OIL AND GAS PRODUCTION
History in California

OIL

California oil was always a valued commodity. When the Spanish explorers landed in California in the 1500s, they found Indians gathering asphaltum (very thick oil) from natural seeps. The asphaltum was used for many purposes, including waterproofing baskets, making wooden canoes, called "tomols," fastening arrowheads to shafts, and decorating objects—usually with shells affixed to the asphaltum. The explorers, in turn, used asphaltum to seal seams in their ships. Later settlers also used the thick asphaltum in many ways, including sealing the roofs of their houses.

As pioneers continued to arrive and settle, the number of oil seeps they discovered in California naturally increased. In Northern California, people were interested in the oil seeps in Humboldt, Colusa, Santa Clara, and San Mateo Counties, and in the asphaltum seeps and bituminous residues in Mendocino, Marin, Contra Costa, Santa Clara, and Santa Cruz Counties. Oil from a Humboldt County seep was sold in 1855, four years before Colonel Drake drilled America's first oil well in Pennsylvania.[4]

A natural tar seep in Ventura County. Seeps are ephemeral, transitory features appearing and disappearing through the years on no apparent schedule. Over 500 onshore seeps are documented in the division publication *Onshore Oil and Gas Seeps in California*. Additional information is on the Internet at http://seeps.wr.usgs.gov/

In Southern California, large seeps in Ventura, Santa Barbara, Kern, and Los Angeles Counties received the most attention. Interest in oil and gas seeps was stirred in the 1850s and 1860s, in part because one of California's oldest and most-used roads passed along nearly all the seep areas on the western side of the San Joaquin Valley. As early as 1849, travelers moving along the route used the seeps, pausing to lubricate their wagon wheels with oil.

Interest in oil seeps became widespread after the 1859 discovery of oil in Pennsylvania, when the value of kerosene as an illuminant became generally known. However, prior to the Pennsylvania activity, a number of California settlers probably collected oil from seeps and distilled it into lamp oil. The first person so recorded was Andreas Pico. In 1850, Pico took oil from seeps found in Pico Canyon, near Newhall, and distilled it for use as an illuminant at the San Fernando Mission.[8]

In 1854, oil was collected from seeps and excavations at Sulphur Mountain, in Ventura County, and refined in stills for home use. Complete records of the operations are not available, but it is reported that as early as 1856, a company organized in San Francisco began working the tar pits at La Brea Ranch, near Los Angeles, distilling some oil.[2]

[4]Superior figures refer to references at the end of the essay.

Other sources state that a G. S. Gilbert was refining oil on a commercial basis as early as 1857, if not before. In 1861, Gilbert set up a larger plant near Ventura to refine asphaltum gathered from seeps on the Ojai Ranch. That plant produced about 300 to 400 gallons of refined oil each week for several years.

Shortly thereafter, oil was obtained from pits dug in seep areas throughout California. Among the most important were those at McKittrick, in Kern County, which were worked from 1864 to 1867, and seeps at Sargent Ranch, in Santa Clara County, worked in 1864 and 1865.

In the early 1860s, oil tunnels were dug in Sulphur Mountain near Santa Paula in Ventura County. Josiah Stanford, a mining engineer, dug about 30 tunnels into the mountain, slanting them upwards so oil flowed down to the entrances. Some tunnels reportedly produced up to 20 barrels of oil per day. The oil flowing steadily from the tunnels made Stanford one of the top oil producers of the 1860s and the tunnels produced more oil in California than any other production method. In the early 1990s, a few tunnels were still producing oil, but by 1997 the last one had been plugged and abandoned.

The Boardinghouse Tunnel in the Adams Canyon area of Santa Paula oil field, dug over 100 years ago, as photographed in February 1980. The tunnel is one of 26 Adams Canyon oil tunnels dug by Union Oil Company (or by companies that eventually merged to form a part of Union Oil).

Such tunnels took advantage of natural oil seepage in the area. When the photo was taken, water and a little oil still flowed from the tunnel through a pipeline buried in the slumped-in dirt and rock at the entrance. The water and oil were collected in tanks by Union Oil Company. *Photo by J. Hardoin.*

Mouth of the Boardinghouse tunnel as it was plugged and abandoned in 1997. The oil tunnels slanted slightly upward as deep as 400 feet into the sharply tilted strata of Sulphur Mountain, which rises abruptly north of the present City of Santa Paula. In the 1860s the tunnels produced more oil in California than any other production method. *Photo by P. Kinnear.*

Inside the Boardinghouse tunnel during plugging and abandonment procedures in 1997. Completed tunnels generally were about five feet high and no more than four feet wide. Miners who made the tunnels chiseled out a gutter on the tunnel floor, lining it with redwood planks. Because of the steep grade, oil and water flowed easily down the gutters, out of the tunnels, and into the holding tanks. The airpipe was installed temporarily during abandonment operations. *Photo by P. Kinnear.*

Often, distances from markets and relatively high operating costs limited seep operations to occasional short periods when circumstances made the work profitable. Seep operations became more sporadic as more oil wells were drilled.

In 1861 in Humboldt County, the first well was drilled in California for oil production.[10] The well was unsuccessful, like numerous other Humboldt County wells drilled between 1861 and 1864.

However, drilling activity soon began in earnest, and in 1865 and 1866 wells were drilled from Humboldt County southward to Ventura. H.G. Hanks[10] writes that 65 companies were drilling for oil in California in 1865.

Remnants of the activity of California's early oil pioneers still dot the landscape. Natural oil seeps abound in this region of central Ventura County.

Another California oil well, the Union Mattole Oil Company well in Humboldt County, was completed in the summer of 1865. The well was not commercial, although it produced some oil for a time. No records are available of its initial production. Reports conflict as to the exact month of completion and the amount of the first oil shipment, but Hanks[10] writes, "Thirty barrels of oil were shipped to San Francisco. 'Six, 20 gallon casks of crude oil,' by another statement, was the first shipment of oil received from the north."

Walter Stalder[10] records that the Stanford Brothers refined and sold the first shipment of oil from the Mattole well, the first oil produced and refined from a California well. Reportedly, the refined "burning oil" sold for $1.40 per gallon.

In 1866, Thomas R. Bard drilled several wells on the Rancho Ojai, near Ventura. The most successful of these was "Ojai" 6, which produced from 15 to 20 barrels of oil per day from a depth of 550 feet. This well was the best to date and would be considered the first California oil well commercially productive, except for the lack of a record of whether the well produced continually or intermittently.

Also in 1866, according to Hanks,[10] a number of stills were built to refine oil: the Charles Stott still on Santa Paula Creek in Ventura County; the Hayward and Coleman still and the Stanford Brothers' still, both in San Francisco; the Buena Vista Petroleum Company still near the present town of McKittrick; and the Polhemus still in Los Angeles.

By 1867, drilling activity had declined. Many California wells capable of producing oil were idled because over-production in Pennsylvania brought Pennsylvania oil to San Francisco at a price lower than California operators could meet. However some development continued, the most important in Pico Canyon near Newhall. Here in 1876, well "Pico" 4 was completed, producing 30 barrels of oil a day from a depth of 300 feet. The well, the first truly commercial oil well in the state, is so designated by the placement of a state historical monument. The site is California Registered Landmark 516.

The same year, the first true oil refinery in the state was built at Newhall to take care of the new production. The refinery had a daily capacity of 20 barrels. About this time in California history, the change was made from candles to kerosene lamps.

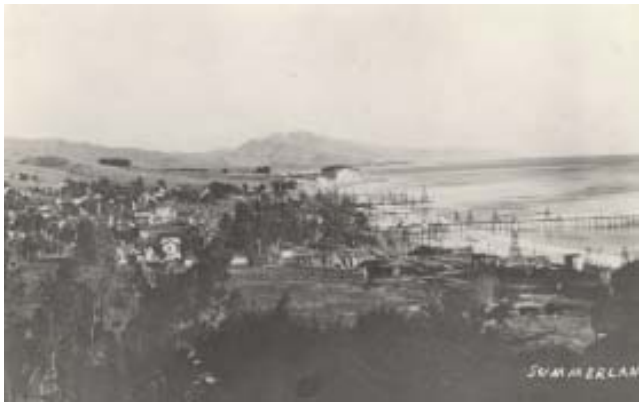
In 1878, well "Pico" 4 was deepened to 610 feet and produced up to 150 barrels of oil per day for a short period—spectacular for the time. In the same year, the Newhall refinery was dismantled and the equipment moved to a new location 1/2 mile east of Newhall near the Southern Pacific Railroad. The refinery, called the Pioneer Oil Refinery, is still standing and open to the public as California Registered Landmark 172. In 1879, the first oil pipeline in California—a 2-inch line—was laid from Pico Canyon to this new refinery, a distance of about five miles.

By 1880, although a number of wells had been drilled in Pico and Wiley Canyons near Newhall, the greatest interest focused at Moody Gulch in Santa Clara County. Moody Gulch wells were from 800 to 1,600 feet deep, and some initially produced up to 100 barrels of oil a day. However the production from these wells declined rapidly. Soon, prospects at Moody Gulch looked poor and interest returned to canyons near Newhall, where increased drilling raised the area's oil production to about 500 barrels a day.

In 1885, development began in Adams Canyon near Santa Paula, greatly increasing the production in the Ventura area and boosting the total state oil production—which was almost entirely from the Ventura County and Newhall fields—to 325,000 barrels for the year.

Most of the oil from the Ventura County and Newhall fields was shipped to the San Francisco area, the most populous region in the state. Railroad rates were high, so the companies sought cheaper ways to ship the oil. To this end, a pipeline was laid from Newhall to the waterfront at Ventura in 1886. In 1888, two wooden steamers equipped with steel tanks were constructed in San Francisco and were soon transporting oil from Ventura to San Francisco at greatly reduced costs.

In 1890, the discoveries of the Sunset Area of Midway-Sunset field in Kern County and the Coalinga field in Fresno County opened large, potentially productive areas for exploration. However, since the discovery wells were small producers, no large-scale development of these fields occurred at that time and statewide production for the year dropped to 307,000 barrels of oil.



Summerland oil field, Santa Barbara County, around 1900. Onshore drilling started here in 1886. As field development continued, operators realized the oil sands extended under the ocean. To reach the offshore sands, piers were built over the water to support drilling and production machinery. The piers, though faint, are seen in this photo.

Close-up of piers around 1900, Summerland oil field. Today the piers and derricks are gone.

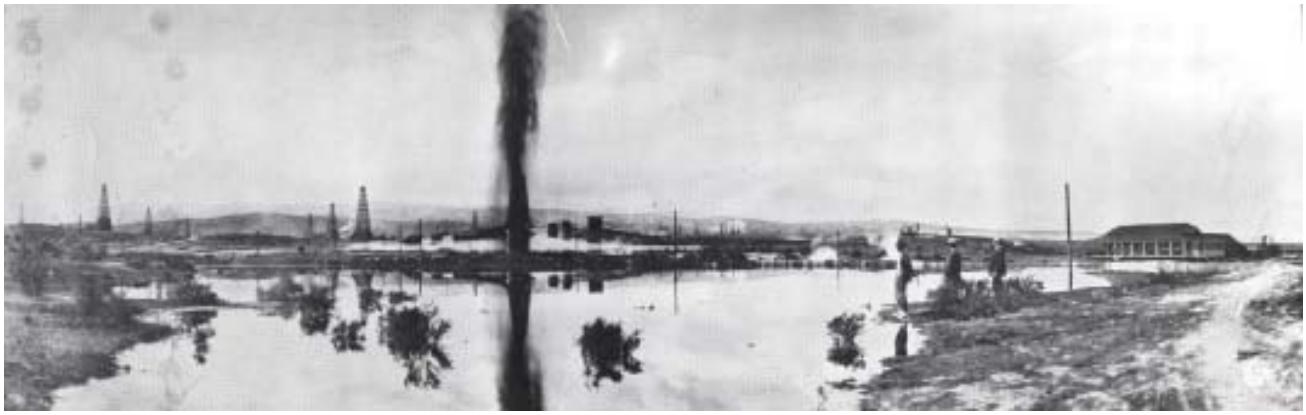
A truck hauling well casing to a Kern County well site in the early 1900s. From a Kern County Museum photo.

Then in February 1892, California saw its first oil gusher. While being drilled in Adams Canyon near Santa Paula, Union Oil Company's well No. 28 hit oil and blew out of control, flowing an estimated 1,500 barrels of oil per day. This was the first truly big well in the state. Unfortunately, no storage facilities were available to contain such amounts of oil. The oil ran down Adams Canyon into the Santa Clara River, and on to the ocean. The well produced about 40,000 barrels of oil before the flow was controlled, but no lasting damage occurred.

In 1893, Los Angeles City field was discovered and soon led the state in production. Shortly thereafter, overproduction became so acute that the price of oil dropped to 25 cents a barrel. In 1895, Los Angeles City field produced about 750,000 barrels, over half of the 1.2 million barrels produced in the state.

In 1896, the first offshore wells in the United States were drilled in the Pacific Ocean as an offshore extension to Summerland oil field in Santa Barbara County. The wells were drilled from piers built over the water.

After a few relatively quiet years, excitement returned when large gushers began to flow in the Oil City Area of Coalinga oil field. One famous gusher, Home Oil Company well No. 3, sometimes known as the "Blue Goose," was completed at a depth of 1,400 feet in 1898. The well first flowed over 1,000 barrels of oil per day.



This was the greatest gusher of them all, the famed "Lakeview Gusher" near Maricopa, Kern County, in 1910. The well, "Lakeview" 1, spewed oil and sand for 18 months before it finally quit, producing over 8 million barrels of oil, an amount equaling about 10 days of California oil production in 2001.

E. H. Musser, California State Oil and Gas Supervisor from 1954 to 1962, standing next to well "Lakeview" 1. By the early 1920s when this picture was taken, the oil had been cleaned up and the well itself redrilled and placed on production. You can see where Mr. Musser is standing on the site by using as reference the building in this photo and in the one above. *Photo courtesy of E. H. Musser.*

Panorama of oil fields, Los Angeles, California, around 1906. Old wooden derricks were a common sight in the Los Angeles area up through the 1930s. *One-half of a stereopticon view by E. W. Kelley, The Library of Congress.*

With the discoveries of McKittrick oil field in 1898, Kern River oil field in 1899, and the Midway Area of Midway-Sunset oil field in 1900, another oil boom was on. By 1900, wells in Los Angeles, Coalinga, and Kern River oil fields were the leading producers, and the annual state oil production had reached 4.3 million barrels.

Production continued to rise and by 1905 the annual state oil production reached 34 million barrels, with Kern River, the largest field, producing 15 million barrels.

New fields were discovered and new gushers occurred with surprising regularity. Finally in March 1910, well "Lakeview" 1 came in, the greatest gusher of them all. Lakeview Oil Company started drilling on January 1, 1909, in Midway-Sunset oil field, about 2 miles north of the City of Maricopa. The company had completely exhausted its finances when the well reached a depth of 1,655 feet. At that time Union Oil Company of California acquired the controlling interest and drilling continued intermittently until a depth of 2,225 feet was reached.

Suddenly around dawn on March 15, 1910, the well started flowing and soon was completely out of control. Oil production estimates for the first 24 hours varied from 15,000 to 125,000 barrels, and two months later the well's production was estimated between 68,000 to 90,000 barrels of oil each day. The well continued to flow out of control for 18 months, finally stopping on September 9, 1911, after producing an estimated 8.2 million barrels of oil. No well comparable to the Lakeview Gusher ever has been drilled in the United States to this day.

Kern Front oil field, Kern County, discovered in 1914.

Signal Hill, a part of the Long Beach oil field, was a prolific oil producer. Long Beach oil field reached its production peak of 68 million barrels just two years after its discovery in 1921.

By 1910, California oil production had reached 77.7 million barrels. The years 1910 and 1911 also saw the discovery of three very important oil fields: Elk Hills, Lost Hills, and South Belridge, all in Kern County. However, because the U. S. Government withdrew the Elk Hills land to form the Naval Petroleum Reserve No. 1, the field was not produced until 1919.

The development of existing fields and the continued search for new fields greatly increased oil production for the next 10 years. Of the many new oil fields discovered during this period, the most important were North Belridge in 1912 in Kern County; Ventura and South Mountain in 1916 in Ventura County; and Montebello in 1917 in Los Angeles County. California oil production for 1920 reached 103.4 million barrels.

With the exception of Wilmington oil field, all of the large oil fields in the Los Angeles area were discovered between 1920 and 1930. These include Huntington Beach in 1920, Long Beach and Santa Fe Springs in 1921, and Dominguez in 1923. Another important discovery during the decade was Kettleman Hills oil field in Kings County in 1928. The development of these fields caused a flood of oil to reach the market, reducing the price.

Production was low and discoveries, except for Wilmington oil field (Los Angeles County) in 1932, were few during the early Depression years of the 1930s; however, during the latter part of the decade, many large oilfield discoveries were made. However, the 223.3 million barrels of oil produced in 1940 was less than the 227.3 million barrels produced a decade earlier—because of depressed oil prices.

From 1960 to 1970, the only large oil discoveries occurred in Santa Barbara County offshore fields. Carpinteria Offshore oil field, lying in both federal waters and state tidelands, was discovered in 1966; and Dos Cuadras,Offshore oil field, lying in federal waters, was found in 1968.

A blowout in the federally-regulated Dos Cuadras field occurred in January 1969 during the drilling of the field's fifth well. This historic blowout caused a large spill and an outcry against offshore drilling. Shortly thereafter, the state placed a moratorium on offshore drilling on lands under state control until tighter and better controls could be instigated.

Between 1970 and 1980, onshore oil production never again reached the 1968, peak-year production levels. In 1974, Yowlumne oil field was discovered in Kern County and by 1979 was the 9th largest producer in the state. By 1980, although no longer on the list of the 10 largest oil producers, Yowlumne field was the third largest California producer of associated (oil zone) natural gas.

The Arab oil embargo of 1973 led the federal government to open Elk Hills oil field (Naval Petroleum Reserve No. 1) to full development and production in 1976. By 1977, Elk Hills field had jumped to second place in the amount of oil produced from a California field. By 1979 (and again in 1980), Elk Hills production had moved to first place for both oil and associated gas production.

During the 1970s, other fields moved up into the ranks of the leading California oil producers. Refined steam- injection techniques, expanded steam-injec-

tion projects, and increased oil prices together led to record amounts of heavy-oil production. (*Heavy oil* is very thick, viscous oil.) One barrel of crude oil from Kern River field selling for $2.15 in 1970, sold for $24.30 in 1980.

The 1980s proved a pivotal time. In the middle of the decade in 1985, California's oil production reached an all-time high. In 1986 oil production began a decline that continued (barring minor upswings) through 2002 and into 2003. Most of the fall was due to an early 1986 worldwide collapse of oil prices, which never rebounded. Compounding the problem, California crude oil is generally of a lower quality than many other oils, bringing a lower price because of higher transportation and refining costs. In addition, as new wells and drilling declined in the state, the percentage of oil produced by secondary recovery methods increased, reaching 62 percent in 2001. This oil often is more expensive to produce, adding to the likelihood that it will be left in the ground, thus lowering state production totals.

By the end of the 1980s, pundits still forecasted the return of substantial oil-production increases, but the 1990s never saw them. Operation Desert Shield, when United States forces defended Saudi Arabia in August 1990, brought temporary upswings in oil prices and oil and gas production. From 1995 to 2001, although oil production dropped (with one small upswing), associated gas production (gas produced with oil) rose due to increased sales of natural gas from Elk Hills oil field in Kern County. Non-associated gas production (gas produced without oil) fluctuated during this period until the last three years, when it dropped steadily.

GAS

A water well, drilled in the City of Stockton (San Joaquin County) between 1854 and 1858, reached a depth of 1,002 feet and produced natural gas with the water. The gas was burned at the Stockton courthouse for many years, even before Drake drilled his Pennsylvania oil well.

Many other water wells drilled in San Joaquin County also produced gas; however, little use was made of the natural gas until 1885 when Standard Gaslight and Fuel Company was incorporated to develop natural gas in the San Joaquin Valley. In 1886, the California Well Company was organized in Stockton for the same purpose.

In 1887, the City of Stockton granted the California Well Company the right to lay natural gas pipelines throughout the city; thus, Stockton became the first California city supplied with natural gas. However, the first utility company with an adequate supply of natural gas was the Santa Maria Gas Company, which began service to its customers in 1907. The importance of natural gas was realized during this era.

In 1910, the City of Bakersfield in Kern County was supplied with natural gas delivered through a pipeline laid from the Midway-Sunset oil field, 40 miles away. In 1913, another pipeline from the same source was laid to supply the Los Angeles area. By 1915 gas from local fields was available in the Los Angeles area, and by 1927 most of the communities in Southern California had gas service. In 1929, the San Francisco Bay region was supplied with gas through a pipeline laid from Kettleman Hills oil field.

Most of the gas originated as associated gas (gas produced with oil). However, some nonassociated gas (gas produced without oil) reached the market as early as 1910, the year after the first gas zone in the state was found in the Buena Vista Hills Area of Midway-Sunset field (now called Buena Vista field).

During the 1920s, the supply of natural gas in Southern California greatly exceeded the demand. Many large oil fields were discovered in the Los Angeles area during the decade, and the large quantities of gas that accompanied the prolific oil production from these fields caused a great gas surplus, which was blown to air and wasted. As the gas pressures in the reservoirs declined, oil production fell as well. In response, conservation laws prohibiting the waste of natural gas were enacted in 1929. The Division of Oil, Gas, and Geothermal Resources, mandated to enforce these laws, obtained injunctions to reduce gas wastage in several oil and gas fields over the years.

The first important nonassociated gas zone found outside an oil field was discovered in 1926 near Buttonwillow, in Kern County. Gas was not in great demand at that time; thus, the discovery did not stimulate new activity. The first intensive effort to find nonassociated gas accumulations occurred in the last half of the 1930s. In 1936, McDonald Island Gas field was discovered in San Joaquin County and Rio Vista Gas field (the largest in the state) in Sacramento, Solano, and Contra Costa Counties. These large fields are near the San Francisco Bay area where additional gas was sorely needed. Now enthusiasm grew to find additional gas fields.

Gas exploration increased appreciably during the 1940s and even more in the 1950s. In the 1950s, more than 30 gas fields were found, most in the Sacramento Valley. Also, Gaviota Offshore, the first gas field discovered in offshore waters, was found in Santa Barbara County.

The search for gas continued throughout the 1970s, and 44 gas fields were found from 1970 to 1980. As in the 1950s, most of the new fields were in the Sacramento Valley. Except for the decade of the 1930s, the 1960s proved the most successful for finding nonassociated gas reserves in the state.

Before the 1940s, California enjoyed a gas surplus. Since then, the situation has changed to one of inadequate supply because of the tremendous growth in population and industry. Thus, California must import gas every year. Since 1947, when gas was first brought into California through pipelines from Texas and New Mexico, more gas has been needed. In 1999, California imported 86 percent of the natural gas it used from other states and Canada.

Although fields in Texas and New Mexico remain major California suppliers, large amounts of natural gas are shipped to the state from fields in Oklahoma, Kansas, Utah, and Colorado. Since late 1961, large quantities of gas have been transported through pipelines from fields in Canada.

SELECTED REFERENCES

1. American Petroleum Institute, 1948, California's oil: New York, American Petroleum Institute.
2. Hanks, Henry G., 1884, Minerals of California, in Fourth annual report of the State Mineralogist: San Francisco, California. State Mining Bureau.
3. Heizer, Robert F., 1940, Aboriginal use of bitumen by the California Indians, *in* Geologic formations and economic development of the oil and gas fields of California: State Division of Mines, Bull. 118, p. 74.
4. Hodgson, Susan F., 1980, Onshore oil and gas seeps in California: Sacramento, California Division of Oil and Gas.
5. Huguenin, E., 1945, History of gas conservation in California, *in* Summary of operations, California oil fields, Vol. 31, No. 1: Sacramento, California Division of Oil and Gas.
6. Miller, Thelma B., 1929, History of Kern County, Vol. 1: Chicago, S.J. Clarke.
7. Orcutt, W.W., 1924, Early oil development in California, *in* American Assoc. of Petroleum Geologists, Bull. 8: Tulsa, Oklahoma, American Assoc. of Petroleum Geologists.
8. Prutzman, Paul W., 1912, Petroleum in Southern California: Sacramento, California State Mining Bureau, Bull. 63.
9. Rintoul, William, 1990, Drilling through time, 75 years with California's Division of Oil and Gas: Sacramento, California Depart. of Conservation, Division of Oil, Gas, and Geothermal Resources.
10. Stalder, Walter A., November 12, 1941, Contribution to California oil and gas history: California Oil World.
11. Walling, R.W., 1934, Report on Newhall Oil Field, *in* Summary of operations, California oil fields, Vol. 20. No. 2: Sacramento, California Division of Oil and Gas.