

Fifty
years of
progress
toward
clean air

*On Oct. 14, 1947, the
Los Angeles County Board
of Supervisors established the
region's first air pollution
control agency, the Los Angeles
County Air Pollution Control
District. This year, 1997,
marks the 50th anniversary of
an epic war on smog that has
been characterized by continual
progress. The following is a
brief history of those efforts,
starting with public recognition
of a serious air pollution prob-
lem in the early 1940s.*



THE SOUTHLAND'S WAR ON SMOG







On July 26, 1943

in the midst of

World War II,

Los Angeles was

attacked—

not by a

foreign enemy,

but a domestic one—

*smog.
smog.
smog.*

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The Los Angeles Times reported that a pall of smoke and fumes descended on downtown, cutting visibility to three blocks. Striking in the midst of a heat wave, the "gas attack" was nearly unbearable, gripping workers and residents with an eye-stinging, throat-scraping sensation. It also left them with a realization that something had gone terribly wrong in their city, prized for its sunny climate.

The following day, city officials pointed the finger at the Southern California Gas Co.'s Aliso Street plant, which manufactured butadiene, an ingredient in synthetic rubber. Public pressure temporarily shuttered the plant, but the gas attacks persisted, proving that it was not the prime culprit.

That summer's "gas attack" was the opening shot in an epic war on smog, which now has been waged for half a century. From a ban on backyard trash incinerators to the introduction of reformulated gasoline, and from inventing the automotive catalytic converter to developing zero-emission fuel-cell electric vehicles, the fight against air pollution has inspired technological innovations and touched off heated political battles. Controlling air pollution has always ignited public controversy.

A look at the past 50-some years of air pollution control shows how far we've come, and yet how far we still have to go to achieve clean air. It demonstrates that victory over smog can be achieved and that all residents of the Los Angeles Basin can breathe air that meets public health standards.

THE ARRIVAL OF AIR POLLUTION

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Los Angeles suffered from smog well before World War II. Industrial smoke and fumes were so thick during one day in 1903 that residents mistook it for an eclipse of the sun. From 1905 to 1912, the Los Angeles City Council adopted several measures to combat dense smoke emissions. As the century progressed, the city sprawled and industry boomed, overwhelming those first primitive air pollution control measures.

World War II dramatically increased the region's industrial base and resulting air pollution. The city's population and motor vehicle fleet grew rapidly as well. As a result, according to weather records, visibility declined rapidly from 1939 to 1943.

Angelenos grew increasingly alarmed at the smoke that clouded their vision and the fumes that filled their lungs.

Polluting smoke was so dense and pervasive it constituted a "serious menace" to aviation, according to the county's health officer. Officials at the Monrovia airport reportedly considered moving the airfield to escape the pall.

1941

As Southland gears up to support war effort, population and industry growth accelerate.

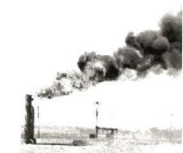


1943

First reported smog "gas attack" on Los Angeles. Blimp samples air quality.



1945



City of Los Angeles establishes Bureau of Smoke Control.



RECOGNIZING THE PROBLEM

In October 1943, the Los Angeles County Board of Supervisors appointed a Smoke and Fumes Commission to study the problem. Following their recommendations, supervisors in February 1945 banned emissions of dense smoke and established an office of Director of Air Pollution Control. The City of Los Angeles adopted a similar smoke regulation the same year, but the other 45 cities in the county took little or no action.

During the war, Angelenos perceived smoke from factories as the number one air pollution culprit. In August 1945, the *Pasadena Star-News* published a series of articles by county Health Officer Dr. H.O. Swartout who asserted that smog, in fact, came from many sources: smoke-belching locomotives and diesel trucks, burning rubbish in backyard incinerators and city dumps and combusting scrap lumber in sawmills. Swartout even correctly identified the region's mountain ranges, relatively stagnant winds and atmospheric temperature inversions as major contributors to Southland smog.

In late 1946, the *Los Angeles Times* hired air pollution expert Raymond R. Tucker of St. Louis to analyze the Los Angeles smog problem and make recommendations to correct it. In a major treatise published in the *Times*, Tucker reinforced the notion that it was not just a few smokestacks, but a plethora of uncontrolled sources causing the problem:

"Caution should be exercised in placing the entire blame on any one industry, plant or group of individuals," he wrote. "Each contributes its share."

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RAYMOND R. TUCKER
CONDUCTED EARLY STUDY
OF AIR POLLUTION

1946	1947	1948
<div data-bbox="237 1831 528 1901" data-label="Image"> </div> <div data-bbox="261 1914 508 2024" data-label="Text"> <p><i>St. Louis smog expert Raymond Tucker, hired by Los Angeles Times, blames smog on myriad sources.</i></p> </div>	<div data-bbox="700 1826 1001 2082" data-label="List-Group"> <ul style="list-style-type: none"> • June 10: Gov. Earl Warren signs AB1, allowing county air pollution control districts. • Oct. 14: LA County establishes APCD. • Dec. 30: APCD enforcement program requires permits for all major industries. </div> <div data-bbox="905 1914 1027 2100" data-label="Image"> </div>	<div data-bbox="1232 1826 1470 1942" data-label="List-Group"> <ul style="list-style-type: none"> • Smog disaster in Donora, Pa., kills 20 people. • Crop damage triggers smog research. </div> <div data-bbox="1245 1954 1460 2126" data-label="Image"> </div>

From Rubber Bands to Ultraviolet Rays: The Evolution of Air Quality Monitoring

Thirty years ago, measuring smog levels could be a real headache.

Ozone measuring instruments demanded constant baby-sitting and frequently leaked chemicals so caustic that they etched the concrete floors and dissolved the plaster walls of monitoring stations. Vacuum pumps clattered constantly.

"It was like working in a factory. Those pumps were really noisy," said William Bope, AQMD's air quality monitoring manager.

Technicians had to fill the refrigerator-sized machines with wet chemical solutions that reacted with ozone and turned colors, providing a means for gauging the pollutant's levels. When a machine's plumbing backed up during a weekend, workers would arrive on Monday morning to a floor flooded with acid solutions. The finicky devices also needed constant adjustment.

"You'd sneeze and the darn thing would be out of calibration," Bope said.

Today, an ozone monitor can fit into a large briefcase. Using only ultraviolet light and solid-state electronics, the silent devices can measure smog levels continuously, with little maintenance.

Scientists started developing air pollution monitoring devices in the late 1940s. Since little was known about the chemical nature of smog, and it had never before been measured, they had to start from scratch.

The first reliable field monitoring technique measured ozone levels based on the amount of time it took for the pollutant to crack a thin strip of rubber. As a vacuum pump drew a measured amount of outdoor air across a folded strip of rubber, a technician with a stopwatch and a magnifying eyepiece timed how long it took for the rubber to crack.

In 1955, the Los Angeles Air Pollution Control District established an alert system to warn the public and curtail or shut down

industrial activity in the event of an impending air pollution emergency. The following year, APCD officials finished installing a 15-station monitoring network, the first in the nation to provide continuous air quality data for measuring and forecasting smog levels.

That system grew into today's network of more than 30 stations, which is the backbone for making daily forecasts, issuing health advisories, gauging long-term progress in reducing smog levels and developing air quality models to predict future attainment of clean air standards.

Today, ozone levels are measured by shining ultraviolet light through a tube filled with outdoor air. Since ozone absorbs ultraviolet light, the amount that passes through the tube is measured to reveal the pollutant's concentration.

Air quality data is recorded on computers and automatically sent by telephone to AQMD headquarters. Each instrument technician, who used to handle only one station, now maintains

three or four.

Computers at AQMD headquarters consolidate this information into summaries used to advise schools, residents and the media. Anyone can check current smog levels by calling 1-800-CUT-SMOG or by viewing AQMD's Internet Website at <http://www.aqmd.gov>.

In the future, air quality monitoring equipment is expected to become even smaller and require less maintenance. Instead of occupying a small building, monitoring equipment may be contained in a lunch pail-sized box mounted on a telephone pole.

As smog levels are reduced and some areas actually achieve health standards, fewer stations will be needed. But some will always stand watch to ensure that air pollution levels continue to decline, and that once clean air is achieved, unhealthy smog never returns.



CONRAD VLECK
LOOKS FOR
OZONE-CAUSED
CRACKS ON A
RUBBER STRIP
CIRCA 1960.

Tucker made 23 specific recommendations, including a prohibition on burning rubbish in backyard incinerators and in dumps, and citations for smoking trucks.

He also pointed out that air pollution officials lacked the clout and legislative authority to effectively control smog. In addition, he said, the separate, disjointed efforts of Los Angeles, 45 other cities and the county and were ineffective against the regional spread of smog. Tucker recommended creating a powerful county-wide air quality agency with broad powers to adopt and enforce air pollution regulations.

BIRTH OF THE FIRST UNIFIED AIR POLLUTION AGENCY

In 1947, Tucker's recommendations became a reality, in spite of stiff opposition from oil companies and other industries. These business interests opposed creating an air pollution permit system and repealing a state law giving manufacturers the right to "necessary" discharge of smoke and fumes.

On April 15, the county Board of Supervisors approved draft legislation allowing counties to set up unified air pollution control districts. The League of California Cities fully supported the measure, agreeing that air pollution would be more effectively regulated by counties than by individual cities.

The bill sailed through the Legislature on votes of 73-1 in the Assembly and 29-0 in the Senate. Gov. Earl Warren signed the measure into law on June 10. On Oct. 14, 1947, supervisors activated the Los Angeles County Air Pollution Control District, the first in the nation, and appointed Louis C. McCabe as its director. On Dec. 30, 1947, the district put teeth into its air quality program by requiring all major industries to have air pollution permits.

During the following decade, county supervisors activated air pollution control districts (APCDs) in Orange County in 1950, and in Riverside and San Bernardino counties in 1957. Twenty years later, the four county agencies were combined to form the South Coast Air Quality Management District (AQMD).

UNRAVELING THE MYSTERY OF SMOG

As early as 1945, residents referred to the city's pall as "smog," in spite of the fact that the combination of smoke and fog—which gave rise to the term—was not very prevalent in Los Angeles. In fact, when the Los Angeles County APCD was created, no one knew exactly what was in smog or what caused it—nor, therefore, how to control it.

In 1948, Arie J. Haagen-Smit, a biochemistry professor at the California Institute of Technology in Pasadena, started examining plants that had been damaged by smog. Farmers near Southland refineries complained that air pollution damaged their crops, bleaching or discoloring the leaves of plants—something not seen in other parts of the country.

Haagen-Smit, a Dutch flavor chemist who had once developed perfumes, knew that Los Angeles smog was unlike air pollution in eastern U.S. cities, where it was chiefly composed of sulfur compounds and soot from burning coal and heavy oil.

He also observed that in spite of early smoke control measures, residents still smelled a curious bleach-like odor in the air, and suffered severe eye irritation on smoggy days.

LOS ANGELES COUNTY AIR POLLUTION CONTROL DISTRICT
434 SAN PEDRO STREET, LOS ANGELES



1949



APCD adopts rule requiring metal melting plants to control dust and fumes with baghouses.

1950

Orange County APCD established.



1952



- 4,000 deaths attributed to "killer fog" in London.
- Haagen-Smit finds that ozone is created photochemically from hydrocarbons and nitrogen oxides.



ARIE J. HAAGEN-SMIT
DISCOVERED HOW SMOG FORMS

Margaret Brunelle, a retired chemist who worked with Haagen-Smit for several years, recalls driving through sharply defined, thick banks of smog along the Pasadena Freeway.

"I'd have to pull over by the side of the road because my eyes were tearing so badly I couldn't see to drive," she said.

Haagen-Smit was on the trail of a highly oxidizing element in Los Angeles air. By 1950, his nose and research led him to the culprit: ozone. By exposing plants to ozone in sealed chambers, he showed the plants suffered similar symptoms as those damaged by smog.

Haagen-Smit also demonstrated in the early 1950s that ozone caused eye irritation, particle formation and damage to materials.

In a Plexiglas chamber set up in the parking lot of the Los Angeles County APCD's Vernon headquarters, researchers created smog by exposing hydrocarbons and nitrogen oxides to sunlight. Air Pollution Control Officer S. Smith Griswold developed bronchitis after voluntarily breathing extremely high levels of ozone in the chamber. Later, APCD employees voluntarily exposed their eyes to smog from the chamber while workers with stopwatches timed how long it took for volunteers to experience discomfort, or even tears.

After tire manufacturers noticed that rubber deteriorated faster in Los Angeles than other areas of the country, researchers at Cal Tech showed air pollution to be the cause. They found that rubber exposed to high smog levels cracked in just seven minutes. Thus was born one of the early methods for measuring ozone levels.

1953



- Los Angeles launches nation's first "smoke school" to control visible emissions.
- Beckman Panel urges broad campaign against smog.

1955

- Highest ozone level ever recorded in Southland — .68 parts per million.
- Los Angeles APCD launches Smog Emergency Warning System.



1956



Los Angeles establishes first air quality monitoring network of 15 stations.



BY 1947, MORE THAN 300,000 BACKYARD GARBAGE INCINERATORS PUFFED OUT WHITE PLUMES—AND BLACK SOOT—ACROSS LOS ANGELES. IT TOOK MORE THAN A DECADE FOR BURNING OF BACKYARD TRASH TO BE BANNED, BRINGING THE WAR ON SMOG TO THE HOME FRONT.



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1957



San Bernardino and Riverside county APCDs formed.



1958



Backyard rubbish incinerators banned.

1959

California Legislature requires state to establish air quality standards and controls on motor vehicle emissions.



Just one question remained: Where did ozone come from? Haagen-Smit and Brunelle drove to Southland refineries and collected samples of air in five-liter flasks. After analyzing the contents and using them to create artificial “Haagen-smog” in the laboratory, Haagen-Smit announced in 1952 that ozone, the primary ingredient in smog, was not directly emitted from tailpipes or smokestacks, but was created in the atmosphere. Driven by sunlight, a photochemical reaction of hydrocarbons—from petroleum products and the partially unburned exhaust of automobiles—with nitrogen oxides, a combustion byproduct, produces ozone.

His announcement shocked industrial and civic leaders.

“There was a real uproar about it,” Brunelle said.

Business leaders argued that irritating ozone came not from oil refineries and cars, but from the stratosphere, where ozone descended to the surface of the Pacific Ocean, then was blown over the Los Angeles area by offshore breezes. Haagen-Smit knew that the atmospheric temperature inversion trapping smog close to the Earth’s surface would form a barrier preventing ozone from descending from the stratosphere. Finally, in 1954, the Stanford Research Institute, funded by oil companies, showed only low levels of ozone on Catalina Island, disproving the migrating ozone theory.

EARLY SMOG CONTROL EFFORTS

In the late 1940s and early 1950s, air pollution officials made significant strides in reducing smoke and fumes by regulating open burning in garbage dumps, reducing smoke from factories and cutting sulfur dioxide emissions from oil refineries.

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These measures reduced the “dustfall” by two-thirds, or 1,200 tons per square mile annually, to 1940 levels before smog was a serious problem.

In addition, banning backyard incinerators brought the smog war to the home front and the campaign against smoky orchard “smudge pots” eliminated a highly visible source of pollution.

In 1947, more than 300,000 backyard trash incinerators puffed out white plumes—and black soot—across the city.

“People would complain—especially women hanging up their washing outside—that the ashes and soot from the incinerators would soil their freshly laundered clothing before it got dry,” Brunelle said.

Many residents fiercely opposed plans to ban backyard incinerators, believing that oil refineries were the true cause of smog, and that refineries should be regulated first. More than a decade after the problem was first identified, trash collection programs were established and backyard incinerators were finally banned in 1958.

In the late 1940s, Southland citrus growers operated more than 4 million smudge pots, burning used motor oil, old tires or other wastes to prevent frost damage to crops.

On a cold winter’s day, when atmospheric inversions trapped pollutants low to the ground, carbon-black smoke smudged the horizon in places such as Orange County.

"You'd blow your nose, and it would be black," said Edward Camarena, who started his 37-year air pollution control career as a chemist with the Orange County Air Pollution Control District. "There was a belief that smoke helped hold the heat in, and therefore, smoke was good."

The Orange County APCD adopted California's first measure regulating orchard heaters and took on the tough task of convincing growers that the heaters would work just fine, and still prevent frost, if they burned cleaner fuels without smoke.

THE BIRTH OF MODERN POLLUTION CONTROL

In London in December 1952, a killer smog so thick that residents could see no more than three feet claimed 4,000 lives. Fearing a similar catastrophe in Los Angeles, Gov. Goodwin J. Knight appointed Arnold O. Beckman of Beckman Instruments to chair a committee recommending air pollution reforms.

One year later, the Beckman Committee made several far-reaching recommendations that set the air pollution agenda for years to come. The committee recommended that:

- Hydrocarbon emissions be reduced by cutting vapor leaks from refineries and fueling operations;
- Automobile exhaust standards be established;
- Diesel trucks and buses burn propane instead of diesel;
- Heavily polluting industries consider slowing their growth;
- Open burning of trash be banned; and
- A rapid transit system be developed.

Scientists and the public were beginning to realize that massive amounts of gasoline were evaporating from refinery storage tanks and fuel pump nozzles at service stations throughout the region. The oil industry estimated that 120,000 gallons of gasoline were evaporating daily. County officials believed the loss to be twice as much. Gasoline vapors contain hydrocarbons, a pollutant proven to form ozone.

In 1953, the Los Angeles APCD started requiring controls to reduce hydrocarbon emissions from industrial gasoline storage tanks, thereby reducing 460 tons of smog-forming emissions per day. Subsequent rules reduced hydrocarbon emissions from filling gasoline tank trucks and underground storage tanks at service stations. It wasn't until 1978 that air quality officials required cumbersome sleeves on gasoline fuel pump nozzles to keep hydrocarbon gases from escaping when motorists filled up at service stations.

"That was the most cost-effective thing we've ever done," said Jeb Stuart, executive officer of the South Coast Air Quality Management District when the agency adopted the measure.

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1960

*California Motor Vehicle
Pollution Control Board
established.*



1961



*State mandates auto
makers equip new cars
with positive crankcase
ventilation (PCV)
"blowby" devices.*

1963

*First federal
Clean Air Act enacted.*



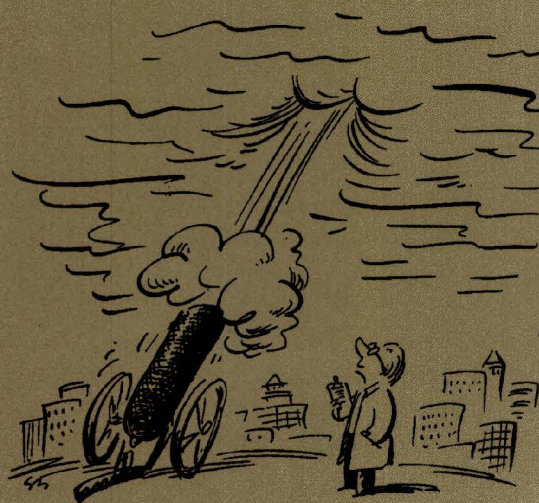
Can't We Just Blow All This Smog Away?

Ever since smog became a noticeable problem in Southern California, Southlanders have suggested solutions to get rid of it. Some of the ideas have included:

- Drilling tunnels or cutting passes through the mountains surrounding the Los Angeles Basin, and installing giant fans to blow smog into the desert;
- Installing spray towers off the coast to wash air at night as it flows offshore;
- Building a massive "air sanitation system" to pipe all industrial emissions out of the Los Angeles Basin;
- Seeding clouds to produce cleansing rains;
- Moving everyone out of the Los Angeles Basin because it is not a suitable place for human habitation;
- Planting smog-absorbing vegetation on mountain sides surrounding the Los Angeles Basin; and
- Tearing a hole in the atmospheric inversion layer that traps smog—thereby allowing it to escape—by firing cannons through the inversion layer from Mt. Wilson, dropping hot water

on it from balloons or burning a hole through it using giant mirrors focusing the sun's rays.

Scientists who evaluated these ideas found them impractical. Arie J. Haagen-Smit, for instance, pointed out that the air mass above Los Angeles County alone, from the ground up to 1,000 feet—a typical inversion height—weighs 650 million tons. The electricity needed to run fans to blow that much polluted air away for one day would require the output of the Hoover Dam for eight years!



Lacking a quick fix for the nation's worst smog, air quality regulators have turned to more down-to-earth technology to develop progressive emission reductions, from the catalytic converter to the electric vehicle and fuel cells.



*EXPRESSING DISPLEASURE OVER SMOG, 75 MEMBERS OF THE HIGHLAND PARK OPTIMIST CLUB
DONNED GAS MASKS AT A LUNCHEON MEETING IN OCTOBER 1954.*

It was also one of the most controversial.

“The initial vapor recovery hoses were extraordinarily clumsy,” Camarena said. Rumors circulated that vapor recovery “boots” could cause pressure to build up in gas tanks, possibly rupturing them, causing a fuel leak and fire hazard. A bill was introduced in the Legislature to kill the program, but it survived and became, in Camarena’s words, “the first control system in the hands of the public.”

Today, gas station fuel nozzles are easy to use and must be certified to capture 95% of fumes that would otherwise be released to the atmosphere.

During the 1950s and 1960s, Southern California air quality officials tackled myriad pollution sources: petroleum-based solvents containing hydrocarbons, landfills emitting toxic gases, power plants emitting nitrogen oxides, even rendering plants that processed animal wastes. Air quality regulations significantly reduced emissions, but peak ozone levels remained extremely high—more than four times the current health standard. Regulators knew they needed to go after the prime source—the motor vehicle.

In 1955, Southland residents suffered the highest ozone level ever recorded—0.68 parts per million in downtown Los Angeles—nearly three times the highest level in 1996.

CLEANING UP CARS

As Los Angeles became more urbanized, residents needed more wheels. By the late 1950s, experts acknowledged that the rapidly increasing number of vehicles—fueled by a lack of public transit, long distances between communities, a widespread freeway network and a relatively prosperous economy—was a major cause of the smog problem.

In 1960, recognizing that counties could not adequately regulate motor vehicle pollution, the Legislature activated the California Motor Vehicle Pollution Control Board, and gave it authority to test emissions and certify emission control devices.

Regulators focused first on reducing unburned hydrocarbon emissions from engine crankcases, the source of one-third of total vehicular emissions, according to Haagen-Smit.

The board required that starting with the 1963 model year, new cars be equipped with a device that routed crankcase “blowby” gases to the manifold, where they were re-burned, rather than venting them to the atmosphere.

The technology worked, but a requirement to retrofit crankcase devices on 1950-1963 model year cars did not fare as well. When widespread—and unfounded—rumors charged that the retrofit devices caused engine damage, the Legislature temporarily rescinded the retrofit program and later re-adopted it only for the state’s smoggiest areas.

1966



- California sets nation's first auto emission standards.
- CHP launches roadside inspections of auto smog control devices.

1967



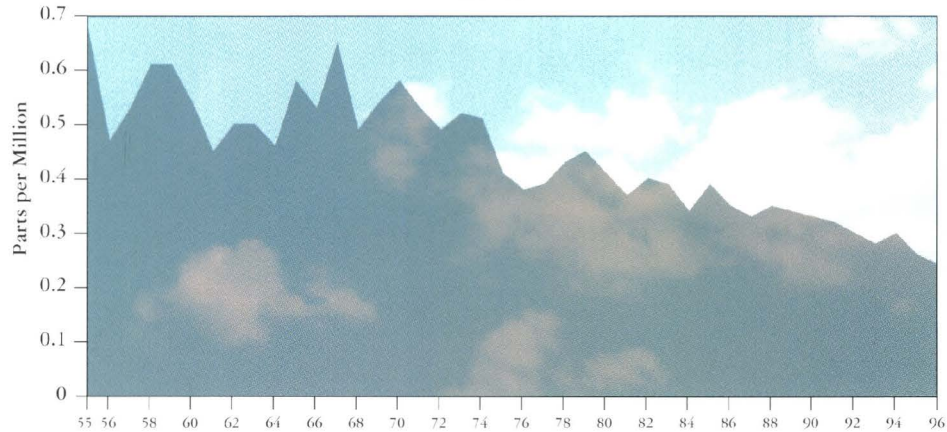
- California Air Resources Board created.
- Federal Air Quality Act allows California to set and enforce more stringent auto standards than rest of the nation.

1969



First state ambient air quality standards enacted.

PEAK OZONE LEVELS
1955–1996



Diesel vehicles weren't subject to the same requirement, but smoking trucks were cited by uniformed Los Angeles County APCD officers driving black-and-white patrol cars.

In the late 1960s, California imposed initial regulations reducing cars' tailpipe emissions. The most significant pollution control device—the catalytic converter—was not required until the 1975 model year.

"Clearly, catalysts were the top measure," said Stuart, executive officer of AQMD from 1976 to 1986. "Without that, we'd still be choking all over the place."

Although catalysts were proposed and tested in the early 1960s, auto manufacturers strongly resisted their introduction, according to air pollution officials.

"In the beginning, they said it could not be done," said Jim Boyd, executive officer of the California Air Resources Board from 1981 to 1996. "They said the technology was impossible. That it was incredibly expensive."

The catalytic converter requirement was one of the state's first "technology-forcing" regulations, compelling industry to develop a new pollution control capability by a set deadline.

"Air quality has improved because of government regulation pushing a reluctant industry to comply with each issue," said Gladys Meade, one of the region's most prominent and longtime clean air activists, and a former board member of both CARB and AQMD.

Technology-forcing regulations in the arenas of zero-emission vehicles and zero-polluting paints are major battlegrounds even today in the debate between what is practical and what is necessary to clean up the nation's dirtiest air.

1970

• First Earth Day on April 22 generates massive support for environment.



- U.S. EPA created.
- 1970 Federal Clean Air Act becomes cornerstone of modern air pollution control.

1971



EPA adopts air quality standards.

1973

OPEC oil embargo sends gasoline prices skyrocketing, resulting in more fuel-efficient cars with lower emissions.



Health Effects of Smog: More Than a Nuisance

DAMAGE WITHIN: ONCE PINK AND HEALTHY, THESE HUMAN LUNGS ARE STREAKED WITH RIB-SHAPED BANDS OF BLACK. THE DAMAGE WAS NOT DUE TO CIGARETTE SMOKE. NOR WAS IT DUE TO A RESPIRATORY DISEASE, A GENETIC ABNORMALITY OR CRUSHED RIBS. THE BANDS OF BLACK ARE ACTUALLY BANDS OF SOOT, THE RESULT OF BREATHING AIR IN SOUTHERN CALIFORNIA.

—“HAZARD IN THE HAZE,” THE PRESS-ENTERPRISE, JULY 1996

Worldwide air pollution disasters in the Meuse Valley, Belgium, in 1930, Donora, Pa., in 1948 and London in 1952 shocked scientists and the public into the realization that smog could kill.

During the London smog episode, health officials first noticed an unusually large number of sick and dying farm animals, which led them to check on hospital admissions and human deaths. They attributed 4,000 excess deaths, primarily from pneumonia, bronchitis, tuberculosis and heart failure, to the five-day smog siege.

In 1956, the Los Angeles County Medical Association documented a “smog complex” of symptoms caused by air pollution. Since then, hundreds of health studies have confirmed the adverse health effects of smog, including:

- Short-term decrease in breathing ability, inflammation of lung tissue, damage to respiratory cells, increased hospital admissions and increased emergency room visits due to short-term exposure to ozone, as well as possible permanent lung damage and reduced quality of life, due to lifetime exposure to ozone;



- An increased number of deaths, increased risk of cancer and increased hospital admissions, emergency room visits and sick days, due to worsening of respiratory and heart conditions, resulting from exposure to particle pollution;
- Increased chest pains and a lack of oxygen in the bloodstream of those with heart disease due to carbon monoxide; and

- Increased susceptibility to infections among children, and increased asthma attacks, due to nitrogen dioxide.

In addition, a number of studies have suggested that today's health standards don't go far enough to protect public health. Researchers and environmentalists argue that tougher standards should be adopted.

Meeting current air quality standards will generate \$4.5 billion a year in health benefits, according to the 1997 Air Quality Management Plan, the region's clean air blueprint. Achieving a tighter standard for ozone and particulate pollution would eliminate 1,000 premature deaths a year in Los Angeles County, according to EPA officials.

With each new study, the evidence of smog's harm is more concrete, and the reason to clean it up more compelling.

During the late 1970s, the City of Los Angeles and later the state required vehicle inspections to ensure that pollution control equipment was operating properly and hadn't been tampered. This controversial inspection and maintenance law evolved into today's Smog Check program, administered by the state Bureau of Automotive Repair. Although the program has achieved some success, environmentalists and the federal government have criticized it for not being effective enough, and controversy still surrounds the debate over how to improve it.

CLEANING UP FUELS

In the 1960s, regulators took the first step in cleaning up motor vehicle fuels by reducing the amount of highly photochemically reactive olefins in gasoline.

Starting in 1970, the federal government also phased out the use of lead in gasoline, a toxic pollutant that in high levels can cause behavioral problems, learning disabilities and even brain damage in children. Due to the phaseout, lead levels in the Southland have not exceeded state or federal health standards since 1982.

During the 1970s and 1980s, California environmental agencies advocated the use of methanol and natural gas instead of gasoline, which could cut a vehicle's smog-forming emissions in half. "Flex-fuel" vehicles could burn any combination of gasoline and methanol, so drivers never had to worry about availability of fuel.

Although methanol never became a dominant alternate fuel—in part because its price has remained somewhat higher than gasoline—the threat of an alternative fuel mandate motivated oil companies to significantly clean up gasoline.

"The oil industry for the first time felt threatened," Boyd said.

In the 1980s, ARCO introduced a gasoline with fewer smog-forming and toxic ingredients. The California Air Resources Board and the U.S. Environmental Protection Agency have since required oil companies to develop and sell even cleaner gasoline.





AN ATMOSPHERIC INVERSION LAYER TRAPPED SMOG CLOSE TO THE GROUND IN THIS 1956 PHOTO OF DOWNTOWN LOS ANGELES. INVERSIONS FORM FREQUENTLY IN THE REGION, WHENEVER A WARMER LAYER OF AIR FROM THE DESERT FLOWS OVER A COOLER LAYER OF AIR FROM THE OCEAN.



CATALYTIC CONVERTERS, SMOG CHECKS AND UNLEADED GASOLINE IMPROVED AIR QUALITY FROM WHAT MANY CALIFORNIA NATIVES REMEMBERED IN THE 1950S. BUT MUCH MORE NEEDS TO BE DONE.

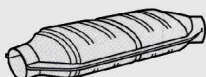
COPY OF DR. PETER VEGER'S CERTIFICATE ON THE DEATH OF
NATHAN GORDON, 73, LISTED "LOS ANGELES SMOG" AS A CONTRIBUTING FACTOR.
CORONER'S OFFICE TOOK ISSUE WITH THE LISTING.

STATE FILE NUMBER		CERTIFICATE OF DEATH				LOCAL REGISTRATION DISTRICT AND CERTIFICATE NUMBER	
STATE OF CALIFORNIA—DEPARTMENT OF PUBLIC HEALTH		STATE OF CALIFORNIA—DEPARTMENT OF PUBLIC HEALTH				STATE OF CALIFORNIA—DEPARTMENT OF PUBLIC HEALTH	
DECEDENT PERSONAL DATA	1a. NAME OF DECEASED—FIRST NAME	1b. MIDDLE NAME	1c. LAST NAME		2a. DATE OF DEATH—MONTH, DAY, YEAR		2b. HOUR
	NATHAN	LOUIS	GORDON		NOVEMBER 6, 1958		5:00 A.M.
	3. SEX	4. COLOR OR RACE	5. BIRTHPLACE	6. DATE OF BIRTH	7. AGE—LAST BIRTHDAY	8. IF UNDER 1 YEAR	
	MALE	CAUC.	RUSSIA	AUGUST 5, 1885	73 YEARS		
PLACE OF DEATH	8. NAME AND BIRTHPLACE OF FATHER		9. MAIDEN NAME AND BIRTHPLACE OF MOTHER		10. CITIZEN OF WHAT COUNTRY		11. SOCIAL SECURITY NUMBER
	UNKNOWN GORDON - RUSSIA		UNKNOWN - RUSSIA		U.S.A.		563-22-5562
	12. LAST OCCUPATION	13. NUMBER OF YEARS IN THIS OCCUPATION	14. NAME OF LAST EMPLOYING COMPANY OR FIRM		15. KIND OF INDUSTRY OR BUSINESS		
	SALES CLERK	3	WESTLAKE OUTLET STORE		RETAIL GENERAL MERCHANDISE		
LAST USUAL RESIDENCE	16. PLACE OF DEATH—NAME OF HOSPITAL		17. STREET ADDRESS		18a. NAME OF PRESENT SPOUSE		18b. PRESENT OR LAST OCCUPATION OF SPOUSE
	(NONE)		193 SOUTH ALVERADO APT. 8		RUBY M. GORDON		HOUSEWIFE
	19c. CITY OR TOWN		19d. COUNTY		19e. LENGTH OF STAY IN CALIFORNIA		19f. LENGTH OF STAY IN CALIFORNIA
	LOS ANGELES		LOS ANGELES		35 YEARS		35 YEARS
PHYSICIAN'S OR CORONER'S CERTIFICATION	20a. LAST USUAL RESIDENCE—STREET ADDRESS		20b. IF INSIDE CITY CORPORATE LIMITS		20c. IF OUTSIDE CITY CORPORATE LIMITS		21a. NAME OF INFORMANT
	193 SOUTH ALVARADO APT. #8		<input checked="" type="checkbox"/> CHECK HERE		<input type="checkbox"/> NOT ON A MAP		3123 Beverly Blvd
	20c. CITY OR TOWN		20d. COUNTY		20e. STATE		21b. ADDRESS OF INFORMANT
	LOS ANGELES		LOS ANGELES		CALIFORNIA		
FUNERAL DIRECTOR AND LOCAL REGISTRAR	22a. PHYSICIAN—I HEREBY CERTIFY THAT DEATH OCCURRED AT THE HOUR, DATE AND PLACE STATED ABOVE FROM THE CAUSES STATED BELOW AND THAT I ATTENDED THE DECEASED FROM		22b. CORONER—I HEREBY CERTIFY THAT DEATH OCCURRED AT THE HOUR, DATE AND PLACE STATED ABOVE FROM THE CAUSES STATED BELOW AND THAT I HAVE HELD		22c. PHYSICIAN OR CORONER—SIGNATURE		22d. DATE SIGNED
	TO: 11/6/58		AND THAT I LAST SAW THE DECEASED ALIVE ON: 11/7/58		Peter E. Veger M.D.		11/6/1958
	23. NAME OF FUNERAL HOME		24. DATE		25. NAME OF CEMETERY OR CREMATORY		26. EMBALMER—SIGNATURE
	444 SOUTH VERBONA AVENUE		NOV. 10, 1958		INGLEWOOD PARK CEMETERY		Sam Crowinger
CAUSE OF DEATH	27. NAME OF FUNERAL HOME		28. DATE ACCEPTED FOR REGISTRATION		29. LOCAL REGISTRAR—SIGNATURE		
	UTTER MC KINLEY WILSHIRE						
	30. CAUSE OF DEATH		31. ENTER ONLY ONE CAUSE PER LINE FOR (A), (B), AND (C)		32. APPROXIMATE INTERVAL BETWEEN ONSET AND DEATH		
	PART I. DEATH WAS CAUSED BY IMMEDIATE CAUSE (A)		Myocardial Infarction		1 hour		
CONDITIONS OF A.D.V. WHICH HAVE DONE TO THE A.D.V. (B) (C) (A) (B) (C) (A) (B) (C) (A) (B) (C)		Arteriosclerotic Heart Disease		5 years			
PART II. OTHER SIGNIFICANT CONDITIONS CONTRIBUTING TO DEATH BUT NOT RELATED TO THE TERMINAL DISEASE CONDITION GIVEN IN PART I (A)		Los Angeles smog					
MEDICAL AND HEALTH DATA	33. OPERATION—CHECK ONE		34. DATE OF OPERATION		35. ANATOMY—CHECK ONE		
	<input checked="" type="checkbox"/> performed				<input checked="" type="checkbox"/> performed		
	36. SPECIFY ACCIDENT, SUICIDE OR HOMICIDE		37. SPECIFY INJURY OCCURRED		38. SPECIFY INJURY OCCURRED		
INJURY INFORMATION	39. TIME OF INJURY		40. PLACE OF INJURY		41. CITY, TOWN, OR LOCATION		
	42. INJURY OCCURRED		43. PLACE OF INJURY		44. CITY, TOWN, OR LOCATION		

21

1975

Catalytic converters required starting with 1975 model cars.



1977

South Coast AQMD formed through merger of Los Angeles, Orange, Riverside and San Bernardino APCDs.



1978



Gas stations required to install vapor recovery "boots" on gas nozzles.

TARGETING THE TOTAL PACKAGE: CLEAN FUELS AND VEHICLES

In 1990, CARB adopted a landmark regulation targeting both vehicles and the fuels used in them. The agency launched its Low Emission/Zero Emission Vehicle program, requiring auto manufacturers to develop incrementally cleaner cars, culminating with the mandate for an electric, zero-emission vehicle by 1998. CARB officials subsequently delayed the mandate until 2003 after oil and auto manufacturers argued that introducing electric vehicles too soon, before the technology was perfected, could alienate consumers.

FORMATION OF THE SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

In the early 1970s, residents and air quality officials in San Bernardino and Riverside counties became discontent with the air pollution control efforts of their neighbors to the west in Los Angeles and Orange counties.

Smog respects no political boundaries. Then, as today, most air pollution originated from vehicles and businesses in Los Angeles and Orange counties. The region's westerly sea breezes blow most of that pollution into San Bernardino and Riverside counties each afternoon, leaving residents of the inland valleys to suffer the brunt of smog's effects. Although most studies indicated that smog drifted inland from the west, Los Angeles county officials maintained they had no responsibility to clean up pollution in San Bernardino and Riverside counties, Camarena said.

The regional conflict spurred the Los Angeles County League of Women Voters, led by Gladys Meade, to call for a regional air pollution control agency that encompassed all four counties in the Los Angeles basin. It took more than five years of political battles to make the idea a reality.

In 1975, air quality officials in the four counties formed a short-lived, voluntary regional agency called the Southern California Air Pollution Control District. The agency's fatal flaw was that any county could withdraw at any time, sabotaging a regional control effort.

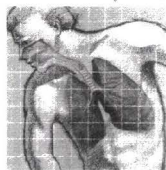
The Legislature twice passed bills to create a mandatory regional agency, and former Gov. Ronald Reagan vetoed them both. Finally, former Gov. Jerry Brown, making good on a campaign promise, signed Assembly Bill 250 on July 2, 1976, creating the South Coast Air Quality Management District. The law and the AQMD became effective on Jan. 1, 1977.

After developing a consistent set of regulations for the four-county area, AQMD adopted several significant emission-reduction measures, including rules to control man-made dust and reduce nitrogen oxides from power plants by 90%.

22

1979

EPA changes ozone standard from .08 ppm to .12 ppm, averaged over one hour.



1984

California's Smog Check program takes effect.



1987



- AQMD establishes ridesharing requirements for region's employers.
- EPA sets standard for fine particulate pollution.



AN APPEAL FOR CLEAN AIR: LIEUTENANT GOVERNOR ED REINECKE, RIGHT, AND MEMBERS OF THE LEGISLATURE HOLD PETITION BEARING MORE THAN 140,000 SIGNATURES OF PERSONS FROM SAN BERNARDINO AND RIVERSIDE COUNTIES ASKING LAWMAKERS TO GIVE PRIORITY TO ABATEMENT OF AIR POLLUTION. —JANUARY 8, 1970

ENVISIONING THE END OF SMOG

In 1986, James M. Lents, former director of clean air efforts for the State of Colorado, took the helm at AQMD.

In spite of progress in cleaning the air, businesses and even air quality regulators at the time generally believed it was impossible to achieve air quality standards in Los Angeles. The problem was too severe, the cost of cleanup prohibitive and the technology needed was nowhere in sight, they said.

Lents proposed a bold and revolutionary goal: to develop a strategy that would actually clean up the nation's worst air pollution. Even some of his own staff were skeptical.

Lents directed the development of the agency's first Air Quality Management Plan to lay out a step-by-step blueprint identifying the specific control measures needed to attain clean air standards by 2007. AQMD's Governing Board adopted it in 1989, creating headlines across the nation and in Europe. Achieving clean air would take years of work and major technological breakthroughs, but it was no longer a vague pipe dream.

"One of the unique things the agency has done is create the vision that we can have clean air," Lents said. "The concept of, 'It's impossible to meet current standards' has gone away."

The plan was the first to call for a number of advanced technologies, including zero-emission electric vehicles, and to specify that clean air could not be achieved in the Southland without them.

AQMD's clean air plan put pressure on other agencies to adopt regulations to require development of the new technology needed to achieve clean air standards, Lents said.

One example of regulation fostered by AQMD's plan was CARB's landmark Low-Emission/Zero-Emission Vehicle mandate, which has achieved the development and commercialization of alternate-fueled and electric vehicles.

TOXIC AIR POLLUTANTS

Until the 1980s, conventional wisdom and federal law directed air quality officials to focus primarily on controlling six pollutants: ozone, suspended particles, carbon monoxide, nitrogen dioxide, sulfur dioxide and lead. In 1987, the state Legislature required major emitters of toxic pollutants to assess and make public the health risk of their emissions. The program has been judged a success since dozens of companies have voluntarily reduced their toxic emissions below the threshold to avoid the public relations embarrassment of conducting a public meeting.

24

1988

- California Clean Air Act adopted.
- Last Stage 2 episode recorded.



1989



AQMD adopts first Air Quality Management Plan to show attainment of clean air standards.

1990



- CARB adopts electric vehicle mandate.
- Federal Clean Air Act Amendments require new programs for smog, toxics and protection of the Earth's ozone layer.
- AQMD requires cleaner charcoal lighter fluid.

BY 1999, AQMD OFFICIALS PREDICT AN END TO STAGE 1 EPISODES, AND THE MORE FREQUENT OCCURRENCE OF PICTURE-POSTCARD DAYS LIKE THIS ONE IN JANUARY 1997.



25

AQMD also adopted measures in the late 1980s to control specific toxic pollutants, such as hexavalent chromium and asbestos, as well as chlorofluorocarbons known to destroy the Earth's stratospheric ozone layer.

BEYOND THE SMOKESTACK AND TAILPIPE

Seeking new areas for pollution reductions—and cheaper ways to accomplish it—air quality officials in the late 1980s and early 1990s moved beyond traditional factory smokestack and vehicle tailpipe controls to transportation and market incentive programs.

AQMD's Governing Board adopted a landmark rideshare program in 1987. It required employers with more than 100 employees to offer tangible incentives to employees to carpool and ride public transit to work. For eight years, the program achieved marked success, reducing 272,000 trips per day. But businesses chafed at trying to change employee behavior. They also perceived the program's cost, estimated at \$110 per employee per year, as excessive and its administration as overly burdensome.

AQMD refocused the program's emphasis in 1995 from carpooling to a broader goal of reducing vehicle emissions. An extensive menu of options was offered under the rule. In 1996, the Legislature required AQMD to phase out its mandatory program, if voluntary ridesharing shows equivalent emission reductions.

The severe economic recession of the early 1990s spotlighted the need to find the most cost-effective measures possible to reduce emissions. During that time, the San Francisco-based



"FILLING UP" ELECTRIC VEHICLES WILL BECOME ROUTINE AS MORE PUBLIC CHARGING STATIONS ARE INSTALLED ACROSS THE SOUTHLAND.

California Council for Environmental and Economic Balance met with AQMD officials and discussed the use of market incentive measures to allow greater flexibility and lower cost in air pollution control.

In response, AQMD in 1993 adopted RECLAIM, the REgional CLean Air Incentives Market. The program includes about 330 of the largest emitters of nitrogen oxides and sulfur oxides, combustion byproducts that form ozone and particulate pollution.

Rather than regulating each polluting piece of equipment and specifying the exact kind of pollution control technology required, RECLAIM imposes an overall emissions limit on each facility. The limit declines each year, so that by 2003, the facilities in sum will have reduced 79 tons of nitrogen oxide emissions and 17 tons of sulfur oxides per day. The business is free to reduce emissions any way it wishes, giving it the flexibility to choose the most cost-effective method.

If a facility reduces its emissions below its limit in a given year, it earns RECLAIM trading credits that can be sold to a facility unable or unwilling to make the changes necessary to meet its target that year. As of early 1997, more than \$30 million in RECLAIM credits had been sold, and the program's emission reduction targets were being met.

ARCO, originally opposed to RECLAIM, is now taking advantage of the program's flexibility by building a plastics plant that will both reduce their emissions and increase their profits. The plant, to be built at ARCO's Carson refinery, will recover propylene from crude oil to make polypropylene, a material used in a wide range of consumer plastics including carpeting, upholstery, clothing and twine. During the recovery process, ARCO will remove sulfur and other polluting byproducts that are now burned, thereby reducing sulfur and nitrogen oxide emissions by several hundred tons a year.

AQMD is expanding its market incentive programs to include area-wide pollution sources such as home hot water heaters. The agency also is developing a broader trading program that will further enhance the efficiency and cost-effectiveness of emissions trading.

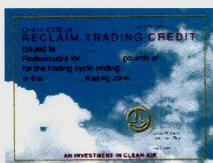
FOSTERING ADVANCED TECHNOLOGIES

Finishing the job of cleaning up Southland smog will require major advances in technology. In 1988, AQMD established its Technology Advancement Office to help private industry speed up the development of low- and zero-emission technologies. Major developments include:

- Fuel cells—First developed for use in space, fuel cells now are being used to power buildings, buses and passenger vehicles. Fuel cells produce electricity using hydrogen and air, emitting only water, heat and carbon dioxide. AQMD is supporting their development.

1993

RECLAIM (REgional CLean Air Incentives Market) emissions trading program adopted.



1994



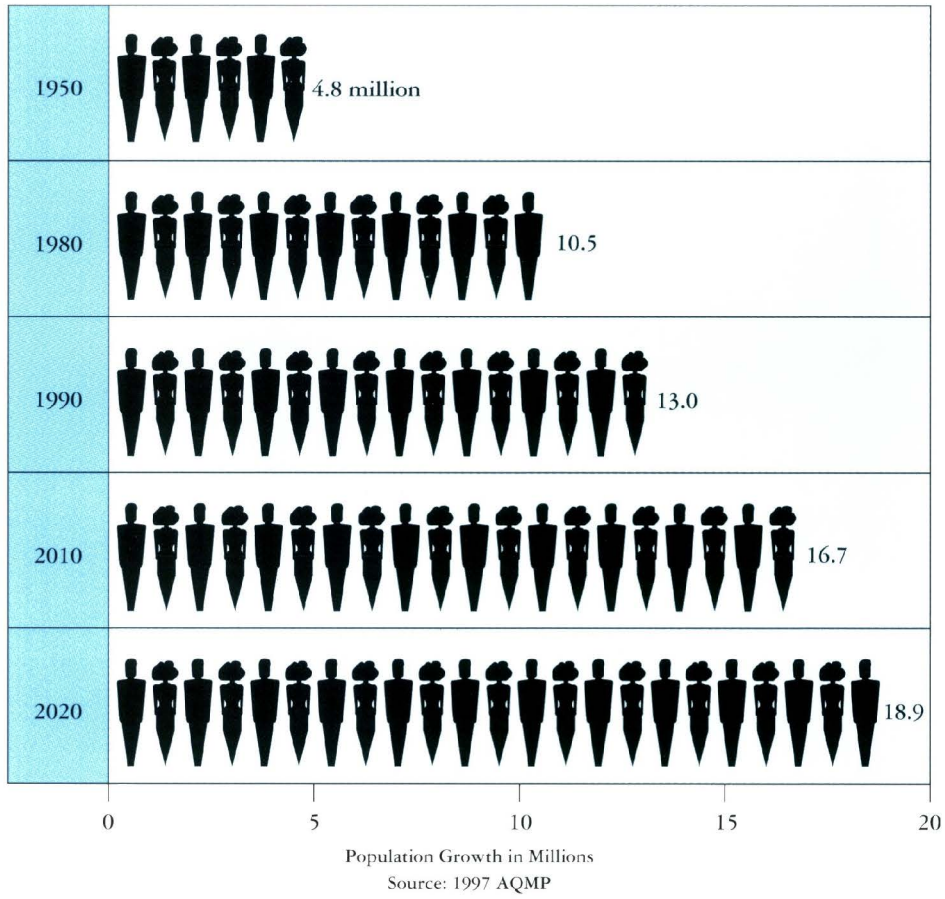
Smog Check II, including remote sensing of tailpipe emissions, tightens vehicle inspections.

1996

- General Motors produces EV-1, first modern-day production electric vehicle.
- California's reformulated gas delivered to pumps.

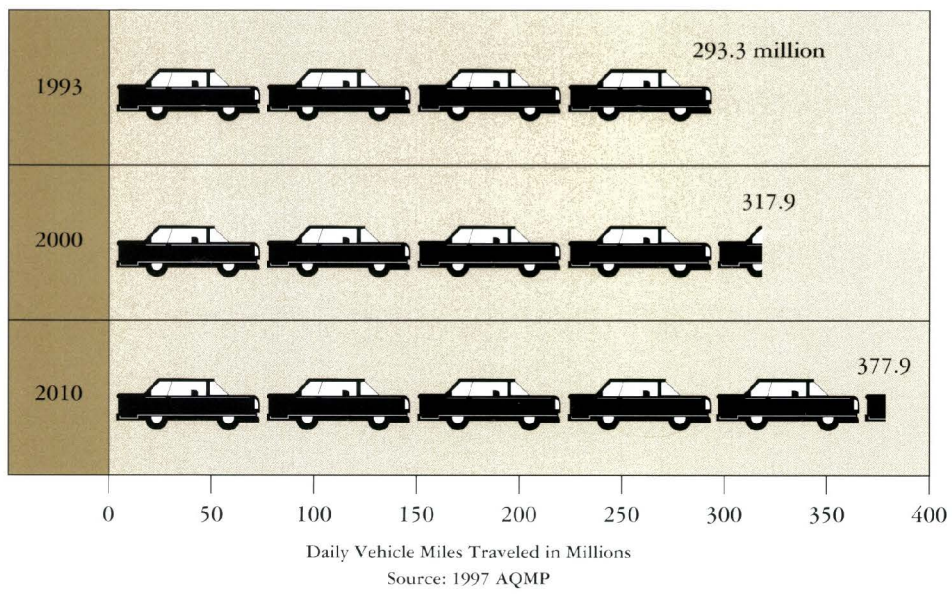


HISTORIC AND PROJECTED POPULATION GROWTH IN LOS ANGELES BASIN



28

PROJECTED GROWTH IN VEHICLE MILES TRAVELED



- Electric vehicles—AQMD has played a supporting role in the evolution of electric vehicles (EVs) by contributing to research on clean battery recycling, electric vehicle range extenders and a prototype affordable, four-passenger EV.
- Reformulation of barbecue starter products—When AQMD adopted a regulation in 1990 requiring manufacturers of barbecue products to slash the smog-forming ingredients in briquettes and starter fluid, skeptics said it would spell the end of backyard barbecuing. Instead, manufacturers found a way to reformulate their products to meet the new standard in less than 15 months.
- Zero-VOC paints and solvents—Recently adopted regulations will require manufacturers to further develop zero-polluting solvents and flat paints.
- Remote sensing—Research sponsored by AQMD has shown that the use of remote sensing to identify and repair high-emitting vehicles is a cost-effective way of reducing vehicle emissions. Remote sensing uses an infrared beam to instantaneously gauge the level of tailpipe emissions from a passing vehicle.
- Alternative fuel heavy-duty vehicles and locomotives—AQMD has helped sponsor several projects demonstrating the use of clean fuels such as compressed natural gas in heavy-duty trucks and transit buses. AQMD also is contributing to research to develop a liquid natural gas-powered locomotive. Diesel locomotives in the region are responsible for more than 31 tons per day of nitrogen oxide emissions.

GROWTH, THE NEVER-ENDING CHALLENGE

Since the dawn of the war on smog, growth has threatened to sabotage every advance in air quality. It is not enough for a car or consumer product to be cleaner tomorrow than it is today. It must be clean enough to account for the fact that more people will be using more vehicles and more products.

29

AFTER 50 YEARS, HOW CLOSE ARE WE TO THE GOAL?

Clean air is within sight. Stage 1 ozone episodes have plummeted from 121 in 1977 to just seven in 1996, and are projected to vanish entirely by 1999. If all emission reduction measures in the 1997 Air Quality Management Plan are carried out, current federal air quality standards can be met by 2010.

However, studies have shown adverse health effects at levels below current standards. EPA is considering strengthening the ozone standard and adding a new standard for particulate matter smaller than 2.5 microns. Such new standards would require additional emission reductions, particularly from manmade combustion sources.

1997

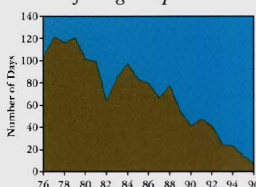
1999

2010

50th anniversary of
Southern California's
war on smog.



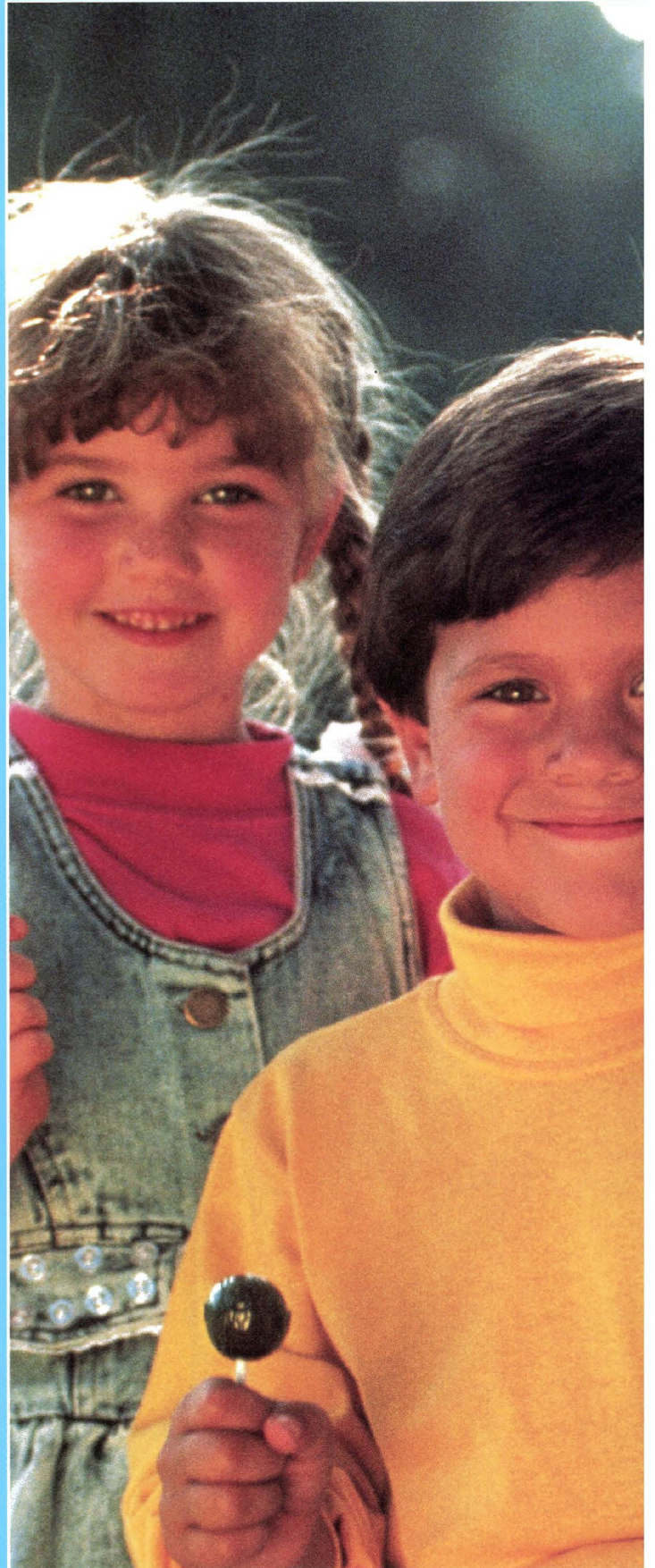
*Predicted end
of Stage 1 episodes.*

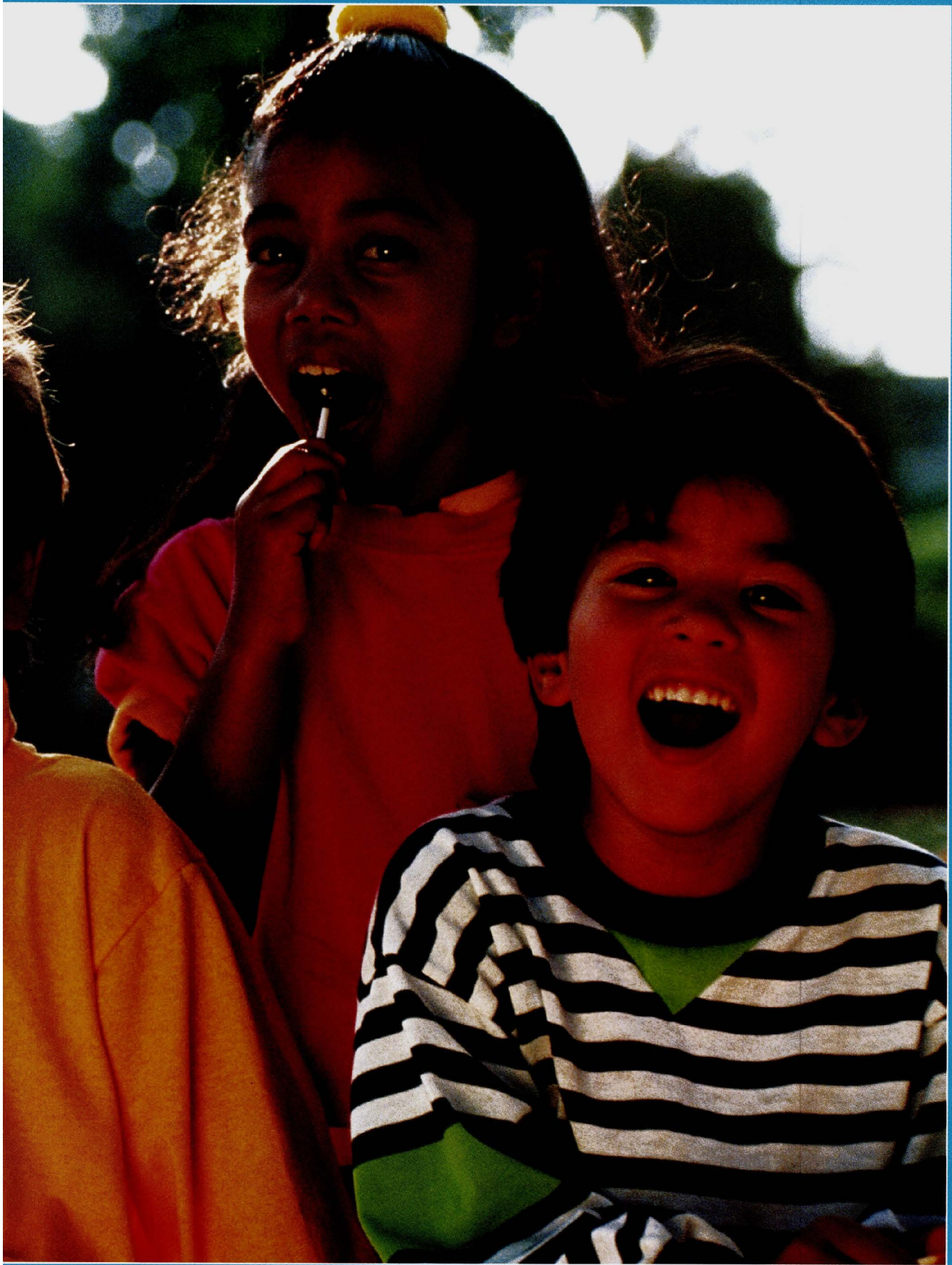


*Projected achievement of
current air quality health
standards.*

*Achieving the proposed
air quality standards in
the future will require
at least as strong a
commitment as residents
and officials made in the
1940s, when they first
decided to do something
about a terrible
menace called*

*smog.
smog.
smog.*







The Clean Air Quest: What You Can Do

AT HOME

- Consider an electric or battery-powered lawn mower or other garden equipment when you buy or replace an old one.
- Look for water-based paints labeled "zero-VOC" when painting your home. The lower the VOC (volatile organic compound) content, the better.
- Fire up your barbecue briquettes with an electric probe instead of starter fluid. Or use a barbecue fueled by natural gas or propane. Barbecue starter fluids sold in Southern California have been reformulated to emit fewer smog-forming gases.
- When re-roofing your home, consider a lighter shade of roofing material to reduce the need for air conditioning and cut electricity bills in the summer. Plant trees for shade.
- Protect yourself from high smog levels by reducing outdoor activity when unhealthy episodes are forecast. Find out about smog forecasts from a local paper, TV newscast, the Internet (<http://www.aqmd.gov>) or by calling AQMD at 1-800-CUT-SMOG.
- Urge your elected representatives in local, state and federal governments to support clean air in Southern California.



32



ON THE ROAD

- When purchasing your next car, think about buying one with high fuel efficiency and low emissions. Or even an electric vehicle!
- When filling your vehicle's gas tank, latch the nozzle on and avoid breathing toxic gasoline fumes. Never top off the gas tank to prevent spilling fuel, a significant source of air pollution.
- Keep your car tuned and support the state's Smog Check program.
- Rideshare and consolidate errands whenever possible to reduce driving.
- Consider scrapping your car if it is old, in poor repair and has high emissions. For information on private scrapping programs, call 1-800-CUT-SMOG.
- Report smoking vehicles, faulty gasoline nozzles and industrial or commercial polluters suspected of violating air quality regulations by calling 1-800-CUT-SMOG.



For more information, check out AQMD's home page on the Internet at <http://www.AQMD.gov>.



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A publication of:
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Air Quality Management District
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*Our thanks to the following
smog-fighting pioneers and others
who helped create this history:*

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William Bope
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