas pipeline rupture in January 1994.

"I had 165 head when that plant came on line," Wayne Johnston said. "I had a beautiful herd. Now it's down to 140 head and dropping."

"I used to keep a lot of cows over the age of 15. Now we can't get them to that age. Some of them will just drop dead on you."

When it began construction on the Caroline plant in 1991, Shell Canada assured its skeptical neighbors that emissions would be minimal, despite a gas stream containing, on average, 350,000 parts per million of hydrogen sulfide.

"This was supposed to be a state-of-the-art plant," Kostuch said, "but from day one they've had problems." Among them: the 1994 pipeline break and numerous "upsets"—unplanned

releases—of hydrogen sulfide, sulfur dioxide and other compounds.

The plant is allowed by permit to give off 8.5 million pounds of sulfur dioxide per year. "It's like a volcano that's erupting 24 hours a day," Wayne Johnston said.

Kostuch theorizes that all the sulfur interferes with essential trace elements—selenium, zinc, etc.—in the animals' diets, allowing deficiencies to develop.

A recently completed, five-year study funded by Shell Canada and other energy companies challenges Kostuch's hypothesis. Directed by Cheryl Waldner, a veterinarian in Sundre, researchers took one health survey of cattle before the Caroline plant opened and another after. No striking differences were found.

Shell Canada spokeswoman Laurieann Lynne said that the study was conceived and executed, without corporate interference, at the local level. "It is owned by the community, not by Shell," Lynne said.

Last spring, Shell Canada won approval from provincial regulators to increase the plant's throughput of gas, from 300 million to 360 million cubic feet per day. An appeal filed by Kostuch and the Johnstons was denied.



Sundre rancher Larry McLeod walks to his truck after picking up hay in his pasture. McLeod, citing what he believes to be a strong correlation between gas releases and problems with his cattle, gave up fighting and sold his land.

"People are very upset," Kostuch said. "Some are giving up and leaving and some are still fighting. We haven't had much civil disobedience in this province, but it's getting close."

Rancher Larry McLeod is among those who left. Through meticulous research he established what he believed to be a strong correlation between releases from sour wells, pipelines, the Shell Canada plant and a smaller Amoco plant, and reproductive problems, low weaning weights and deaths among his cattle.

"Can I one hundred-percent guarantee it? No," McLeod said. "Am I damned positive? Hell, yes."

This appears to be cumulative. Cows appear to be poisoning their calves through their milk."

The sour gas activity in Alberta affects people as well as livestock.

"This industry has totally gone nuts up here," Wayne Johnston said. "When the wind comes out of the northwest, you can't think quite clearly. Your eyes water. Your ears start to ring, and the wax just turns to crap. Your emotions really get to you. It's so easy to get depressed."

Two of the Johnstons' once-unflappable neighbors are in an almost-constant state of agitation. "One of them's so riled up he's ready to shoot someone," Wayne Johnston said.

Drilling near their home outside Rocky Mountain House periodically forces Cheryl Golding and her 24-year-old retarded son, Shane, to take refuge in a motel. The oil companies foot the bill, but Golding has come to dread what can turn into weeks of exile.



Cheryl Golding spends another day at the Walking Eagle Motor Inn with Shane, her 24-year-old son. Hydrogen sulfide emissions from drilling periodically force the two to leave their home near Rocky Mountain House and take refuge in a motel.

She and her son moved here three years ago from Hardisty, an oil town in eastern Alberta. "I came out here to get some fresh air for Shane," Golding said in her room at the Walking Eagle Motor Inn. "The Welcome Wagon didn't bring a little pamphlet saying, 'You could be gassed.'"

The drilling began in the fall of 1994. Golding said that she and Shane—a frail, childlike young man who surrounds himself with stuffed animals and other toys—have since been overcome five times by hydrogen sulfide.

On one occasion, Golding said, she had the sensation of being drunk. On another she "couldn't breathe and had the most awful headache I've ever had in my life."

Shane is particularly susceptible to the gas, Golding said, because he is asthmatic and unable to care for himself.

"They tell you, 'This is for the people of Alberta,' then they come in and muck up your land," Golding said of the oil companies. "Hundreds of us are being driven out of our homes. This whole thing is just a losing proposition."

The origins of Alberta's natural-gas industry can be traced to 1890, when a shallow, non-sulfurous (sweet) well was drilled near the town of Medicine Hat, in the southeastern corner of the province. A deeper, more productive well drilled in 1904 set off a gas boom in the area, drawing international notice.

"Shortly after this discovery, the newly incorporated city of Medicine Hat acquired gas lights on its railway platforms and downtown street corners, making the headlines of Robert Ripley's *Believe it or Not* in the process," writes Fred Stenson in his book, *Waste to Wealth: A History of Gas Processing in Canada*.

When English author Rudyard Kipling came to town in 1907, Stenson writes, "The city went to elaborate lengths to entertain its celebrity, taking Kipling for a ride in a motor car, treating him to a community picnic and, the piece de resistance, a long gander at a roaring gas flare unleashed from the city's fiery bowels."

A few years later, the activity shifted to the sour fields of southwestern Alberta, where hydrogen sulfide concentrations can reach 90 percent.

There was a sour gas boom near Turner Valley in the early 1920s, another near Pincher Creek in the late 1940s. The drilling and processing (sweetening) intensified in more populous areas in the 1960s, and workers occasionally were felled by hydrogen sulfide releases.

In terms of public safety, however, the defining moment came at 2:30 p.m. on Oct. 17, 1982, when an Amoco well blew out 12 miles west of the small town of Lodgepole.

Two workers from Texas were killed, and sour gas spurted from the well for 67 days. Nauseating odors reached Edmonton, 75 miles away; people closer to the blowout reported headaches, eye irritation, nosebleeds among children and various gastrointestinal and respiratory ailments.

After a high-profile inquiry, the Alberta Energy Resources Conservation Board (now the Energy Utilities Board) concluded in 1984 that the accident "could probably have been avoided, even allowing for equipment failures, if Amoco had followed a policy of cautious drilling in the critical zone and if Amoco had been better prepared to deal with unexpected developments. The public was understandably concerned, frightened and angry about the blowout."

The inquiry set in motion a series of government initiatives designed to prevent a recurrence at an even worse location—say, on the outskirts of Calgary.

"Prior to 1984, it was primarily the industry and regulatory folks who looked after sour gas," said Dick Bissett, a petroleum consultant in Calgary. "Now we have a new ballplayer. It's called the public."

Although Cheryl Golding and others in the Rocky Mountain House area disparage it, the Energy Utilities Board has put in place a fairly elaborate system of checks and balances that applies to wells, pipelines and processing plants.

For example, operators of "critical wells"—those thought to pose the greatest risks to the public—must install redundant safety equipment, prepare detailed emergency-response plans, go door to door to warn residents of impending drilling and maintain certain setback distances from homes and public buildings.

In the event of a release, evacuation of the surrounding area becomes mandatory if the hydrogen sulfide concentration reaches 20 parts per million. Before Lodgepole, there was no standard.

"The onus is on the industry," said Marilyn Craig, program liaison leader for the Energy Utilities Board in Calgary.

Lodgepole did more than beget regulations. It seemed to embolden people who might have remained silent prior to the blowout.

Case in point: In 1991, Calgary's top public-health officials took an unprecedented stand against Canadian Occidental Petroleum, which wanted to drill in an established sour field near subdivisions in the northeastern part of the city. The officials called for more stringent setbacks than the company was proposing, and it eventually abandoned its plan.

"We took a fair bit of heat over that one," said John Pelton, director of environmental health for Calgary Health Services.

"The company took the approach that death from hydrogen sulfide was less likely than getting hit by a meteorite," said Dr. Ken Corbet, an assistant professor of community medicine at the University of Calgary who served as a consultant to the health agency. "Well, you don't compare an exposure situation like that to an act of God; it's apples and oranges. Besides, death is not the only consequence. Other health endpoints have to be considered."

The progress made in Alberta since Lodgepole has come mainly in the area of preventing catastrophic hydrogen sulfide releases. Routine emissions have received less attention.

There are new worries about sour gas flaring—in particular, the burning of an estimated 1.6 billion cubic meters of solution gas at some 5,000 crude-oil tank batteries around the province.

Once thought to be relatively harmless—compared to the discharge of uncombusted hydrogen sulfide, anyway—flaring unleashes a "cocktail of chemicals," including benzene and other carcinogens, said Tom Marr-Laing, executive director of the Pembina Institute for Appropriate Development in Drayton Valley.

"It's like peeling an onion," Marr-Laing said. "Here's another layer of issues we need to be concerned about."

In a 1996 report, the Alberta Environmental Centre chronicled the effects of hydrogen sulfide and sulfur dioxide on cattle: bronchial constriction, slow weight gain, gastrointestinal disturbances, breathing difficulties, eye irritation, increased body temperature and heart rate, and death.

The center recommended that flaring be phased out and that the effects of low doses of sulfur and other contaminants on cattle be studied "with special attention to the reproductive and immunological systems." It also called for further study of the effects of high doses released during upsets.

Industry representatives, however, argue that things are better than they seem.

Sulfur dioxide emissions from oil and gas operations in Alberta have fallen by about 75 percent in the past two decades, said Rob McManus, manager of environment and safety for the Canadian Association of Petroleum Producers. This is partly because of better control technologies, McManus said, but mainly attributable to depressed sulfur prices.

"People are trying to find sweet gas now rather than sour," he said.

The provincial government's one major attempt to answer questions about chronic, low-level hydrogen sulfide exposures came in 1985. Researchers from McGill University in Montreal conducted a three-month, \$3.7 million study of 2,157 residents of Pincher Creek, in extreme southwestern Alberta.

These people had complained since the 1960s that emissions from sour gas processing plants were making them and their livestock ill. When the McGill researchers compared the Pincher Creek population to two others that presumably had not had such exposures, they found no significant differences in health status.

Debate over the study continues to this day. Did the McGill team, by refusing to conduct air monitoring and doing its work during a period of light activity at the plants, skew the data? Or were the environmental "illnesses" all in the Pincher Creek residents' heads?

Two Alberta academics have tried, with limited success, to pick up where the McGill study left off.

Dr. Tee Guidotti, director of the occupational health program at the University of Alberta in Edmonton, and Dr. Sheldon Roth, who heads the division of toxicology at the University of Calgary, have spent countless hours investigating the effects of H₂S exposures.

Each has published extensively on the subject. Each displays the impatience of a scientist whose work remains incomplete.

"Biochemically, hydrogen sulfide shouldn't give you much in the way of chronic problems," Guidotti said. "But we continue to get these reports. People certainly aren't making them up."

Guidotti's interest in sour gas was piqued in the mid-1980s by accounts of "persistent neurological deficits" among workers who had survived knockdowns.

By 1990, he and Roth had crafted a grant proposal to establish a hydrogen sulfide research network in Alberta that would have included a registry of exposure victims. The cost was to be split between the sour-gas industry and the provincial government.

At the last moment, the province backed out without explanation.

"Government here is sometimes to the right of industry," Guidotti said. "There was a fear of what we might find."

Roth, for his part, has tried to discern the actions of hydrogen sulfide on the central nervous systems of young rats. He embarked on a three-year, province-funded study in 1986 that suggested the developing brain was vulnerable.

At about the same time, Dr. Rhoderick Reiffenstein of the University of Alberta was pondering the effects of high doses of hydrogen sulfide on mature rats.

Roth and Reiffenstein teamed up in 1990 and approached the Canadian Medical Research Council in Ottawa—the equivalent of the National Institutes of Health in the United States—with a proposal to continue their animal studies. They were rebuffed.

"It was kicked back as a provincial problem," Roth said. "We said it was a national problem, a global problem."

He and Reiffenstein appealed to the council and got their funding in 1991. Reiffenstein died of esophageal cancer four years later. Roth reunited with Guidotti, and the two hope to complete their unfinished business with regard to the exposure registry.

"We need to know the effects of low doses—under a part per million," said Roth, who became so passionate about hydrogen sulfide that he helped organize an international conference on it at Alberta's Banff National Park in 1989. "We need to know the aftermath of acute exposures."

It's difficult research to do."

Strong suspicions are not enough, Roth said, because "you're dealing with a gas that's produced for economic gain."

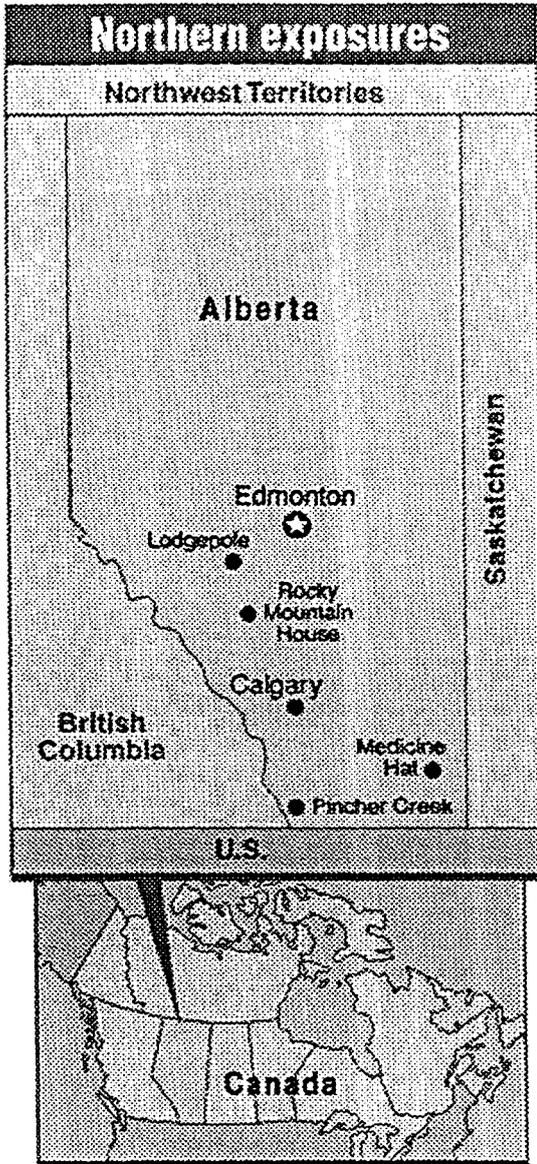
Indeed, Alberta's sour gas industry is an economic colossus that annually produces more than \$4 billion in natural gas, gas liquids and elemental sulfur.

"We're trying to get the industry to quit denying that it's emitting anything dangerous," said Rob Macintosh, research and policy director for the Pembina Institute.

[Back to top](#)

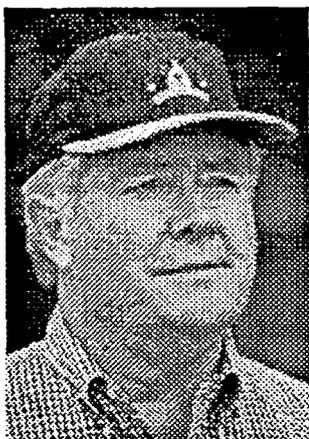
THE BRIMSTONE BATTLES: A Houston Chronicle Special Report

[HoustonChronicle.com](#) [Chronicle News](#) [The Brimstone Battles](#) [Discussion Forum](#)



THE BRIMSTONE BATTLES: A Houston Chronicle Special Report

[HoustonChronicle.com](#) [Chronicle News](#) [The Brimstone Battles](#) [Discussion Forum](#)



Consultant Galen Hartman of Tool has become a thorn in the side of the oil and gas industry.

One Man's Stand

Oil and gas firms wary of bite from lonely watchdog

TOOL—Oil and gas companies tapping the extraordinarily sour fields of East Texas must brook a growing number of adversaries, but a consultant named Galen Hartman has proved particularly irksome.

Hartman, who lives on the western shore of Cedar Creek Lake in Henderson County, has a background in chemistry, likes to crunch numbers and is not afraid to speak publicly about what he calls "dry-labbing"—the concoction of data without benefit of precise laboratory analysis.

Hartman maintains that many operators in East Texas are cutting corners in this fashion, deliberately understating the worst-case accident scenarios they must prepare under the Texas Railroad Commission's Rule 36, which governs the handling of hydrogen sulfide.

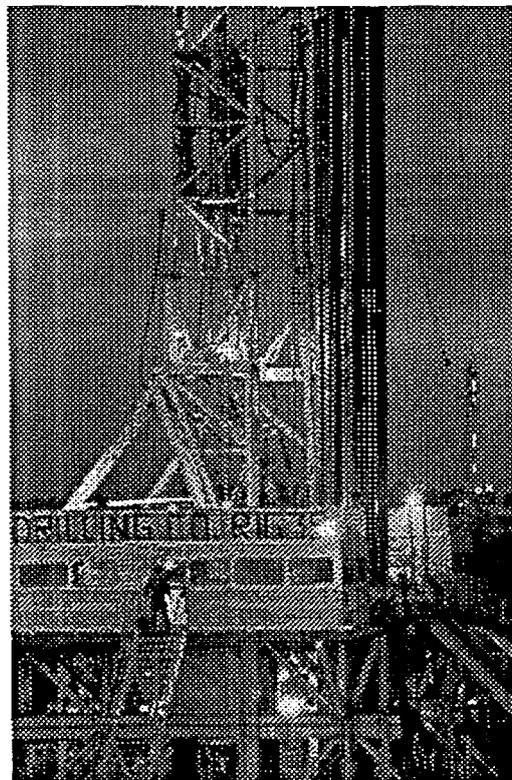
"The data is flawed," he said. "It's always flawed to the low side."

Such statements have made Hartman highly unpopular with some companies, notably Ultra Petroleum of Vancouver, British Columbia, which is trying to win state approval to begin producing from a dormant sour well near Tool.

In a Sept. 19 letter to Hartman, Ultra attorney John Soule charged the consultant with making inaccurate public comments about the company's contingency plan, filed with the Railroad Commission.

"Ultra takes these comments very seriously and will have to consider appropriate legal action if false statements are made in the future," Soule wrote.

Hartman's grievance centers on a document known as Railroad Commission Form H-9, which must be completed by companies wishing to drill or build pipelines or gas-processing plants in sour zones.



Rigs like these two drilling in the Pinnacle Reef near Buffalo are an increasingly common sight across East Texas.

There is one box on the form for the hydrogen sulfide concentration in the well or pipeline, another for the "maximum escape volume" of the noxious gas.

The figures are plugged into two prescribed equations. A "radius of exposure" for a normally lethal dose of hydrogen sulfide—500 parts per million—is then calculated, as is a radius for a 100-ppm dose.

The extent of these two zones, which can be plotted as rings on a map, influences the type of contingency plan a company must develop: the greater the number of people at risk, the more intricate and potentially expensive the plan becomes.

The presence of, say, a school or a nursing home inside one of the rings further complicates the process because of the evacuation quandaries children and the elderly can create.

The East Texas wells feed processing plants such as the one operated in Henderson County by Houston-based Warren NGL Inc. and the one recently fired up in neighboring Anderson County by Pinnacle Gas Treating. At these plants, the hydrogen sulfide is extracted and converted to sulfur so the gas can be sent to consumers.

Pinnacle, a subsidiary of Denver-based Western Gas Resources, decided to build its gargantuan plant—which will be among the world's largest when it is running at capacity—about two miles from the Cayuga Independent School District's consolidated campus.

For a good part of the year, the plant will be upwind of 650 children, a situation that gave rise to considerable angst and the formation of a local group called Citizens Against Pollution (CAP) earlier this year.

The group, comprising a dozen or so property owners, was preparing to drag Pinnacle into hearings before the Railroad Commission and the Texas Natural Resource Conservation Commission when a settlement unexpectedly was announced on Aug. 7.

Pinnacle agreed to buy out its closest neighbors, reduce hydrogen sulfide emissions by installing a high-efficiency incinerator ahead of schedule and spend \$215,000 on monitors, a long-term community health study and other projects.

In exchange, CAP agreed to drop its opposition to the plant. There will be no hearings.

"I wanted to stay here but I can't," said Ron Kotara, a former Cayuga High School civics teacher who agreed to sell his 40 acres to Pinnacle. "My conscience is bothering me, because nobody in this community stood up to (the company)."

On its current Form H-9, filed with the Railroad Commission on Aug. 1, Pinnacle estimates the hydrogen sulfide concentration of the gas entering the plant to be 5,000 ppm.

Based on a maximum escape volume of 700 million cubic feet per day, it predicts that a 500-ppm dose of the chemical would travel no more than 1.5 miles, a 100-ppm dose no more than 3.2 miles. The latter radius easily would include the Cayuga schools.

Hartman's figures for the plant are scarier. Assuming that the Pinnacle Reef wells feeding the plant contain 5,500 ppm of hydrogen sulfide and that the maximum escape volume is 12.6

billion cubic feet per day, Hartman determined that a 500-ppm dose could extend 9.3 miles from the plant, a 100-ppm dose 20.4 miles.

Why the big difference?

For one thing, Hartman believes 5,500 ppm to be a more accurate reflection of the hydrogen sulfide content of Pinnacle Reef wells than 5,000 ppm. More important, he and the company disagree about the maximum escape volume.

Although the plant eventually will be able to process 1.4 billion cubic feet of gas per day, Pinnacle says that its design ensures that no more than half that amount—700 million cubic feet—could come out at one time.

"We have the ability, from the plant, to shut in wells, adjust wells," said project manager Gary Davis. "We have a lot of control over our volume." Hartman, however, maintains that Pinnacle is being unrealistic about its ability to harness the incoming gas.

"If there's a catastrophic (pipeline) failure, you're going to have flow coming out of that rupture and from the wells," he said. "It will be a lot higher than 700 million cubic feet, I guarantee you."

Hartman said that the Railroad Commission should have caught the discrepancy but didn't because "they just rubber-stamp these forms." He finds it odd, for example, that three wells supplying the Pinnacle plant are shown to have identical hydrogen sulfide concentrations and maximum escape volumes.

"You will never have two wells that are exactly the same," Hartman said.

Charles Ross, a compliance specialist with the Railroad Commission's Oil and Gas Division, insisted that H-9s are checked for accuracy.

"If it's an existing field classified as sour, the district offices and Austin will both have databases listing all the (hydrogen sulfide) concentrations," Ross said. "They're going to have a good idea what range is out there."

If a well is drilled in uncharted territory, he said, a hydrogen sulfide concentration of 100 ppm is assumed and a 3,000-foot protective zone is established until specific data are available.

Because of the disquiet in East Texas, the agency's three commissioners have instructed the Oil and Gas Division to review Rule 36 "to make sure we've got the right kinds of regulations in place," said Railroad Commission Chairman Charles Matthews.

Still, Matthews cautioned, "As we continue to urbanize the state of Texas, we will have more and more conflicts between residential areas and producing areas. Prices are high, and the industry's taking another look at some of these reserves."

[Back to top](#)

THE BRIMSTONE BATTLES: A Houston Chronicle Special Report

[HoustonChronicle.com](#) [Chronicle News](#) [The Brimstone Battles](#) [Discussion Forum](#)

And the devil that deceived them was cast into the lake of fire and brimstone . . . - Revelation 21:10

Brimstone—"burning stone"—is sulfur. It was so terrifying to the ancients that they used it in scriptural visions of hell thousands of years ago. The effects of its chemical relative, hydrogen sulfide, have been documented for nearly three centuries:



Ramazinni

1713: Italian physician Bernardino Ramazzini, known as "the father of occupational medicine," publishes a discussion of "Diseases of Cleaners of Privies and Cesspits" describing painful and sometimes blinding eye inflammation among such workers. Ramazzini postulates that the disturbance of excrement unleashes an acidic gas that irritates the eyes.



Scheele

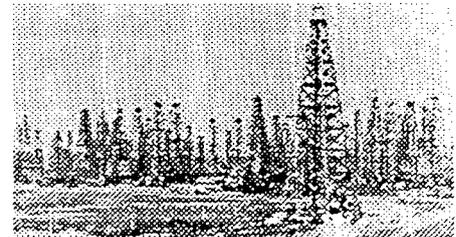
1777: Swedish chemist Carl Wilhelm Scheele discovers hydrogen sulfide after treating ferrous sulfide with mineral acid and noting a foul odor he calls schwefelluft (sulfur air) and stinkende (stinking; fetid).

1845: In *A Treatise on Poisons*, Scottish physician Robert Christison writes about the effects of "hydrosulphuric acid gas," noting its acute effects: The individual becomes suddenly weak and insensible; falls down; and either expires immediately, or, if he is fortunate enough to be quickly extricated, he may revive in no long time, the belly remaining tense and full for an hour or upwards, and recovery being preceded by vomiting and hawking of bloody froth." Christison adds: "When the exposure has been too slight to cause serious mischief, the individual is affected with sickness, colic, imperfectly defined pains in the chest, and lethargy."

1862: In his novel *Les Miserables*, French author Victor Hugo graphically describes a series of worker deaths from "sulphuretted hydrogen" in the sewers of Paris—"a sarcophagus where asphyxia opens its claws in the filth and clutches you by the throat . . ."

1925: Yale University Professor Howard Haggard writes in the *Journal of Industrial Hygiene*: "Prolonged exposure to low concentrations of hydrogen sulphide is generally believed to result in a chronic form of poisoning" particularly damaging to the central nervous system and the eyes.

1929: C.M. Aves, a Houston physician, warns in the *Texas State Journal of Medicine* of a potent and insidious gas threatening oil field workers in West Texas. "The deaths in Texas, in the past two years, from hydrogen sulphide poisoning have been estimated from fifteen to thirty," Aves writes. "It is quite a surprise to one to find that the old 'rotten egg' gas of our laboratory days is as toxic as hydrocyanic acid, and that it is coming from nature's laboratory three thousand feet underground in such concentrations."



1950: A malfunction at a new Petroleos Mexicanos natural gas-treatment plant in Poza Rica, Mexico leads to a 20-minute release of hydrogen sulfide shortly before dawn on Nov. 24. A

temperature inversion allows a toxic fog to settle over the town and invade the sleeping residents' homes, killing 22. In all, 320 people are hospitalized.

1951: Swedish physician Gunnar Ahlberg reports in the Archives of Industrial Hygiene and Occupational Medicine that 72 percent of 459 workers regularly exposed to at least 20 parts per million of hydrogen sulfide in an oil shale plant complained of fatigue, irritability, headaches, loss of appetite, poor memory and eye irritation, among other maladies. Within a control group of 384, only 44 percent reported such conditions.

1962: Thomas Milby with the U.S. Public Health Service writes in the Journal of Occupational Medicine about the growing controversy over chronic hydrogen sulfide poisoning, noting that in "low concentrations, H₂S may cause headache, fatigue, irritability, insomnia, and gastrointestinal disturbances."

1974: The Illinois Institute for Environmental Quality recommends a strict air-quality standard for hydrogen sulfide—.01 parts per million, based on an eight-hour average—marking H₂S as a public-health threat at levels once thought harmless.

1978: A National Research Council subcommittee on releases a lengthy report recommending, among other things, that a national ambient emission standard for hydrogen sulfide be considered by the U.S. Environmental Protection Agency.

1995: Kaye Kilburn of the University of Southern California School of Medicine reports in Toxicology and Industrial Health that prolonged exposure to low doses of hydrogen sulfide appears to cause "persistent neurobehavioral dysfunction."

1996: Five Finnish researchers profile two towns in Finland: one polluted by a pulp mill (a source of hydrogen sulfide, sulfur dioxide and other harmful compounds) and another described as "nonpolluted." The researchers report in the Archives of Environmental Health that residents of the polluted city experienced substantially more respiratory infections, headaches and coughing than residents of the cleaner one. "These results indicated that adverse health effects of malodorous sulfur compounds occur at lower concentrations than reported previously," they write.

[Back to top](#)

THE BRIMSTONE BATTLES: A Houston Chronicle Special Report

HoustonChronicle.com [Chronicle News](#) [The Brimstone Battles](#) [Discussion Forum](#)

7:36 PM 11/8/1997

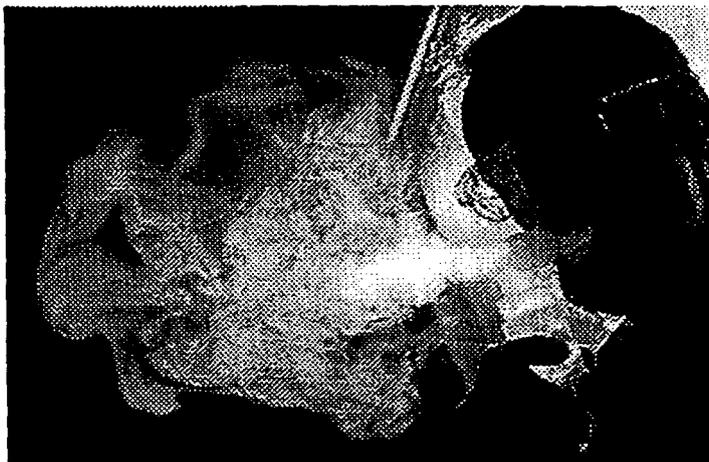
Lost Opportunity

EPA had its chance to regulate hydrogen sulfide

By JIM MORRIS
Copyright 1997 © 1997,
Houston Chronicle

Nov. 15, 1990, was an agreeable day at the White House, a reprieve for George Bush, who had been preoccupied with the Iraqi invasion of Kuwait.

At a crowded East Room ceremony, Bush signed the Clean Air Act of 1990, an unwieldy piece of legislation that, among other things, provided for a methodical and far-reaching assault on toxic air pollutants.



Every breath he takes reminds Gary Cools of his exposure a year ago to hydrogen sulfide, which so damaged his lungs that he must inhale medication through a nebulizer for 30-minute sessions, three times a day.

"Every American expects and deserves to breathe clean air," the president said as congressional and environmental leaders looked on approvingly.

Seven years later, the federal government's crusade against air toxics is more or less on schedule. New controls are in place, or soon will be, for 188 of the most fearsome substances released in this country.

One virulent and pervasive chemical, however, fell through the cracks, over the objections of government scientists and public-interest groups. It was a casualty of an inconspicuous deal struck between Congress and an oil industry facing potentially expensive regulations.

The chemical is hydrogen sulfide (H₂S), a foul, explosive gas that smells like rotten eggs and attacks the central nervous system, sometimes to lethal effect.

An 11-month Houston Chronicle investigation suggests that its deletion in 1990 from a federal Hazardous Air Pollutant list was a serious error -- although hardly an oversight -- whose full consequences have yet to be realized.

Already the gas has disrupted tens of thousands of lives in places as diverse as Los Angeles and Contra Costa County, Calif.; Corpus Christi, Beaumont, Pasadena and Ochiltree County, Texas; Tulsa and Guymon, Okla.; Detroit and Manistee, Mich.; Dakota City, Neb.; Artesia, N.M.; Pleasant Hill, Ark.; Coffeyville, Kan., and the Puna District of Hawaii.

A recent example: On Sept. 18, a hydrogen sulfide leak from the Quaker Chemical Co. plant in Detroit sent 45 people -- 29 of them students at an elementary school a mile away -- to hospitals with nausea, headaches and vomiting. A Quaker official described the release, which also sickened at least six plant workers, as "minor."

A byproduct of many industrial and agricultural processes -- oil and natural gas extraction and refining, paper manufacturing, human and animal waste treatment -- hydrogen sulfide can kill in a few seconds if present in sufficient concentrations.

At lower levels it can cause headaches, fatigue, memory loss, insomnia, depression, nausea, dizziness, respiratory problems and eye irritation.

Although studies published in the past decade indicate that hydrogen sulfide is harmful in extremely low doses, the U.S. Environmental Protection Agency and most states, including Texas, have done little to control it.

Attempts at regulation have met with fierce resistance from industry, which has argued successfully that the chemical poses only intermittent risks.

As a result, hydrogen sulfide may be the least-regulated common poison in the United States, a situation that has forced some of those affected by it to turn to the courts for help.

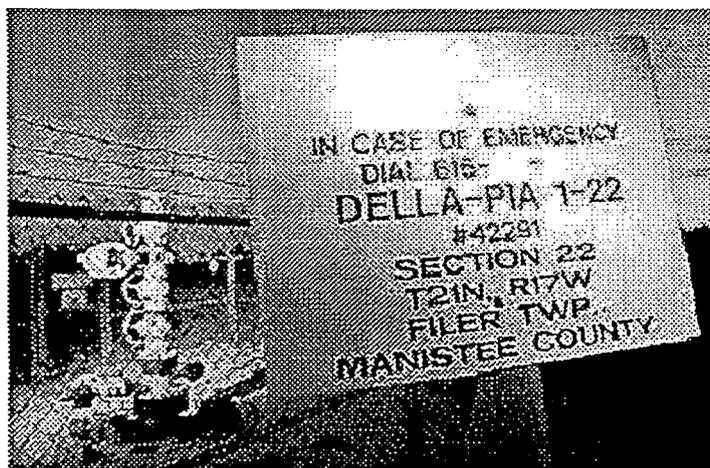
At a noteworthy hearing on April 28, a Michigan judge condemned that state's Department of Environmental Quality for failing to protect the public from leaking "sour" oil and gas wells and pipelines -- those tainted with hydrogen sulfide.

"Who in the hell stands for the public health?" asked Circuit Judge James Batzer, presiding in a lawsuit filed by rural Filer Township against two independent exploration companies. "What do we have -- a total abdication in this state?"

Hydrogen sulfide would seem to meet the federal government's legal definition of a hazardous air pollutant: A compound that presents or may present "through inhalation or other routes of exposure, a threat of adverse human health effects ... or adverse environmental effects ... as a result of emissions to the air."

The law requires that consideration be given to chemicals that may cause cancer, birth defects, neurological damage or reproductive impairment. Such chemicals may be either acutely or chronically toxic.

And yet when the EPA put hydrogen sulfide on the Hazardous Air Pollutant list, the oil



With its incomplete phone number, this gas well sign in a residential area of Manistee, Mich., would be useless in a crisis.

industry lobbied successfully to have it removed. Chemicals far less prevalent, if not less toxic, stayed on.

"It was a political deal," said a former EPA official, who asked not to be identified. "Companies in Texas were very successful in removing (hydrogen sulfide) from the list because of its presence in the extraction of oil -- because of that and the voting bloc there.

"It meets the criteria (for listing). There's no question it meets the criteria."

Virginia Hughes, an EPA air-enforcement officer in Dallas, found the delisting inexplicable.

"I couldn't believe they did that," she said. "I think it was a poor scientifically based decision, extremely poor. We all know it is extremely deadly."

The curious chain of events didn't end in 1990. Two years later, when the EPA proposed that routine emissions of hydrogen sulfide merely be reported -- not controlled -- it was threatened with a lawsuit by the chemical and paper industries. The agency backed down in 1994.

Historically, hydrogen sulfide has been viewed as an exotic occupational hazard of little concern to the public.

"There was some question (in 1990) as to whether hydrogen sulfide was a pervasive enough pollutant," said Bill Harnett, associate director of the EPA's Air Quality Strategies and Standards Division at Research Triangle Park, N.C. "It was felt that there were very few sources of it."

The Chronicle's study demonstrates otherwise.

"This stuff is like asbestos -- it's everywhere," said Dr. Kaye Kilburn, a professor at the University of Southern California School of Medicine who has reported neurological effects -- imbalance, tunnel vision, inability to concentrate -- from exposures to very low concentrations of hydrogen sulfide.

"If we'd had any sense, we'd have done something about it," Kilburn said.

Indeed, the chemical's dangers have been known for centuries. One of its elemental components is sulfur, the brimstone in biblical descriptions of hell.

In his 1862 novel *Les Miserables*, French author Victor Hugo was referring to hydrogen sulfide when he described "slow asphyxia by uncleanliness" among workers in the squalid sewers of Paris.

Victims of hydrogen sulfide exposures at a minimum are afflicted with throbbing heads, stinging eyes and churning stomachs. Those who have suffered acute exposures do not forget the experience, a nightmarish fusion of drunkenness and the worst conceivable bout of stomach flu.

Gary Cools remembers stepping out the back door of his business, Manistee Auto Electric, to drink a cup of coffee and enjoy the breeze from nearby Lake Michigan the afternoon of Aug. 27, 1996.

What he got instead was a whiff of hydrogen sulfide, liberated during the plugging of a sour gas well about 100 yards away.

"We weren't advised of anything," said Cools, 47. "We heard a rush of gas coming from the wellhead area. It sounded like a jet engine."

A white cloud, reeking of rotten eggs, drifted southeast into Cools's shop and several other businesses on Parkdale Avenue in Manistee. Cools became nauseated and giddy. His eyes burned, and he couldn't draw a full breath.

Cools, his wife Judy and nine other people wound up going to the emergency room that day. Cools continues to receive treatment for breathing difficulties, has trouble sleeping and has been weakened by repeated respiratory infections.

The incident in Manistee last year is among at least 11 that have occurred since 1993 in the northwestern Lower Peninsula, a lovely resort area underlain by a deep natural gas field called the Niagaran Reef. In recent years, the reef has attracted a number of exploration and production companies, most of them small independents.

Late on the evening of May 13, 1994, a sour gas compressor station near Ludington, 30 miles south of Manistee, blew a gasket. The heavier-than-air cloud that was released and moved along the Lincoln River sickened a number of people in its path, including a woman driving across a bridge nearly five miles away.

Early the next day, Debbie Nickelson and her family awoke with headaches and nausea. "We thought it might be a bug," said Nickelson, who runs a day-care center out of her basement and was preparing for the imminent arrival of five young children.

Four of the five were overcome later that morning by hydrogen sulfide, which had accumulated overnight in the basement, and were taken to the hospital. The fifth didn't stay long enough to feel any effects.

"It was really scary," Nickelson said. "They were basically just passing out. One little girl kind of went to sleep. One little boy passed out on the kitchen floor; he started to vomit as he passed out. I had another little boy with asthma -- he was having great difficulty breathing."

No one had bothered to warn the Nickelsons -- or anyone else -- about the gas leak; those closest to it evacuated on their own, out of necessity. "The kids, they play downstairs by themselves sometimes," Debbie Nickelson said. "Would they have died if I hadn't gone down there when I did?"

Unpublicized, worst-case scenarios developed by some oil and gas companies indicate that the Michigan victims were fortunate.

In a document filed in February with the Texas Railroad Commission, for example, representatives of the Warren NGL Inc. sour gas processing plant near the East Texas town of Eustace offered their best guess about the impacts of a catastrophic pipeline rupture.

A cloud with lethal levels of hydrogen sulfide (500 parts per million) would move up to 4.3

miles from the plant, they predicted, and a 100-ppm cloud -- capable of causing serious illness -- up to 9.3 miles.

Hydrogen sulfide need not be discharged in high concentrations, however, to do harm. It can, over time, impair quality of life at levels deemed safe by most regulators.

Its offensive odor has ruined property values and literally driven people from their homes. There is evidence that it has hampered young students' performance in the classroom.

Extremely corrosive, it has consumed barbed-wire fences and the copper entrails of air conditioners. And it continues to kill poorly trained or careless workers.

Company reports to the EPA's Emergency Response Notification System show that there were 197 accidental releases of hydrogen sulfide nationwide during the first nine months of 1997. Fifty-four percent -- 107 -- of these were in Texas.

Such mishaps aren't the worst of it. In some parts of the country, routine, legal hydrogen sulfide emissions dwarf accidental releases.

In 1995, for example, the old Farmland Industries oil refinery in Coffeyville, Kan., put out 840,000 pounds of the chemical. Much of the malodorous gas settled on the city's low-income east side.

"It takes the paint off people's houses," said Nicketa Nevils, who runs a day-care center in the neighborhood. "It messes up people's roofs and air conditioners. You can smell it inside your house."

Last November, Farmland paid \$1.45 million in penalties to the EPA and agreed to make \$4.25 million in refinery improvements to resolve a litany of violations, among them failure to promptly report 29 accidental hydrogen sulfide releases, known as "upsets," over a four-year period.

Farmland's output of hydrogen sulfide has fallen since the 1995 peak and is expected to keep falling -- to perhaps 40,000 pounds per year -- only because an expansion project subjects it to new, stricter rules.

Had the expansion not gone forward, regulators say, the absence of federal and state standards would have tied their hands.

Farmland is not an isolated case. Navajo Refining Co. has been stinking up the southeastern New Mexico town of Artesia for many years. The Los Angeles-Long Beach and Bay Area refinery belts in California are prodigious sources of hydrogen sulfide, sometimes released in window-shattering explosions.

The chemical has repulsed neighbors of an IBP meatpacking plant in Dakota City, Neb., and the Dynagen synthetic-rubber plant in Odessa. Residents of Corpus Christi's "Refinery Row" have learned to distinguish it from the other industrial odors that drift into their homes.

Hydrogen sulfide upsets almost always are dismissed as unavoidable accidents and go unpunished by regulators, although at some plants they occur so frequently that workers and

adjacent residents come to expect and dread them.

The stakes of such releases are high because of the chemical's potency and its propensity for settling, as a pungent fog, in low spots. Motorists have been known to pass through such clouds with their windows up and emerge seconds later gasping and wrenching.

Still, "people have a cavalier attitude about this chemical," said Dr. Myron Mehlman, an adjunct professor of environmental and community medicine at the Robert Wood Johnson School of Medicine in Piscataway, N.J. "They always find excuses why we can't regulate it."

In a sort of consolation prize for public-health advocates, hydrogen sulfide was proposed for and remains on an EPA "extremely hazardous substances" list drawn up for the 1990 law.

Companies that store or produce chemicals on this list must develop plans to prevent and respond to accidental releases. Routine emission controls, however, aren't part of the picture.

There was, in addition, a 1993 EPA report to Congress on hydrogen sulfide discharges associated with oil and gas production.

The study's conclusion: "From the limited data available, there appears to be no evidence that a significant threat to public health or the environment exists from routine emissions from sour oil and gas wells."

The authors didn't look at other large sources of hydrogen sulfide, such as refineries.

And their own report noted that a single tank battery in the Lone Butte Oil Field near Theodore Roosevelt National Park in North Dakota had recorded more than 3,000 violations of the state's hydrogen sulfide standard each year from 1984 through 1986.

As it stands, the chemical essentially is treated as an afterthought by the EPA: Its concentration in industrial fuel gas is limited to minimize emissions of sulfur dioxide, the lung-irritating gas created when hydrogen sulfide is burned.

The story of the federal government's failed run at hydrogen sulfide begins in the mid-1980s, by which time a groundswell had developed for an overhaul of the original Clean Air Act, passed in 1970.

Restrained by a cumbersome regulatory scheme that forced it to do elaborate risk analyses on a case-by-case basis, the EPA had made little headway against air toxics. Realizing that hundreds of pernicious compounds were threatening public health and the environment, agency officials began to rethink their strategy.

Ultimately it was decided that air-toxics regulation should be a two-step process. Industries that put out listed chemicals above certain levels are being required to employ "maximum achievable control technologies" (MACT) -- systems used by the most progressive members of a given industrial category.

After these controls are in place, the EPA will revisit each category. If it determines that there is a residual health risk, more controls will be required.

The MACT program is proceeding apace. One hundred seventy-four categories -- from dry cleaners to aerospace and organic-chemical manufacturers -- must have state-of-the-art control technologies in place by November 2000. About half already do, and the EPA estimates that this has resulted in an annual reduction of 2 billion pounds of air toxics.

What would have happened if hydrogen sulfide had stayed on the EPA's target list? The agency would have looked at industries known to pollute the air with large amounts of the chemical -- refineries, paper mills, etc. -- and probably would have set a tough but attainable emission standard, as it has or will set for much rarer compounds.

Industry resistance to controls on hydrogen sulfide is not surprising, given that compliance could be quite expensive. Harder to fathom is the reaction to a seemingly less onerous EPA proposal to add hydrogen sulfide to a list of chemicals whose releases must be reported annually under the Toxics Release Inventory program.

The chemical was among 82 nominated for listing in a petition submitted in 1992 by then-New York Gov. Mario Cuomo and the Natural Resources Defense Council. After it accepted the petition and announced its intentions, the EPA received a torrent of letters, many of which focused on hydrogen sulfide and a related compound, methyl mercaptan, added to natural gas to give it a detectable odor.

The Chemical Manufacturers Association insisted that there had not been a "sufficient demonstration of hydrogen sulfide's chronic effects."

The American Forest and Paper Association said that there was "no scientific rationale for listing either hydrogen sulfide or methyl mercaptan."

The EPA scientists held their ground. One internal memorandum advised the agency to "continue support for (hydrogen sulfide's) chronic neurotoxicity effects."

But in the end, hydrogen sulfide and methyl mercaptan were culled from Cuomo's list. Any action on them was put on hold under what the EPA calls an administrative stay. The reason was explained with unusual candor by Assistant EPA Administrator Lynn Goldman in the Aug. 22, 1994, Federal Register:

"The Chemical Manufacturers Association and the American Forest and Paper Association have told the agency that unless administrative action is taken to resolve the issues outlined in today's document, a prompt legal challenge will be brought."

Susan Hazen, director of the EPA's Environmental Assistance Division in Washington, said the administrative stay on hydrogen sulfide may be lifted by the end of the year and the substance "may well meet the listing criteria on chronic neurotoxicity."

Earlier this year, however, oil and gas companies dodged yet another bullet. When the EPA brought seven broad industry sectors under the Toxics Release Inventory program, one was conspicuously absent: oil and gas exploration and production.

One who has argued for inclusion of this industry is Robert Wages, president of the Oil, Chemical and Atomic Workers union in Denver. In a letter to EPA Administrator Carol Browner on May 30, 1996, Wages wrote that oil and gas operations release "vast quantities"

of toxic chemicals.

He singled out gas processing plants, "which are mostly made up of old, surplus equipment" and leak "substantial, unreported volumes of hydrogen sulfide."

The EPA's position is that the industry is so idiosyncratic and diffuse that it is difficult to bring under any sort of regulatory program. "It isn't neat and tidy," said the agency's Hazen, who emphasized that the matter is still under evaluation.

Chris Shuey, an oil and gas specialist with the Southwest Research and Information Center in Albuquerque, sees no need for further study.

"The oil and gas industry made all these outrageous claims that if they were to be included in (the inventory), it would cost them \$200 million and put people out of work," Shuey said. "They claimed that all of their sites are in remote areas, well away from people. For us, those kinds of statements don't pass the laugh test.

"The industry's claims are spurious, but you would expect that," he said. "What I don't expect is this continued penchant of certain EPA administrators to simply cave in. It's a little bit tiresome that people in Washington seem to cower at the big, bad oil and gas industry."

The industry's clout is well-documented. Oil and gas producers and marketers contributed nearly \$9 million to congressional candidates -- most of them Republican -- in the 1994 elections, according to the Center for Responsive Politics in Washington, and gas distributors gave another \$2.5 million.

The EPA isn't the only federal agency to capitulate to these interests.

On May 10, 1988, the National Transportation Safety Board recommended to the U.S. Department of Transportation that it establish a maximum allowable hydrogen sulfide concentration for natural gas in pipelines; that pipeline operators be required to install detection and shutoff equipment that would respond automatically when maximum levels were exceeded; and that such incidents be reported.

The NTSB didn't pull this proposal out of thin air. There had been several disturbing pipeline incidents, including one near Winters, Texas, on Aug. 12, 1987. A gas stream feeding a Lone Star Gas plant was found to contain 1,600 parts per million of hydrogen sulfide -- several times the lethal dose.

Residents were safely evacuated, but it was learned that an automatic shutoff valve programmed to close the pipeline when hydrogen sulfide levels exceeded 6 ppm had failed. Lone Star told the NTSB that it had had 11 other incidents involving excess hydrogen sulfide levels in its pipelines since 1977.

On June 7, 1989, the Transportation Department accepted the NTSB's recommendations and published an "advance notice of proposed rulemaking." Like the EPA, it was quickly inundated with letters.

The consensus among companies such as Texaco, Phillips, Chevron, Tenneco and Lone Star was that the regulations were unnecessary and would be prohibitively expensive. On March 7,

1996, the Transportation Department formally abandoned the idea, much to the annoyance of the NTSB.

The case for an EPA crackdown on hydrogen sulfide was made at a hearing before the Senate Committee on Environment and Public Works on June 19, 1987. The two witnesses that day were from North Dakota, home of the late Sen. Quentin Burdick, then chairman of the committee.

John Brophy of the Fargo-Moorhead Audubon Society and John Lamb with the Dacotah Chapter of the Sierra Club testified that hydrogen sulfide releases from oil and gas wells in the western part of the state had killed cattle and caused the evacuation and hospitalization of people.

They pleaded for federal intervention. It never came.

Dr. Harriet Ammann joined the EPA's science staff in North Carolina in 1984 and was immediately handed the task of researching hydrogen sulfide. She did so, off and on, for the next six years, authoring a detailed health-assessment document on the chemical before leaving the agency in 1990.

Now a senior toxicologist with the Washington Department of Health in Olympia, Ammann is convinced that an important opportunity was missed when hydrogen sulfide was bumped from the Hazardous Air Pollutant list.

"I don't know why it was removed," she said recently. "We were working on risks to the general public, and the public is exposed to it in areas where there are facilities that produce it.

"It's clearly known, from industrial exposures, that it's a very toxic gas," Ammann said. "It hasn't gotten a lot of respect, in a sense, because everyone's smelled it and made jokes about it. But there's no one who could stand even 20 parts per million of it. I have encountered it in a number of different situations in this state."

The EPA list that exists today took shape in 1988, when then-Sen. George Mitchell, D-Maine, submitted the names of 224 chemicals derived from three EPA databases.

The EPA to this point had developed standards for only eight compounds: asbestos, mercury, beryllium, vinyl chloride, benzene, inorganic arsenic, coke oven emissions and radionuclides. Its air-toxics program was, by any measure, a bust.

Hydrogen sulfide was included on the Mitchell list, according to an internal EPA document, because of its high toxicity. The list was trimmed to 191 during the first half of 1990, and hydrogen sulfide survived the cut.

By the time the final bill got to the White House in November, only two of the 191 chemicals had been targeted for removal: hydrogen sulfide and, in a concession to agriculture, ammonia.

A former congressional aide involved in the negotiations said that the inclusion of hydrogen sulfide on the list "became a lightning rod. API (the American Petroleum Institute, the major oil companies' trade association) was all over it. Our preference would have been that it

stayed on the list."

A senior API attorney explained the oil industry's position. "What it really came down to was that hydrogen sulfide emissions are not appropriately handled as routine emissions," Ellen Siegler said. "Our view was that this was more of an accidental-release issue."

Told that the chemical is, in fact, regularly discharged in large quantities at a number of locations, Siegler said: "That's news to me."

U.S. Rep. Henry Waxman, D-Calif., one of the architects of the 1990 act, said that there was uncertainty at that time about hydrogen sulfide's behavior at low levels.

"There have since been some studies showing that low-level exposure does present a public-health threat," Waxman said. "I'm concerned about it."

It is fair to say that less was known seven years ago about hydrogen sulfide's more subtle actions on the human body than is known today.

But even in 1990 there were clues.

A 1964 U.S. Public Health Service report on an outbreak of nausea, vomiting, diarrhea and shortness of breath in Terre Haute, Ind., for example, identified as the culprit a "vile odor" -- discovered to be hydrogen sulfide -- from an industrial waste lagoon.

"Certainly nausea is more than merely a nuisance since it interferes with physical comfort, appetite and general well-being," the report's authors wrote. "People do not have to die to prove that a medical or public health problem exists."

As it happened, a clerical error allowed hydrogen sulfide to remain on the Hazardous Air Pollutant list for a year after Bush signed the act. It took a joint resolution of Congress -- Waxman made the motion in the House -- to get it off for good.

The final list of 189 has since been reduced by one. Caprolactam, a feedstock used in the making of nylon, was removed by the EPA in response to an industry petition.

There is nothing in the law that precludes the agency from adding a chemical to the list; the administrator can do so independently, without a petition, in the face of persuasive new evidence.

"Even if you come to the conclusion that Congress made a mistake," said David Hawkins, a senior attorney with the Natural Resources Defense Council, "that mistake doesn't have to be a permanent one."

THE BRIMSTONE BATTLES: A Houston Chronicle Special Report

[HoustonChronicle.com](#) [Chronicle News](#) [The Brimstone Battles](#) [Discussion Forum](#)

7:52 PM 11/8/1997

Locales differ, but similar tales of frustration heard

By JIM MORRIS
Copyright 1997 Houston Chronicle

PLEASANT HILL, Ark. -- Vanquished after two years of resistance, Lisa White was moving out.

The night before, White had attended yet another fruitless meeting about a sour gas processing plant that lay just west of her home and had made life miserable for her and her two sons. She'd come away fuming and dejected.

"I've given up," she said. "I don't even want to be here anymore."

White reluctantly would send her boys, 17-year-old Dusty and 11-year-old Billy, to live with their grandparents in Texarkana, 10 miles north of this unincorporated community in the piney woods of southwestern Arkansas. She'd go back to her cross-country trucking job and visit them as often as she could.

White had challenged a small segment of the oil and gas industry and lost, learning a hard lesson in the process: It is nearly impossible to stop or curtail development of this sort, even with evidence of chronic disease or life-threatening neglect.

It is a lesson that also has been learned in Manistee, Mich., Artesia, N.M., and other out-of-the-way places where the economics of energy can overshadow public health.

"The oil and gas guys are very powerful," said Hugh Kaufman, an engineer in the U.S. Environmental Protection Agency's Office of Solid Waste and Emergency Response in Washington. "They've got a lot of money to throw around."

By and large, the 300 or so residents of Pleasant Hill came to the hills of central Miller County in search of sanctuary. To them, even Texarkana was too dirty and chaotic; they wanted to be in the country where they could raise their children and their animals with minimal disruption.

Chaos found them anyway, in the form of a gas "sweetening" plant and five adjoining oil wells that routinely give off stomach-turning odors and occasionally disgorge poisonous clouds. A large paper mill just across the state line in Texas adds to the putrescent mix.

"We feel like all the sour gas in the world is coming through here," said Pat Rodgers, who had a hydrogen sulfide monitor in her yard from January 1995 until April of this year. The monitor regularly displayed readings of 50 parts per billion -- 10 times the widely recognized odor threshold and two to five times the statutory limit in several states. (Arkansas has no limit.)

A more sophisticated monitor on Bill and Ann Grey's ranch recorded hydrogen sulfide levels in excess of 100 ppb on numerous occasions last summer.

"We've had mornings where we tried to gather the cows up and our eyes got to watering so bad we had to quit," Bill Grey said.

In July 1996, the Arkansas attorney general's office took the unusual step of suing the gas plant owner, Warren Energy Resources (a subsidiary of Houston-based NGC Corp.), and the well operator, Harleton Oil and Gas of Tyler, on the grounds that their emissions of hydrogen sulfide and sulfur dioxide constitute a public nuisance.

International Paper, owner of the mill in Texarkana, Texas, recently was added as a defendant.

The lawsuit alleges that the sour-gas pollution has afflicted the people of Pleasant Hill with headaches, nausea, dizziness, burning eyes and shortness of breath. As a result of the noxious odors, it says, "many of the residents have been and continue to be unable to use their property for work and enjoyment."

The attorney general is seeking a permanent injunction that would force the companies to stop the offensive releases. The case is so politically sensitive that four judges begged off before one was found to preside.

"I've never gone through four judges before," said Assistant Attorney General Charles Moulton, the lead prosecutor.

At first, Lisa White and the others in Pleasant Hill were heartened by the attorney general's action: Perhaps the three companies finally would be held accountable for incidents such as the May 8, 1996, explosion at Warren, which terrified and sickened dozens of people, including young Dusty White.

As the months wore on, however, their optimism faded.

It became obvious that, although one arm of the Arkansas government had declared the Warren plant a nuisance, another -- the state Department of Pollution Control and Ecology (PC&E) -- was inclined to let it double its production of sulfur, from about 36,000 pounds per day to about 72,000 pounds.

Warren promised PC&E that it could accomplish this without increasing the amount of sour gas it brings into the plant. Indeed, it promised reductions in hydrogen sulfide and sulfur dioxide emissions, thanks to pollution-control upgrades.

The people of Pleasant Hill were incredulous. At a meeting with PC&E officials in Texarkana on July 2, they voiced their exasperation.

"We've given up using the word 'smells,' " said Gerald Adcock, a tall, white-haired man of 71 who has lived in Pleasant Hill since 1936. "It's a health hazard. Why do they bring this (sour gas) out of the ground? Because it's a money-making deal. They're shoving something down our throats that's a money-making deal."

Members of the audience were told that there was virtually nothing they could do to influence the department's decision on Warren's sulfur proposal. Although the state and the EPA have come to terms on an elaborate air-monitoring program for Pleasant Hill, Warren's permit application apparently cannot, by law, be held up pending the results.

"We want to help you," said PC&E's Barbara Davis, who moderated the discussion, which, at one point, nearly propagated a fistfight between a Warren employee and a plant critic. "No one's trying to talk down to you. I know you are frustrated. Our director knows you are frustrated. Our commission knows you are frustrated."

At first, Warren wanted to capitalize on a sour gas boom in East Texas by building a second processing plant in Miller County. Dogged opposition from Pleasant Hill residents -- notably, a woman named Barbara Willis -- convinced the company to offer an alternative: a 100 percent increase in sulfur production at the existing plant, which opened in 1990.

Willis was among those who denounced the idea at the July 2 meeting, saying, "To me, this is not a trade-off. It's a health issue we need to seriously look at."

PC&E chief legal counsel Steve Weaver said in an interview, however, that "from the department's point of view, this was a pretty good deal. We were having not two sour-gas plants but one, and getting better pollution-control efficiency."

In order to deny Warren's permit application, Weaver said, the department would need a clear indication that the plant is a significant contributor to the distress in Pleasant Hill.

Asked about the attorney general's lawsuit, which suggests that Warren *is* a problem, Weaver said: "We're two separate agencies. We have litigated against the attorney general before on regulatory matters and won."

As it stands, there are three suspects in the Pleasant Hill inquiry: Warren, Harleton and International Paper.

International Paper spokesman Kirk Clayborn said that the company was "quite surprised by our inclusion in this suit," given that it has reduced odors by more than 75 percent since 1990 and complies with all state and federal standards.

"I think it's just a shotgun approach," said Harleton President Bruce Wooldridge. "They just named everybody that's in the area."

Dean Ayers, NGC's vice president for investor relations, declined comment on the Warren plant.

PC&E is still mulling the Warren matter and may reach a decision by the end of the year. A few months ago, the department was handed an even taller order by the Arkansas legislature: develop a statewide ambient air standard for hydrogen sulfide.

Residents of Pleasant Hill are not hopeful about either endeavor.

"We're fighting money and politics," said Pat Ray, who became violently ill early one morning after driving through what she believed to be a patch of sour gas.

Said Pat Rodgers: "Three or four years ago, I didn't even know about hydrogen sulfide. Now, it's taken over my life. You can't go to bed at night with any peace of mind."

Turmoil in Michigan

A thousand miles northeast of Pleasant Hill, people in Michigan's Manistee and Mason counties are understandably edgy about drilling in the prolific Niagaran Reef.

The area has had at least 11 sour gas releases since 1993 and 16 since 1980, according to research by Manistee resident Dana Schindler and the Michigan Land Use Institute in Benzonia. Evacuations took place and illnesses were reported in almost every case.

"Many of the H₂S releases ... never were officially recorded or thoroughly reviewed by either the oil and gas industry or state regulators," institute director Keith Schneider wrote in a recent newsletter. "They represent a significant public health problem that essentially has been ignored by state authorities."

Filer Township, which lies just south of the lakefront city of Manistee, is pressing a public-nuisance lawsuit against two independent oil and gas exploration companies. In effect, the township has given up on the Michigan Department of Environmental Quality, which is supposed to regulate such operations, and turned to the judicial system for relief.

Both defendants have inactive sour wells in populated areas. One well, which has an estimated hydrogen sulfide content of 43,000 parts per million, was shut in but not permanently plugged by Manistee Gas Limited Liability Co. of Wyoming.

There is confusion about the current ownership of the so-called Della Pia 1-22 well, and a sign posted on the chain-link fence that surrounds it is not reassuring. "In case of emergency," it reads, "dial 616- ." The final seven digits are missing.

"We want it plugged, and we don't want it reopened -- ever," said Jim Olson, an attorney in Traverse City who is representing the township.

The other well, with a hydrogen sulfide concentration of 1,400 ppm, has been plugged by Aztec Producing Co. of Traverse City, but there are concerns about its stability.

Carl Mikolajczak lives about 800 feet north of the Aztec 1-23 well and runs an excavating business from a nearby shop.

At about 2 p.m. on Jan. 27, Mikolajczak was struck by a wave of nausea as he approached his shop. "Before I even got close to it, I could smell this strong odor," he said. His head began to pound and his face flushed.

The odor was still overpowering when Mikolajczak arrived home a few minutes later. His wife, Delphine, already had evacuated; his dog had vomited in the breezeway. The Mikolajczak's grown son, Eric, also became ill.

There is no doubt in Carl Mikolajczak's mind that sour gas leaked from the 1-23 well, then being drilled.

"What they're doing in a populated area is totally uncalled for," he said. "What they're telling us is, 'The heck with you, as long as we get the oil out of the ground, that's all that matters.' Their dollars are more important than my life."

Aztec's attorney, Kurt Bowden, said in a prepared statement that although the company's drilling contractor noticed no problems among its workers on Jan. 27, it "cannot categorically deny that there was any release."

The contractor apparently complied with all state requirements, Bowden said, adding that attempts by Filer Township and others to assume greater control over oil and gas operations "will do nothing but create a hodgepodge of conflicting local regulations which will render it impossible for a producer to do business in Michigan."

Two top Filer Township officials say that they are well within their purview, given the stakes. Fire Chief Ron Gutowski and Supervisor Jim Espvik shudder at the thought of a massive hydrogen sulfide release, guessing that the little community could not muster an effective emergency response.

"It's a nightmare," Espvik said.

Attorney Olson said that Michigan is experiencing a "regulatory crisis" with regard to hydrogen sulfide. Circuit Judge James Batzer, presiding in the township's nuisance case, seemed to agree during an April 28 hearing on an Aztec motion to dismiss, saying he was "amazed ... flabbergasted and astonished" at the state's apparent nonchalance.

The DEQ "has not addressed the health, safety and welfare issue," Batzer said. "This court is prepared under the law of nuisance to shut down any and all sour gas wells in this circuit, if necessary, to assure public safety."

DEQ spokesman Ken Silfven said that while the department had not been ignoring the sour gas issue, an August 1996 well release in Manistee that sent 11 people to the hospital brought to light certain regulatory weaknesses.

Since the accident, Silfven said, the DEQ has taken steps to improve its oversight of the oil and gas industry. In June, it ordered operators to burn any excess hydrogen sulfide rather than simply vent it.

The DEQ has held training sessions with local 911 operators who might have to field complaints about gas leaks and broached the idea of joint training exercises with the Michigan Fire Chiefs Association. The state Department of Community Health has agreed to assess victims of any future releases.

"This is really something that the (DEQ) is paying attention to," Silfven said. "It's not just talk on our part."

The fracas of the moment in northwestern Michigan involves the proposed 43-mile extension of a 26-mile sour-gas pipeline. If certified as a "public necessity" by state officials, the 69-mile line would pass through three counties -- Oceana, Mason and Manistee -- and carry gas laced with 20,000 ppm of hydrogen sulfide

Two public hearings have been held on the proposal thus far; in both cases the operator, Basin Pipeline, and regulators got an earful.

Jim Skifstad, a professor of mechanical engineering at Purdue University and a summer resident of Manistee, has condemned in many forums the state's "unbelievably lax" sour gas pipeline-safety regulations and Republican Gov. John Engler's aggressively pro-business policies.

"The laws in our state have been written by the gas industry," he said. "These people have been running wild."

Michigan Oil and Gas Association director Frank Mortl rebutted this charge, saying in a prepared statement that the industry makes "every effort to prevent the release of any hydrogen sulfide gas during our operations."

Engler's spokeswoman, Pat Masserant, said that the governor has asked the Michigan Environmental Science Board to review the state's oil and gas regulations on a scientific basis rather than an emotional one in light of the strong feelings on both sides of the issue.

Shouted down in Artesia

Divina and Robert Duncan are glaringly overmatched in their campaign against Navajo Refining Co., whose refinery looms above the small buildings in downtown Artesia, N.M.

The Duncans, who live due north of the refinery, say that it frequently unleashes sulfurous odors that cause headaches, nausea and dizziness.

"I was raised on a hog farm, and it was never like this," Divina Duncan said.

"The stench gets so bad that you don't even want to take a breath," her husband said.

Divina Duncan and her daughter, Jackie Box, were taunted when they spoke out against Navajo at a public hearing in Artesia last March.

The meeting room was jammed with refinery workers and other boosters; three days earlier, the Greater Artesia Chamber of Commerce had exalted the refinery in a full-page advertisement in the local newspaper.

The ad's headline: "Imagine Artesia without Navajo."

From 1991 to 1995, Andy Nowak inspected the refinery for the New Mexico Environment Department. "I had lots of trouble with them," he said.

Two years ago, Nowak became a permit engineer for the department. One of his first assignments was to review Navajo's request to modify a unit in Artesia.

"I wanted to write a tight permit," Nowak said, forcing Navajo to correct what he believed to be unsatisfactory flaring of hydrogen sulfide.

"Boy, did they howl," he said of Navajo. "They howled all the way to the top."

On Feb. 8, 1996, Nowak and three colleagues sent a memorandum to two of their supervisors, recommending that a public hearing on Navajo be held in Artesia.

Without such a hearing, the memo's authors warned, "we may be doing the community a disservice and risking accusations of indifference." The refinery, they noted, "has been a consistent violator of air quality regulations."

Nowak was reprimanded and taken off the Navajo case. He lodged a whistleblower complaint with the U.S. Department of Labor, got a favorable decision and settled with his bosses in February.

One condition was that Nowak keep his job; another was that the hearing in Artesia go forward.

It did, on March 19. Nowak was there to watch Divina Duncan and Jackie Box be ridiculed.

"The refinery packed it with 300 of their family members," Nowak said. "It was a circus. They took total control of the meeting, and the state let them do it."

Navajo spokesman Bill Gray said that while the refinery's capacity has nearly quadrupled since the late 1960s, emissions are down considerably.

"I think we're excellent corporate citizens," said Gray, who referred to the refinery's critics as "soreheads."

The Duncans, he speculated, are angry because Navajo will not buy them out.

As recently as Sept. 15, however, the state cited Navajo for 10 alleged violations, including inadequate monitoring of hydrogen sulfide levels in its fuel gas.

"They just drag their feet on anything to do with environmental compliance," Nowak said.

THE BRIMSTONE BATTLES: A Houston Chronicle Special Report[HoustonChronicle.com](#) [Chronicle News](#) [The Brimstone Battles](#) [Discussion Forum](#)**H₂S exposures**

Hydrogen sulfide exposures treated at poison control centers have nearly tripled since the late 1980s.

Year	Cases	Deaths	Centers reporting
1987	480	1	63
1988	531	7	64
1989	769	4	70
1990	688	1	72
1991	897	5	73
1992	123	0	68
1993	1144	2	64
1994	1411	9	65
1995	1407	0	67

Source: American Association of Poison Control Centers

Chronicle

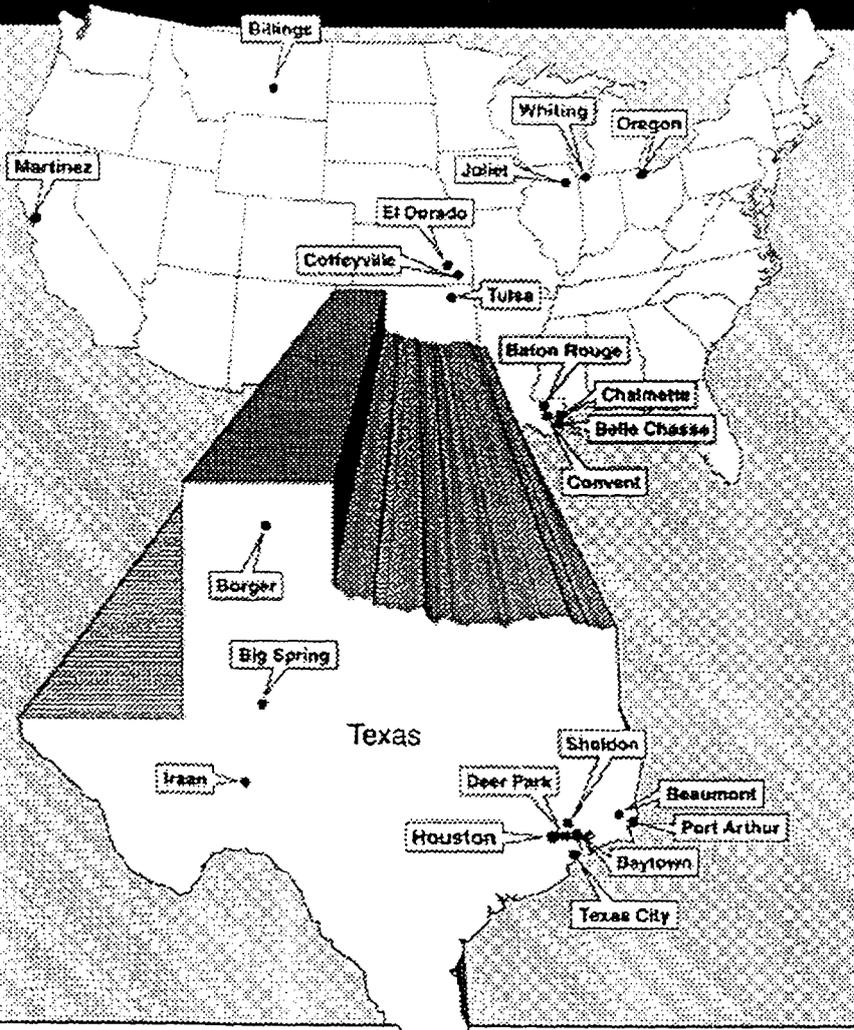
THE BRIMSTONE BATTLES: A Houston Chronicle Special Report

[HoustonChronicle.com](#) [Chronicle News](#) [The Brimstone Battles](#) [Discussion Forum](#)

Hard-hit cities

Each of these cities had at least 15 hydrogen sulfide releases from 1987 through mid-1997. The figures are derived from reports by companies to the Environmental Protection Agency's Emergency Response Notification System.

City	Number of releases
Borger	308
Houston	130
Port Arthur	105
Coffeyville, Kan.	67
Texas City	63
Baton Rouge, La.	56
Baytown	39
Iraan	38
Belle Chasse, La.	35
Big Spring	30
Deer Park	27
Chalmette, La.	24
Convent, La.	24
Martinez, Calif.	24
Billings, Mont.	20
Beaumont	18
Sheldon	18
Whiting, Ind.	18
Oregon, Ohio	17
Tulsa, Okla.	17
El Dorado, Kan.	16
Joliet, Ill.	16



Edwin Louie/Chronicle

THE BRIMSTONE BATTLES: A Houston Chronicle Special Report

[HoustonChronicle.com](#) [Chronicle News](#) [The Brimstone Battles](#) [Discussion Forum](#)

A sickening experience in the Kazakhstan oil fields

H2S exposure leaves engineer with severe debilitating illnesses

By JIM MORRIS

Copyright 1997 Houston Chronicle

Gabe Sugar is into yoga and organic foods with an enthusiasm that borders on obsession.

He is a recent, and desperate, convert.

Sugar's aim, he explained in his small Houston apartment, is to rid his body of the poison -- hydrogen sulfide -- that ravaged him while he was working in the former Soviet republic of Kazakhstan four years ago. He has lost faith in traditional medicine, which proved unable to cure his headaches, his sleeplessness, his joint pain, his fatigue.

"Using natural techniques, I can get the gas from my system," Sugar, a 51-year-old chemical engineer, said between handfuls of roasted soybeans. "It cleans you. I believe the worst part is over."

The saga of Gabor "Gabe" Sugar, a Hungarian-born American citizen, began in September 1993, when he was hired by Bechtel Corp. and sent to the Tengiz oil field on the northeastern shore of the Caspian Sea. Bechtel had contracted with the principal American developer of the field, Chevron, to oversee construction of an oil and gas processing plant.

The job, Sugar knew, was not cushy. Kazakhstan is brutally hot and bug-infested in the summer and brutally cold in the winter, and Tengiz is notorious for its high H2S concentrations. (Experts determined that a 1985 well blowout had the potential, according to the Russian newspaper *Izvestia*, to "poison every living thing within hundreds of kilometers.")

Still, Sugar, a widower with two children, felt that he had no choice. The money was appealing, and he'd been around toxic chemicals before without incident. How bad could it be?

Very bad, as it turned out. Apart from the austere accommodations and the vile food, there was the constant threat of exposure to hydrogen sulfide, whose rotten-egg odor permeated the site.

"My friends said, 'You're crazy. Don't go,'" Sugar recalled. "I said, 'I'm a U.S. citizen. I'm working for a big company.' I was just naive."

Indeed, in the mid-1980s -- years before Bechtel and Chevron sent Americans to Tengiz -- the field was replete with Hungarian construction workers who toiled under gulag-like conditions.

The chilling stories told by the Hungarians when they returned home became the basis for a 1990 book by journalist Kata Réz, titled *Hungarians in the Death Zone*.

In the book, Réz discusses what she calls "Tengiz Syndrome" -- a debilitating form of hydrogen sulfide poisoning. She quotes Dr. Mórsa Szabolcs, a physician who examined a number of sick workers, as saying that "symptoms of the mucous membranes, the respiratory tracts, the eyes and the intestinal tracts and anomalies of the nervous system point to the presence of low-concentration gas as the real cause" of the illnesses.

The Hungarian government had refused to acknowledge these conditions as being work-related. Szabolcs observed that "doctors who are not familiar with the effects of low-concentration hydrogen sulfides and mercaptans (a related family of substances) are befuddled by the incoherent symptoms and think of a great variety of internal pathologies."

The breakup of the Soviet Union in December 1991 cleared the way for American investment. In April 1993, Chevron and the newly independent republic of Kazakhstan formed a partnership known as Tengizchevroil to extract and process the estimated 6 billion to 9 billion barrels of oil in the Tengiz field. (Mobil also had a stake.)

Sugar was notified of his hiring by Bechtel on Sept. 7, 1993. He would be a project engineer, earning a base salary of \$1,038 per week.

Sugar put his son, Martin, in a German boarding school and sent his daughter, Julie, to live with friends. He left Houston for Kazakhstan on Sept. 19, stopping for a day in London to receive what he later described as cursory hydrogen sulfide safety training by a Bechtel consultant.

Sugar said that he became ill almost immediately upon his arrival at Tengiz but ascribed his malaise to jet lag and immunizations he had been given in London. During the last few months of 1993 and the first few months of 1994, he said, he rarely felt well.

The nadir came on March 2, 1994, when, Sugar maintains, he experienced a "knockdown" -- a loss of consciousness caused by a large dose of H₂S. He spent three days in the Tengizchevroil infirmary, complaining of weakness, dizziness and abdominal pain.

"I was vomiting blood, had blood in my stool," Sugar said. "I had the feeling that, really, I am dying."

Both Bechtel and Chevron -- which last summer settled a lawsuit filed against them by Sugar -- denied in court documents that hydrogen sulfide played a role in Sugar's illness or that he was fired for reporting a potentially serious design flaw.

In a declaration signed Dec. 12, 1994, the medical director for Tengizchevroil, Dr. William Chapman, stated that Sugar was suffering from a long-standing ulcer and that "at no time did (he) come to the clinic for injury or disease related to exposure to H₂S."

Chapman added, however, that "after exhaustive searching of medical files at the clinic," none of Sugar's records from March of 1994 could be found.

(Dr. Arch Carson, an occupational medicine specialist at the University of Texas Health Science Center in Houston who treats Sugar, gives "noxious vapor inhalation injury" as his primary diagnosis.)

In a speech to the World Affairs Council of Orange County (Calif.) on Aug. 9, 1994, Chevron vice president Espy Price characterized Tengiz as a "geologist's dream but a petroleum engineer's nightmare."

"The field is deep -- two to three miles down -- and it's hot down there and under extreme pressure," Price said. "So the wells cost a lot to drill and the wellheads have to be big, strong and elaborate.

"Tengiz holds not just oil, but a lot of natural gas as well. The oil and gas come out of the ground together, and the gas is laced with toxic hydrogen sulfide, which can be deadly if you don't contain it."

Sugar's main safety concern -- to which Bechtel never responded, he said -- pertained to two desulfurization units known as KTL-1 and KTL-2. The purpose of such units, as the name implies, is to remove sulfur compounds from the oil-gas mixture prior to shipment.

When Sugar arrived in Kazakhstan, KTL-1 already was up and running; KTL-2 was under construction and behind schedule. Under considerable pressure from Chevron, Sugar said, Bechtel proposed an engineering shortcut he feared would overload KTL-1 and lead to a major hydrogen sulfide release.

After pressing his concern with Bechtel management, Sugar was reassigned in April 1994. He returned to Houston -- quite ill, he said -- and was placed on nebulous, unpaid "holding status" by Bechtel until January 1995, when he was officially fired. He has worked infrequently since then.

Jeff Berger, a spokesman for Bechtel at its San Francisco headquarters, said that Sugar's claims are "totally without merit, pure and simple. We settled that case on a nuisance basis to avoid the cost of litigation."

Berger said that the company's internal investigation indicated that Sugar was not sickened by hydrogen sulfide. "There was no problem," Berger said. "There is no problem."

Both Bechtel and Chevron had extensive measures in place at Tengiz to protect employees from H₂S, Berger said.

"We don't have a second-tier safety program that we pull out of our coat when we're working in a developing country," he said. "We aim high all over the world."

In a prepared statement, San Francisco-based Chevron said that Sugar was "one of thousands of workers at Tengiz at that time, and the only one to make allegations of this nature. We settled the case short of a trial basically to avoid the cost of litigation."

The company added: "Everywhere we operate in the world, including Tengiz, we apply the same health and safety standards as we do in the United States."

In a deposition taken on Aug. 26, 1996, however, Dr. Pal Bukkerdo, a Hungarian physician who worked at Tengiz, testified that he knew of 30 to 40 instances between 1990 and 1994 "where there was leakage of hydrogen sulfides and there was an alarm ordered because of

that."

As of early 1994, the on-site laboratory was not equipped to determine whether a worker had been exposed to the gas, Bukkerdo said. And some Bechtel workers, he testified, were not provided H2S monitors.

Sugar cannot reveal the terms of his settlement with Bechtel and Chevron. He did say that he is experiencing financial difficulties -- in large part because two insurance companies are squabbling among themselves and refuse to pay his medical bills.

"I would be happy if I could put this behind me, but I can't," Sugar said. "I am still not receiving any benefits."

His attorney, Robert M. Rosenberg, said that Sugar's protracted state of limbo has been particularly trying for his children, 20-year-old Martin and 13-year-old Julie, who lost their mother in 1989.

"Watching their father decline, worrying about his health -- if he dies, what's going to happen -- it's just a tragedy to me," Rosenberg said.

[Back to top](#)

THE BRIMSTONE BATTLES: A Houston Chronicle Special Report

[HoustonChronicle.com](#) [Chronicle News](#) [The Brimstone Battles](#) [Discussion Forum](#)

BRIMSTONE TEAM:

Special projects reporter: [Jim Morris](#)

Photographer: [Smiley N. Pool](#)

Projects editor: [Don Mason](#)

Coordinating editor: [Paul A. McGrath](#)

Designer: [Kellye B. Sanford](#)

Photography editor: [Dave Einsel](#)

Art Director: [Ernie Williamson](#)

Electronic imagers: [David Foltyn](#) and [Pattie Harrington](#)

Interactive design: [Marla Cloud](#)

THE BRIMSTONE BATTLES: A Houston Chronicle Special Report

[HoustonChronicle.com](#) [Chronicle News](#) [The Brimstone Battles](#) [Discussion Forum](#)

7:58 PM 11/9/1997

Fouled air creates ire; enforcement labeled ineffective

By JIM MORRIS

Copyright 1997 © 1997, Houston Chronicle

At 5:13 p.m. on June 18, the Corpus Christi Fire Department's Engine 12 was dispatched to a neighborhood near that city's "Refinery Row," a 10-mile industrial strip northwest of downtown.

A resident had called and complained of intense nausea, blaming it on an unidentifiable odor he assumed had come from one of the plants.

For Refinery Row, this was nothing new. The mostly poor people who are effectively stuck in the area had complained for years about repugnant odors, not to mention brilliant, smoking flares and ear-splitting noises.

As Engine 12 arrived on the scene this sultry June afternoon, however, the gravity of the situation quickly became apparent. The crew encountered what was later described as a "strong sulfur and rotten egg" odor and asked that other units be brought in to help locate the source.

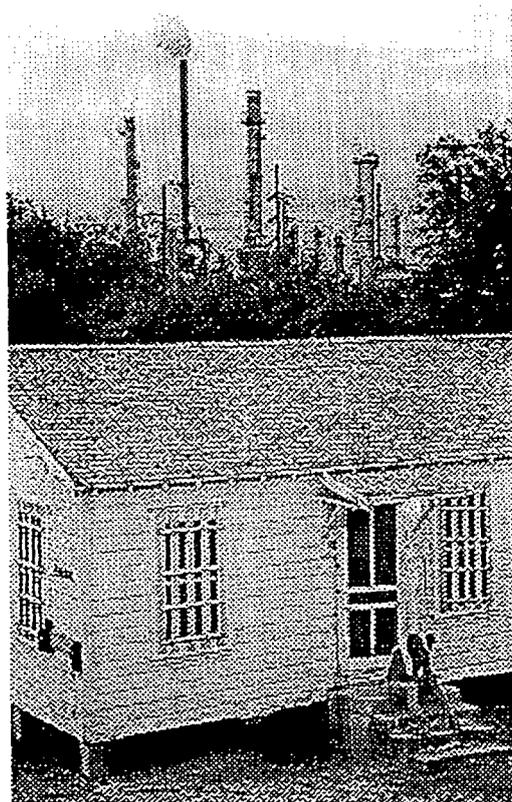
When Engine 9 passed by the Citgo West refinery about 45 minutes later, two firefighters suffered burning eyes and throats.

Nearby, two investigators with the Texas Natural Resource Conservation Commission felt queasy as they sampled for the suspect chemical: hydrogen sulfide. The readings displayed on their hand-held analyzer at the refinery fence reached 2.1 parts per million, more than 17 times the state limit (.12 ppm, averaged over 30 minutes) for industrial areas.

Citgo was cited by the TNRCC for creating a nuisance. Fire Department officials were perturbed, not only because two firefighters got sick but also because Citgo was slow to confirm that there had been a release.

"The Citgo incident caused us a lot of concern," said Fire Chief J.J. Adame. "The information was not flowing the way we like it to."

The events of June 18 came as no surprise to the people of Refinery Row. To them, the only



Freddy Robinson sits on the porch of the small home he rents in the shadow of Corpus Christi's Koch refinery. Residents are calling for an industry buyout and a buffer zone around the plants.

remarkable thing is that Citgo was caught.

"They (the plants) never tell you nothing," said Alfred Williams, who has lived in Mobile Home Estates since 1972. "Sometimes you have to turn the air conditioner off because it sucks in that bad air, just pulls that rotten-egg scent into your house."

Company spokesman Chuck Cazales said that the June 18 release from Citgo West occurred after a bird flew into an off-site transformer, disabling emission-control equipment at the refinery.

"It was kind of an act of God," he said.

Hydrogen sulfide (H₂S) would pose a sizable public-health problem in Texas even if it were confined to Refinery Row, where an estimated 20,000 people are routinely exposed to it.

In fact, a Houston Chronicle investigation has found that the problem is much bigger. People in many parts of the state -- from the industrial neighborhoods of Pasadena, Beaumont-Port Arthur and Odessa to rural East Texas and the Panhandle -- have gotten little relief from a substance that is at best bothersome and at worst deadly.

In 1995, according to company estimates filed with the TNRCC, nearly 10 million pounds of hydrogen sulfide were legally released by refineries, paper mills and other industrial plants in the state.

One plant alone, the Sid Richardson Carbon Co. in Big Spring, put out 1.8 million pounds, although in a relatively remote area. (On April 3, 1996, technicians in the TNRCC's mobile air-monitoring laboratory noted "very intense H₂S odors" outside Sid Richardson -- which produces carbon black, used in tires and other products -- and the nearby Fina refinery).

In the Houston area, the Marathon Oil refinery in Texas City emitted 900,000 pounds of hydrogen sulfide, the Simpson Pasadena paper mill in Pasadena 244,000 pounds and the Champion International paper mill in Sheldon 236,000 pounds.

These routine emissions, allowed through a combination of state permits, exemptions and grandfather clauses, do not include accidental releases, euphemistically known as "upsets."

From 1984 through 1996, according to company estimates reported to the TNRCC, nearly 2 million pounds of hydrogen sulfide were discharged in this fashion.

For some communities, the complete picture -- an almost-constant, low-grade insult to the sinuses and lungs, punctuated by moments of sheer terror -- is profoundly depressing. In many cases the victims blame the TNRCC -- which regulates the state's major sources of air toxics -- as much as the polluters for their predicament.

"I don't think they're hearing us," said Gladys Gillord, who has lived in Beaumont's Charlton-Pollard neighborhood since 1965.

"The TNRCC has done a miserable job of making themselves available to the neighborhood," said the Rev. Roy Malveaux, pastor of Mount Zion Baptist Church in Beaumont and state director of People Against Contaminated Environments (PACE).

Charlton-Pollard borders several large sources of hydrogen sulfide, including the Mobil refinery and the Elf Atochem petrochemical plant. Gillord said that she has had three unnerving brushes with the gas in the past four years.

A release in early 1993 "almost killed me," said Gillord, 61, who has a heart condition and whose 69-year-old husband is blind and bed-ridden. "One morning I got up and it was real cold, misting rain. I went outside to the garbage can and I couldn't hardly get back in the house.

"The odor was very familiar. It smelled like rotten eggs. And, honey, my face was so numb and I couldn't breathe. My mouth was sour for three days -- just sour, sour, sour, like I was sucking lemons."

To be sure, the TNRCC faces a demanding task. A ground-hugging cloud of hydrogen sulfide can follow a wildly unpredictable course and disperse rapidly. Where it settles, it can sicken and even kill.

Violations of the state's hydrogen sulfide standard for residential areas (.08 ppm) were documented by the TNRCC's mobile lab in February near the Valero and Citgo East and West refineries in Corpus Christi.

The Clark refinery in Port Arthur exceeded the standard in October 1996. Things got so bad at that city's Fina refinery several years ago -- some residents of the Fairlea Addition had to be hospitalized after a hydrogen sulfide release in the spring of 1991 -- that Attorney General Dan Morales brought a civil action against the company.

The lawsuit, alleging 25 violations of the Texas Clean Air Act between 1988 and 1993, was settled last year. Fina agreed to pay a \$509,000 fine and build a second sulfur-recovery unit to curb the emissions.

In the Houston area, the Exxon refinery in Baytown reported 31 major hydrogen sulfide upsets from 1984 through 1996 and the Lyondell-Citgo refinery in Houston 13, according to state records.

An upset at Lyondell-Citgo last winter demonstrated the potential consequences of equipment failure: When the refinery's sulfur-recovery unit went down on Jan. 21, an estimated 5,277 pounds of hydrogen sulfide, 488,504 pounds of sulfur dioxide and 11,209 pounds of sulfur trioxide came spewing out.

Any one of these chemicals is menacing; the three together are alarming. Only a favorable wind kept the pestilent cloud from invading residential areas.

The problem goes beyond refineries. For instance

In March, the TNRCC's mobile lab documented a violation of the residential hydrogen sulfide standard by the American Rockwool insulation factory in Bell County. Eight months earlier, the company had signed a formal agreement with the agency, promising to reduce H₂S emissions.

· In early 1995, 54 families in rural Wise County sued Mitchell Energy and Development of The Woodlands, claiming that their water wells had been poisoned by hydrogen sulfide leaking from improperly drilled gas wells. Mitchell Energy says that the contamination occurred naturally.

The case is being tried in segments. In February 1996, at the end of the first phase, a jury awarded eight families \$204 million. Mitchell Energy appealed.

At the end of the second phase, tried before a different jury last spring, 17 families came away with nothing. The third phase, involving one family, is set for January.

· As a result of monitoring on June 12, 1996, near G.M. Trading Corp., a lamb-skin processing plant in East San Antonio, the TNRCC warned that occupants of a neighborhood 1,500 feet to the north could experience nausea and headaches because of "high H₂S levels." In fact, one mobile-lab technician became ill.

· From September 1994 through February of this year, the agency undertook 107 odor-complaint investigations of the overloaded wastewater treatment plant operated by the city of Crandall, in Kaufman County near Dallas. Violations were found in 27 of the investigations.

Hal Cook sold his house in the Buffalo Creek subdivision, near the plant, at a \$45,000 loss just to get away from the recurring stench. "There were times you could not stay inside the house," he said. "We had people in the neighborhood moving out to live in motels."

Victor Bringle, a civil engineer in Dallas who advised the Buffalo Creek residents, concluded that hydrogen sulfide was a likely source of the odors.

· And on Oct. 2, 1996, a TNRCC investigator sampling near an inactive lime kiln at the Champion International paper mill in Lufkin recorded a pollution level so high that it had to be verified by agency engineers in Austin.

Champion's state permit allows it to release up to 5 ppm of total reduced sulfur compounds, including hydrogen sulfide. The reading was 33,000 ppm, or 6,600 times the limit.

This was not an isolated event. Champion routinely shut down the lime kiln at least once a year for maintenance. When it did so, sulfur compounds that typically were burned were simply vented to the atmosphere.

"Nobody knew just how much was coming out during these outage periods," said Vic Fair, the TNRCC's regional manager in Beaumont.

Although Champion was cited, Fair doubts that the citation will stick because the release occurred during maintenance -- a common and usually effective defense -- and the TNRCC received no complaints from the public.

Given that the mobile lab makes only a few trips a year, it is probably safe to assume that many hydrogen sulfide violations go undetected. Some find it lamentable that the TNRCC has not, through more energetic enforcement and more rigorous permitting, compelled known polluters to reduce their discharges.

As things stand, well-connected law firms have a great deal of influence over the enforcement and permitting processes. The public often has little say in either.

The TNRCC "has bent over backward to accommodate the regulated community in the last couple of years," said Cathy Sisk, chief of the Bureau of Environmental and Community Protection of the Harris County Attorney's Office. "It's to the point of ridiculousness."

TNRCC Executive Director Dan Pearson takes umbrage at the suggestion that his agency -- created four years ago with the merger of the Texas Air Control Board and the Texas Water Commission -- has grown servile to industry.

He promises more air monitoring in places like Corpus Christi and Beaumont, harsher penalties statewide for recalcitrant polluters and more thorough analyses of upset data.

Although he sympathizes with them and takes their complaints seriously, Pearson said, residents of Refinery Row, Charlton-Pollard and similarly blighted areas really are saying, "We just don't want these facilities here anymore."

The law, he said, "doesn't give the TNRCC the right to remove refineries from along the coast of Texas," although it is empowered to protect public health and the environment -- and tries to do so.

Still, the perception of the TNRCC as "a lapdog of industry," as one widely traveled environmental consultant put it, did not materialize overnight, or without foundation.

At a briefing in Arlington on Sept. 22, Allyn Davis, regional director of planning and permitting in the EPA's Dallas office, pilloried the TNRCC for its deficient air-monitoring efforts in the most polluted areas of the state.

"We have people with health problems," Davis told representatives of state and local government, business and environmental groups. "We have an obligation."

In researching the public-health risks of hydrogen sulfide, the Chronicle encountered a number of cases that raise questions about the TNRCC's resolve. Here are three:

The tank battery

In 1985, a company called Spain Oil began operating a sour crude tank battery in the small town of Somerset, south of San Antonio in Bexar County.

Tank batteries normally don't get a second look in South Texas, but this one was different. It was right in the middle of town, uncomfortably close to a school, a park and several houses. And it was not in good shape.

Hydrogen sulfide odors from the crude, deterioration of the storage tanks and grass fires possibly ignited by an erratic flare gave rise to a number of citizen complaints that resulted in a TNRCC citation on Dec. 27, 1995.

An agency investigator had noted that the flare -- needed to turn the hydrogen sulfide into less

dangerous sulfur dioxide -- was too short and did not have an automatic source of ignition, rendering it unreliable.

Moreover, Spain Oil had never applied for an air permit, which might have resulted in a public hearing on the tank battery, or a standard exemption, which would have precluded a hearing, providing certain conditions were met.

What to do? A meeting was held at the TNRCC's regional office in San Antonio on Feb. 28, 1996; in attendance were three TNRCC officials and Norman Parker, president of Spain Oil.

According to a memorandum prepared by James Menke, then the TNRCC's air program manager in San Antonio, it was decided that the tank battery did not qualify for any exemption on the books at the time because it was within a quarter-mile of people (including schoolchildren) and produced more hydrogen sulfide (up to 700 parts per million) than was considered safe.

On July 30, 1996, however, Parker was notified by letter that the TNRCC permitting staff in Austin had found a creative solution to his dilemma: The agency would allow him to avoid a potentially acrimonious permitting process by bringing him under two exemptions from 1982. (Spain Oil, of course, didn't exist until three years later).

In short, the TNRCC denied the residents of Somerset an opportunity to comment on a smelly and possibly hazardous tank battery in their midst. Parker paid no penalty for operating out of compliance for 11 years, although he was required to raise the flare, install the automatic ignitor and make other improvements.

"We got them into compliance to protect the neighbors," said Duncan Stewart, the TNRCC permit engineer in Austin who approved the deal.

At the end of last year, however, Somerset Mayor Paul Cuellar was still complaining about Spain Oil and another sour crude operation nearby.

In a letter to the Texas Railroad Commission dated Dec. 16, 1996, Cuellar noted that "serious, noxious odors occur quite often and it is feared by residents and the city that illness ... may result if immediate corrective action is not taken to upgrade these facilities to capture and contain this poisonous gas."

The complaints have fallen off in recent months, Cuellar said, and a joint TNRCC-Railroad Commission inspection in December revealed no hydrogen sulfide levels of concern. "All of the problems have been corrected," Parker said.

Still, a senior Harris County Pollution Control Department official familiar with the state permitting process was astonished to learn what the TNRCC had done for Spain Oil.

"I've never heard of anything like that in my life," said Darhl Ferraro, the department's technical manager. "You don't dig back until you find an exemption that just fits."

A member of the TNRCC's legal staff agreed.

"That shouldn't happen," said senior attorney David Duncan. "They shouldn't claim a standard

exemption that existed before the plant existed.'

The Spain Oil case illustrates the TNRCC's willingness to expedite permitting by granting exemptions and, since 1995, issuing so-called "standard permits for oil and gas," neither of which allows for public hearings.

The ostensible aim is to reduce the regulatory burden on insignificant sources of air pollution. The effect, intended or not, is one of public exclusion.

"I think their main concern is getting those permits out and being a friendly agency to their customer, which is industry," said Rob Barrett, director of the Harris County Pollution Control Department. "I have felt that the actions they have taken are going to come back and haunt them."

The hardship case

In the spring of 1994, the aged Crown Central refinery in Pasadena was facing a TNRCC fine of \$579,050 for consistently exceeding the allowable concentration of hydrogen sulfide in its fuel gas and consequently releasing clouds of sulfur dioxide, a lung irritant that smells like burnt matches.

Crown Central's attorney, Pat Finn Braddock with Fulbright & Jaworski in Austin, argued that such a fine would cause an economic hardship for the struggling refinery; that \$6.2 million in pollution-control equipment already had been installed and another \$3 million to \$4 million would be spent; and that Crown Central's emissions "generally pose(d) no threat to public health and safety in the area."

By the spring of 1995, Crown Central's fine had been reduced by 81 percent, to \$110,000, on the condition that the company improve its environmental performance.

The violations, however, didn't stop. On July 18 of this year, the TNRCC found itself in the familiar position of citing Crown Central for, among other things, exceeding the hydrogen sulfide limit in fuel gas.

On July 21, three environmental groups and three Pasadena residents sued the refinery under the federal Clean Air Act, alleging that it had recorded more than 12,000 violations and had blanketed the surrounding neighborhoods with "sharp, sulfurous odors."

(Another lawsuit, accusing Crown Central of creating a health hazard and interfering with residents' enjoyment of their property, had been filed in state court on June 25).

The EPA -- which, like Harris County, had been prepared to penalize Crown Central in the early 1990s but had deferred to the TNRCC -- has just completed another inspection of the refinery.

"Quite frankly, it doesn't look very good," said Ray Magyar, an EPA enforcement officer in Dallas. "Even though there was (a TNRCC) enforcement action, it doesn't look like Crown Central has improved the situation any."

Mark Wenzler, an attorney with Trial Lawyers for Public Justice in Washington, which filed

the federal complaint against Crown Central, suspects that "the EPA regrets having let the TNRCC take the lead in the 1994 enforcement action. The penalty the TNRCC obtained was nowhere near the amount necessary to deter illegal conduct."

"Worst of all, the TNRCC didn't make Crown fix the problem, the result being that the pollution continues unabated to this day," Wenzler said.

Braddock, a former senior attorney with the Air Control Board, said that the refinery plans to install a \$490,000 backup amine absorber tower -- which should clean up the fuel gas and reduce the number of upsets -- by December.

Crown Central, Braddock said, has made a diligent effort to address the issues outlined by the TNRCC in 1995. "We tried lots of different things," she said, and it was only after these steps were taken that corrosion-related flaws in the amine system were found.

Asked about the large reduction in the 1995 fine, Braddock said: "They (TNRCC officials) were the ones who decided what an appropriate penalty would be, given our financial situation and the alleged violations."

There is a simple premise behind the imposition of swift, firm punishment on chronic polluters.

At a hearing before the Senate Environment and Public Works Committee on June 10, Lois Schiffer, the top environmental lawyer at the Justice Department, testified that "many people ... would not send their tax checks to the IRS next April if tax violations carried no penalty. So, too, we cannot expect voluntary compliance with environmental laws unless those laws are enforced, and enforced vigorously."

An audit by the EPA's inspector general released in September 1996 concluded that the TNRCC, in deciding the appropriate penalty for an air polluter, too often failed to consider the economic benefit a company had realized by being out of compliance.

Although the state Clean Air Act provides for penalties of up to \$10,000 per day for each violation, the plants that have drawn many of the complaints in Corpus Christi and Beaumont have avoided big fines.

The Citgo East and West refineries in Corpus Christi, for example, have paid \$38,750 in air-pollution penalties since 1986 and nothing since the TNRCC was created in 1993, although an enforcement case is pending.

Last year, Tulsa, Okla.-based Citgo Petroleum Corp. reported revenues of \$13 billion.

Phil Vrazel, manager of environmental affairs for the two Corpus Christi refineries, said that the June 18 hydrogen sulfide spike (caused by the bird in the transformer) and other high readings in February (caused by the stoppage of a tower called a sour water stripper) were anomalies and implied no pattern of neglect.

A malodorous proposal

In March, Harris County officials beat back an attempt by the TNRCC to weaken the state's

nuisance-odor rule, a flexible enforcement tool for field investigators responding to complaints about hydrogen sulfide and other rancid compounds.

The TNRCC had pushed legislation in Austin that would have allowed it to investigate only odors that presented a clear risk to public health; odors that merely interfered with quality of life no longer would have elicited an agency response.

"They said it was just too resource-intensive, that they got too many odor complaints and couldn't respond to them all," said Sisk, of the Harris County Attorney's Office. "The appropriate response would have been stronger enforcement. That might mean that, ultimately, you'd have fewer problems to deal with."

The TNRCC, director Pearson explained, had reasoned that it might be time for local governments to take a more prominent role in odor investigation and enforcement.

"I think we got a pretty clear signal that (legislators) wanted it to continue to be a state responsibility," Pearson said.

Not that everyone is happy with the status quo. On Jan. 11, 1995, TNRCC field offices received a directive from headquarters listing the types of complaints they would no longer be expected to investigate. Among these were "recurring unconfirmed complaints."

No doubt some of these complaints are invalid, the product of someone's fertile imagination or grudge against a company. Others, however, may be unconfirmed because it took the investigator days, or even weeks, to respond.

Neighbors of the 2-year-old Mitchell Energy gas-processing plant, near Navasota in rural Grimes County, have a strained relationship with the TNRCC's regional office in Waco.

Although residents insist that the plant reeks, especially at night and on weekends, the agency has been unable to verify a hydrogen sulfide problem -- or any problem, for that matter.

Retirees Harvey and Nell Williams nonetheless have decided to leave their home just east of the plant.

"You can't believe what it does to us," Nell Williams said. "It makes us heavy in our chests. We have this nasty taste in our mouths. I've been up all night with nausea and my eyes just burning. Sometimes I'm afraid I won't wake up."

On Oct. 16, the Williamses and 26 others filed suit against Mitchell Energy, claiming that noxious releases, loud noise and bright light from the plant have greatly devalued their property, harmed livestock and pets, and caused them physical and mental distress.

Mitchell Energy rebuts these accusations. Although hydrogen sulfide levels reach 900 parts per million near a combustion device at the plant called a thermal oxidizer, the gas actually entering the plant has fewer than 30 ppm, said Allen Tarbutton, president of the firm's Gas Services Division.

Even if there were a catastrophic line rupture near the oxidizer, the company said in a filing with the Railroad Commission, debilitating levels of hydrogen sulfide would travel no more

than 328 feet, keeping it well away from people like the Williamses.

"We don't know of anything that would be causing the health concerns they've talked about," said Greg Lewis, environment and safety manager for Mitchell Energy's gas division.

Residents of Refinery Row in Corpus Christi admit to being chronic complainers, but only by necessity. Since 1994, the local TNRCC office has logged nearly 300 calls about the Javelina sour gas processing plant and the Valero, Citgo, Koch and Coastal refineries.

The complainants felt vindicated in February, when the TNRCC's mobile lab detected several elevated hydrogen sulfide readings, including one that "pegged the meter," said Laurel Carlisle, a toxicologist with the agency in Austin.

The Valero and Citgo East and West refineries were, in fact, cited by the TNRCC on May 23. But Neil Carman, clean air program director for the state Sierra Club and a former Air Control Board investigator in Odessa who wrote dozens of hydrogen sulfide and nuisance-odor citations in West Texas, is unimpressed.

"Twenty-five years after the state air program comes into existence and they find these violations in Corpus Christi for the first time?" Carman said. "That's ridiculous. Why didn't this happen 10 or 15 years ago?"

On behalf of the Sierra Club, Carman petitioned the Air Control Board for a stricter residential hydrogen sulfide standard in April 1993; he petitioned the TNRCC in March 1994.

Carman argued that the state was saddled with an outdated standard, adopted in 1973, that put infants and other vulnerable populations at risk. He reminded the TNRCC that "H₂S is not an isolated concern in a few small communities," as evidenced by Refinery Row alone. His proposal was to lower the limit from .08 ppm to .01 or .015 ppm.

The petitions went nowhere. Carman, knowing that the enforcement of a lower limit could prove costly for industry, was not surprised.

"It always comes down to money," he said.

Three years ago, Carman and Texas Southern University law Professor Grover Hankins drew up a civil rights complaint against the TNRCC and the city of Corpus Christi on behalf of the predominantly Hispanic and African-American residents of Refinery Row.

The complaint, which alleges environmental racism, is under investigation by the EPA. The allegations have been emphatically denied by both defendants.

The people of Refinery Row, many of whom would like to be bought out, remind outsiders that *they* settled in the area first and the plants came afterward.

They believe that the city conspired with the oil companies to sacrifice once-pleasant neighborhoods such as Hillcrest, and that the TNRCC has given its tacit blessing to stupefying levels of pollution by writing lenient permits and failing to penalize violators.

A week's worth of TNRCC mobile monitoring on Refinery Row in February 1994 did nothing

to temper the residents' suspicions.

Hydrogen sulfide levels as high as .67 ppm -- more than eight times the state residential standard -- were measured downwind of the Valero refinery.

"During this sampling period," Maria Aponte-Pons of the TNRCC's Air Quality Enforcement Division wrote in a memo, "sampling personnel experienced acute respiratory irritation and evacuated the area."

Valero also exceeded the standard for sulfur dioxide. Levels of hydrogen sulfide and sulfur dioxide from the Citgo East, Southwestern (now Koch East) and Coastal East refineries were below the limit but still high enough to cause nuisance odors.

"We strongly recommend that levels of these two compounds be reduced significantly to ensure protection of public health," Aponte-Pons wrote.

Although Valero received a nuisance-odor citation, it paid no fine because its releases were considered unpreventable. Incidents documented since Aponte-Pons made her recommendation suggest that it fell on deaf ears.

The Rev. Harold Branch moved into Hillcrest -- then a neat, largely white enclave -- in 1956 and watched it slide as the area became increasingly industrialized.

"When the refineries started buying over here, the city started relaxing code enforcement," said Branch, pastor emeritus of St. John Baptist Church and a former city council member.

Weeds sprouted. Orange and peach trees withered and died. Entire blocks were blemished by trash and abandoned houses.

"The plants have encroached into the neighborhoods to the extent that there's no breathing room," said Bill Green, regional director of PACE. "They profit off of poverty."

Ethel Simmons, 82, lives about 100 yards from the Koch East refinery's fence.

"I had a beautiful yard, a nice garden with fruit trees," said Simmons, who moved to Hillcrest in 1963. "Now nothing grows, and you get these odors. Sometimes, at night, I don't know what they're doing but it just smells terrible."

The city's official response to major chemical releases on Refinery Row is "Shelter in Place," the concept being to stay in one's home, school or business until the danger passes.

Simmons called this "one of the stupidest things I've ever heard. You could suffocate in your house."

She wishes instead that the plants would be made to control their discharges -- or, better yet, that Koch would offer her a reasonable price for her home so she can move.

"I never would have bought here if that place had been around," Simmons said, nodding toward the refinery.

THE BRIMSTONE BATTLES: A Houston Chronicle Special Report[HoustonChronicle.com](#) [Chronicle News](#) [The Brimstone Battles](#) [Discussion Forum](#)

7:54 PM 11/10/1997

Residents not so wild about hog operations

By JIM MORRIS

Copyright 1997, Houston Chronicle

OCHILTREE COUNTY -- If the proliferation of high-tech hog barns in the Texas Panhandle can be traced to any one event, it is a meeting that took place nearly four years ago in the Amarillo office of state Sen. Teel Bivins.

The meeting broke a regulatory logjam, enabling pork producers to quickly establish themselves in virgin territory.

And it helped ensure that they would face little risk of punishment if they polluted the air with hydrogen sulfide or other harmful compounds.

On the morning of Dec. 10, 1993, Bivins, a leading Republican senator and cattle rancher, conferred with five men who had an ardent interest in the state's nuisance-odor rule.

Three were from the Texas Natural Resource Conservation Commission, two from the Texas Cattle Feeders Association (of which Bivins had once been a director).



Don Ukens' hat summarizes the feelings of those opposing the growth of hog operations.

enthusiastic in enforcement," says the memo, obtained by the Houston Chronicle under the



Large hog farms have been linked to water pollution and hydrogen sulfide-related illnesses.

The TNRCC had been aggressively citing cattle feedlots for producing pungent and potentially unhealthy clouds of dust; the feedlot owners, unaccustomed to such treatment, were furious. They turned to Bivins -- whom they considered an ally, and whose campaigns they had supported -- for assistance.

"Senator Bivins said he has had numerous telephone calls from disturbed feedlot operators asking if there is a new law, and rather dumbfounded as to why they were being cited for nuisance violations," the TNRCC's Terry Leifeste, one of the participants in the meeting, wrote in a memorandum.

Bivins asked whether the agency -- in particular, Rick Costa, then its air program manager in Amarillo -- was being "overly

Texas Open Records Act

The senator was assured by the TNRCC officials that this was not the case, that the agency's investigations arose from citizen complaints. The polemic did not end there, however.

By the summer of 1994, records show, Bivins had drawn up a proposal to simplify the state's permitting process for concentrated animal feeding operations, known as CAFOs. A key element was the elimination of public hearings, contingent upon the applicant's meeting certain environmental criteria.

"The perception throughout the United States that the regulatory environment in Texas is burdensome and unfavorable creates disincentives for (CAFOs) to locate in Texas," Bivins wrote to the TNRCC. His aim, he said, was to attract operations that had been moving into states such as New Mexico and Oklahoma.

John Hall, then chairman of the TNRCC, responded promptly, writing to Bivins that the agency had been thinking along the same lines and "agrees with the basic thrust and direction of your proposal."

By the summer of 1995, the TNRCC had changed its CAFO permitting rules, incorporating Bivins' suggestions. Its field personnel were ordered to stop issuing nuisance-odor citations to CAFOs, regardless of how disagreeable their emissions became.

These were the signals that the pork producers -- outcasts in some states because of water pollution and hydrogen sulfide-related illnesses and odors associated with their operations -- had been awaiting.

Into remote Ochiltree County they came, building metal barns in which to fatten up the animals and digging lagoons to hold their liquefied manure.

Today, tens of thousands of hogs are being fed in the county, some by a local man named Dean Paul but most by Texas Farm, a subsidiary of Nippon Meat Packers Inc. of Osaka, Japan, which ships much of its pork to Asia.

For Texas Farm, expansion appears imminent. It already has state permits for 341,593 hogs and 52 lagoons, and it is seeking TNRCC permission to add 307,350 hogs and 64 lagoons.

In the past two years, the TNRCC has received dozens of complaints about sulfur and ammonia odors emanating from the operations' congested barns and stagnant lagoons. The complainants, by and large, are farmers and ranchers themselves and are not easily disgusted.

"There's no way to describe the odor," said Barbara Philipp, who lives about a half-mile west of Texas Farm barn No. 1, which opened last year. "It kind of comes in streams. When it gets into your house it lurks in little corners."

Like many of their neighbors, Philipp and her husband, Bernhard, were farming here long before the pork producers arrived.

"You live here, have a good life, and then this thing comes in," Barbara Philipp said. "It turns your life totally upside down. You just feel invaded."

In a prepared statement, Texas Farm said that "we selected this region because of its environmental soundness" and because it has a "successful history of large-scale animal agriculture operations."

The company said that its lagoons surpass federal and state standards and that it intends to bring "new life" to the local economy by building a \$10 million feedmill west of Perryton that will employ 400. It would not disclose the head counts in its barns.

Paul, who is feeding 15,000 hogs in two barns, dismissed his critics as "radicals" who "need a cause."

He said that his permits have "all the safeguards considered for odors and spillage. We don't need a watchdog group to oversee our operations. The TNRCC's got that completely covered."

When word got out in early 1995 that the hogs were coming en masse to Ochiltree County -- as they had several years earlier to Texas County, Okla., just to the north -- some residents formed a group called Active Citizens Concerned Over Resource Development (ACCORD).

The plan, said Jean Gramstorff, one of the organizers, was to demand hearings on every operation.

In June of 1995, however, the TNRCC changed the rules, decreeing that pending permits could be challenged only on matters of technical merit -- clear violations of often-arcane regulations. The mere fact that a barn or lagoon might reek or otherwise be troublesome would not suffice.

"We don't do property value," said Brad Jones, the TNRCC's regional manager in Amarillo. "We don't do truck traffic."

Jones said that he sympathizes with groups such as ACCORD. "I guess they don't know how unempowered environmental agencies have become," he said. "We're frustrated as well."

ACCORD has sued the TNRCC, claiming the rule change deprives property owners of their fundamental right to a hearing prior to the permitting of a feedlot.

The group's attorney, Stuart Henry of Austin, said that such hearings proved invaluable to residents of Erath County, who defeated a number of proposed dairy operations in the early 1990s.

"The state permitting process should not be a formality," Henry said. "It is now, but it shouldn't be."

James Kowis, an agriculture and water-quality specialist with the TNRCC, said that the state adopted its so-called general CAFO permit in an effort to compress what had been a fragmented system and make better use of the agency's limited resources.

"I would say that it's worked fairly well," Kowis said.

Said TNRCC Chairman Barry McBee: "If you compare what Texas requires with what other states require, we are as stringent, if not more stringent. What we require in Texas is protective of the environment and the people around these facilities."

In doing away with site-specific permits and hearings based more on land-use disputes than on actual environmental risks, the state was simply following a national trend, McBee said.

Some in Ochiltree County, however, believe that there is another explanation: successful lobbying by powerful agriculture interests.

Bivins has close ties to agriculture, as do two of the three TNRCC commissioners, McBee and John Baker.

Baker was a director of the Texas Farm Bureau, the Texas Beef Council, the Texas Corn Producers Board and the Lone Star Corn Growers Association prior to his appointment to the TNRCC. McBee was deputy commissioner of the Texas Department of Agriculture.

The makeup of the TNRCC's Agriculture Advisory Committee, formed in November 1993, is noteworthy as well.

Twenty-three of the 24 members are in the industry, representing groups such as the Texas and Southwestern Cattle Raisers Association, the Texas Pork Producers Association and the Texas Association of Dairymen.

Although state law requires that all advisory boards be balanced, there is only one representative of an environmental group: Dede Armentrout of the National Audubon Society.

TNRCC spokesman Pat Shaughnessy said that all of the appointments were made by commissioners who are no longer with the agency. The committee members' four-year terms have just expired, and Shaughnessy said "the current commissioners have expressed some interest in creating greater balance."

Although the TNRCC is the lone defendant in ACCORD's lawsuit, Henry pins the Panhandle hog boom on Bivins.

"He was totally responsible for it," Henry said. "Basically, Senator Bivins has written off the citizens of Ochiltree County. He doesn't care that those folks up there are being stunk out of their houses. I guarantee you Mr. Bivins wouldn't put up with a pig farm next to his mansion."

Bivins said that he is mindful of the Panhandle environment and that "the hog operations on the High Plains have grown faster than I certainly anticipated they would."

However, he said, CAFOs should not be outlawed merely because some of their neighbors find them unappealing.

"While many people would like to use the TNRCC as a sort of rural zoning agency, that's not their job," Bivins said. "Their job is environmental protection."

Bivins said that he convened the December 1993 meeting with the TNRCC and the cattle feeders' association to discuss Costa, the allegedly overeager investigator who had been issuing most of the nuisance-odor citations.

The cattle feeders' complaint was that Costa, in a reversal of agency policy, did not give them time to correct violations before writing them up. Bivins likewise criticized Costa's "gotcha" style of enforcement.

Costa, who attended the meeting and resigned from the TNRCC in August 1996, declined comment.

Several people familiar with his work, however, say that he quit because he could no longer tolerate the agency's hands-off policy toward CAFOs -- especially Palo Duro Feedyard, a 30,000-head cattle feedlot in Hansford County that had drawn an increasing number of complaints about airborne manure as it expanded in the late 1980s and early '90s.

On May 3, 1995, a brown plume extended north from Palo Duro nearly three miles, onto the property of rancher David Bergin. Bergin's son John David, then 2, went into respiratory arrest and had to be rushed by helicopter to a hospital in Amarillo.

"He was in intensive care for several days and in the hospital for over a week," said Bergin, whose ancestors settled in Hansford County in 1884 and who has a lawsuit pending against Palo Duro. "There were questions about his survival during the first few hours."

On July 14, 1995, TNRCC investigator Kathy Palmer inspected Palo Duro in response to a complaint from Bergin.

"The concentration of dust being carried outside the feedlot was adequate to interfere with the normal usage and enjoyment of the property to the north, including (Bergin's) house," Palmer wrote in her report. "The dust could potentially cause adverse physiological discomfort, such as burning and itching eyes, coughing and breathing difficulties, to persons of ordinary (sensitivity). Individuals with compromising health conditions could be more severely impacted."

Seventeen days later, Costa visited the feedlot and noted a similar offsite dust problem. His supervisors in Austin would not allow him to cite Palo Duro for creating a nuisance, however, because he had no proof that homes in the area were affected.

The TNRCC did cite Palo Duro on Feb. 7, 1996, for exceeding its permitted head count, but never rebuked the feedlot for its failure to contain dried manure.

"They didn't directly address the health hazard," said Nancy Stone, an Amarillo attorney who represents Bergin.

Bill O'Brien, managing partner of Palo Duro's Amarillo-based parent company, Texas Beef, said that the feedlot for several years has tried to suppress dust by spraying water on it and regularly cleaning the animals' pens.

"We want to be good neighbors to all the folks up there," O'Brien said.

Bergin and his family have abandoned their ranch for the time being and moved into the nearby town of Gruver. John David's health has improved markedly.

"To me, there's a reason those regulations are in existence," Bergin said. "When you can pretty much ignore them and do what you want, that's really disappointing."

Debra Barber, air program director in the TNRCC's Field Operations Division, explained that the agency's ability to cite a CAFO for nuisance odors was muddled by a 1993 Texas Supreme Court ruling.

In that case, the F/R Cattle Co. of Erath County had contested a citation by the Texas Air Control Board (TNRCC's predecessor), claiming the feedlot's odors were part of a "natural process" and therefore exempt from regulation under the state Clean Air Act. F/R Cattle lost in the trial and appellate courts but won in the Supreme Court.

In light of the decision, Barber sent out a memo in March 1994 instructing the TNRCC's regional offices to submit all proposed CAFO odor citations to a review committee in Austin.

The committee, Barber wrote, would look for evidence of "flagrantly bad management practices, extremely intense impact and/or a pattern of problems at the source."

In the 3½ years since the memo went out, the TNRCC has issued four nuisance-odor citations to CAFOs. All were resolved informally, without the imposition of a fine.

Barber said that she has been searching for a formal enforcement case with which to test the F/R Cattle decision. "I have not seen the right case," she said.

Asked about Palo Duro, Barber said, "We did not confirm a nuisance situation there."

Henry said that the TNRCC is simply "using F/R Cattle as an excuse for not enforcing the rules. There's nothing in the law that prohibits them from doing it."

In no way, he said, could odors from "factory" hog farms be considered natural, nor should their right to make money supersede the rights of adjoining landowners to be free from annoying and possibly hazardous air pollution.

"You can design these facilities not to stink up your neighbors, but it will cost a lot of money and the TNRCC's not willing to require (producers) to do that," Henry said.

The hog farms that have sprung up in the Texas and Oklahoma panhandles have two basic components: the barns, where the animals feed, and the lagoons, which receive enormous volumes of manure flushed from the barns.

"When you combine the waste of any animal -- human, cow, pig, chicken -- with water, you have the conditions for creating septic odors," said Dr. Leon Chesnin, professor emeritus in the University of Nebraska's Department of Agronomy. "If you have an

anaerobic lagoon -- an absence of oxygen in the system -- you can generate hydrogen sulfide. You can also generate ammonia, which has a caustic effect on the tissues, eyes and respiratory systems of the animals -- and humans."

Bivins pointed out that odors are subjective. What is unbearable for one person may be hardly noticeable to another.

There are, however, objective ways to measure hydrogen sulfide. Thus far, the TNRCC's Amarillo office has not monitored for the chemical, despite the presence of some 300 CAFOs in its 26-county region.

For the time being, the people of Ochiltree County must hold their noses and glean what data they can from other states. The picture is not rosy.

Take, for example, the anecdotal evidence supplied by Dave Curtis with Cathodic Protection Services, an oil field service company in Liberal, Kan.

Workers with the firm regularly drive by Seaboard Farms, a huge hog operation in Guymon, Okla. On several occasions last summer, a hydrogen sulfide monitor lying on the seat or the dashboard of the workers' truck began sounding as they neared Seaboard's lagoons.

The monitor, Curtis said, is designed to go off at 10 parts per million. If the readings outside Seaboard were accurate, hydrogen sulfide was present in concentrations at least 125 times the statutory limit in Texas and 1,000 times the limit in New York.

More reliable numbers are available from Renville County, Minn., another cradle of modern hog farming.

Monitoring there has detected hydrogen sulfide levels as high as 1.4 parts per million, more than enough to cause headaches, nausea and diarrhea.

In 1994, two lagoons went in near Julie Jansen's home day-care center in Olivia, Minn. At the time, Jansen was responsible for as many as 17 children.

Once the hog farms came, she said, "I began blacking out. For me to be blacking out, those levels had to be pretty high. A lot of parents pulled their children out because they were getting sick."

By 1996, Jansen was keeping only six children. That year, she said, "we had 140 days of illness among those six kids."

Chuck McGinley, a consulting engineer in Stillwater, Minn., who has worked with residents of Renville County, believes that the symptoms Jansen and others describe are "consistent with low-level, chronic exposures to sulfur compounds" from hog lagoons. He has seen these symptoms in at least a dozen communities, he said.

It is possible to design aerobic lagoons that minimize hydrogen sulfide and ammonia releases, Chesnin said, but "a lot of engineers don't like to propose them to clients because you have to spend money for electricity and equipment and need a larger

surface."

Texas Farm's lagoons in Ochiltree County are anaerobic, but their designer said that this is not inherently bad.

If not overloaded, such lagoons "will give a very complete breakdown of organic matter" with only moderate odors, said Mac Safley, president of Agri-Waste Technologies in Raleigh, N.C.

In some parts of the country, people have taken a firm stand against factory hog farms. On Sept. 16, for example, voters in Seward County (Liberal), Kan., decided by a 3-to-1 margin not to allow any more of the operations to locate there.

In Texas, however, the door remains open, just as Teel Bivins apparently envisioned when he began advising the TNRCC almost four years ago. Since the 1995 rule change, 49 CAFOs -- for hogs, cattle or chickens -- have received permits from the agency.

"We're not seeing an industry expansion -- it's an industry migration," said Don Ukens, a resident of Hooker, Okla., and a leader of Safe Oklahoma Resource Development (SORD), an anti-hog group. "They go places where the state and local officials roll over."

Editor's note: A Chronicle report later this year will examine hydrogen sulfide dangers in the workplace.

THE BRIMSTONE BATTLES: A Houston Chronicle Special Report

[HoustonChronicle.com](#) [Chronicle News](#) [The Brimstone Battles](#) [Discussion Forum](#)

7:50 PM 11/12/1997

New alarm over hydrogen sulfide

Researchers document lasting damage to human nervous system

By JIM MORRIS

Copyright 1997 Houston Chronicle

INDIANAPOLIS -- Exposure to hydrogen sulfide, even in extremely low concentrations, can cause lasting damage to the nervous system, according to research presented here Wednesday, Nov. 12.

Members of a panel at the American Public Health Association's annual meeting discussed study results that challenge the conventional wisdom on the chemical, a highly toxic byproduct of oil and natural gas extraction and refining, as well as other industries. The thinking has been that if an exposure to hydrogen sulfide (H₂S) isn't fatal, there are few, if any, lasting effects.

But in his presentation Wednesday, Dr. Kaye Kilburn, of the University of Southern California School of Medicine, said unequivocally that "H₂S poisons the brain, and the poisoning is irreversible."

In recent years, Kilburn has studied workers subjected to relatively high doses of the chemical and residents of two California refinery communities -- San Luis Obispo and the Wilmington neighborhood of Los Angeles. Kilburn's subjects underwent extensive neurological testing and showed pronounced deficits in balance, reaction time and other characteristics tested. They also complained of recurring ailments such as dizziness, insomnia and overpowering fatigue.

Three Texas researchers who have just completed their analysis of data collected near a geothermal power plant in Hawaii reported similar findings.

Dr. Marvin Legator and Chantele Singleton, of the University of Texas Medical Branch in Galveston, administered a detailed "symptom survey" to 97 people who live within four miles of the Puna Geothermal Venture. PGV produces electricity from subsurface volcanic heat and gives off hydrogen sulfide in the process.

Eighty-eight percent of the subjects said they had experienced central nervous system impairment of the sort described by Kilburn.

Only 26 percent of those in a control group -- people who live some 20 miles from the plant -- reported such problems.

Dr. Bob Borda, a neuropsychologist in Stafford, put neighbors of the plant through a battery of tests and found that many demonstrated attention deficits and an inability to process information quickly. The condition, Borda said, is analogous to an outdated computer

program: It runs, but it is maddeningly slow and inefficient.

All of the findings presented Wednesday are significant because hydrogen sulfide is common and poorly regulated, as the Houston Chronicle reported in a series of articles earlier this week.

There remains a "tremendous information gap" regarding the chemical's chronic, low-level effects, said Legator, a toxicologist. He is convinced, however, that hydrogen sulfide is a "potent neurotoxin" that does lasting damage.