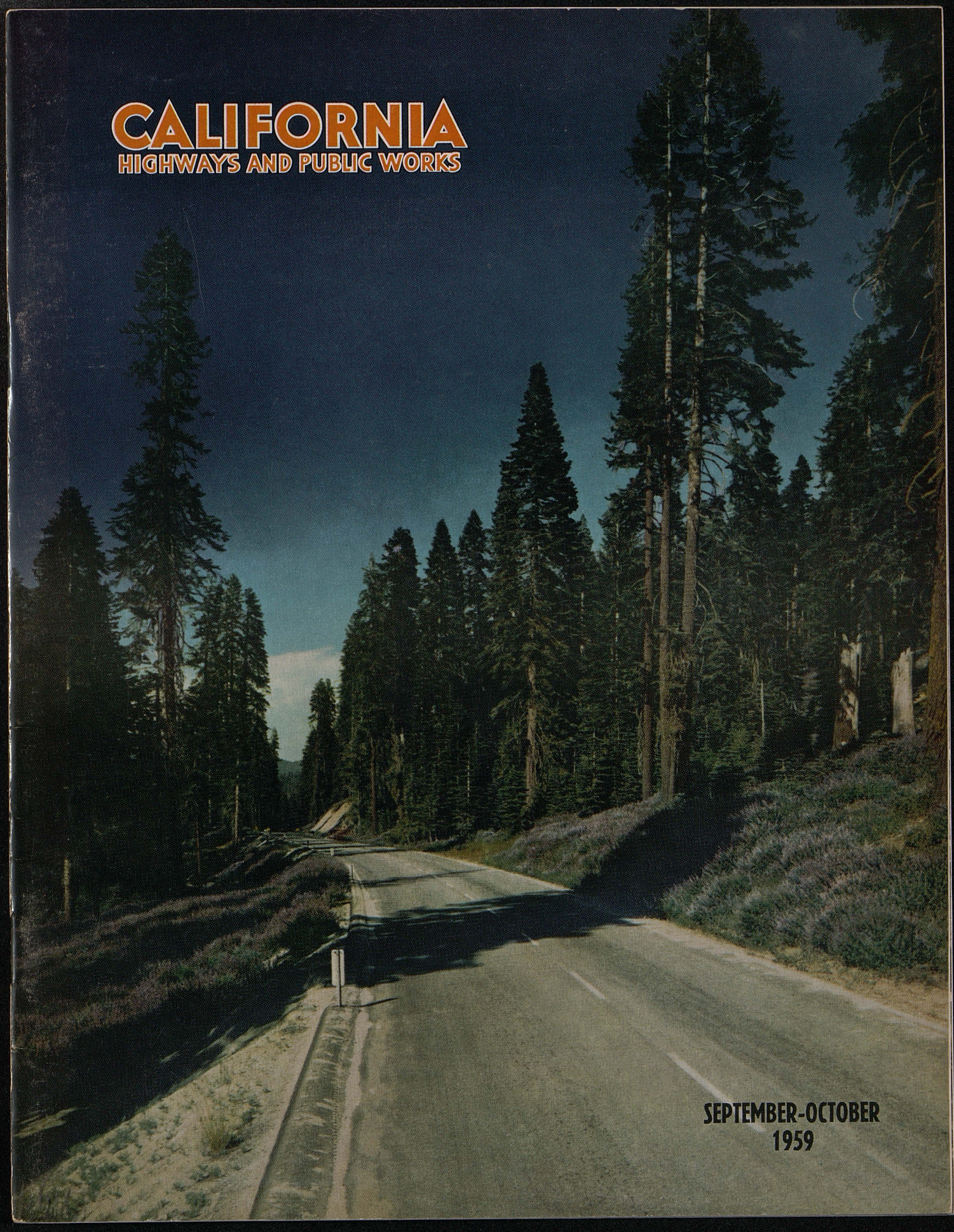
CALIFORNIA
HIGHWAYS AND PUBLIC WORKS



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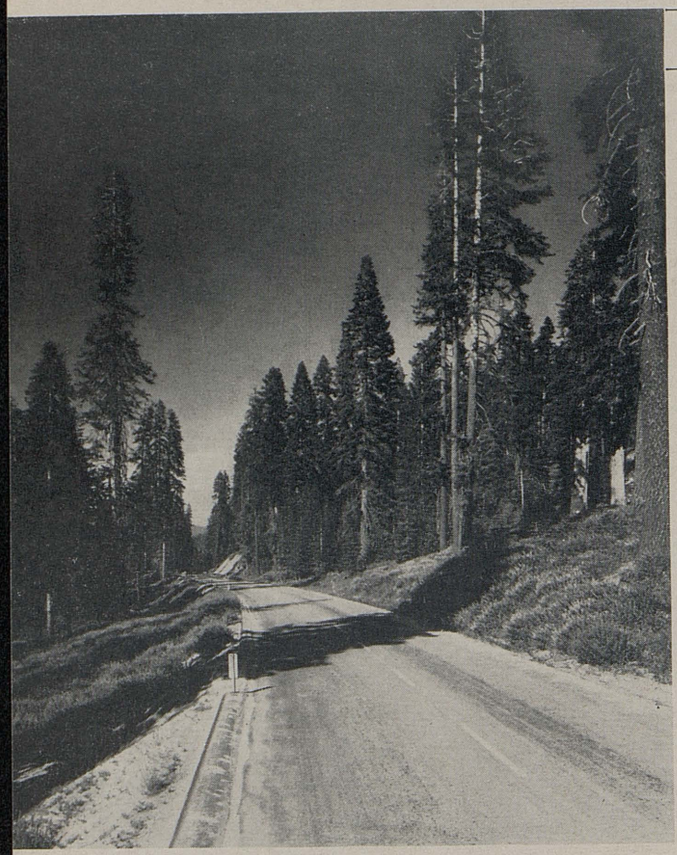
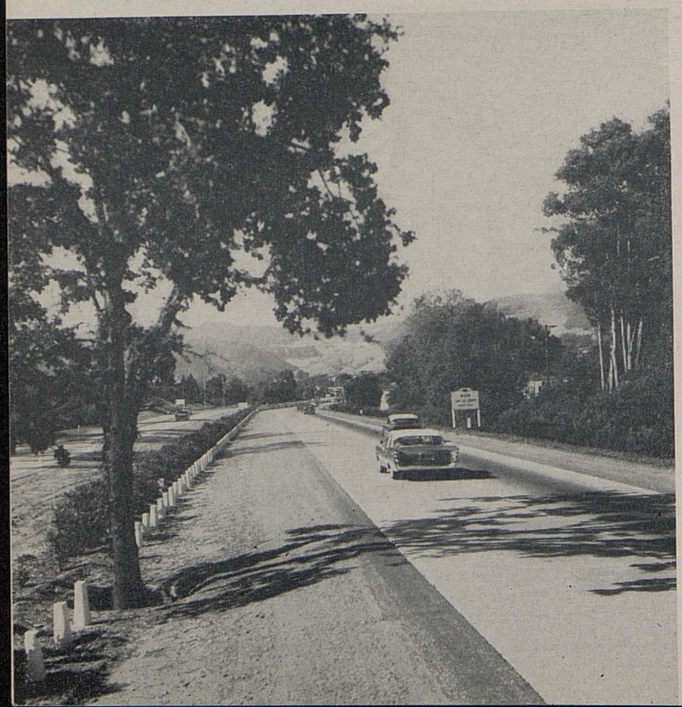


FRONT COVER

Roadside patches of purple lupine are a common sight during the early summer along this mountain section of Sign Route 168 near Huntington Lake in Fresno County.

—Photo by William R. Chaney



BACK COVER

A landscaped section of US 101 freeway near Mission San Luis Obispo. The colorful oleanders along the center strip serve as an effective screen against headlight glare at night.

—Photo by Jack Meyerpeter

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Published in the interest of highway development in California. Editors are invited to use information contained herein and to request prints of any black and white photographs.

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Master Plan

Legislature Enacts Mammoth $10½-billion Road Program

A LONG RANGE highway plan of monumental scale became state law June 19th when Governor Edmund G. Brown signed legislation establishing the 12,414-mile California Freeway-Expressway System.

The master plan, which calls for a $10½-billion freeway-expressway construction program in the next 20 years, was adopted by the 1959 Legislature in Senate Bill No. 480.

The measure was introduced by Senator Randolph Collier of Yreka, Chairman of the Joint Interim Committee on Highway Problems. It became effective September 18th and is now included in California law as Chapter 1062, Statutes of 1959.

Governor Brown said the signing of the bill was "a momentous occasion in our State's history.

"This will eventually result in linking of all cities of 5,000 or more persons, and it will carry 59 percent of the total vehicle travel when completed," the Governor said.

Director of Public Works Robert B. Bradford reported that the freeway-expressway system will be by far the biggest public works project in the State's history, and the largest freeway program ever undertaken by any state.

When plans for the system were submitted to the Federal Bureau of Public Roads in Washington, Bradford added, it was praised as "the finest job of planning a highway network in history."

Future Routes Included

As adopted by the Legislature, the freeway system includes 10,811 miles of highway which are already under state jurisdiction as part of the 14,000-mile State Highway System. The remaining 1,603 miles are streets and roads now maintained by cities and counties, or new routes which are not yet built.

The plan is geared to an estimated population in 1980 of 31,000,000 and to motor vehicle registration of 17,000,000 with yearly travel by cars and trucks of some 200 billion vehicle-miles. Californians today drive an estimated 63 billion vehicle-miles in about 7,500,000 motor vehicles.

Over a 20-year period of use, the freeway-expressway system will return user benefits amounting to nearly twice the estimated $10.5 billion cost. This means savings in 20 years to the motoring public of some $20 billion.

Discussing the system in a recent address in Los Angeles, Director Bradford paid special attention to what he called the program's "practical planning philosophy."

Although general termini of routes in the system are designated in the law, Bradford explained, "the details of development for each route are not spelled out—they are left to the executive branch to determine, in line with existing policy."

At the same time, he continued, the Legislature provided clear guidelines for the Highway Commission and the Division of Highways to follow in getting the massive highway network into operation.

Adequate Right-of-Way Acquired

The Legislature directed that the system be completed with provision for control of access "to the extent necessary to preserve the value and utility of the facilities to be constructed."

"This provides," Bradford said, "for a range of development all the way from an initially constructed eight-lane freeway to an expressway in mountains or desert with only two lanes but with protected access."

Provision is also made for continuing review of the freeway-expressway system plans. The Division of Highways is required to submit a progress report to the Legislature every four years, beginning in 1963, and to suggest possible revisions as indicated by changing growth and economic patterns.

The suggested revisions are to be considered by the Legislature through its own committees and through advisory committees of city and county officials which the Legislature may appoint.

While work is progressing on routes included in the system, other state highways will not be neglected. The law calls for concurrent improvement of these highways according to relative deficiencies and traffic conditions. An estimated $1,133,000,000 will be spent by 1980 on the 3,578 miles of state highways outside the freeway-expressway system.

Legislature Requests Study

Studies leading to the overall plan for a freeway-expressway network were requested by the 1957 Legislature in Senate Concurrent Resolution No. 26.

The resolution instructed the Department of Public Works to undertake a study which would provide the basis for an integrated statewide system of freeways and expressways. It specified that potential routes were not to be limited solely to state highways, but should also include city streets and county roads.

Two years of intensive work went into the plan, involving the most comprehensive analysis of motor vehicle traffic, population, and economic conditions ever developed in California for highway planning purposes.

In preparing the plan, the Division of Highways worked closely with a Legislature-appointed committee of city and county officials which acted in a technical advisory capacity (see "SCR 26" in Sept.-Oct. 1958 issue of *California Highways and Public Works*). The Automotive Safety Foundation of Washington, D. C., and the Institute of Transportation and Traffic Engineering of the University of California also assisted. County and city engineering staffs extended full co-operation.

. . . *Continued on page 52*

Public Works Building
Twelfth and N Streets
Sacramento

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Pacific Palisades Slide Report Made

The New York City consulting firm of Moran, Proctor, Mueser and Rutledge, employed by the Department of Public Works to study and seek a solution to the problem of landslides along the Pacific Palisades in the Santa Monica area, has completed its work and submitted a report.

The studies were authorized by the 1957 Legislature, which made an appropriation of $300,000 from the State Beach Fund available for the purpose. The Cities of Los Angeles and Santa Monica and the County of Los Angeles co-operated in the studies.

The report recommended remedial measures which would cost in excess of $6,000,000, which would include installation of drains, the construction of berms or benches in some locations and the partial filling of some canyons. The estimate of costs is preliminary and subject to detailed engineering studies, the report said.

The consulting engineers stated:

"While it is certainly possible to flatten slopes to a point where they would become absolutely stable against any eventuality, such an operation would destroy much of the property it is desired to protect. It would be simple to call for such massive regrading and fills or large-scale drainage provisions in the landslide areas. But instead, recommendations are made only for control measures that are reasonable in magnitude, have a definite likelihood of alleviating the landslide threat, and which have a fair justification by the value of properties to be protected."

The report is contained in three volumes of text, drawings, and technical data.

Director of Public Works Robert B. Bradford said the report was thorough and showed intensive study of the problems. He said the consulting engineers' report would be studied by the co-operating agencies and that the Department of Public Works would present its conclusions to the Legislature.

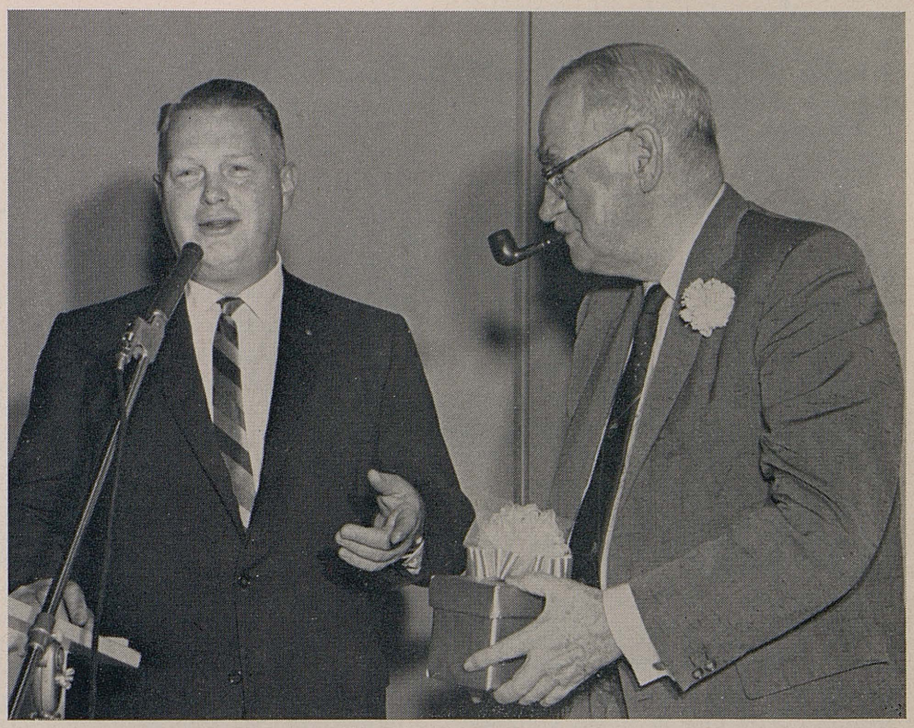
McCoy Retires; Vickrey Named

George T. McCoy has retired as California State Highway Engineer, a post he has held since 1943 and in which he has won national fame as a leader in highway planning and construction.

The appointment of J. W. Vickrey, Deputy State Highway Engineer for the past three years, to succeed McCoy has been announced by State Director of Public Works Robert B. Bradford.

McCoy's retirement climaxes a notable career in engineering. After graduating from Whitman College in Walla Walla, Washington, and completing a course in civil engineering at Columbia University, his first major professional assignment was as assistant engineer on bridge and dam construction and highway relocation in connection with the $300,000,000 Catskill Aqueduct.

In 1916 he went to work for the Washington State Highway Department and rose to be assistant state highway engineer. McCoy came to California in 1927 as assistant office engineer, and in the following year was appointed administrative assistant to State Highway Engineer C. H. Purcell. In 1933 he was advanced to the position of Assistant State Highway Engineer, becoming State Highway Engineer 10 years later.



Robert B. Bradford (dark suit), State Director of Public Works, presents a gift to George T. McCoy, retiring State Highway Engineer, at a dinner given in McCoy's honor on September 23d in Sacramento.

J. W. VICKREY

In that office he was responsible for the expenditure of some two and a half billion dollars for state highway improvement and guided the development of California's highway system into a position of recognized leadership throughout the Country.

McCoy has held numerous offices and committee posts in the American Association of State Highway Officials and served as president of the organization in 1955. In 1958 McCoy received the MacDonald Memorial Award from A.A.S.H.O. for outstanding service in highway engineering. He was the first highway official in active service to receive it.

He is a native of Milton, Oregon, born on September 12, 1889.

At McCoy's retirement dinner on September 23, Chester H. Warlow of Fresno, on behalf of the California Highway Commission of which he is a member, paid the following tribute to the retiring State Highway Engineer:

"On the Way of Life, men travel by different paths—some for personal gain —some for honors and personal aggrandizement.

"Fortunately there are others who tread a trail where their energies are devoted to the walfare of mankind, each contributing, in his own particular way, something of value to his community and state, making the world a better place, a more pleasant place, a more beautiful place in which all men may live. On such a course, carefully and faithfully pursued, the individual achieves not only these results, but as he nears the end of his labors he finds that he has gathered undreamed of honors and fame, all added to the personal satisfaction which is his in the remembrances of

. . . Continued on page 54

Trip South

Highway Commissioners Inspect Projects in Southern California

The California Highway Commission convened in Southern California in July for a three-day business meeting and tour.

The commission, the citizen group which represents all Californians in guiding the State's highway program, visited Los Angeles, Orange and San Diego Counties.

The commissioners spent a day in regular business sessions, considering route adoptions and financial matters. They held this session in the Division of Highways Building in Los Angeles.

They spent another day inspecting construction projects and familiarizing themselves with freeway route proposals and other highway planning in the three counties.

Two half days were devoted to hearings in Los Angeles and San Diego, arranged to permit the public to make presentations to the commission.

Luncheon and dinner meetings honoring the commissioners were held in both Los Angeles and San Diego.

The Chairman of the Highway Commission is Robert B. Bradford, State Director of Public Works and a public administrator for a quarter century. He is the only salaried state employee on the commission, the others all having been selected and appointed by a Governor as representative Californians who take time from their own businesses to contribute their counsel to the State Highway Program.

Other Trips Planned

The commission is making a series of trips similar to this one in order that the members may study highway matters in all parts of the State, Bradford explained.

"We want to get a first hand impression of planning and construction in the people's ideas," Bradford said.

"Our trips will supplement the more formal procedure and ensure that we personally and individually keep in touch with the people and the problems."

Members of the commission, in addition to Bradford, are:

James A. Guthrie, Vice Chairman; a member of the commission since 1943, publisher of the San Bernardino *Sun* and *Telegram*, daily newspapers.

Chester H. Warlow, also a member of the commission since 1943; a retired banker and attorney of Fresno, a highway enthusiast for nearly a half century.

Robert E. McClure, a member since 1954; Editor of the Santa Monica *Evening Outlook*, daily newspaper; novelist and writer.

Robert L. Bishop, member since January, 1956; automobile dealer and former mayor, Santa Rosa.

Arthur T. Luddy, member since January, 1959; insurance man and former member of the City Planning Commission, Sacramento.

Roger S. Woolley, member since March, 1959; attorney and leader in the San Diego Highway Development Association, San Diego.

Duties Explained

The background and work of the commission were explained by Bradford, the chairman:

"The State Legislature determined that the best way to keep California's expanding highway program close to the people and responsive to their wishes was to delegate the responsibility and authority for highway routing and budgeting to the Highway Commission.

"The Legislature establishes terminal points for state highways and delegates the determination of the exact routing to the commission. The Legislature sets up the rules governing the general apportionment of highway user tax funds and delegates the detailed budgeting to the commission.

"The Legislature created the commission as a body of unsalaried officials to give conscientious guidance to the program. The commissioners' terms were arranged to provide continuity of membership and policy through changes in state administration.

"The Legislature made the Director of Public Works chairman of the commission to provide working liaison between the policy-making commissioners and the operating Department of Public Works.

"The commission established procedures which provide that it will consider and study the views of interested citizens, the suggestions of local governmental agencies, and the recommendations of the State Highway Engineer before it approves route adoptions and financial allocations."

Merit Award Board Announces Winners

Employees of the Department of Public Works receiving certificates of commendation and cash awards since the last list published in the July-August issue of the magazine are:

Charles G. Andert, Highways, San Diego, Certificate of Commendation for recommending a method for reducing armature travel on detector relays.

Walter H. Kuebler, Highways, Sacramento, $40 for recomemnding that sign bridge shop drawings be sent direct to the Bridge Department for approval.

M. L. Lindblom, Architecture, San Jose, $15 for suggesting use of insulated copper pull wires in underground electrical conduits.

Harold Sellman, Highways, San Francisco, $20 for suggesting revising standard tracing forms of highway project plans.

Richard A. Walker, Highways, San Luis Obispo, $50 for recommending multiple vertical spacing of the IBM Slope Stake Data Sheet.

HIGHWAY CONTRACTS AWARDED

There were 255 highway contracts under way at the end of August with a total value of $360,000,000. This included 48 contracts totaling $14,000,000 which were awarded during the month.

Co-operation

State, Community "Togetherness" Held Vital to Highway Program

EXTENSIVE co-operation between the State of California and its communities is an important factor in the success of the State Highway Program.

This was the message which Governor Edmund G. Brown and Director of Public Works Robert B. Bradford gave to a luncheon meeting of eight civic organizations in Los Angeles July 22d.

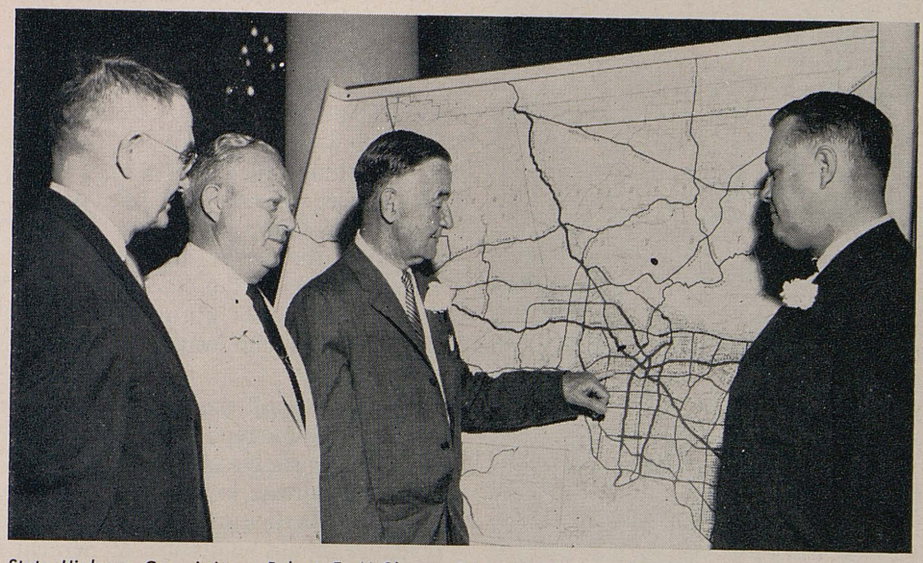
Governor Brown, in a statement read to the audience by Bradford, thanked the civic organizations for "helping us in State Government cope with our exploding population," and said:

"Pride of authorship is unimportant here. Whether I am supporting the people's program or the people are supporting my program is less noteworthy than the fact that real two-way co-operation does exist on the program. This meeting is an excellent example.

"My thanks to the important groups represented here not only for sponsoring this luncheon, but for years of grass-root support of the highway program statewide.

"You have worked with vigor in behalf of your community, too. It is vital that California keep pace with the State's metropolitan growth and provide mobility and related economic benefits to the public without sacrifice of community values.

"Keep up your crusading. Give us in State Government a push if you think we're slowing down. Speak out forcefully if we in government seem to overlook our obligations."



State Highway Commissioner Robert E. McClure points out a freeway location on the map to (left to right) E. T. Telford, Assistant State Highway Engineer, Harrison R. Baker, Chairman of a luncheon sponsored by the eight Los Angeles civic organizations honoring the commission, and Robert B. Bradford, State Director of Public Works and Commission Chairman.

Sponsors Named

The luncheon was arranged to honor the California Highway Commission, which held its July meeting in Los Angeles, and the commission chairman, Bradford. The sponsoring organizations were:

Automobile Club of Southern California, California State Chamber of Commerce, Downtown Businessmen's Association, Los Angeles Chamber of Commerce, Los Angeles Metropolitan Traffic Association, Los Angeles Traffic Advisory Board, Metropolitan Los Angeles Freeway Committee, and Metropolitan Transportation Engineering Board.

Bradford, in his address to the luncheon, summarized the background of successful freeways in the Los Angeles area with these words:

"The essence of the story is in one word—teamwork. Or in two words—co-operative planning. * * *

"The local governmental bodies—city, county and regional—were the ones who sat down with the State's highway planners and worked out the general plans. Independent organizations like yours, motivated by a desire to solve the mounting traffic problems on a sound basis, spearheaded the drive for public recognition, understanding and acceptance of the need for a well-planned freeway system. It was you who saw to it we were furnished the tools to do the job."

Extensive Planning Told

Bradford told the Los Angeles audience of the great amount of co-operative planning which went into the California freeway and expressway system (see page one of this issue of *California Highways and Public Works* for an article giving details of the system) and concluded his address with these words:

"The hallmark of the past and the future in California freeway planning has been teamwork; teamwork not only among governmental jurisdictions, but also on the part of civic groups and independent organizations.

"Wherever and whenever this teamwork has produced co-operative planning on a sound, big-picture basis, there has been genuine progress.

"The new program, looking 20 years ahead and with built-in provisions for continuing flexible and orderly long-range planning, offers us a challenge to keep building in line with the needs of our dynamic economy. I know you and your organizations join happily with us of the Highway Commission and the Division of Highways in welcoming this challenge."

John H. Skeggs

Colonel John H. Skeggs, who served more than 33 years with the Division of Highways in San Francisco, most of them in charge of District IV which embraces nine Bay area counties, died August 28th at his ranch home near Saratoga. He was 76 years old.

Colonel Skeggs retired April 1, 1952, as Assistant State Highway Engineer.

He attained his military rank during World War I. He entered the Army as a captain in the Army Corps of Engineers and saw active service in the St. Mihiel and Meuse-Argonne offensives as roads officer for the Second American Army.

He was a native of Somerville, Alabama, and came to California in 1901 after graduation from Alabama Polytechnic Institute.

Before joining the Division of Highways in 1919, he worked on railroads, on the Owens Valley-Los Angeles aqueduct and as a county surveyor in Los Angeles.

During his long career in District IV Colonel Skeggs was responsible for building, widening or repaving practically every mile of highway in the San Francisco Bay area.

Before the word "freeway" was known, Colonel Skeggs fought for and was successful in applying the freeway principle of control of access. Later under his leadership the Bayshore and Eastshore Freeways and other multilane highways were begun. He also participated in the building of the Golden Gate and San Francisco-Oakland Bay Bridge approaches.

The results of his work are evident throughout the Bay area. Opening the Lake County recreation area with the road from Calistoga north, the Russian River realignment from Cloverdale to Hopland, McDonald to the Sea (Sign Route 128) and the elimination of the Corte Madera grade were some of his projects.

His contributions to highway engineering also include the three major tunnels in the district, Broadway Low Level, Waldo and Funston.

One-Year SCR 62 Study of City-County Road Deficiencies Cited as Vitally Important

Work is under way on a one-year study by the state and local governments of California of the deficiencies on roads and streets under city and county jurisdiction.

The study is being carried on in accordance with Senate Concurrent Resolution No. 62, adopted at the 1959 session, which calls for a report by the Department of Public Works to the Legislature by August 1, 1960, analyzing the street and road deficiency reports of the cities and counties as a basis for future legislation aimed at meeting local traffic needs more rapidly.

"Such analysis," the resolution states, "shall include a report on the advisability of legislative consideration of a one cent increase in the state gasoline tax, and whether such additional tax revenues should be divided 60 percent to cities and 40 percent to the counties, together with alternative recommendations, if any."

The study was formally launched with a meeting in the Public Works Building in Sacramento on August 31st attended by state highway officials and members of a 14-man advisory committee. The advisory committee was appointed, as provided in SCR 62, by Speaker Ralph M. Brown of the Assembly and Senate President pro Tempore Hugh M. Burns.

At its opening session the committee chose Supervisor Francis Dunn, Jr., of Alameda County as its chairman and City Engineer E. A. Fairbairn of Sacramento as vice chairman and secretary. Other city officials on the committee are: Mayor Ira J. Chrisman of Visalia; City Engineer John A. Morin of Oakland; City Engineer Lyall A. Pardee of Los Angeles.

County officials on the committee are: Road Commissioners A. S. Koch of Orange County and William McIntosh of Lassen County; and Director of Public Works Victor W. Sauer of Contra Costa County.

Organization representatives on the committee are: Harry V. Cheshire, Jr., General Counsel, Automobile Club of Southern California; Kenneth Kendricks, Vice President, Standard Oil Company of California; Claude Minard, Director, California Railroad Association; Edwin S. Moore, Executive Vice President, California State Automobile Association; Wade Sherrard, Managing Director, California Trucking Association, Inc.; and C. Clarke Williams, Secretary of Statewide Highway Committee, California State Chamber of Commerce.

In a letter to officials of California cities and counties announcing the commencement of the study, State Highway Engineer G. T. McCoy said in part:

"It is reasonable to believe that this study and the findings therefrom will be the basis of legislative consideration of the city and county road and street deficiency needs. The study is therefore of vital importance to all of the cities and counties of the State of California.

"It is believed that this study can best be carried through to a successful conclusion if conducted along the lines of the excellent co-operative and co-ordinated working procedures and relationships which were developed between the city, county and state organizations during the Federal 210 and the State (SCR 26) freeway-expressway studies."

The work of carrying out the study and preparing the subsequent report has been assigned to the Highway Planning Survey Department of the Division of Highways, with assistance from the City and Co-operative and the Federal Aid Secondary Departments and from the various districts.

AUGUST TRAFFIC COUNTS UP

Traffic counts in August showed the number of passenger vehicles increased 7.9 percent over August of 1958 and freight vehicles increased 8.1 percent. The passenger vehicle count in August decreased 7.7 percent from that in July, although the average for the last five years shows August up 3.6 percent over July.

Report From District VI

By W. L. WELCH, District Engineer

THE PAST year saw the completion of 10 major construction projects in District VI.

US 99

Two of these projects were on US 99, the most important north-south route in California.

In October, 1958, work was completed in the City of Madera on a full freeway which eliminated the last remaining section of two-lane road on this heavily traveled route. This four-mile project cost $2,278,000 and involved construction of eight road separation structures, one railroad separation structure and two bridges over the Fresno River.

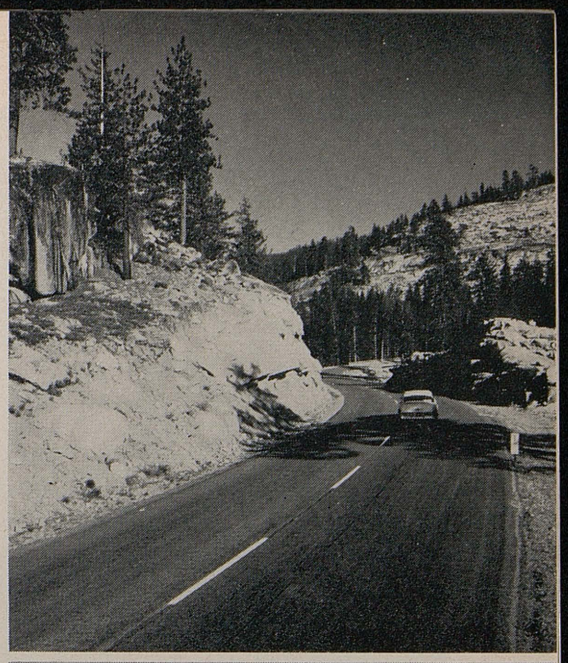
In August of this year another project in Madera County was completed to correct a structural deficiency in the northbound lanes between Berenda and Califa. This was accomplished by resurfacing with portland cement concrete pavement. This 3.9-mile project was constructed by the Madonna Construction Company of San Luis Obispo at a cost of $380,000.

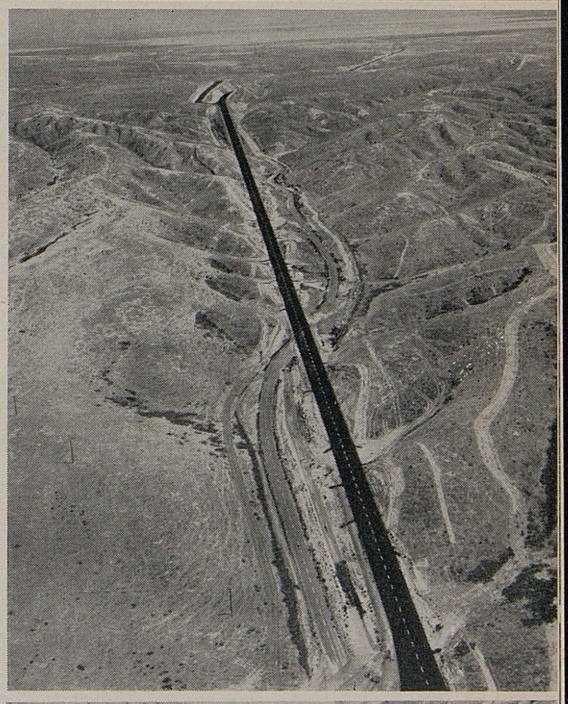
Construction on the Grapevine Canyon project just north of the Los Angeles county line has reached the halfway mark. This section of interstate highway, commonly known as the Ridge Route, is the largest highway contract ever undertaken by the district. The seven-mile $7,700,000 project involves the construction of four additional traffic lanes through Grapevine Canyon and reconstruction of portions of the existing four lanes to provide an eight-lane freeway between Fort Tejon and two miles north of Grapevine Station. This contract was awarded to Guy F. Atkinson Company on April 17, 1958, and should be completed in the summer of 1960.

In June of this year, Guy F. Atkinson Company started work on a $1,989,000 project which begins at the northern terminus of the Grapevine Canyon project and runs 12.3 miles to Sandrini Road, or 15 miles south of the City of Bakersfield. The work involves placing a 24-foot concrete blanket over the existing southbound lanes, constructing two interchanges and a weigh station for trucks. The project is expected to be completed in June of 1960 and is the first stage of ultimately converting this section to full freeeway status.

On the northerly extension of the Fresno Freeway to the Madera county line, construction is progressing on schedule and should be completed sometime in April of 1960 if the weather this winter does not delay the contractor unusually.

This $3,273,000 project is 7.7 miles in length and is being constructed by the Griffith Company of Los Angeles.





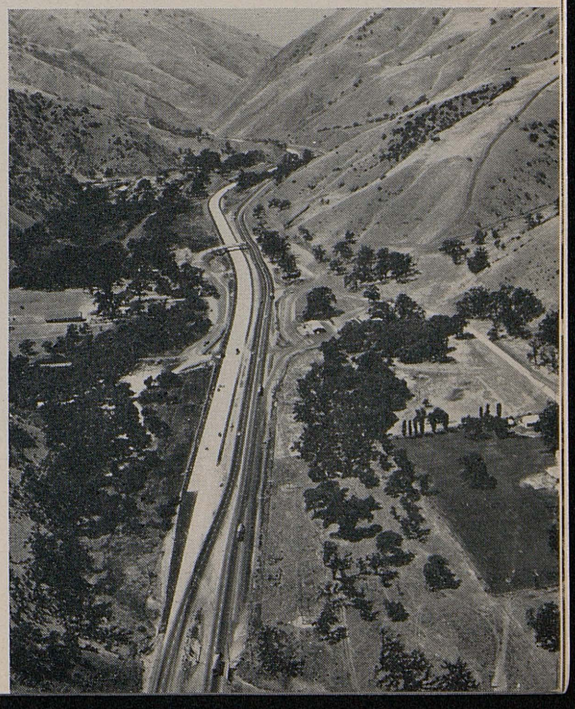
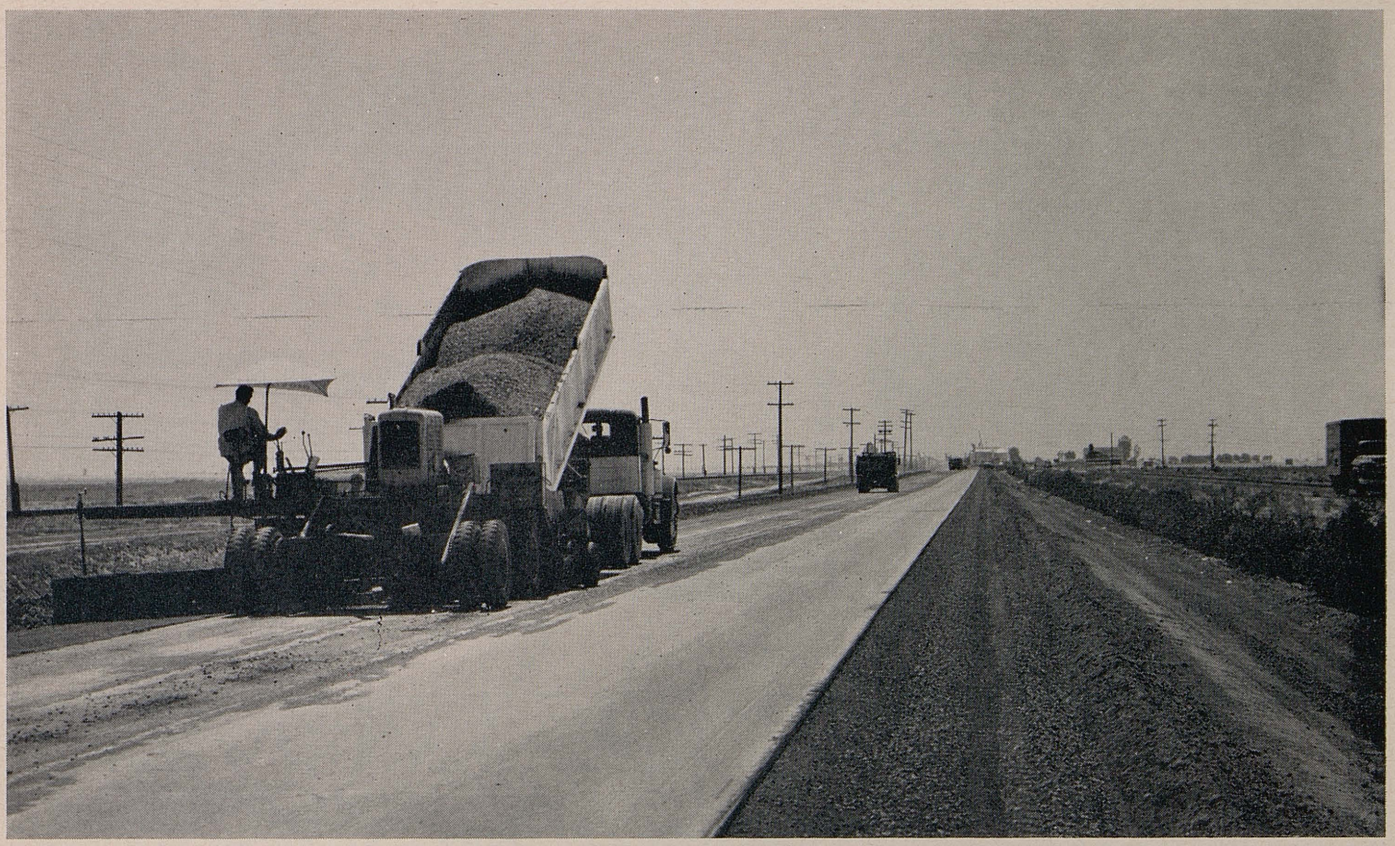


PHOTO TOP—An improved section of Sign Route 168 near Huntington Lake in Fresno County. MIDDLE—A northeast view of the Sign Route 41 project through the Kettleman Hills in Kings County. Note the old highway to the left and right of the new roadway. BOTTOM—Freeway construction progresses on Grapevine Grade on US 99 in Kern County. This aerial looking northward shows the Fort Tejon overcrossing (center).

UPPER LEFT—Construction continues on another section of the US 99 freeway north of Fresno. The two overcrossings are Dakota Avenue (front) and Ashland Avenue. UPPER RIGHT—The relocated section of Sign Route 180, east of Fresno, crosses the Friant-Kern Canal in the foreground. LOWER LEFT—Operations have started on a big cut for the realignment of US 466 east of Bakersfield. LOWER RIGHT—The bridge shown here takes the relocated section of Sign Route 190 across the Tule River in the Success Dam area near Porterville.



UPPER—Shoulder construction on the US 99 resurfacing project in Madera County. LOWER—A view southward of freeway construction in the Grapevine Grade (US 99).

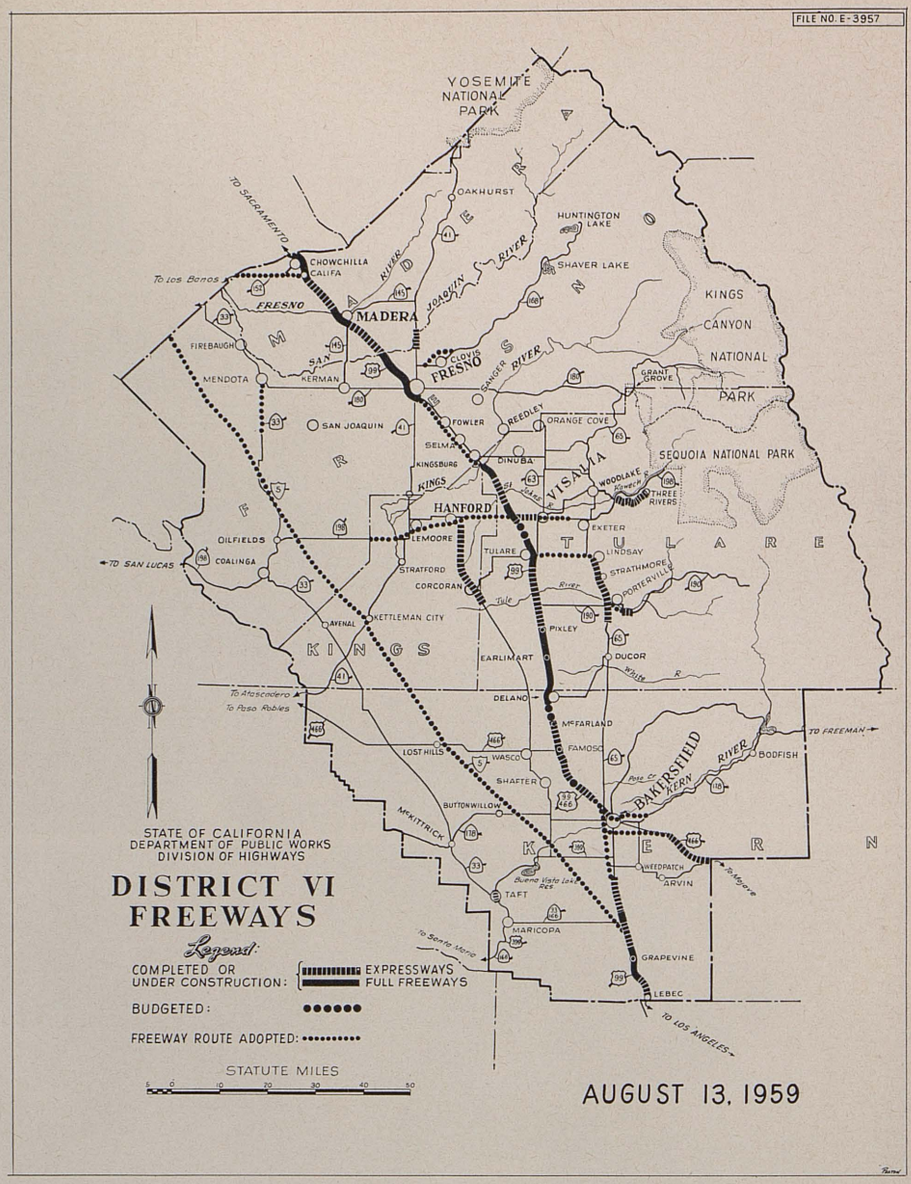
Work is nearly completed on all of the major structures on the project, which include five highway separations, one railroad separation and three bridges across the Herndon Canal, one of which carries a frontage road.

This project will eliminate the last remaining three-lane section of highway in the district and will complete the separation of opposing traffic on US 99 for its entire 190-mile length in District VI.

The gaps in the full freeway will continue to be closed. Plans are being made for the relocation of US 99 in the City of Bakersfield and rights-of-way are being acquired. The relocation, approximately 17 miles in length, is estimated to cost a total of $19,550,000. The project will relieve a serious bottleneck on US 99 and will prove of value not only to the high volumes of through traffic but also to the Bakersfield area in general.

The groundwork is also being laid for the construction of full freeway from Fresno to one mile south of the Tulare county line near the City of Kingsburg. The present facility, although four lanes divided, passes through three incorporated cities and has several traffic signals and many crossings at grade. The proposed improvement will be 21.3 miles in length and will be constructed in several units estimated to cost a total of $20,250,000.

Upon the completion of the relocations in Bakersfield and south of Fresno, the entire length of US 99 in District VI will be built either to freeway or expressway standards. However, the story does not end here. Plans are being formulated for the conversion of the expressway portions to full freeway standards, thus resulting in freeway varying from four to eight lanes completely throughout the district, from the Los Angeles to the Merced county lines.



Sign Route 41

On June 26, 1959, travelers on State Sign Route 41 bid a fond farewell to a 9.6-mile section south of Kettleman City when 6.6 miles of new construction knifing through the Kettleman Hills was completed and opened to traffic.

These hills, lying adjacent to the foothills of the Coast Range, rise above the valley floor to an elevation in excess of 1,300 feet and occupy an area about 30 miles long and five miles wide.

The section of road which was replaced was originally built by Kings County and provided two very narrow oil mix traffic lanes. There were 93 curves, with a total deflection of 2,700 degrees and with grades up to 10 percent.

By contrast, the new alignment consists of 32-foot all-paved section with grades reduced to 5.7 percent. There are but four horizontal curves with minimum radius of 3,000 feet, with long intervening tangents.

The total cost of this project was $608,400.

Sign Route 190

On November 14, 1958, traffic was diverted to 9.2 miles of relocated highway on Route 190, east of Porterville, Tulare County, between Hospital Road in Porterville and 4.5 miles southwest of Springville. Total cost of this project was $1,715,000, primarily financed by federal funds. The relocation of this route was necessitated by the construction of the Success

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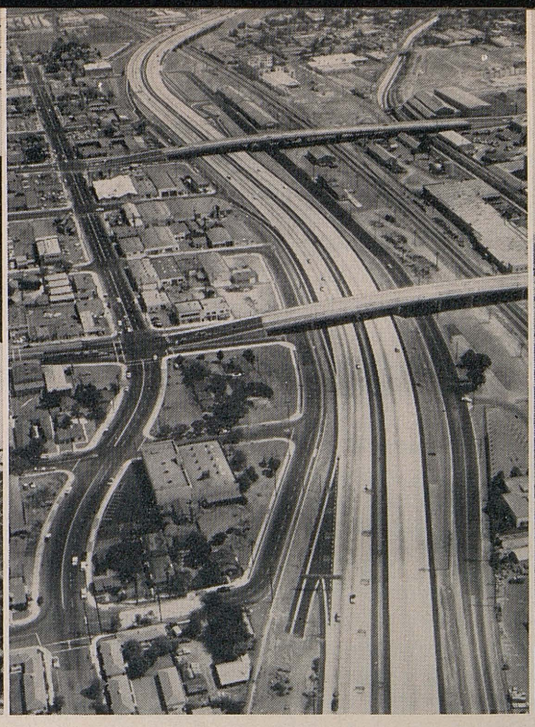


Freeway Loop

New Eight-lane Roadway Will Encircle L. A. Downtown Area

By LYMAN R. GILLIS, District Engineer

THE ANNUAL meeting of the Downtown Business Men's Association of Los Angeles is always an important event well attended by local public officials, governmental engineers and civic leaders. Upon the occasion of the thirty-fifth annual meeting of this association at the Biltmore Hotel on June 24, 1959, its president, Donald Buckingham, prefaced his address with these statements:

L. R. GILLIS

"Within the next decade, the Los Angeles central area will undergo a dramatic change. Magnificent new office buildings, a part of the $150,000,000 construction now under way in downtown Los Angeles, will provide new headquarters for business and industry. Other signs of Los Angeles' growing maturity are the increased interest in beautification and our increased cultural, entertainment and convention activities. The new Santa Monica and Golden State Freeways will complete *a freeway loop around downtown* and permit easy access to the central area from all points."

Now Buckingham knows his freeways and fully appreciates their worth. However, the importance of the Santa Monica Freeway and the Golden State Freeway that form "the Freeway Loop" is perhaps not so generally recognized by others. The purpose of the present story is to describe the progress which has been made in the developmeent of the eight-lane freeway loop around the Los Angeles area, to present a pictorial record of the present status of this development as covered by staff photographers of State Division of Highways, and to point out the impact that this freeway development will have upon the community.

While other cities and communities in Los Angeles County will profit by this freeway development, the chief beneficiary is the City of Los Angeles. The first quarter of 1959 shows an estimated population of 2,423,300 within the city limits of Los Angeles, and 5,869,300 within Los Angeles County. In the City of Los Angeles, on April 1, 1959, there were an estimated 877,-155 dwelling units spread over a land area of approximately 455 square miles. The total amount of all building construction for the year 1958 was $1,540,200,000, making Los Angeles the Nation's second construction market after New York City. During 1958, out-of-state automobiles coming into Southern California numbered 1,015,170, carrying 2,737,146 passengers. On January 1, 1959, there were 2,868,033 automobiles registered in Los Angeles County, indicating a car for every two persons, a higher ratio than any other major city in the world.

Los Angeles City has three transcontinental railway systems. It has 12

PHOTO TOP LEFT—Grading operations in progress on the Golden State Freeway in the Lincoln Heights area. MIDDLE—A view southeastward of the completed Golden State Freeway in Burbank showing Magnolia Avenue (front) and Olive Avenue overcrossings and the Southern Pacific grade separation in the background. RIGHT—Excavation of the Burbank-Western Storm Drain Channel.

certificated air carriers with some 500 daily scheduled flights, transporting over 5,000,000 passengers annually. Los Angeles County has about 900 miles of state highways including freeeways and expressways, 4,257 miles of county roads in unincorporated areas and 11,464 miles of city streets in incorporated areas. In Los Angeles County there are 285,000 registered commercial trucks; six major passenger bus lines; and 53,000 retail trade outlets doing an annual sales business of nearly 8½ billion dollars.

Los Angeles City is particularly fortunate in having a fine system of public parks under the efficient administration of its Department of Recreation and Parks. Three of these Los Angeles city parks were under careful consideration as critical controls in connection with location and design studies for the Golden State Freeway portion of the freeway loop. Where the Golden State Freeway passes through the Boyle Heights district of East Los Angeles, an encroachment of the freeway into Hollenbeck Park was unavoidable. While this park is relatively small in size, being a little over 21 acres in extent, it is attractively landscaped around the lake and provides facilities for picnicking and boating. In order to disturb the existing park facilities as little as possible, the freeway was carried over the most westerly portion of the lake on an attractively designed box girder reinforced concrete bridge with specially designed slender columns.

No Park Encroachment

Where the Golden State Freeway crosses the Pasadena Freeway and extends northwesterly, it skirts along the northeasterly boundary of Elysian Park. Motorists on the Golden State Freeway will have a good view of the attractively wooded hillsides of Elysian Park where it fronts upon Riverside Drive. This park is 603 acres in extent and provides playground facilities and tables for picnicking. It serves an area close to Los Angeles Civic Center where space for play and recreation are badly needed. The Golden State Freeway does not in any way encroach on Elysian Park.

Two miles northwesterly from Elysian Park, the Golden State Freeway passes through the easterly fringe of Griffith Park along the Los Angeles River, between Los Feliz Boulevard and Forest Lawn Drive. This park was named after Col. Griffith J. Griffith who made a gift of his 3,015-acre property to the City of Los Angeles in 1898. Since that time, additional parcels have been added to it, and the park now covers 4,254 acres. It is the largest park within a city anywhere in the United States.

In passing through the Griffith Park area, the freeway was located and designed to do as little damage as possible to park recreational facilities.

Northerly of Griffith Park, a segment of the Golden State Freeway enters the City of Glendale. Glendale's history dates back to 1784, to the first Spanish land grant in California and within 50 years of its incorporation in 1906, it had grown to far beyond the 100,000 mark in population. Assessed valuation in the City of Glendale was $199,531,780 for 1958-1959; to June 30, 1958, bank deposits reached $154,517,044; bank clearings, $877,982,891. The present estimated population of Glendale is 114,460.

While much has already been accomplished in providing a freeway system for the Greater Los Angeles Area, as reported in Assistant State Highway Engineer E. T. Telford's story about District VII freeways in the January-February, 1959, issue of *California Highways and Public Works*, additional freeways are now needed to relieve present peak hour traffic congestion. Of prime importance in this regard are the portions of the Golden State Freeway and the Santa Monica Freeway that make up the Los Angeles Freeway Loop.

Location and Design

In the location and design of sections of the Golden State Freeway and the Santa Monica Freeway that comprise the Los Angeles Freeway Loop, the usual problems were encountered. The choice of routes for freeways is a complicated business involving a great deal of time and a great many considerations. Properly located freeways will not only provide the best trafficway for motorists, but will also greatly benefit the communities through which they pass. For these reasons we carefully consider any and all possible alternate routes, so that the end result will be the best freeway location from a traffic service standpoint at the lowest possible cost.

The standards for location and design for all the freeway work included in the loop were in accordance with the latest State Division of Highways and federal interstate highways standards for urban freeways. The loop freeways were designed throughout and are being constructed as eight-lane freeways—four lanes in each direction. The only exception to this is through the interchange structure for the Golden State Freeway with the Pasadena Freeway where the interchange roadways will take off so much traffic that only six lanes of freeway are needed through the interchange for a short distance only.

The standard of sight distance is that required for a minimum design speed of 60 miles per hour. The maximum grade has been maintained at 3 percent, excepting in one instance. The one exception is where the Golden State Freeway passes through the Pasadena Avenue interchange. One of the roadways has a grade rate of 3.88 percent. Where this grade rate prevails, an additional traffic lane has been provided for trucks that may be proceeding at slow speed because of the grade. Throughout the freeway loop, all alignment is of high standard with horizontal curves of 2,000-foot radius or over, excepting in two instances. At one location within the Golden State-Pasadena Avenue interchange, there is a curve of 1,800 feet and in another instance through the Golden State-Glendale Freeway interchange, the radius of curvature is 1,500 feet.

Routing Problems Encountered

The design of the section of the Santa Monica Freeway between the Harbor Freeway and the Santa Ana Freeway presented a problem with many facets. Here the freeway location was over an area consisting of a gridiron system of city streets serving a large number of industrial installations. Interspersed were a number of railroad sidings and close to the Los

THE LOS ANGELES FREEWAY LOOP

Scale In Miles

2 1 0 2

12 AUGUST 1959

Angeles River mainline railroad tracks. Under the surface of the city streets were found dense networks of utility lines of various kinds. Subsurface investigations indicated that foundation conditions were none too good and that if the conventional freeway embankments were built to carry freeway construction over city streets that extensive ground settlement might occur which would cause great damage to the network of underground utility lines, as well as distort the street grades and cause expensive repair jobs. Since through this industrial area right-of-way costs were found to be very great, alternate economic studies of various systems of freeway location, alignment and grade were made and it was found that the most economic solution would be to carry the Santa Monica Freeway over this entire area between the Harbor Freeway and the Santa Ana Freeway on bridge structures. This is the design which was approved and upon which construction has started.

It goes without saying in freeway location and designing that interference with established institutions that represent large capital outlays should be kept to a minimum. This is illustrated by the section of the Golden State Freeway through the Boyle Heights area. On the left, a short distance from the Golden State Freeway as now being constructed, is the White Memorial Hospital. This is a medical facility and teaching institution of the College of Medical Evangelists, founded in April of 1918 and since several times enlarged. A total of 140,000 patients visit the clinic annually. Its medical staff numbers 360 physicians, 134 registered nurses and 300 nursing assistants.

Many Patients Served

Just a short distance northerly and on the right of the Golden State Freeway is the Los Angeles County General Hospital. This 56-acre medical institution, located on Marengo Avenue near Mission Road close to the Golden State Freeway now under construction, was established in 1878. More than 1,500 doctors are on the staff of General Hospital. The hospital has 3,579 beds; a total of 5,634 employees; including 900 registered nurses, and 1,800 auxiliary nurses. Admissions to the hospital since its founding, number 2,300,000; births, 231,000. The operating budget for fiscal 1959-1960 is $33,000,000.

Although in the cases of both these hospitals the Golden State Freeway was so located that there was no interference with either one, we were not so fortunate as to many other properties involving taking homes, business and industry. Details regarding this will be found in the paragraphs below under the subheading "Right-of-way Acquisition."

Right-of-Way Acquired

Right-of-way activity on the Golden State Freeway portion of "The Loop," extending from the Santa Monica Freeway north to Lankershim Boulevard in the San Fernando Valley, began with initial negotiations in December, 1954. In the intervening five years $50,231,886 was expended on 2,492 parcels. The average cost per mile along the 15-mile right-of-way line was $3,350,000, with the largest single transaction being $3,750,000. The route of this freeway traverses an area principally improved with light and medium industry and also contains commercial and old residential structures. Some of the representative types of properties acquired by the State were as follows: single and multiple family residences, commercial laundries, railroad yards, aircraft parts manufacturers, theaters, cafes, service stations, junk yards, and upholstery supply manufacturers. The average length of time necessary for moving the industries in this area to new locations was from eight to ten months from the date the consideration was paid.

Negotiations on the Santa Monica Freeway from the Harbor Freeway east to the Golden State Freeway at the East Los Angeles interchange, began in May, 1955, and extended over a four-year period. Right-of-way purchases totaled $24,830,000 and 709 parcels were acquired. The average cost per mile along the four-mile right-of-way line was $6,200,000, and the largest single transaction amounted to $400,000.

As in the case of the Golden State Freeway, the route of the Santa Monica Freeway within the limits set forth herein traverses an area of light and medium industry, commercial and old residential structures. Some of the more interesting properties acquired included casket manufacturers, mortuaries, trucking firms, jelly and jam processors, metal salvage yards, shoe manufacturers, dance halls, carpet manufacturers, bulk oil distributors and railroad switching yards.

Completed Projects

Three projects have already been completed on the Golden State Freeway section of the freeway loop. These, grouped together, extend 6½ miles from Glendale Boulevard near the south end of Griffith Park, northerly to Burbank Boulevard in the City of Burbank.

The first contract, 2.2 miles long with an allotment of $4,754,000, was awarded to Vinnell Company, Inc., and Vinnell Constructors on October 3, 1955, and was completed on September 6, 1957. This job extended from the northeast corner of Griffith Park in the City of Los Angeles near the site of the Old Rodger Young Village, long since demolished, across the Los Angeles River, through a small section of the City of Glendale to Ash Street in the City of Burbank. Under the title of "Golden State Freeway," by J. F. Smith and C. J. Woodbridge, this construction was described in *California Highways and Public Works* issue of September-October, 1957.

A second construction contract, 2.5 miles long, was completed on January 17, 1958, at a cost of $5,418,000, between Glendale Boulevard and a point south of the Los Angeles River. Contractor was likewise the Vinnell Company, Inc., and Vinnell Constructors.

The third and most recent Golden State Freeway contract to be completed is the Alameda Avenue to Burbank Boulevard, 1.3-mile link, which carried an allotment of $5,299,000. The contractor, Ukropina, Polich and Kral, concluded their work in August, 1959, though the freeeway had been partially open to traffic since early May of this year.

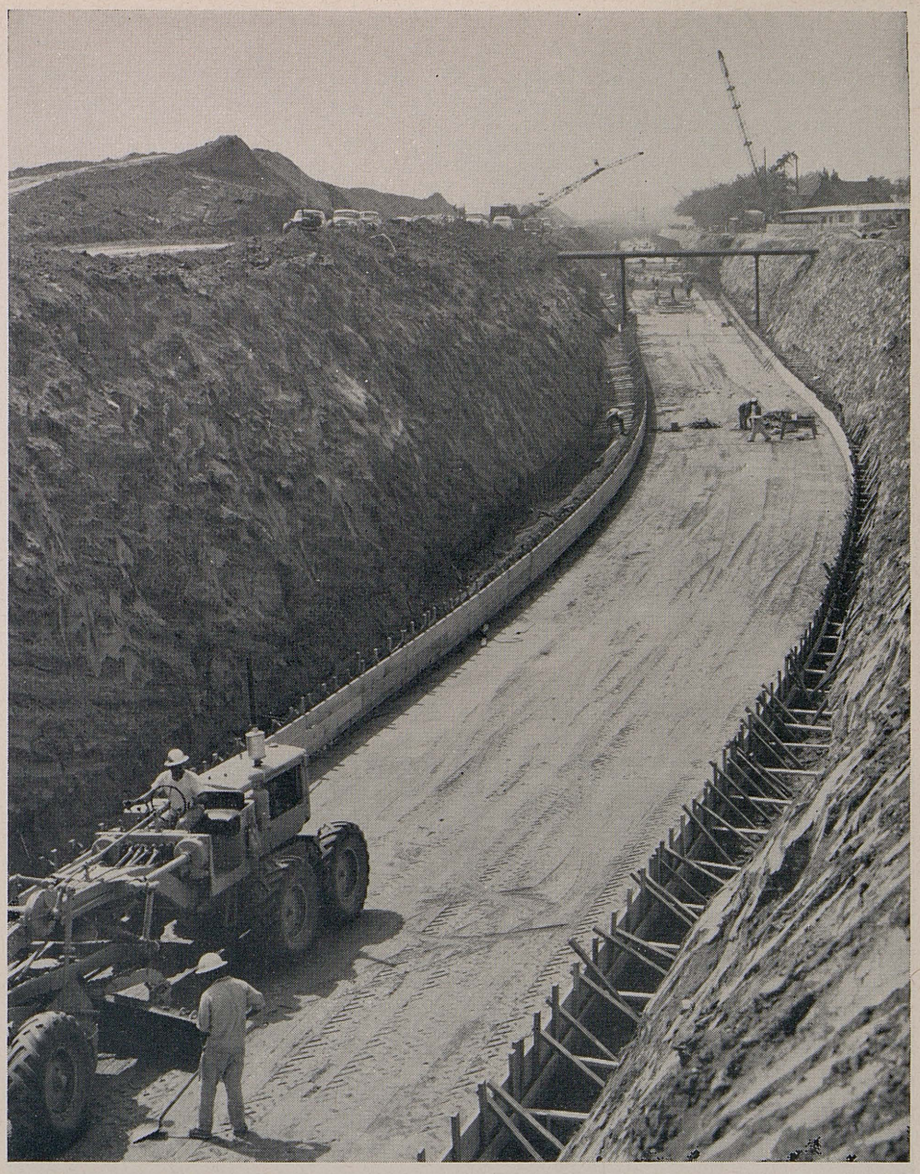
On the Santa Monica Freeway section of the loop there is only one completed contract. This was for foundations and substructures construction in the Los Angeles River near Eighth Street. The purpose of the job was to facilitate the later building of the superstructure for the bridge to carry the freeway over the Los Angeles River and main line railroad tracks along the river banks, which work is now well along toward completion. The substructure and foundation work was completed by Jones Brothers Construction Corporation at a cost of $490,000.

Projects Under Contract

Of the six major construction contracts under way along the route of the loop, representing a combined construction cost of nearly $34,000,000, the first to be let was the Santa Monica-Harbor Freeway interchange. The contract was awarded to the firm of Webb and White of Los Angeles on January 16, 1958, with a contract allotment of $1,599,700.

This Santa Monica Freeway separation structure, located between Venice and Washington Boulevards in metropolitan Los Angeles, is unique in the district, since its construction required the detouring of traffic on a heavily traveled major freeway, the Harbor, with an average daily traffic count in the neighborhood of 190,000 motor vehicles; in addition, a busy east-west city street, Venice Boulevard, intersected the site of the project and consequently had to be carried by temporary timber bridge over the Harbor Freeway detour. The latter detour necessitated construction of an eight-lane bypass to the east of the Harbor Freeway, in order to maintain uninterrupted north-south freeway traffic flow through the construction zone. Periodic traffic restriction on the Harbor Freeway during off-peak hours allowed completion of the detour and the final switch of traffic. Thus the Harbor Freeway detour, costing $380,000, besides being a substantial part of the construction involved, is probably the most expensive and heavily traveled detour in the world.

With the complicated detouring done, the freeway bridge building project could go forward and construction is now scheduled for November, 1959, completion. (For further details see Resident Engineer Lloyd A. Compton's article in the July-August, 1959, issue of *California Highways and Public Works* and for details of the scale model of this interchange built by Mr. and Mrs. John Unruh of District VII staff see March-April, 1959, issue.)



This photo shows the form work in place for the bottom slab of the Burbank-Western Storm Drain Channel.

Los Angeles River Bridge

A second construction project on the Santa Monica Freeway and another segment in "the Loop" is a bridge structure across the Santa Fe Railway, the Los Angeles River, and the Union Pacific Railroad just northerly of Olympic Boulevard in East Los Angeles. Under a $3,410,000 contract to Peter Kiewit Sons' Company, work started in May, 1958, and will be completed in October of this year.

At this location the Santa Monica Freeway is a structural steel girder bridge with concrete deck slabs supported by reinforced concrete caps, columns, footings and concrete piles. Materials used in the bridge include 5,200 tons of structural steel, 1,700 tons of reinforcing steel, and 18,600 cubic yards of portland cement concrete. (For further information see

article by Resident Engineer H. J. Scott in *California Highways and Public Works*, July-August, 1959.)

East Los Angeles Interchnage

The third item of current construction is the East Los Angeles Interchange, located on the east side of the Los Angeles River in the vicinity of Boyle Avenue, Soto Street and Eighth Street in the City of Los Angeles. Here the Santa Monica, Santa Ana, Golden State and future Pomona Freeways meet in a complex pattern of roadways and bridges which provides for free flowing movement between the various routes.

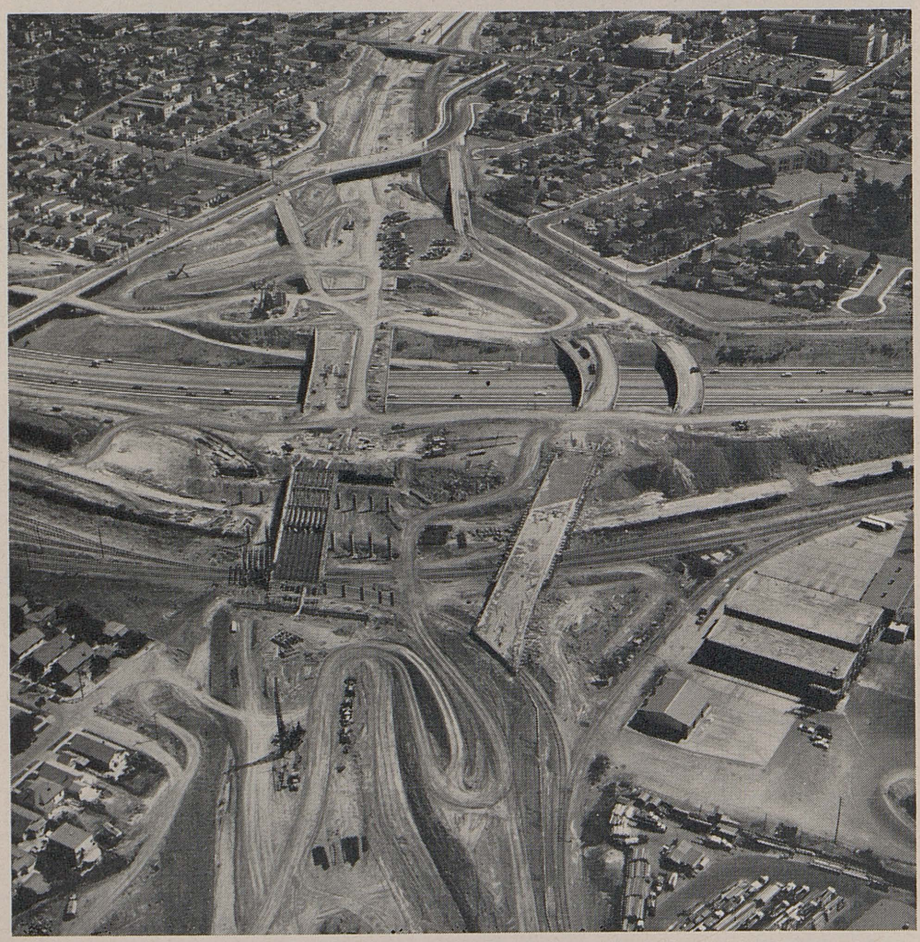
Thirty major structures are combined in this project to provide separation between the freeways and to carry traffic under or over the city streets. To construct these bridges will require 63,110 cubic yards of concrete, 13,253,000 pounds of reinforcing steel and 4,235,000 pounds of structural steel at a total cost of over $6,000,000.

Of the 30 structures, seven provide for freeway separations, 20 for ramps and street crossings, one which will span an arm of Hollenbeck Lake, one railroad underpass, and one section of freeway viaduct. Also included in the bridge portion of the contract are 17 cantilever retaining walls.

Both spread footings and piles are used for the structure foundations. Piling will consist of steel H piles, driven concrete piles and cast-in-drilled-hole piles. The majority of the structures are of box girder design with spans ranging up to 162 feet.

The largest single structure to be constructed under this contract is the Santa Monica Freeway Viaduct Spur. This section of the Santa Monica Freeway originates at the Los Angeles River Bridge and Overhead and proceeds in an easterly direction for a distance of 1,488 feet. This structure is composed of 13 box girder spans, two plate girder spans and one precast, prestressed concrete girder span.

The Golden State-Santa Ana Freeway Separation consists of two separate plate girder structures, 589 feet and 753 feet in length, supported on concrete columns ranging up to 55 feet in height. The longest steel girder is to be 146 feet. Erection of the steel girders will necessitate the closing of the Santa Ana Freeway, at which time traffic will be routed over city streets. This work is to be done between the hours of 12.30 a.m. and 5 a.m., at which time traffic is at its lowest volume.



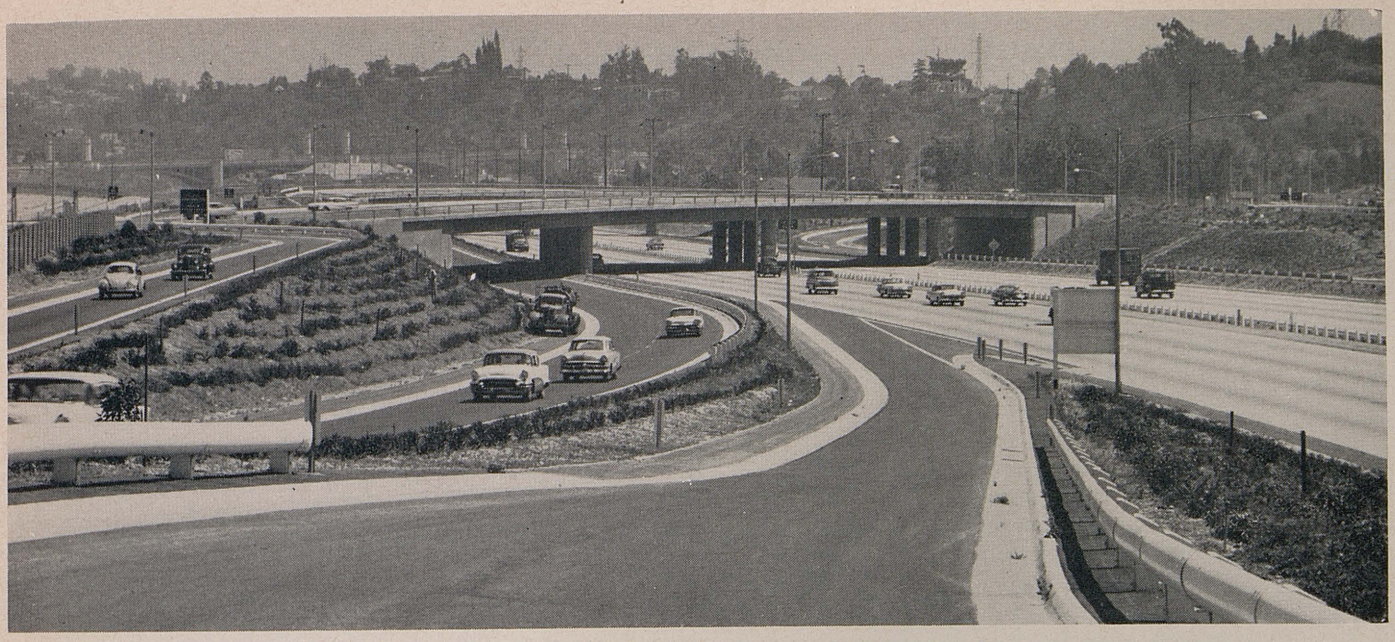
A southward view along the Golden State Freeway construction and the future interchange with the San Bernardino Freeway.

Special Consideration Given

Near the end of the project, the Golden State Freeway is to be carried over a segment of Hollenbeck Lake. Special consideration was given to the design of this structure to provide for a pleasing view of the park from the Hollenbeck Home for the Aged. Since the cost of an arch-type structure would have been prohibitive, the final selection was to build twin box girder bridges with spans of 90 feet to 125 feet supported on slender columns which will blend in with the landscape.

To facilitate the construction of the future Pomona Freeway to the east, which it is planned to bring into this interchange, portions of the foundations for the Pomona-Santa Ana-Golden State Separation will be built as part of this project.

During the design stage of this project, the Bridge Department Architectural Section built a three-dimensional mode (1 inch = 50 feet) of the complete interchange. This model was used to a great extent by the Design Department; and was especially beneficial in leading to harmony of bridge types, clarifying line drawings and in clarifying structural design problems. Later it became a popular public display. The model has now been housed on the project site and is proving to be a great benefit to the contractor's construction men and our engineers. With 854 sheets of detailed contract plans for the project, the ability to get an overall concept of the work to be done from viewing the scale model will undoubt-



This overcrossing takes Los Feliz Boulevard traffic across the Golden State Freeway.

edly help solve many of the problems that are being encountered.

Contractor for the project is Peter Kiewit Sons' Company of Arcadia, California, whose low bid was $9,924,-600. Completion of the contract is scheduled for March, 1961.

Sixth Street to Mission Road

On February 27, 1958, bids were opened for the fourth unit of current construction on the freeway loop, being the Golden State Freeway from Sixth Street to Mission Road including realignment of the San Bernardino Freeway from Macy Street to Cornwell Street. Included in the contract were the interchange structures, ramps and roadways between the two freeways. Low bidder for the contract was Vinnell Co., Inc., and Vinnell Constructors, and the construction allotment was $7,626,500.

The work to be done consisted, in general, of constructing 17 structures, 11 reinforced concrete retaining walls, grading and paving two separate roadways on the Golden State Freeway and the San Bernardino Freeway with their related ramps.

Excavation of nearly two million cubic yards of earth was necessary for the project, the bulk of which was due to the realignment of the San Bernardino Freeway. This shift in alignment of the San Bernardino Freeway eliminates the hazardous, curving section of freeway that followed the alignment of the Pacific Electric Railway tracks in the area since the early 1940's. Approximately three-quarter million cubic yards of excess material was hauled off the project. This excess material was hauled via city streets to state-provided disposal sites along Riverside Drive. These disposal sites will be incorporated as embankments in the construction of the Golden State Freeway from Arnold Street to Fletcher Drive.

Freeways and interchange roadways are paved with portland cement concrete pavement on cement-treated material, while the on- and off-ramps and the join areas to the old San Bernardino Freeway are plant-mixed surfacing.

As is usually necessary when construction operations involve the passage of traffic through the work, stage construction was required for the realignment of the San Bernardino Freeway. This was accomplished by utilizing the old freeway for the westbound traffic and the new freeway for the eastbound. The connection for the old eastbound freeway to the new alignment was then accomplished; however, a 2,000-foot detour consisting of the three permanent eastbound concrete lanes and three temporary plant-mixed surfaced lanes was necessary in the vicinity of Macy Street. This detour enabled construction of additional portland cement concrete pavement along the realigned westbound freeway and revision of the approach to the interchange ramp for the southbound Santa Ana Freeway.

One of the most troublesome construction difficulties encountered was the presence of perched ground water throughout the interchange excavation area. Perforated metal pipe was placed at the various trouble spots in order to provide a stable subgrade for base and surface courses. This ground water made storm drain and sewer construction difficult operations, as considerable pumping and diversion of water was necessary.

The project has 450 working days allotted for completion and is expected to be completed in January, 1960, approximately a month ahead of the time expiration.

Mission Road to Pasadena Avenue

This fifth unit of current construction on the loop is a 1.17-mile-long bridge and highway contract, being built on the Golden State Freeway between Mission Road and Pasadena Avenue in Los Angeles by contractors J. C. Boespflug and J. L. McLaughlin. The contract allotment is $3,040,500.

This construction through a densely populated urban area has entailed the usual heavy right-of-way clearance and building removal operations. Utility removing or replacement and local street remodeling at the start of the contract, added considerably to the contract work.

The roadway is eight lanes of portland cement concrete pavement on cement-treated subgrade and certain ramps and shoulders of plant-mixed surfacing on cement-treated base.

The structures consist of seven bridges of both steel girder and concrete box girder types and of seven retaining walls. There are also a concrete storage box and pumphouse and concrete pipes and box-type storm drains.

A special problem has been presented in the handling of telephone company ducts and T-V and radio cables through the North Broadway Bridge. In place of the usual spliced cable bypass around the structure, a scheme for supporting the ducts and cables on independent steel girders was devised. The ducts and cables were raised up and supported above the bridge deck level until sufficient bottom deck was constructed so they would be lowered into place. The top deck was then constructed to close them in. This procedure cost about $59,000 as compared with an estimated cost of $125,000 for cutting in and splicing bypass cables. The handling of cables was done by the telephone company. This contract will be finished about the first of January, 1960.

Burbank and Roscoe Boulevard

The sixth item of current construction on the freeway loop is the section of the Golden State Freeway between Burbank Boulevard and Roscoe Boulevard. This construction is for 3.5 miles of eight-lane freeway for which the contractor is Ukropina, Polich & Kral. The contract allotment is $8,324,000. Construction is largely in the City of Burbank and includes 14 major structures, one railroad overhead and five bridges over the Burbank-Western Storm Drain Channel, the construction of 3.7 miles of which is also a part of the State Division of Highways contract. The latter storm drain construction work as designed by the U. S. Corps of Engineers for the Los Angeles County Flood Control District is being constructed by the State Division of Highways under a co-operative agreement whereby costs are split in proportion to benefits received by each governmental agency. The financing of this construction contract on the basis of the triparty co-operative agreement provides for financing on the following basis:

State (including federal aid)	$5,895,000
Corps of Engineers, U. S. A.	2,024,298
City of Burbank	404,702
Contract cost	$8,324,000

The City of Burbank is financing construction of the Burbank Boulevard Overhead which will eliminate the grade crossing of Burbank Boulevard with the Southern Pacific Railroad. This construction is part of an overall program, which will eventually provide for grade separations at all major city cross streets with the Southern Pacific tracks in the City of Burbank. The program is financed by municipal bonds. Two of the grade separation structures have been completed under this bond act and are now in operation at Olive Avenue and at Magnolia Boulevard.

Flood Channel Construction

The Corps of Engineers in financing construction of the Los Angeles County Flood Control Channel, known locally as Burbank-Western Channel, which will extend 3.70 miles from its present terminus just southeast of Burbank Boulevard, then generally paralleling the freeway to its new terminus just north of Roscoe Boulevard. Also included in the channel work is the construction of 1,000 feet of Stough Canyon Channel, which will join with Burbank-Western under Burbank Boulevard and proceed in a northeasterly direction toward Stough Canyon in north-central Burbank. This contract provides for construction from the confluence to San Fernando Road. The Stough Canyon section will consist of a box section approximately nine feet square.

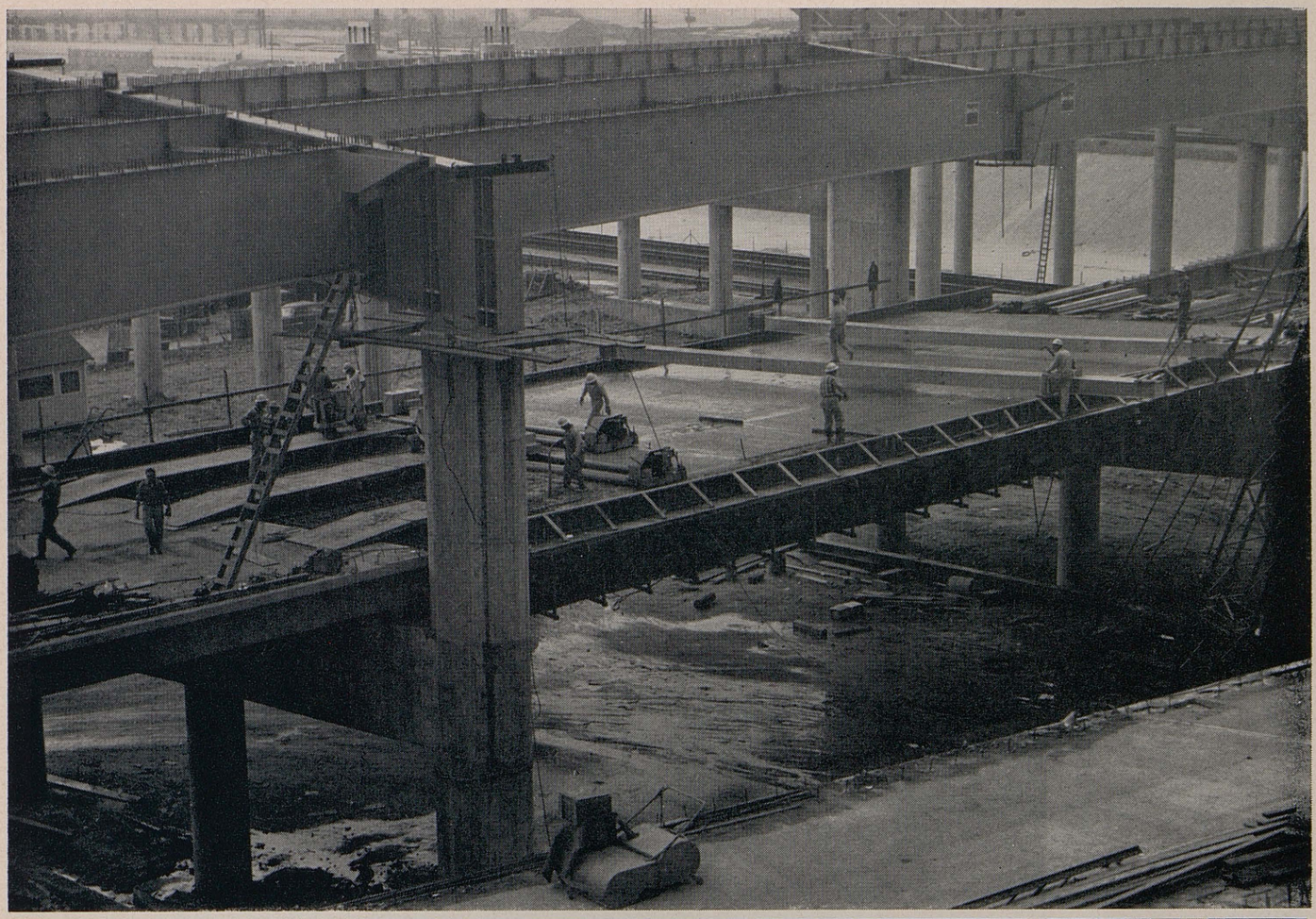
The Burbank-Western Channel will, in general, consist of about 0.6 mile of rectangular covered box section varying in height from 11 feet to 18 feet and in width from 20 feet to 30 feet and about 3.1 miles of open rectangular section varying in height from 11 feet to 23 feet with a constant width of 30 feet. The general depth of channel below ground line will be about 15 feet. The channel is lined with reinforced concrete throughout. A total of 66,000 cubic yards of concrete and 7,800,000 pounds of reinforcing steel will be used in constructing this channel.

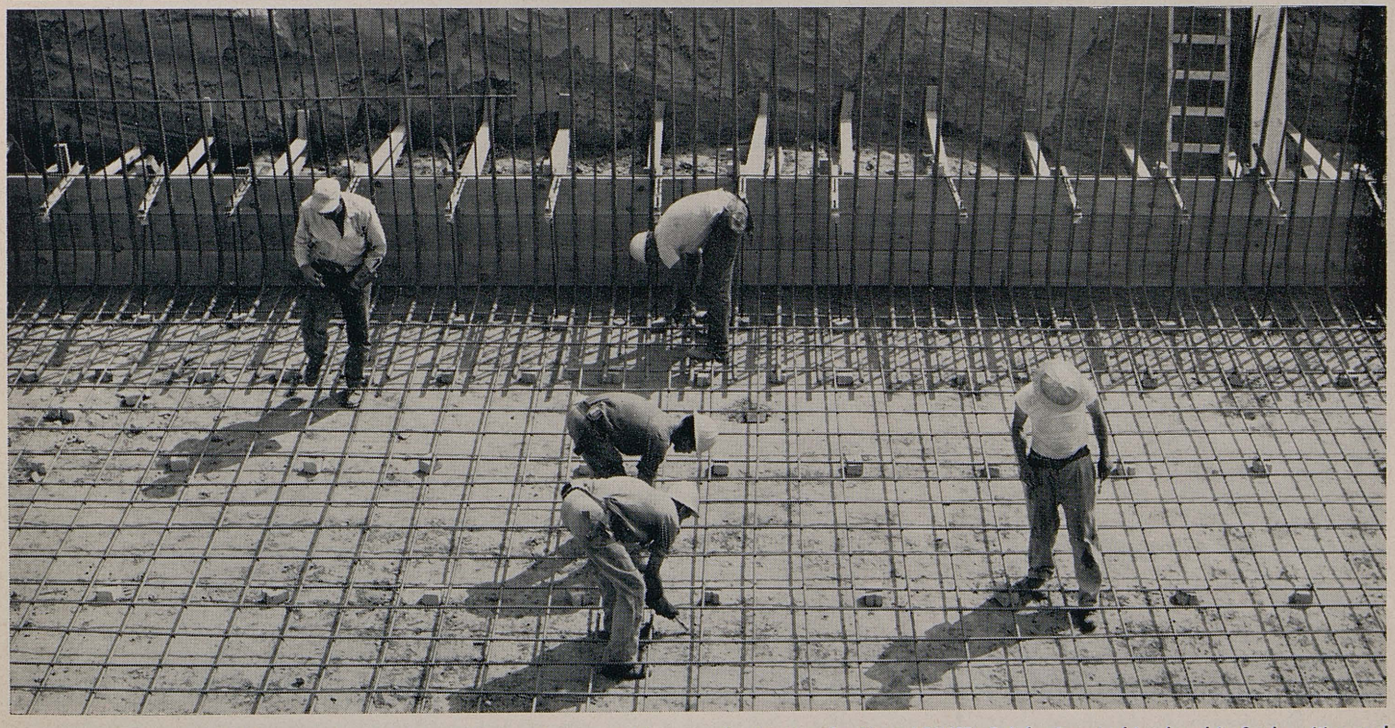
The 0.6-mile covered section of the Burbank-Western Channel had to be developed because of the freeway alignment crossing and paralleling the channel alignment. The channel was originally designed for open section throughout except for city street crossings which were to bridge the channel on simple spans. Due to the Golden State Freeway crossing the channel almost at the beginning of the project, it became necessary to design the first 1,500 feet of Burbank-Western, including the Stough Canyon confluence section, to a heavy covered section strong enough to support a 30-foot fill in addition to live street and freeway loading. Burbank Boulevard, a heavily traveled city street, will also cross the channel on a 30-foot fill at this location. As a result of these loadings it was found necessary to design and construct a box section with inverts as heavy as 4′ 3″ thick, walls 3′ 6″ thick, and a roof slab 3′ 9″ thick.

Completion of the Burbank-Western Storm Drain Channel is scheduled for October 15, 1960, under the terms of the contract specifications and the date for completion to finish the entire project is May, 1961. As of this writing, construction is estimated to be 20 percent completed.

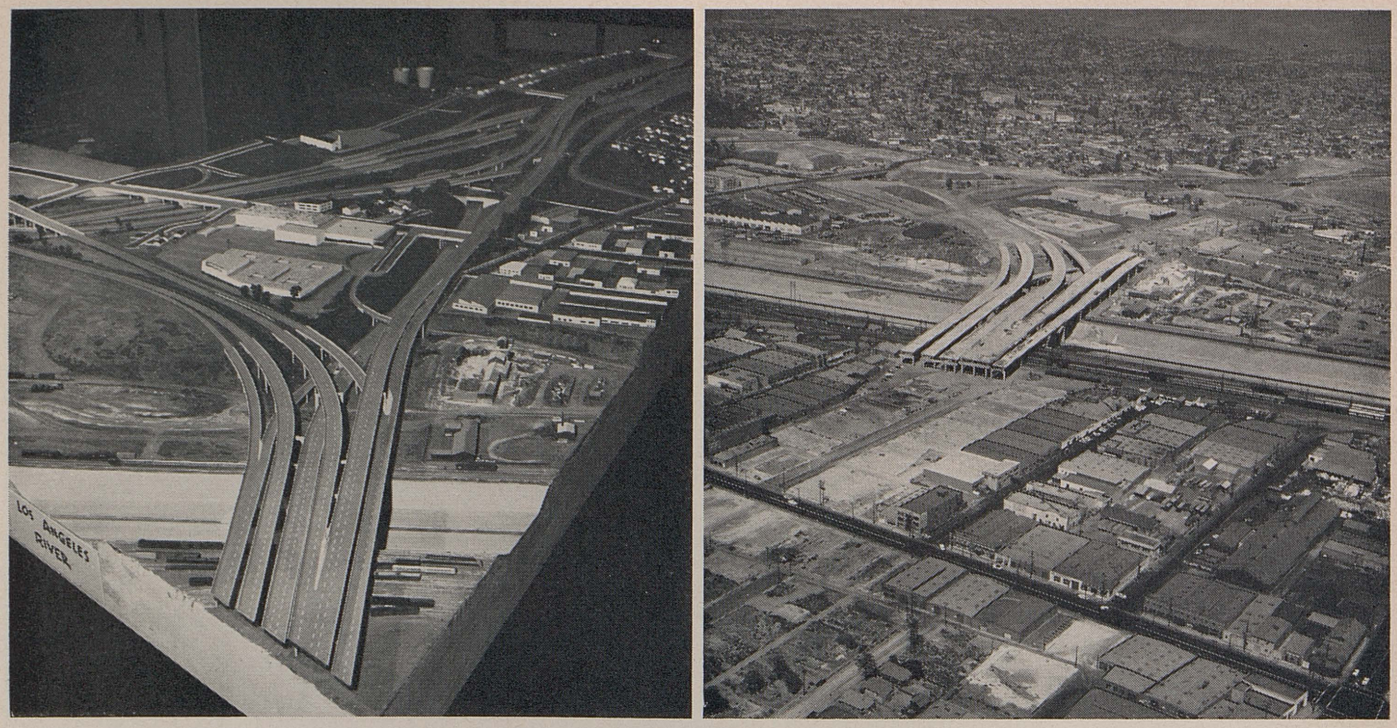
The City of Burbank is rich in California history. Much of it was contained in the 36,400-acre Rancho San Rafael, granted by the Spanish crown to Don Maria Verdugo in 1797. The city was incorporated in 1911 with a population of 400 persons.

The City of Burbank in the year 1959 has 450 manufacturing plants employing 60,000 people, with a payroll amounting to $260,000,000; its population of 92,000 is centered within





UPPER—The lower deck slab is poured on the Santa Monica Freeway Bridge over the Los Angeles River. LOWER—Reinforcing steel is placed in final position and checked for the Burbank-Western Storm Drain Channel.



The shape of freeways to come is apparent in these two photos showing a section of the downtown loop just east of the central business district of Los Angeles. Photo (left) is a model prepared for design study purposes; photo (right) is the actual project now under construction.

an area of 16.9 square miles; assessed valuation is $145,318,510.

Signing Will Conform

Signing on the freeway loop will in general conform to the U. S. Interstate Highway standards pattern, with white lettering on dark green background for directional and guide signs and with the other incidental warning and regulatory signs of conventional colors.

Large overhead illuminated signs with down arrows will indicate the proper lane for the various destinations following the freeways. Street names will be used for the various turnoffs to city streets with a sloping up arrow. Reassurance signs with distances to the three next turnoffs will also be of the overhead illuminated type. The overhead signs are generally mounted on substantial steel sign bridges or post-supported frames designed to support the sign under a 90-mile wind velocity.

The lighting of the overhead signs is accomplished using fluorescent lighting fixtures developed by the State Division of Highways and mounted at the bottom of the signs. Large ground-mounted signs with white reflectorized legends and green background will be used to supplement the overhead illuminated signs to provide lane indication and supplementary information.

Shields for the interstate roads will be in blue and red background with white lettering. U. S. and state route shields will be white reflective background with black legends. Signing includes not only the signs on the freeway but directional signs on the streets indicating the proper ramps to use for traveling to the various destinations.

Within the freeway loop there will be 164 overhead signs with a total value of $1,300,000; 201 large ground-mounted signs at a cost of $110,000; together with a large number of miscellaneous smaller warning, regulatory and guide signs at a cost of $170,000.

Traffic Benefits

Engineers on the District VII staff have been irked from time to time by statements to the effect that "freeways are obsolete the day they are opened to traffic." What is really meant by such a statement is that the traffic volume desiring to use the new freeway facility is far in excess of the design capacity. People like the freeways too well!

In a metropolitan area such as Los Angeles, it obviously is not practical to design one freeway to handle all traffic desiring to travel it. Freeway planning in a metropolitan area must be based on the concept of a freeway network. With completion of the freeway network, traffic on various alternate routes will soon learn to adjust itself, and thus by reducing the peak loads most of the traffic tieups or slowdowns will be eliminated. The difficulty now is, we do not have alternate routes. The Los Angeles Freeway Loop will provide badly needed alternate routes.

The Golden State Freeway (U. S. Sign Route 99) coming into Los Angeles from the San Joaquin Valley, passes to the north of the Los Angeles Civic Center and connects to the Santa Monica-Santa Ana Freeways on the east side of Los Angeles at the East Los Angeles interchange. From this interchange, the Santa Monica Freeway goes westerly, passing to the

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New Lanes

Minor Improvements Aid Freeway Traffic Flow

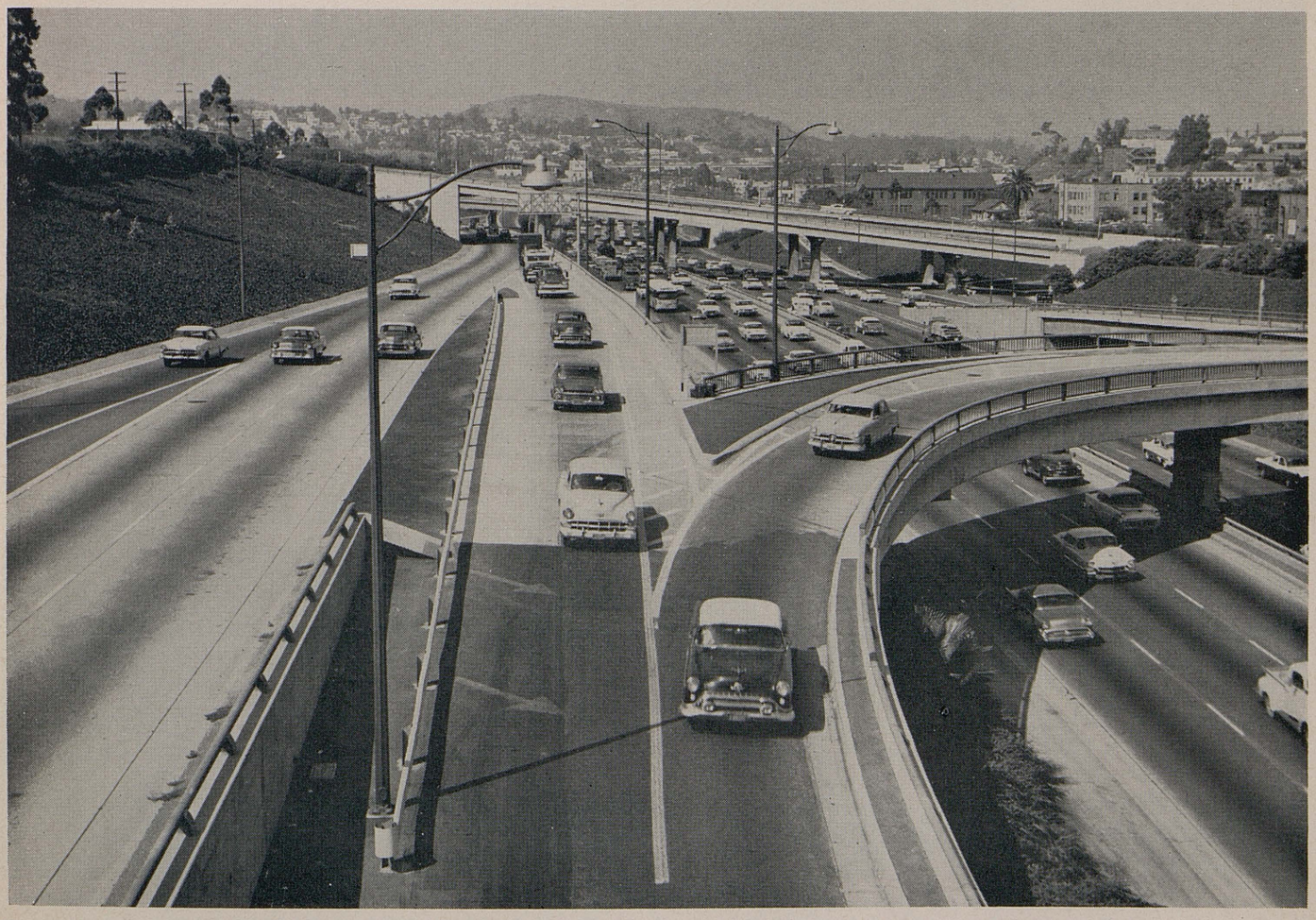
By DONALD FRISCHER, Traffic Engineer, District VII

FREEWAY designs in the vicinity of the Los Angeles Civic Center were started some 20 years ago, when the planners had no conception of the excessive traffic overloads that these freeways would be called upon to carry. Each year many comparatively small items of additional construction are carried out on freeways under traffic to alleviate the congestion that always seems to result from the public's desire to use to the fullest extent the modern travel facilities afforded by freeways. Minor freeway improvements of this nature are hardly noticed by the motorists who benefit from them, but to the engineers who did the planning and the construction, they are sources of great satisfaction —particularly when the value of the benefits which accrue are so greatly in excess of the costs.

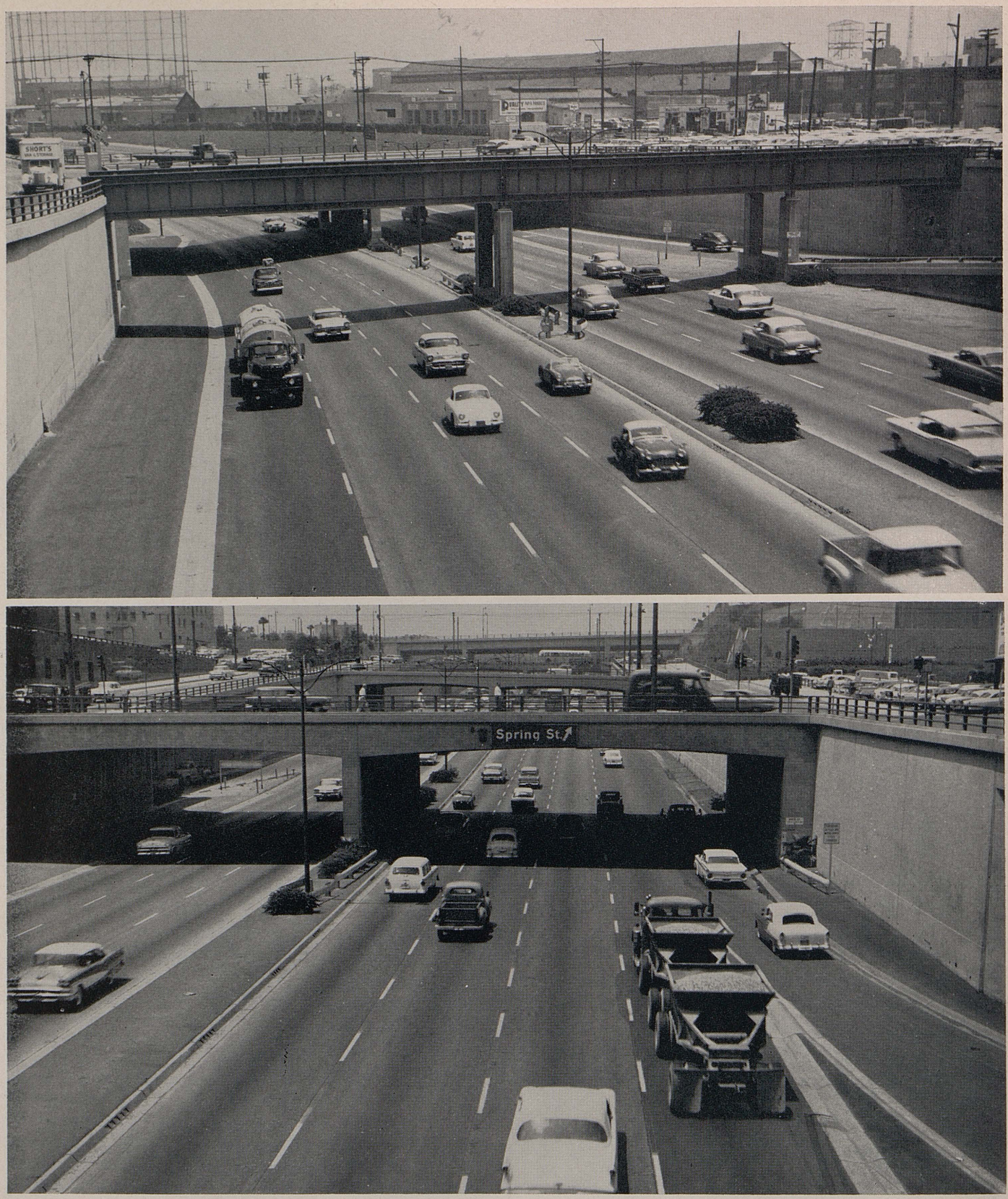
While the beneficial effects of a freeway improvement are usually felt immediately, the engineer's inherent sense of prudence does not permit him to evaluate the benefits until the "dust settles" and numerous observations have been made to justify his conclusions. During 1958, two freeway modifications were completed in the Civic Center area of Los Angeles City—one on the Santa Ana and Hollywood Freeways, east of the "Four-Level" interchange and the other on the Harbor Freeway, just south of the "Four-Level." The beneficial effects of these improvements and justification for their cost can now be proven.

Westbound Road Widened

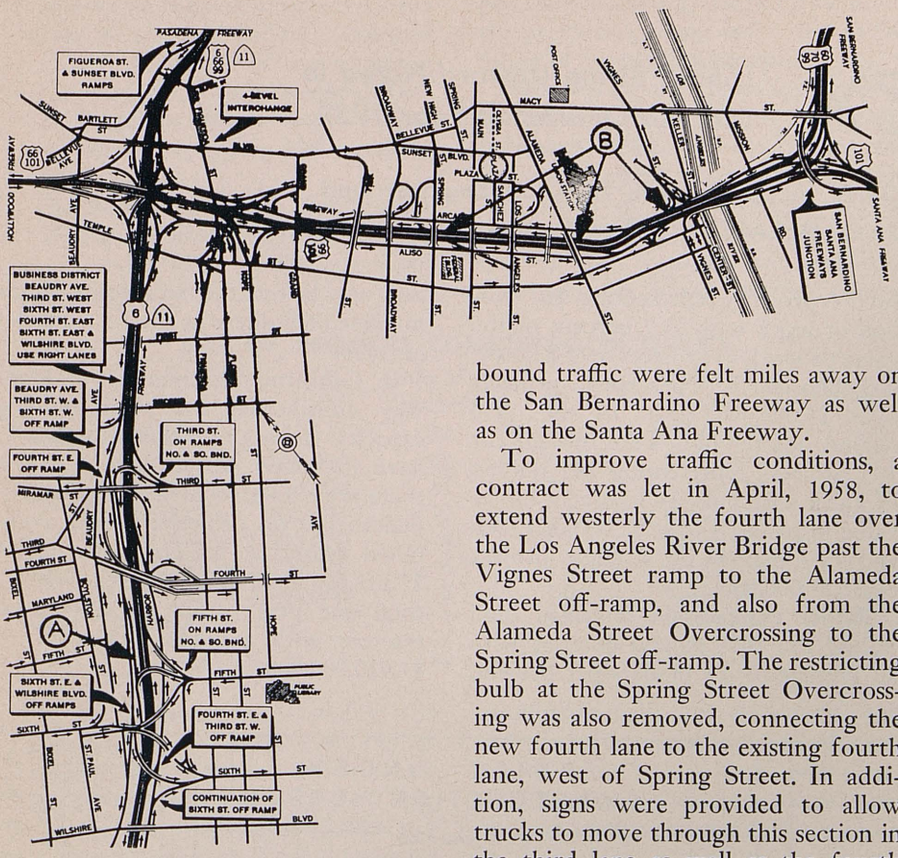
The first reconstruction job involved the widening of the westbound roadway of the Santa Ana-



The Harbor Freeway, looking northward, showing the new slip ramp which handles traffic from the distributor road (left) to the curved Fifth Street southbound inlet (right).



UPPER—This eastward view of the Santa Ana Freeway, taken from Los Angeles Street, shows the added lane for westbound traffic (extreme right). LOWER—A westward view of the Santa Ana Freeway at the Los Angeles Street on-ramp showing the added traffic lane occupied by the truck and trailer (right foreground).



This map of the four-level structure and vicinity shows the location of the lane improvements described in this article. The circled "A" and arrow points out the new slip ramp on the Harbor Freeway; circled "B" and arrows, the new westbound lane on the Santa Ana Freeway.

Hollywood Freeway from the Los Angeles River to Spring Street through the section that is being locally called "The Slot." The conditions that previously existed were as follows:

From the interchange of the Santa Ana and San Bernardino Freeways, the Santa Ana Freeway westbound roadway consisted of 4 lanes across the Los Angeles River Bridge, narrowing to three lanes at the Vignes off-ramp, and continuing as such to Spring Street. The roadway grade was, and still is, a plus 4.8 percent from Los Angeles Street to the "Four-Level" interchange. It is this steep grade that makes it necessary for trucks to change gears and causes a general slowing down of the westbound traffic (some 90,000 vehicles per day, of which 6,000 are trucks). During peak hours, the "stop and go" effects of this slowing down of westbound traffic were felt miles away on the San Bernardino Freeway as well as on the Santa Ana Freeway.

To improve traffic conditions, a contract was let in April, 1958, to extend westerly the fourth lane over the Los Angeles River Bridge past the Vignes Street ramp to the Alameda Street off-ramp, and also from the Alameda Street Overcrossing to the Spring Street off-ramp. The restricting bulb at the Spring Street Overcrossing was also removed, connecting the new fourth lane to the existing fourth lane, west of Spring Street. In addition, signs were provided to allow trucks to move through this section in the third lane as well as the fourth lane, thus allowing those trucks intending to continue west on the Hollywood Freeway to do so without changing lanes. This reconstruction job was completed in July, 1958, at a cost of $88,000. Vernon Paving Company of Vernon, California was the contractor. The author was resident engineer.

Downgrade Aids Trucks

The westbound roadway of the Santa Ana Freeway between the Alameda Street off-ramp and the Alameda Street Overcrossing was not widened and remains three lanes. This section is on a downgrade which allows trucks to accelerate prior to climbing the 4.8 percent upgrade. In addition, a sizeable amount of traffic leaves the freeway via the Alameda Street off-ramp. Therefore widening of this section was not needed.

The second reconstruction contract was on the southbound roadway of the Harbor Freeway and involved construction of a "slip ramp" between the southbound distributor road and the freeway at Fifth Street. Construction began in June, 1958, and was completed in December, 1958, at a cost of $84,000. V. A. Gilbertson of Beverly Hills was the contractor. The resident engineer was John O. MacNeill.

Prior to this contract, many observations were made to determine the cause of traffic delay and congestion south of the "Four-Level" Interchange on the Harbor Freeway. At this location the southbound roadway with five lanes just south of the "Four-Level" Interchange narrowed to three lanes within 1,800 feet, with two lanes leading into the distributor road running along the westerly side of the freeway from Second Street to Wilshire Boulevard. On the freeway, the three lanes continuing south are augmented by a fourth lane at the Fifth Street on-ramp. It was observed that the congestion on the Harbor Freeway in the area of the "Four-Level" Interchange was caused by southbound vehicles entering on the right from the interchange roadways of the Hollywood and Santa Ana Freeways, and then merging with the through traffic from the Pasadena Freeway traveling south on the Harbor Freeway. Traffic moving southerly on the Pasadena Freeway to the Harbor Freeway destined for the off-ramps at Second Street and southbound distributor road further complicated the situation because of the many weaving maneuvers in changing lanes. During peak hours, traffic here appeared to be standing still, and the effects of the congestion extended back to other connecting freeways, particularly westerly on the Hollywood Freeway.

Therefore the problem was to provide a new way so that traffic could remain in the two right lanes of the Harbor Freeway and continue south on the distributor roadway to a point where merging would not interfere with through traffic in the three fast lanes. To accomplish this, a contract was let to provide an opening from the southbound distributor road to the Fifth Street southbound on-ramp. This "slip ramp" provides a means for traffic entering the Harbor Freeway south of the "Four-Level" structure on the right, to remain in the two right lanes, travel down the distribu-

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Cost Index

Sharp Swing Upward Noted in Second Quarter of Year 1959

By J. P. MURPHY, Assistant State Highway Engineer and
H. C. McCARTHY, Office Engineer

DURING the second quarter of 1959 the California Construction Cost Index took a sharp upswing to 270.4. The increase is 54.3 points or 25.1 percent above the first quarter of 1959.

Although this is the second highest point reached since maintenance of a cost index was started in 1940 (all-time high was 277.7 in 1957 first quarter), the index rise is not believed truly indicative of a major increase in construction costs.

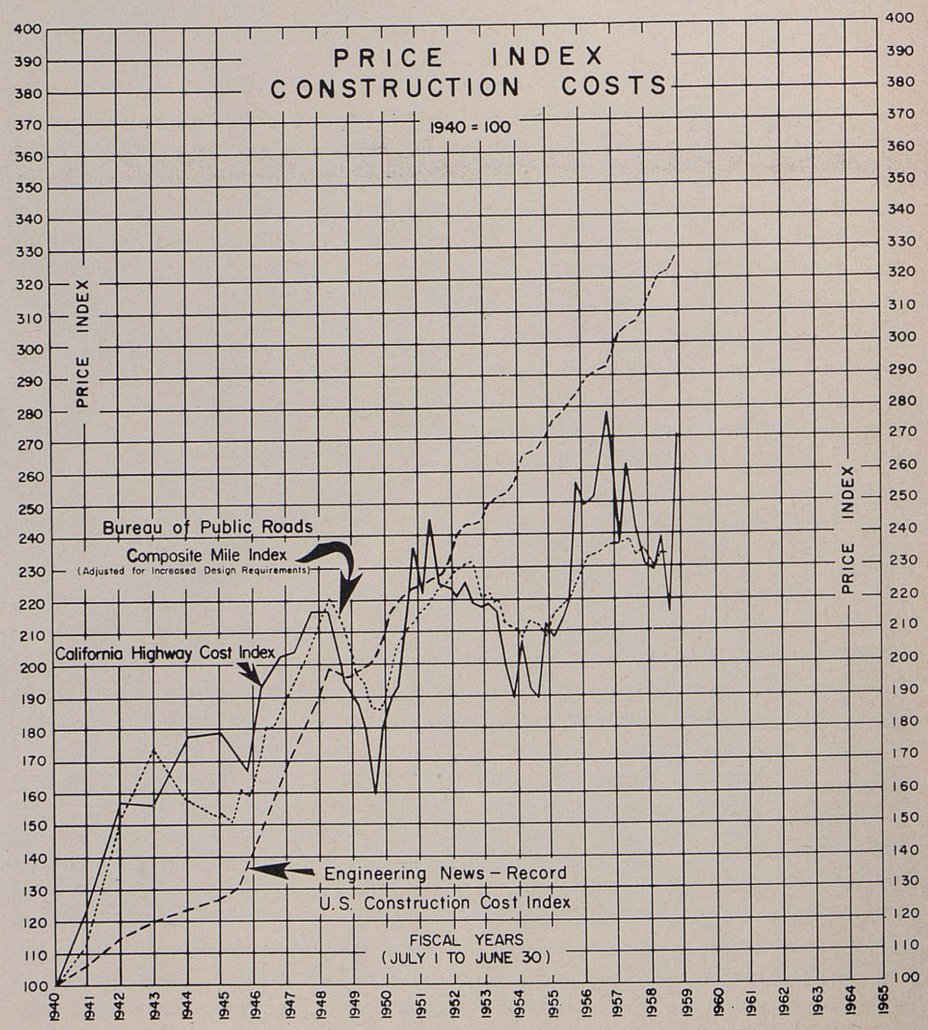
A review of the recent cost index trend indicates that the upswing in the 1959 second quarter is attributable generally to two factors.

One factor is simply the natural recovery from a false 9.4 percent decrease in the 1959 first quarter. That decrease apparently was occasioned by extremely keen competition among bidders who largely disregarded indicated cost increases and cut profits to the bone to secure basic projects to keep their organizations employed. Undoubtedly many bidders had a weather eye out for the predicted slowdown of the interstate highway program.

The other prime factor causing an apparent cost increase in the 1959 second quarter was the smaller size and different nature of the work predominating in the quarter. With future availability of federal funds in doubt, California was forced to reduce its advertising schedule. The reduction was mainly in the largest projects in the budget, projects which by their size and nature would permit large production and economies in plant setups or were more inviting because of lack of traffic interference. A number of the second quarter contracts were resurfacing projects, with considerable cost chargeable to traffic handling and with little opportunity for effecting major economies. During the 1959 first quarter bids were opened for 74 projects representing $67 million of work with 89.7 percent of the value of work in projects over $1,000,000 each and 45.4 percent in projects over $5,000,000 each. In the 1959 second quarter bids were opened for 189 projects representing $41 million of work with only 54.3 percent of the value in projects over $1,000,000 each and 12.4 percent in a single project over $5,000,000.

Bidder competition remained high during the 1959 second quarter, with an average of 6.3 bidders per project, but was below the 8.2 high average number of bidders in the first quarter of 1959.

In California the number of highway contractors and their bidding capacity (from prequalification totals) have increased. As of July 1, 1959, there were 1,045 contractors prequalified to bid on projects, with a combined estimated bidding capacity of $2,115,000,000, as compared with a total one year earlier of 1,018 contractors with a bidding capacity of $1,920,000,000.



Two accompanying charts show the average number of bidders arranged according to types of construction and project value for the Fiscal Year 1958-59 and for the six-month period from January to June, 1959, respectively.

The project values in this quarter are distributed as shown in the accompanying table "Size of Projects Considered in Survey."

SIZE OF PROJECTS CONSIDERED IN SURVEY

	No. of projects	%	Value of projects	%
Under $50,000	84	44.4	$1,793,553	4.4
50,000 to $100,000	37	19.6	2,727,396	6.7
100,000 to 250,000	43	22.8	6,732,578	16.4
250,000 to 500,000	12	6.4	4,445,442	10.8
500,000 to 1,000,000	4	2.1	3,054,407	7.4
1,000,000 to 2,500,000	6	3.2	8,712,212	21.3
2,500,000 to 5,000,000	2	1.0	8,444,745	20.6
Over 5,000,000	1	0.5	5,094,662	12.4
Total	189	100.0	$41,004,995	100.0

Six of the seven items used in the preparation of this index show higher average unit prices than in the previous quarter. Only untreated rock base dropped, with a reduction of $0.05 per ton. A tabulation of average contract prices is included in this article.

The average price for untreated rock base ($1.77 per ton) is $0.05 below the first quarter of 1959 price, which is within the range of normal fluctuation. Prices for quantities exercising a significant influance on the index range from $1.10 to $2.20 per ton.

The average unit price for roadway excavation ($0.66 per cu. yd.) is $0.25 higher than the first quarter of 1959. Unit bids in projects exercising significant weight in establishing this average price range from $0.40 to $1.50 per cubic yard.

Of a total quantity of 9,400,000 cubic yards included in contracts for this quarter, one project in Tulare County covering highway relocation at the Terminus Reservoir site in mountainous country where hard rock formations are encountered involved 1,900,000 cubic yards at $1.15. Elimination of this project would have resulted in an average price for this item of $0.54 per cubic yard.

The average unit price for portland cement concrete pavement ($14.03 per cu. yd.) is only three cents above the previous quarter, and is within the range of normal fluctuation.

The average unit price for asphaltic and bituminous mixes ($5.77 per ton) increased $0.40 from $5.37 per ton, but is still within the range of average unit prices for the last two years. The letting during this quarter of a number of thin blanket and seal coat contracts on which traffic control problems usually are experienced probably influenced the average unit cost of this item.

The average unit price for portland cement concrete structures ($65.36 per cu. yd.) increased $15.96 from $49.40 per cubic yard. The price for the first quarter was down because of a low bid on a large attractive project. The current price is above the previous trend, probably due to the scarcity of major projects involving large structures.

The average unit price for bar reinforcing steel ($0.134 per lb.) is an increase of $0.024 per pound above the unit price of $0.108 for the first quarter of 1959. Bid prices for this item ranged from $0.100 to $0.180.

The average unit price for structural steel ($0.198 per lb.) increased $0.033 from the first quarter of 1959. A total volume of 5,000,000 lbs. was used in this quarter, with the prices of significant quantities ranging from $0.110 to $0.210 per pound. About half of the projects using this item had a total value of less than $100,000.

Cost Index

The California Highway Consruction Cost Index, the Engineering News-Record Construction Cost Index, and the United States Bureau of Public Roads Composite Mile Index,

AVERAGE CONTRACT PRICES

	Roadway excavation,[1] per cu. yd.	Untreated rock base, per ton	Plant mixed surfacing, per ton	Asphalt concrete pavement, per ton	Asphaltic and bituminous mixes, per ton	PCC pavement, per cu. yd.	PCC structures, per cu. yd.	Bar reinforcing steel, per lb.	Structural steel, per lb.
1940	$0.22	$1.54	$2.19	$2.97	--	$7.68	$18.33	$0.040	$0.083
1941	0.26	2.31	2.84	3.18	--	7.54	23.31	0.053	0.107
1942	0.35	2.81	4.02	4.16	--	9.62	29.48	0.073	0.103
1943	0.42	2.26	3.71	4.76	--	11.48	31.76	0.059	0.080
1944	0.50	2.45	4.10	4.50	--	10.46	31.99	0.054	0.132
1945	0.51	2.42	4.20	4.88	--	10.90	37.20	0.059	0.102
1946	0.41	2.45	4.00	4.68	--	9.48	37.38	0.060	0.099
1947	0.46	2.42	4.32	5.38	--	12.38	48.44	0.080	0.138
1948	0.55	2.43	4.30	5.38	--	13.04	49.86	0.092	0.126
1949	0.49	2.67	4.67	4.64	--	12.28	48.67	0.096	0.117
1950	0.40	2.25	4.26	3.75	--	11.11	43.45	0.079	0.094
1951	0.49	2.62	4.34	5.00	--	12.21	47.22	0.102	0.159
1952	0.56	2.99	5.00	4.38	--	13.42	48.08	0.098	0.150
1953	0.51	2.14[2]	5.31	4.58	--	12.74	50.59	0.093	0.133
1954	0.45	2.13	4.50	4.86	--	14.41	48.42	0.094	0.124
1955	0.39	2.22	4.93	--	--	13.35	45.72	0.095	0.142
1st Quarter 1956	0.40	2.08	5.40	6.50	--	14.05	52.51	0.105	0.166
2d Quarter 1956	0.51	2.06	6.27	--	--	14.64	57.13	0.113	0.219
3d Quarter 1956	0.52	2.27	6.12	--	--	15.57	56.32	0.121	0.178
4th Quarter 1956	0.52	2.21	--[3]	--[3]	$5.93[3]	14.95	59.63	0.112	0.197
1st Quarter 1957	0.63	2.10	--	--	5.94	17.28	61.14	0.129	0.235
2d Quarter 1957	0.63	2.10	--	--	6.18	15.59	58.61	0.119	0.204
3d Quarter 1957	0.42	2.34	--	--	5.10	14.34	58.68	0.130	0.200
4th Quarter 1957	0.68	1.78	--	--	5.45	16.88	59.76	0.129	0.177
1st Quarter 1958	0.52	1.85	--	--	5.45	14.96	55.21	0.118	0.192
2d Quarter 1958	0.48	1.73	--	--	5.67	13.77	54.44	0.125	0.158
3d Quarter 1958	0.39	2.18	--	--	5.56	13.39	53.93	0.126	0.182
4th Quarter 1958	0.52	2.10	--	--	5.74	13.55	55.20	0.122	0.165
1st Quarter 1959	0.41	1.82	--	--	5.37	14.00	49.40	0.108	0.165
2d Quarter 1959	0.66	1.77	--	--	5.77	14.03	65.36	0.134	0.198

[1] Unclassified.
[2] The item of crusher run base was used before 1953.
[3] Asphalt concrete pavement combined with plan mix surfacing in 4th Quarter 1956, and will be identified as asphaltic and bituminous mixes in the future.

NUMBER AND SIZE OF PROJECTS, TOTAL BID VALUES AND AVERAGE NUMBER OF BIDDERS

(July 1, 1958, to June 30, 1959)

Project Volume	Up to $50,000	$50,000 to $100,000	$100,000 to $250,000	$250,000 to $500,000	$500,000 to $1,000,000	Over $1,000,000	All Projects
Road projects							
No. of projects	287	87	102	49	19	8	552
Total value*	$6,034,814	$6,362,663	$16,264,619	$17,140,369	$13,208,991	$9,983,876	$68,995,332
Avg. No. bidders	5.1	5.7	6.4	7.6	9.8	8.9	5.9
Structure projects							
No. of projects	28	10	14	5	3	6	66
Total value*	$703,883	$724,399	$2,511,489	$1,729,053	$2,569,031	$12,633,982	$20,871,837
Avg. No. bidders	7.0	6.6	8.9	9.8	9.7	9.0	7.9
Combination projects							
No. of projects					7	41	48
Total value*					$5,711,246	$142,367,550	$148,078,796
Avg. No. bidders					7.3	8.6	8.4
Summary							
No. of projects	315	97	116	54	29	55	666
Total value*	$6,738,697	$7,087,062	$18,776,108	$18,869,422	$21,489,268	$164,985,408	$237,945,965
Avg. No. bidders	5.3	5.8	6.7	7.8	9.2	8.7	6.3

* Bid items only.

TOTAL AVERAGE BIDDERS BY MONTHS

	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Avg. Year
1958-59	5.4	5.5	5.6	5.6	7.0	6.9	7.7	8.0	8.7	7.0	6.1	5.8	6.3
1957-58	6.2	6.3	5.7	8.2	9.2	9.7	11.4	9.2	7.6	7.1	4.5	4.8	6.9

NUMBER AND SIZE OF PROJECTS, TOTAL BID VALUES AND AVERAGE NUMBER OF BIDDERS

(January 1, 1959, to June 30, 1959)

Project Volume	Up to $50,000	$50,000 to $100,000	$100,000 to $250,000	$250,000 to $500,000	$500,000 to $1,000,000	Over $1,000,000	All Projects
Road projects							
No. of projects	121	40	45	19	5	4	234
Total value*	$2,440,785	$3,042,241	$6,959,244	$6,789,219	$3,269,231	$4,733,210	$27,233,930
Avg. No. bidders	5.6	5.8	6.9	9.1	11.8	8.0	6.4
Structure projects							
No. of projects	14	3	8	1	2	1	29
Total value*	$351,671	$210,382	$1,453,041	$416,621	$1,980,184	$1,838,928	$6,250,827
Avg. No. bidders	8.3	8.7	8.8	16.0	10.0	5.5	8.9
Combination projects							
No. of projects					1	19	20
Total value*					$975,625	$75,759,371	$76,734,996
Avg. No. bidders					9.0	9.2	9.2
Summary							
No. of projects	135	43	53	20	8	24	283
Total value*	$2,792,456	$3,252,623	$8,412,285	$7,205,840	$6,225,040	$82,331,509	$110,219,753
Avg. No. bidders	5.9	6.0	7.2	9.4	11.0	9.0	6.8

* Bid items only.

TOTAL AVERAGE BIDDERS BY MONTH

	Jan.	Feb.	Mar.	Apr.	May	June	Avg. for six months
1959	7.7	8.0	8.7	7.0	6.1	5.8	6.8
1958	11.4	9.2	7.6	7.1	4.5	4.8	6.6

all reduced to the base 1940 = 100, are shown on the accompanying graph. The latter two indexes are based on nationwide construction costs.

The engineering News-Record Cost Index for the second quarter of 1959, which now stands at 326.5, again shows a rise over the preceding quarter. It is up 4.4 index points or 1.4 percent. This index is strongly affected by many large projects outside the highway construction field.

The Bureau of Public Roads Composite Mile Index is based on federal-aid highway construction contracts awarded by the state highway departments. The index for the first quarter of 1959, which is the latest available, dropped 1.2 index points or 0.5 percent from the fourth quarter of 1958 and now stands at 234.1.

The California Highway Construction Cost Index

Year	Cost Index
1940	100.0
1941	125.0
1942	157.5
1943	156.4
1944	177.8
1945	179.5
1946	179.7
1947	203.3
1948	216.6
1949	190.7
1950	181.2
(1st Quarter 1950—160.6)	
1951	225.0
(4th Quarter 1951—245.4)	
1952	225.9
1953	215.2
1954	193.5
(2d Quarter 1954—189.0)	
1955 (1st Quarter)	189.3
1955 (2d Quarter)	212.4
1955 (3d Quarter)	208.6
1955 (4th Quarter)	212.6
1956 (1st Quarter)	219.5
1956 (2d Quarter)	255.9
1956 (3d Quarter)	249.1
1956 (4th Quarter)	252.1
1957 (1st Quarter)	277.7
1957 (2d Quarter)	266.9
1957 (3d Quarter)	237.5
1957 (4th Quarter)	262.1
1958 (1st Quarter)	241.8
1958 (2d Quarter)	231.0
1958 (3d Quarter)	228.5
1958 (4th Quarter)	238.5
1959 (1st Quarter)	216.1
1959 (2d Quarter)	270.4

County Bridges

Flood Damage Restored With Federal, State, Local Funds

By W. C. KIEDAISCH, Supervising Bridge Engineer

AN ARTICLE at this time about flood damage that occurred nearly four years ago may seem to have little "news" value, but residents of the affected areas undoubtedly feel otherwise, particularly those who are still awaiting new bridges. It has been a long, hard pull, but the last county bridge to be replaced is finally ready for contract.

Although any adverse weather in California is tritely referred to as "unusual," the winter of 1955-56 was unusually unusual and in addition, unusually early. A storm in the middle of November brought high winds, heavy rain and early snow as far south as Mt. Baldy and then a series of weak storms in mid-December saturated the watershed mantles. Thus when the major storm waves arrived shortly thereafter and continued through December 26th, the runoff was immediate and flood levels in the rivers rose to record heights in Northern and Central California.

Geological survey measurements showed that the Klamath River near Klamath rose six feet higher than ever recorded previously and the Eel River at Scotia reached almost seven feet above the previous high. The Russian River flooded Guerneville first on December 20th, and again on December 23d, when it exceeded the previous maximum flood stage by nearly three feet.

These flood flows carried large amounts of drift and debris which gathered at each bridge. With each structure creating a partial or complete dam, the stream flow either dug a deeper channel under the structure, pounded its way over the bridge, pushed it out of the way completely, or bypassed the main spans of the structure and destroyed the approaches.

Although the storms continued during January and February of 1956, adding considerably to the total damage, additional bridge damage was confined principally to the temporary bridges that had been thrown across the streams after the December flood.

A survey by federal, state and county engineers during and immediately following the floods indicated that the costs of restoration would far exceed funds available from local sources.

Recognition of this situation was taken by the California Legislature and an emergency measure was enacted, entitled "The Flood Relief Law of 1956," under which local agencies could apply for state aid from the General Fund to augment already available, but inadequate, federal funds. Approximately $14,200,000 of state funds have been obligated under this statute to assist in the financing of damage totaling over $22,000,000.

The damage to major county bridges was spread over 24 counties at 134 different sites. The total repair and reconstruction cost of these bridges will approximate $10,500,000. About 60 percent of these structures were either completely destroyed or damaged so extensively as to necessitate replacement. Of the above total major bridge damage, $8,800,000 was concentrated within six counties. A brief description of the major bridge replacements in these counties follows.

Humboldt County

Humboldt County applied for state aid at 43 different bridge sites with an estimated construction cost of $3,200,000. New structures, varying from concrete slab trestles to large steel trusses, were required at 16 of these sites.

The county let formal contracts through competitive bidding for most of the projects but used force account for some emergency work. While construction of the larger projects was underway, the county was often forced to construct temporary detour roads and log bridges to provide access to critical areas.

At three sites, the destroyed facilities were old suspension bridges which had outlived their usefulness. The new structures for these three sites (two completed and the last advertised for bids), have a total estimated cost which is equal to the total of the other 40 locations. Following is a description of these three projects:

Willow Creek Bridge over the Trinity River is 508 feet long and has welded steel deck girder spans, two at 152 feet 6 inches and two at 101 feet 6 inches.

Fort Seward Bridge over the Eel River is 620 feet long and consists of welded steel deck girder end spans at 112 feet and 86 feet and two steel deck truss spans at 211 feet.

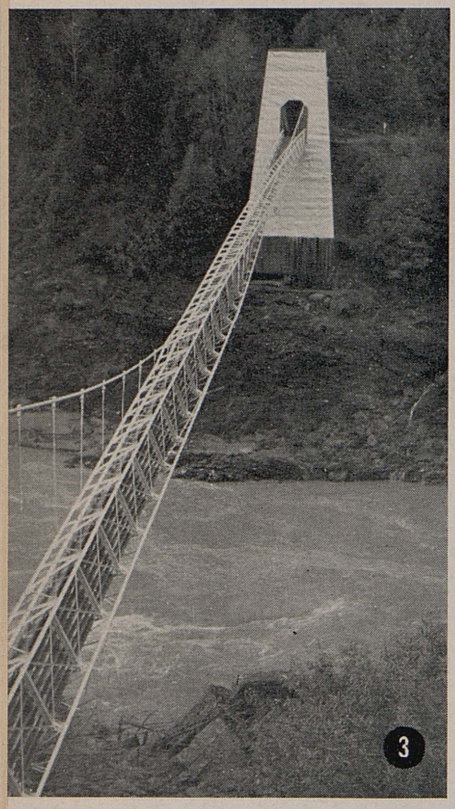
Martin's Ferry Bridge over the Klamath River will be 680 feet long made up of rolled steel girder spans at 45 feet and 35 feet and steel deck truss spans, two at 150 feet and one at 300 feet.

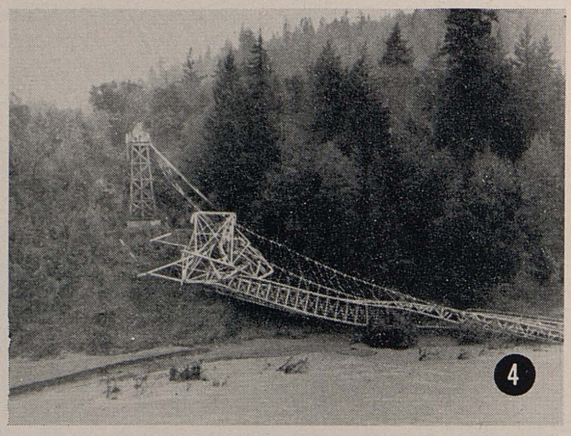
Mendocino County

With conditions similar to those in Humboldt County but not as severe, the Mendocino County damage was confined to 16 sites at a total cost of $540,000, with completely new structures necessary at eight sites. The most important of these were the new structures across West Branch Russian River at Calpella, Eel River Bridge at Hearst and the Outlet Creek Bridge at Longvale, total cost, $380,000.

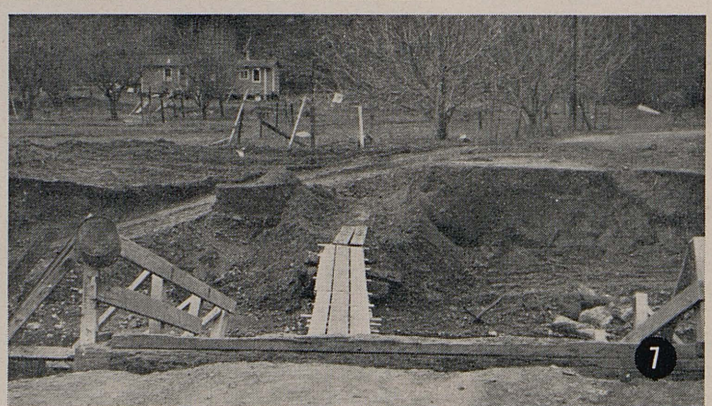
Sutter County

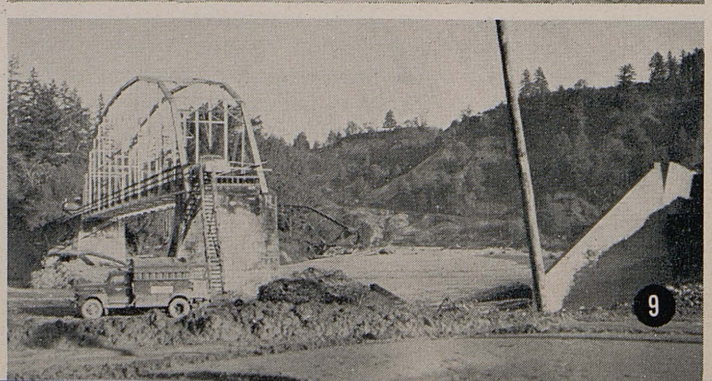
The Feather River Bridge at Nicolaus in Sutter County had a long history of flood damage which started while it was being constructed in 1916. This time a portion of the box girder spans (constructed because of the flood damage of 1938) were lost. Studies of the remaining portions of the bridge indicated the futility of replacing the missing portion when consideration was given to the probability of more flood damage in the future. Financed with federal and state funds,

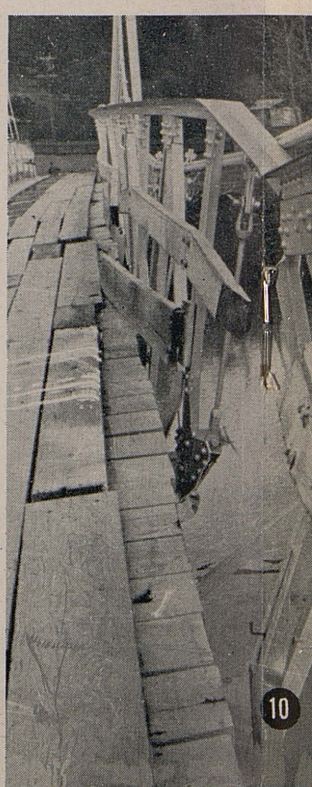


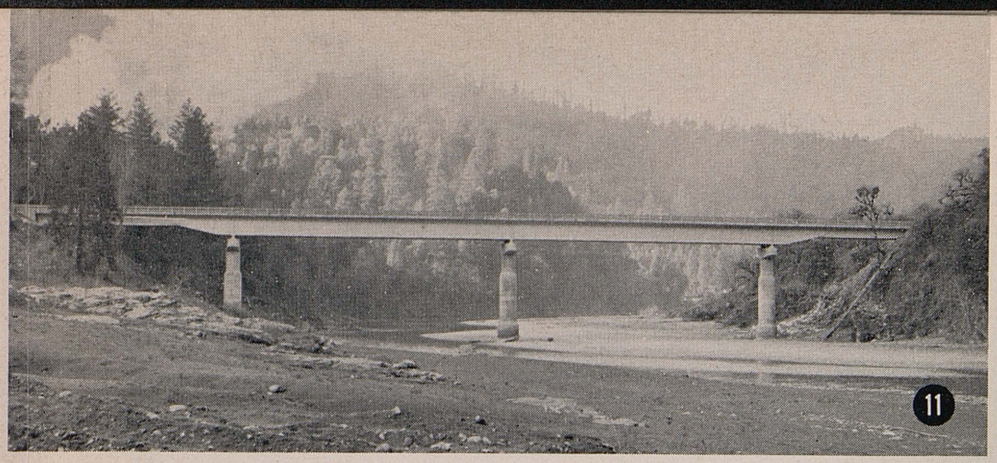


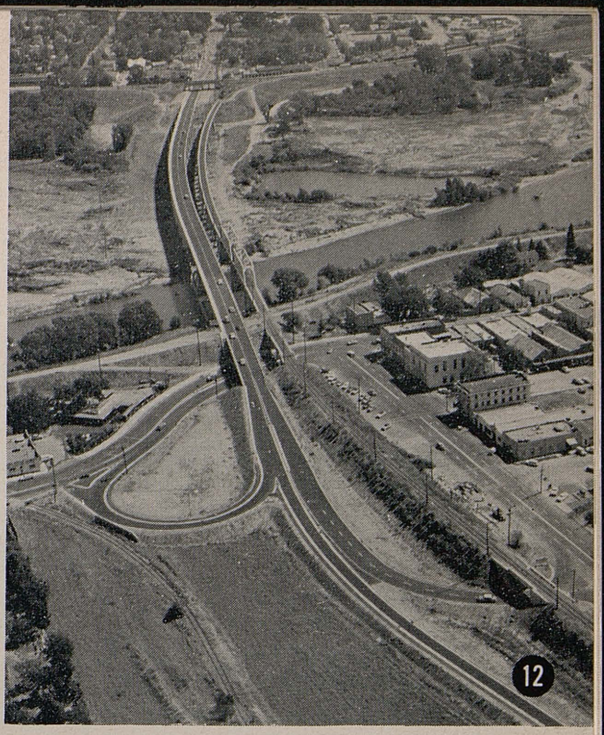
See Page 27. *Photo 1*—The temporary crossing over in Mendocino County shortly after the bridge ha[d] be[en] Willow Creek Bridge in Humboldt County after it h[as] twisted span of the old single-lane suspension b[ridge] in Humboldt County shown here is now being re[placed] *Photo 4*—Flood waters destroyed the Eel River Bridg[e] *Photo 13*). *Photo 5*—This temporary crossing on Count[y] over Kenney Creek after the bridge was washed out. Tylor-Foote Road Bridge on the Middle Fork of the Yu[ba] ties. *Photo 7*—Robinson Creek Bridge crossing on Me[ad] flood *(see Photo 15)*. *Photo 8*—The crossing over the Rivers, Tulare County after the flood. *Photo 9*—The flo[od] Fork of the Eel River in Humboldt County. *Photo 10*—Mattole River Bridge on Lighthouse Road in Humbol[dt] Bridge across the Trinity River in Humboldt County *(s[ee]* Bridge between Yuba City and Marysville replaces s[ix] new Eel River Bridge at Fort Seward (*see Photo 4*). *Ph[oto]* on the Longvale-Covelo Road, Mendocino County (*[see]* Robinson Creek Bridge, Mendocino County (*see Photo* near Nicolaus replacing the one washed out by the [flood] duct along the Russian River in Sonoma County re[placed] Photo 18—The new Kenney Creek Bridge, Mendocino



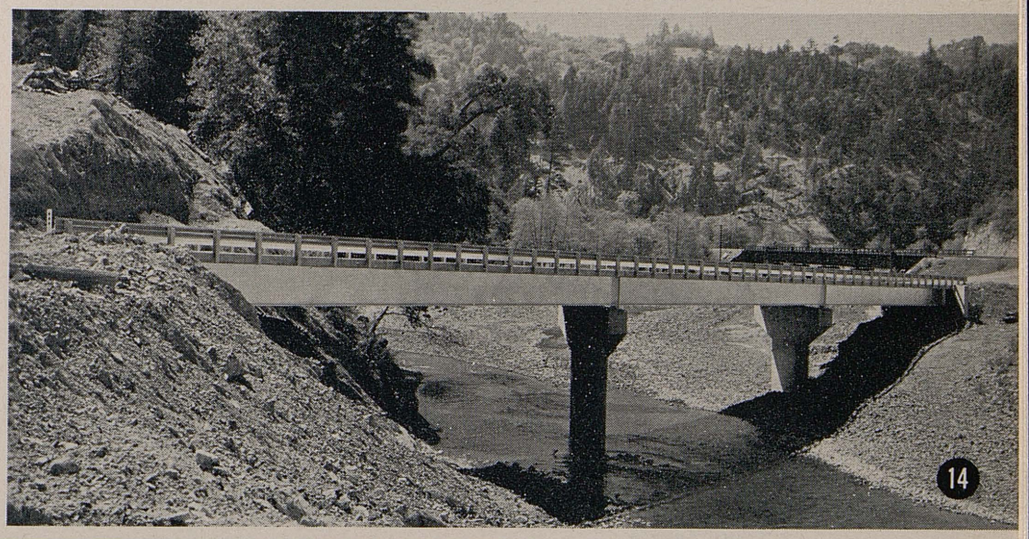


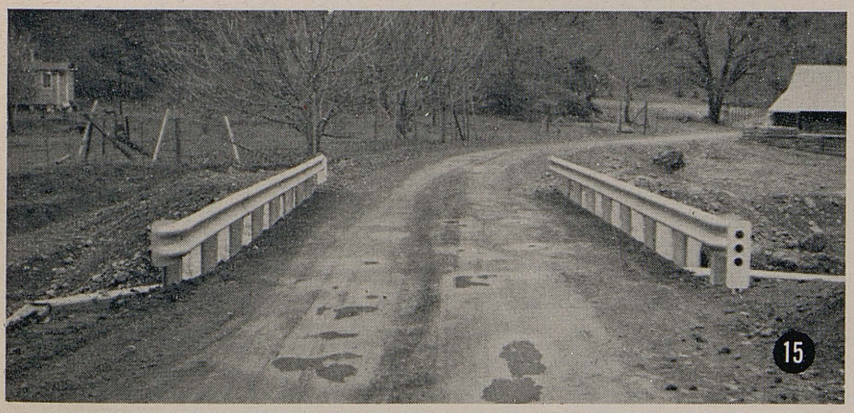


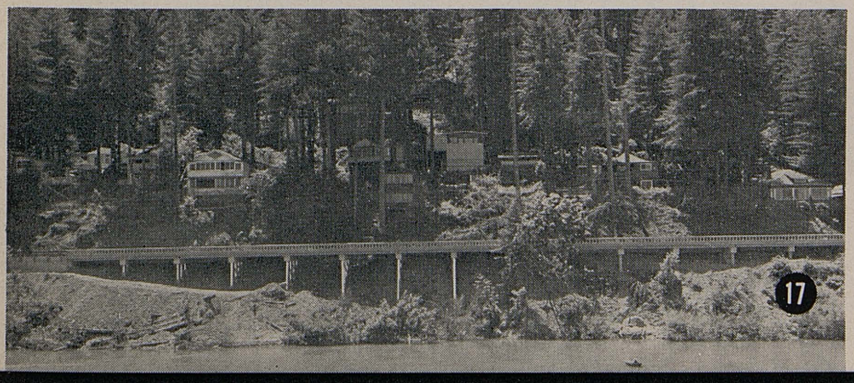




ssing over Outlet Creek on the Longvale-Covelo Road
ge ha[illegible] been washed out (*see Photo 14*). *Photo 2*—The
after it had collapsed (*see Photo 11*). *Photo 3*—The
sion bridge across the Klamath River at Martin's Ferry
ng replaced with a modern two-lane steel truss bridge.
River Bridge at Fort Seward in Humboldt County (*see*
g on County Road 429 in Mendocino County took traffic
ashed out (*see Photo 18*). *Photo 6*—Remains of the Old
k of the Yuba River between Nevada and Sierra Coun-
sing on Mendocino County Road 125 shortly after the
g over the Middle Fork of the Kaweah River in Three
9—The flood-damaged Moody Bridge across the South
Photo 10—Floating debris caused this damage to the
in Humboldt County. *Photo 11*—The new Willow Creek
County *(see Photo 2)*. *Photo 12*—The new Fifth Street
replaces spans destroyed in the flood. *Photo 13*—The
hoto 4). *Photo 14*—The new bridge across Outlet Creek
County (*see Photo 1*). *Photo 15*—The reconstructed
(*see Photo 7*). *Photo 16*—The new Feather River Bridge
ut by the 1955 floods. *Photo 17*—The new sidehill via-
County replacing a section damaged by the floods.
Mendocino County (*see Photo 5*).







a new structure consisting of 29 105-foot and two 68-foot prestressed precast T-beam spans was constructed at a cost of $2,300,000.

Similarly, the Feather River Bridge between Marysville and Yuba City on Fifth Street had been damaged severely. The concrete portions remaining were unstable and the through steel truss portion was too narrow for the mounting traffic demands. A new structure was placed at this site at a cost of $1,500,000 provided from state, federal, Sutter and Yuba County funds. It consists of eighteen 80-foot prestressed precast T-beam spans, one 88-foot prestressed precast I-beam span and two 150-foot continuous prestressed cast-in-place T-beam spans.

Yuba County

Besides contributing to the cost of of the above-noted Feather River Bridge on Fifth Street, Yuba County was forced to replace the flood-demolished Simpson Lane Bridge over the Yuba River at a cost of $300,000. This structure now consists of five 83-foot prestressed precast T-beam spans.

Sonoma County

The bridge damage in Sonoma County was confined to 11 sites (of which eight required new structures), with a total cost of $480,000. In all cases the new structures consist of structural steel and/or concrete superstructures on concrete substructures.

Tulare County

Damage was at 10 different sites in Tulare County with a total cost of $470,000, with new structures required at eight of the sites. These new structures also consisted of structural steel and/or concrete superstructures on concrete substructures.

Conclusion

To answer those who may be puzzled as to why it is taking so long to complete a program no more costly than one of the larger interstate freeway projects, the following should be added.

Many of the bridges destroyed were only one lane wide but were replaced with modern two-lane structures. As the difference in cost between a new one-lane bridge and a new bridge two lanes wide is not eligible for state aid, the funds to be furnished by the local agencies was greatly increased. This placed a heavy burden on Humboldt County, where the greatest portion of the damage occurred. Had not this county elected to provide modern structures in lieu of replacing the narrow bridges in kind, all work could have been long completed. However, in order to raise the one and one-third million dollars of county funds required to finance "betterments" under its flood restoration program, it has been necessary for Humboldt County to spread the reconstruction work over several fiscal years. This county is to be commended for its tenacity and its citizens for their patience.

The time-worn expression, "It's an ill wind that blows nobody good," certainly applies to the 1955 floods. With one exception, all of the county bridges suffering major damage were from 20 to 40 years old and were inadequate in roadway width and structural strength. Nearly all needed constant maintenance at excessive cost to keep them in service. In short, these bridges were due for replacement regardless of the floods. However, bridges in rough terrain are costly and the counties were having extreme difficulty in providing any more funds than were required for maintenance. The floods brought the situation to a head and resulted in the legislative action.

As a measure of the effectiveness of the bridge replacement program conducted under the Flood Relief Law of 1956, it may be noted that none of the new structures were damaged by the floods which occurred during the spring of 1958. This may account for the fact that although the floods of 1958 were in some respects more severe than those of 1955, the damage to public property was less than two-thirds of that caused by the earlier floods. It is thus quite obvious that permanent benefit is being derived from the State Flood Relief Programs and that the permanent Emergency Flood Relief Law enacted by the 1959 Legislature will be material help to the cities and counties in their struggle to modernize their street and road systems. Nevertheless, the expenditures under future flood restoration programs should become less and less as more of the substandard facilities are replaced with modern construction.

Norris J. Burke

Norris J. Burke, attorney with the Division of Contracts and Rights of Way in San Francisco, died July 29.

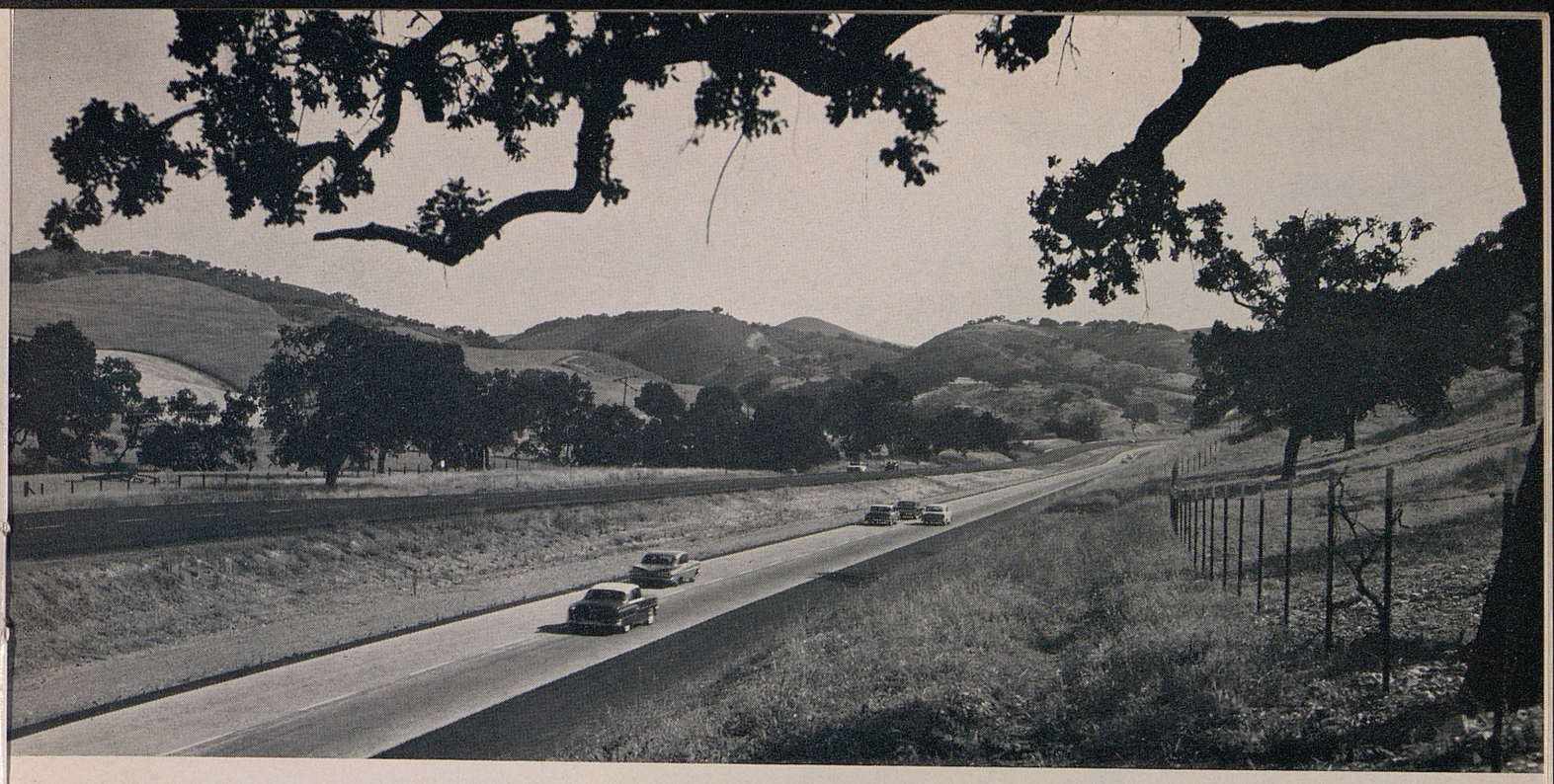
Burke had an extensive record in both state and federal service and in private practice. During his service with the Department of Public Works he had participated in much of its most complicated litigation.

A graduate of Boalt Hall, University of California at Berkeley, in 1926, Burke passed the Bar examination at the age of 20 and had to await his twenty-first birthday before he could be admitted to practice. In 1939 he was awarded a fellowship at Harvard University. While there he was granted both a master of laws degree and a doctor of juridical science. His first position with the State was as Chief Deputy Legislative Counsel at Sacramento in 1927. Between 1928 and 1936 he was in private practice in San Francisco and Sacramento.

In 1936 he left on a tour of the Far East, returning to Sacramento in 1937 to become a special investigator for the State Personnel Board. Following his attendance at Harvard, Burke was on the legal staffs of several federal agencies in Washington, D. C. In 1947 he returned to California as general counsel and co-ordinator of the California Legislative Committee on Constitutional Revision.

He became Principal Attorney with the Division of Contracts and Rights of Way in 1950, leaving in 1954 to become Chief Research Attorney of the Judicial Council and later Assistant Legislative Secretary to the Governor. In 1957 he returned to the legal staff of the Division of Contracts and Rights of Way in San Francisco.

Burke was a member of the California Bar Association and the Harvard Law School Alumni. He is survived by his wife, Edythe.



Report From District V

By A. M. NASH, District Engineer

As in past years, dominant element in the highway development program in District V is the construction or reconstruction of US 101 to freeway standards. As one of the two main north-south highway arteries in California US 101 is naturally subject to heavy traffic, as it provides a more scenic, often cooler north-south route than does US 99 in the central portion of the State. Moreover, as US 101 is continually improved more and more travelers choose this route which, in turn, makes greater demands on the remaining two-lane sections of US 101. Under these conditions it becomes of increasing importance that we provide the best possible divided four-lane highway on US 101 as soon as possible to meet the heavy traffic demands.

As a step forward in this program the Thomas Construction Company of Fresno completed in June of this year the "San Juan Interchange" in San Benito County separating US 101 from State Sign Route 156 which leads to Mission San Juan Bautista and Hollister. This eliminated an inadequate grade intersection having poor sight distance for motorists and consequently an area with, up to now, the highest accident frequency rate in San Benito County, as well as one of the highest in the district.

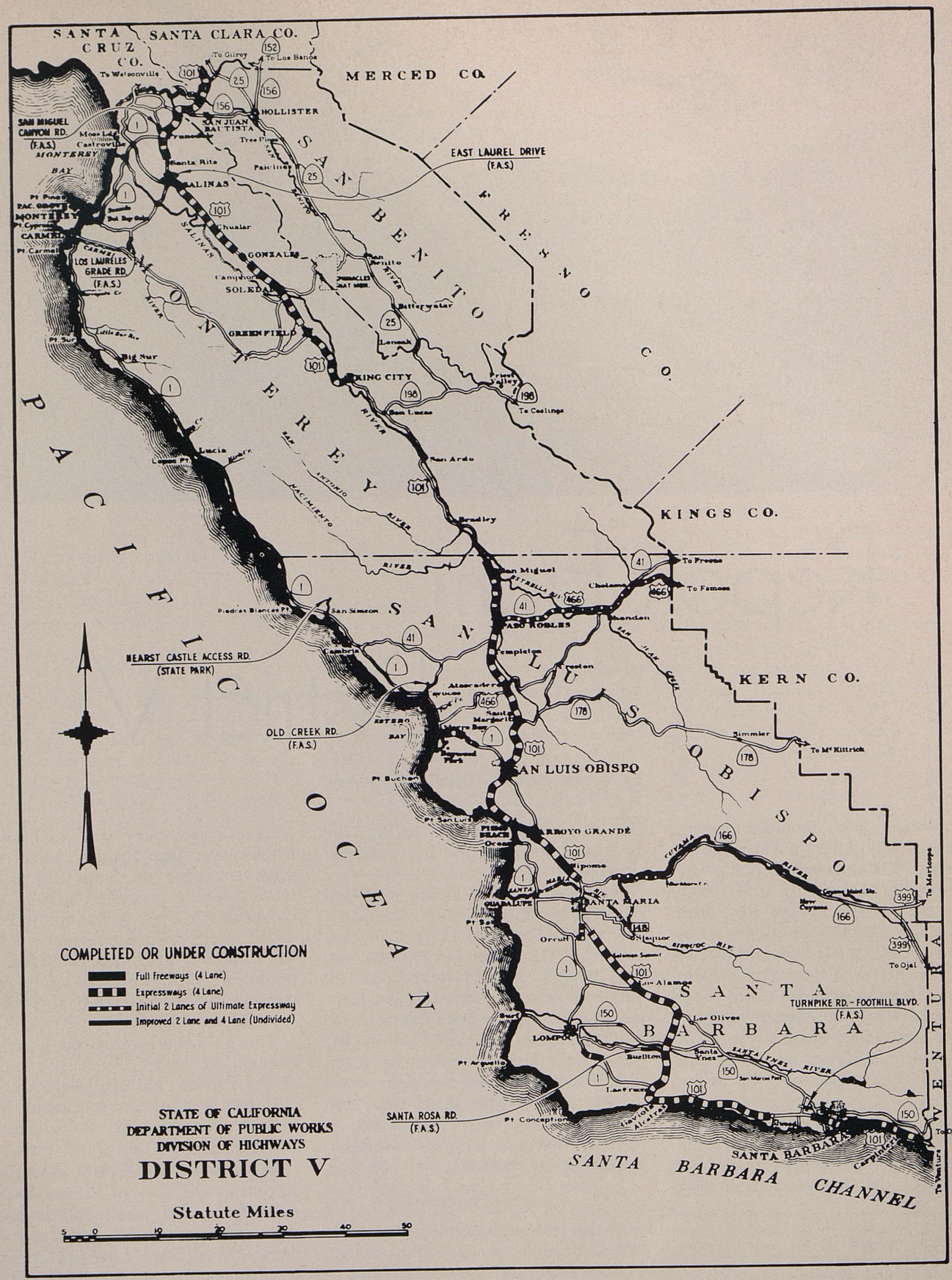
PHOTO TOP—The new US 101 freeway section between Buellton and the US 101-Sign Route 150 junction in Santa Barbara County.

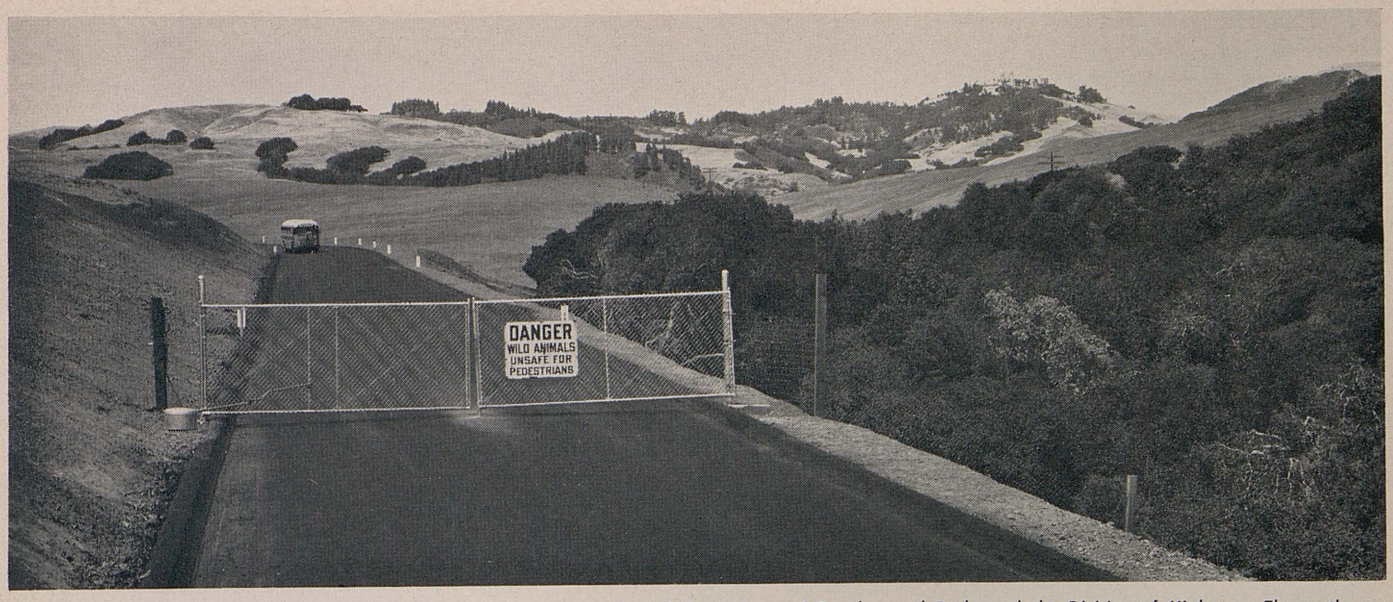
Atmosphere Preserved

At this intersection much of the familiar Spanish style adobe walls, wooden cross, and campanile, long a landmark and entry way to historic Mission San Juan Bautista, some two miles southeast on State Route 22, were carefully preserved, keeping intact as much of the quaint atmosphere of the intersection as possible while at the same time providing the traveling public with the essential safety and convenience afforded by a modern freeway interchange.

This $375,000 project was financed through the "antirecession" provisions of the Federal Aid Highway Act of 1958 and was completed in rapid time in line with the spirit and intent of that act.

In the northern, rapidly expanding section of the City of Salinas, heavy commercial and residential development adjacent to US 101 has rendered the divided four-lane section obsolete and presents a constant traffic


SANTA CRUZ CO.
SANTA CLARA CO.
MERCED CO.
SAN BENITO CO.
FRESNO CO.
KINGS CO.
KERN CO.
SAN LUIS OBISPO
SANTA BARBARA
VENTURA
PACIFIC OCEAN
SANTA BARBARA CHANNEL
MONTEREY BAY
SAN MIGUEL CANYON RD. (F.A.S.)
LOS LAURELES GRADE RD. (F.A.S.)
HEARST CASTLE ACCESS RD. (STATE PARK)
OLD CREEK RD. (F.A.S.)
SANTA ROSA RD. (F.A.S.)
EAST LAUREL DRIVE (F.A.S.)
TURNPIKE RD. - FOOTHILL BLVD. (F.A.S.)
HOLLISTER
SAN JUAN BAUTISTA
SALINAS
GONZALES
SOLEDAD
GREENFIELD
KING CITY
SAN ARDO
BRADLEY
PASO ROBLES
ARROYO GRANDE
SANTA MARIA
LOMPOC
SANTA BARBARA
To Los Banos
To Gilroy
To Watsonville
To Coalinga
To Fresno
To Famoso
To McKittrick
To Ojai
To Mariposa
To Ventura
COMPLETED OR UNDER CONSTRUCTION
Full Freeways (4 Lane)
Expressways (4 Lane)
Initial 2 Lanes of Ultimate Expressway
Improved 2 Lane and 4 Lane (Undivided)
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
DISTRICT V
Statute Miles
5 0 10 20 30 40 50



Reconstruction of the Hearst Castle access road was a co-operative project of the Division of Beaches and Parks and the Division of Highways. The castle can be seen on top of the ridge to the right.

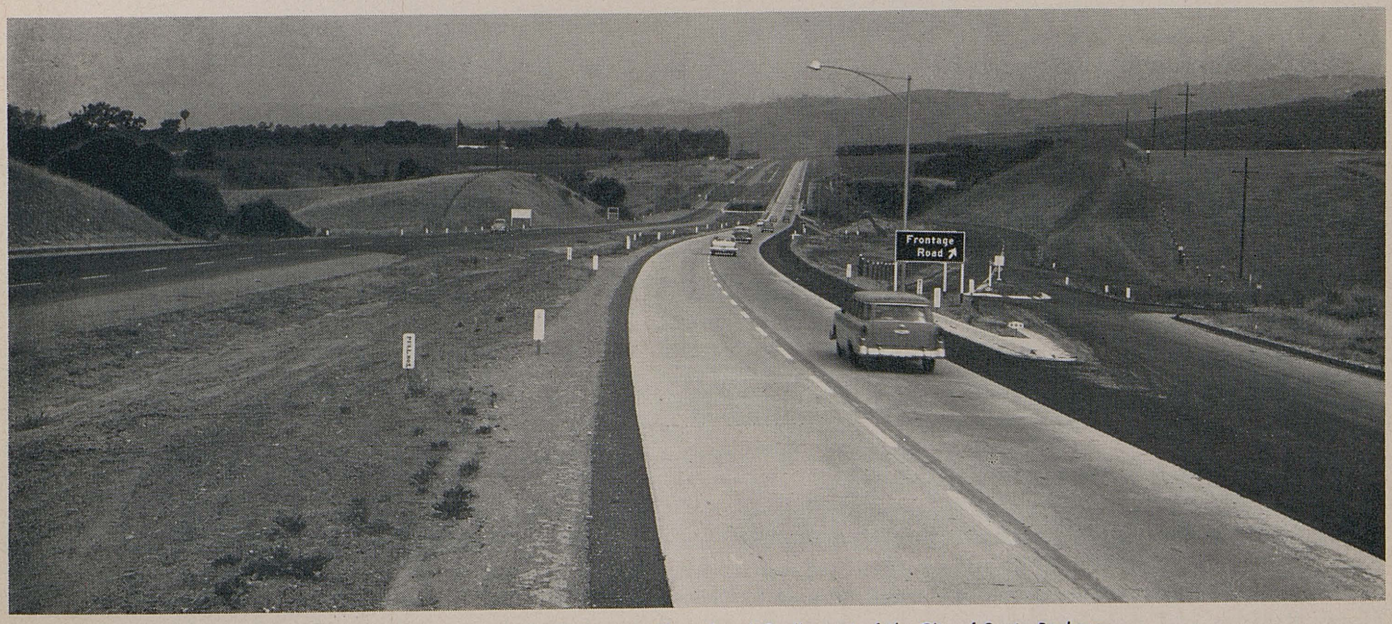
hazard throughout the area. Preliminary studies have been made looking toward construction of a northerly extension of the Salinas bypass freeway from its present terminus at North Main Street to a point one mile north of Espinosa Road beyond any present development, roughly paralleling existing US 101 and west of it. However, further planning has been in abeyance pending development and approval of a master plan by city and county officials which has been under study for some time.

Was Jointly Financed

The County of Monterey completed in June a $229,000 expressway on East Laurel Drive between Natividad Road in North Salinas and Sanborn Road in the large, unincorporated community of Alisal directly southeast of Salinas to provide a direct route around the city lessening traffic congestion in the center of the city as a result. This was a jointly financed federal-county-state project supervised by state employees.

In the heart of the fertile productive Salinas Valley, considerable planning and construction are now under way on previously undeveloped sections of US 101. At the City of Gonzales plans are complete for a freeway bypassing the city on the east and right-of-way acquisition is in progress.

Between Gonzales and Soledad to the south a 5.7 mile four-lane expressway project is now under construction directly paralleling the existing highway on its east side with portions of the present highway being utilized



A new freeway section on US 101 between Elwood and Orella west of the City of Santa Barbara.

as southbound lanes with the remainder serving as a frontage road when construction is complete. Separation structures are being completed at Camphora Road and at the entrance to Soledad State Prison.

Directly joining this project on the south, construction is now under way on the Soledad bypass freeway paralleling the westerly city limit and running adjacent to the Southern Pacific Railroad in many places. This project is actually the connecting link between the expressway north of the city, now under way, and an expressway from the Salinas River to one mile north of Greenfield completed in the fall of 1958.

Span Crosses Railroad

Bridge construction is a major item on this project, as another bridge across the Salinas River almost identical to and parallel with the existing bridge is required as well as a separation structure south of the city and construction of four-span parallel structures over the Southern Pacific Railroad and the existing US 101 north of Soledad.

Asphaltic concrete is being utilized as both a base and a surfacing material as a test section on this project.

Contractors John Delphia and Fred J. Early, Jr., operating as a joint venture, have both this $1,850,000 freeway contract and the $1,500,000 expressway project between Soledad and Gonzales, and are attempting to complete both projects in November of this year, although they have until next July to finish the first named project. If the contractor is successful in his efforts, motorists will have approximately nine miles of divided four-lane highway opened to traffic at one time.

Design plans are complete on the proposed freeway bypassing the City of Greenfield on its east side and right-of-way acquisition has reached a point where construction can begin as soon as funds become available.

Planning and design is under way on the section of US 101 in Monterey County between the Salinas River Bridge south of San Ardo and the southern county boundary at Camp Roberts and right-of-way acquisition is under way on the most southerly portion.

Traffic Congestion Eased

In San Luis Obispo County the opening of the $3,500,000 Paso Robles freeway bypass late last year was a culmination of over two years' construction work and has already proved its worth to the motoring public by speeding through traffic around the city and easing traffic congestion through the center of town.

In San Luis Obispo County this year our efforts concerning US 101 were concentrated on construction of the $1,080,000 Arroyo Grande freeway bypass which was completed in June. Located within the city limits, a 1.93-mile freeway was constructed generally parallel to the existing highway but on an improved more direct alignment.

Four structures were included in this project and, interestingly enough, each of a different type to meet differing physical conditions. The Bridge Street undercrossing carrying local southbound traffic onto the freeway lanes is of steel girder type while the Valley Road overcrossing involved construction of a prestressed concrete slab 22 inches thick to provide greater head room, without excavating too deeply into the ground. At Arroyo Grande Creek "T" beam construction on concrete piles was used, and the Grand Avenue overcrossing utilizes the box girder type of construction with adequate width for four lanes of traffic.

The remaining unimproved section of US 101 in San Luis Obispo County runs through the City of Pismo Beach, a distance of 2.2 miles. Design plans are complete, all necessary right-of-way has been acquired, and utilities and other improvements removed from the right-of-way so that construction can begin. The project is in the approved budget for the 1959-60 Fiscal Year, but advertisement for bids is being delayed pending a decision in the Congress on the federal nationwide financial problem for federal aid highways. With completion of this freeway section motorists will be able to drive on divided four-lane highway on US 101 for a distance of 69 miles without any major traffic hindrance.

Freeway Bypass Planned

Across the county line in northern Santa Barbara County plans are well along for construction of a freeway bypassing the City of Santa Maria to the east, and the greater portion of the necessary right-of-way has been acquired.

The City of Santa Maria has been experiencing an explosive growth in population over the last two years with a resultant residential and commercial expansion greatly adding to the congestion problem of local and through traffic on existing US 101 running two miles through the center of the city. The major portion of this expansion has been a direct result of the establishment and development of the Vandenberg Missile Base some 18 miles southerly.

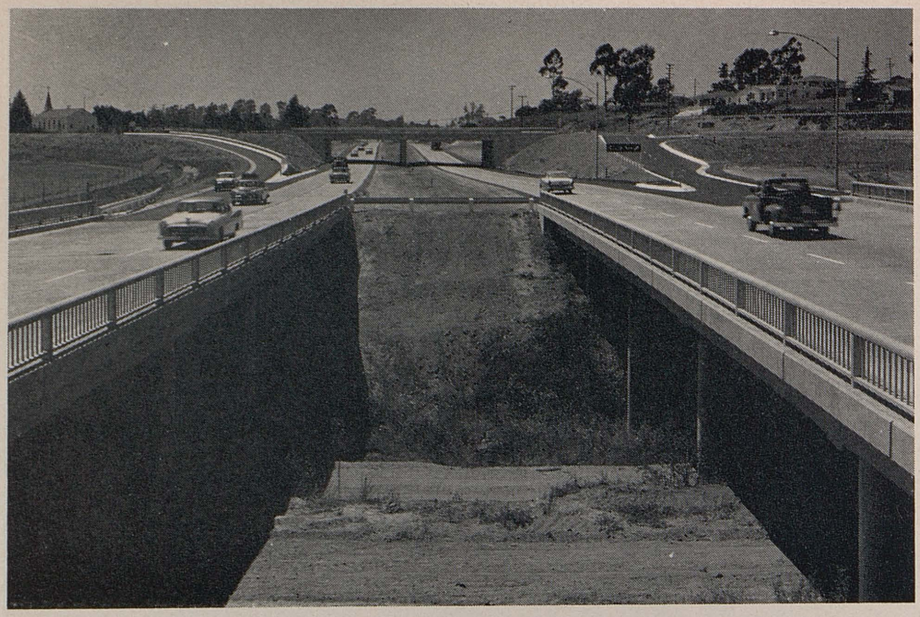
Four miles south of Santa Maria the southbound two lanes of the expressway between that point and one mile north of Los Alamos on US 101 are presently being reconstructed by A. J. Diani Construction Company of Santa Maria who began work in July of this year.

The present roadway, constructed in 1932, is being widened from its present 20-foot to 24-foot width and repaved with plant-mixed surfacing. Wider shoulders are also being provided to bring these heavily traveled southbound lanes up to modern expressway standards. The northbound lanes of this expressway had been completed in 1955, but due to limited funds this final stage in expressway construction could not be completed until this time.

Freeway Is Extended

In the center of Santa Barbara County, Fredrickson and Watson Construction Company of Oakland completed work in February of this year on a 5.0-mile section of divided four-lane expressway on US 101 between the northern limits of Buellton and the intersection of US 101 with State Route 150. Completion of this strategic section of US 101 now provides the traveling public with divided four-lane highway from a point four miles south of Santa Maria to the rail-

UPPER LEFT—A reconstructed section of Sign Route 41 in northern San Luis Obispo County. UPPER RIGHT—An aerial of the new section of US 101 freeway west of Santa Barbara near Elwood. LOWER—An improved section of Turnpike Road north of US 101 near Santa Barbara.



These twin bridges carry the US 101 freeway across Arroyo Grande Creek in San Luis Obispo County.

road point of Elwood some 10 miles west of Santa Barbara with minor exceptions at the Santa Ynez River south of Buellton, and a short section near Refugio Beach State Park.

We hope to soon begin construction of a divided four-lane freeway from Elwood to the westerly limit of Santa Barbara at the Hollister Wye joining a freeway section completed in 1958, closing one of the most significant and heavily traveled gaps in divided four-lane highway in the county. This project is also in the approved budget, but similar to the Pismo Beach job in San Luis Obispo County, the advertisement is being held up as a result of the present federal highway financing dilemma in the Congress.

Through co-operative planning with the County of Santa Barbara, Turnpike Road, a main access to this proposed freeway, was the subject of a $170,000 road improvement project so as to adequately handle the increased traffic flow on this artery expected after completion of the freeway project.

This area is faced with a fast growing traffic problem caused by the rapid industrial and residential growth of Goleta, previously a small citrus growing and packing community just west of Santa Barbara on the coast.

An additional significant factor in the growth of this area is the new and expanding University of California at Santa Barbara campus recently relocated at Goleta. To handle the resulting heavy traffic in this area, design is under way on State Route 236, referred to as the Clarence Ward Memorial Highway in honor of a former State Senator from Santa Barbara County. This new route on new alignment begins in the Hope Ranch area, skirting the university and terminating at US 101 near Patterson Avenue where separation and interchange structures will be constructed.

Future Needs Considered

Detail design work, as well as right-of-way acquisition, is well along on the proposed US 101 freeway section in the City of Santa Barbara between Bath Street and El Sueno Road. A divided four-lane freeway is already in existence beyond El Sueno Road to the west. The connecting section to the east between Bath Street and Salsipuedes Overhead, while only a conventional four-lane divided road, is handling traffic fairly well at the present time, but planning is presently under way to determine what will be necessary to bring this section up to full freeway standards.

On the Bath Street-El Sueno Road section some right-of-way for a widening of the present road was acquired just prior to World War II, but the type of improvement then planned was halted by the war. The much more complicated improvement now needed has naturally required further expansion of previous acquisition and much more new right-of-way. Right-of-way acquisition is now proceeding in line with funds available.

An expressway-to-freeway expansion project is nearing completion at the eastern fringe of Santa Barbara at Milpas Street, along with the expansion of a section of undivided four-lane highway at and near Ortega Hill to freeway standards. Both projects have been combined into one contract. The work lies between Park Place in Montecito and the Salsipuedes Street overhead where US 101 crosses over the railroad tracks adjacent to the street. An interchange is being constructed at Milpas Street where US 101 crosses overhead on twin 239-foot steel girder bridges. Several small grade crossings are being closed and all direct access to the highway is being eliminated. Further east near Ortega Hill another interchange is being constructed at Sheffield Drive on the outskirts of Montecito. Ortega Hill itself is being cut down 25 feet at its crest to improve sight distance. Completion of this $1,175,000 contract by Madonna Construction Company of San Luis Obispo is scheduled for December of this year.

Conversion to Full Freeway

From Ortega Hill to 0.5 mile south of the Ventura County line plans are being developed to convert the existing divided four-lane expressway between these points—except for the Carpinteria freeway bypass already in existence—to full freeway standards on the existing alignment except for a proposed new alignment through the hills and over Rincon Creek near the Ventura county line. A public hearing was held in the Veterans' Memorial Building in Carpinteria on March 25, 1959, to discuss these proposals. This meeting was attended by 88 interested persons who, after the Division of Highways presentation, submitted various additional data con-

cerning the freeway routing which are now under study by the district.

Sign Route 1

Although not subject to the heavy traffic demands existing on US 101, State Sign Route 1 along our rugged, scenic coast from Morro Bay to the Carmel River is being subjected to increasingly heavy tourist traffic as a result of the opening of the Hearst Castle at San Simeon as a state historical monument. Thousands of tourists are visiting this attraction during the summer, and surprisingly the demand is also holding up during the winter months.

Further south, centered around Lompoc, the development of the huge Vandenberg Air Force Missile Base, as well as the Naval Facility at Point Arguello, has caused a very considerable increase in traffic on State Sign Route 1 in that area. For these reasons then, it is understandable that improvement of critical sections of State Sign Route 1 will assume increasing priority importance.

Population Growth Heavy

Farther to the north, in the rapidly expanding Monterey Peninsula area, traffic growth has been both exceptionally heavy and sustained since World War II. Not only has there been heavy population growth, but there has also been a constantly increasing volume of recreational travel into this area each year, with the result that the existing highways are being overburdened with the local and recreational traffic, with consequent congestion and high accident rates.

This district has been doing everything in its power to speed the development of adequate highway facilities to meet this heavy demand through its planning and design activities on State Sign Route 1 and Legislative Route 117, the Monterey - Salinas Highway, which are the two major routes leading into and through the area.

From the Santa Cruz county line to 1.5 miles south of Castroville, the California Highway Commission has adopted a freeway routing on new and improved alignment. Both the highway routing and detailed design work is being done in co-operation with District IV who have the responsibility for State Sign Route 1 in Santa Cruz County.

A public meeting was conducted on August 20th to discuss proposed plans for freeway development on State Route 1 from 1.5 miles south of Castroville to Seaside and from Marina to Fort Ord.

Freeway Agreements Negotiated

Heavy emphasis is being placed on development of a freeway system on the Monterey Peninsula for both State Sign Route 1 and Legislative Route 117. Hearings were held and routes were adopted in 1957 and early 1958 on both routes and freeway agreements negotiated with the City and County authorities.

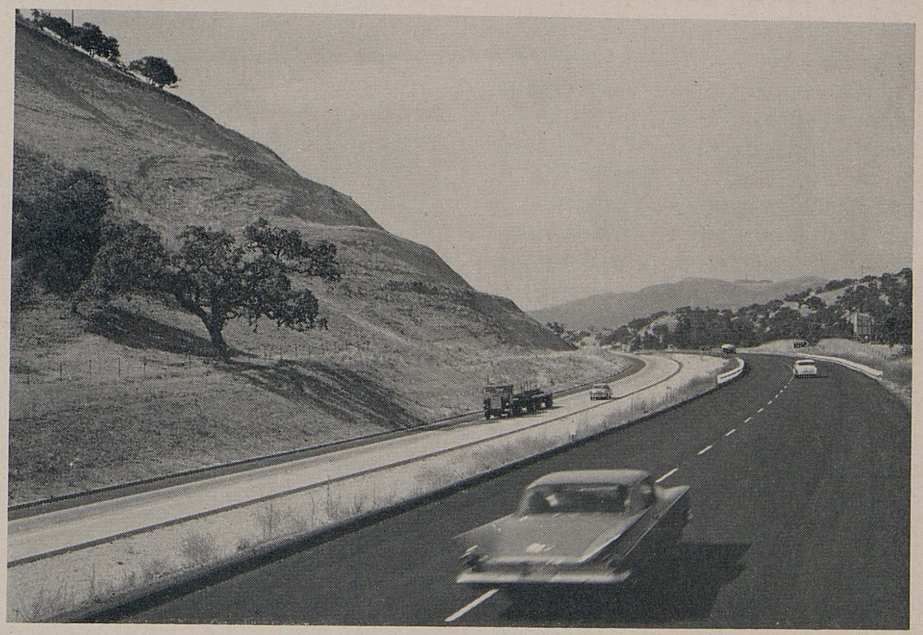
Design is well under way from the south city limit of Monterey to Seaside and right-of-way acquisition and clearance in Monterey is progressing at a satisfactory pace.

Construction is presently well along on the 0.8 mile freeway project from the southern city limit of Monterey to the northern section of Carmel on State Route 1. This $1,000,000 project mainly involves construction of a trumpet-type cloverleaf interchange connecting the Carmel Gate road to Del Monte Forest and Pebble Beach beyond, the Pacific Grove-Carmel Highway, and State Sign Route 1. Annual traffic counts at this intersection in July 1958 recorded weekday 16-hour counts of 19,000 vehicles using State Route 1, 4,000 on the Pacific Grove-Carmel Highway, and 3,000 entering the toll gate and road to Del Monte Forest, indicating the need for this grade separation structure.

To keep local residents fully informed of our work progress in this area, the Resident Engineer on the project has advised local radio and television stations, and local newspapers of all major or minor construction changes affecting traffic conditions. As an added convenience to motorists our Design Department established an order of work designed to keep four lanes of traffic open on State Route 1 at all times. This will require 15 stages of detour construction before this project is completed in the spring of 1960.

Routes Adopted

Due to the greatly increased traffic to and from Hearst Castle and its surrounding seaside resort areas, our planning department has been concentrating their efforts on freeway development on the existing State Route 1 from Morro Bay to San Simeon. In



A section of new US 101 freeway between the northern outskirts of Buellton and the Sign Route 150 intersection.

1956 public meetings on freeway proposals from Morro Bay to Cayucos, from Cayucos to one mile south of Cambria, and from San Simeon to San Carpojo Creek at the Monterey county line, all following generally the present alignment, resulted in adoption of those routes by the California Highway Commission, and design and right-of-way acquisition are progressing satisfactorily on these sections.

In 1958 public meetings concerning development of freeways through Cayucos, and from the Cambria Maintenance Station to one mile north of San Simeon led to the same favorable results, and detail design work is now under way on those projects. A freeway agreement was executed this August pertaining to the section from one mile south of Cambria to the Cambria Maintenance Station.

Construction by the California Department of Water Resources of the Whale Rock Dam near Cayucos required relocation of Old Creek Road, a federal aid secondary county road, as most of the existing road will be inundated by the reservoir resulting from the dam construction. The Division of Highways was asked by the Department of Water Resources to handle both the design and construction of this relocation.

Co-operation Cited

The dam and road construction is being financed by a bond issue voted by the people of San Luis Obispo, augmented by funds voted by the State Legislature to pay for the share of the water supply which will be provided for two state institutions in this area. Co-operation on general and technical details of work has been excellent and the highway construction was divided into two units to accommodate phase construction on the dam itself.

Another highway improvement in this area requiring co-operation of state agencies to achieve a desired goal was completed in June of this year when the Division of Beaches and Parks and the Division of Highways co-operated to reconstruct a 1.7-mile two-lane, plant-mixed surface road from State Sign Route 1 near San Simeon to a connection with the access road on the steep mountain to the Hearst Castle State Monument. Included in the work was construction of a 600′ x 140′ parking lot.

On State Route 1 from Morro Bay 5.4 miles east towards San Luis Obispo, construction is in its final stages on a $1,260,000 improvement designed to provide a modern highway. The first 2.7 miles easterly from Morro Bay is being constructed to four-lane expressway standards, and the adjacent 2.7 miles provide the initial two lanes of a future four-lane expressway on improved alignment.

From the Orcutt "Wye" one and one-half miles south of Santa Maria on US 101 to Clark Avenue in Orcutt on State Sign Route 1, the Madonna Construction Company of San Luis Obispo recently began a $570,000 conversion of this substandard two-lane highway to four-lane divided standards to accommodate the recent heavy influx of traffic between Santa Maria and the Vandenberg Air Force Missile Base.

Substandard Roadway Replaced

Between Lompoc and US 101 at Las Cruces approximately three miles of State Sign Route 1 is being reconstructed on greatly improved alignment replacing a substandard roadway completed by the County of Santa Barbara in 1933. Here again construction of the Vandenberg Air Force Missile Base, with the resultant heavy increase of traffic, has served to sharply emphasize the serious deficiency of this San Julian Road as it is locally called. Stecker and Scott and J. H. Harrison of San Ardo expect to complete this $900,000 project in October of this year.

Completion of work on Santa Rosa Road, a Federal Aid Secondary county road out of Buellton toward Lompoc in December, 1958, has served well to take some of the traffic load off the main state routes in this critical area and is a good example of county-state co-operative planning for mutually beneficial highway development.

The east-west laterals in the district are now receiving increasing attention as a result of population and economic growth on the central coast and San Joaquin Valley areas. On State Sign Route 166 for example, a $3,300,000, eight-mile, two-lane highway relocation is being completed as an adjunct to and result of construction of the Twitchell Dam on the Cuyama River designed to serve the water needs of the Santa Maria Valley.

Involved in this reconstruction is a $1,000,000 bridge over the Huasna River. One of the largest of its type in the State, it has a clear roadway width of 28 feet, is 1,570 feet long, with piers from 65 feet to 140 feet above ground. Further details of this interesting project can be found in the May-June issue of this magazine.

Further improvement of this narrow, winding, substandard two-lane highway to future four-lane expressway standards is now in various planning and design stages. A public hearing was conducted at New Cuyama on March 19, 1959, to consider expressway routings on several sections from US 101 near Santa Maria to the Division of Highways Maintenance Station near New Cuyama. A routing generally following the existing roadway but on much improved alignment was developed by the California Highway Commission on August 26, 1959. A section from Deadman's Gulch to New Cuyama was adopted by the commission on June 20, 1956.

Prompt Action Taken

State Sign Route 178, a lateral used for cross traffic mainly between Kern County and the central coast, is also receiving increased attention. Proposals concerning improvement of a nine-mile section from 1.0 mile west of San Juan Creek to 0.5 mile west of Simmler Road were discussed at a public hearing at Simmler on September 25, 1958, and the route was promptly adopted by the Highway Commission a little over a month later.

On State Sign Route 41, the main east-west artery in the district, three separate construction contracts were let last fall using funds provided by the "antirecession" provisions of Federal Aid Highway Act of 1958.

Beginning 12.5 miles east of Paso Robles, the most westerly of the three projects bypasses the community of Shandon to the north on improved

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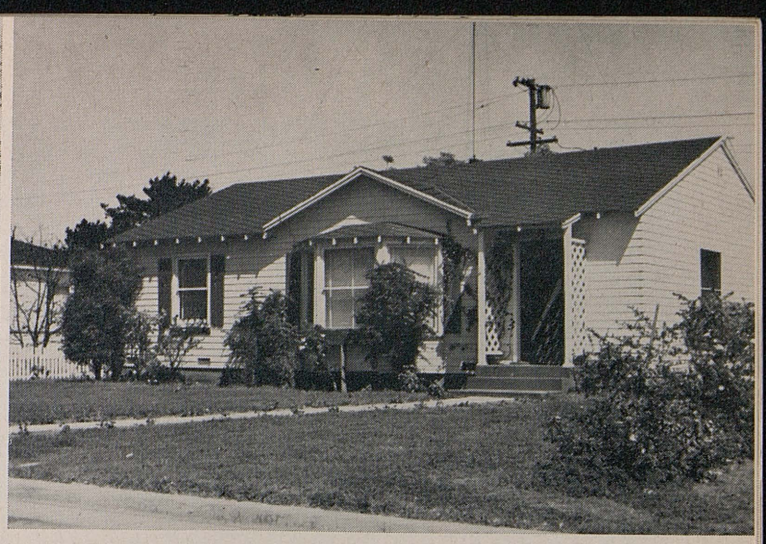


Relocation

People and Homes—Where Do They Relocate When the Freeway Comes?

A Report of the Land Economic Studies Section, Right-of-Way Department
Summation by JAMES R. SMITH, Headquarters Right-of-Way Agent

THE MAJOR function of any highway right-of-way department is to acquire the lands upon which a proposed highway facility is to be constructed. Some of these lands will be vacant and some will be improved. All will reflect varying uses and will be used to varying degrees.

Most right-of-way parcels in a typical project will be in private ownership. Most, then, will have an assessed value and will be taxed for local government support. Since the public use contemplated for the parcels will be a tax exempt use, these properties will no longer be tax assessible after transfer to public ownership. If it is assumed that the total local tax needs remain unchanged after this transfer to an exempt use, then it readily follows that someone or something must make up the "loss" in subsequent higher taxes.

Property owners whose lands are not required for the proposed facility are thus alarmed that they and their neighbors will be the "someone" whose tax bills will be raised to make up the difference. They become understandably concerned.

PHOTOS TOP—*A typical instance of willingness of home owners to reinvest in higher value properties after acquisition of their former residences for the freeway. Photograph (left) shows home purchased by the State in 1949, with an assessed value of $530. Photograph (right) is property this same owner subsequently acquired in 1950 with an assessed value of $1,800.*

Measuring the Difference

It is logical to attempt to determine this aspect of freeway effect by a relatively simple process involving the examination of three components of the overall picture. These are: (1) the land within the right-of-way upon which the facility is to be built; (2) the homes and buildings within the right-of-way which are acquired and subsequently cleared; and (3), the people who own and occupy the right-of-way homes and buildings who are subsequently displaced.

With respect to the first aspect, it is clear that the land which will ultimately lie under the freeway itself is going to be tax free, certainly for the life of the improvement. (Traffic service from the improvement and traffic and other benefits generated by it are not generally looked at from the tax viewpoint, to be related back to the assessed value of the right-of-way lands to see if, in fact, there is any ultimate gain or loss.) And so in a direct sense, the tax values attributable to the land itself which is needed for the freeway facility are presumed to be "removed" from the community base, and this is a realistic assumption.

Moving to the second and third components, the tax values attributable to homes and buildings are likewise assumed to be "lost" to the community, since it is evident the structures on improved properties are subsequently cleared from the freeway right-of-way. Moreover, when improved residential properties are involved, families are required to give up their homes, and concern is also expressed that a substantial percentage of these "tax paying units"—families—will move out of the area to other competing communities.

When one considers only these last two aspects—an area's people and their homes and enterprises—as a prime measure of the economic stability of a community, disruption of either or both is clearly cause for concern. It would follow, however, that if it were demonstrated that most families remain in the community, and if most of the improvements are relocated therein as well, the disruption would in reality be only a temporary one and taxwise, at least, it might be shown that much of the concern may be largely needless. The scope and purpose of this summation are thus suggested.

Study Limits and Purpose

This study of two communities analyzes the subsequent movements of people and the improvements they occupied to ascertain if there is any degree of validity to the statement that a large portion of tax impact can be measured by simply writing off all the taxpaying owners displaced by a freeway, as well as the tax values attributable to their homes.

Presently when freeway improvements are initially proposed for certain areas, such assumptions of complete loss and disruption are often made. The picture of freeway impact upon the community may thus be exaggerated, at least to the extent that such effects may not actually be so directly nor completely inferred.

As noted above, it is easily perceived that the land itself within any highway right-of-way becomes ultimately tax exempt. The need for an improved public service in itself should justify the use of land upon which that service is to be furnished. The beneficial effects on land values for all of the area coming within the influence of an improved service facility have been tabulated and reported in many previous studies. (Nolen and Hubbard, "Parkways and Land Values"; Norris and Elder, "A 15-year Study of Land Values and Land Use Along the Gulf Freeway"; Kelly, "Industry and Freeways" and "Industry and Frontage Roads"; Bangs, "Boost for Freeways"; Young, "Escondido Study" and "Freeway Ups Business"; and many others.) No study or further discussion of this component of the overall picture is thus attempted herein.

However, it is not at all widely known how many freeway displaced families relocate within, and thus remain in, a community after right-of-way acquisition. It is furthermore not at all widely known how many homes and buildings are actually destroyed by freeway construction and how many are relocated and rehabilitated within the area to continue to serve out their remaining utility. It is therefore the purpose of this study to follow—in two adjoining Southern California cities—these people as well as their former buildings to determine what is in fact the "after" situation in one instance. Such data may well be helpful in ultimately establishing a typical sequence of owner and building relocation activity in a residential area. Cities through which a comparable improvement is proposed may subsequently find such a sequence helpful in analyzing and assessing similar factors in their own community.

No attempt will be made to determine if the two study communities themselves are "typical" communities. People and their homes are the essential factors covered herein and we are, in a very direct sense, measuring the reactions of both to a directly affecting public improvement. However, it will be left to the reader to judge, after his own reflection, how typical may be the sequence described hereinafter and what carryover it will have to his own community.

The tax base concerns already described are anxieties "unaffected" property owners generally express, i.e., those whose property is *not* being taken. Fearing that the right-of-way homes and owners, and the taxes they represent, will be lost forever, they are the ones to whom the assumed higher taxes pose an undesirable prospect. The data reported upon herein will thus be of most interest to these property owners, for it is actually they who, in the absence of available facts, are left to assume that owners, homes, and taxes, are forever lost.

Method Explained

A direct approach has been taken. It has been implied in preceeding sections and is outlined below:

1. After freeway acquisition, what happens to the *people* directly involved?
   a. Where do they go?
   b. What replacement real estate do they buy?
   c. How do the assessed values of these replacements compare with those formerly owned?
2. After freeway acquisition, what happens to the *building improvements* directly involved?
   a. Where do they go?
   b. What is the "before and after" assessed value comparison?

Each of these two elements will be evaluated in the sections which follow. First of all, however, a brief description of the study area and its freeway improvement will be helpful.

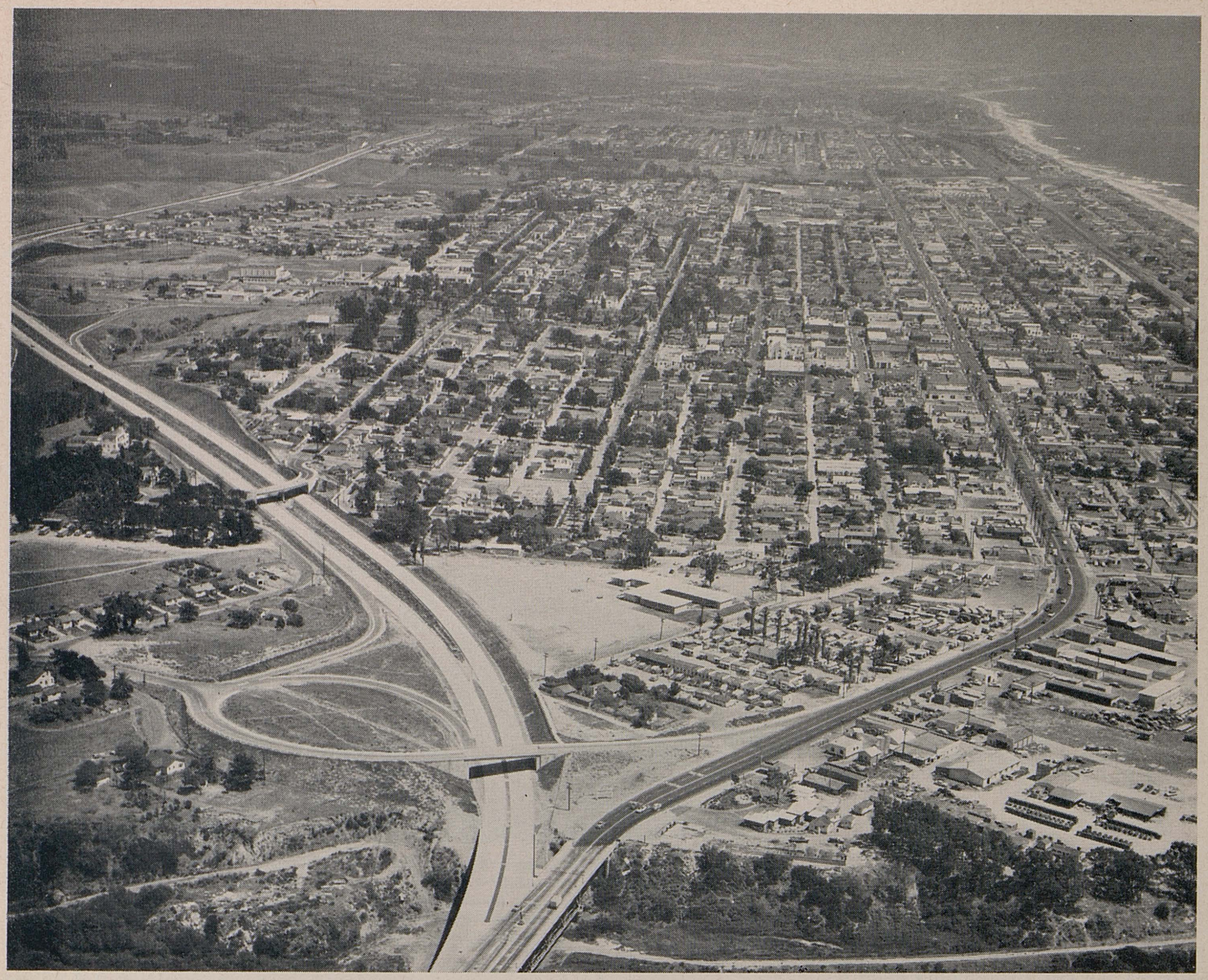
Study Area and Freeway Facts

The side by side communities of Oceanside and Carlsbad are located along the Southern California coast approximately 35 miles north of the City of San Diego. The mild climate, nearby white sand beaches, and a spectacular surf have always been community assets, and the fact that both cities began and grew primarily as resort and residential areas reflects the early emphasis which these environmental aspects received. However, with the establishment in 1942 of nearby Marine Corps Camp Pendleton, the continued growth and prosperity of specialized farming in the surrounding agriculturally rich areas, and the gradual influx of light industry and manufacturing—all of these in many ways also attributable to the climate and other area and community amenities—both cities have become increasingly less resort-oriented over the years. The combined population of both is estimated at 28,000, about 21,000 of these living within the Oceanside section itself.

The 10½-mile Oceanside-Carlsbad Freeway was completed and opened to travel on November 16, 1953. Rights-of-way for the complete project involved the acquisition of 292 separate parcels of real estate, the bulk of which were acquired in 1950 and 1951.

Primarily, the freeway traversed vacant, undeveloped lands, rural homesite sections, and city residential areas. Two hundred five of the entire 292 parcels acquired were either completely unimproved or had only relatively insignificant, minor improvements. One hundred seventy actually involved the purchase of only a portion of a larger holding, and only upon nine of these remnants were significant improvements located within the portion acquired.

One hundred twenty-two parcels out of the total constituted acquisitions of entire properties, and 78 of these in turn contained one or more major building improvements. Eighty-



An aerial view looking south at the City of Oceanside and towards the City of Carlsbad, which is in extreme background. The 10½-mile freeway shown as the left leg of the "Y" with the old highway is visible on the right.

seven improved parcels were involved, then, in the Oceanside-Carlsbad project, and a total of 90 separate buildings and structures were purchased and cleared from the freeway right-of-way.

It is to these property improvements and to their owners that this analysis will be directed.

Disposition of Improvements

Of the entire 90 structures directly affected by the freeway alignment, 66 or almost three-fourths were relocated from the freeway right-of-way to other parts of the Oceanside-Carlsbad cities. In those instances where it was

DISPOSITION OF IMPROVEMENTS

Improvements	*Disposition*	*Assessed value at time of state's acquisition*	*Assessed value after relocation*
22	Retained and relocated by same owners	$39,070.00	$58,602.00
8	Exchanged with or sold to other right-of-way property owners	8,340.00	9,921.00
36	Sold to others at public sales	44,560.00	58,684.00
66 *	*Subtotal*	$91,970.00	$127,207.00
17	Demolished	$14,150.00	------
4	Moved out of area	3,950.00	------
3	Disposition not determined	8,680.00	------
90	*Total*	$118,750.00	$127,207.00

* All 66 within the Oceanside-Carlsbad area.

economically feasible to do so, and where owners so desired, relocation and rehabilitation costs were paid by the State, and the improvements were moved by the owners to new locations clear of the right-of-way. In the remaining instances, improvements purchased by the State were sold to the highest bidders at public and sealed bid auctions and these new owners subsequently removed them from the construction area. Of the entire 90 improvements involved, only 17 were of such construction and in such condition that relocation was not considered desirable. These were ultimately demolished for salvage. Four other buildings were relocated entirely out of the study area, and the exact disposition of the three remaining structures could not be clearly determined.

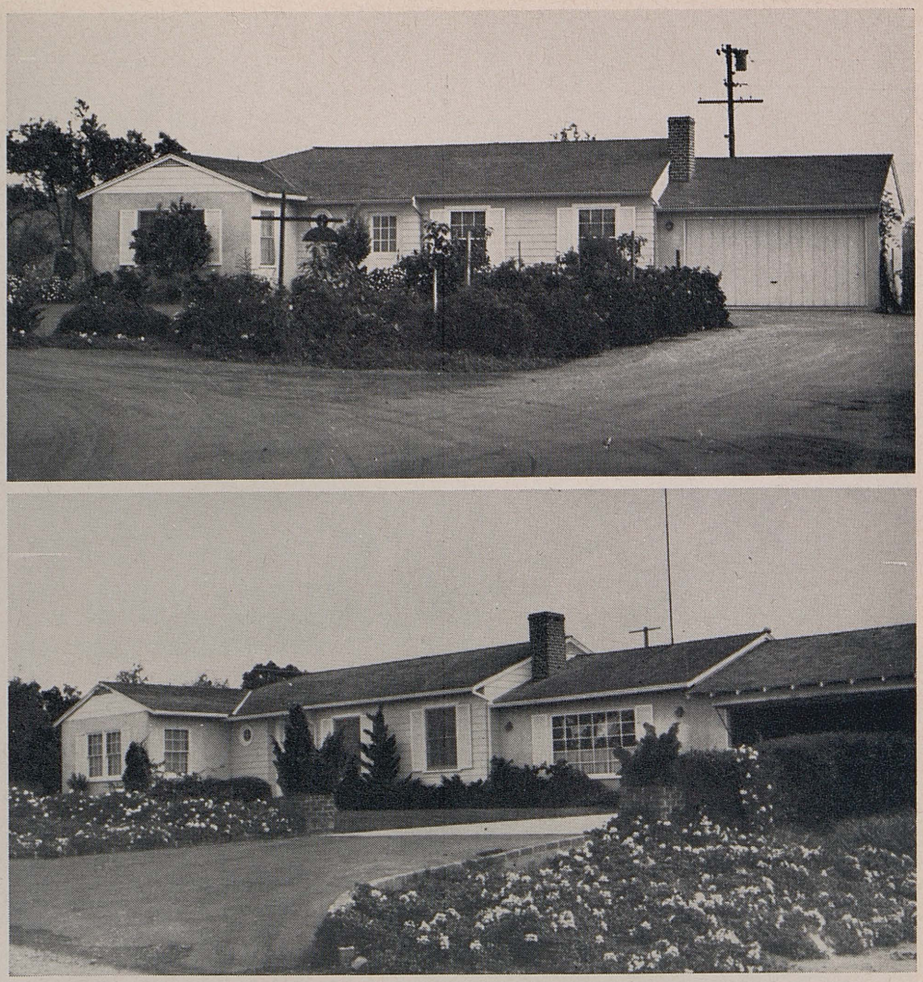
The disposition of all improvements and their before and after assessed values appear on page 41.

It can clearly be seen that within the Oceanside-Carlsbad area *73 percent of the improvements which were removed from the highway right-of-way were not lost to the community* but instead were successfully relocated to other sites clear of the proposed construction.

Moreover, as a part of the entire relocation and rehabilitation process, the improvements were placed upon new foundations and received new utility and service connections and painting and decorating in most instances. All current building code requirements were met in the rehabilitation process, which meant—for older homes at least—rewiring and replumbing in many cases. Fencing, patio developments, landscaping, and other miscellaneous improvements were allowed for, and owners characteristically took full advantage of their opportunities to modernize and upgrade these aspects.

Thus as a result of analyzing these data, it may be premised that not only will most freeway-displaced homes be successfully salvaged, but that they can be expected to end up in a significantly improved condition to support higher "after" values as well.

Merely writing off improvements and the taxes they support, then, does not constitute a fair and realistic initial approach to the freeway impact problem.



UPPER—This modern residence, purchased by the State in 1950, supported an assessed value of $2,170. Its market value at the time of acquisition was $19,750. LOWER—The same residence after sale at public auction and relocation upon another site. Assessed value 1953, $4,610. Note characteristic "upgrading" changes completed even on this relatively modern improvement, i.e., the family room addition where the garage was formerly located.

Where Did Owners Move?

What about the property *owners* involved in the purchase of Oceanside-Carlsbad improved parcels? How many actually stayed in the area and what did they do after purchase of their respective properties?

Although 90 improvements were purchased, only 87 improved parcels were actually affected and only 86 owners were in turn directly affected in these improved parcel acquisitions. The resettlement activity of these owners and the before and after assessed value comparisons arising therefrom are shown on page 51.

It can be seen that almost exactly two-thirds—58 out of 86—of the displaced owners not only stayed within the Oceanside Carlsbad area but reinvested in substitute improvements shortly after acquisition of their former properties. It is also apparent that these owners, though certainly not required to do so, attempted to better their former residence situation.

In many instances, this inclination to get something better is actually made possible by the procedures utilized by the public agency itself in carrying out a buying policy of cash payments and the assumption of the usual escrow and other costs normally borne by the property sellers. Owners' fair market value net receipts are thus characteristically greater than they would usually be were the sale a transaction between private parties,

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Tunnel Lighting

Webster Tube Illumination Will Use Latest Techniques

By HAROLD SKOOTSKY, Senior Highway Electrical Engineer and
JOHN R. BRASS, Associate Highway Electrical Engineer

WITHIN a short time work will be under way on the Webster Tube, a 3,435-foot-long, two-lane, vehicular facility under the Oakland-Alameda Estuary. This tube will have tiled walls and ceiling and many outstanding design features, including a continuous-line, fluorescent lighting system which it is believed will economically provide a degree of driver visibility, particularly during the daylight hours, which has not been previously achieved. The lighting system is unique in that it was designed to fulfill certain lighting and performance requirements determined by advance studies. Earlier tunnel lighting installations investigated in these studies have compromised desirable performance characteristics due to inherent limitations of available lighting equipment.

Existing Systems Studied

The lighting of vehicular tunnels is, on the surface, a deceptively simple matter which becomes somewhat complicated only upon close examination. For example, a still common solution to the tunnel lighting problem is the more or less arbitrary selection of a standard lighting fixture which is then installed at intervals determined by what is assumed to be a desirable level of roadway illumination.

Some attempt is usually made to intensify daytime tunnel lighting within the entrance, in what is often called the entrance zone, although many engineers hold the belief that the extraordinary blinding effects of sunlight upon drivers looking into a dark entrance cannot be overcome by artificial lighting.

Although most tunnel lighting installations provide some method of dimming to lower light levels at night, the need for night dimming is not always recognized. For example, the I. E. S. Recommendations for Lighting Traffic Tunnels and Underpasses (I. E., June, 1957) indicate the night illumination level should be the same as the day level in the central zone. The appropriate comment to this is that if the night level is not excessive, then the same light level during the day is certainly inadequate.

New Approach Required

Suitable methods of lighting and the correct light levels for day and night conditions in the entrance and central zones must be arrived at by making properly controlled tests with the aid of typical driver observers. The results of tests will be summarized later.

The above comments are not intended to imply that most tunnel lighting installations have been thoughtlessly planned; the intention is only to point out the common practice of relying too heavily on incomplete theoretical data and expert opinions rather than controlled tests and observation of conditions at existing tunnels.

As an example of incomplete theory, it is generally believed and it seems theoretically sound, that daytime visibility into the entrance of a tunnel could be greatly improved by darkening the face of the portal (as well as other surrounding surfaces just outside the tunnel, and the sky in particular if possible. An ingenious idea developed by J. M. Waldram, a lighting engineer in England, was to construct a series of large black baffles spanning the roadway ahead of the entrance (at say 100-foot spacing) through which vehicles would pass. These baffles (which could be surfaced with black aluminum honeycomb) would overlap in perspective from the driver's point of view, thereby eliminating sky brightness as well as effectively reducing the average field brightness seen by the driver. But would the driver then be able to see into a relatively dark tunnel on a bright day? Theoretically yes, actually no. The series of baffles would of course have little or no effect (depending upon the time of day) on the intensity of sunlight falling on the dust and exhaust fumes in the air between the driver and the entrance. The apparent brightness of this body of contaminated air is in the range of 50 to 100 foot-lamberts when seen from a point 200 to 300 feet ahead of a tunnel entrance. This bright haze actually veils the entrance and makes it impossible to discern vehicles within a relatively dark tunnel entrance. The effect is comparable to the veiling glare of daytime reflections in store display windows and was apparently discovered independently and almost simultaneously here and in England by Waldram who then abandoned his earlier idea of entrance screens or baffles.

Tests Made

As mentioned above, numerous visibility tests were made at existing tunnels in the San Francisco Bay area. Two of the tunnels—the Broadway Low Level Tunnel and the Posey Tube—have central zone wall brightnesses in the range of 0.10 to 0.50 foot-lambert. Others—the Park Presidio, Waldo and San Francisco Broadway Tunnels—have central zone wall brightnesses in the range of 5 to 15 foot-lamberts. It is fortunate that the Bay area provides the opportunity of making tests at lighting installations of widely different quality under varying conditions.

Summary of Finding

The roadway should be largely ignored as a factor in providing visibility within a tunnel. Wall and ceiling brightness from the driver's point of view is of greatest importance in tunnel lighting. This approach is simply the result of observing how we best

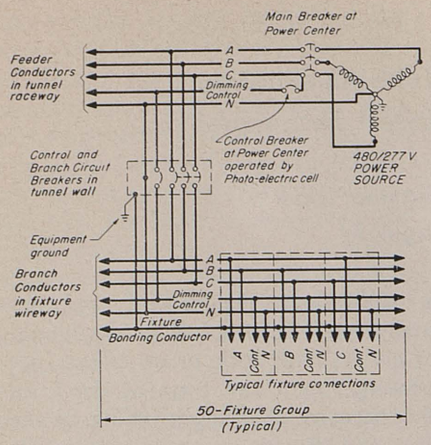


Figure 1—Schematic of power distribution system showing dimming control and typical branch circuit.

see on approaching and entering a tunnel. This is not to say that the roadway has no influence on visibility, but only that its role is much less important than commonly believed. In any case, if proper wall and ceiling brightness is maintained, adequate roadway illumination will automatically follow.

Considering the above, and the fact that bright fixtures should be avoided because of glare, then it becomes apparent that direct lighting of the roadway would be undesirable.

In order to stress this point, make the extreme assumption that the roadway has zero reflectance. Direct light confined to this surface would light objects on the roadway and the walls and ceiling would be dark. By directing the same amount of light only on walls and ceiling with 100 percent reflectance, the same amount of light would be directed on the roadway and visibility conditions would be greatly improved. Practical conditions are of course far less extreme, but the preferred method becomes obvious.

(a) *Daytime Entrance Zone Lighting*

In order to provide good daytime visibility into the tunnel entrance (the "Dark Hole") for approaching drivers, 60-foot-lambert lower wall brightness is required to clearly silhouette vehicles within the entrance. Fair silhouetting may be obtained with 30-foot-lambert lower wall brightness.

As described earlier, the veiling glare over a typical tunnel entrance has a brightness, on a sunny day, in the range of 50 to 100 foot-lamberts. Therefore, it is apparent that the 60-foot-lambert wall brightness recommended should be increased if conditions at the entrance are favorable to higher concentrations of dust and vehicle fumes. This situation might occur if the approach is upgrade and natural ventilation is poor, especially if traffic is very dense and has a high percentage of trucks.

The brightness of the field of view surrounding the entrance has far less effect on visibility into the entrance than the veiling glare discussed above.

The length of entrance zone lighting should be approximately equal to the safe stopping distance for the fastest entering vehicles. A 300-foot-long entrance zone will be adequate for speeds up to 55 mph. Much longer lengths of entrance lighting have been recommended by others. These recommendations are apparently based upon the need for slowly reducing the light level down to the very low level central zone lighting existing in older tunnels. However, the recommendation made here is based upon central zone lighting which provides nearly instantaneous adaptation after the driver has entered the tunnel. The daytime entrance zone lighting recommended here is actually more than needed for the driver who has entered the tunnel, but is not so great that the recommended central zone lighting beyond will appear dark. Therefore, long adaptation stages are required only if the central zone lighting is inadequate.

(b) *Daytime Central Zone Lighting*

The lower wall brightness in the central zone should be at least five foot-lamberts to provide good daytime visibility of vehicles. No tunnel is long enough to allow the retina of the eye to completely adapt to nighttime light levels during the day. Unlike iris adaptation, which occurs in a few seconds, complete retinal adaptation to dark surroundings takes up to 50 minutes. It is therefore necessary to have a much higher level of illumination in the central zone during the day than is required at night.

(c) *Nighttime Lighting*

Tests indicate that a lower wall brightness of only one-half foot-lambert in the entrance and central zones, provides good visibility of vehicles during the night. This may be easily proven. The Posey Tube incandescent lighting system, which has wall brightnesses in this range, is very deficient during the day. However, it is not only entirely adequate at night, it is actually more than adequate, as evidenced by the fact that certain circuits are turned off during the night. Therefore, it is emphasized that the high nighttime light levels recommended by others are not required for safety, visibility, comfort or any other known reason. A maximum maintained wall brightness of one foot-lambert is recommended. The high nighttime light level in many existing tunnels is simply the result of installing continuous lines of fluorescent fixtures which (due to inherent limitations) cannot be sufficiently dimmed. It seems incongruous to recommend lower light levels when the general trend in light levels is upward, but in view of the facts mentioned above, the additional operating cost of higher than necessary light levels cannot be justified.

Objectives of New Design

The Webster Tube lighting system has been designed to satisfy, with little compromise, the wall brightness and dimming requirements outlined above, and to be versatile enough for use in any tunnel, especially those with restricted overhead clearance.

Other design objectives may be listed as follows:

1. Special light control characteristics to provide relatively uniform wall and ceiling brightness.
2. Lamps shielded from driver's view.
3. Dust- and spray-tight fixture construction without sacrificing ease of relamping.
4. One-piece plastic cover which can be easily removed for thorough cleaning and does not require a metal frame or other hardware attachment.
5. Branch circuit or feeder wireway within fixture shell—to eliminate expense of separate wireway (or conduit with outlet boxes) and to facilitate installation in existing tunnels.
6. High-voltage branch circuits—to eliminate auto-transformers in ballasts and reduce line losses.

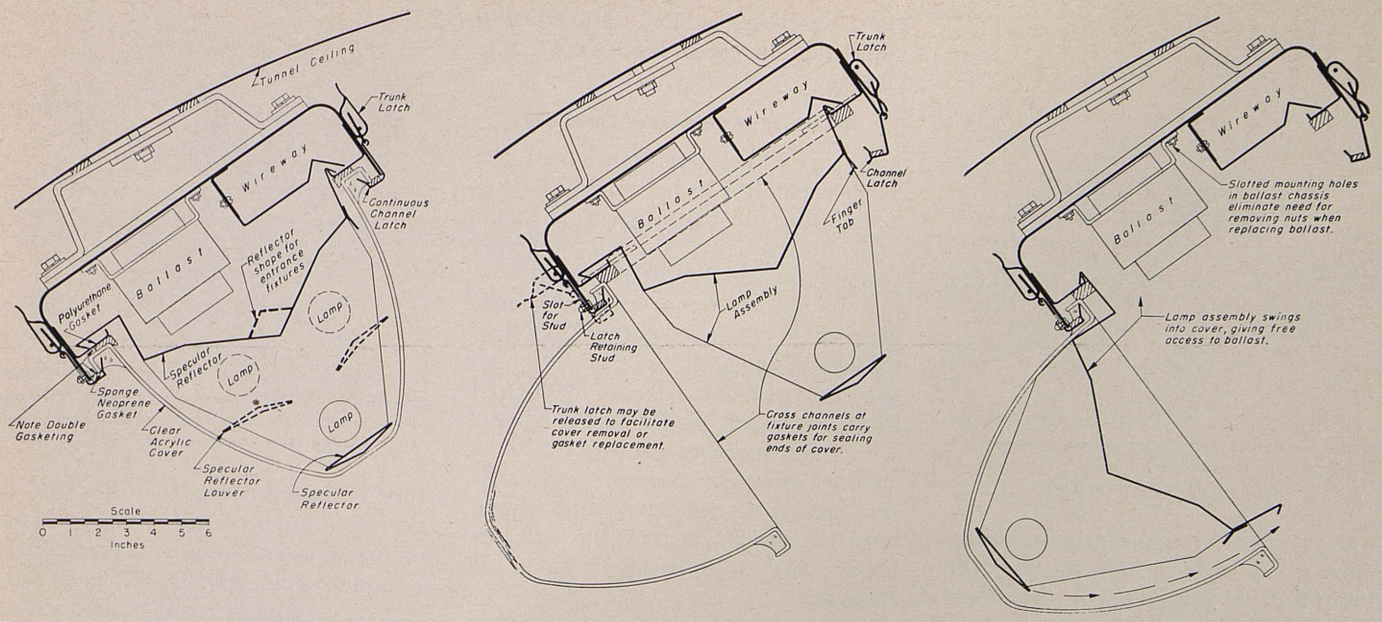


Figure 2a (left)—Cross-section of fixture. Dashed lamps and reflectors are part of entrance fixtures only. Lamps are 96", T 12, CW/VHO or SHO, operated at 1400 ma. in entrance zone, daytime; 600 ma. in central zone, daytime; and lower lamp only at 60 ma. throughout at night. Figure 2b (middle)—Illustrating hinging of cover and operation of latches. Figure 2c (right)—Showing lamp assembly swung into open cover for access to ballast.

7. Easily accessible, high quality, unity power factor ballasts.

8. Heat "sink" ballast mounting.

9. Free air circulation behind fixture shell to cool ballast and reduce air temperature in fixture.

10. Highest quality, corrosion resistant construction to reduce maintenance expense to a minimum.

Need For New Design

Since to this date no commercially available tunnel or underpass lighting fixture satisfies more than a few of the above requirements, it became apparent when work was started on the lighting system for the Webster Tube, that a new type of lighting fixture was needed. Therefore, the decision was made to design a suitable lighting fixture primarily to determine if the numerous special features could actually be obtained in a practical unit.

The first step was to select or design suitable components for the system.

Lamps

The most suitable lamp for a fluorescent tunnel lighting system should have a small diameter (to increase efficiency of multilamp fixtures and allow effective light control), high maximum light output (particularly for entrance zones) and should provide stable operation at very low light output. The high-current, rapid-start lamps with T-12 bulbs are a quite satisfactory compromise. For entrance zone fixtures, the 1.5-ampere, T-12, rapid-start lamps are desirable in order to keep the number of lamps per fixture to a minimum.

Eight-foot lamp lamps are desirable for their high efficiency and the reduction in the number of lamps to be maintained. Fixture cost per foot of length is also reduced.

Ballasts

Special 480-volt, 60-cycle ballasts were designed to satisfy the objectives mentioned above (particularly the dimming feature). A relay is incorporated in each ballast to switch lamps to the night inductor for dimming without interrupting cathode filament current. In entrance zone fixtures this relay also switches off the upper lamps during night operation. The inductors have been designed for low losses, minimum distortion of lamp current wave shape, and long service life. A ballast prototype has been thoroughly tested in a three-lamp fixture prototype and has been found very satisfactory in all respects.

Certain features of these ballasts which facilitate maintenance are described later.

New Design Features

The design of the fixture housing and lamp assembly satisfies the objectives outlined earlier and is more fully described below. The cross-section and mechanical operating features of the fixture are shown in Figures 2(a), 2(b) and 2(c). The fixture is also adaptable to center mounting in tunnels with high ceilings and in such installations will provide even better uniformity of wall brightness than it does when mounted as shown in Figure 4.

Light Control

Figure 3 shows the light distribution of a long line of entrance fixtures during the day. Also see Figure 4. The shape of the curve is essentially the same for night operation and for single lamp fixtures during the day, although the light intensity values will naturally be lower.

Integral Wireway Installation

One of the most important features of the new design is the accessible integral wireway within the fixture housing which greatly simplifies installation of the system, especially in existing tunnels. The first step in installing the fixtures is to place the brackets which support the two ends of adjacent fixtures housings (see Fig-

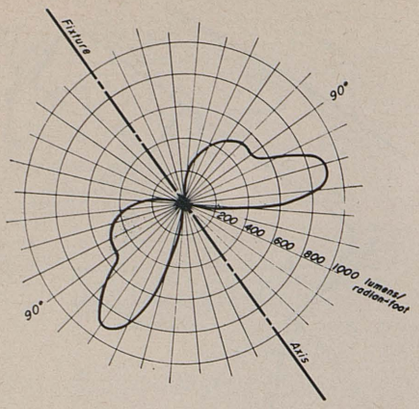


Figure 3—Curve showing cylindrical luminous intensity (I_c) in lumens/radian-foot at center of 10 or more 3-lamp fixture units.

ure 5). These brackets automatically align the housing ends so that the extruded vinyl sealing strip can effectively seal the joint. After the housings are in place with seal, the branch circuit conductors (which may be laid out on the roadway) are lifted up into the wireway as cross channels (see Figure 2(b)) are dropped into place at each joint to hold the conductors temporarily. Connections to the ballasts are then made and the wireway covers installed. The lamp assembly and plastic cover will be packaged separately and installed last.

Dust and Spray Tightness

It is very difficult to imagine the quantity of dirt which can accumulate in a tunnel in a short time. Conditions are far more difficult than for ordinary street lighting fixtures. Conventional methods of sealing tunnel lighting fixtures are not suitable; that is, any method which relies entirely on squeezing a long gasket between a cover frame and a housing flange, ordinarily develops small gaps in the seal through which dust and water may enter. To prevent the entry of water when a tunnel is being cleaned by a high pressure spray, a double-gasketed and baffled method of sealing a long fixture is preferred. See Figures 2(a) and 5. In this design, the spray of water is deflected by the continuous channel latch from the main gasket and cannot enter the fixture. Any water which bypasses the channel latch losses its force and drains out the end of the latch. This latch is operated by three trunk-latch type operators which automatically apply the correct sealing force to the gaskets.

Necessary Maintenance Simplified

As may be noted in Figure 2(c), the lamp assembly can be quickly swung down into the plastic cover to gain access to the ballast and wireway. For further ease of maintenance, the cover may be quickly removed for cleaning. Neither of these operations requires the use of tools.

Electrical maintenance is facilitated by the use of high quality ballasts which are fused to protect the units against excessive current, especially that caused by defective lamps which tend to rectify current through the ballast due to unbalanced aging of cathodes.

Terminal blocks on the ballast chassis allow quick changing of these units. A defective ballast may be taken to the maintenance shop and repaired, rather than scrapped, since components are mounted on a chassis and may be individually replaced.

Durable Materials

It has been found that a fixture of low first cost may in the long run be very costly. For this reason, special attention has been given to design factors which affect reliability.

Mechanical reliability depends to a great extent upon the corrosion resistance of metals used in exterior parts of the fixture housing. Aluminum, which is entirely satisfactory in outdoor lighting fixtures, especially if anodized, is not suitable where the fixture is subjected to the very severe corrosive elements in a tunnel. Some of the unusual causes of corrosion in a tunnel which have a destructive effect on aluminum are alkaline deposits from the tunnel lining, concentrated exhaust fumes and especially the rather harsh alkaline solution which must be used to thoroughly clean the tiled tunnel walls. Other problems also arise with aluminum construction. One is that aluminum hardware, such as machine screws, must be made of high strength alloys which have relatively poor corrosion resistance and which, at best, are weak compared to other metals used for this purpose. Another is the incompatibility of most other metals (including the best stainless steels) when used with aluminum and the resultant electrolytic corrosion. For equal strength, and where an attempt is made to achieve the best corrosion resistance from aluminum, aluminum construction will be only a little less expensive than all stainless steel construction. This will be true only if the design is adaptable to sheet metal fabrication. For the above reasons, stainless steel is favored for exterior metal parts of the fixture housing. Reflectors are to be made of specular finished aluminum with protective oxide coating as in most fluorescent street lighting fixtures.

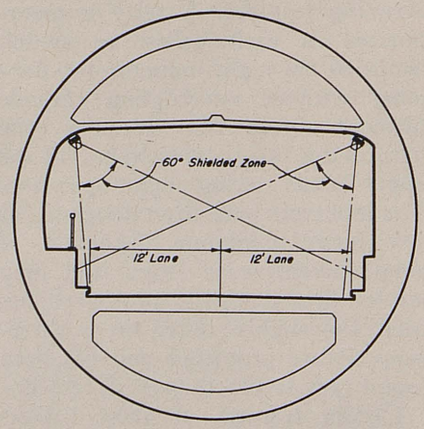


Figure 4—Typical cross-section of tube showing fixture orientation and illustrating shielding and light control.

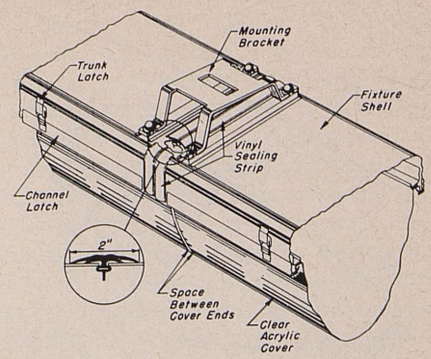


Figure 5—Joint between fixtures illustrating how mounting brackets support and align the two ends of adjacent fixture housings so that the extruded vinyl sealing strip can effectively seal the joint.

The plastic cover is to be made of age-, heat- and craze-resistant acrylic material annealed after fabrication, and every indication is that it will be very satisfactory. Only very high concentrations of alkalies and oxidizing acids attack acrylic. Some care will

. . . Continued on page 53

Santa Rita Road

Widened Highway, New Bridge Constructed with FAS Funds

By OLOF E. ANDERSON, Road Commissioner, Alameda County

In opening ceremonies sponsored by the board of supervisors and the Pleasanton Chamber of Commerce, Alameda County, on March 15, 1959, formally reopened Santa Rita Road to highway traffic. The project, constructed as a Federal Aid Secondary Project in co-operation with the Bureau of Public Roads and the California Division of Highways, marked completion of the reconstruction of a portion of Santa Rita Road (FAS Route 1019), located between Pleasanton city limits and the Arroyo Mocho Bridge, a net length of approximately 1.7 miles.

This project involved the reconstruction and widening of 1.7 miles of road and the replacement of the Main Street Bridge at the north city limit of Pleasanton, the improvement of two railroad grade crossings and miscellaneous work. The total construction cost of the project, exclusive of right-of-way, railroad crossing improvements, and engineering, was $357,000 and was defrayed by the utilization of federal, state, and county funds under the federal-aid secondary highway program.

PHOTO TOP OF PAGE—This new bridge at Pleasanton carries Santa Rita Road across Arroyo Del Valle.

Connects U.S. Routes

Santa Rita Road, a portion of FAS Route 1019, lies between the City of Pleasanton and U. S. Highway 50. The entire route is 4.9 miles in length and connects U. S. Highway 50 to State Highway Route 107, both part of the interstate system. Pleasanton is located approximately midway along FAS Route 1019. Previous work along this route included a $114,490 FAS contract in 1953, for road work south of Pleasanton, and four other county-let and financed contracts totaling an additional amount of nearly $115,000. Another 0.9 mile of this FAS route remains to be reconstructed and will be resurfaced with county funds during 1959.

Santa Rita Road acquired its name from the early California Rancho Santa Rita, surveyed in 1862. Opening of the road was on November 8, 1870, from the northerly end of Main Street, Pleasanton, at the Arroyo del Valle to the road from "Haywards" to Stockton near Tassajara Creek.

Pleasanton is the commercial, cultural, and recreational hub for the people of the Pleasanton-Murray Township area, many of whom are engaged in agricultural pursuits or employed in the area's several aggregate-production plants. These endeavors constitute the primary occupations followed in the area. Jackson and Perkins, the largest growers of roses in the world, cultivate an entire section. Henry J. Kaiser Co., Pacific Cement & Aggregates, Inc., and Rhodes & Jamieson produce enormous quantities of mineral aggregates, and their trucks subject it to a considerable amount of heavy traffic.

Harvest Season Brings Increase

Holly Sugar Corp. has a sugar beet loading station adjacent to Santa Rita Road. Field trucks transport the beets from the fields to the loading station where they are loaded into rail cars and semitrucks and trailers. During

the harvest season the volume of truck traffic is sharply increased.

Two schools, Amador Valley Union High School, which is now being expanded, and Alisal Elementary School, front on Santa Rita Road. Along the easterly side of the road are residential subdivisions, plans for the future extension of which are already developed.

Pleasanton also hosts the Alameda County Fairgrounds where the annual county fair is held. Here a horseracing meet is held each year, using the oldest race track in the United States.

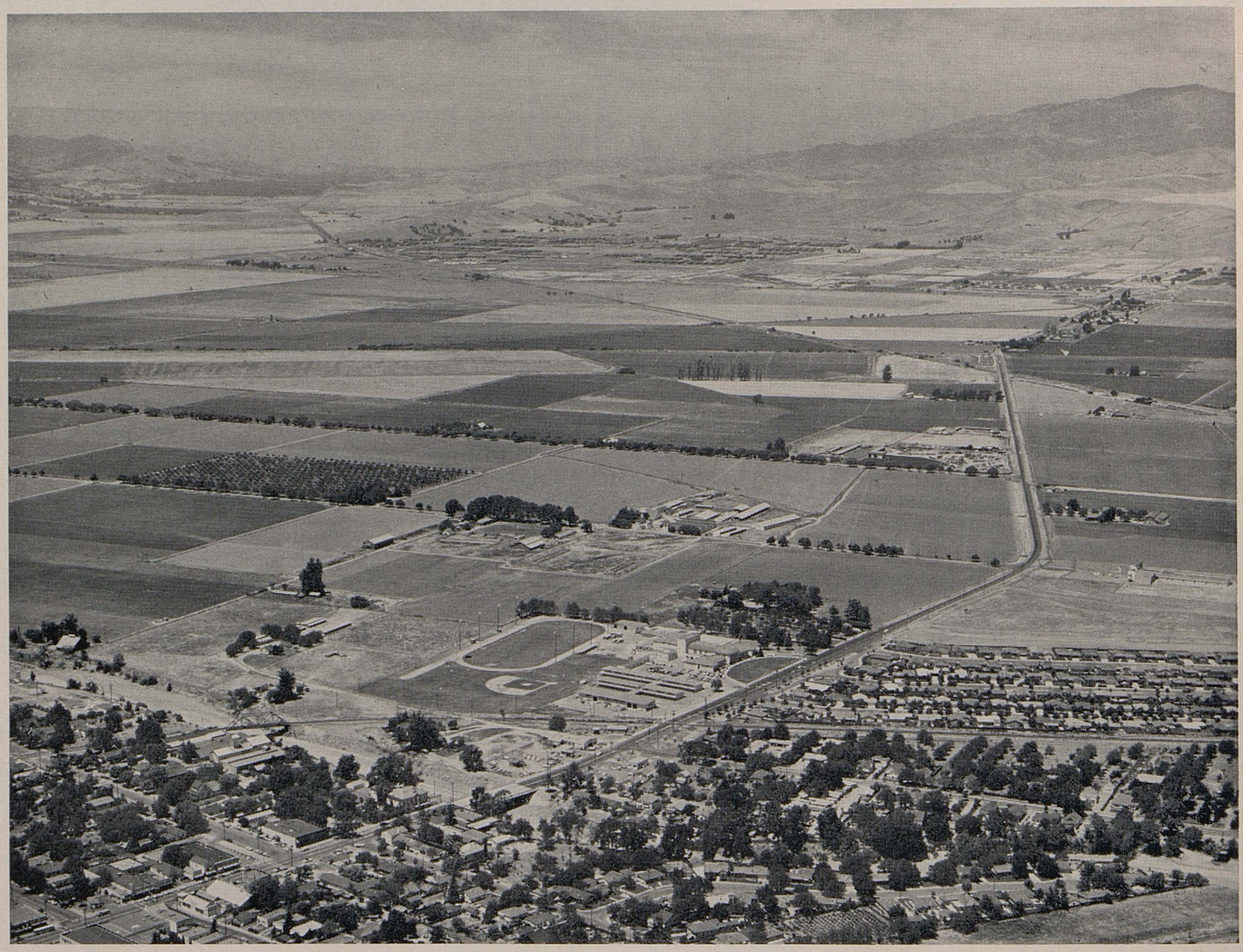
Prior to construction, letters were sent to the property owners and occupants whose properties abut Santa Rita Road. These letters explained the general nature of the project, encouraged removal of encroachments such as flowers and shrubbery, warned of unavoidable inconveniences, advised of detours, informed as to whom to contact in case of complaints, and sought the co-operation of the recipients during the course of the work. The paucity of complaints during the progress of the job can undoubtedly be attributed to this simple demonstration of regard for the public.

The roadway work involved the construction of a four-lane highway and sidewalk from the Pleasanton city limits northerly to the Amador Union High School's northerly boundary line, a distance of 0.31 mile, and a two-lane highway with 12-foot traffic lanes and eight-foot shoulders for the remainder of the project.

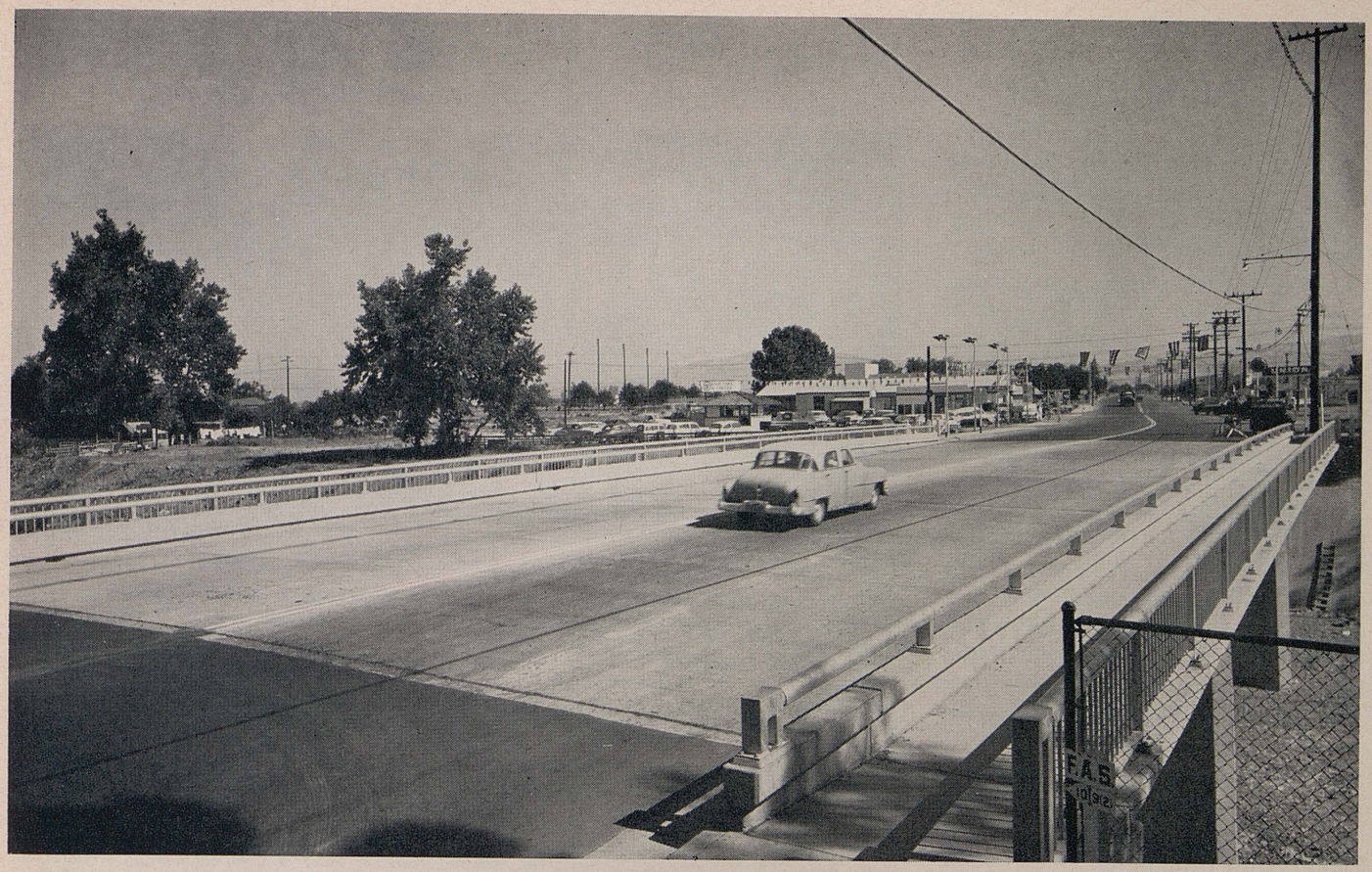
Bridge Alteration Necessary

Approximately 89 feet of Main Street in the City of Pleasanton was reconstructed to properly accommodate the 1½-foot lowering and the increased width of the new Arroyo del Valle Bridge and required removal of the existing pavement between curbs and replacement of base materials and surfacing.

At the Western Pacific Railroad Company's grade crossing, new flashing light signals, cantilevered over the roadway, were installed. At the Southern Pacific Company's grade crossing, the existing flashing light signals were relocated to clear the new roadway widening. Approach sight distance and riding comfort



This view northward from Pleasanton shows the reconstructed portion of Santa Rita Road (FAS Route 1019). The new bridge can be seen in the left center foreground.



The new bridge at Pleasanton has adequate roadway width as can be seen in this photo. Space for sidewalks is also provided on each side.

have been improved at both grade crossings.

The grade was lowered from Station 10 to Station 18 to reduce the height between the road and the adjacent subdivisions and Amador Union High School. Existing grades between Station 18 and the end of the project at Station 91 + 65 were followed quite closely, allowing the utilization of a maximum portion of the existing road as a subgrade for reconstruction. A 1,500-foot radius curve to the left was constructed at Black Avenue to improve horizontal alignment. Alignment between Black Avenue and the end of the project at the Arroyo Mocho Bridge followed the existing centerline of the road.

A section consisting of three inches of plant-mixed asphaltic surfacing, four inches of Class "A" cement-treated base, four inches of Class "B" cement-treated base and six inches of untreated base was adopted.

About the only difficulty experienced on the job was fitting the new road to the old road, to utilize as much of the old road as practicable. Embankment slopes were 2:1 or flatter and there were no excavation slopes. Good weather, good planning, proximity of materials, and the development of time saving operations contributed to the rapid completion of the project.

The new bridge over the Arroyo del Valle, replacing the old structure erected in 1902, offers many advantages over its predecessor. This steel and reinforced concreted structure, clearing the stream bed by about 22 feet, has three spans of approximately 55 feet, from center of supports, and an overall length of 171 feet. During the periods of high flow, these 55-foot spans, in contrast to the seven 25-foot spans of the former bridge, will permit fallen trees and debris to flow through, instead of damming the channel as was the case with the old structure. The old bridge was underpinned at least five times in recent years, due to the eroding action of the Arroyo del Valle. Pleasanton's "old-timers" remember the days when a team of horses could not be driven in the channel under this bridge, but at the time the bridge was removed there was a 23-foot clearance between the deck and the stream bed. Due to debris hung up on the piers of an earlier bridge, it is said that the Arroyo del Valle overflowed its bank many times, causing the flooding of Main Street in the then quaint and peaceful Town of Pleasanton.

Design and construction engineering for the project was provided by Alameda County under the direction of Olof E. Anderson, County Surveyor and Road Commissioner. Alameda County also paid the entire costs of acquisition of rights-of-way and relocating railroad crossing protection. Resident Engineer for Alameda County was Arthur Froerer. Robert J. Crossett was Engineer in charge of the construction of the bridge.

W. O. Halstead Leaves Chief Estimator Job

Wade O. Halstead, Principal Estimator of Building Construction in the Division of Architecture, retired from state service on August 31st following 20 years of service with the division.

WADE O. HALSTEAD

Halstead has been in construction work for half a century. He was born in Cleveland, Ohio, and received his engineering training prior to World War I in Illinois and Michigan.

He came to California in 1920 and for 15 years supervised many construction projects throughout the State.

Halstead joined the Division of Architecture on November 25, 1935, as an estimator. During World War II he was on leave of absence for three years working as a staff engineer on U. S. Army Engineers' construction in Hawaii.

His civilian employment with the Army Engineers began in the Hawaiian Islands in September 1941. He was on Bellows Field during the attack on December 7, 1941. For two years he was engaged in constructing air strips on Pacific islands. He was transferred to San Francisco in 1943 to assemble supplies for the Army's Hawaiian Command.

Following his return to the division in 1944, Halstead became acting head of the division's estimating section on October 1, 1945.

On July 1, 1946, he was appointed Supervising Estimator of Building Construction and Principal Estimator in 1949.

Halstead married Irma Richter in Oakland, California, in 1920. The Halsteads have two sons, Wade, Jr., of Sacramento, and Robert who lives in Roseville. They have three grandchildren.

Halstead will devote his spare time to construction activities as a consulting construction analyst.

JAPANESE BRIDGE ENGINEERS TOUR L. A. DISTRICT

By FRED T. FUJIMOTO, Project Design Engineer

Dr. Kasuo Aoki (front row, fifth from left), Professor of Engineering at Waseda University in Tokyo, headed a team of Japanese engineers which visited District VII on August 6 and 7. Hosts to the team during its tour were (front row, beginning second from left and reading right): Myron Goral, President of International Prestressing Company; Howard M. Christensen, US Bureau of Public Roads and Fred J. Fujimoto, District VII engineering staff. To the right of Dr. Aoki is Richard T. Murphy, International Co-operation Administration, Washington, D. C. and (behind Murphy in the rear row) is James E. McMahon, Bridge Engineer, Southern area. Others in the Japanese team included Hajime Ikeda, Assistant Chief of Erection Department; Teruo Kizake, President, Takada Kiko, Ltd.; Kiyoli Kurosawa, Vice Chief, Nihon Road Corporation; Eiichi Murakami (Secretary), Chief of Local Road Section, Road Bureau; Shohei Noto, Chief of Road Section, Kanagawa Prefectural Government; Toichiro Okamoto, Chief Engineer, Shiraishi Foundation Company; Yoshikazu Ozaki, Chief Engineer, Tokyo Steel Rib & Bridge Works; Shinji Tetsu, Assistant Chief of Designing Department, Matsuo Bridge Company, Ltd.; Tsunehiro Wada, Chief of Civil Engineering Department, Gifu Prefectural Government; Tsuguo Tategami, Director, Osaka Branch, P. S. Concrete Company, Ltd.; Tadashi Yashima, Chief of Civil Engineering, Tottori Prefectural Government; Y. Okamoto and Kusano, Japanese Interpreters, affiliated with I. C. A.

UNDER THE auspices of the United States International Co-operation Administration, a 12-man team of prominent Japanese highway bridge engineers was in Los Angeles on August 6 and 7, 1959, as a part of a one-month bridge study tour of the United States.

The tour included a visit to the construction site of the East Los Angeles Interchange, which joins the Santa Ana, Golden State, Pomona and Santa Monica Freeways. On August 7th, the team members were conducted to various bridge material manufacturing firms. Conferences were also held with E. T. Telford, Assistant State Highway Engineer, and members of his staff at which highway and bridge construction problems were discussed.

The visiting engineers said that the improvement of highways and bridges in Japan is an urgent and necessary step toward integrating and facilitating transportation for a multiple island economy. Special attention is being given to the construction of long-span bridges in their five-year highway planning program.

In Japan, the visitors said, there are very few bridges more than 300 feet long. Japanese engineers are anxious to learn all they can about the building of bridge substructures in deep water.

Most of the old bridges in Japan are made of wood and are considerably different in design and structure from the old stone bridges found in China or in Rome. Presumably, this is because lumber was plentiful in Japan and because the soft foundation near the mouth of a river or in the flat urban areas, where most of the bridges were built, was generally unable to support stone bridges.

One of the oldest bridges referred to in Japanese historical annals is the Bridge of Ikainotsu built in 326 A.D. It is said also that in 612 A.D. imported Korean craftsmen built some 200 bridges in various districts in Japan.

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RESETTLEMENT OF STATE'S GRANTORS

Number of grantors	Activity	Assessed value of improvements "before"	Assessed value of improvements purchased or retained "after"
21	Retained and relocated own improvements	$39,070.00	$58,602.00
6	Purchased improvements from the State or received improvements in exchange from State	4,300.00	9,921.00
21	Purchased new homes	30,280.00	52,040.00
10	Purchased older improvements	14,300.00	47,862.00
58	*Subtotal*	$87,950.00	$168,425.00
5	Stayed in area, did not reinvest directly in real estate	$2,340.00	------
12	Moved out of area, stayed in county	16,390.00	------
8	Moved out of county	7,970.00	------
3	Whereabouts and activity unknown	4,100.00	------
86	*Total*	$118,750.00	$168,425.00

and being paid in cash without discount often enables the owners to assume a stronger bargaining position when entering the local real estate market than might otherwise be possible.

Clearly, then, freeway-displaced owners should not be completely and unequivocally "written off" as taxpayers and further contributors to heightened economic activity within the community.

Conclusions

1. Freeway right-of-way acquisition through primarily residential areas affects people and their homes. When the owners have moved and the freeway path has been cleared, it is not accurate to assume that both taxpayers and taxable improvements have been completely "written off" the community's tax and economic roster.

2. In the Cities of Oceanside and Carlsbad a before and after study of these two important elements of the overall right-of-way acquisition picture has been made in which it is clear that a majority of the displaced owners and their former homes and buildings remain in the incorporated area of the two communities. To the extent that this study measures the reaction of people to a directly affecting freeway improvement—as well as the relocation sequence of their homes and buildings—it can be a helpful measure of expected impact to those concerned with the problem in other communities where similar facilities are proposed. It may be premised that the sequence developed in this study area *is* both reasonable and typical.

3. The facts produce a pattern; the pattern permits theory. A sequence of building disposition can be premised. From the total number of improved properties acquired for a freeway project, a majority of homes will be relocated clear of the highway right-of-way but still within the immediate vicinity. In some cases the occupants will go with the homes; in other cases, the improvements will be sold to new owners to be subsequently removed from the right-of-way. In either case, after the extensive rehabilitation and upgrading, which relocation makes possible, these improvements as a group will support higher values than those which prevailed in previous locations.

4. A certain number of improvements on any project will not be allowed to be relocated and these will be subsequently demolished for salvage. Such improvements will *always* be buildings which do not currently meet community standards and are in such a condition so as not to justify the expense of bringing them up to the required levels. The marginal values attributable to such buildings will be removed from the community base.

5. Most of the owners displaced by right-of-way acquisition will remain within the immediate area. As noted in (3) above, some will retain and relocate their original buildings, while

. . . Continued on page 52

Bill McNeely Leaves, Joined State in 1912

William C. McNeely, assistant highway engineer who has been in charge of the "vital statistics" on freeway routings for the Division of Highways, retired August 1st after an engineering career dating back to 1912.

W. C. McNEELY

McNeely had been with the division since that year except for a period with private industry during World War I.

McNeely's first work with the division was with District III, which then had headquarters in Sacramento, in the field as a draftsman and on survey parties. Later he became associated with planning and has been concerned with freeways since the first routes were adopted in 1939. When freeway planning and construction was accelerated after World War II he was assigned to route adoption procedures in the Planning Department and has been in charge of freeway records and status since.

A native of Sacramento, McNeely was educated in the Sacramento schools and attended Chico Normal School (now Chico State College). McNeely is married and has a daughter, Mrs. James Hansen of Sacramento, and two grandchildren.

Known as an ardent golfer, McNeely plans to continue that sport in retirement, has scheduled work at his home, 2709 12th Street, and contemplates some trips.

A dinner honoring McNeely was given July 29th at the Officers' Club, McClellan Air Force Base.

Louis H. Kahl Ends Long Highway Career

Louis H. Kahl, District X Maintenance Superintendent at Altaville, retired August 1, 1959, after more than 34 years with the Division of Highways.

His retirement ended a career that began early in 1923 when he went to work as a laborer on highway and construction work in District III.

He transferred to District X when it was formed in 1923. From 1925 to 1931 he worked as a subforeman, maintenance foreman, and construction foreman in the Groveland area.

On May 25, 1931, he became a highway superintendent. He was superintendent of the Ione, Groveland, and Altaville territories during his career. He pioneered a number of early highways and improved many of the county roads which were taken into the State Highway System in the early 1930's. He also acted as construction supervisor on a $300,000 forest access road which was constructed in the early years of World War II.

Kahl and his wife, Belle, were married in Groveland in 1929 and have two children: Michael, who is an inspector for the Bank of America, living in San Francisco, and Joyce, who lives with the Kahls in Altaville. He is a member of the Knights of Columbus Lodge.

The Kahls have lived in Altaville in the mountain area for many years; however, they now plan to move to the Lodi area.

MASTER PLAN

Continued from page 1 . . .

A total of 23 separate meetings were held, involving 730 county representatives and officials from 280 cities.

These co-operative studies also developed valuable by-products in local street and road system planning. In seven instances, cities and counties conducted their own detailed traffic-ways studies, with some financial participation by the State, in connection with the statewide freeway system.

FREEWAY LOOP

Continued from page 20 . . .

south of the Civic Center. This loop around the Los Angeles Civic Center will, in the not too distant future, offer an alternate route for much of the freeway traffic now using the four-level interchange. This loop, together with the extension of the Golden State Freeway to the northwest through the San Fernando Valley and the extension of the Santa Monica Freeway westerly to the Pacific Coast, is important not only because it directly serves areas generating high volumes of traffic, but also because of its many connections to other important freeways and city street traffic arterials.

Outlook For Completion

It is apparent, in addition to the projects discussed in this article which have been completed or are now under construction, that there still is a great deal of work to be accomplished before the full traffic service offered by the Los Angeles Freeway Loop can be realized.

The loop could be completed with opening to traffic throughout its entire length in about three years if all of the projects included in the California Highway Commission's annual budget for 1959-60 could go forward as scheduled. These budgeted projects include two jobs on the Golden State Freeway, which will close the gap between Pasadena Avenue and Glendale Boulevard, and a third unit to extend the Golden State to the north between Roscoe Boulevard and Lankershim Boulevard. A total of $24,200,000 has been budgeted for these three projects.

Also included in the 1959-60 Fiscal Year construction program are three projects on the Santa Monica Freeway extending from Eighth Street at the west end of the Los Angeles River Bridge that is now nearing completion to Oak Street, which is immediately west of the Harbor Freeway. Budget items for these three projects total $24,700,000.

Both the Santa Monica and the Golden State Freeways are a part of the federal system of interstate and defense highways. Accordingly, their cost is borne by the Federal Government to the extent of 90 percent of the total cost. At the time of writing this article, there is a big question as to whether the interstate highway program will continue at a uniform rate, and federal funds be available for the construction projects in the 1959-60 Fiscal Year budget. Unless the present Congress takes affirmative action to insure the financing of the program at the established uniform rate, these projects already budgeted by the California Highway Commission may well be delayed for an indefinite period of time. Similarly affected would be projects unbudgeted by California to extend the Golden State Freeway to the north and the Santa Monica Freeway to the west.

The traffic service which can be realized by completion of this freeway loop around downtown Los Angeles is badly needed now and it is certainly hoped that steady construction progress can be continued. After completion, motorists will realize the time-saving features that can be obtained by using the freeway loop, and we can be positive that now existing traffic congestion on present freeways traversing the Los Angeles Civic Center will be greatly relieved.

RELOCATION

Continued from page 51 . . .

others will prefer to sell their homes and thereafter purchase or build another. It is characteristic that owners will attempt to better themselves by acquiring something more desirable—generally more valuable—than that which they have sold. In most instances the payment of cash and the assumption of almost all selling and escrow costs by the State provides the opportunity for such betterment with its resulting individual and community gains.

BIDS AVERAGE SIX PER JOB

Competition for highway jobs continued during August. Bids were received from 311 different contractors on the 47 projects advertised for bid opening during the month. This averages 6.6 bidders per job.

TUNNEL LIGHTING

Continued from page 46 . . .

have to be exercised to avoid scratching the covers during the cleaning process, but all things considered, the acrylic covers will be far easier and safer to handle than if made of glass.

The neoprene gaskets and the vinyl sealing strips are made of long life materials which have unusually good resistance to the effects of aging, water, alkalies, acids, oils, lights, heat and weathering, and are relatively free from compression set.

The polyurethane gaskets are not quite as durable as the above materials, but they will have longer service life than materials of comparable softness such as latex foam.

Attractive Appearance

As seen from the driver's point of view (see Figure 4) the lighting fixtures will have a unique and attractive appearance. Due to the small (2½″) spacing between lamp ends and the very small gap (3/16″) between the ends of the all plastic covers, the individual fixtures will not be apparent, and the installation will present a smooth unbroken line. The mounting brackets will be concealed and the latching hardware will not be discernible from the roadway. Since lamps and lamp images are shielded, the plastic cover will appear to "glow" softly with a brightness in the range of 200 to 400 foot-lamberts. Therefore, the overall range of brightnesses will be unusually small, contributing to good visibility, comfort and pleasing appearance.

Future Developments

Certainly the ultimate development in tunnel lighting will be a practical method of achieving luminous walls and ceilings. Installations of electroluminescent wall and ceiling panels may some day achieve this goal with very high efficiency, although low brightness, high cost and installation, wiring and maintenance problems now prohibit use of this system. However, improvements in fluorescent lamps will undoubtedly keep continuous line fluorescent tunnel lighting tunnel systems in the forefront for a good many years.

Wright Named Deputy In Water Resources

Governor Edmund G. Brown has announced the transfer of James F. Wright, Deputy Director of Public Works, to a new post as a Deputy Director in the Department of Water Resources.

"Department of Water Resources Director Harvey Banks is preparing his department for the vast job of carrying out the California Water Plan," Brown said. "At his request we have transferred one of the State's top experts on organizational, administrative and fiscal problems into that department."

Wright will fill the new deputy's post authorized by the 1959 Session of the Legislature.

The status of Ralph M. Brody, now Deputy Director of the department and Special Counsel on water problems to Governor Edmund G. Brown, will remain unchanged.

Brody's time is devoted principally to advising the Governor on water policy and legislation and working with leaders of the statewide water bond campaign.

Banks said he will place Wright in charge of administration and organization with "full authority to act," thus giving himself more time for consideration of policy on the complex engineering, economic and financial aspects of the water program.

"This gives us a splendid team in this vital department," the Governor said.

Wright moved to his new post October 1.

Before becoming Deputy Director of Public Works he was a highway and public works fiscal expert for the State of New York and had a long and successful career in federal administration of major public works projects.

Engineering Costs In Field Analyzed

A unique study of field construction engineering costs has been completed by the Construction Department, Division of Highways, and a report prepared by J. C. Obermuller, Assistant Construction Engineer.

The study analyzes how manpower is utilized in construction engineering and the findings are set forth in table and graph form.

About $22 million per year is charged to construction engineering by the Division of Highways, and the study was an investigation of how the field construction engineering dollar is spent.

Present accounting procedure gives a distribution among payroll, operating expense, and equipment rental, but there have been no direct measures of how much of the construction engineering is field engineering or how the field construction engineering costs are distributed among the contract items of work. To get this information a detailed study was made of a group of sample projects.

As a result, the report offers data useful for management control and in estimating field engineering costs of future projects.

In one instance it was noted that the cost of engineering was more than the cost of the contract item.

In other instances the proportions of engineering costs were out of balance with the costs of the contract items and their bearing to the total cost of the projects. Corrective measures for this imbalance were indicated.

The report is published in pamphlet form under the title "Field Construction Engineering Costs" and is available to highway engineers and others interested on request to the Division of Highways, attention of the Construction Department.

The upward trend of traffic on the State's San Francisco Bay toll bridges continued during July. Biggest increase was on the Richmond-San Rafael Bridge, where traffic was up nearly 13 percent over the same month last year and revenue was up 16 percent. The San Mateo-Hayward and Dumbarton Bridges, reporting together, showed traffic increased 10 percent and revenue 14 percent. The San Francisco-Oakland Bay Bridge increases were 6 percent in traffic and 7 percent in revenue.

DISTRICT V

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alignment, eliminating three existing narrow bridges in the process. Completion of this $1,250,000 project in the middle of October will provide the initial two lanes of a four-lane divided expressway, as do all recent and current projects on State Sign Route 41. A similar and directly adjoining $315,000 project is already completed and open to traffic.

Now nearing completion, the most easterly section of this overall 19.5-mile highway improvement realigns that portion of U.S. 466, the Polonio Pass Road, from its intersection with State Sign Route 41 to the Kern county line, eliminating the hazardous curves and humps on the existing alignment. Such improvement will no doubt be welcomed by travelers between Fresno, Bakersfield and the central coast area. With completion of this project, we will have provided motorists with 31 miles of modern two-lane highway from Paso Robles to the Kern county line, replacing a completely substandard and hazardous highway in use only six years ago.

On shorter state highway arteries and federal aid secondary county roads, similar planning and construction activity has progressed throughout the year to properly distribute local traffic, while at the same time providing safety and convenience of travel so essential in this modern age.

Follows Existing Alignment

On State Sign Route 156 from 0.5 mile to 3.5 miles north of Hollister plans have been completed and right of way acquired for expressway development. From that point to the Santa Clara county line, an expressway routing following an existing alignment was adopted in February of this year following a public hearing in Hollister in July, 1958.

Plans are now complete for expressway development from the west city limits of San Juan Bautista to Cagney Road and design and right-of-way acquisition is under way from Cagney Road to the San Benito River just west of Hollister.

About 2.2 miles of San Miguel County Road between U.S. 101 and Strawberry Road and near the Prunedale junction is being completed in October as a federal aid secondary project at a cost of approximately $200,000. This project will widen the roadbed and eliminate sharp curves and will serve as an important link between Salinas and Watsonville for farmers in the area.

Construction of 3.95 miles of the Los Laureles Grade County Road, the connecting link between the Carmel Valley Road and State Route 117 which runs between Salinas and Monterey was completed in April of this year as a third stage of overall improvement of this county road. Work has just begun on the final 1.5-mile section which when completed will provide excellent transportation for local residents who commute to Salinas and Monterey and for tourists who visit the scenic Carmel Valley.

At another location on State Sign Route 150 directly north of the City of Santa Barbara, a public meeting was conducted in March this year discussing proposals for expressway development of a section of this route (San Marcus Pass Highway) from San Antonio Creek to U.S. 101. The route was adopted by the California Highway Commission on June 23, 1959.

Richard Winn Leaves To Take M.T.A. Post

Richard Winn, Information Officer for the State Department of Public Works and Editor of *California Highways and Public Works*, resigned in mid-October to take a new post.

He joined the staff of the Los Angeles Metropolitan Transit Authority as manager of its Public Information Department.

Winn had been with the State since 1957, when he retired from the Navy as a Commander. He served in the Navy for 15 years, holding public information and public relations assignments in Washington, D. C.; Charleston, South Carolina, and the Far East.

After graduating from the University of California in 1929, Winn was a reporter for the *Oakland Tribune* until he was commissioned in the Navy in 1941.

McCOY RETIRES

Continued from page 3 . . .

that which he has accomplished. These remembrances he continues to enjoy until his sun sets in the west.

"Few men have the knowledge, the ability, the kindness, the courtesy, the diplomacy, and the firmness to travel this course and climb to the summit of their profession.

"Mr. George T. McCoy, State Highway Engineer of the State of California, is one of these few. He has reached these heights and has received national acclaim. His garden of memory is beautiful to behold, and his fame and honor will long remain a bright spot in the history of California."

Vickrey will assume his new duties on October 1, succeeding McCoy.

Vickrey has been with the Division of Highways for 42 years, and for the past 12 years has been closely identified with the California freeway program as the division's chief planner.

Vickrey was born in Hendricks County, Indiana, in 1892, and was raised in that state. He studied engineering at Danville, Indiana, and later at the Los Angeles Polytechnic Institute.

After some engineering work with the Southern Pacific Railroad and the Los Angeles County Surveyor's Office Vickrey went to work for the Division of Highways at Willits (Mendocino County) in 1917 as a transitman. For the next eight years he worked as a construction engineer and on survey parties in various parts of the State.

In 1925 he was appointed assistant engineer in charge of location and construction for District III, at that time with offices in Sacramento, and three years later was appointed District Maintenance Engineer.

In 1932 he was transferred to District IX at Bishop as Acting District Engineer and the following year was appointed District Engineer of District I at Eureka. He remained there until his promotion to Traffic and Safety Engineer for the Division of Highways in 1938, and has been in the Sacramento headquarters office ever since.

In 1947, when California began its intensive highway modernization pro-

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DISTRICT VI

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Dam on the Tule River by the Army Corps of Engineers.

The work, consisting of grading and constructing a standard 40-foot all-paved section using plant-mixed surfacing over Class "C" cement treated base, was started in July of 1957 by the Madonna Construction Company of San Luis Obispo. A bridge across the South Fork of the Tule River was constructed, consisting of three 132-foot spans. This bridge, when the reservoir is full, will be in the backwater of the lake and was constructed some 80 feet above the existing streambed.

In the early part of May, 1958, work was begun by Dicco, Incorporated, of Bakersfield, on 2.8 miles of highway between Hospital Road and Worth Road that joins the Success Dam relocation alignment at Worth Road. This project was completed in November of 1958 at a cost of $287,-000.

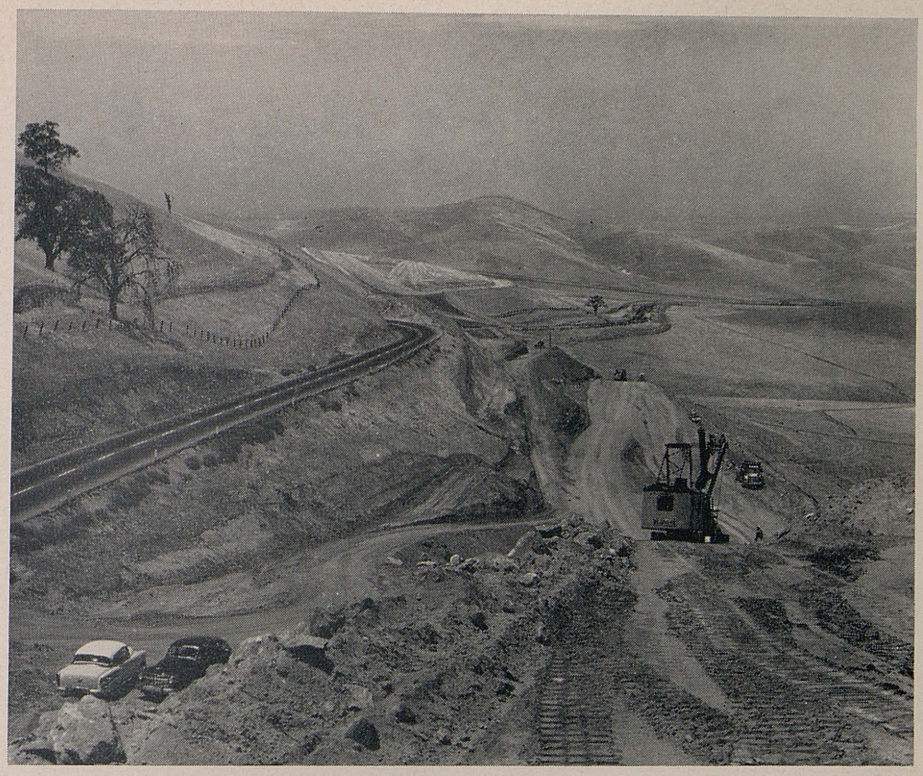
Sign Route 198

Work began in July of this year to relocate Sign Route 198 east of Visalia, between Lemon Cove and Three Rivers. The project was necessary because of the proposed construction of Terminus Dam on the Kaweah River by the U. S. Corps of Engineers. As a result of this dam construction, the reservoir which will be formed will inundate the existing two-lane highway.

Compared with the existing route, the project, confined as it is to the sidehill location dictated by the resulting waterline of the proposed reservoir, is considerably more circuitous as the distance between common points exceeds that of the existing highway by 2.5 miles. The 7.6-mile, $3.5 million job was undertaken by the Isbell Construction Company of Reno, Nevada, and should be completed in June of 1961. The work is being financed chiefly by federal funds.

US 466

This route, located in Kern County, known as the Tehachapi Highway, is a part of an important east-west route. The portion of the route between Tower Line Road and Bear Mountain Ranch, about 10 miles east of the City of Bakersfield, is being constructed on 11.9 miles of new alignment as a four-lane expressway. Right-of-way has been acquired to permit ultimate conversion to full freeway standards. Work was begun on the $5.5 million job in January of 1959, by Griffith Company of Los Angeles and should be completed in September of 1960.



Shown here are some of the US 466 relocation operations now going on east of Bakersfield. The present highway is to the left.

Sign Route 180

Sign Route 180 between Sign Route 33 near Mendota and Kings Canyon National Park has added another link of improved highway to its length with the completion of 2.5 miles of four-lane divided highway. Much of this route in the City of Fresno is on a one-way street system inaugurated in 1955. It is the main east-west highway through Fresno. The portion completed in August, 1958, provided a four-lane divided arterial on Ventura Street in the City of Fresno, between R Street and Chestnut Avenue.

Stewart and Nuss, Incorporated, of Fresno were the contractors and the approximate final cost was $485,000.

Another portion on this route east of Minkler was completed in March of 1959. Two substandard curves, including a severe horseshoe, were eliminated in the portion between 0.7 mile east of Reed Avenue and 2.3 miles east of the Friant-Kern Canal. This project was a part of the continuing process of improving this route to the Kings Canyon and Sequoia National Parks. The improvement was completed by the Thomas Construction Company of Fresno at a cost of approximately $200,000.

Sign Route 65

This project, located between Linda Vista Avenue and the Tulare-Lindsay Highway in Tulare County, is the second link in an overall plan to convert this Ducor-to-Lindsay route to a four-lane divided highway facility. It provides an expressway on new alignment passing to the west of Strathmore and joining the Tulare-Lindsay Highway at the west city limits of Lindsay. Portions of Route 65 follow the old Fremont Trail.

This project was completed by Dicco, Incorporated, of Bakersfield in March of 1959 at a cost of approximately $815,000.

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NEW LANES

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tor road, and re-enter the freeway at the Fifth Street inlet where the fourth lane southbound is already in existence.

Improvements Are Similar

These two improvements differ in that one involved the construction of a new lane adjacent to an existing freeway, while the other provided a connection from existing lanes to an existing freeway. However, they are quite similar, in that each provided additional traveled way to existing congested metropolitan freeways with the relatively small expenditure of $172,000 for both. Because of their proximity to each other, the two improvements cannot be separated when considering the beneficial effects they had on freeway traffic.

As a result of the widening, peak hour traffic increased about 42 percent, from 4,800 to 6,800, on the westbound Santa Ana Freeway, north of the Los Angeles River through the Civic Center Slot. There was a noticeable decrease in traffic congestion on the inbound San Bernardino Freeway and a definite increase in vehicle speeds observed by habitual users of these two freeways.

There are now close to 9,000 vehicles traveling southbound during the morning peak hour on the Harbor Freeway between the "Four-Level" Interchange and the Third Street off-ramp. The new "slip ramp" at Fifth Street now carries up to 1,000 vehicles per hour, which indicates the great reduction that has been made in vehicle weaving movements south of the "Four-Level" Interchange.

"Floating car" speed runs made before and after completion revealed that the average speed of traffic has increased as much as five miles per hour on the Santa Ana Freeway between the San Bernardino Freeway and the "Four-Level" during peak hours subsequent to the improvements.

Based on conservative estimates of the value of the time savings to the traveling public, it may be concluded that the cost of $172,000 for both projects, has already been fully recovered in less than one year after being opened.

JAPANESE ENGINEERS

Continued from page 50 . . .

Many Chinese crafstmen came to Japan in the Nara Period (710 A.D.-787 A.D.) bringing their techniques for the construction of Buddhist temples and bridges. These were all of wood construction, so that Chinese masonry techniques for the building of stone bridges was not transmitted to the Japanese.

A great development in the bridge construction methods occurred after the Great Earthquake of 1923 when many steel bridges were erected. These were all fabricated in domestic factories.

Because of frequent earthquakes there are many restrictions in Japan for the construction of long-span masonry or reinforced concrete arches. Until prestressed concrete bridges were erected in 1952, the majority of Japan's bridges have been of steel, except for the short-span bridges.

The study team recognized that some procedures in Japan are outdated and that more advanced methods should replace them. For example, it was pointed out that the manufacturing of bridges in Japan was accomplished by using full-sized drawings employing trial erection.

In addition, as the method is relatively new, Japanese bridge engineers have encountered problems with prestressed concrete girders.

After careful consideration by the United States Operations Mission in Tokyo and Japanese team members, the following points have been selected as those most necessary for study by Japanese bridge engineers sent to this Country:

1. The United States practice for rating bridges, highways and bridge reinforcement with relation to maximum loads and the use of larger-sized vehicles in highway transportation.

2. The planning and construction of long-span bridges.

3. The modernization of steel bridge manufacturing, including visits to some of the leading United States bridge companies.

4. The testing of bridges and highways, with a special visit to the AASHO Test Road Project in Ottawa, Illinois.

5. Construction — investigating the use of long piles, designing by means of electronic calculators, complicated grade separations, elevated bridges, viaducts and overpasses.

DISTRICT VI

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Sign Route 168

The completion of 3.14 miles of six-lane divided highway on Shaw Avenue, between Sign Route 41 and 0.2 mile east of Chestnut Avenue, marked the beginning of an overall improvement program for Sign Route 168, which leads to the recreational areas of Shaver and Huntington Lakes.

As originally proposed, Shaw Avenue was scheduled for construction as a four-lane divided highway within a 120-foot right-of-way. However, due to the great increase in traffic volume resulting from the newly completed Fresno State College, and with indications pointing to an even greater increase in the next several years from residential and commercial developments, the ultimate six-lane divided roadway was constructed.

This project was constructed by Commercial Transfer, Incorporated, of Fresno, and was completed in May of 1959 at a cost of approximately $584,000.

McCOY RETIRES

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gram under the Collier-Burns Act, Vickrey was appointed Assistant State Highway Engineer in charge of Planning. He was promoted to Deputy State Highway Engineer in 1955, and has since been responsible for all the various engineering phases of the California highway program.

Vickrey is married and has two sons, John W. Vickrey, Jr., of Alamo (Contra Costa County), and William J. Vickrey of Los Angeles. He is a member of the American Society of Civil Engineers and the American Association of State Highway Officials.

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