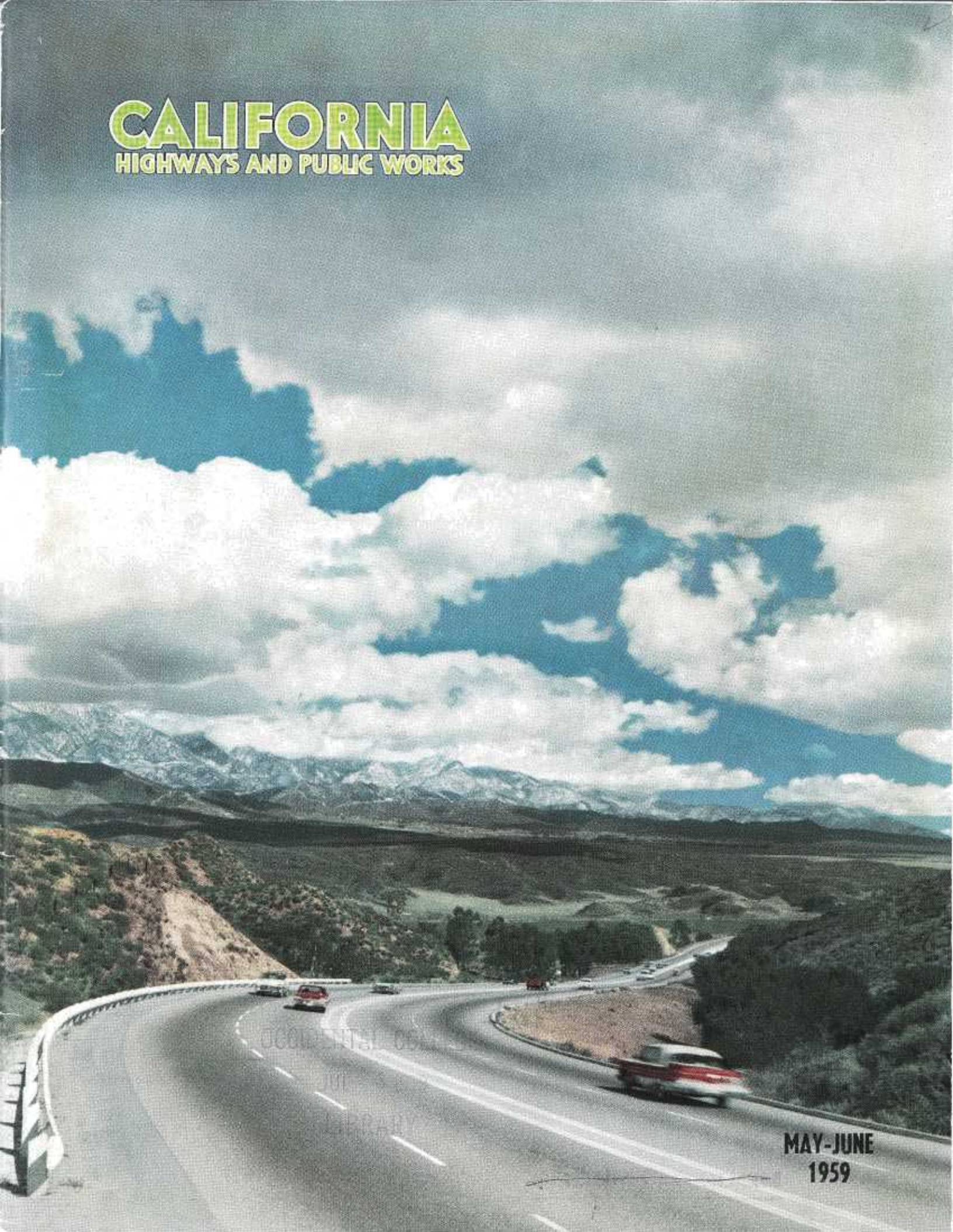
CALIFORNIA
HIGHWAYS AND PUBLIC WORKS



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FRONT COVER

This section of US 60 passes through the foothills west of Beaumont in Riverside County. The cloud-wreathed San Bernardino Mountains in the background contain peaks well over 11,000 feet high. The view is northeastward.

—Photo by Bill F. Ruland

BACK COVER

Sand and sky of California's desert country serve as an effective setting for this steel bridge which carries US 80 over the All American Canal in southeastern Imperial County.

—Photo by Bill F. Ruland

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Local Plans

Consideration for Local Needs in Freeways Told by Governor, Director

The State Department of Public Works is doing everything in its power to meet the requirements of local communities in locating California's Freeway System, according to Governor Edmund G. Brown.

In the last analysis, however, the Governor said, there must be central planning so that highways and freeways will serve the needs of all the people and not stand as concrete monuments of engineering ingenuity.

Governor Brown made the remarks at a meeting of the Governor's Council in his offices in Sacramento on April 27th.

At the same meeting, Robert B. Bradford, State Director of Public Works and Chairman of the California Highway Commission, outlined proposed freeway plans through 1980.

Bradford emphasized that the State Division of Highways is giving earnest consideration to local problems in devising the system.

He listed four recent instances in which the division has changed its plans at the request of local officials. Hearings in Sacramento on a proposed east-west freeway have been postponed in response to the city council's request for time to make new land use studies, Bradford said.

The West Side Freeway route from Tracy to Wheeler Ridge was altered in four places, he explained, to keep it clear of irrigated areas. In Bakersfield, the route was changed so that it could be integrated into the city's one-way street pattern.

Bradford also pointed to the Junipero Serra Freeway from the San Francisco county line south through San Mateo County where a shift westward from the residential area to the Skyline Boulevard area was made at the request of local residents and local public officials. This shift sacrificed 86 million dollars in traffic savings to the driver but saved 64 million dollars in construction costs and settled a protracted controversy.

Bradford told of the extensive planning that went into the proposal for a 12,300-mile California Freeway System to meet the State's automotive vehicle traffic needs in 1980.

The Division of Highways made growth studies which led to the conclusion that, during the next 20 years, the population of California would increase from 15 million to 31 million. The number of motor vehicles registered in the State, the forecast said, would increase from 7½ million to 17½ million in the same period.

The number of vehicle miles traveled per year would increase from the current 65 billion to 200 billion in 1980, according to the prediction of the division studies.

The planning study dealt also with present and future locations of agricultural production in California, population centers, timber croplands, seats of local government, areas of recreational interest, and other similar factors.

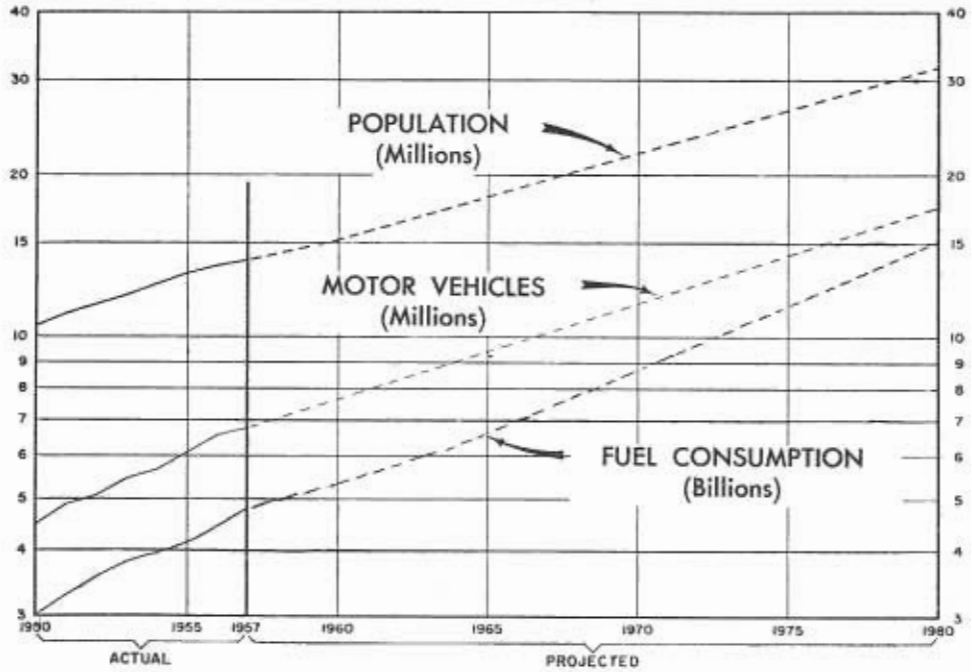
The statewide freeway system planned to take care of all these elements, Bradford explained, would cost 10½ billion dollars and would take 20 years to build. It would carry 59 percent of the State's traffic in 1980 and would save motorists 25 billion dollars in driving expenses against driving costs on present roads, streets and highways.

The proposed system should reduce highway fatalities by 60 to 75 percent, the State Public Works Director told the Governor's Council.

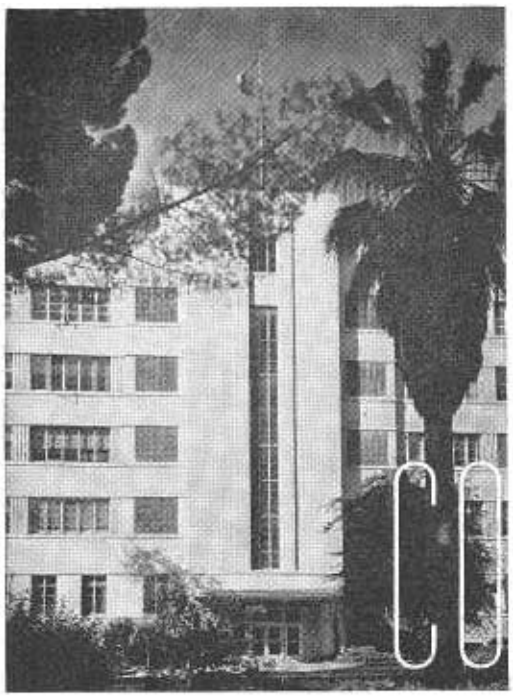
Bradford said that the California Freeway System he described was economically feasible on a pay-as-you-go basis without increasing current highway users' taxes.

Planning for the statewide freeway system was requested by the California Legislature in Senate Concurrent Resolution No. 26 of January, 1957. The completed plans were forwarded to the Legislature in September, 1958, and were incorporated in legislative proposals made to the 1959 session in January.

(The S. C. R. 26 report was detailed in the September-October, 1958, issue of *California Highways and Public Works.*)



The above chart, reproduced from the report published by the State Legislature's Joint Interim Committee on Highway Problems, forecasts probable population, motor vehicle totals and fuel consumption in California for the next 20 years.



Public Works Building
Twelfth and N Streets
Sacramento

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Fresno Freeway Shows Marked Accident Drop

The accident rate dropped 66 percent on U. S. Highway 99 at Fresno in the year following completion of the Fresno Freeway, a Division of Highways before-and-after study has revealed.

The study covered traffic and accidents on the old US 99 at Fresno in the year before the freeway was opened, and on the freeway and the old highway, which became the US 99 Business Route, in the year after the freeway was placed in operation.

In the one-year "after period," the combined freeway-business route accident rate was 4.17 per million vehicle-miles of travel, a decrease of 66 percent from the preceding year's rate of 12.1 accidents per million vehicle-miles on the old highway.

The number of accidents was cut from 461 on the old highway to 34 on the freeway and 179 on the business route.

The comparatively small number of accidents on the freeway demonstrates the substantial traffic safety benefits from this type of highway.

The accident rate on the freeway alone for the first year of operation was a low 1.2 per million vehicle-miles. The rate on the business route was 7.6 accidents per million miles, also an impressive reduction from the previous year's rate.

The number of persons injured in accidents also declined.

The year before the freeway was put into use 71 persons were hurt in accidents on the old route. The following year 18 were injured in mishaps on the business route and 39 were injured in freeway accidents.

The reductions were recorded even though traffic volume on the freeway and business route combined was 32 percent higher than on the old highway.

Average daily traffic on US 99 at Fresno in the "before period" was 20,800 vehicles. In contrast, the freeway-business route average was 27,500 vehicles per day—15,700 on the freeway and 11,800 on the business route.

Report From District XI

By JACOB DEKEMA, District Engineer

THE PAST several months in District XI have seen an unprecedented number of public meetings and route adoptions in this southern district. Three public meetings on US 80, a portion of the National System of Interstate and Defense Highways, preceded 134 miles of route adoption by the California Highway Commission. The route adoptions extend from the City of El Cajon within the San Diego metropolitan area, to Gray's Well, about two-thirds of the way between El Centro and the California-Arizona boundary. Construction and right-of-way costs are estimated at 100 million dollars.

In addition to the foregoing, public meetings have been held relative to route adoptions on segments of US 101, State Sign Route 67, and US 60-70-99. The portion of US 101, also on the Interstate System, under consideration was that section between Rose Canyon Creek and the former north city limits of San Diego, while on State Sign Route 67 a segment between US 80 and the San Diego River just north of Lakeside came under discussion. On US 60-70-99, several alternate routes east of the City of Indio and projecting easterly to Cactus City were debated publicly by interested factions. It was interesting to note the wide participation by local residents, which sometimes numbered from 200 to 500 people, in these public meetings held in relatively remote areas.

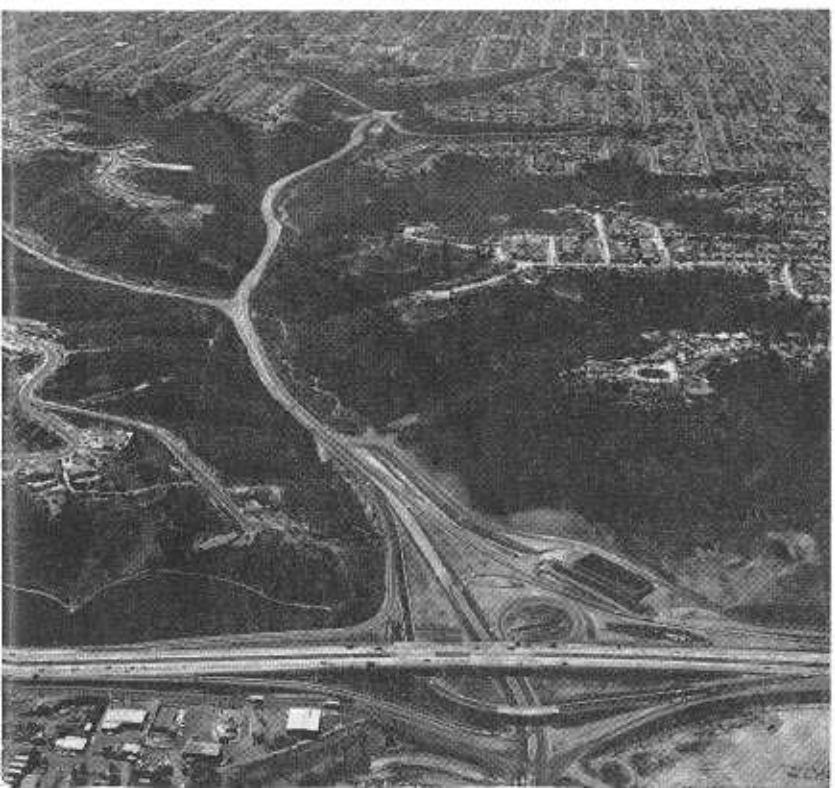
BELOW, LEFT—An aerial of the US 80-Fairmont Avenue interchange looking south along Fairmont Avenue. East San Diego is in the background. RIGHT—An aerial looking eastward through the Palm Desert from above the Sign Route 111-74 intersection in Riverside County.

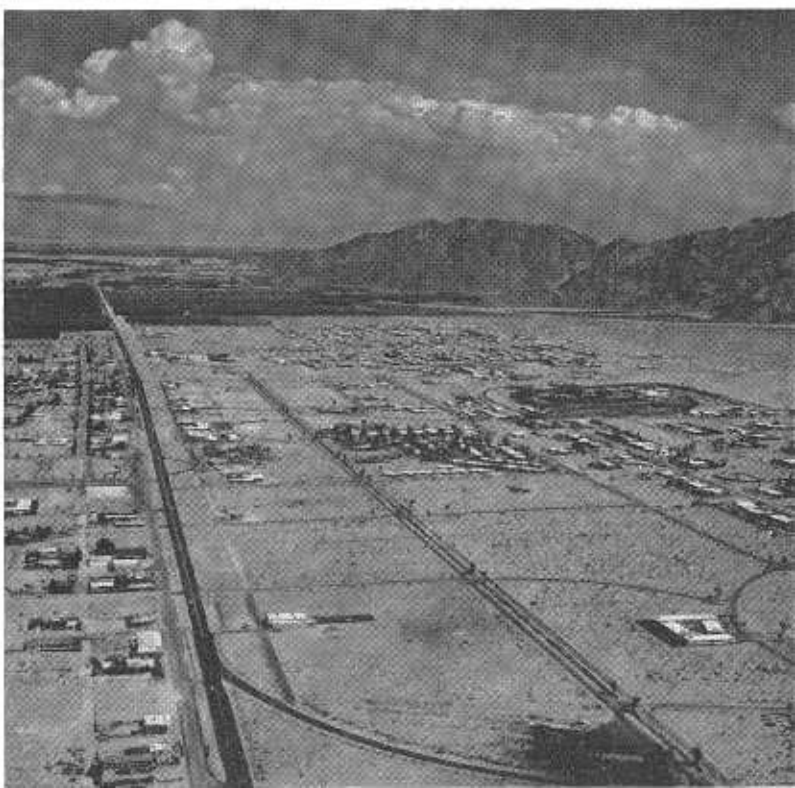
Full Freeways Built

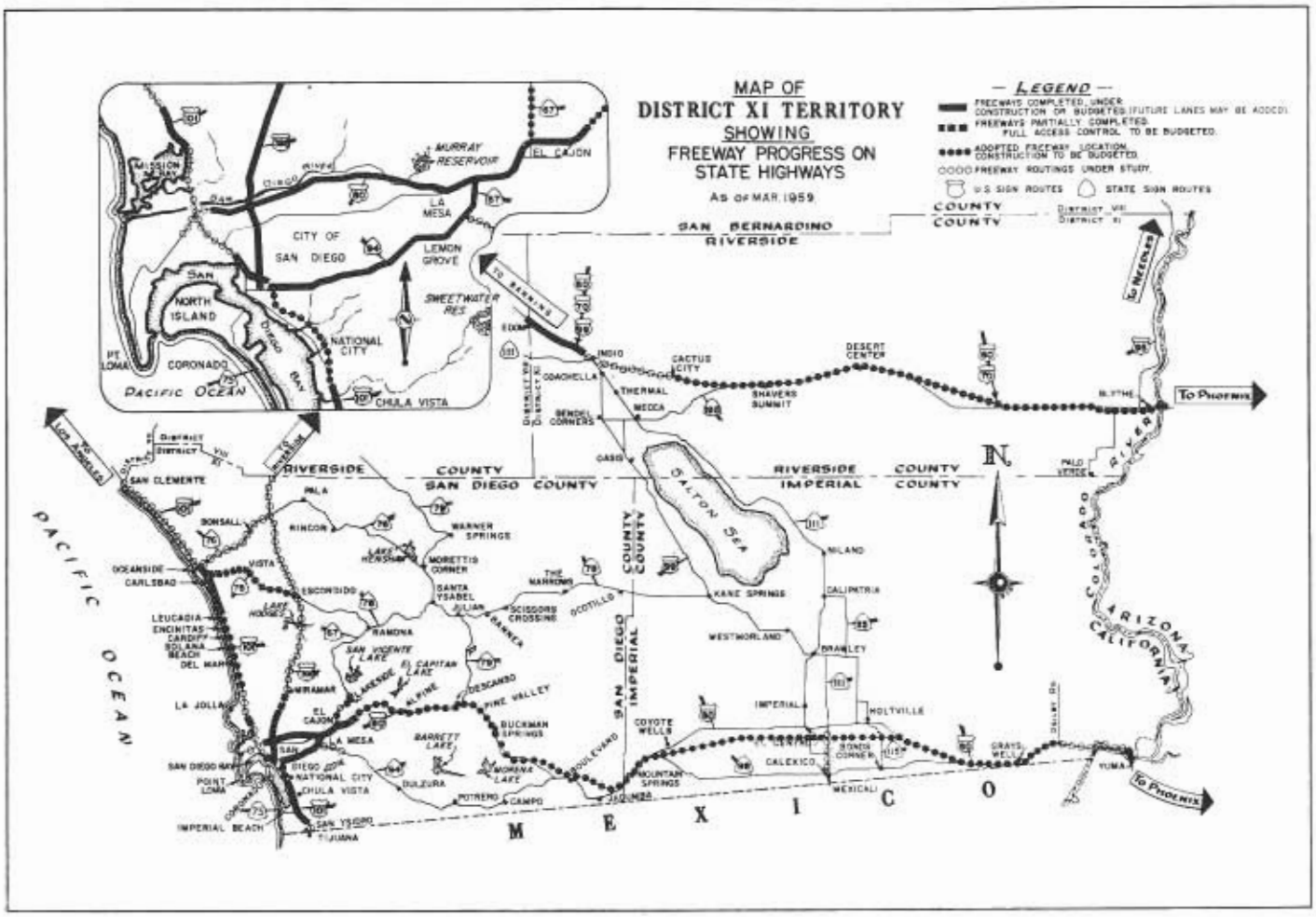
Constructionwise in District XI, US 80 occupies the spotlight. Eleven major contracts for 17 miles of full freeway between US 101 and the east side of the City of El Cajon have been completed, are being constructed, or are budgeted for the current fiscal year. The westerly portion of US 80 lying on the south side of Mission Valley is particularly interesting in that it overlays the old Mission Trail (El Camino Real) which connected the early California missions. A number of monuments to California's early history will cast their shadows upon the eight-lane freeway presently under construction.

Between US 101 and US 395, 1.3 miles of eight-lane full freeway development is currently under construction by R. E. Hazard & W. F. Maxwell at a bid price of $1,214,000. Frontage roads will be constructed parallel to the entire development and structures will provide for motorists to cross the freeway. On- and off-ramps will be built at the Presidio Park structure near the western terminus of the contract.

One noticeable aspect of this area of construction is the rapid mush-







rooming of motels. Property prices have skyrocketed since the initial freeway planning and the highway contractor will be hard pressed to keep up with the motel builders adjacent.

Traffic Presents Problem

The next contract provides for a revision of the US 80-US 395 interchange and is approximately 70 percent complete at the time of this writing. Seven separate structures were necessary to provide direct turns for the major traffic movements, while loops suffice for the other movements. Traffic handling during construction has been particularly difficult, although surprisingly efficient, inasmuch as there are no major parallel facilities to use as detours. This condition is existent over almost the entire length of US 80 presently under construction.

The third contract on US 80, between US 395 and Fairmount Avenue, is the largest single contract yet to be awarded in District XI. The contract award was made to R. E. Hazard and W. F. Maxwell in the amount of $4,560,000 for the construction of 3.6 miles of eight-lane freeway, including three major interchanges in addition to two two-lane bridges over the San Diego River. Frontage roads will serve the properties adjacent to the freeway which are rapidly expanding with recreational and commercial enterprises. Due to unprecedented residential expansion north of Mission Valley area, it was mandatory that four-quadrant treatment of the interchanges be planned. Ward Road and Texas Street, sites of US 80 interchanges, are destined to become major arteries in the near future.

The Fairmount Avenue Interchange, recently completed, was the fourth among the 11 contracts planned for metropolitan US 80. It overlooks the Mission San Diego de Alcala and serves as a connection to Mission Gorge on the north and eastern San Diego, together with San Diego State College, on the south.

Alvarado Canyon Section

Contract number five in the US 80 chain is that segment between Fairmount Avenue and 70th Street (Lake Murray Boulevard). This six-lane freeway section will traverse Alvarado Canyon, with interchanges at Waring Road and College Avenue. The Waring Road connection will serve a large residential area presently expanding on the north of the freeway. The College Avenue interchange also will serve a large residential area to the north of the freeway and will eliminate two accident prone intersections by substituting a grade separation for a grade crossing of the high-speed arterial. It is considered fortunate that the City of San Diego, when originally developing Alvarado Canyon to expressway standards, acquired a major portion of the access

UPPER LEFT—Looking eastward along US 80 showing the Sign Route 67 interchange in the foreground. The City of El Cajon is in the background. UPPER RIGHT—This bridge near Blythe in Riverside County carries US 60-70 traffic over the Colorado River. The structure at the west end of the bridge is the agricultural inspection station. LOWER LEFT—Looking northeast along Balboa Avenue in San Diego. LOWER RIGHT—This view looking north above Nimitz Avenue shows freeway construction now under way and Mission Bay Park in the background.

rights thereto, foreseeing a freeway development on the alignment in the future. The Griffith Company was low bidder for this 2.6 miles of freeway, which was estimated to cost $2,565,000.

The eastern terminus of Alvarado section of US 80 will deliver the motorist onto a newly completed six-lane freeway extending from 70th Street through Baltimore Drive in the City of La Mesa. This segment of US 80 was constructed under two contracts, at a cost of $1,663,000 for a 2.5-mile section. These, the sixth and seventh projects, added two new interchanges, to give the motorist access to Lake Murray Boulevard and the San Diego County-built Fletcher Parkway at Baltimore Drive.

Major Interchanges Planned

Segment eight in the contract chain of US 80, will be a six-lane freeway between Baltimore Drive and the recently completed Grossmont Summit section. Design is in the final stages, and the 1959-60 Fiscal Year budget adopted by the Highway Commission allocates $3,000,000 for this 2.3-mile link of US 80. Major interchanges are planned for connecting El Cajon Boulevard and Jackson Street with the Freeway. Three new bridges in addition to the one presently in use will be built to accommodate traffic crossing the freeway, as well as to afford entry and exit on the south at El Cajon Boulevard (former US 80). At Jackson Street in the City of La Mesa, it is possible to utilize the existing grade separation structure and, by adding another alongside, to accommodate the additional lanes together with several ramps, to develop a very desirable geometric design at a minimum of cost. Service is provided to the City of La Mesa on the south and La Mesa's industrial area to the north of the freeway.

Link nine of the US 80 chain of contracts is the recently completed $3,594,000 job in the Grossmont Summit area. Although the traffic paint is hardly dry, the project is functioning smoothly despite the tongue-in-cheek attitude of a multitude of sidewalk superintendents. The rapidity with which the traveling public adapted to the somewhat complex geometric design was very revealing and will be extremely useful in future interchange planning.

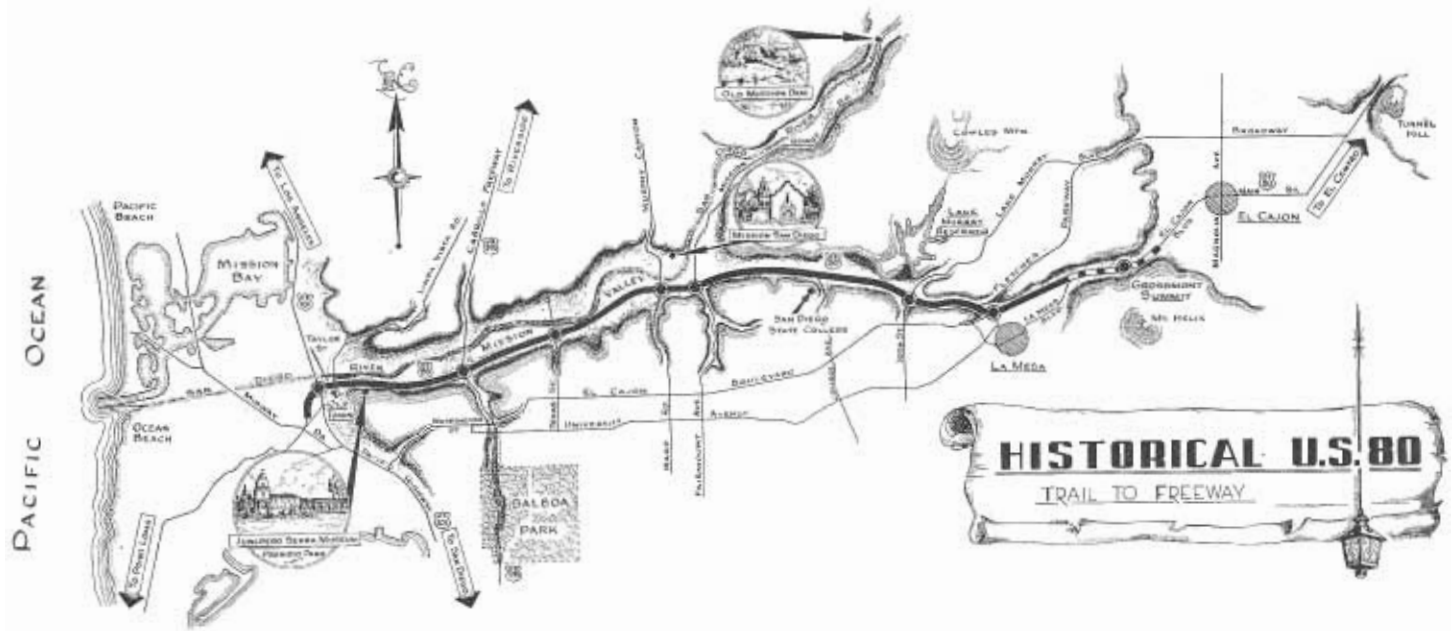
Surplus Excavation Used

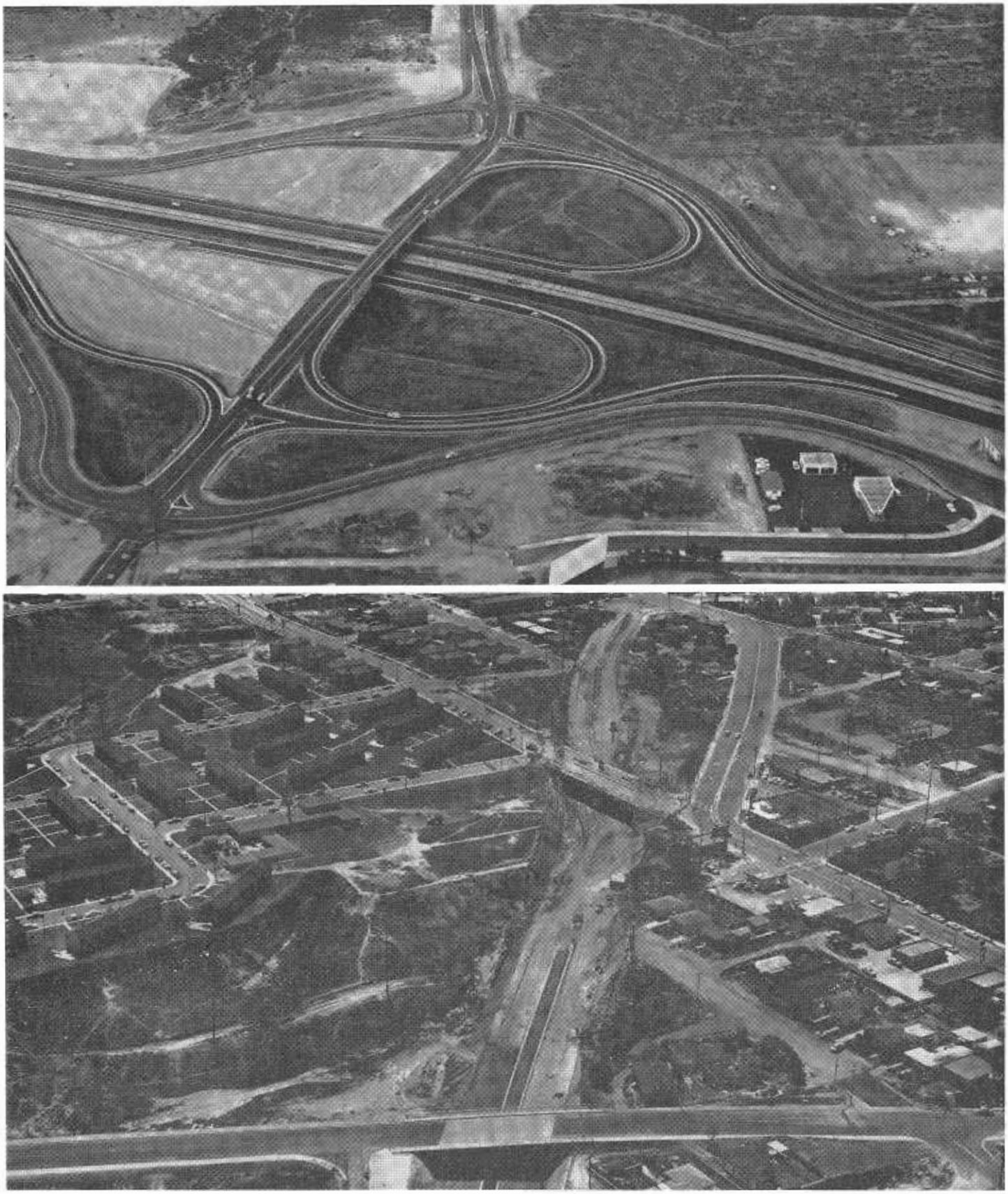
Momentarily, and perhaps before this article is in print, advertisement is expected on contract 10 of the US 80 freeway. This project will carry the development on six lanes along the western hillside overlooking the El Cajon Valley between Grossmont and Magnolia Avenue (State Route 67). Excess excavation from the Grossmont project has been placed to form a portion of the fills along this alignment which provides a diamond interchange at West Main Street and grade separations at Marshall and Johnson Avenues. A four-quadrant cloverleaf with collector roads will accommodate the State Route 67 Junction at Magnolia. Highway Commission action has budgeted $4,000,000 in the 1959-60 Fiscal Year for this link.

The eleventh and last development presently budgeted in the US 80 series of contracts will extend a four-lane freeway development from Magnolia Avenue on the westerly side of the El Cajon Valley to Third Avenue on the easterly side of the valley. This contract, which will provide for diamond underpasses at Mollison and Second Streets and grade separations at Ballantyne Lane and First Street, will include a half-diamond interchange at Third Avenue as well as a temporary connection to existing US 80 at Broadway. Foreseeing increasing traffic demands in the future, right-of-way sufficient to accommodate eight lanes is presently being acquired. With the completion of the foregoing 11 contracts in the near future, the traveling public will have 17 miles of full freeway across the metropolitan area of San Diego at an estimated construction cost of 29 million dollars.

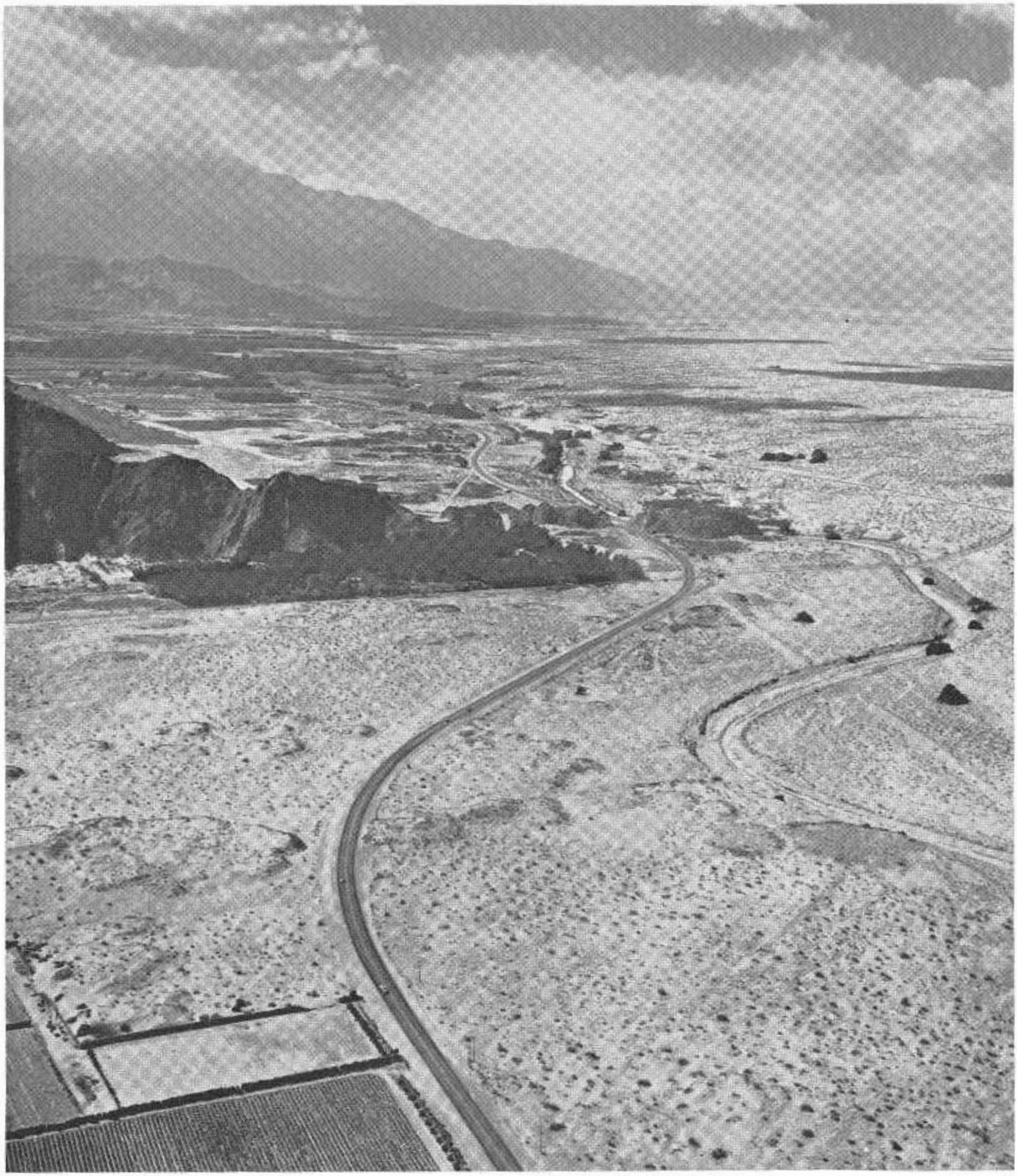
US 101

With completion in sight of the major construction on US 80 in the





UPPER– This aerial, looking westward, shows the US 395-Clairmont Mesa Interchange in San Diego County. LOWER An aerial showing construction along Nimitz Boulevard in San Diego. The view is south.



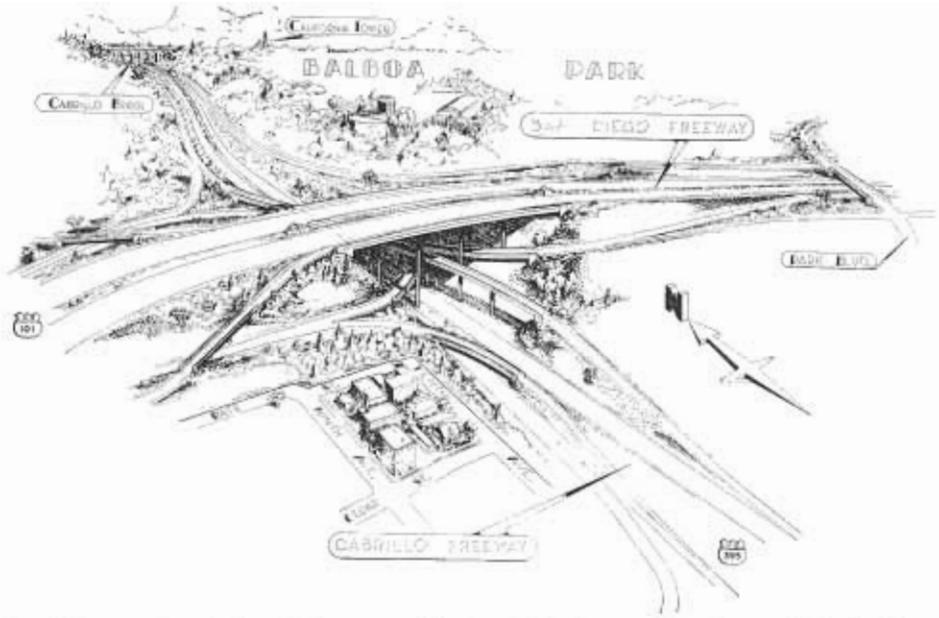
State Sign Route 111 winds its way through the desert country west of Indio in central Riverside County. Note the neatly demarked crop and orchard areas in the left fore-, middle- and background of the photo.

metropolitan area, it is anticipated there will be a shift of construction emphasis to US 101—District XI's principal north-south artery between the Mexican border and the northern district boundary.

Highway construction involved for the new border crossing station at the international boundary has been advertised, with bids opened May 7, 1959. Engineering design and contractual procedures will be handled by the State Division of Highways, with cost participation between the State and the Federal General Services Administration.

Progressing northerly, the section of San Diego Freeway (US 101) from Market to Palm Streets within the City of San Diego is in the final design stages, with the first contracts expected to be advertised in the fall of this year. Right-of-way acquisition is nearing completion for the first phase of construction, involving grading and a number of structures at and on either side of US 395. Thirteen million dollars have been allocated for construction and three million dollars for rights-of-way on this metropolitan segment of US 101 by the Highway Commission, for the 1959-60 Fiscal Year. The structures for the planned four-level US 101-US 395 interchange near Date Street will be a portion of this first contract for the projected eight-lane freeway development.

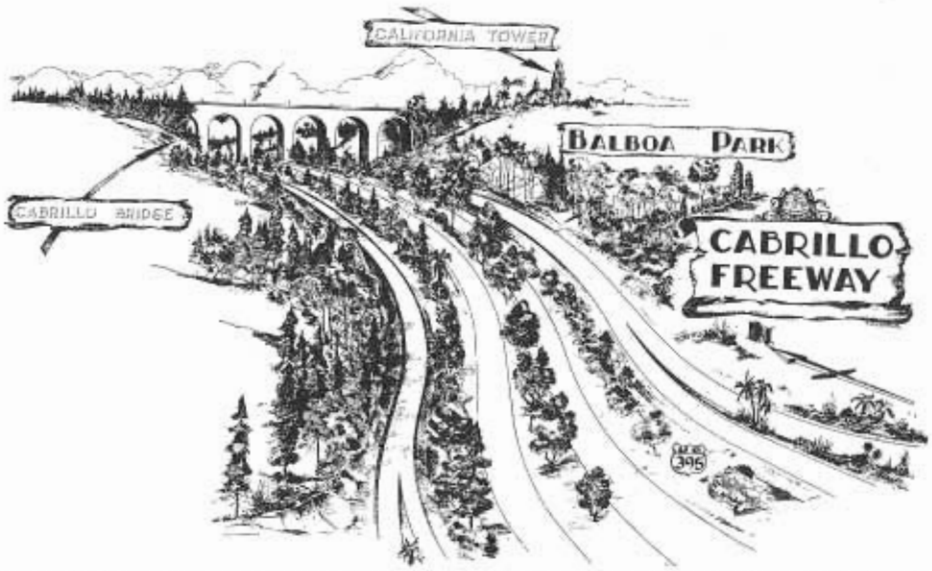
With the completion of the one-mile section of eight-lane freeway between Washington Street and Barnett Avenue, what formerly was an arterial blocked solid with standing cars up to a mile in length at peak load hours is now a free flowing, 55-mile-an-hour freeway.



An aerial perspective drawing of the proposed four-level interchange which will connect the San Diego and Cabrillo Freeways.

Recently, the Legislature added a new route to the State Highway System, Legislative Route 241. It will begin at US 101 near San Ysidro and end at US 101 near the northwest boundary of the City of San Diego. This route will be located east of existing US 101 and will serve as a north-south belt line route around the more heavily populated portions of San Diego County.

Planning studies are presently under way to ascertain the exact routing for commission action. The newly adopted route will be a part of the National System of Interstate and Defense Highways.



An artist's sketch of the Cabrillo Freeway in the vicinity of the future four-level interchange shown at the top of this page.

State Sign Route 94

With the recent completion of nine bridges on State Sign Route 94, and with grading and paving operations progressing rapidly, the freeway section between 24th Street and Home Avenue is fast becoming a reality. This eight-lane full freeway will serve as a connecting facility between the San Diego Freeway and the previously developed freeway extending easterly.

Interchanges will be placed at 25th Street, 28th Street, and at the City of San Diego's Wabash Boulevard, while 30th Street will bridge the freeway on a grade separation structure. Anticipated completion of this 0.8-mile unit in the fall of this year should go far toward alleviating the Market Street bottleneck presently feeding traffic into the freeway extending easterly toward US 80. The connecting fills and viaduct sections to accomplish the final connection to US 101 will be a portion of the US 101 construction.

. . . Continued on page 45

Oakland Study

Effects of Street Work on Tax Base Reported

By FRANK CHENEY, Senior Engineer
Street and Engineering Department, City of Oakland

A view westward along a portion of 27th Street between Telegraph Avenue and Broadway in Oakland which served as a study area for the accompanying article. The business establishments in the foreground are located on surplus property acquired for street right-of-way.

NEW FREEWAYS and street widenings have long been charged with feeding on a city's tax base. In light of current studies, this stereotyped criticism can no longer be justified.

The tax implications of any public works activity—either proposed or already accomplished—are properly and desirably matters of citizen concern. Subsequent expressions of that concern—enlightened by thought and study—are helpful. But statements predicated on little if any factual analysis have just the opposite effect.

Unfortunately, many widely held opinions of the effects upon the property tax base of property acquisition for street improvements and widenings, are based on lack of information. Of course, a certain amount of misconception is understandable. Street improvements generally require the purchase of taxable land for a tax exempt use and it may seem reasonable to assume that the community tax base will be correspondingly reduced. No further investigation of offsetting factors and influences, or study of actual case examples, seems necessary on first glance. As a result, little private research has been actually carried out or published.

There is, of course, another viewpoint that has pertinency—the impressions of those who are literally on the street improvement job itself. It is not surprising that these latter experiences and observations, drawn from review of areas where street widenings have been completed, have tended to create an impression of tax base effect which is quite different from the first glance impact already sketched. Higher land values, upgraded buildings and residences, and newer and more profitable land uses, all have been observed frequently enough following street improvement to strongly suggest beneficial, rather than adverse, tax effects as the more realistically predictable results of street betterments. Here too, however, little subsequent compilation and reporting has been achieved. The following city street improvement report thus attempts to begin to remedy that deficiency by factually analyzing the problem within Metropolitan Oakland, so that sound answers to a good many of the widely held tax effect assumptions can be developed.

Preliminary Study

As a necessary first step in this research project, extensive study was made of the entire Oakland area to determine which sections and which construction projects were available for "before and after" study and analysis. Four major street improvements which had been completed within the last 10 years were found to meet all the preliminary requirements initially suggested, and more intensive study of each was subsequently commenced.

Land and improvement inventories were established for each area, and assessed values and value trends were plotted for the years both before and after the street improvement in each was completed. Even from this relatively cursory examination, several factors became readily apparent:

1. Trends in all areas were clearly similar.
2. All areas were subject to city-wide fluctuations and influences, and street improvement effects themselves tended to be "masked" thereby.

The necessity for some type of "control area" analysis so that the effects attributable only to the street improvement itself could be isolated, was clear. Similar districts in close proximity to each study area were thus chosen, and identical comparisons for these "control sections" were carried out.

UPPER—This photo taken in 1953 looking eastward along 27th Street shows the end of the street, private homes and the U. S. Government housing that was removed to make way for the roadway. LOWER—This photo was taken from approximately the same location as the one above after the new divided roadway was completed in 1958. For a point of reference note the church spire in the right background of both pictures.

Again a similarity of trend and pattern was clearly evident in all four study areas. Because of the lengthy and comprehensive study and analysis which still had to be carried out, one project was chosen from the group for final study. This project, the 27th Street improvement between Telegraph Avenue and Broadway in Oakland, is reported in detail hereinafter.

It should perhaps be emphasized that this latter project is a representative situation rather than a unique one. The conclusions deriving from a study thereof are thus considered typical of at least the three other projects and areas initially studied—probably they are entirely representative of what we can expect, taxwise, from betterments within the entire Oakland area, and probably within other similar California cities as well.

Project and Area

Prior to the construction of this project, residential 27th Street was a discontinuous street, traveling in a generally easterly direction from Telegraph Avenue. Its improvement, commenced on July 21, 1955, and completed on March 22, 1956, was the second unit in the overall improvement of both 26th and 27th Streets between Grand and San Pablo Avenues. Construction resulted in the creation of two 41-foot roadways (one parking and three moving lanes) in each direction, with a six-foot median strip. (See accompanying photographs.)

Overall, this unit represents one of the closing links in a major cross-town arterial providing easy access to the San Francisco-Oakland Bay Bridge, and the cities of Emeryville, Albany, and other outlying cities of the Greater East Bay; thus relieving, in part, the growing traffic congestion in Metropolitan Oakland. The entire cost of the project was $390,491, including right-of-way acquisition costs of $274,435.

About 60 years ago the study area was developed exclusively for residential use in what might have been called the residential district of the city at that time. Today, as Oakland has grown, the area is located on the fringe of the downtown business district adjacent to "Automobile Row." Because of the age of its houses, it is probably only a matter of time before private developers will enter to purchase the properties, tear down the existing improvements, and erect new and modern business structures in their place. This then, was the type of development situation to which our attention was to be directed.

Problem Approach

As indicated earlier, a "before and after" study approach was utilized. Assessed value trends for both the land and improvements within the study area were developed and compared. Also, market value trends were measured and analyzed. Identical factors were developed and assessed for the so-called control area as well, the nearby section not having been affected by a street improvement but similar in all other respects to the 27th Street section under study.

In this respect the Street and Engineering Department of the City of Oakland is fortunate in having, as an integral part of its organization, a "Block Book Section." Within this section is maintained a complete accounting of all property transfers, both public and private, that transpire within the City of Oakland. Through the use of microfilm all such transfers become an integral part of this department's records. Using this material, together with the records of the County Assessor of Alameda County, the factual property data necessary for this study were compiled. Certain summary facts became quickly apparent.

Summary Results

Careful analysis of all relevant factors has clearly indicated that street openings and widenings result in an increased tax base, together with other allied tax and community benefits. In the 27th Street improvement area, it was found:

. . . Continued on page 43

A vicinity map showing the location of the portion of 27th Street (encircled) studied in this report.

Benicia-Martinez Bridge

Construction of the Benicia-Martinez Bridge came a step nearer realization when the California Toll Bridge Authority, at its April 23d meeting, authorized the sale of 34 million dollars in bonds to finance the building of the bridge and its approaches.

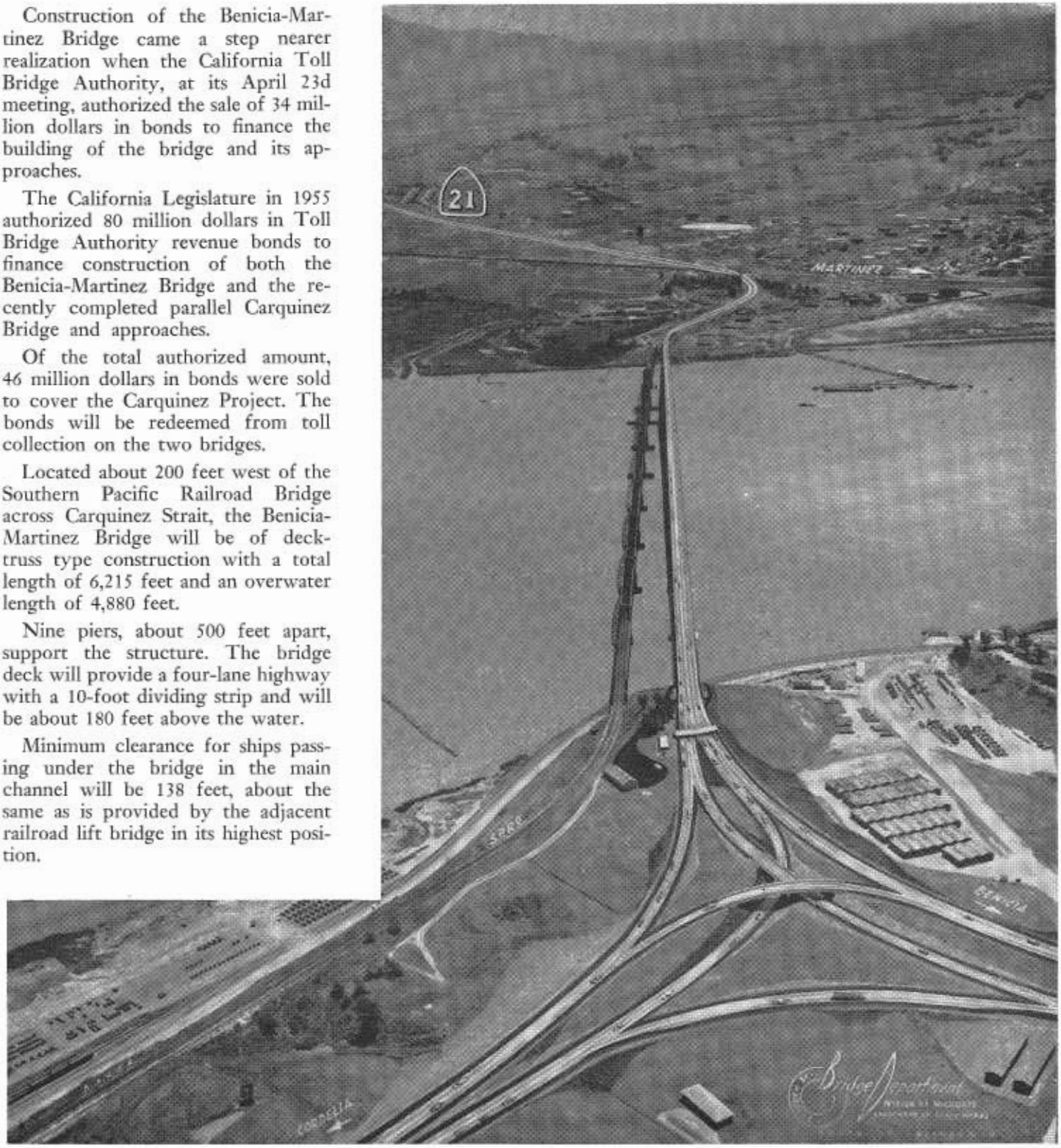
The California Legislature in 1955 authorized 80 million dollars in Toll Bridge Authority revenue bonds to finance construction of both the Benicia-Martinez Bridge and the recently completed parallel Carquinez Bridge and approaches.

Of the total authorized amount, 46 million dollars in bonds were sold to cover the Carquinez Project. The bonds will be redeemed from toll collection on the two bridges.

Located about 200 feet west of the Southern Pacific Railroad Bridge across Carquinez Strait, the Benicia-Martinez Bridge will be of deck-truss type construction with a total length of 6,215 feet and an overwater length of 4,880 feet.

Nine piers, about 500 feet apart, support the structure. The bridge deck will provide a four-lane highway with a 10-foot dividing strip and will be about 180 feet above the water.

Minimum clearance for ships passing under the bridge in the main channel will be 138 feet, about the same as is provided by the adjacent railroad lift bridge in its highest position.



This artist's sketch of the proposed Benicia-Martinez Bridge is looking from above the approach and interchange on the Benicia side toward Martinez and the connection with Sign Route 21.

Photogrammetry

Department Engineer Wins Abrams Award

A STUDY on the problems of photogrammetric map accuracy has brought national recognition to L. L. Funk, California Division of Highways Photogrammetric Engineer. The study, published in several periodicals circulated to photogrammetrists and to scientists in associated fields, was selected by a special committee as the most outstanding during 1958, and as meriting the Talbert Abrams Award.

This award is given annually to the member, associate member, or honorary member of the American Society of Photogrammetry whose published work is considered the best contribution to the science during the previous year. The recipient retains the trophy for a year, has his name inscribed on the base, and receives a $100 prize.

A number of distinguished men in the field of photogrammetry have won the award, which was first given in 1944. In 1948, for instance, Harry T. Kelsh won it for the Kelsh plotter, an instrument which greatly simplified the conversion of aerial photographs into contour maps. Indicative of how rapidly the science is being adapted to modern uses, the committee gave Dr. Hellmut H. Schmid the award in 1958 for "development of techniques and equipment enhancing usefulness of photogrammetry in solving geometric problems and also in the fields of missile testing and satellite performance."

Funk's study is concerned with the accuracy of contour mapping as it applies to highway design. He points out that many applications of photogrammetry are concerned with relative relief, and slight errors in overall elevation may be unimportant. The highway engineer is vitally concerned with vertical values, of course, in order to accurately calculate cut and fill quantities.

In exploring this facet of photogrammetry, Funk has reached the conclusion that while the current specifications for contour mapping for highway purposes are reasonably sound from a practical viewpoint, they allow a possibility, under certain conditions, for systematic errors. These errors, though well within the tolerance allowed by the mapping specifications, could be seriously inaccurate for contract pay quantities.

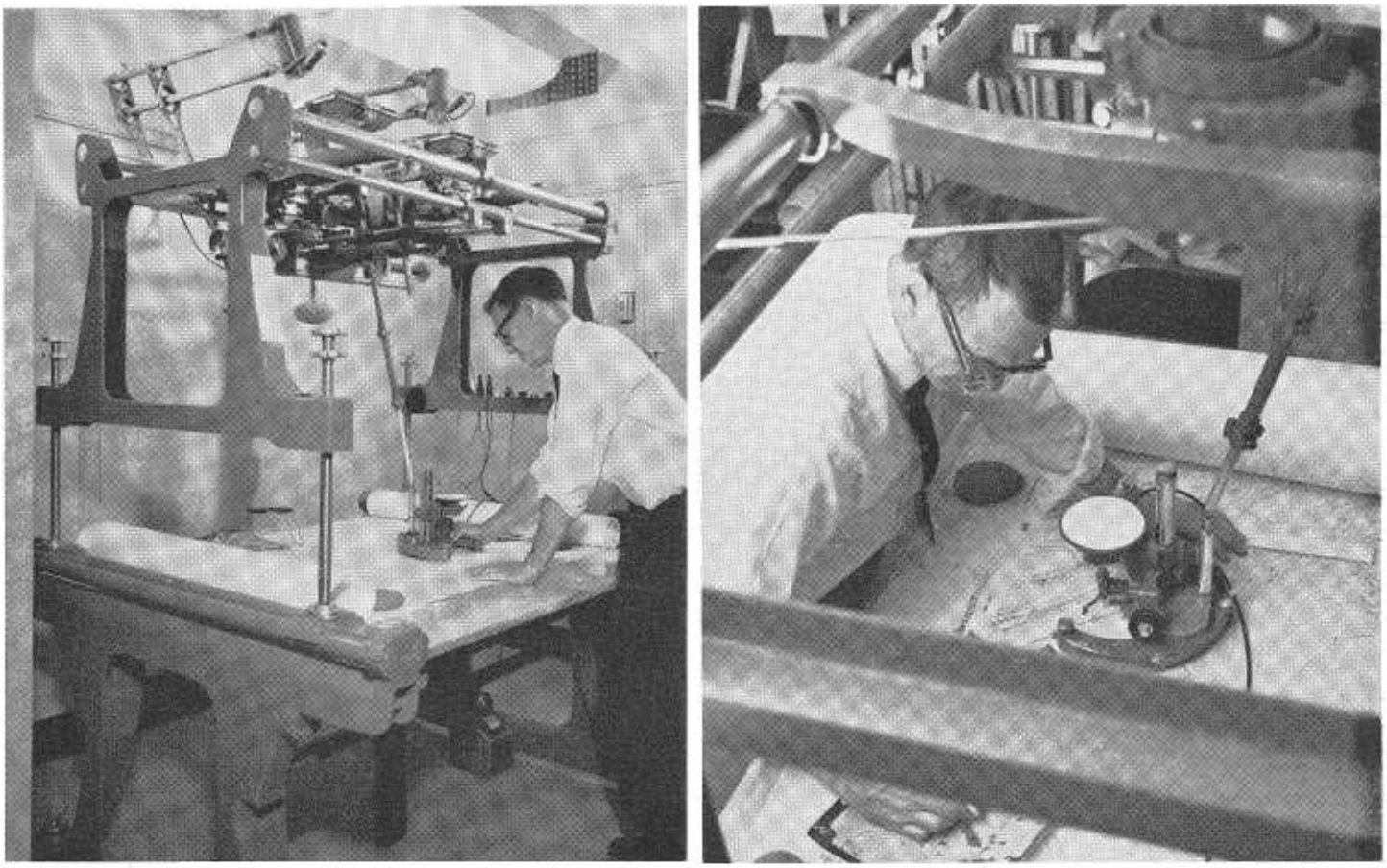
L. L. Funk, Principal Highway Engineer, in charge of California Division of Highways Photogrammetry Sections, poses with Talbert Abrams Award and photogrammetry exhibit in Public Works Building, Sacramento.

For instance, on a half-mile length of interstate highway 200 feet wide, a systematic error of one foot in elevation represents about 20,000 cubic yards of material. Yet such an error would be permissible under present mapping specifications. Fortunately, errors of this sort are rare, and are more apt to be high-low variations which tend to cancel each other.

Funk feels too much dependence is placed upon arbitrary use of a figure known as a "C-factor." Actually, this is the desired contour interval divided into the altitude of the airplane. Much confusion has arisen from the indiscriminate use of this term—some experts contending a C-factor of 1,500 is perfectly workable, while others contend it should be as low as 750 or 800.

Funk points out grass and weeds alone can cause an apparent error of one to two feet in stereomapping. Also, that for certain purposes a large contour interval will be satisfactory, allowing the pilot to fly high and cover more ground with each photo. Other jobs, requiring more accurate contouring, must be flown at lower altitudes.

It should not be assumed, however, that photogrammetric methods in use today are undependable. Photographic contouring for highway location and design offers many advantages over field party work. It saves both time and money, and it can be

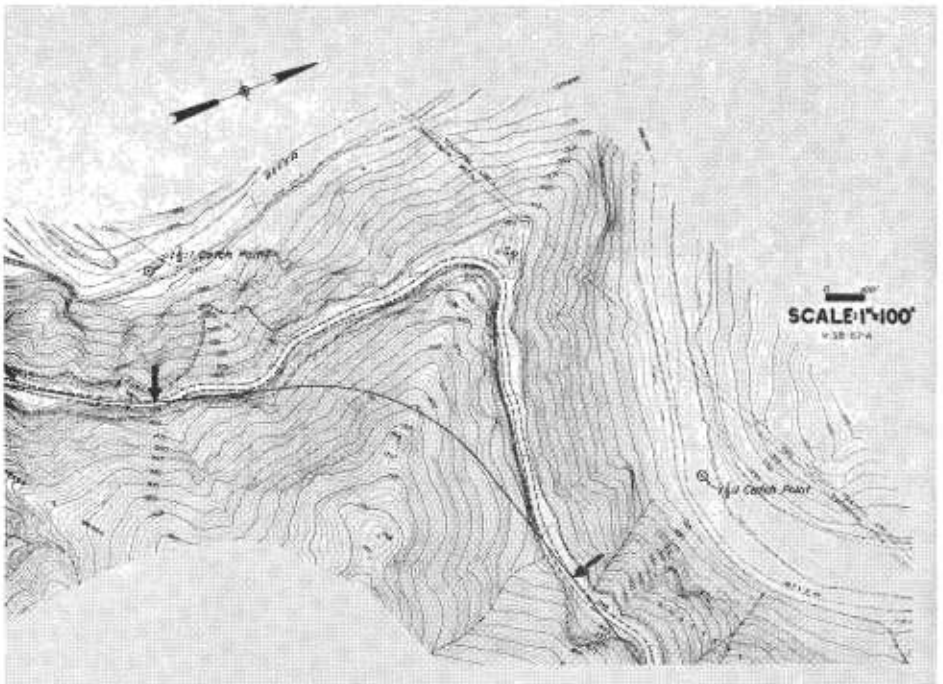


LEFT—Photogrammetrist Brennan Davis operates one version of stereo-plotter, complicated mechanism for stereo-picture projection for map making. For accurate work, machine must be sturdy and built to close tolerance. RIGHT—Davis demonstrates use of stereo-plotter. A three-dimensional image is projected on white disk. The operator wears special glasses, one lens red, the other blue, to get three-dimensional effect. The machine traces contours as operator follows apparent relief.

done without stirring up premature speculation about possible route locations. If properly handled, it yields quantitative results as reliable as those obtained by field methods. For most location problems, a contour map, supplemented by a minor amount of field survey work, is all that is needed to design the highway.

Before an actual construction contract can be let, the route must still be staked in the field. This is a relatively simple job, however, since the major mapping has already been completed.

This field stake-out of the route follows the centerline of the roadbed, and gives an excellent check on the photogrammetric contouring. Usually, the two systems check closely. Funk feels, however, now that photogrammetry is becoming a more exact science, standards for its accuracy should be more clearly established.



A contour map made from aerial photography and used in study for road location. The map showed that grading catch points would be in the middle of a river bed, damming the stream. This projected route was discarded.

Cost Index

Construction Prices Down For First Quarter of 1959

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

The California Highway Construction Cost Index for the first quarter of 1959 shows a drop in construction costs on the basis of unit bid prices received during the period. The Index now stands at 216.1 (1940 = 100) which is 22.4 index points or 9.4 percent below that of the fourth quarter of 1958, which more than offsets the rise in the Index of 4.4 percent experienced in that quarter.

This 216.1 figure is 25.7 index points or 10.6 percent below the corresponding period of 1958, and 61.6 index points or 22.2 percent below the all-time high of 277.7 established in the first quarter of 1957. It is the lowest point reached by the Index since the four quarter of 1955, when it stood at 212.6. The accompanying tabulation shows the California Highway Construction Cost Index by years from 1940 and by quarters from 1955 to date.

The bidders' competition in this quarter for highway projects was high, averaging 7.7 bidders per project in January, 8.0 in February, and 8.7 in March, resulting in an average for the three months of 8.2 bidders per project. This compares with 6.3 bidders per project for the fourth quarter of 1958.

Included with this article is a tabulation showing the average number of bidders arranged according to types of construction and project value, and includes all projects for which bids were received.

In this quarter bids were opened for 74 projects with a total value of $66,975,520, compared with bid openings in the previous quarter for 174 projects with a total value of $36,189,715. The higher average value of projects in the first quarter of 1959 is due largely to the opening of several large freeway projects in the 1958-59 Fiscal Year budget which had been scheduled for earlier advertising but were delayed by right-of-way negotiations, co-operative agreements, and other factors. In addition, bids were opened for several large urgent freeway projects being placed under way as quickly as possible under the 1959-60 Fiscal Year budget. On the other hand, the lower average value in the last quarter of 1958 is due in part to the so-called "crash" program under the Federal Aid Highway Act of 1958, wherein additional federal funds were available and utilized for a large number of county road federal-aid secondary projects of moderate size which were required under the act to be awarded prior to December 1, 1958.

An accompanying table lists, according to size, the 74 projects considered in this survey.

Five of the seven items used in the preparation of this Index show lower average unit prices than in the previous quarter. Of the remaining two, structural steel is unchanged and only portland cement concrete pavement shows a slight increase. A tabu-

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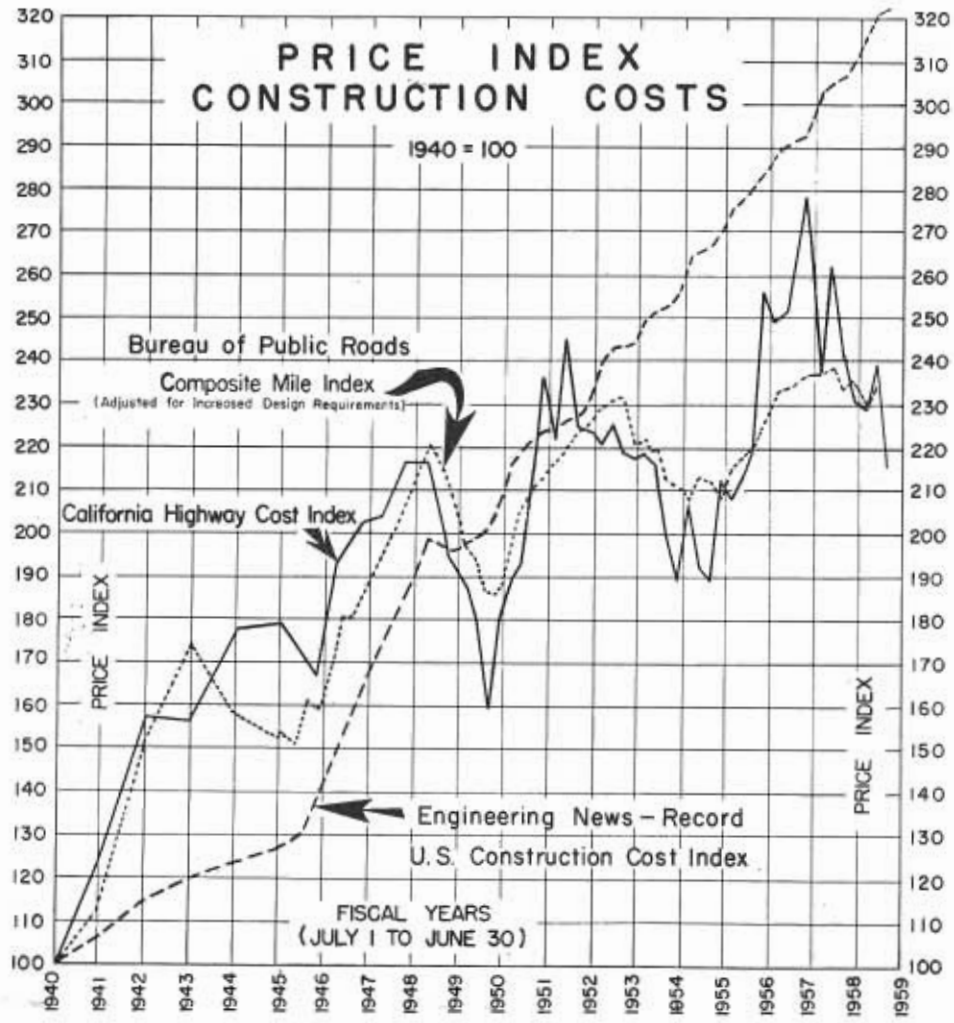
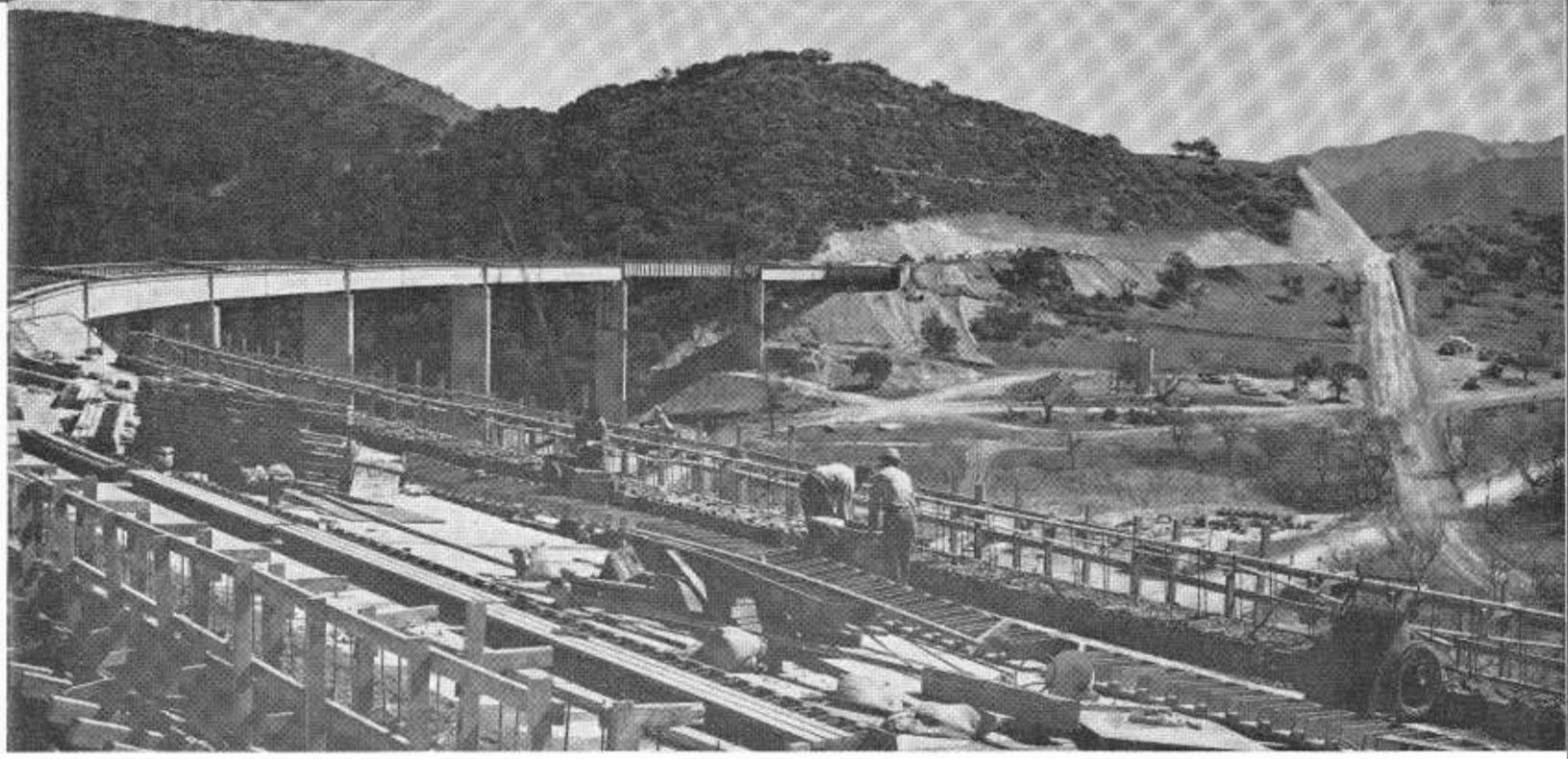




Cuyama Road

New Eight-mile Relocation on Sign Route 166 Nears Completion

By L. D. KRAATZ, Resident Engineer

A RATHER spectacular relocation of approximately eight miles of State Sign Route 166 is 66 percent complete and the contractor's operations have now reached the point where it is possible to visualize the final appearance of this new highway. This relocation is under way in conjunction with construction of the Twitchell Dam by the Bureau of Reclamation on the Cuyama River some seven miles east of US 101 north of Santa Maria. Approximately one-half of the existing highway will be inundated by the reservoir which will be created by the dam.

Highway 166, known locally as the Cuyama Road, connects the main north-south arterials, U. S. Highway 101 in the Central Coast and U. S. Highway 99 in the San Joaquin Valley. It commences approximately three miles north of Santa Maria and closely follows the Cuyama River through the Santa Lucia and San Rafael Mountain ranges while passing through large cattle ranges and rich oil fields, particularly near the town of New Cuyama, thence through Maricopa, finally joining U. S. Highway 99 approximately 23 miles south of Bakersfield. This route also serves as an important access for Central Coast residents to Mt. Abel, a popular winter sports area.

PHOTO TOP OF PAGE—Construction progresses on the new bridge across the Huasna River. Some of the reinforced concrete piers constructed by the new slip-form method described in the article can be seen supporting the bridge deck in the left middleground.

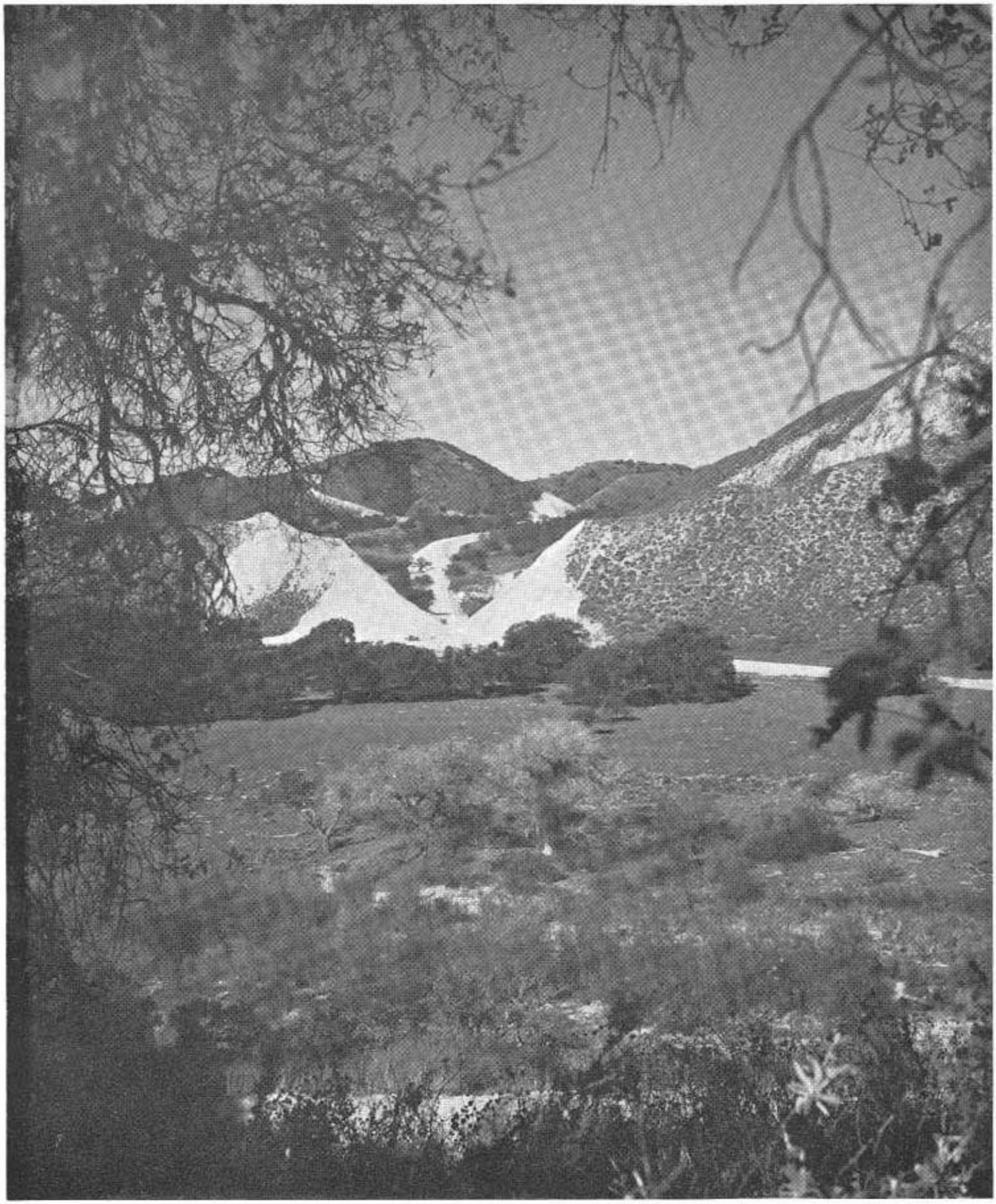
Existing Road Narrow

The first 30 miles of this road from Highway 101 easterly is located through extremely rugged terrain, with very substandard undulating grade and alignment with grades up to 7 percent, curves with 80-foot radius and safe driving speeds of 30 m.p.h. The existing roadway is quite narrow compared with modern standards with an oiled surface that averages only 17½ feet in width.

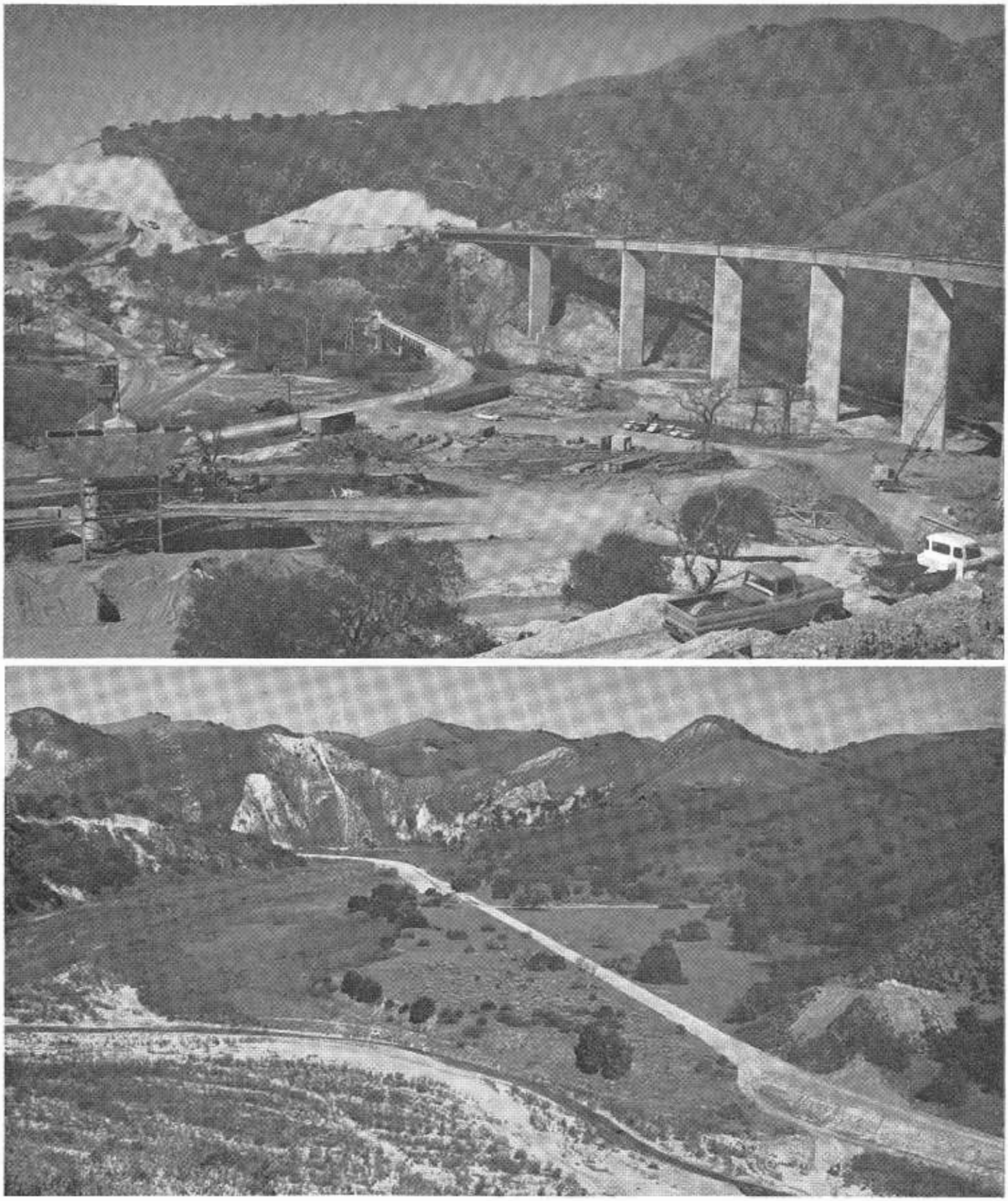
The 3.5-million-dollar project now under construction consists of eight miles of new alignment approximately in the middle of the existing "rugged 30 miles." Design speed is 50 m.p.h. with maximum grades of 6 percent and minimum radius of curvature of 850 feet. Approximately five miles of the project will be constructed adjacent to and above the reservoir area and three miles beyond the reservoir area to improve alignment and grade. The entire project will result in a distance saving of 1.7 miles. There will naturally be a considerable additional saving in time and vehicle operating cost due to the improved alignment and grade and additional lane width as the new facility will be 28 feet wide in cuts and 34 feet in embankments. The paved roadway will consist of 28 feet of three inches of plant-mixed surfacing over six inches of untreated base and four inches of imported subbase material.

Terrain Presents Challenge

The grading operation has been a spectacular test of modern methods and equipment pitted against nature's



Some idea of the size of this cut necessitated by the realignment of the highway can be gauged by the two pieces of road equipment visible at its base.



UPPER—This photo of the new bridge across the Huasna River shows some of the slip-form constructed concrete piers and the cut and fill work on a section of the realigned highway. The old highway and low-level bridge can be seen in the middle of the picture. LOWER—Although the country is generally arid, construction of the section of highway seen in this photo required some swamp fill.

rugged arrangement of the terrain. Cut slopes are 1:1 in predominantly hard shale and range in height to 250 in areas where the slope of the natural ground is 1:1 or steeper. Embankment slopes are 1½:1 except within the reservoir area where 2:1 slopes are constructed and protected with three to five feet of light and heavy stone riprap. Major grading quantities consist of 1,500,000 cubic yards of roadway excavation, 265,000 cubic yards of ditch and channel excavation in four major channel changes of the Cuyama River, 34,000,000 station yards of overhaul, and 80,000 tons of stone riprap.

Pioneering and clearing and grubbing was accomplished by bulldozers. Oak trees and brush were buried off the right-of-way due to the extreme fire hazard involved in burning. The major portion of the dirt was moved by 15 three-axle rubber-tired 18-24-cubic-yard scrapers at rates of 5,000 to 10,000 cubic yards per day for hauls of up to two miles. Material in cuts was loosened by drag-type and hydraulic rippers. Occasionally it was necessary to drill and shoot hard ridges of shale. Sheepsfoot and 50-ton pneumatic rollers were used to obtain the required compaction.

Materials used in embankments contained 30 to 50 percent fractured shale larger than three-quarter-inch sieve. Fills across canyons were tied into the existing steep side slopes a minimum of four feet by continual removal of overburden with dozers. Stone riprap was produced approximately one mile north of the center of the project by normal quarrying methods, hauled to embankment areas by truck and placed by dozers as the embankment was constructed.

Precautions Against Flooding

The new alignment crosses numerous small and large canyons serving watersheds of varying extent. Drainage will be carried under fills via 18-inch to 60-inch corrugated metal pipe and 66-inch to 108-inch field-assembled corrugated metal plate culverts. Due to the height of the embankments, culverts were designed to be placed above the existing channel flow line to save on length of culvert required. At the inlet end the canyons were filled to flow line of the new culvert to prevent ponding and the culvert was placed to outlet in natural ground to avoid washout of the embankment.

Large culverts up to 300 feet in length were placed on two to three foot thick sand cushions and cambered to provide a uniform foundation and prevent serious distortion due to embankment subsidence. At various locations, reinforced concrete boxes and one nine-foot concrete arch culvert for cattle passes and drainage have been constructed.

The new alignment crosses the Huasna River and Alamo Creek just north of their confluence with the Cuyama River at the east end of the project. Also crossed is the Cuyama River. These crossings are accomplished by three bridges involving major quantities consisting of 10,000 cubic yards of Class "A" portland cement concrete, 2,125,000 pounds of reinforcing steel, 2,915,000 pounds of structural steel and 530 concrete and steel piles.

Slip-form Method Used

The Huasna River Bridge is one of the largest structures of its kind constructed in this State and the final cost will be over $1,000,000. It consists of a 28-foot-wide reinforced concrete deck supported by nine 174-foot spans of twin welded plate girders on reinforced concrete piers and footings and steel bearing piles. Total length is 1,570 feet on a curve with a radius of 1,100 feet. The deck is constructed with 10 percent superelevation. Pier footing excavations in the Huasna River channel were dewatered by direct pumping and well point systems prior to pouring concrete. Concrete piers range in height from 60 to 135 feet and were constructed by the "slip-form method." While not a new construction method, slip-forming has had limited use on bridge work in this State. The nature of the site and standard dimensioning of the piers made this method a natural choice from the economic standpoint. The piers are 27 feet long and six feet wide with three hollow interior cells, and semicircular ends.

The slip-form conforms to these dimensions and is six feet deep. It is raised at a rate of 12 to 20 inches per hour by eight hydraulic jacks supported on one-inch round extendable vertical jacking rods separated from the fresh concrete by a pipe sleeve within the slip-form. Concrete is added continuously via buggies loaded with a crane. The jacks are controlled from a common electric hydraulic pump mounted on the four-foot working platform surrounding the top of the slip-form. Each jack may be controlled individually to make minor adjustments for line and grade which is continuously checked by state personnel from fixed transit locations.

Method Described

In actual operation, the form is raised one inch every three to five minutes depending on the various factors which affect the setting time of concrete. The slip-form consists of the form itself with a working platform at the top and platforms roughly 15 feet above and below the working platform for placing reinforcing steel and finishing the concrete. Below the finishing platform a two-inch iron pipe fitted with nozzles applies a fine fog spray of water for curing purposes.

Rocker-type bearing plates anchored to the top of the piers and abutments support twin welded plate girders spaced 19 feet apart. Each girder is approximately 170 feet long, 10 feet deep and weighs 60 tons. Flange plates are 30 inches wide and vary in thickness from one and one-quarter inches to two and one-quarter inches. The web plate is one-half inch thick. Structural steel angle cross bracing provides laterial stability.

Girders were transported from Los Angeles to Santa Maria via railroad flat car and trucked to the site in halves. Ten miles of narrow twisting highway tested the contractor's ingenuity during the transportation of these girders. Butt welded splices were accomplished at the site and were checked by X-ray for defects. Girders were erected using "Chicago" type derricks mounted on each pier by a special structural steel yoke with power supplied by two drum-type winches. The erection operation,

... Continued on page 46

F.A.S. Highway

Road Linking US 101 and 395 Improved in San Diego County

By JOHN F. MULGREW, Assistant County Surveyor, San Diego County

DEL DIOS Highway between Rancho Santa Fe and Escondido was completed on February 27, 1959. This section, 9.9 miles long, is a portion of San Diego County Federal-Aid Secondary Route 728 between U. S. Highway 101 near Del Mar and U. S. Highway 395 at Escondido.

Beginning at Rancho Santa Fe on the westerly end of the project, the highway traverses country estates and rolling farmlands for 1.9 miles. It then enters the rocky central portion of the project, crawls around the right abutment of Lake Hodges Dam and for the last eight miles continues along the north shore of Lake Hodges past the resort and fishing settlement of Del Dios to the avocado and citrus groves and small farms which surround the City of Escondido.

F. A. S. Route 728 ranks high in the two-lane highway classification in regard to both importance and traffic usage. Well over two thousand vehicles per day have been counted on this route during the county fair and racing seasons when the recreational users and tourists are added to the regular commuter and farm-to-market traffic.

Development of this highway has taken place intermittently for the past 43 years. In December, 1916, Road Improvement District No. 3 was formed as provided for in the act of 1907 to construct a road from Del Mar to Escondido. Surveys were made and easements obtained but the road improvement district did not materialize and the project was abandoned.

Dam Road Built

During the year 1916 a contract was let for the construction of the Lake Hodges Dam and a road was constructed up the river from the Del Mar District by the contractor for handling supplies at the dam. After completion of the dam, the county realigned and widened this road to pass over the spillway of the dam and through to the City of Escondido.

This road was traveled until the winter of 1927 when the waters of the reservoir overtopped the spillway, washing out the roadway and doing such damage that it was necessary to reconstruct the highway at a higher elevation on the hillside above the spillway.

A contract was let by the county board of supervisors, but owing to the lack of funds the road was only constructed in part, a temporary connection being made with the then existing road just below the dam.

In 1931 construction work was again resumed, the contract being let in December, 1931, to Yglesias Brothers to finish the project.

In 1933 the County of San Diego made application to the State of California for use of federal funds which were being allotted to the states for the purpose of building highways and other public improvements. Contemplating that the funds would be used by the county for the improvement of the highway from Rancho Santa Fe to Escondido, the City of San Diego requested that the county relocate that portion of the highway along the north shore of Lake Hodges to a higher elevation so as to prevent flooding in the event that the spillway to the Lake Hodges Dam would be raised to elevation 405 as planned for the ultimate development of the resources of the San Dieguito watershed.

State Writes Specifications

Under an agreement with the State Division of Highways the County of San Diego was to secure the right-of-way, complete the surveys and plans in compliance with state standards, and stand all incidental expenses with the provision that the State would write the specifications, prepare the preliminary report and construct the Lake Hodges Feeder Road Project under a State Highway contract.

This construction contract was completed in 1935-36.

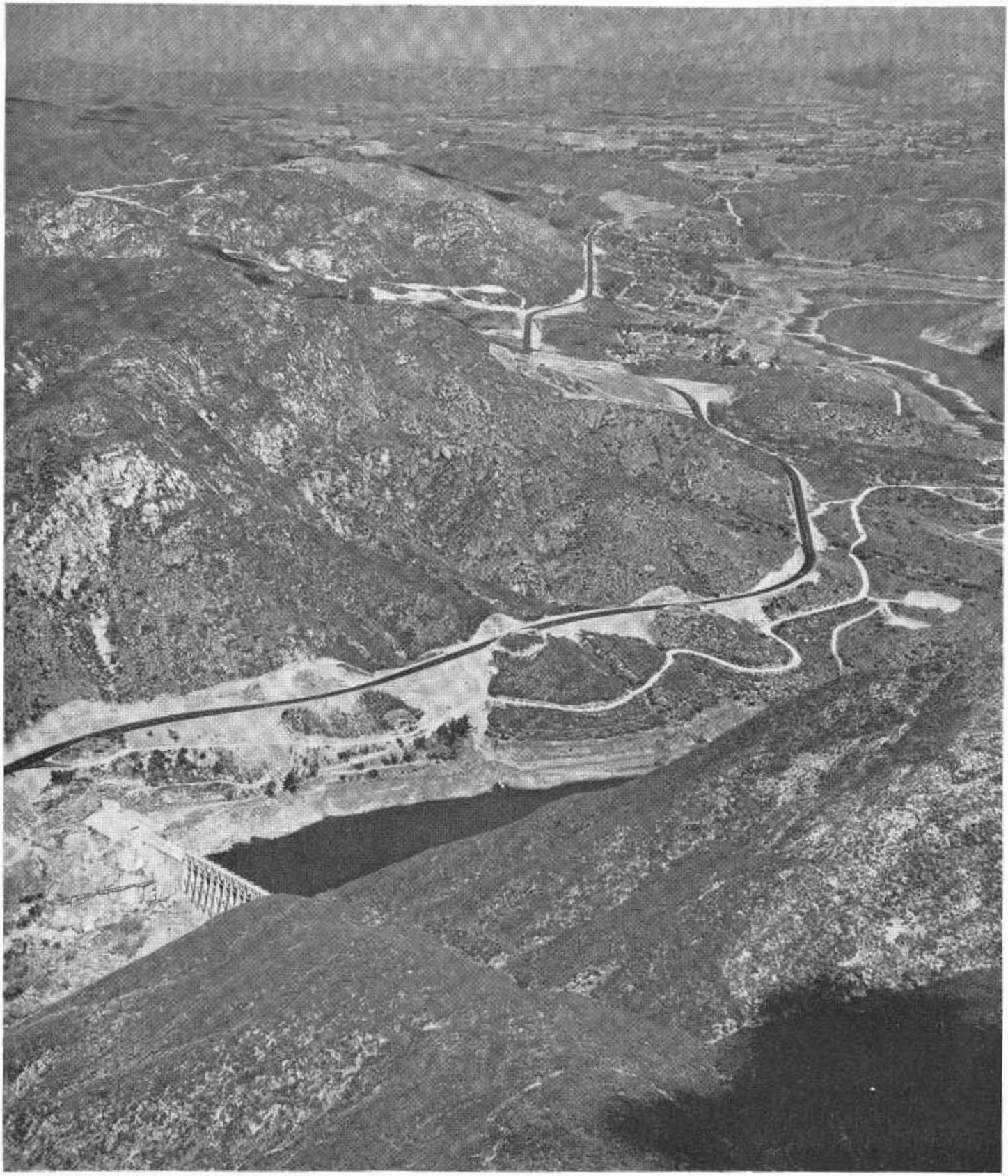
Before reconstruction, under the F. A. S. Project, the road consisted of a 20-foot-wide portland cement concrete pavement and a road-oil mix pavement with variable 4-foot to 8-foot unpaved shoulders.

This roadway section was reconstructed to provide for two 12-foot traffic lanes with 6- to 8-foot shoulders, paved with plant-mixed surfacing. Maximum grade is 6.50 percent with 700-foot minimum radius curves.

The structural section consists of 3 inches of plant-mixed surfacing on base material varying in depth from 6 to 17 inches for the traveled way, while the shoulders were paved with 3 inches of plant-mixed surfacing at the traffic lane edge tapering to 2 inches at the gutter line. Base material varied from 6 to 12 inches in depth for the shoulders.

Because of the mountainous terrain, no detours were available through the central portion of the project. It was necessary for the contractor to maintain at least one 10-foot-wide lane for traffic at all times during construction. Blasting operations in the deep igneous rock cuts made this requirement both difficult and hazardous, as did the close proximity of Lake Hodges Dam, the utility lines, nearby houses and a public water supply flume. Even though every effort was made to prevent traffic delays and blasting damage, several accidents did occur. Utility lines were damaged and two houses were struck by flying rocks.

For drilling the 2½-inch diameter holes for blasting operations, the contractor used a tracked wagon drill supplied with air from an air compressor. Stick and bag powder was used when control was necessary, and ammonium



The reconstructed Del Dios Highway after completion. This aerial view northeastward shows Lake Hodges Dam in the foreground and the City of Escondido in the background.

nitrate was employed in unpopulated areas.

Selected Material Available

Materials of satisfactory quality for the processed selected material were obtained from several cuts on the project which consisted of disintegrated rock or granite interspersed with layers of hard fractural rock of varying thickness.

Roadway excavation, including blasted rock, was handled by tractor-scrapers.

The contractor erected a crusher and asphalt plant, crushed and processed aggregate on the job, and produced up to 2,000 tons of 200-300 penetration asphalt plant-mixed surfacing per day.

The widening of two short structures over the City of San Diego's water flume which furnishes water for the Rancho Santa Fe and San Dieguito areas, provided a problem in the protection of the water supply and the assurance of uninterrupted flow.

Major items of work consisted of 420,000 cubic yards of roadway excavation, 130,000 tons of processed selected material and 47,000 tons of plant-mixed surfacing. The deepest cut was 140 feet and the highest fill 130 feet.

The contract was awarded to the A. Madonna Construction Company of San Luis Obispo, California, November 29, 1957, on a low bid of $1,052,253.

The completed job is the result of co-operation and teamwork by many individuals including the county board of supervisors, the State Division of Highways and the Bureau of Public Roads.

The engineering, fieldwork, right-of-way acquisition, design and a substantial amount of the construction inspection was performed by personnel from the county surveyor's department.

Co-operation and assistance were given by Jacob Dekema, District Engineer, State Division of Highways, and his entire staff and especially R. J. Datel, City-County Projects Engineer, C. E. Walcott, District Construction Engineer and P. E. Ruplinger, District Materials Engineer. Dick Chaffin was Superintendent of Construction for the contractor and James C. Thompson of the county surveyor's department was Resident Engineer for the project.

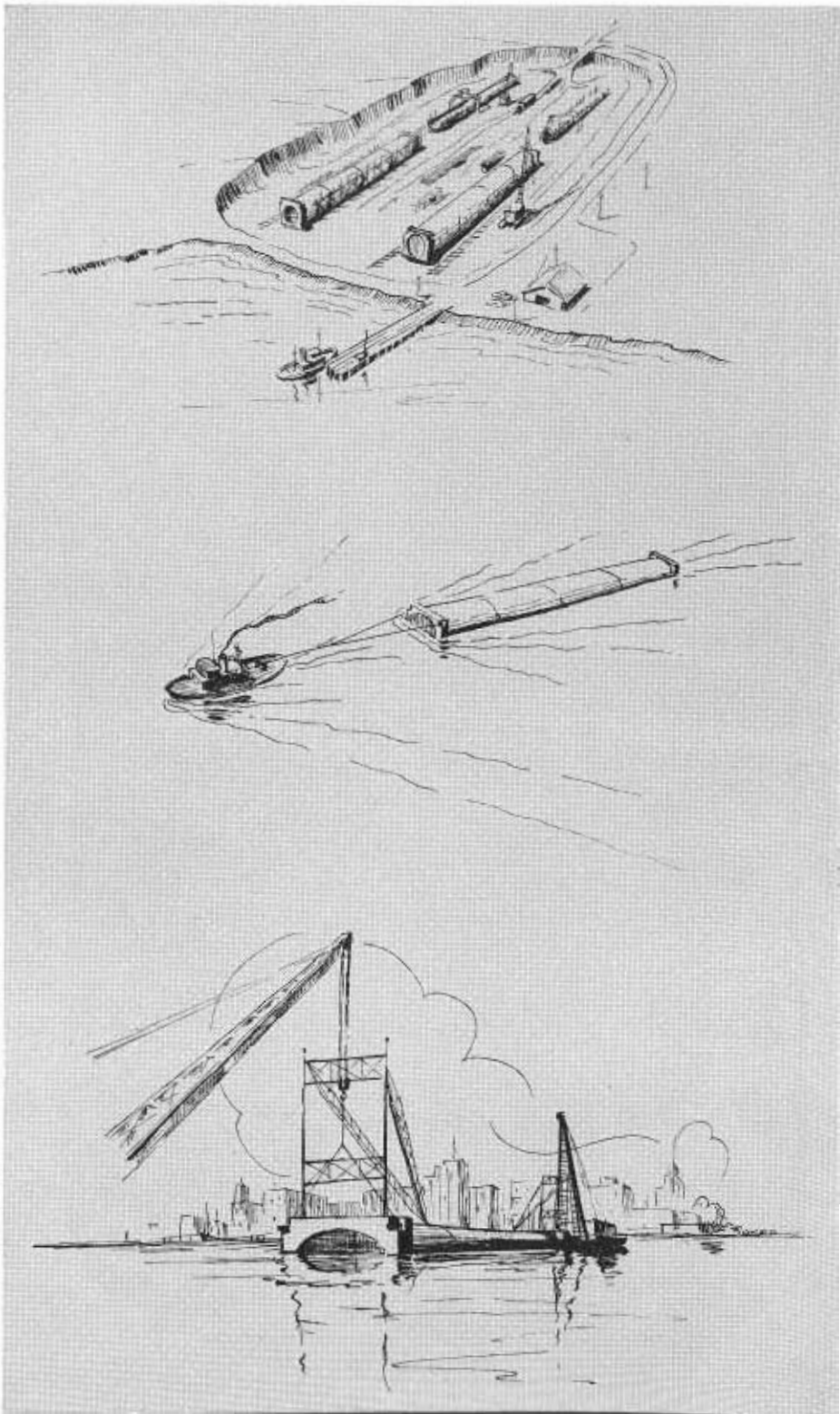
Improvement of the Del Dios Highway (shown here) was a co-operative federal-state-San Diego County project. This aerial view looking northeastward was taken near the west end of the project and shows the Rancho Santa Fe area in the foreground and the Lake Hodges Dam in the background.

Following renovation at a cost of $1.4 million, the old Carquinez Bridge was reopened to traffic on April 29th. Southbound traffic on US 40 is now carried on the old bridge, with northbound traffic using the new parallel structure completed in November, 1958.

Oakland-Alameda Tube

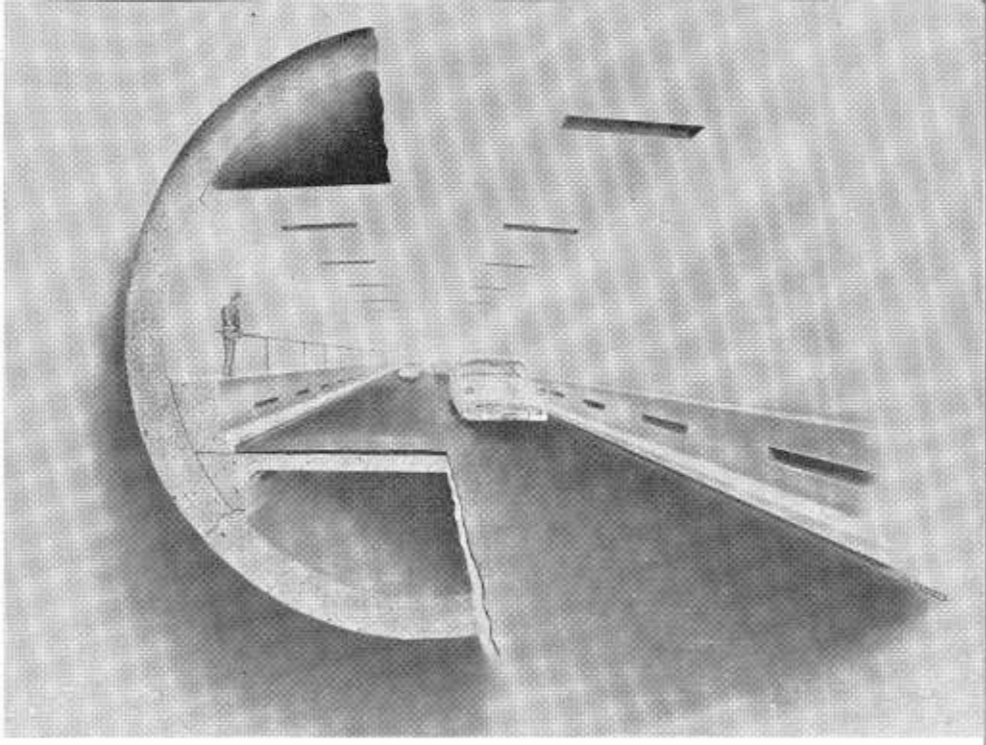
Construc
Second

Location of the existing Posey Tube in the photo above is shown by the dotted white line on the right; the dotted line on the left indicates the location of the future Webster Street tunnel.



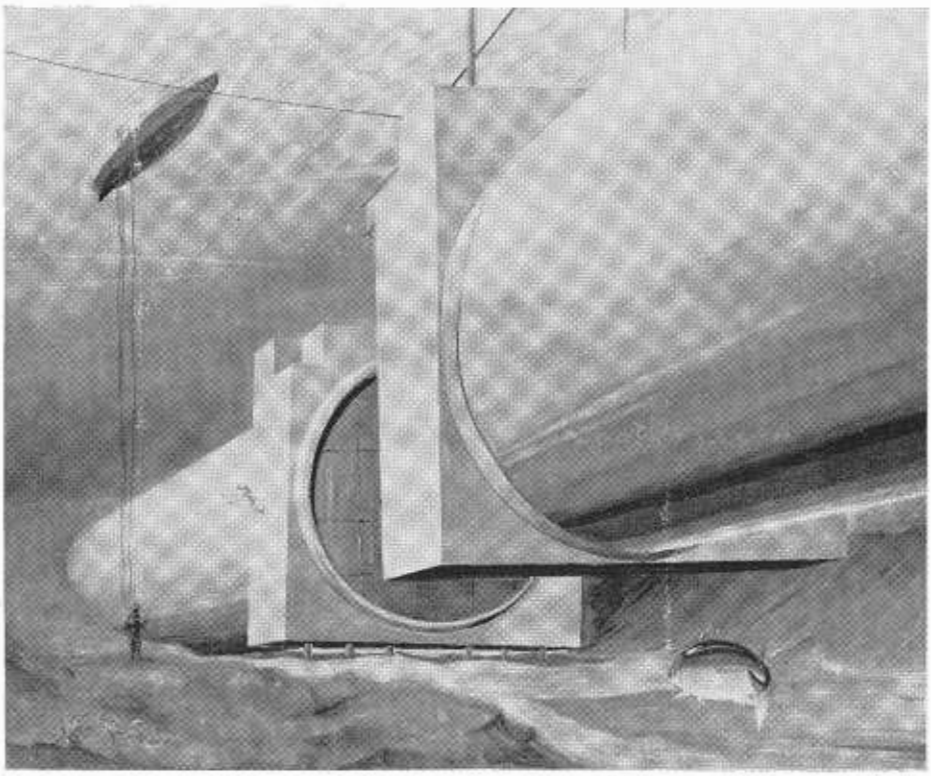
The series of drawings (right) shows how the segments for the new tube will be constructed in dry dock, floated to the site under tow and sunk in final position. The segments will be connected under water. Twelve tube segments, each 200 feet long and 37 feet in diameter, will be constructed. The remainder of the tube from First Street to Fourth Street in Oakland will be built in place in an open trench and then covered over. Total length of the tube will be 3,350 feet.

;tion to Start This Fall on Under-Estuary Highway Tube



The new tube will be one of the most modern in the world and will have an all-tiled interior and continuous fluorescent lighting. Its 24-foot roadway will equal or exceed in width that of any other vehicular tunnel. It will carry two lanes of traffic.

Four blower and exhaust fans in the Portal Building at each end of the tube will supply nearly one million cubic feet of air each minute to meet the high ventilating standards established for today's traveling public.



Perhaps the most interesting feature of the project will be the connecting of the precast concrete tube sections under 90 feet of water. Because of the muddy water anticipated at this depth, divers will have to rely to a great extent on sense of touch only and the method of connecting the sections has been made as nearly automatic as possible.

B. W. Booker Retires, Sinclair Is Appointed

Assistant State Highway Engineer B. W. Booker, who has been responsible for state highway matters in nine San Francisco Bay area counties since 1952, retired May 1st.

Booker was succeeded by J. P. Sinclair, who has been district engineer

B. W. BOOKER

under Booker in District IV, San Francisco, since Booker was named assistant state highway engineer.

During the seven years of Booker's administration highway improvements costing many millions of dollars have been effected. These include completion of the James Lick Memorial and Bayshore Freeways from the San Francisco-Oakland Bay Bridge to Palo Alto, completion of the Nimitz Freeway between San Jose and Oakland; virtual completion of US 40 as a freeway connecting to the new parallel Carquinez Bridge; and completed and current construction on many other routes.

In all, Booker has spent more than 16 years in District IV, having been appointed assistant district engineer in 1942 and promoted to district engineer in charge of operations in 1947. Five years later he became assistant state highway engineer, upon the retirement of J. H. Skeggs.

He was in charge of the Bay Area Metropolitan Traffic Survey, and participated in planning, design, construction and maintenance of some of the State's most important highways. One of his recent tasks was supervision of planning for the extensive Junipero Serra Freeway for which a route has been adopted down the peninsula.

Booker has not announced his plans during retirement. He has been with the State Division of Highways for 38 years, serving in four other state highway districts in Northern California before coming to San Francisco.

He was born in Topeka, Kansas, in 1891 and came to California in 1899. He was educated in the San Francisco public schools, Polytechnic High School and the University of California. He is married, resides in Oakland, and is a member of the American Society of Civil Engineers, Commonwealth Club and Olympic Club of San Francisco.

Sinclair, the new assistant state highway engineer, has held a key position in District IV and has been

JOSEPH P. SINCLAIR

particularly responsible for planning and design.

He was born in Minneapolis in 1910 and was educated in California, receiving his B.S. degree in civil engineering from the University of South-

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Legislative Report On Freeways Ready

A comprehensive report on the proposed 12,200-mile California Freeway System by the Legislature's Joint Interim Committee on Highway Problems is now available on request.

The report recommends adoption by the Legislature, with some changes, of the plan for a statewide system of freeways and expressways which was prepared by the Division of Highways in co-operation with city and county officials. The plan requested by the 1957 Legislature in Senate Concurrent Resolution No. 26.

The 78-page booklet outlines some of the committee's findings at a series of public meetings on the freeway plan. Included are sections on public reaction to the proposal, methods of financing, and the freeway system's effect on local roads and streets.

Appended to the committee report is an analysis of financial and economic data pertaining to the California highway program, with emphasis on the freeway system idea. The analysis was prepared by Richard M. Zettel, committee executive secretary and economic consultant.

Zettel reviews the background, benefits and costs of the proposed system, outlines the highway revenue picture in California, discusses geographic distribution of highway needs, and deals with the financing of county roads and city streets.

The booklet contains many explanatory graphs, charts and statistical tables.

Interested individuals may obtain a copy of the report by addressing their requests to the Division of Highways, 1120 N Street, Sacramento; Attention: F. M. Reynolds, Planning Survey Engineer. A limited quantity is available.

In order to achieve uniformity with Federal requirements that guide signs on Interstate freeways must have green backgrounds, California has adopted the same background for guide signs to be installed on all other State freeways. This action will provide a uniform and distinctive type of guide sign on all freeways.

Report From District VIII

By CLYDE V. KANE, District Engineer

A MAJOR step in interstate highway construction was achieved on December 13, 1958, with the opening of the new freeway between Victorville and Barstow. The California Highway Commission has named this route the Barstow Freeway from its junction with the San Bernardino Freeway at Highland Avenue in the City of San Bernardino to the Nevada state line southwest of Las Vegas. Traffic counts made since the opening of the section between Victorville and Barstow indicate that approximately 90 percent of the average daily travel has now shifted from the old route to the new freeway. This very closely fits the prognosis made several years ago at the time of routing studies and economic analysis of alternate routes.

TOP OF PAGE PHOTO—This San Bernardino Freeway interchange is under construction at Haven Avenue east of Ontario.

Barstow Freeway

Another section of the Barstow Freeway extending from 27th Street in San Bernardino to Devore in Cajon Pass was opened to traffic on March 30, 1959. This project, 8.6 miles in length, brings the total initial stage and full freeway construction on the Barstow Freeway to 70 miles, upon which 13.8 million dollars have been expended for right-of-way and construction to date.

Plans are complete for construction of the eastward extension of the Barstow Freeway through the City of Barstow, and it is anticipated this project, for which 6.8 million dollars have been budgeted, will be advertised for construction this month.

. . . Continued on page 29

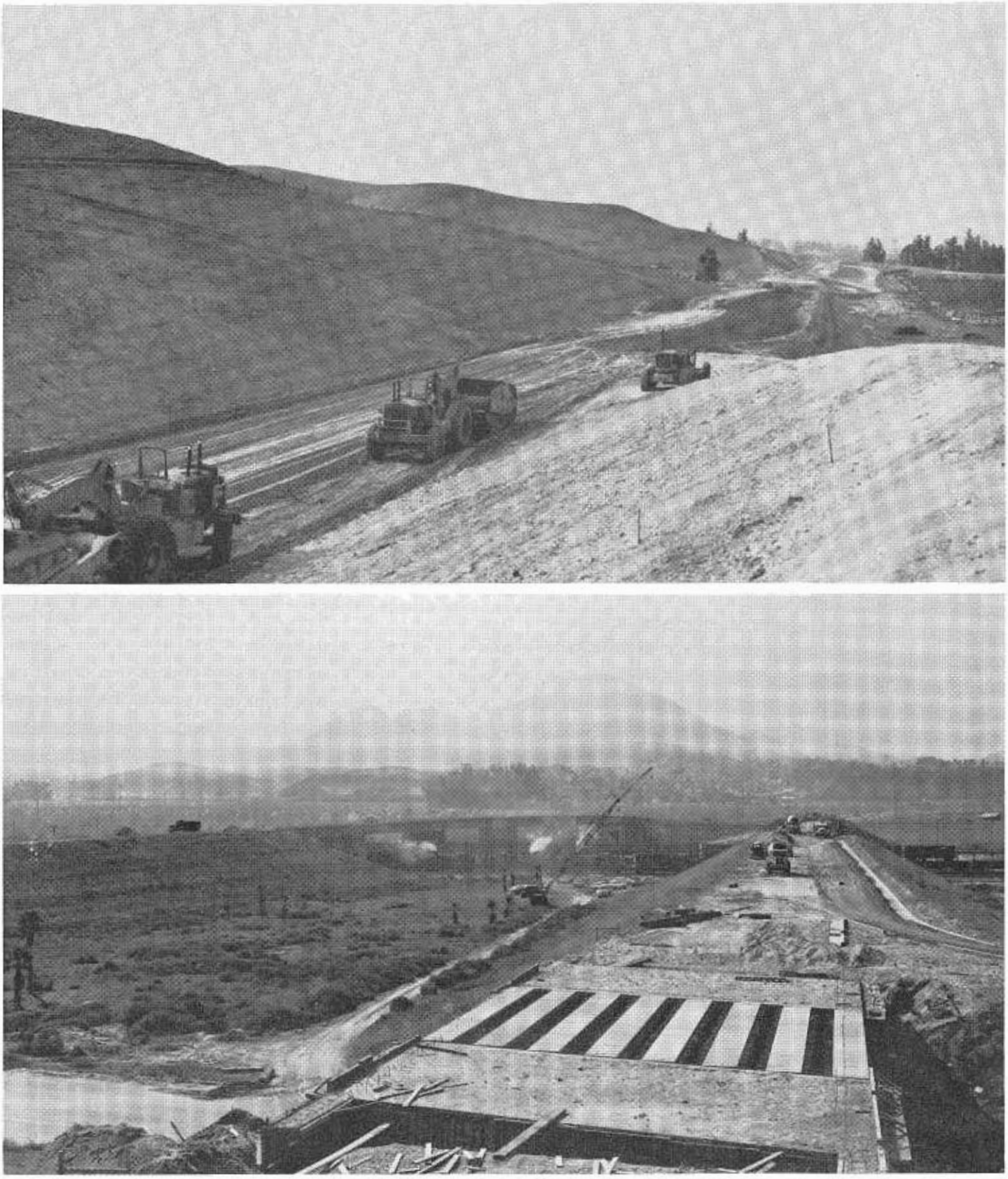
Victorville-Barstow Freeway Safety Record Noted

The built-in safety of modern freeways is again demonstrated by observation of the accident record on a recently completed section of the Barstow Freeway (US 91-66) north of Victorville.

Reporter Bob Bohon of the *Victor Press* checked the record at the Victorville unit of the California Patrol. His findings appeared in an April 9th news story which reported no fatal accidents for the first three and one-half months after the freeway opened. The news story follows in part:

"When the new freeway to Barstow was opened December 13th, only the most optimistic observer could foresee a full month before it would claim its first life.

. . . Continued on page 46



UPPER—This construction scene is on the Corona Freeway near Pine Avenue south of Chino. LOWER—A view of construction near the north end of the "Missing Link" section of the Riverside Freeway showing the Colton-Loma Linda Yard Overhead structures just south of the interchange with the San Bernardino Freeway.

DISTRICT VIII

Continued from page 27 . . .

Plans are nearing completion for another 24 miles of the Barstow Freeway between Baker and Valley Wells for which 6.8 million dollars have also been budgeted by the California Highway Commission. Construction is expected to start this fall and will require approximately 18 months to complete.

San Bernardino Freeway

Four projects are currently underway on this freeway. Three of them consist of grade-separated interchanges converting first stage (expressway) to full freeway at Haven and Milliken Avenues near Etiwanda; at Sierra and Cherry Avenues near Fontana; and at Riverside and Citrus Avenues near Rialto. It is anticipated these interchanges will be completed early in 1960.

The terminal link of the San Bernardino Freeway between US 66 and State Route 30 in the City of San Bernardino is under construction and expected to be open to traffic this fall.

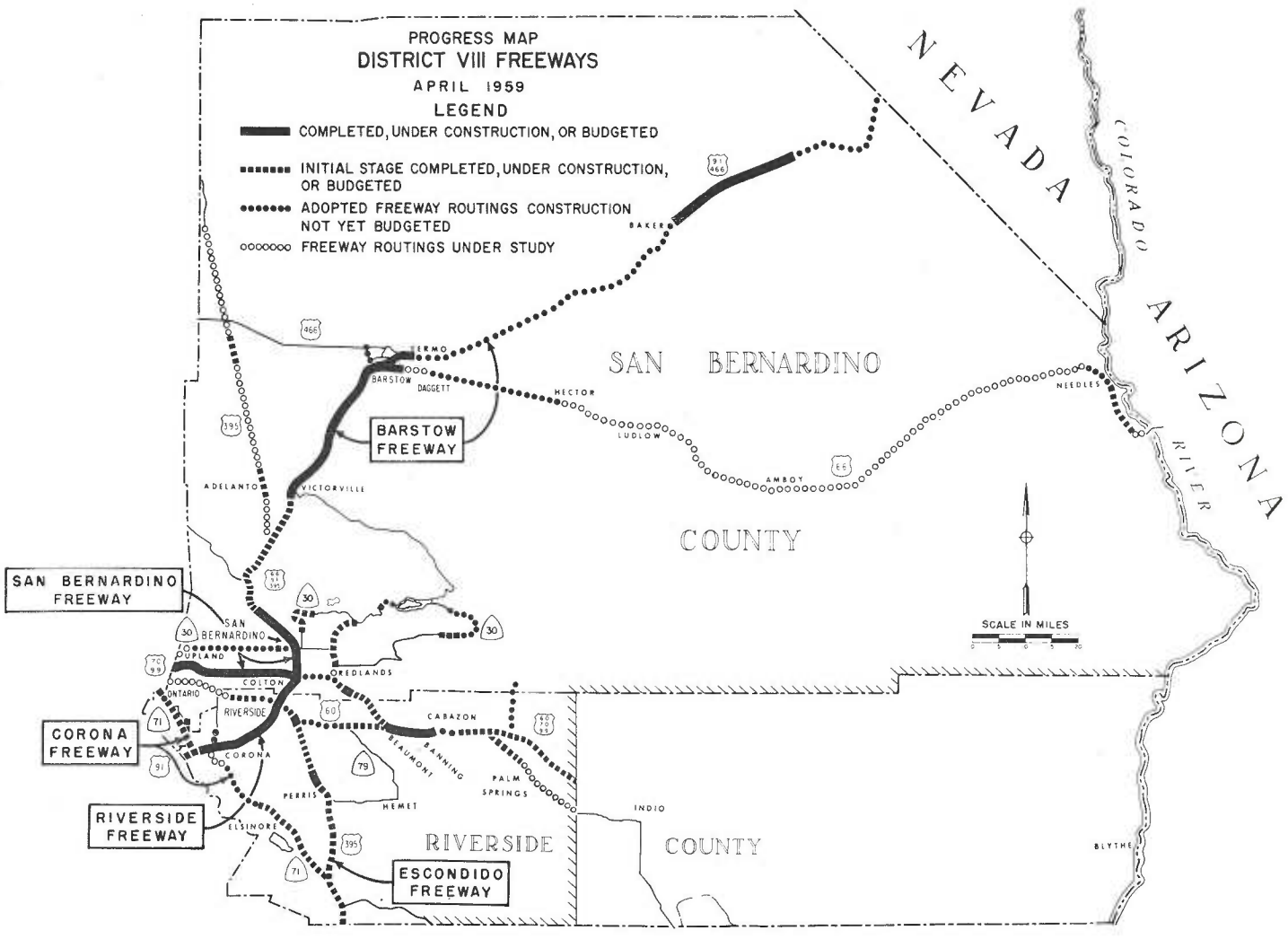
Riverside Freeway

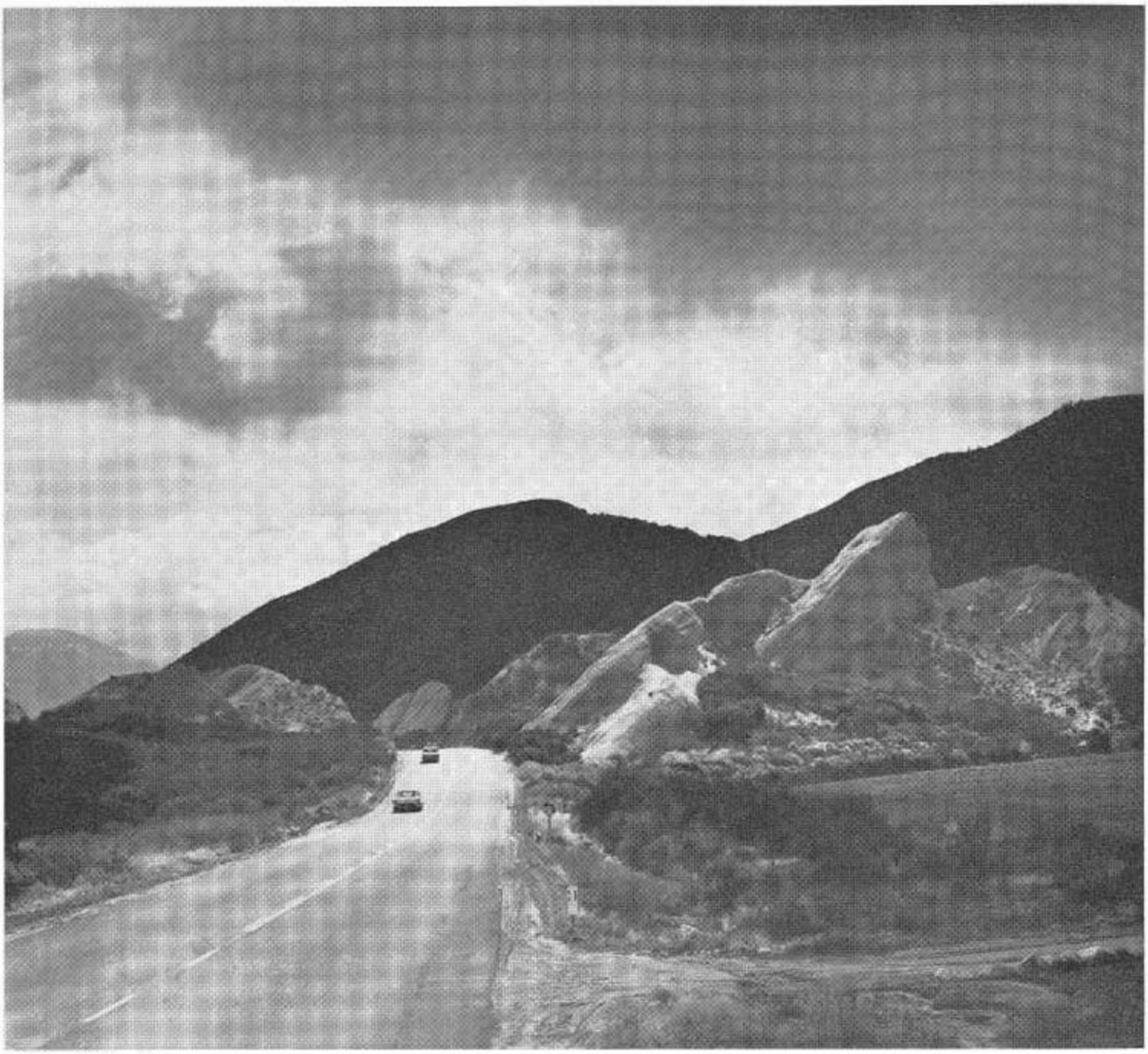
Three major construction projects are under construction on this freeway; two of them are extensions of the freeway southward from the City of Riverside toward Corona, and the third one is the "missing link" connection between the San Bernardino Freeway and the junction of US 91 and US 395 just north of Riverside. The "missing link" project is expected to be completed late this year and will eliminate the current devious routing of US 91, US 395, and State 18 through the Colton area.

On the south side of the City of Riverside, the project between Arlington Avenue and Van Buren Street has recently been completed by Winston Bros., contractors, bringing the total completed construction of Riverside Freeway in the city to over 12 miles. South of this unit another contract extending from Van Buren Street south to Pierce Street was recently awarded to contractors Fredricksen and Kasler. This project, 3.4 miles in length, is scheduled for completion in May, 1960. Plans are complete and funds are budgeted for still another unit of this freeway extending southwesterly from Pierce Street to and through the City of Corona, connecting to the expressway in Santa Ana Canyon. It is anticipated that this project will be advertised for bids in the very near future.

Escondido Freeway

One project is underway at the present time on this freeway and a landscaping project on a portion in





Sign Route 2-138 runs through some scenic rock and mountain country west of Cajon in San Bernardino County.

the City of Perris has just been completed. The project underway just south of the completed landscaping job involves construction of an additional two lanes to provide four-lane divided expressway for an additional 1.3 miles to the westerly junction with State Sign Route 74. The contractor, A. S. Hubbs, is scheduled to complete work in May, 1959. Funds have also been provided by the California Highway Commission for further extension of this work to construct four-lane initial stage freeway for another 2.5 miles to the easterly junction with State Sign Route 74, the connection to the City of Hemet. It is anticipated that bids for this construction will be advertised this summer.

Advertising for bids on another project on the Escondido Freeway at the University of California, Riverside campus, is anticipated momentarily. This will be the first step in conversion of the existing four-lane highway to full freeway standards and will provide for a separation structure in the vicinity of Canyon Crest Boulevard and Campus Avenue. Plans and right-of-way acquisition for full freeway construction on the portion from the University of California to Main Street, in Riverside, including the junction with the Riverside Freeway, are nearly complete.

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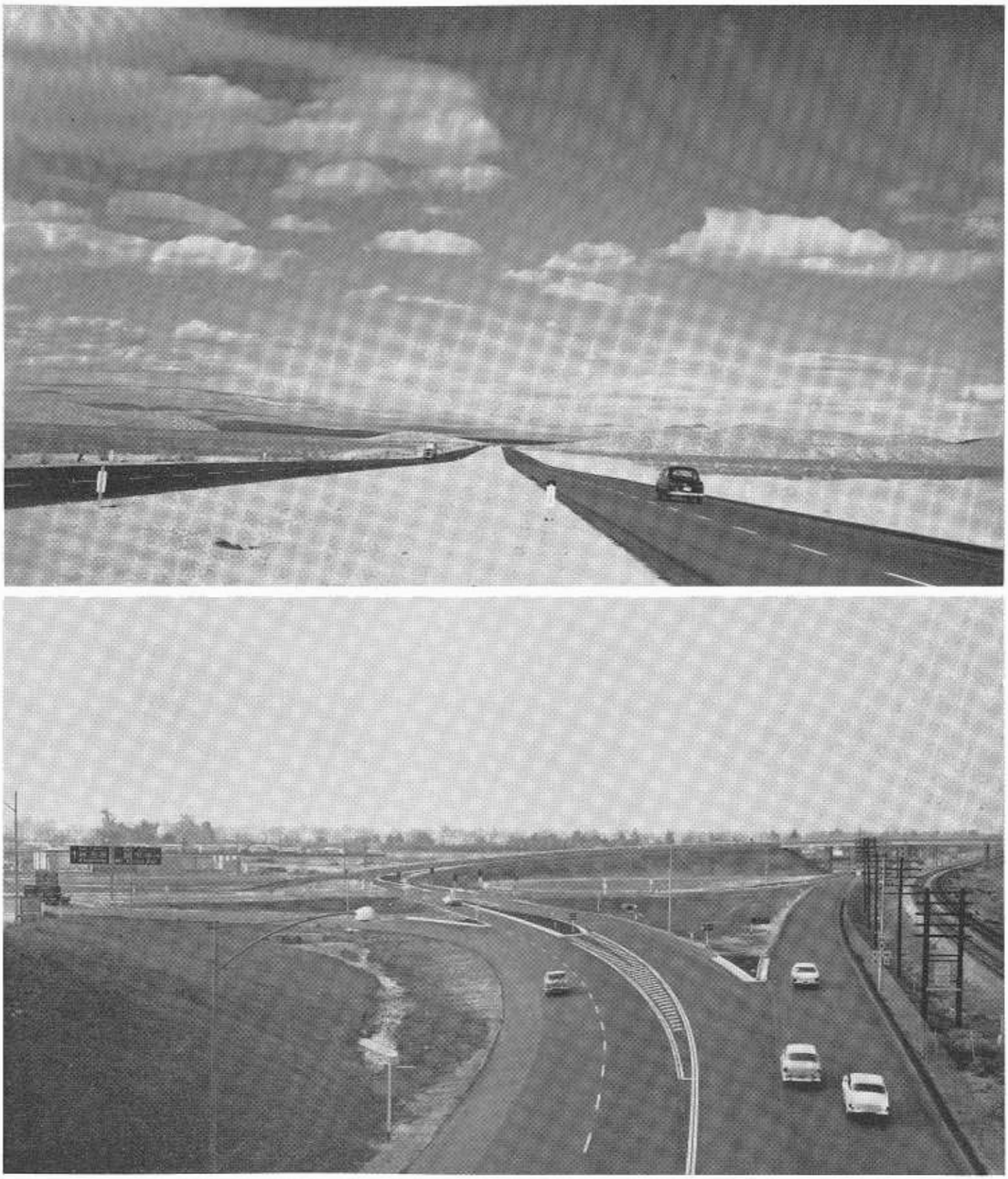
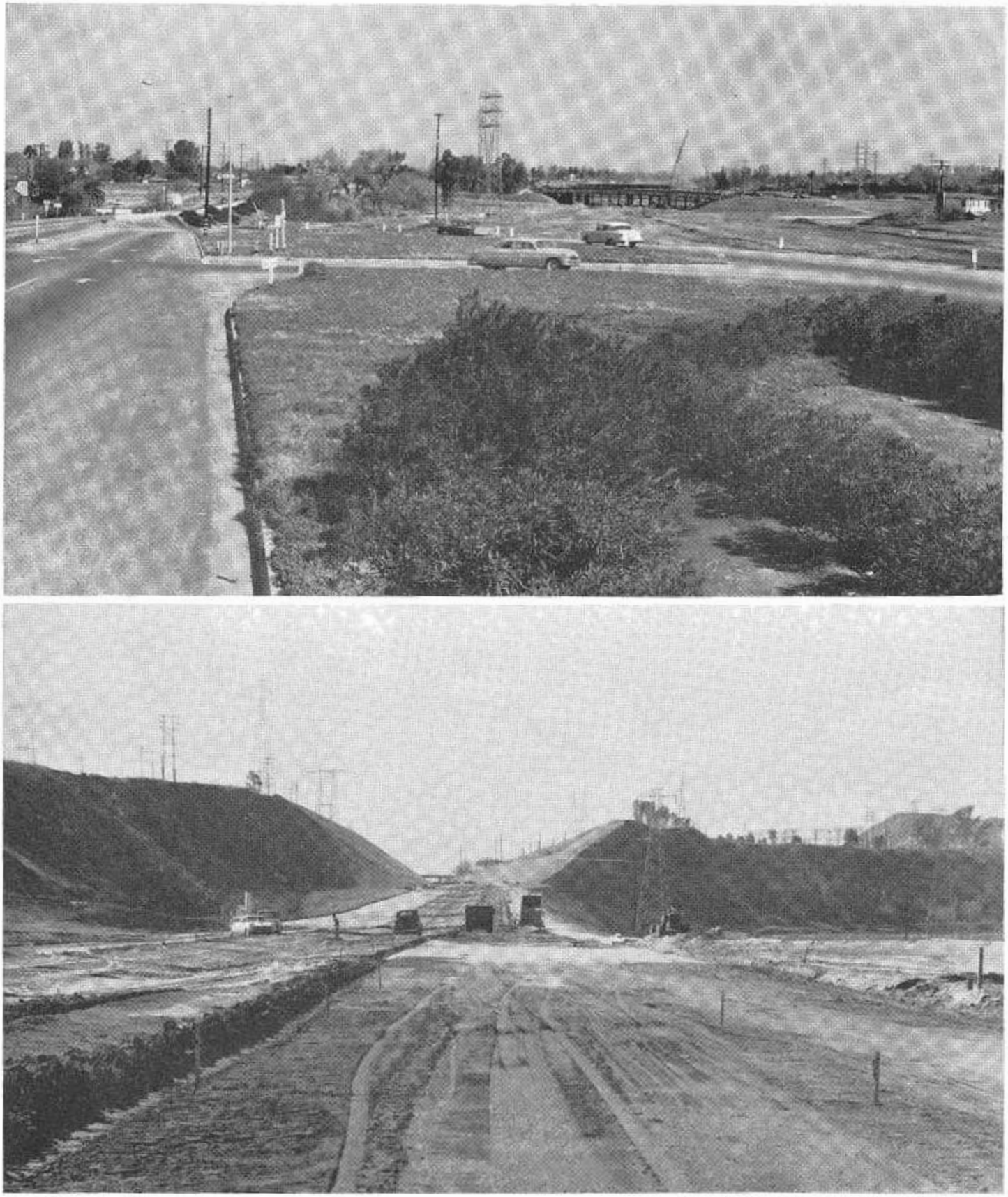
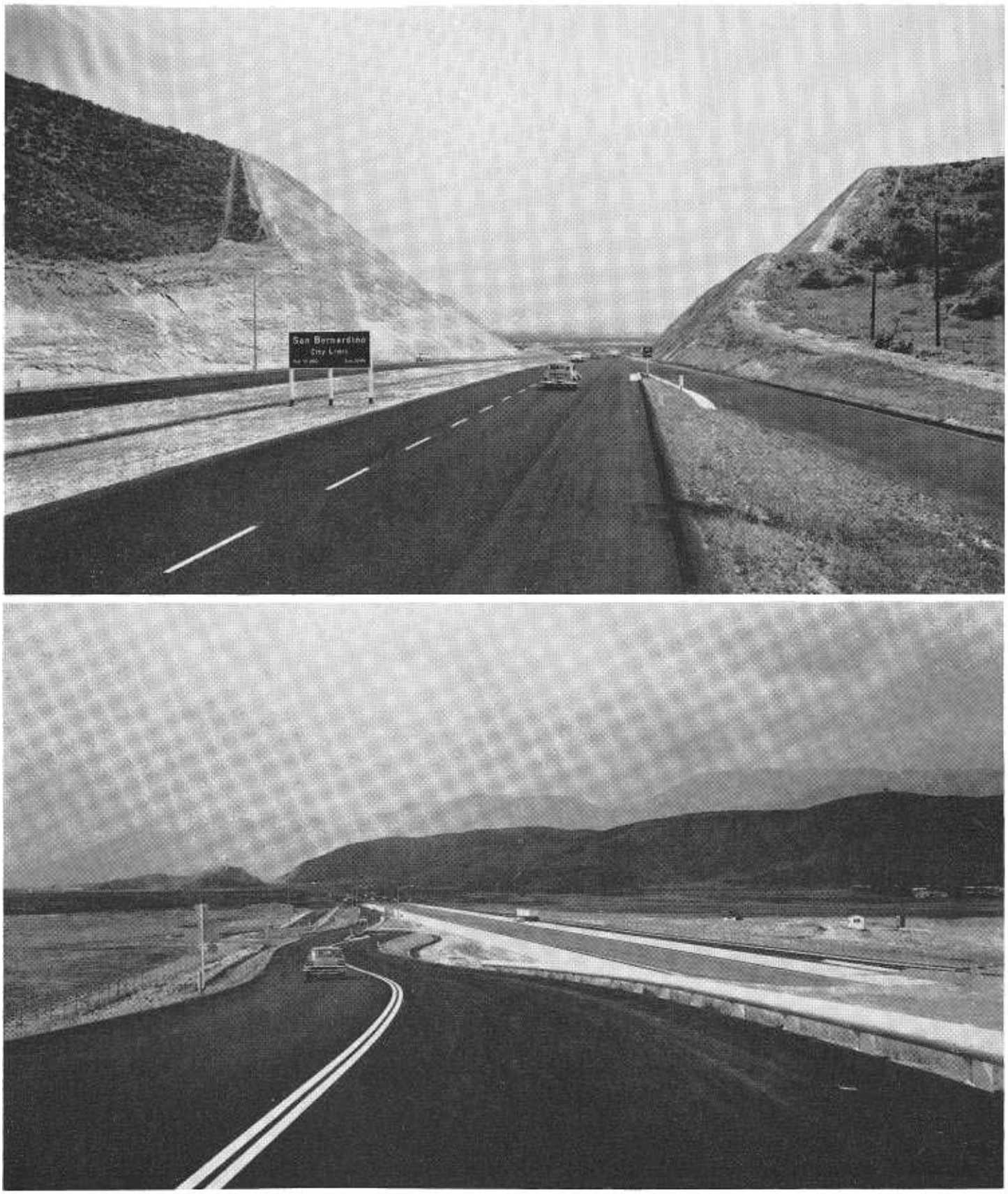


UPPER—A view of the Victorville-Barstow Freeway and some of the rolling desert country through which it passes. LOWER—This interchange connects Highland Avenue (Sign Route 30) with US 66-91-395 in the City of San Bernardino.



UPPER—Work is progressing on the south end of the "Missing Link" section of the Riverside Freeway near the City of Riverside. The interchange in the distance will connect US 91 and 395. LOWER—The Grand Terrace Cut on the "Missing Link" section of the Riverside Freeway.



Two photos of recent construction of the San Bernardino Freeway show (upper) the new freeway looking south from the San Bernardino city limits and (lower) looking north from the vicinity of Highland Avenue.

Corona Freeway

One project is currently under construction on the Corona Freeway, consisting of 5.3 miles between Euclid Avenue and Merrill Avenue in San Bernardino County. This project, located south of the City of Chino, is being constructed to initial two-lane stage freeway standards and is scheduled for completion in June, 1959.

At present, the only portion of the Corona Freeway for which the general route has not yet been adopted by the California Highway Commission is through the City of Corona.

Interstate Progress

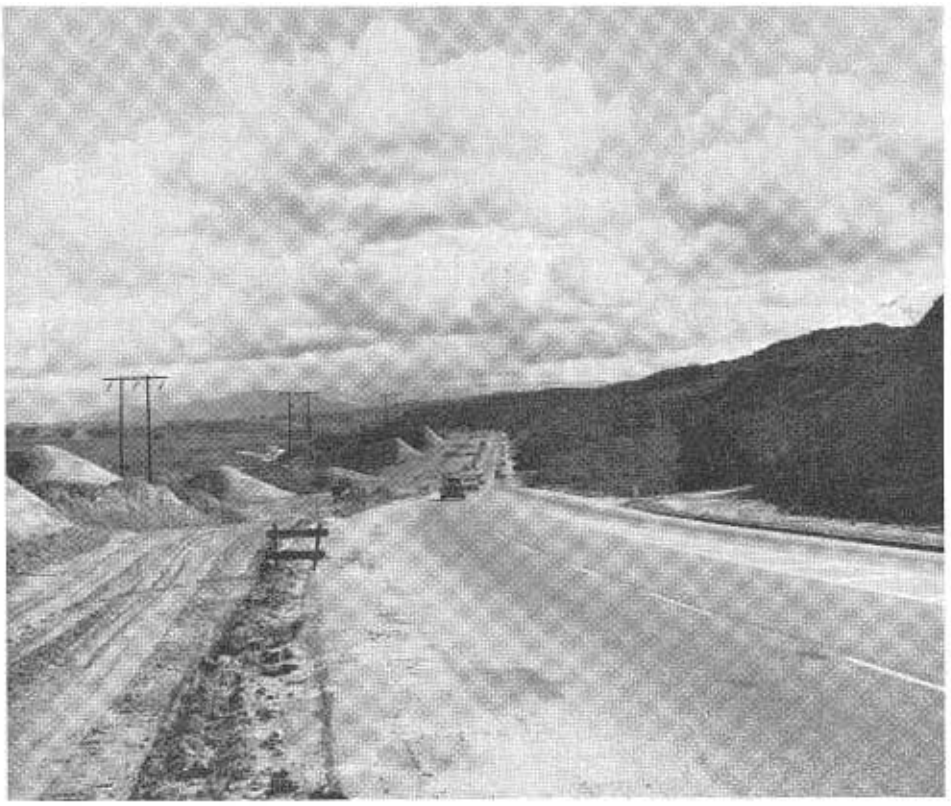
In addition to the named freeways, 6.8 million dollars is budgeted for another Interstate project, 5.6 miles in length, from Beaumont to Banning. Construction is scheduled to start this fall. It will include rebuilding the US 60-70-99 junction on the west side of Beaumont and will be constructed to six-lane full freeway standards.

Another project on this interstate highway west of Beaumont consists of a full freeway interchange now under construction at the intersection with Yucaipa Boulevard on US 70-99. Work on the Yucaipa Boulevard interchange is scheduled for completion in October, 1959.

Advance planning of the interstate highway on US 66 between Ludlow and the Arizona state line will reach an important step with a public meeting to be held May 7th in the City of Needles. This public meeting will secure the views of local communities and individuals concerning location of this freeway in California and the adjoining portion of the State of Arizona. Recommendations to be made following this public meeting will prepare the California Highway Commission for consideration of the route to be adopted for US 66 between Ludlow and Arizona.

US 60

A project is now under construction just west of the Beaumont junction of US 60-70-99 which is converting 4.8 miles of two-lane highway to divided expressway standards. This is the last section through the rough terrain known as the "Badlands" and should be completed about July, 1959. As mentioned previously, plans are nearly complete for construction of US 60 to full freeway standards through the City of Riverside, a portion of which lies on the Escondido Freeway.



Construction now under way through the "Badlands" west of Beaumont is converting a section of US 60 to multilane, divided expressway.

US 395

Half a million dollars has been budgeted for improvements on US 395 and work is expected to start about June. It will be interim-type construction consisting of the widening of the pavement and shoulders, resurfacing, and elimination of numerous dips between US 66-91 near Cajon Summit and US 466 at Kramer. Advance planning for ultimate freeway construction on this route is progressing and a public meeting to discuss the results of a location study will be scheduled in the near future.

Mountain Highways

A comprehensive traffic and planning study of the San Bernardino mountain area has recently been completed. The purpose of this study was to determine priorities for construction of many needed improvements in the mountain areas. It is anticipated that the results of these studies will be presented to the California Highway Commission soon for their consideration.

These areas have posed special problems in highway planning because of the expense of construction in rugged terrain and the unusually high peak traffic volumes associated with both summer and winter recreational uses. The proximity of the populous Los Angeles metropolitan area creates a problem somewhat unique to two-lane mountain recreational roads where frequently vehicular counts of 14,000 per day are recorded.

During April, the Department allocated $7.5 million to the 354 incorporated cities of California under the provisions of Section 2107 of the Streets and Highways Code. Two of the cities, Walnut in Los Angeles County and Union City in Alameda County, were incorporated in the first quarter of 1959.

Trees Moved

Highway Crews Transplant Giant Palms in South State

By J. M. HARRIS, Assistant Highway Engineer

SOUTHERN CALIFORNIA, in its natural and developed areas alike, has always been conscious of the part palm trees play in beautifying the countryside. The Division of Highways, in constructing the San Bernardino and Riverside Freeways, is now saving many of these stately beauties found within the freeway right-of-way by moving them to spots along future and present freeways. This not only adds beauty, but perpetuates the thoughts and plans of previous generations; the many years of growing time are not wasted.

Palms are relatively free from disease and require little maintenance compared to other trees. Palm trees 30 to 90 feet tall can be moved successfully when the work is well planned and well executed. Root action is most active in the period from April to September. This does help to establish the plant. With careful handling, however, they can be moved at any time; some of the methods used will be described later in this article.

Through the Redlands and Riverside areas in Southern California, many palms were planted in the 1880 and 1890 period. As you drive through the area, you realize the time, care, water, and forethought, our pioneers gave when they planted these great rows and clumps of majestic palms. We are seeing the result of a 75-year-old dream.

In San Marino, there is a palm growing that was moved from the Palm Springs area in 1840. In Arcadia are some that were moved from Palm Springs between 1850 and 1860.

Many Palms Imported

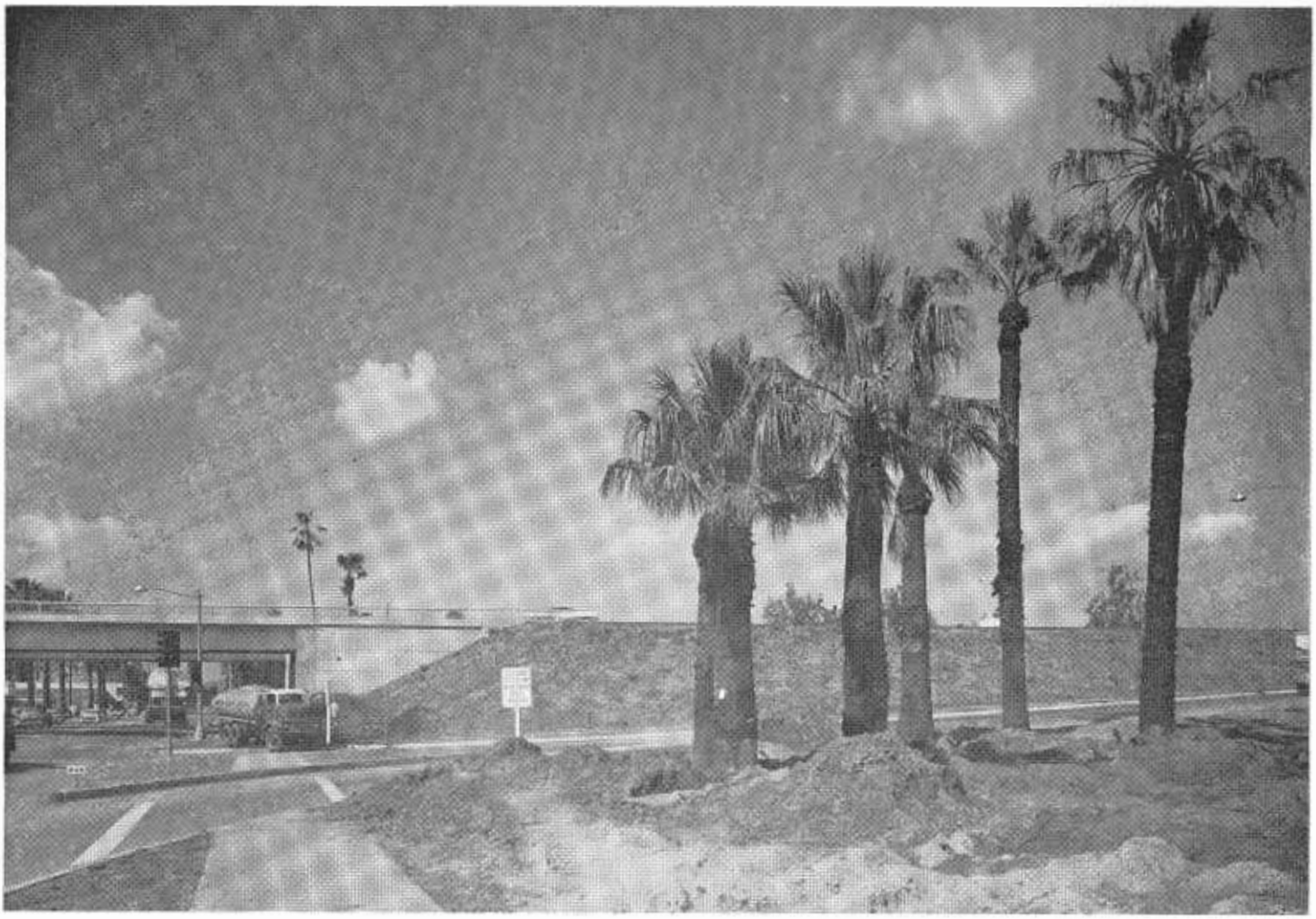
There are over 1,300 recorded species of palms. Many of them freeze easily and grow slowly. The palm is both a tropical and a semitropical tree. There are several varieties that have become common and grow well in Southern California. Many of them are natives of Australia, Asia, Africa, and South America.

Of the pinnate or feather-leaved palm, the Phoenix is most often seen. Due to cross-pollination and mixed planting, many of these cannot be defined species. The *Phoenix canariensis* with its massive trunk, enormous crown, graceful leaves, and orange colored datelike fruit is more widely used for ornamental purposes than the other Phoenix palms. The *Phoenix dactylifera* is the fruit-bearing date tree. The *Phoenix sylvestris* is very similar to the *Canariensis* and has cross-pollinated with it. In growth, it is a smaller tree.

We encounter many *Arecastrum romazoffianum*, commonly known as the "*Cocos plumosa*." It is a native of South America and has a beautiful crown, although prevailing winds sometimes kink the leaves.

Our only native palms belong to the palmate or fan-leaved group. The *Washingtonia filifera* or desert fan

This photo shows some newly transplanted palm trees along the Ninth Street on-ramp leading to the freeway in Riverside. Palm trees play an important role in Southern California landscaping. The transplanted trees shown in the foreground of the photo are date palms (left) and queen palms (right). The tall, thin trees in the right distance are Mexican fan palms.



This photo shows some palm trees along the Riverside Freeway near the Seventh Street shortly after they were transplanted from the Eighth Street Underpass area. The shorter, heavier trees to the left are California fan palms; the two taller ones are Mexican fan palms.

palm is a native of Palm Canyon and other desert canyons, and is just as wild as cactus or other native trees and shrubs. It grows to a height of 80 feet and develops a heavy trunk. The fronds form a skirt to protect the trunk. Because of fire hazard and untidiness, they are often trimmed. The *Washingtonia robusta* has a much more slender trunk and smaller leaves than the *filifera*. It grows faster and often reaches a height of 100 feet.

Palms First Located

The first step in transplanting palm trees is to check the topographic maps for all palms within the limits of the freeway construction area. Plans are then made to move them to locations which will not interfere with construction operations or with the finished freeway landscape plans. Each tree to be moved is shown, by number, on a map, with its approximate height and distance to be moved. Next, the location where each tree is to be planted is shown by number on another map.

A truck crane cable is tied to the trunk of the tree with belting or other protective material to prevent any injury to the trunk or crown of the tree after the ball is excavated. A tractor is used to push it over. After the tree is down, the trunk is trimmed, and the fronds are trimmed and tied. This lowers the wind resistance on the top of the tree. The tree is now ready to be loaded on a low bed truck and transported to the planting location. In this process, one should consider that a *filifera*, 60 to 70 feet tall, weighs about 25 tons, and a *robusta* of similar height weighs about 20 tons.

A truck crane can be used to pick it up at a balance point approximately 10 feet above the ground level and place it in the planting hole. It is replanted two to three feet deeper than it was in the ground before. Palms send out new roots at the base of the trunk. These help to anchor and feed it. The *Cocos plumosa* are an exception to this; they are planted at their former ground level.

In transplanting, any injury, especially an injured crown, is likely to kill the palm. Reject sand is used for backfill. This will compact readily, and with very thorough watering the trees will require no guy wires to hold them in position. Trees as tall as 85 feet, planted in this manner, have withstood severe "Santa Ana" windstorms shortly after the transplanting operation. A good basin is very necessary. Weekly watering for a nine-month period should make the planting a success.

Dust Control

Special Mixes Alleviate Dust Problem on Detours

DENSE and choking clouds of dust were a persistent annoyance and hazard to early-day drivers who piloted their gas buggies and touring cars over California's then rutted and unpaved roads.

Goggles, face masks and canvas dust covers were often standard equipment for the hardy motorists who took to the road in the days when the automobile was still in competition with the horse.

With today's paved highways and modern cars, such cumbersome equipment is long discarded. As far as most California motorists are concerned, dust is an almost forgotten driving hazard.

To state highway engineers and contractors, however, dust control is a constant problem. Wherever highway construction is in progress, there is a potential nuisance and danger from dust.

The problem is intensified by the fact that Californians are conditioned to dust-free travel on smoothly paved roads. Even a short stretch of dusty road through a construction project will often mean numerous complaints.

Fortunately, with paved detours and extensive dust control measures, the California Division of Highways has been able to eliminate much of the dust annoyance from state highway construction projects.

Detours Built Beforehand

Because of the heavy traffic volumes on California highways and in the interest of holding public inconvenience to a minimum during construction, the division attempts whenever possible to route traffic through or around work zones on dust-free surfaces. Sometimes paved detours must be built before actual construction on the permanent highway can begin.

In some instances, however, it is not practical to provide paved detours because traffic control is needed for only a few days. In other cases rough terrain makes the cost of building such detours too high.

At these times, when traffic must be routed through construction on unpaved base rock or gravel, effective dust control measures are mandatory.

The most common method of keeping down the dust is as ancient as roadbuilding itself—putting water on the road.

Although this method is time-tested and generally reliable, and is widely used, it is not always the most efficient and lasting answer to the dust problem. This is especially true when relatively large numbers of vehicles must use an unpaved roadway through a construction zone for a long period.

When water is used as a dust palliative, the contractor must be prepared for a continuing cycle of application and reapplication in the face of often rapid evaporation, percolation and runoff.

In addition, the condition of the road under water treatment frequently ranges from too wet immediately after application to dry and dusty before the next application of water can be made.

Special Mixtures Used

These shortcomings are being overcome through the increased use of a special dust control mixture. Water is still the main ingredient, but something has been added.

Highway builders have found that by adding various amounts of asphaltic mixing emulsion to water, they come up with a mixture which effectively controls dust for longer periods and which also provides other benefits.

When this mixture is applied, the asphalt adheres to the dust particles after the water has disappeared. Thus, the dust particles stick together or are made heavier by the asphalt film, which accumulates with each application and results in successively longer-lasting control.

A big advantage of this kind of dust control is that the mixture can be applied by the same equipment used for water spraying. No special apparatus is required and there is no trouble with the mixing.

Other advantages include protection of the roadbed both during wet weather and in the summer.

In rainy periods, the asphalt film speeds the runoff of water, thus protecting the underlying base materials from saturation which leads to instability under the pounding of heavy traffic.

Through the dry months, the shape of the roadbed is maintained with less frequent watering and blading and with less likelihood of road surface "whipoff."

Used as Prime Coat

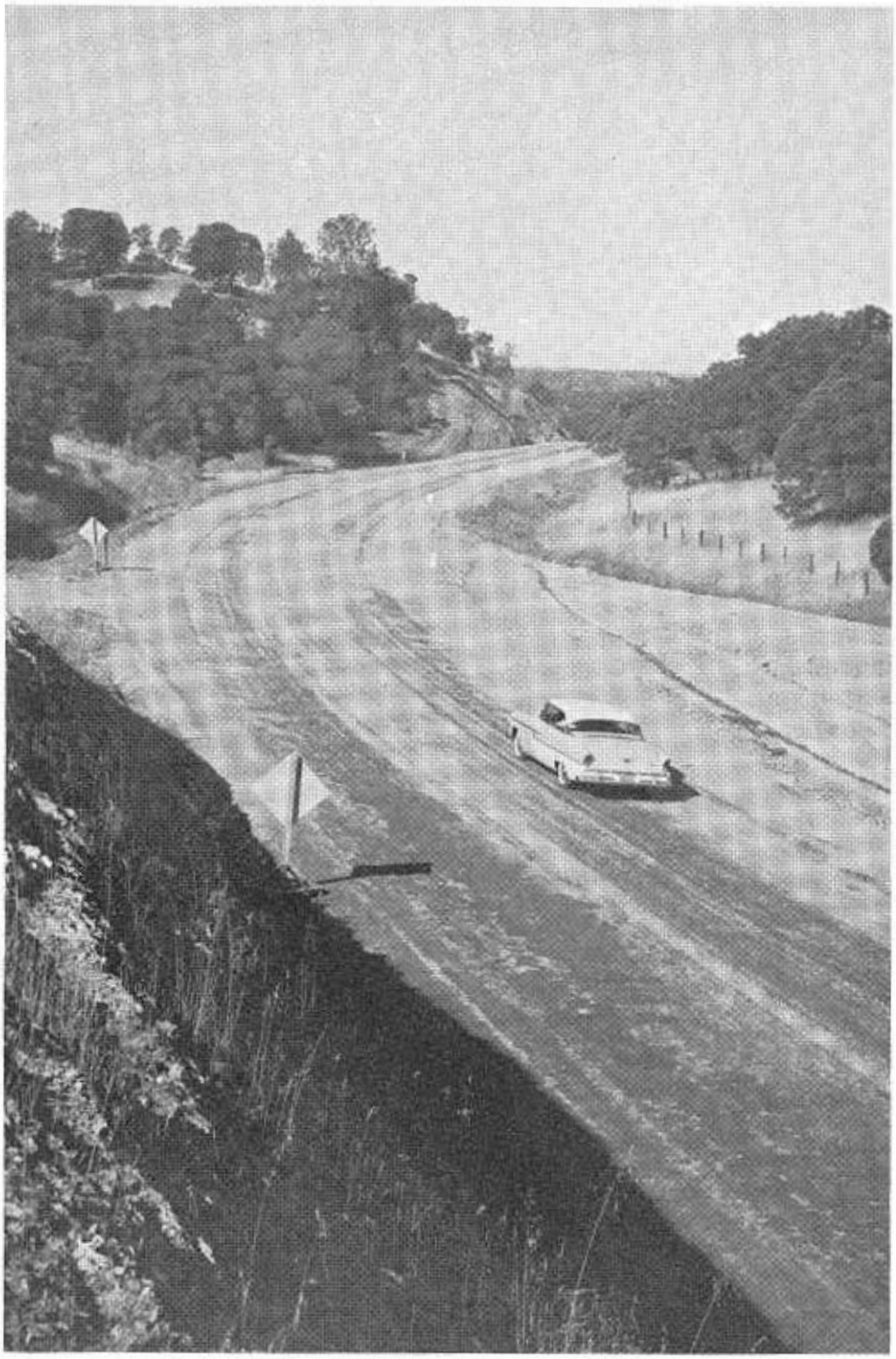
Finally, experience with this type of dust control procedure has indicated that in at least some cases the asphalt emulsion will serve as a prime coat before the start of paving or surfacing operations.

One recent state highway project in which the water-asphalt mix was used to good advantage was a 7.8-mile foothill realignment project on State Sign Route 88 between Ione and Martell, Amador County.

Resident Engineer C. F. Roderick of District X described the dust control operations on this project in a report to District Engineer J. G. Meyer. His report follows in summary:

The contractor had opened up the entire 7.8 miles of road on this contract and traffic had been maintained through the winter on unsurfaced base rock. In early spring a severe dust problem developed. It was being controlled by spraying from water trucks at considerable expense.

Faced with the need for adding another water truck to the two already in service, it was decided to



When traffic has to be routed through highway construction on unpaved road, dust control is an ever-present problem. On this section of State Sign Route 88 between Ione and Martell, Amador County, the resident engineer found that a mixture of asphalt and water effectively held down the dust and also provided other benefits.

try out the diluted emulsion on sections where the contractor would not be working for several weeks.

A mixture of 90 percent water and 10 percent mixing emulsion was used. A 4,300-gallon capacity water tank, mounted on a truck and equipped with a pump and spraying unit, made the spread. The emulsion and water were poured into the tank simultaneously. Temperature of the emulsion was about 120 degrees.

The mixture was placed on the road at about the normal speed used for applying water, with the exception of grades 6 percent and over where speed was increased to prevent excessive runoff.

First Application Effective

No special work was done on the road in preparation for the treatment. Most of the roadbed was untreated base. Portions were at the subgrade elevation for plant-mixed surfacing, and other sections lacked one course. A small section was pit run material which had been placed on the subgrade in order to carry traffic.

This first application was effective in laying the dust and one of the two water trucks which had been in use was eliminated.

Two to three weeks later the treated area was worked with a blade and watering was resumed. Water requirements for the reworked areas were considerably less than before the application of the emulsion.

About a month later two additional applications were made. The second covered three short sections on which the spread was tried down the center of the road. On one longer stretch the application was made one lane at a time.

It appeared that better results were obtained from the spread by separate lanes; also, traffic was not held up while the emulsion dried.

These applications held the base in good condition for several weeks, especially on the one long section where the application was made one lane at a time. In fact this stretch was in such good shape that no prime coat was required. After patching a few rough spots, the contractor was permitted to go ahead with paving operations.

The specifications for the water-asphalt treatment as a dust palliative are now included when applicable in the special provisions of Division of Highways construction contracts. The process will also be provided for in future standard specifications.

At the end of April, 286 highway construction contracts with a total value of $368.5 million were under way. Fifty-seven of these, valued at $23.4 million, were awarded by the Department during April.

Terminal Island

Highway Commission Votes Needed Funds

THE California Highway Commission decided April 30th to provide State Highway funds to complete financing of the proposed San Pedro-Terminal Island toll bridge in Los Angeles County.

The California Toll Bridge Authority has been planning for construction of the bridge under terms of legislation which provided financing from bonds and other sources. But this financing plan proved inadequate and the authority, at a meeting April 23d, asked the commission for assistance.

Governor Edmund G. Brown, chairman of the Toll Bridge Authority, advised the Highway Commission that the authority endorsed the bridge plan and requested sufficient financial help to permit an early start of construction.

State Director of Public Works Robert B. Bradford, Chairman of the Highway Commission and member of the Toll Bridge Authority, said the commissioners' action closes the $4,500,000 financial gap which that authority had been unable to fill by bonding.

The bridge and approaches will cost an estimated $18,000,000 plus $1,500,000 for engineering.

Legislation adopted in 1958 (A. B. 74, Thomas) provided for advances of not more than $5,000,000 out of the State Highway Fund and $2,000,000 each from the City of Los Angeles and Los Angeles County out of their shares of state highway user taxes, in addition to whatever funds could be raised by revenue bonds. The money advanced from the State Highway Fund and from the city and county would be repaid out of bridge tolls, after bridge bonds were repaid, according to the law.

Revenue bonds of $6,000,000 are the maximum that the proposed bridge would support, consultants reported recently to the authority. This, with the sums to be advanced under terms of the legislation, left the gap which was closed by the Highway Commission's action today.

Artists of the Division of Highways have prepared this drawing to show how the new Terminal Island Bridge will appear after it is completed. It will form part of a link connecting the Long Beach and Harbor Freeways.

The commission's decision was to advance the additional money under the same terms as provided for the other, that is with the understanding it will be repaid out of toll revenues after the bonds have been redeemed.

The commission also said its decision is contingent upon continuation of the current federal interstate highway financing program. There is a possibility of curtailment of this program and consequent loss to California of $500,000,000 in the next two fiscal years. If this occurs, Bradford said, the commission will have to review and curtail many plans, including those concerning the San Pedro-Terminal Island toll bridge.

State Highway Engineer G. T. McCoy estimated the structure and approaches would take approximately two and a half years to build. He said plans and specifications were well underway.

The bridge would be located near the west end of Terminal Island, slightly north of the present route of the Terminal Island Ferry, which it would replace. It would be on the State Highway System and would serve as part of a connecting link, designated by the Legislature, between the Harbor and Long Beach Freeways.

Plans of the Division of Highways call for a project totaling about 7,400 feet in length, including about 4,000 feet of approach structure, a 1,500-foot span between the two main suspension towers, and two 500-foot side spans between the main towers and the anchorages on either side. The remaining 900 feet would consist of sections of fill.

The bridge will have four traffic lanes, and provide for 185-foot vertical clearance above mean high water.

On the San Pedro side the bridge approach would cross over and connect with Harbor Boulevard near Regan Street. It would also connect with Pacific Avenue near Front Street. Provision would also be made for a direct connection to a proposed extension of the Harbor Freeway, which now ends at Battery Street.

On Terminal Island, where the toll plaza will be located, the project will end on the south side of Seaside Avenue near Morman Street.

Division of Architecture contracts in progress in April totaled $139.5 million. During April, contracts totaling $8.5 million were awarded.

Retirements of Public Works Employees Noted

The following Department of Public Works employees have retired since the previous list was published in the September-October issue of the magazine.

Division of Highways Headquarters

Clarence Bovey, Principal Highway Engineer, 44 years; Lloyd B. Reynolds, Associate Highway Engineer, 28 years.

District I

Hugh Ross, Light Power Shovel Operator, 30 years; Ralph W. Sorin, Highway Superintendent, 31 years.

District II

Frank E. Leaphart, Associate Highway Engineer, 14 years; Lile H. Barber, Laborer, 32 years; O. T. Eastlick, Highway Foreman, 34 years.

District III

Orville E. Collins, Laborer, 19 years; Robert G. Wallace, Highway Foreman, 32 years; Jerry S. Connelly, Laborer, 11 years; Phillip C. Schifferman, Highway Equipment Operator-laborer, 25 years; Fred H. Schmidt, Drawbridge Operator, 18 years.

District IV

Devere L. Detrick, Highway Field Office Assistant, 13 years; Norman Helgren, Highway Foreman, 37 years; M. C. Armstrong, Highway Equipment Operator - laborer, 21 years; Stephen G. Solovieff, Delineator, 2 years.

District V

Edward P. Soberanes, Highway Equipment Operator - laborer, 34 years; Charles H. Snyder, Highway Equipment Operator - laborer, 28 years.

District VI

Robert Rasmussen, Highway Equipment Operator-laborer, 24 years.

District VII

Frank W. Long, Highway Equipment Operator - laborer, 24 years; William A. Nye, Highway Leadingman, 20 years; Thomas Stubbs, Highway Leadingman, 24 years; Harry J. Allen, Highway Equipment Operator-laborer, 25 years; Henry E. Christian, Highway Equipment Operator-laborer, 34 years; Horacio C. Diaz, Laborer, 36 years; Clementine Dougherty, Senior Clerk, 31 years; Ella M. Katerndahl, Intermediate Stenographer-clerk, 25 years; John Simonich, Highway Equipment Operator-laborer, 25 years.

District IX

Paul Scanavino, Laborer, 24 years.

District X

Chester S. Scrimsher, Highway Leadingman, 35 years; Henry Sprock, Drawbridge Operator, 23 years; Clarence Quinn, Engineering Aid II, 33 years; Richard A. Wilson, Senior Highway Engineer, 36 years.

District XI

Frank Calohan, Associate Right-of-way Agent, 10 years; Joseph E. Coomes, Highway Equipment Operator-laborer, 17 years; Phillip S. Kerr, Highway Foreman, 29 years.

Bridge Department

Hugo R. Lendecke, Associate Bridge Engineer, 32 years; Lawrence J. Hubbard, Associate Bridge Engineer, 25 years; G. W. Thompson, Associate Bridge Engineer, 38 years.

Bay Bridge

Emily Van Dorn, Senior Account Clerk, 16 years.

Shop 8

Henry Wacker, Laborer, 24 years.

Division of Contracts and Rights-of-Way

Meta M. Powers, Supervising Clerk II, 32 years.

Glenn H. Cheeseman

Glenn H. Cheeseman, District Maintenance Engineer, District VII, died in Whittier on January 27th after 40 years of service in highway maintenance with the Division of Highways.

He was born in Michigan October 1, 1898, and came to California with his family in 1910 and settled in Imperial Valley. He completed high school just in time to serve a little more than a year in the Army in World War I.

On January 16, 1919, he started work with the State Division of Highways in District VII as a laborer at $3 per day, on what he believed to be only temporary employment of a few weeks' duration. However, promotion through the ranks of truckdriver and equipment operator was rapid and in October, 1921, he became a maintenance foreman.

He was promoted to maintenance superintendent when that position was established in 1933 and served in that capacity until he obtained his registration as a civil engineer and was promoted to senior highway engineer and district maintenance engineer in 1953. Although all of his service was in District VII, he was widely known throughout the State and assisted in developing maintenance procedures and policies.

During World War II he served as major in the Army Corps of Engineers and earned the Bronze Star Medal along with the European, African, Middle Eastern Campaign with four battle stars, World War II Victory and American Campaign Medals.

Cheeseman is survived by his wife, Lenore E. Cheeseman, his father, Dwight Cheeseman, and two sisters, Mrs. Charles Rosenberger and Mrs. Edith Pratt.

Inspection Procedure Courses Being Given

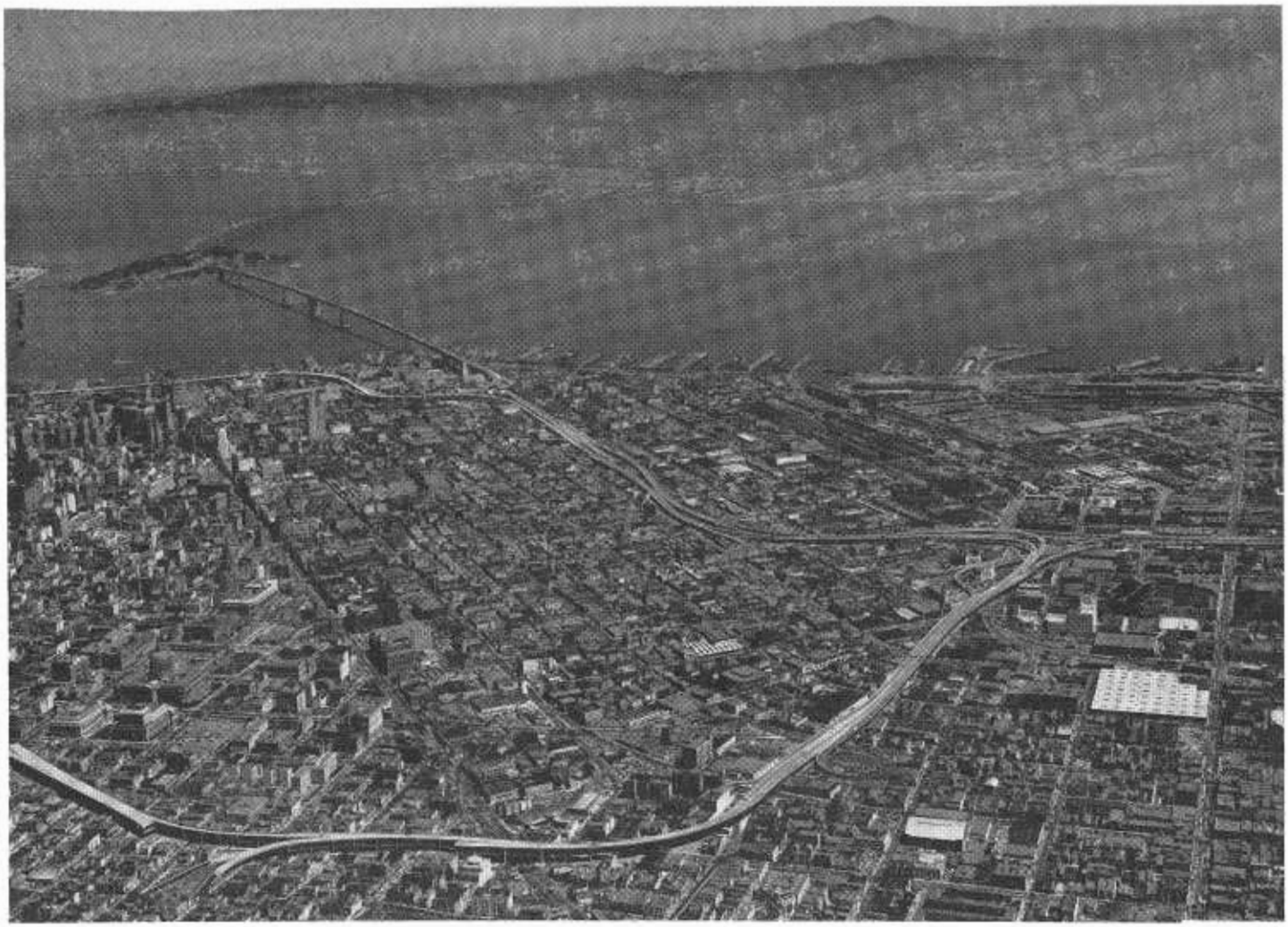
Division of Highways inservice training courses in street and plant inspection procedures for asphalt and portland cement concrete paving were held in the 11 highway districts in March and April.

The six-hour asphalt inspection course was given with the co-operation of the Asphalt Institute. The Portland Cement Association assisted with the eight-hour class on inspection of portland cement concrete.

The courses were part of the division's continuing inservice training program.

Central Freeway

South Van Ness-Turk Street Section Opened to Traffic



A new 1.4-mile section of the Central Freeway in San Francisco between South Van Ness Avenue and Turk Street, including an overcrossing of Market Street (foreground), opened April 22d. The Embarcadero Freeway and San Francisco-Oakland Bay Bridge may be seen in the background.

A 1.4-mile section of the Central Freeway in San Francisco between South Van Ness Avenue and Turk Street was opened to traffic on April 22d.

This section of the Central Freeway was the second to be placed under contract. The first contract provided a connection to and from the James Lick Memorial Freeway (Bayshore) at Mission Street and South Van Ness Avenue.

Peter Kiewit Sons Company, the contractor, began work on the newly opened section July 15, 1957. Construction cost of the project was $7,803,948.

The structure changes from a single level at South Van Ness Avenue to two levels near Market Street with opposing traffic on different levels. Over most of the freeway section there are two lanes in each direction. Southbound traffic uses the top level while northbound traffic travels on the lower level.

The elevated freeway was constructed on relatively narrow right-of way to minimize the amount of property required and to allow normal city traffic to move without interruption over the surface city streets beneath.

The terminals of the new freeway are laid out to take maximum advantage of the city's one-way street system. The northerly terminal connects with the north-south Franklin-Gough one-way street pair and with the east-west Golden Gate-Turk one-way pair. The westerly terminal connects with the Oak-Fell pair leading into the Sunset. One block of Laguna Street between Oak and Fell Streets has been made one-way to facilitate traffic at the ramps.

Merit Award Board Announces Winners

Employees of the Department of Public Works receiving certificates of commendation and cash awards since the last list was published in the March-April issue of this magazine are:

JACK ROY, Architecture, Los Angeles. Certificate of award and $25 for recommending revision in the wording on structural tracings to save time in hand lettering.

MAYNARD L. YOUNG, Highways, San Francisco. Certificate of award and $150 for recommending that pay quantity tables, covering drainage structures, be included in highway contract plans.

MISS ALMA R. TERNING, Highways, Los Angeles. Certificate of award and $20 for recommending that triplicate copy of the monthly time sheet be printed on green or blue paper so that it can be immediately identified.

JOHN M. FITZ, Highways, San Francisco. Certificate of award and $50 for developing a method for coding ambiguous traverses for computation by the electronic computer so that the proper solution will always be stored for subsequent use.

ERWIN R. PAASKE, Highways, San Luis Obispo. Certificate of award and $30 for preparing a right-of-way engineering check list.

STERLING S. SEARCY, Highways, San Francisco. Certificate of commendation for recommending the installation of permanent pushbuttons in traffic-actuated signal cabinets to facilitate rapid and safe checking of control equipment.

LYMAN D. BAILIE, Highways, Stockton. Certificate of commendation for recommending that a grip handle be placed on the bottom of canvas disposal bags.

MISS JUNE H. BRUSH, Highways, Pinole. Certificate of commendation for recommending a procedure which reduced the number of long distance calls made in connection with passenger car mileage chargeable to Federal Aid.

ROBERT R. WIRTS and RUSSELL M. GRAY, JR., Highways, San Bernardino. Certificates of commendation for recommending that dirty canvas sample bags be washed and re-used instead of purchasing new ones.

GARY L. SIMMS, Fresno. Certificate of award and $150 for designing a "fuzz" pen for inking access lines on highway plans.

DAVID V. MYRON, Garberville. Certificate of ward and $25 for two suggestions: one recommending a revision of Form A 1226, Receiving Record; the other recommending a revision of Form A 523, Transfer Form.

NORVAL A. RYDER, JAY H. CARLTON, and DARRAL D. BROOKS, Fresno. Certificates of award and $30 for recommending the use of carbon sheets for route comparison studies when using T.S. 9.1 form.

JACK LYNN, Bridgeport. Certificate of award and $150 for designing and constructing a snow stake puller that speeds up the pulling of poles and reduces the breakage.

ROBERT W. BOWER, San Bernardino. Certificate of award and $25 for recommending that portions of old discarded tires be used to mount clearance lights on snow and rock plows to protect and prolong the life of the lights.

CLARENCE J. BROWNELL, Sacramento. Certificate of commendation for recommending an improved method of filing reduced plan sets.

CHARLES G. ANDERT and THOMAS F. WALSH, San Diego. Certificates of commendation for recommending that sectional horizontal repair plates be used to prolong the life and usefulness of HR and HRD pressure sensitive vehicle detector frames installed in pavement that has deteriorated due to heavy vehicle travel.

DONALD D. MARTY, Sacramento. Certificate of commendation for designing a plan hanger for reduced sized plans.

CLINTON R. SMITH, Salinas. Certificate of commendation for designing and building a detachable safety hand rail for getting on and off of flat bed trucks.

JOHN M. FITZ, San Francisco, $50 additional award for an improved method of computing ambiguous traverses on machine computations, etc. (A certificate was issued at the time of the original award in March, 1959.)

Robert L. Thomas

Robert L. (Bob) Thomas, who retired March 31, 1948, after more than 30 years of service with the Division of Highways, died April 28th in San Jose. Funeral services were held in that city, which had been his retirement home.

Some of his better known engineering work included the location of the Weldon Canyon Road, Ridge Route Alternate, and the Angeles Crest Highway in District VII where he was employed as Location Engineer and Engineer of Special Investigation from 1927 to 1933. At the time of his retirement he was Assistant Engineer of Surveys and Plans, Headquarters.

Thomas leaves his wife, Mabel, two nieces who live in Garberville and another niece in Berkeley. A sister resides in Portland, Oregon.

The Thomas home in San Jose was at 1079 Camino Tablo.

Veteran Road 'Super' Clyde Rust Retires

Clyde W. Rust, Sr., highway superintendent in the Sacramento area, retired on April 30th after a career of nearly 46 years with the California Division of Highways.

Rust was born on October 13, 1898,

CLYDE W. RUST

in Sacramento, California, and attended public grade and high schools in that city. He entered state service as an office boy at headquarters in 1913.

In 1917 Rust entered the U. S. Army and served until 1919 when he returned to state service as an assistant resident engineer with the Construction Department in District III. He worked on numerous construction projects throughout District III. From 1926 to 1930, he served as assistant maintenance engineer, and it was during this period that Rust was assigned the task of constructing a 0.7-mile detour around an uncompleted bridge and overhead grade separation for the Truckee River Highway celebration on June 10, 1926. He was given orders to complete the bridge in five days, and although it was hardly expected that the work could possibly be accomplished in that time, the bridge was finished on the evening of the sixth day.

From 1930 to the present time, Rust has worked in his present capacity as highway superintendent in the Sacramento area. During this lengthy career with the State, he has served under 10 Governors.

Rust is a charter member of the State Highway Employees Association, American Legion, Veterans World War I, and his fraternal associations include membership in the Masonic and Elks lodges.

Rust is married, and has a son and a daughter both residing in Sacramento.

Contractors' interest in highway projects was maintained at a high level during April. As many as 22 bids for one project were received. Bidders averaged seven per project.

OAKLAND STUDY

Continued from page 12 . . .

1. The assessed valuation of the area increased from $359,750 to $514,650, a jump of $154,900, despite the fact that the project removed from the tax roll property with an assessed valuation of $46,975.
2. Had there been no street improvement, the valuation would have increased $53,963 in line with an average 15 percent increase in citywide assessed valuation from 1952 to 1958. Therefore, the area's assessed valuation realized a net gain of $100,937, despite the "loss" from the city's right-of-way acquisitions.
3. As a result of any civic improvement, there customarily develops a certain amount of neighborhood pride which soon after manifests itself in the form of property improvements, i.e., "face lifting," repainting, additions, landscaping, old sidewalk replacement, etc. All of these beneficial changes can now be seen on the improved 27th Street.
4. Since 27th Street was improved, excluding additions and minor improvements to existing properties, $150,000 has been expended for private improvements or new construction within the one block abutting the new 27th Street improvement.
5. All property owners formerly located within the right-of-way have relocated within the City of Oakland, a sequence which can be expected to further enhance the local tax rolls.

SOUTHERN CROSSING STUDY

New studies seeking the best location for a Southern Crossing of San Francisco Bay were ordered by the California Toll Bridge Authority at its April 23d meeting. The Department of Public Works was directed to study the feasibility of a crossing from Sierra Point, San Mateo County, to Roberts Landing, Alameda County, and of a crossing in any location north from that line to the San Francisco-Oakland Bay Bridge. There will be need for another Bay crossing after 1972, when the modernized Bay Bridge will reach capacity, experts told the Authority.

New Expressway Completed in Antelope Valley

An eight-mile section of the US 6 in Los Angeles County was opened to traffic on April 15th. Reconstruction of this section of US 6, which is also known as the Sierra Highway, extends from Avenue R in Palmdale to Avenue I in Lancaster and involved four-laning the highway at a cost of $600,000. Work on the project was started last September.

LIKE FATHER, LIKE SON

EDITOR:

The Gualala River Ferry of which you had a picture in the March-April issue was owned by my father, Rufus Niles. He used to get 25 cents per team for ferry fare, the same fare the State charges now on the Bay Bridge.

My folks used to tell me how they did their banking. They would convert the ferry fares into $20 gold pieces and when there were enough my mother would sew them into the hem of a dress and take a lumber schooner down the coast to San Francisco and the bank.

My father went out of business when the county built the bridge in 1894 and moved to Oakland where I was born.

However, the bridge builders weren't through with us yet. When I grew up I got a job on one of the San Francisco Bay ferries. Along came the State and built the Bay Bridge and, like my father, I found myself out of work.

Actually, I feel quite close to bridges and highways as I am now a building engineer in the Public Works Building in Sacramento, where the Division of Highways has its headquarters.

Sincerely,

LEWIS R. NILES

E. Brooks Currey

Edward Brooks Currey, Assistant District Engineer in charge of surveys, materials and drainage for District VII, died after a protracted illness May 8th. He was 64.

Currey was first employed by the State Division of Highways as Senior Engineering Office Aid in July, 1931. Following a year's absence (1935-36), during which time he was employed by the Los Angeles County Surveyors Office, he returned to highways and remained until his death. He was appointed supervising highway engineer in May, 1951.

Currey was born on March 4, 1895, in Mountain Home, Idaho, and attended the Kearney, Nebraska, Military Academy from which he was graduated in 1912. He subsequently held various engineering jobs, enlisted in the 109th regiment engineers in World War I and served as city engineer of San Fernando from 1925 to 1930.

Currey, who lived at 1225 Westerly Terrace, Los Angeles, is survived by his son, E. Brooks Currey, Jr., daughter-in-law and grandchildren. Pauline Currey, his wife, died on April 30, 1959.

Veteran Maintenance Employee Retires

Phillip C. Schiffmann, a Division of Highways employee in the Chico Maintenance District, has retired because of disability. Schiffmann completed 25 years of state service in April, 1958.

He was born in Denver, Colorado, on August 1, 1903. He started his employment with the Division of Highways in the Oroville Maintenance District on April 5, 1933. All of his service was with the maintenance department of District III.

At a recent safety meeting he was presented a gold watch by his fellow employees. The presentation was made by District Engineer Alan S. Hart.

He served in the armed forces during World War II from July, 1942, to May, 1953.

Schiffmann will reside at his home on Lassen Avenue in Chico following his retirement.

R. E. Milton

R. E. Milton, 53, an employee of the Division of Highways for 29 years, died March 4th at his home in Sacramento. He had been ill for several weeks following a heart attack.

Milton, an associate highway engineer, had been a specifications writer at the division's Sacramento headquarters for the past 11 years.

He began his career in 1929 as a junior engineering aid for District II in Redding.

Milton was assigned to various departments in District II until 1948, when he transferred to the specifications section at the headquarters. He was a licensed civil engineer.

A native of La Grange, Kentucky, he was born February 2, 1906. He is survived by his wife, Esther.

During the 1957-58 Fiscal Year, the Division of Highways let contracts for 102 new traffic signal installations, and 45 existing signal systems were modernized. Of the new installations, 76 were traffic actuated and 26 were of the pretimed type.

Heslep Named Aide To Bridge Authority

Edward A. (Ted) Heslep was appointed executive officer of the California Toll Bridge Authority by Governor Edmund G. Brown on May 20th.

Heslep, 40, formerly served as legislative liaison for the State Senate Rules Committee. He was Northern California campaign manager for U. S. Senator Clair Engle in 1958.

Heslep was born November 24, 1918, in Narrows, Virginia. He attended Virginia Polytechnical College in Blacksburg, Virgina.

Heslep came to California in 1945 after service in the U. S. Army, during which he rose from the rank of private to lieutenant. He worked six years as a sales representative for several eastern firms in Los Angeles.

After a brief period in the insurance business in Modesto, Heslep moved to Sacramento and worked in the California Disaster Office until 1957, when he resigned to travel.

Heslep lives at the John Hay River House on River Road, northwest of Sacramento. He is a member of the Consistory of Sacramento and Ben Ali Shrine and is active in the Red Cross, Boy Scouts and YMCA.

Construction Course At Marysville Office

An orientation course in construction engineering was recently conducted for county road officials by the Division of Highways District III office in Marysville.

The 40-hour course was arranged under the supervision of the district cities and counties co-operative engineer.

Technical presentations were made by various staff members. Lectures and films were supplemented by instruction in procedures for typical field job control tests.

Twenty-two county road commissioners, resident engineers or construction inspectors participated, representing nine of the 11 counties in District III.

The training program sought to acquaint county personnel with field and office procedures necessary in FAS county road jobs. The course also covered current construction practice.

Clyde F. Johnson

Clyde F. Johnson, highway maintenance superintendent in charge of the Bakersfield territory in District VI, died on April 7th after an illness of five months.

Johnson was born in New Carlisle, Ohio, April 15, 1895, and attended grammar school and high school there. He attended Ohio State University and was in the Army Signal Corps in 1917 and 1918. He came to California in 1922 and went to work for the California Division of Highways shortly thereafter.

He worked in District IV in the San Francisco area from 1923 until 1937, where he was an inspector, a mechanic's helper, a timekeeper-clerk, and a foreman. Since 1937 he has been a highway superintendent in District VI, until 1940 in the Taft area, and then in the Bakersfield area until the time of his death.

Johnson was active in local organizations and civil service affairs. He helped organize the California State Employees' Association and the California State Employees' Retirement System. He was chairman of the Streets and Highway Committee of the Civilian Defense Council of Kern County.

He was a member of the Caledonia Masonic Lodge, the Bakersfield Scottish Rite Bodies, the High Twelve Club, the American Legion, and the Quarter Century Club.

He was fond of travel, photography, and bridge; and was a member of the Photographic Society of America, the Tejon Camera Club, and the American Contract Bridge League.

Johnson is survived by his wife, Pauline Margaret, and a sister, Miss Ruth Johnson, of Dayton, Ohio.

DISTRICT XI

Continued from page 9 . . .

Riverside County

A contract for the construction of nine miles of four-lane full freeway on US 60-70-99 between the Indio Overhead just northwest of Indio and Thousand Palms (Edom) has recently been awarded to Massey and Hill of Indio and San Gabriel as a joint venture. The low bid of $1,757,000 will provide interchanges at Jefferson Street, Washington Street, and at Kubic Road. The Washington Street bridge will span the railroad west of the freeway in addition to the freeway lanes.

The Indio Overhead to Thousand Palms section of US 60-70-99, together with the budgeted Beaumont Freeway, will provide 125 miles of continuous multilane divided highway between Los Angeles and Indio except for the undivided four-lane section through Redlands.

On another US 60-70 project, a new two-lane welded steel girder bridge will be constructed to carry east-west traffic over the Colorado River in the vicinity of Blythe, California. Osborn & Pierson were low bidders, asking $995,957 for the job. The new 1,112-foot bridge will be located just north of the existing structure and will be financed by cooperative funds from the States of California and Arizona. The connecting approaches will be handled under a subsequent contract.

Imperial County

With the recent completion of construction on State Sign Route 115 between Alamorio and Sandia Turn, another contract has been awarded projecting construction due south to connect to US 80 near Holtville. The new project provides for grading and paving 4.3 miles parallel to and approximately 1½ miles westerly of the existing facility. A 205-foot bridge over the Alamo River will be a part of the contract which was awarded Rice Brothers, Inc., in the amount of $518,000.

With minor exceptions, District XI's construction scheduling is meeting the planning timetable. Considering the large number of recent route adoptions, together with the public meetings anticipated in the near future and the designation of the new Legislative Route 241, the outlook is for continuing rapid development of the State Highway System in this southernmost part of California.

This aerial of construction on Sign Route 94 shows the Wabash Boulevard interchange in the foreground and the San Diego business section in the background.

Two District VII Retirements Marked

Two employees of the Division of Highways District Office in Los Angeles have retired from state service.

Ernest R. Scott, assistant highway engineer, ended 32 years with the division when he retired on March 31st.

ERNEST R. SCOTT

Clarence V. Zook, highway field office assistant with the District Maintenance Department, retired on February 27th after 23 years of service.

Scott, who was born in New Zealand, acquired U. S. citizenship after serving overseas with the U. S. Infantry during World War I. He worked for both private and governmental engineering organizations before being employed as a highway engineering draftsman in District IV in 1926. Transferring to District VII in 1929, he served both in design and right-of-way engineering capacities.

CLARENCE V. ZOOK

The Scotts will maintain their present home in Los Angeles, although foreign travel will occupy much of their time. Their first itinerary will take them to some of the South Pacific islands.

Zook, who was born in Crete, Nebraska, joined the District VII staff in 1936. He and his family reside in Montebello.

BOOKER RETIRES

Continued from page 26 . . .

ern California in 1932. He joined the Division of Highways after graduation and except for a short time with the Metropolitan Water District of Los Angeles and service in the Navy during World War II, has been with the Division of Highways throughout his engineering career. Before his promotion to district engineer in District IV in 1952, Sinclair was assistant district engineer (design) in District VIII, Los Angeles.

He is a member of the honorary civil engineering fraternity Chi Epsilon and the American Society of Civil Engineers. He is married and a resident of San Carlos.

VICTORVILLE-BARSTOW

Continued from page 27 . . .

"But weeks and then months went by without a fatality. On the freeway's 108th day, April 1st, the inevitable occurred." (A driver, apparently asleep at the wheel, was killed when his car ran off the freeway and struck an embankment.)

"Another impressive fact was uncovered at the CHP office:

"The 12.6 miles of the new freeway from Victorville to Wild Wash bridge had only one injury accident during the first three months of the year, a record which more than substantiates the State Division of Highways opinion that freeways are safe highways."

The news story also reported a big reduction in the number of accidents on the former highway, which was replaced by the freeway.

"At the CHP office, a 'pin map' is used to show where accidents have occurred during the current year. Last year old Highway 66 was dotted with pins representing more than 400 accidents.

"So far this year, old 66—now used much less—shows no fatalities, no injury accidents and only two property damage accidents."

(Statewide accident records maintained by the Division of Highways show that in the five-year period from 1953 to 1957 the fatality rate on full freeways was one-third the rate on conventional highways.)

All public school building plans in the State are checked for structural adequacy by the Division of Architecture. During the current fiscal year, from last July 1 to April 30, a total of 1,066 school projects valued at $221.8 million has been submitted. This is a decrease of $41.5 million from the corresponding period last year.

CUYAMA ROAD

Continued from page 20 . . .

complicated by the size of the girders involved, was further hampered by erratic wind conditions at the site.

Overhang Presents Problem

Falsework for the deck forms has presented quite a problem due to the deck overhang which varies from four to eight feet from the girder and is quite inaccessible due to the extreme height above ground. This was effectively solved by the use of adjustable triangular timber jacks mounted on the bottom flange of the girders and supported by U-shaped high-strength steel rods to be partially embedded in the concrete deck. Deck pours are progressing at the rate of one span (200 cubic yards) every 10 days.

The Alamo Creek and Cuyama River bridges are similar in design to the Huasna River bridge although much smaller by comparison and are being constructed by similar methods.

Traffic handling has not been a major problem due to the low volume. Where the new alignment conflicts with the existing road, paved detours have been constructed. Flagmen handle traffic on a one-way basis during grading operations where heavy equipment crosses the existing highway.

This project is the first step in the proposed improvement of 58 miles of Highway 166. Completion is scheduled for late in 1959. $1,994,340 of the the total cost of this highway project was contributed by the U. S. Bureau of Reclamation with the remaining funds being drawn from the State Highway Fund by action of the California State Highway Commission. This contract is administered by the Division of Highways under A. M. Nash, District Engineer of District V. L. D. Kraatz is Resident Engineer, and J. D. Norberg was Bridge Department Representative. Madonna Construction Company is the prime contractor represented by Superintendent H. D. Carder. Vinnell Steel Company subcontracted the structural steel.

The Division of Architecture is designing parking lots for the 38 residence hall units under construction at state colleges throughout California.

COST INDEX

Continued from page 16 . . .

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

(January 1, 1959 to March 31, 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	43	4	3	4	3	0	57
Total value*	$789,714	$343,101	$548,226	$1,396,717	$2,195,009	$0	$5,272,767
Avg. No. bidders	7.3	5.5	12.0	10.5	9.3	0	7.9
Structure projects							
No. of projects	1	0	2	1	0	1	5
Total value*	$42,813	$0	$296,951	$416,621	$0	$1,838,925	$2,595,310
Avg. No. bidders	7.0	----------	8.0	16.0	9	11.0	10.0
Combination projects							
No. of projects	----------	----------	----------	----------	1	14	15
Total value*	----------	----------	----------	----------	$975,625	$58,240,964	$59,216,589
Avg. No. bidders	----------	----------	----------	----------	9.0	9.0	9.0
Summary							
No. of projects	44	4	5	5	4	15	77
Total value*	$832,527	$343,101	$845,177	$1,813,338	$3,170,634	$60,079,889	$67,084,666
Avg. No. bidders	7.3	5.5	10.4	11.6	11.5	9.1	8.2

* Bid items only.

TOTAL AVERAGE BIDDERS BY MONTHS

	Jan.	Feb.	March	Avg. for three months
1959	7.7	8.0	8.7	8.2
1958	11.4	9.2	7.6	9.3

SIZE OF PROJECTS CONSIDERED IN SURVEY

	Number of projects	Percent	Value of projects	Percent
Under $50,000	42	56.7	$815,055	1.2
$50,000 to $100,000	3	4.0	251,428	0.4
100,000 to 250,000	5	6.8	845,177	1.3
250,000 to 500,000	5	6.8	1,813,338	2.7
500,000 to 1,000,000	4	5.4	3,170,634	4.7
1,000,000 to 2,500,000	7	9.5	13,194,864	19.7
2,500,000 to 5,000,000	4	5.4	16,444,727	24.6
Over $5,000,000	4	5.4	30,440,297	45.4
Total	74	100.0	$66,975,520	100.0

lation of average contract prices is shown on the following page.

The average unit price of $0.41 a cubic yard for roadway excavation is $0.11 below the fourth quarter of 1958 price of $0.52 per cubic yard, and returns the price of this item to its low range value during the last three years. Unit bid prices in projects exercising significant weight in establishing this average range from $0.23 to $1.04 per cubic yard. The decrease in the average unit cost may be attributed primarily to the large volumes of earthmoving involved in individual projects, in locations subject to minimum traffic interference. Of the 17,200,000 cubic yards of roadway excavation in this quarter over 8,000,000 cubic yards were included in four contracts in Los Angeles and Orange Counties resulting in prices of from $0.23 to $0.36 per cubic yard.

The average price of $1.82 per ton for untreated rock base is $0.28 below the fourth quarter 1958 price of $2.10 per ton. Prices for quantities exercising a significant influence on the index range from $1.08 to $2.00 per ton.

While the average unit price of $14.00 a cubic yard for portland cement concrete pavement is up $0.45 from the fourth quarter of 1958 price of $13.55 per cubic yard, it is within the range of normal fluctuation.

The average unit price of $5.37 per ton for asphaltic and bituminous mixes decreased $0.37 from $5.74 per ton, but is still within the range of average unit prices for the last two years.

The average unit price of $49.40 per cubic yard for portland cement concrete (structures) decreased $5.80 from $55.20 per cubic yard. One-third of the total volume of 219,000 cubic yards in this quarter was in one project for the interchange structures for the Golden State, Santa Ana and Santa Monica Freeways. The unit price for this project was $47.50 per cubic yard, which had the greatest lowering effect.

Bar reinforcing steel dropped $0.014 per lb. from the unit price of $0.122 for the fourth quarter of 1958 to $0.108 a pound. The bid price for this item continued to decline despite rising steel costs, which appears to reflect higher productivity in construction and increased bidder competition.

The average unit price of $0.165 for structural steel did not change from the fourth quarter of 1958. A total volume of 10,357,000 pounds was used in this quarter with the prices ranging from $0.13 to $0.18 per pound.

General Trends

The drop of 9.4 percent in the Index is not necessarily indicative of the resumption of a downward trend in highway construction costs in the near future. In this quarter there occurred a combination of circumstances which had a predominant effect in lowering prices, particularly the natural tendency for close competition on early season lettings, when contractors endeavor to secure basic projects to engage their forces, and 15 relatively high-value projects (over $1,000,000 each), several in areas free from traffic interference, which normally lend themselves to more efficient operations and higher productivity, resulting in lower unit prices.

AVERAGE CONTRACT PRICES

	Roadway excavation, 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	[1]2.14	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	[2]	[2]	[2]$5.93	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	13.99	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

[1] The item of crusher run base was used before 1953.
[2] Asphalt concrete pavement combined with plant mix surfacing in fourth quarter 1956, and will be identified as asphaltic and bituminous mixes in the future.

At present the extent of wage increases, and their possible effect on bid prices, which will result from labor-management negotiations now going on or to be held before summer in the steel and construction industries, cannot be predicted. However, wage increases which have been provided for in existing long-term contracts no doubt will affect prices during 1959. Increases in construction wages, and in steel prices, which have increased for the last 14 consecutive years, could only be balanced by increased productivity and a reduction in profits.

Taking into consideration the above factors, it appears that a moderate rise in highway costs may be expected in the coming months.

Cost Index

The California Highway Construction Cost Index, the Engineering News-Record Construction Cost Index, and the United States Bureau of Public Roads Composite Mile Index, 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 first quarter of 1959, which now stands at 322.1, again shows a rise over the preceding quarter, but at a slower rate. It is up 2.0 index points or 0.6 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 fourth quarter of 1958, which is the latest available, increased 3.9 index points or 1.7 percent from the third quarter of 1958 and now stands at 235.3, resuming the position of the second quarter of 1958.

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

San Mateo-Hayward Span Action Taken

The Toll Bridge Authority's meeting on April 23 included action on the San Mateo-Hayward Bridge. The Authority directed the Department of Public Works to seek the adoption of legislation to permit using revenues of the San Francisco-Oakland Bay Bridge as advances to finance construction to double the capacity of the San Mateo-Hayward Bridge. This would obviate the necessity of issuing new revenue bonds and consequently paying millions of dollars in interest. The money advanced for the reconstruction would be returned to the Bay Bridge Fund out of revenues from the San Mateo-Hayward Bridge after existing bonds are paid off.

In conformance with the recent revision in the law establishing speed limits, a statewide review of all State highways has been initiated to determine restricted speed zones to conform to the new legislation.

EDMUND G. BROWN
Governor of California

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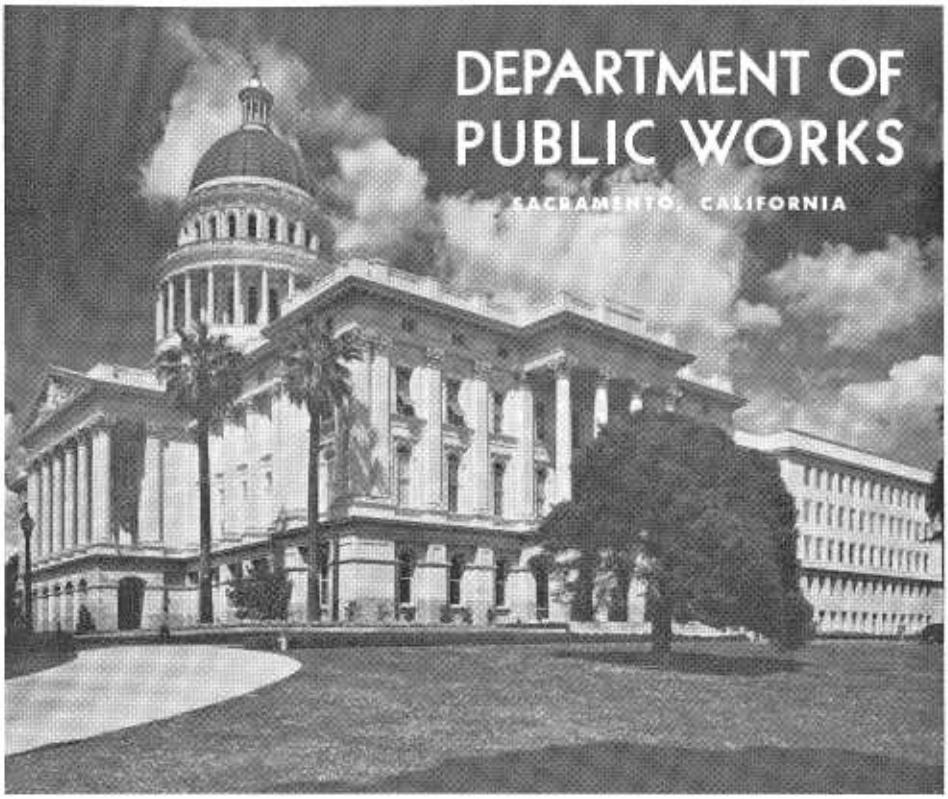

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