

SPECIAL REPORT

In the Shadow of Danger: The Chemical Plant Peril

# How Safe, How Secure?

Toxins and terrorism fears spur call for oversight



Arnold Suydan and son Christian, 5, watch as Suydan's nephew John Morrone rides a four-wheeler in a field between his home and the Valero Energy Corp. refinery in Paulsboro, Gloucester County. Valero is one of eight chemical plants and refineries in the region that could put large populations at risk.

MICHAEL PLUNKETT / Inquirer Suburban Staff

First of two parts.

By Adam Fifeild  
INQUIRER STAFF WRITER

**A**t a sleepy council meeting in December, Paulsboro's emergency-management coordinator waited his turn. Then, Glenn Roemmich stood, cleared his throat, and matter-of-factly suggested that the Gloucester County river town needed six-story warning sirens — "in case something happens" at the neighboring refinery.

But to warn of what?

It could be a small leak of hydrogen fluoride, like the one in October 2001 that caused a local school to rush its children and staff into the gym, and seal it with duct tape.

Or, it could be an unprecedented event — a mass release of this potentially lethal gas. In which case, for those closest to the plant, the siren might be a death knell.

The source of that danger could be the

Valero Energy Corp. oil refinery that cleaves to Paulsboro, across the Delaware border from Philadelphia International Airport. It is one of eight chemical plants and refineries in the Philadelphia region that could put more than one million people at risk of serious injury or death in a "worst-case scenario," according to the Environmental Protection Agency.

Across the country, there are at least 110 such facilities, though none has experienced a disaster resulting in widespread loss of life.

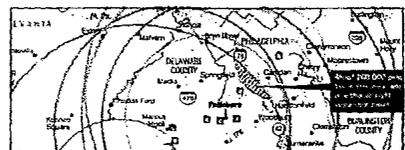
Industry representatives say that worst-case scenarios are highly unlikely and that the scenarios do not take safety mechanisms into account. Valero has used hydrogen fluoride since the 1940s without a major release.

But after the Sept. 11 attacks, the possibility of a deliberately engineered chemical catastrophe has raised alarms and calls for mandatory security measures.

No federal security standard exists for such companies, unlike for nuclear plants.

See **PLANTS** on A10

## A CLOSER LOOK INSIDE



**Vulnerable zone:** Are you within reach of a toxic plume? A map shows who could be affected in a "worst-case scenario." **A10.**



**Aerial view:** A sprawling oil refinery clings to the border of Paulsboro, across the river from Philadelphia International Airport. **A11.**

# Fears prompt calls for tighter security

## PLANTS from A1

Measures are largely voluntary and generally secret, with company officials saying they do not want to tip off terrorists.

Sen. Jon Corzine (D., N.J.) calls the absence of such federal regulations "Neanderthalic."

"If we can't deal with something as simple and straightforward a risk to the population as these chemical plants and refineries, I think we're not taking homeland security seriously," he said.

Valero's worst-case scenario, on file at the EPA, involves a toxic release of 240,000 pounds of hydrogen-fluoride gas drifting 19 miles and exposing schools, hospitals and dense housing before it dissipates.

"Originally, when companies had to release worst-case scenarios, they said: 'You don't have to worry about this,'" said Sanford Lewis, a Boston environmental lawyer and author of a manual for community groups seeking to reduce the risk of chemical-plant hazards. "You can't say that anymore. We all know there are people of ill will who want to see a worst-case scenario happen."

In February, the FBI warned that al-Qaeda operatives "may attempt to launch conventional attacks against the U.S. nuclear/chemical-industrial infrastructure to cause contamination, disruption and terror."

The devastation of such a toxic-gas release became apparent in 1984, when a cloud of methyl isocyanate from a Union Carbide pesticide plant in Bhopal, India, killed nearly 4,000 and injured 200,000.

A day before the United States went to war with Iraq, the General Accounting Office, Congress' investigative arm, warned that although some chemical facilities were shoring up security, the extent of their preparedness was unknown. The GAO urged laws to create security standards.

That same day, Homeland Security Secretary Tom Ridge increased Coast Guard patrols for petroleum and chemical plants.

However, many communities are not aware of the hazards in their backyards.

On the East Coast, the Philadelphia region has the highest concentration of facilities that could endanger more than a million people. Four are in Gloucester County. There is one each in Salem and Delaware Counties. Two are in Philadelphia.

More than four million people — or 86 percent of the population of the eight-county region — could be exposed.

This month the debate over chemical-plant security flared on Capitol Hill: On one side is Corzine, whose bill would direct the Department of Homeland Security and the EPA to identify "high-priority" facilities and compel them to fix security weaknesses and study ways to reduce or eliminate chemical hazards.

Alternative legislation being developed by the Bush administration would impose security standards but not require consideration of safer technologies.

Corzine predicts the Republican-sponsored bill will be "100 percent on the side of the chemical industry."

After the GAO report, the American Chemistry Council, a trade association of 200 companies that helped defeat Corzine's bill last year, said that it supported a "national program" to make sure chemical plants assessed their vulnerabilities and addressed deficiencies.

A federal study of security at more than two dozen chemical plants in 1999 found measures at those plants ranged "from fair to very poor."

The eight Philadelphia-area plants, which were not a part of the study, say they have strengthened their security since Sept. 11, but — for security reasons — they provided few details.

Valero's spokeswoman Claire Riggs said the company's perimeter, enclosed by a chain-link fence, was monitored 24 hours a day by cameras and multiple roving and stationary guards.

Some facilities are working with the chemistry council's voluntary security guidelines.

"Our industry has spent a tremendous amount of sweat, tears, energy and creativity on addressing security since Sept. 11 and before Sept. 11," said Dorothy Kellogg, plant-operations team leader for the council.

A New Jersey task force is working with the council to upgrade plants' security. State Department of Environmental Protection Commissioner Bradley Campbell said that "a great deal of progress" had been made, but he would not elaborate.

"I think 9/11 was a loud wake-up call," said Hal Bozarth, executive director of the Chemistry Council of New Jersey, representing 100 firms. "Right away, we all knew the business of chemistry was going to be vulnerable, and that extraordinary measures

had to be taken, and I believe that in the vast majority of cases, they have been taken."

Bozarth said that the security measures included cameras, concrete blocks, and stricter background checks.

The Philadelphia Police Department has offered non-mandatory security tips to city plants.

"The plants are all very different, and obviously there isn't much in the way of standards," said Ronald Koopman, who runs the "chem/bio" security program at the Lawrence Livermore National Laboratory in California.

Koopman said that some plants are better than others. Two refineries that he visited in the western and southern United States had "zigzag concrete barriers, they had borrowed armored personnel carriers, they had armed guards. They had a fence and tank-stopping concrete blocks."

But citizen and labor groups say that security at many facilities remains inadequate.

"Most security precautions to date have been superficial," said Rick Engler, executive director of the New Jersey Work Environment Council, representing 60 unions and environmental groups. "In this new era of relatively sophisticated terrorism, much more needs to be done."

The Clean Air Act amendments of 1990 directed companies to submit

## For Information

To learn what to do in case of an industrial accident or attack, contact your Local Emergency Planning Committee. To find your local committee, visit [www.epa.gov/ceppo/lepclist.htm](http://www.epa.gov/ceppo/lepclist.htm).

To learn more about "worst-case scenarios" and other risk-management-plan information, visit the EPA Reading Room at 1650 Arch St. in Philadelphia. Call for an appointment: 215-814-5254.

To find other EPA Reading Rooms, visit [www.epa.gov/ceppo/readingroom.htm](http://www.epa.gov/ceppo/readingroom.htm).

Risk-management-plan summaries are available online at [d1.rtknet.org/rmp](http://d1.rtknet.org/rmp).

Shelter-in-place information can be found at [www.redcross.org/services/disaster/beprepared/shelterinplace.html](http://www.redcross.org/services/disaster/beprepared/shelterinplace.html).

To learn how to help reduce the threat of attacks on chemical facilities, visit [www.safehometowns.org](http://www.safehometowns.org).

risk-management plans — their worst-case scenarios, accident histories, and prevention and emergency-response programs. The plans, first filed in 1999, must be updated every five years.

The million or more people at risk in each of the eight plants' scenarios include everyone living within a radius of a facility, or what the EPA calls the "vulnerable zone." But a toxic plume would only affect those downwind of a release.

Still, thousands or tens of thousands could be exposed.

Among the region's eight plants is Repauno Products LLC, in Gibbstown, Gloucester County, a specialty chemical maker that stores sulfur dioxide. Sulfur dioxide's vapor can cause severe shortness of breath and suffocation.

Four other facilities use large quantities of chlorine — Solvay Solexis and FERRO in Gloucester County, DuPont Chambers Works in Salem County, and the Northeast Water Pollution Control Plant in Philadelphia.

Employed by Germany as a chemical weapon in World War I, chlorine gas can trigger chest pain, vomiting and, in high concentrations, suffocation.

The Northeast plant will soon discontinue the use of chlorine.

The other three — Valero, the Sunoco plant in South Philadelphia, and Conoco Phillips in Trainer, Delaware County — are oil refineries storing what the EPA calls "one of the strongest acids known."

Hydrogen fluoride is used by 50 refineries in the United States to make high-octane gas, while sulfuric acid — also dangerous, but less likely to form a lethal cloud — is employed by 45 refineries.

Valero's Paulsboro plant is the only refinery in New Jersey using hydrogen fluoride. Unlike a sister plant near Los Angeles, it has no plans to switch to a safer form of the chemical.

Hydrogen fluoride can become a colorless, ground-hugging cloud that can defoliate trees, scorch grass and etch glass. It may also burn eyes and skin, and, in dense concentration, flood lungs with fluid, causing suffocation.

"Hydrogen fluoride is really nasty," said Jonathan Ward, director of toxicology at a University of Texas medicine. See **PLANTS** on A11.

### PLANTS from A10

cal branch. "There are a lot of things that, if released, might smell bad, or there might be some chronic effects to be worried about, but you're not going to kill people on the spot. Hydrogen fluoride could do that."

The chemical is also a known quantity to some terrorists, said Neil Livingstone, board chairman of Global Options, a security firm in Washington. "Many terrorists come from oil-producing countries. Normally, people gravitate to stuff they know about, and [hydrogen fluoride] is something they know well."

The vulnerable zones for the Valero, Sunoco and Conoco Phillips refineries overlap across the Delaware River, encompassing Philadelphia International Airport, the new sports stadiums, and many city neighborhoods.

In 1986, tests conducted by Lawrence Livermore and Amoco Oil Co. in the Nevada desert revealed the dangers of the concentrated kind of hydrogen fluoride used by refineries. In one test, potentially lethal levels from a 977-gallon release were detected five miles downwind.

There have been significant accidental releases elsewhere.

In October 1987, a crane operator at Marathon Oil's Texas City refinery dropped a 30-ton heater on a tank, releasing 30,000 pounds of hydrogen fluoride. About 3,000 residents were evacuated, and 900 were treated for ailments ranging from eye irritation to long-term breathing problems.

"There were houses right up against the fence," said Koopman, of Lawrence Livermore. "The only thing that saved people was that the [hydrogen-fluoride] plume shot 200 feet up in the air, and it went about 900 meters downwind before it actually came down into the neighborhood. If it had squirted out sideways, it would have killed hundreds, if not thousands."

A month later, a Mobil refinery explosion in Torrance, Calif., caused a 100-pound leak of hydrogen fluoride. Six workers were hurt in the explosion.

In 1991, two workers died and five were injured after an accidental release at Southwestern Refining Co. in Texas.

In this area, there have been small hydrogen-fluoride leaks.

Between 1995 and 1997, four one-pound releases at the Sunoco refinery injured one worker in each accident.

In 1997, seven pounds of hydrogen fluoride escaped from the Trainer refinery, injuring two workers.

In Paulsboro, there have been two minor hydrogen-fluoride releases since Valero acquired the refinery in 1998.

The three refineries said that hydrogen fluoride did not travel off-site in any of the releases and that their facilities had numerous safety mechanisms, including leak detectors, a "water curtain" to remove vapors from the air, and a "rapid acid evacuation system" to transfer leaking acid into an alternate tank.

On Oct. 2, 2001, when 150 pounds of hydrogen fluoride leaked within the Valero refinery, the wind was blowing toward neighboring Greenwich Township, recalled the township's emergency-management coordinator, Al Silbaugh.

Broad Street Elementary School ushered all the children and staff into the gym, and sealed the doors and windows with duct tape and plastic.

A major release with a higher concentration of the chemical, Silbaugh said, "could have been a real catastrophe."

Glenn Roemmich, a police dispatcher, is responsible for protecting Paulsboro from disasters such as floods and earthquakes. As the volunteer emergency-management coordinator — a position with a \$1,500 yearly budget — he also supervises evacuation and sheltering procedures in the event of chemical releases.

Roemmich, with Silbaugh, is trying to raise \$112,000 for a system of five sirens, because right now, "there is no way to notify people except going door-to-door."

**"Both industry and government have a duty to warn people if they could be put in harm's way from chemical releases."**

**Paul Orum**,  
director of Working Group  
on Community Right-To-Know

Valero spokeswoman Riggs said the company "is committed to supporting" a siren system. But Silbaugh said he had yet to receive any commitment from area companies to help fund it.

In South Philadelphia, a community group and the city sued Sunoco for such improvements. A 1997 settlement required Sunoco to spend an estimated \$5 million in upgrades and provide additional funds to build 10 warning sirens.

The 1986 Emergency Planning and Community Right to Know Act, passed after the Bhopal tragedy, set up local emergency-planning committees to prepare for such a catastrophe. But many are hamstrung by a lack of resources.

Despite community efforts in Paulsboro to educate the public about emergency procedures, the refinery's risks remain a mystery to many residents.

Among a dozen interviewed in recent months, only one, a volunteer firefighter, was aware of Valero's worst-case scenario or emergency precautions.

"Both industry and government have a duty to warn people if they could be put in harm's way from chemical releases," said Paul Orum, director of the nonprofit Working Group on Community Right-To-Know in Washington.

Also required of the companies by the Clean Air Act amendments was a public meeting to discuss their risk-management plans. In 1999, Valero and two other companies hosted an open house at the Gibbstown firehouse. The event drew fewer than 10 people, recalled a Repaumo Products plant manager.

The companies also included some information on their plans in a newsletter mailed out by a community advisory panel.

The panel, composed of community members and representatives of five companies, has publicized the concept of "shelter-in-place" which involves closing doors and windows, shutting vents, and sealing a room with duct tape and plastic.

The panel's efforts include a coloring book featuring Shelly the Turtle. "Shelly stays safe when she shelters in her shell," the book explains. Children can connect numbered dots that form a toxic-gas cloud.

Paulsboro Mayor John Burzichelli said shelter-in-place, not evacuation, may be the town's only option.

"If you've ever tried to drive at 3:30 [p.m.] on our highways, you'll never get anywhere," he said.

But John Sorensen, a researcher at Oak Ridge National Laboratory in Tennessee, explained that "sheltering-in-place is not a simple, one-size-fits-all solution."

A study by Sorensen found housing built before 1950 "will likely be unsuitable for sheltering without weatherization." In Paulsboro, 38 percent of the homes went up before 1940.

For those living at the edge of a plant, there may not be time to shelter in place.

These people fall into what Stuart Greenberg, director of the nonprofit Environmental Health Watch, dubbed "the sacrifice zone."

"It's the area into which a cloud of dangerous concentration could move so fast that people will not be able to take protective action," he said.

In city neighborhoods near Sunoco, "the closest people to the refinery don't have a chance," said Joanne Rossi, head of the Community/Labor Refinery Tracking Committee in South Philadelphia. "We're dead if anything happens. The [hydrogen fluoride] is something the government itself needs to take a position on. The chemical is just too hazardous for the city."

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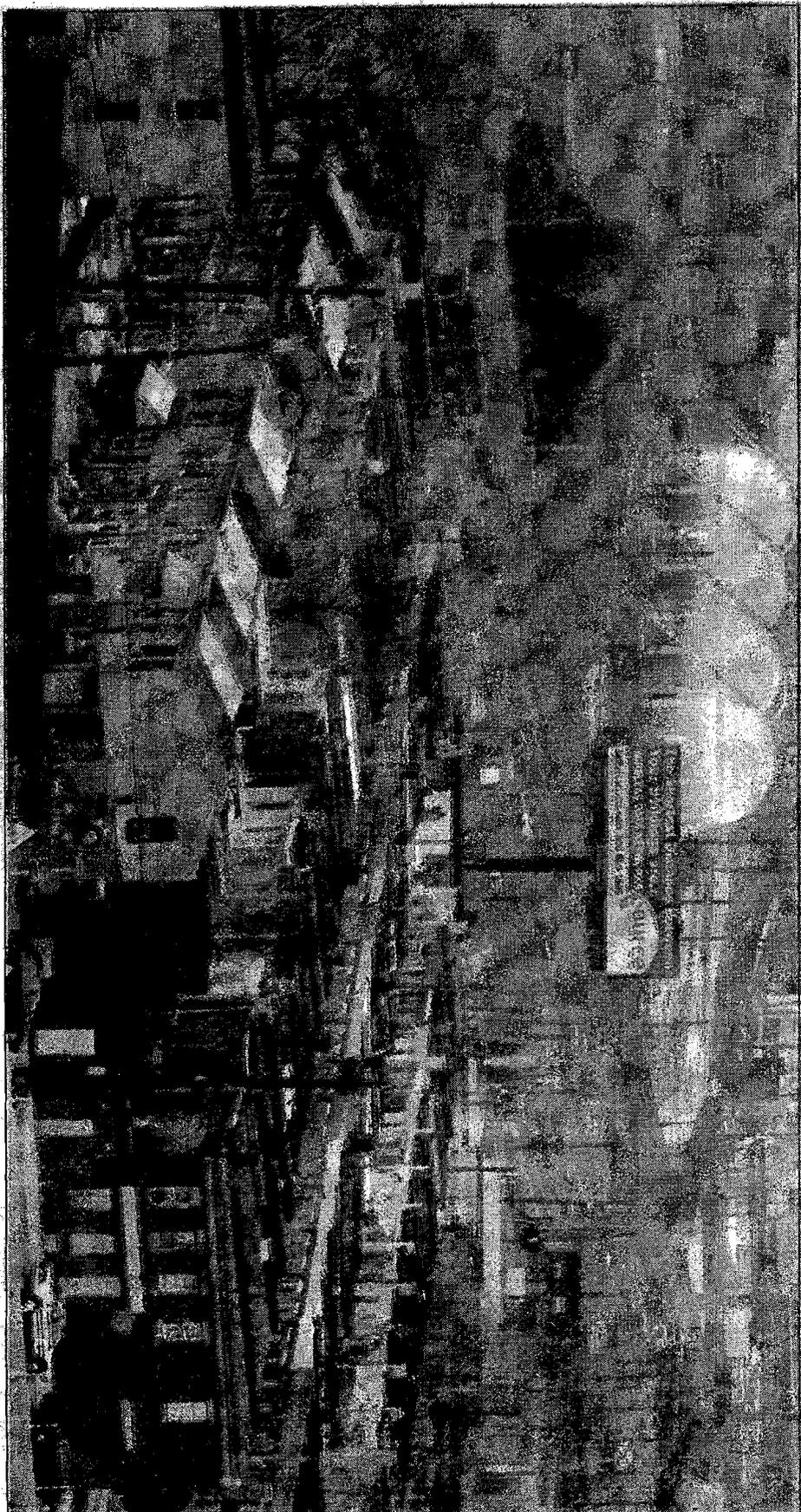
Inquirer staff writers Mark Fazlollah and  
Jennifer Lin contributed to this article.

**Tomorrow: Some companies are reducing hazards by adopting safer technologies.**

IN THE SHADOW OF DANGER: THE CHEMICAL PLANT PERIL

"Originally, when companies had to release worst-case scenarios, they said: 'You don't have to worry about this.' You can't say that anymore. We all know there are people of ill will who want to see a worst-case scenario happen."

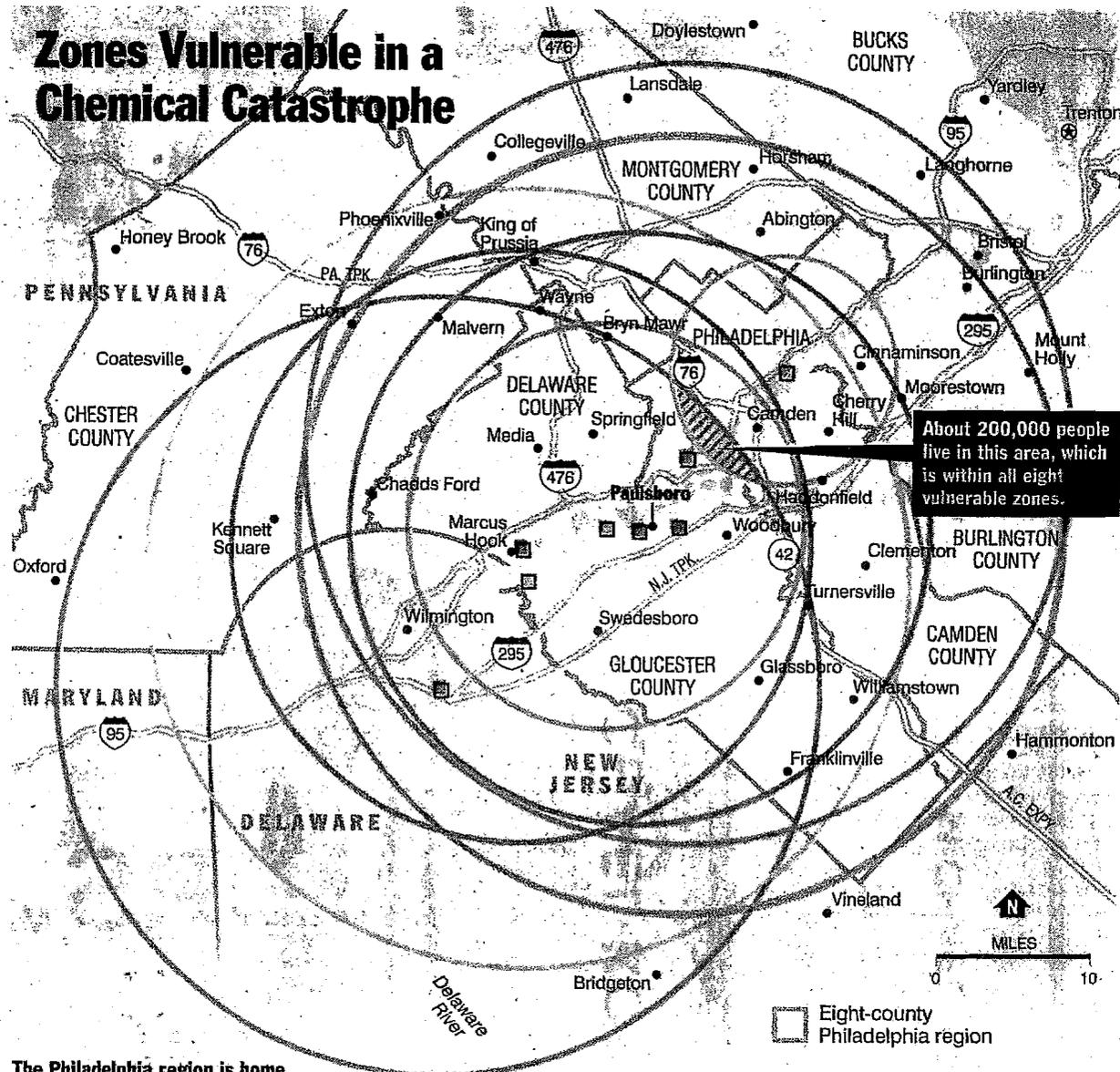
**Sanford Lewis**, environmental lawyer



**The Sunoco refinery in South Philadelphia (in background) is one of three area sites that uses hydrogen fluoride — what the Environmental Protection Agency calls "one of the strongest acids known." A 1997 lawsuit won by a community group and the city forced the firm to spend \$5 million in upgrades and to help build 10 warning sirens.**

BONNIE WELLSER / Inquirer Staff Photographer

# Zones Vulnerable in a Chemical Catastrophe



About 200,000 people live in this area, which is within all eight vulnerable zones.

The Philadelphia region is home to eight industrial facilities that could endanger more than a million people each in the event of a catastrophic chemical release — the highest concentration of such facilities on the East Coast.

Shown here is each facility and its "vulnerable zone" — the maximum distance toxic gases could spread, according to the plant's "worst-case scenario" filed with the Environmental Protection Agency.

In all, more than 4.3 million residents — 86 percent of the eight-county region — live within at least one of the eight zones:

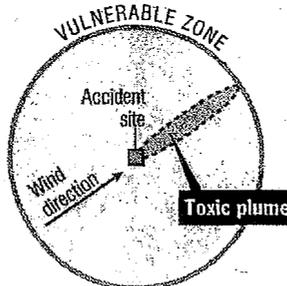
Colors indicate both the location of each facility and its corresponding vulnerable zone.

Facility	Location	Hazardous chemical	Zone radius	People in zone
Sunoco Inc.	Philadelphia	Hydrogen fluoride	25 miles	3,900,000
Solvay Solexis	Thorofare, N.J.	Chlorine	25 miles	3,800,000
FERRO	Bridgeport, N.J.	Chlorine	25 miles	3,400,000
Valero Energy Corp.	Greenwich, N.J.	Hydrogen fluoride	19 miles	2,836,121
Conoco Phillips	Trainer, Pa.	Hydrogen fluoride	19 miles	2,200,000
DuPont Chambers Works	Deepwater, N.J.	Chlorine	25 miles	2,000,000
Repauno Products LLC	Gibbstown, N.J.	Sulfur dioxide	13 miles	1,619,647
Northeast Water Pollution Control Plant	Philadelphia	Chlorine*	7 miles	1,575,971

\*The plant will soon substitute a safer chemical for chlorine.

## Toxic Plumes and Vulnerable Zones

Though no mass chemical release has occurred in this country, such an event could produce a toxic plume that would travel downwind from the accident site. Most likely affected would be those in its path — far fewer than the population living within the "vulnerable zone."

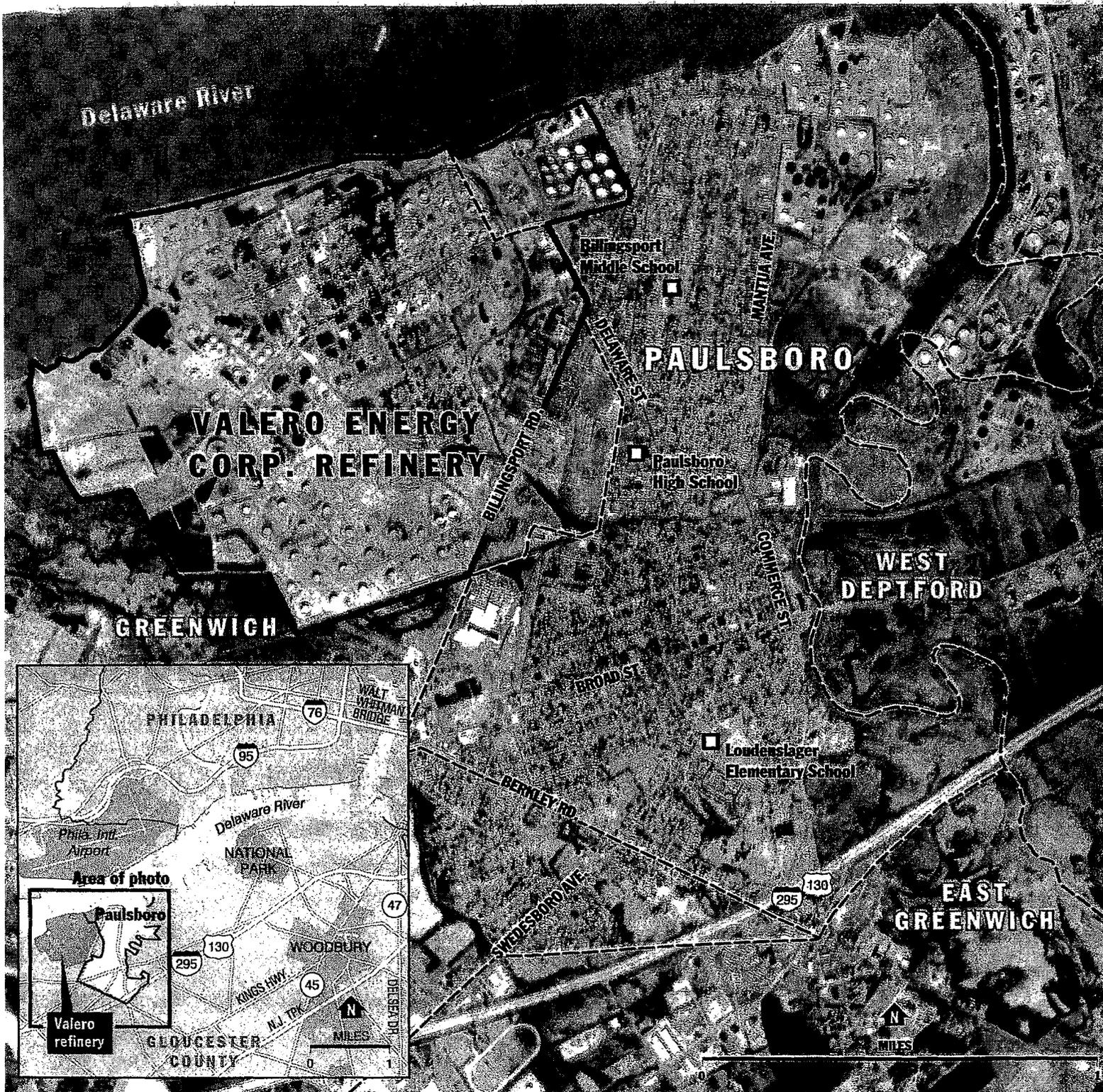


## Health Effects of Hazardous Chemicals

**Hydrogen fluoride:** Can burn the eyes with possible permanent damage; inhalation can cause irritation and shortness of breath; high exposure can cause suffocation.

**Chlorine:** Can irritate the nose and throat, causing tearing, coughing and chest pain; high exposure can cause suffocation.

**Sulfur dioxide:** Can irritate and burn the skin and eyes with possible permanent damage; high exposure can cause fluid buildup in the lungs and suffocation.



Valero Energy Corp.'s 950-acre refinery is shown adjacent to the town of Paulsboro in this 1995 color-corrected aerial photo available on the Internet. According to Valero's risk-management plan on file at the Environmental Protection Agency, a "worst-case scenario" would release 240,000 pounds of

potentially lethal hydrogen-fluoride gas that could travel in a plume stretching 19 miles. Approximately 2.8 million people live within 19 miles of the refinery.

A spokeswoman for Valero says the refinery is outfitted with devices to contain leaks and has an exemplary safety record with no major releases.

SOURCES: U.S. Environmental Protection Agency; N.J. Department of Environmental Protection; ESRI; GDT

BETO ALVAREZ and JOHN DUCHNESKIE / Inquirer Staff Artists

# A town closely tied to its neighbor

By Adam Fifield

INQUIRER STAFF WRITER

The skyline behind the Paulsboro High School football field is a tangle of tanks, towers and smoke. The Valero oil refinery sprawls across 950 acres along the Delaware River, directly across from Philadelphia International Airport.

Since the refinery opened in 1917 and cycled through a handful of owners, its relationship with the surrounding blue-collar towns has been both harmonious and contentious. It has infused the area with jobs and tax revenue — and pungent odors and emissions.

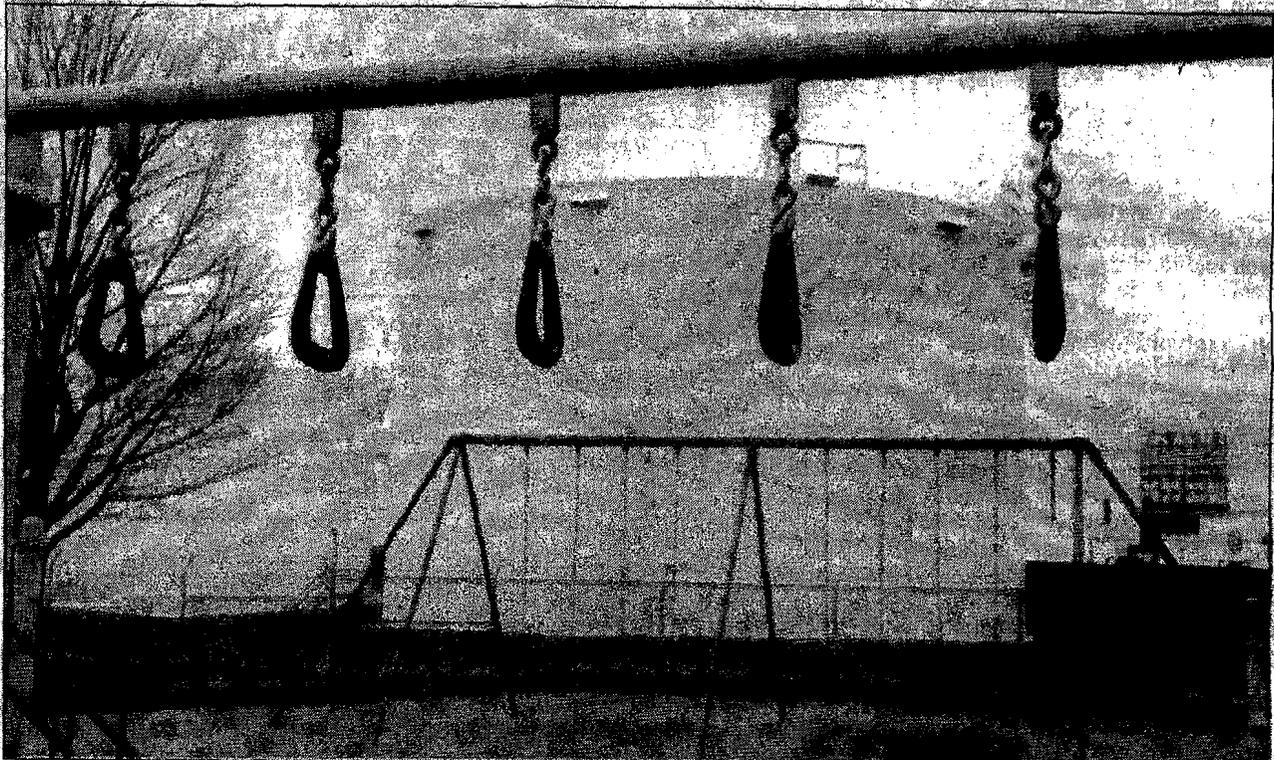
In 1998, the Texas-based Valero Energy Corp., which owns 12 refineries in North America and has annual revenues of close to \$30 billion, bought the refinery from Mobil Corp. The 195,000-barrel-per-day facility employs 540 people, about three-quarters of whom come from Gloucester County.

Though the facility is known as the “Paulsboro refinery,” neighboring Greenwich Township claims it as a ratable. Last year, Valero paid more than \$7 million in taxes, which was shared by the township, local schools and Gloucester County.

But the financial benefit of Valero’s presence extends beyond taxes and jobs. The company has doled out more than \$350,000 to area charities and nonprofits, and has raised an estimated \$1.8 million for the United Way of Gloucester County.

Valero employees provide thousands of hours of community service, participate in food drives, and helped renovate the recently opened Boys and Girls Club of Paulsboro.

“We are closely tied,” said Paulsboro Mayor John Burzichelli. “They’re a good neighbor to us.”



MICHAEL PLUNKETT / Inquirer Suburban Staff

Lincoln Avenue Park runs alongside the Valero Energy Corp. oil refinery in Paulsboro. The firm has brought jobs, millions in tax revenue, and charitable donations to surrounding communities. Its effects on the environment remain a concern.

Valero’s environmental record, however, has raised concerns among neighbors and the state.

The New Jersey Department of Environmental Protection has cited Valero for more than 90 violations since 1998. On May 5, 2000, the company agreed to pay the DEP \$600,000 to settle penalties and to install a \$90 million scrubber to cut emissions.

The DEP settlement grew out of problems inherited from Mobil, said Valero spokeswoman Claire Riggs. “Valero has taken great measures to

improve the facility,” she said.

Last year, the company received penalties totalling \$485,600 from the DEP. Riggs said that those fines were for “relatively minor events,” and that the company is working with the DEP “on review and settlement of these penalties.”

The DEP received more than 50 complaints of odors and of dust and of ash coating cars and houses in the vicinity of the refinery in 2001 and 2002. The refinery has paid to have some of the property washed.

Two residents said the odors and emissions might have improved since Valero took over the facility. Two others said that, improvements or not, they planned to move.

“You have these smells from the plant, and everyone is nervous about the release of chemicals in the air and the long-term effects it’s going to have on you health-wise,” said Kent Depina, who lives with his 8-year-old daughter about 100 yards from the facility. “I don’t want to live right next to the refinery anymore.”