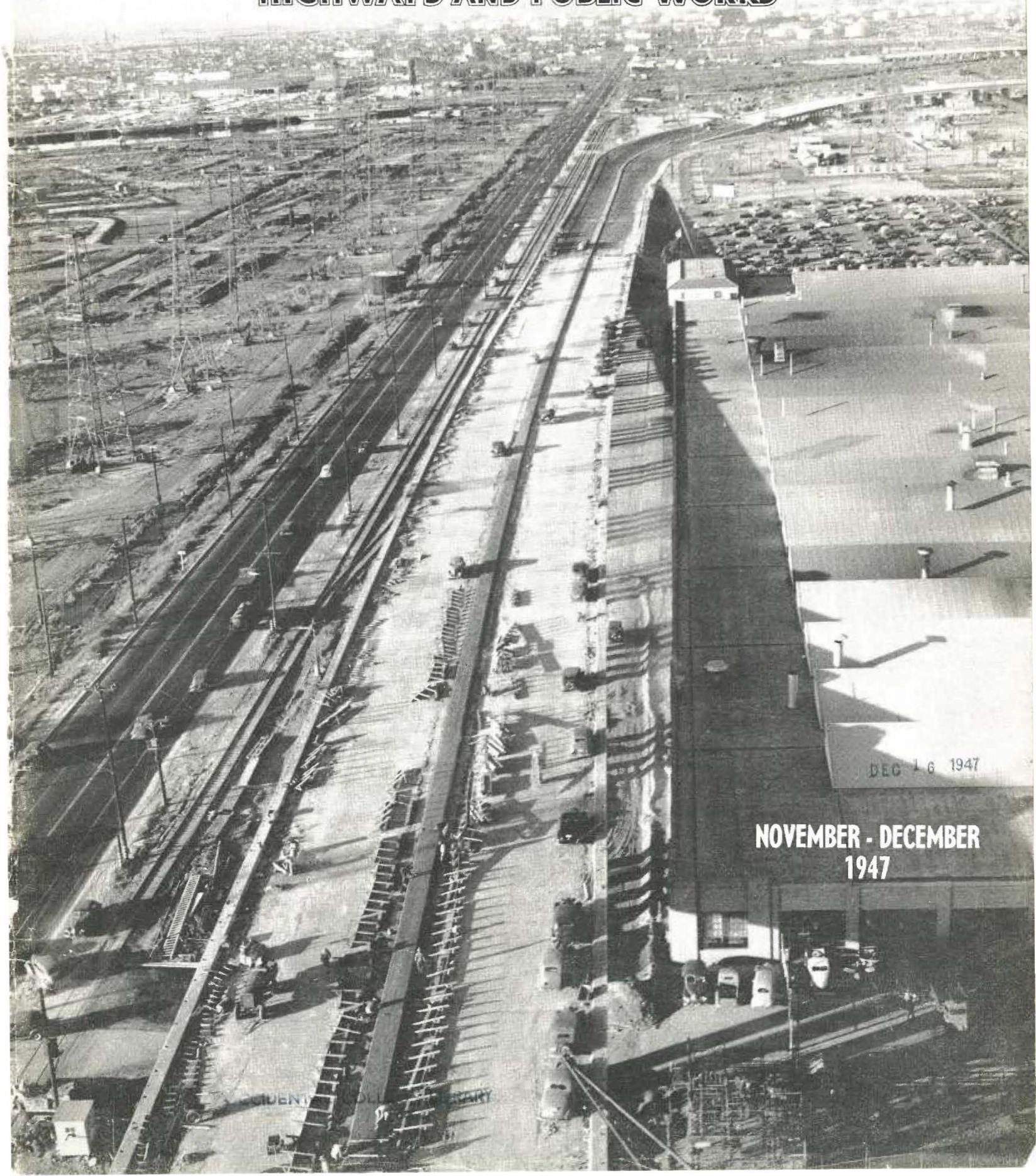


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# CALIFORNIA

## HIGHWAYS AND PUBLIC WORKS

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# CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official Journal of the Division of Highways, Department of Public Works, State of California

[PRINTED  
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# Two New San Francisco Bay Crossings Are Given Approval by the Governor And the California Toll Bridge Authority

**T**HE STATE Department of Public Works, after studying the San Francisco Bay traffic problem and all available crossing sites for two years, has determined that if the needs of the region are to be fully served, it will be necessary to construct two additional bay crossings in the near future—one in close proximity to the present San Francisco-Oakland Bay Bridge, and the other from the neighborhood of Army Street in San Francisco to Alameda—a so-called southern crossing.

The California Toll Bridge Authority with the emphatic support of Governor Earl Warren, its chairman, on November 10 concurred in this decision.

The order in which these crossings are to be constructed must depend upon facts yet to be determined, particularly with relation to their cost including approaches, the length of time necessary to construct, their ability to relieve present traffic congestion, as well as serve the needs of the future, and the problems of financing through revenue bonds.

In order to be certain that rights-of-way for these crossings will not be encroached upon and thus involve unnecessary expense and waste in the future, it is essential that both rights-of-way be now determined and the necessary action taken to protect them from such encroachment.

## TO HOLD PUBLIC HEARINGS

The Department of Public Works will continue its activities to determine the essential facts with relation to both crossings. When these factors are determined, and before deciding the priority of construction, the California Toll Bridge Authority will hold public hearings in which interested persons and public agencies will be invited to testify in the light of the established facts.

In this way the solution of the very serious San Francisco Bay traffic problem can proceed in an orderly manner without delay.

The authority took action after hearing the report of Director of Public Works C. H. Purcell, which follows:

“To the California Toll Bridge Authority  
Sacramento, California

“Gentlemen:

“Pursuant to the resolution of the California Toll Bridge Authority, adopted October 30, 1945, requesting, authorizing and directing the Department of Public Works to proceed to make a comprehensive engineering investigation and study of the need for an additional bridge across San Francisco Bay, and providing that such study include consideration of the financial requirements for such a bridge, the Department of Public Works of the State of California herewith formally presents to the California Toll Bridge Authority the report entitled ‘Preliminary Studies for an Additional Bridge Across San Francisco Bay,’ dated January 31, 1947.

“The report contains studies and investigations made by the Department for crossings at 12 separate locations.

“Upon consideration of the information developed by this study, and subsequent thereto, the Department of Public Works is of the opinion that two additional crossings of the Bay of San Francisco from the City and County of San Francisco to the County of Alameda are required; that such crossings constitute necessary and essential links in the public highways of the State, and that it is for the best interests of the public highways in the State that such additional crossings be constructed and operated by the State of California.

“In view of improvements presently under way, and anticipated in the future, within the right of way which necessarily must be occupied by these crossings, their appurtenances and approaches, the Department of Public Works is of the further opinion that it is in the public interest that action be taken at this time.

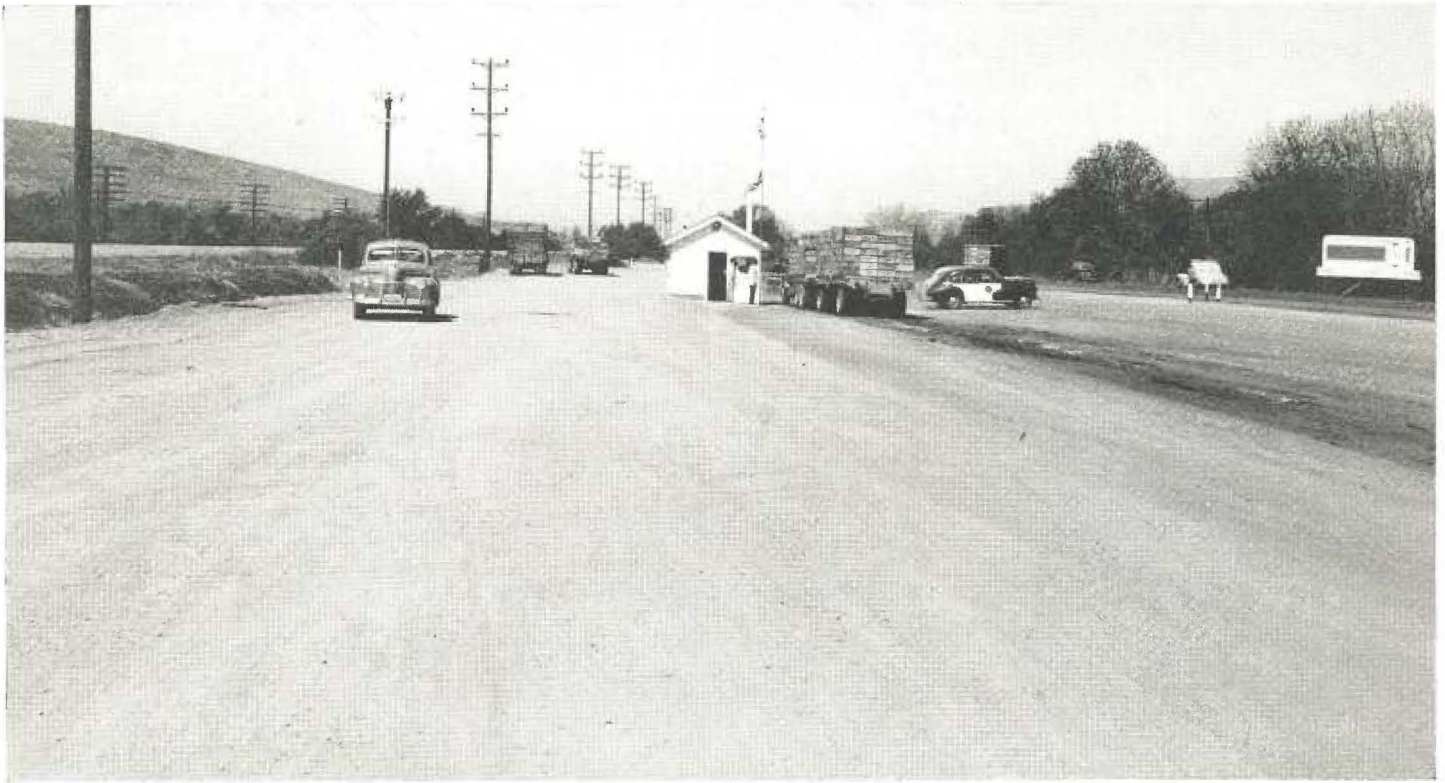
## RECOMMENDATIONS

“The Department of Public Works recommends (a) that one of such crossings should be a toll bridge on a line between Rincon Hill, in the City and County of San Francisco, and the City of Oakland, via Yerba Buena Island, approximately parallel to, and northerly of, the existing San Francisco-Oakland Bay Bridge, together with tube under the Oakland Estuary with connections to the East Bayshore Freeway and the City of Alameda; and (b) that the other of such crossings should be a toll highway crossing on a line from the Bayshore Freeway in the vicinity of Army Street, in the City and County of San Francisco, across the Bay of San Francisco, to the southerly limits of the City of Alameda; thence northerly in the vicinity of Fifth Street to and including a crossing of the Oakland Estuary to a connection with the East Bayshore Freeway, in the City of Oakland, County of Alameda; together with necessary appurtenances and approaches for both such crossings.

“Preliminary estimates of the cost of such additional bridge, based on studies by the Department of Public Works, is \$105,000,000, and of the cost of such additional highway crossing, based on estimates contained in the report of the Joint Army-Navy Board, is \$134,468,000, a total of \$239,468,000.

“The amount required to be raised for the purpose of retiring outstanding bonds and the indebtedness to the State Highway Fund secured by a pledge of the tolls and revenues of the existing San Francisco-Oakland Bay Bridge is constantly decreasing, and the amount which will be required for such purposes will have to be determined at the time of the authorization of any bond issue. Facts respecting outstanding bonds and the application of estimated revenues of the existing bridge to bond redemption are set forth in the attached tabulation of bond service.

(Continued on page 36)



General view of the Coyote scale in Santa Clara County. A load of tomatoes is on scale. Two vehicles in left background are preparing to unload a portion of excess load

# The Overload Problem on Highways

By BLAIR GEDDES, District Traffic Engineer—Administration

CALIFORNIA is faced with a problem of considerable magnitude because of a combination of factors. Much of the State's development has occurred since the advent of the motor vehicle resulting in an unusual dependence on highway transportation. Three-fourths of the entire area of the State is in rolling hills, foothills and rugged mountains. The communities in these areas are limited in size and usually separated by considerable distance.

The geographic and topographic conditions are not conducive to the construction of rail and water transportation which has been such a factor in the development of many of our eastern and central states. One-third of the communities in California have no form of transportation except highways.

The primary means of transport and intercommunication in California is so dependent upon highways that

the development and economy of the State are irrevocably geared to highway use. In 1940, the last census year, California had one motor vehicle per 2.49 persons as compared to a national average of one motor vehicle per 4.1 persons. During the war years with the limitation of vehicle manufacture for public distribution, these figures dropped to one vehicle per 3.11 persons in California compared to the figure of 4.6 for a national average in 1945.

## TRUCK TRAFFIC HIGH

In 1945 California had 9 percent of all motor vehicles in the United States which consisted of 2,853,177 motor vehicles upon which registration fees were paid. These were divided into 2,604,789 automobiles and 248,388 trucks. Figures are not completely available as to the weight and capacity of these registered truck units but the 1941 inventory of the Public Roads

Administration showed that while California listed a total of 7½ percent of all trucks and truck tractors of over 1½ tons capacity it had 15.6 percent of the inventoried units in the 15-22½-ton class. In addition, California had 34 percent of all inventoried trailers over 1½ ton capacity and 7 percent of all semitrailers with 29 percent of the 15- to 22½-ton class.

The preponderance of heavy trucks and semitrailers and the large number of full trailers in California is an indication of the dependence of the State on motor truck transportation. The truck allocations to California during the war by the Office of Defense Transportation indicates that a high percentage of the heavier types were placed in service which increased rather than diminished the volume of the heavy units.

A comparison of truck weights during 1944 in the United States fur-

ther accentuates the ratio of heavy trucking in California where the average weight of all loaded trucks and combinations was 23,470 pounds as compared to the national average of 18,439 pounds. Axle weights in California averaged 11,995 pounds as compared to the national average of 9,906 pounds. Ninety-five of every 1,000 trucks weighed in California grossed 50,000 pounds or over as compared with 19 out of every 1,000 for the United States average.

This high ratio of heavy trucking is the result of the realization of the dependence of the State on highway transportation and the resulting liberalization of restrictions and statutes which today are among the most liberal of all of the states with respect to height, width, length, and weight of vehicles allowed to operate on the public road system.

#### EQUIPMENT OVERLOADED

Despite these most liberal provisions, a certain proportion of the operators, either wilfully or thoughtlessly, overload their equipment in excess of the statutory limits. The control of these violations has, in the past, been inconsistent, and in some cases desultory for several reasons, the prime factor being inadequate or improperly located scales. Other factors have been a lukewarm support on the part of some of the courts, and a drastic shortage of manpower in the California Highway Patrol making it necessary to assign certain other duties to the regular Commercial Detail Officers which reduced the amount of time which could be devoted to the regular enforcement activity on commercial vehicles.

During the calendar year of 1940 the officers assigned to commercial work made 7,019 arrests for overloading. Of these, 3,003 citations were issued to 120 operators who accounted for 10 or more violations each which were segregated as follows:

100 or more arrests	3
50 to 100 arrests	9
25 to 50 arrests	20
15 to 25 arrests	34
10 to 14 arrests	54

120

Of the above 120 repeaters, the 66 who were apprehended 15 or more times accounted for 2,379 of the violations, for which they were assessed an average of \$9.70 per violation.

During 1945 overload citations numbered 2,730 for miscellaneous and 45 log and lumber trucks. In 1946 incomplete records show that this was increased to 6,052 miscellaneous and 806 log trucks for a total of 6,856 citations.

The 1946 repeater citations were as follows:

100 or more arrests	3
50 to 100 arrests	6
25 to 50 arrests	14
15 to 25 arrests	25
10 to 14 arrests	23
	69

The total arrests and the number of repeater citations would have, in all probability, been higher than in 1940 except that two checking points, namely Burlingame and Madrone, were not in operation during the entire year. The state-owned scales at Burlingame were removed at midyear to accommodate the expansion of the Bay Shore Highway to a freeway and have not been reinstalled. Due to an ownership change of the winery at Madrone, the private scales at this location were withdrawn from use by the Patrol during the last four months of the year. As these two locations accounted for over 34 percent of the repeater citations in 1940, the inoperative period has caused a large reduction in citations which might lead to the

conclusion that conditions have improved when the reverse is true.

The enormity of the problem can be realized when a review of the amount of the overloads is seen. The following tabulation covers the number of overloads cited during 1946, the first column listing the amount of the overload and not the gross load.

Pounds Overload	(1946)		Misc.		Total	
	Gross	Lumber Axle	Gross	Axle	Gross	Axle
0- 2,000	35	66	854	1080	889	1146
2- 4,000	111	118	1310	1315	1421	1433
4- 6,000	56	99	486	355	542	585
6- 8,000	44	55	203	120	247	175
8-10,000	50	30	80	40	130	70
10-12,000	36	9	49	19	85	28
12-14,000	23	2	31	2	54	4
14-16,000	13	2	26	3	39	5
16-18,000	20	2	13		33	2
18-20,000	6	1	21		27	1
20-22,000	13		12		25	
22-24,000	4		9	1	13	1
24-26,000	2		3		5	
26-28,000	1		3		4	
28-30,000	1		8		9	
30-40,000	4		4	1	8	1
40-50,000	2		2		4	
50-60,000			1		1	
60-70,000	1				1	

As the structural design of our pavements is based on the number of 5,000-pound wheel loads anticipated during the first 10-year period of its life, and a 10,000-pound wheel load is equivalent to 32 5,000-pound wheel loads in the factors of determination, it is evident that the substantial overloads shown above constitute a problem which cannot be overlooked.

Measuring at Coyote to determine allowable gross weight. Note mast arm and height indication to right of flag pole



District IV has long been cognizant of these conditions and has advocated the installation of additional checking stations at strategic locations. In certain areas of the district, adequate enforcement is realized because of existing installations.

On U. S. 40 state-owned scales are located at Hercules and at the Carquinez Bridge. The Hercules scales are on the east side of the road and are used when commercial traffic is predominately northbound. When the truck traffic is predominately southbound the activity is transferred to the scales at the north end of the Carquinez Bridge where the scales are on the west side of the highway.

#### GOOD COVERAGE AT SOME POINTS

In Marin County both directions of travel are intercepted on the scales north of San Rafael. As no alternate routes are available good coverage is attainable at this location on U. S. 101. Such favorable conditions do not prevail in other sections of the district.

In the southern and eastern sections of Alameda County, privately-owned scales which are available for patrol use are not located on the highway and adequate coverage is impossible. The officers must intercept vehicles which appear to be heavily laden and escort them to the scales where they can be checked. This is a slow, tedious process and the results are unsatisfactory.

Reasonably good coverage was obtainable in southern Santa Clara County prior to the time that the privately-owned scales were withdrawn from use at the Madrone Winery; however, at all of the private scales there is either little or no room for parking.

#### FINES NOT DETERRENT

Because of the high percentage of consistent violators, it is increasingly evident that the fines assessed by the various courts have not been, of themselves, a sufficient deterrent to the malpractice of overloading. To supplement the citations, unloading of the excess is required before the vehicle is allowed to proceed. This policy was made effective in March of 1946 and between the effective date and the end of the calendar year a total of 7,417,489 pounds were caused to be unloaded. During the first six months of 1947, the unloaded poundage amounted to 4,951,407 pounds.

The process of unloading is in some cases a difficult problem, particularly



Truck-trailer combination being checked for gross weight and overall length at Carquinez Bridge scale

with bulk goods or when the materials are of considerable value, in which event the vehicle must be parked until another truck can be called to remove a portion of the load. Where this occurs frequently, few scale installations have sufficient vacant area in the immediate neighborhood to accommodate the parked vehicles.

On September 18, 1947, a new installation was completed and put in operation at Coyote, some 10 miles south of San Jose on U. S. 101. At this particular point there are no alternate routes where vehicles can bypass the scale and every vehicle to and from the San Francisco Bay area to the southern part of the State via 101 must pass the scale.

Every effort has been made to provide the necessary facilities for rapid and efficient checking. The scale house has windows along the entire front and at each end. The scale platform is 10 feet x 30 feet with dial indication. The 80,000-pound dial is double faced and is set crosswise in the house so that it can be seen from either door. Illumination is provided for night weighing and, as an additional feature, an arm is mounted from the light standard extending over the scale platform from which is suspended a series of cords. These cords are successively 13 feet-6 inches; 14 feet-0 inches and 14 feet-6 inches above the scale platform and

indicate, at a glance, the overall height of the vehicle and load.

#### AMPLE SPACE

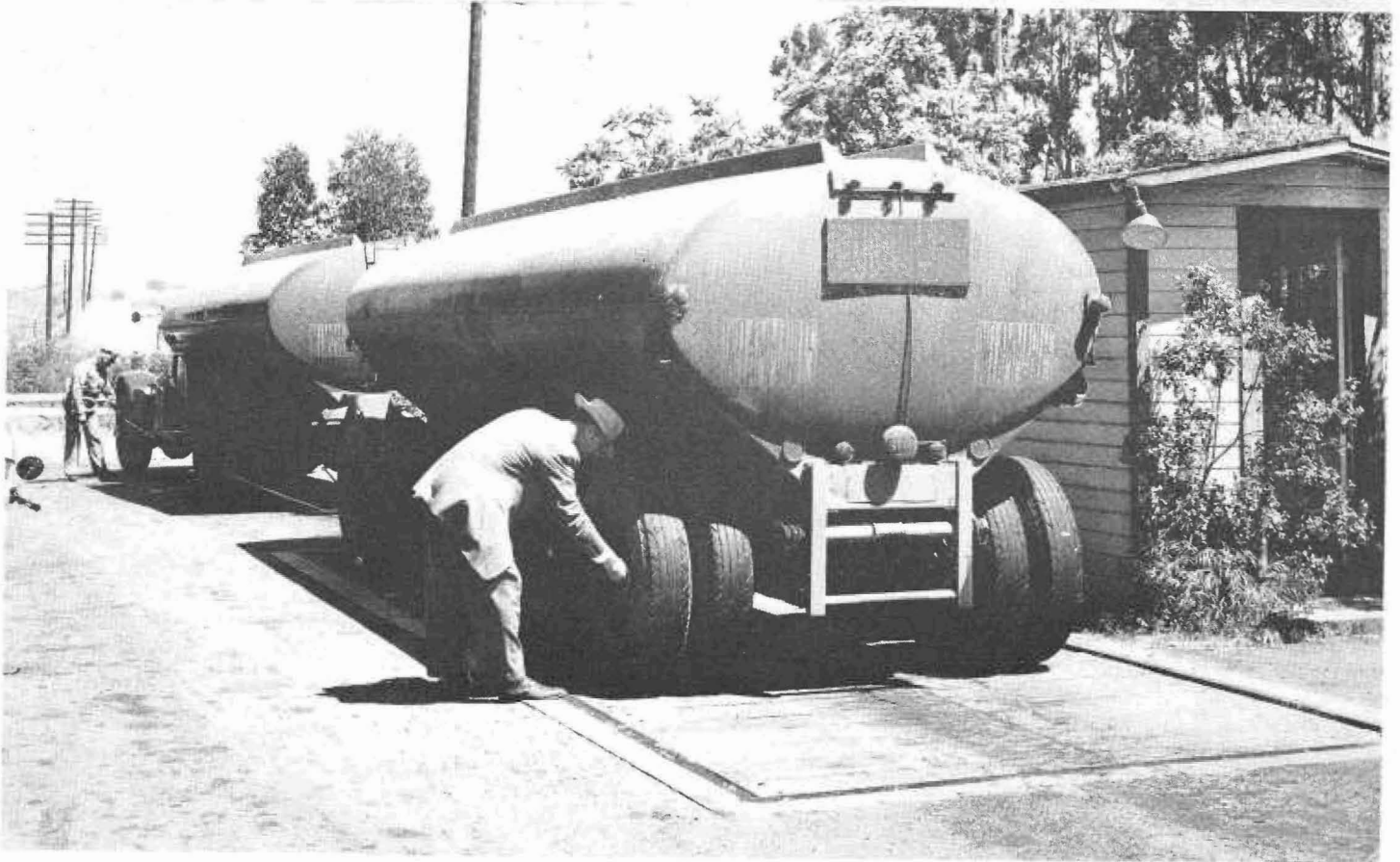
Water and toilet facilities are provided within the scale house for the officers' use and electric heaters are built into the wall to provide heat during inclement weather. The area surrounding the scale where parking can be accommodated ranges from 50 feet to 150 feet in width and is approximately 2,000 long.

A similar installation on a slightly smaller scale is presently in progress on U. S. 50 approximately five miles east of Livermore in Alameda County. When this installation is completed, the major entries to the Bay area will be well controlled.

Under provisions of the California Vehicle Code, fines assessed for weight violations are turned over to the counties in which the violator is apprehended. Because all of the financial return is a county benefit it was felt that the counties should share in the installation costs. On both the Coyote and Livermore installations the respective counties were contacted and

(Continued on page 36)

Upper—Freight truck and trailer being measured at Carquinez Bridge. Lower—Measuring length of tank truck and trailer at Hercules scale



# Shasta-Schilling Highway Project Cuts Number of Curves From 72 to 7

By H. CLYDE AMESBURY, Construction Engineer  
and DRURY ELDER, Resident Engineer

**W**HEN the recently improved Shasta-Schilling link of the Redding-Eureka highway was completed, the old town of Shasta once more observed an improvement in local transportation facilities, the factor that had been responsible for her lusty, boisterous youth, and had later led to her decay.

Shasta's location was determined by the Sacramento-Clear Creek divide. Topography permitted the freight wagons to drive up from the Sacramento Valley as far as this location. Beyond lay the rough, broken country that could only be traversed by pack trains. Naturally, a trading post developed at this spot. And what a trading post!

#### GOLD DISCOVERED

Gold was discovered and business boomed. In 1853 gold shipments averaged \$100,000 a week, or \$5,000,000 for the year. One merchant averaged over \$10,000 a week in gold dust. The first Masonic Hall was built in this year to house the Western Star Lodge. This same year a half million dollar fire destroyed the whole business section.

Shasta was not dead. By 1855 there were 28 brick buildings with a cash value of a quarter of a million dollars. It was the county seat. The Empire Hotel was one of the finest between Sacramento and Portland. Bull, Baker & Company, whose faded name can still be deciphered on the front of some of the ruined buildings, was the largest wholesale firm in Northern California. Their pack trains went as far as Oregon. Sometimes there were a hundred freight wagons in town at one time. Shasta was a real camp. It had a population of several thousand.

Shastans preceded the efforts of Californians, Inc. by sending a group of men to Salt Lake to induce immigrant trains to come to Northern California by way of Beckwourth Pass.

Then, along in the seventies, the railroad came through Redding, seven miles to the east. At about the same



Upper—Original Shasta County Court House at Shasta stands as landmark of pioneer days. Lower—Whiskeytown Hotel at Schilling, built in 1852

time the pack trail to the west was widened to accommodate wagon traffic. Shasta's career was ended. Transportation conditions made her and transportation conditions ruined her.

Shasta now rests on her past glories. People from Redding moved out there for housing accommodations but others have followed them for the real beauty and advantage of their surroundings.



It is now a quiet little family community.

The western end of the new highway improvement is just west of Schilling, but no Shastan ever calls it that. It is Whiskeytown. If the postal department decrees that mail for this community must be addressed to Schilling, that's that, but the residents live at Whiskeytown. Make no mistake about it.

#### WHISKEYTOWN FOUNDED 1849

**Whiskeytown was founded in 1849. Rumor says a barrel of whiskey lost from a pack train in the little creek near the hotel created the name of Whiskey Creek and, hence, Whiskeytown. The adjacent stream is Brandy Creek so the explanation seems specious.**

The old pack trail between these points was widened for wheel traffic in the 1870's. It was first improved as Camden's Toll Road and then taken over as a county road. This location was taken into the State Highway System in 1909; but the first improvement was performed in 1919. The road was graded and provided with a surface 20 feet in width. Grades were generally 5 percent with some stretches of 6.50 percent. The alignment generally followed the old county road; that is, it followed the contour into the gulches and around the hillsides. Sight distances were sometimes less than 100 feet.

#### DEMAND FOR LUMBER

At that time, this was a very worthwhile improvement. However, highway standards advanced until the road built for 1919 traffic compared to modern requirements on about the same basis as automobiles and trucks of 1919 compared with our present-day units.

Then came the war and the demand for lumber. Some of the largest stands of virgin timber still in the State are in Trinity County. Logs and lumber from the saw mills began to stream over the highway. The curves were so short and loads so long that the trucks could not negotiate the road without crossing over the centerline. One native said he poked the radiator cap of his old Ford around the corners; if he didn't get hit, he followed with the rest of the car. It was a highly dangerous condition but, strangely enough, few accidents occurred. The danger was so evident that the users were careful.



Upper—New construction virtually took a straight swath through the original crooked alignment. Lower—Starting the deep fills required cooperative tugging and pushing on part of heavy equipment

In early 1945 delegations of citizens from Shasta and Trinity counties besought the Highway Commission to provide some relief for this highway. They pointed out that there were 2,400,000 MBM of badly needed timber in Trinity County. They called attention to the fact that busses loaded with California's most precious asset, her school children, negotiated this road daily.

#### SHASTA-SCHILLING PROJECT

The commission, impressed with the serious aspects of the situation, reallocated certain funds set aside for Shasta County projects and advanced the Shasta-Schilling project to con-

struction in 1946. Bids were opened in August and the contract was awarded to N. M. Ball & Sons and Harms Bros.

Grading work was rushed all winter under the direction of Milne Simpson, General Superintendent for N. M. Ball & Sons, and Job Superintendent Andy Webster. The excavation contained much rock, and, contrary to expectations, slides developed on most of the larger cuts. This was cured by benching. The really difficult part of the work was taking care of the traffic. This had to be carried through construction because there was no other means of caring for it. The construction crossed the existing road 28 times.

Grading operations involved the handling of 558,000 cubic yards of roadway excavation. Grading was carried on very expeditiously by means of 10 scrapers of 22- to 30-cubic yards capacity, and a Northwest "80" power shovel. Most of the work was performed on a two-shift basis; operating from 7 a.m. to 11 p.m.

Geologic formation through which the project passes shows evidence of ancient activity in the area. Materials encountered in grading operations were extremely variable in nature, ranging through loose earth; porphyry in various stages of disintegration; conglomerate earth and rock interspersed with frequent quartz and diorite intrusions.

Two miles of the project, over Shasta Divide, pass through a very unstable formation, in which deep cuts reach a maximum of 110 feet. Cuts were benched approximately half-way up the slope, and back-slopes were flattened in an effort to prevent future slides.

Embankments through this section reach a maximum of 120 feet below finished grade. Steep natural ground slopes presented many problems in pioneering the grading work. Starting of fills often required combinations of four tractors pushing and pulling to retrieve empty scrapers from the fill areas. Since most of the heavy grading interfered with the existing road, maintaining suitable conditions for traffic presented quite a complex problem.

The Schilling-Shasta area is noted for its abundance of springs. Frequently during grading operations,



Straight stretch of Shasta-Schilling highway

water seams were opened that carried free water sufficient to fill a pipe line one inch or more in size. To provide for proper subgrade drainage, systems of six-inch perforated metal pipe underdrains were installed. A total of 9,600 feet of underdrain was required, most of which was installed through wet cuts, with the line being situated parallel to centerline, adjacent to the shoulder on each side. Other interesting features of the drainage items were the erection of 105-inch and 180-inch field assembled plate culverts.

Harms Bros. put on the crushed rock surfacing and plant-mixed surfacing under Superintendent Jack Wilson.

**So now Shasta is again affected by highway improvement. In place of the**

**old highway with its 72 curves and short sight distances, there now stretches a modern highway. Grades are limited to 7 percent and there are just seven long radius curves. The distance has been shortened .65 of a mile.**

The citizens of Trinity County and western Shasta County, as well as sportsmen, vacationists and those engaged in lumber transportation, appreciate this improvement as only those people can who were forced to use the former highway with its steep grades, sharp curves and limited sight distances.

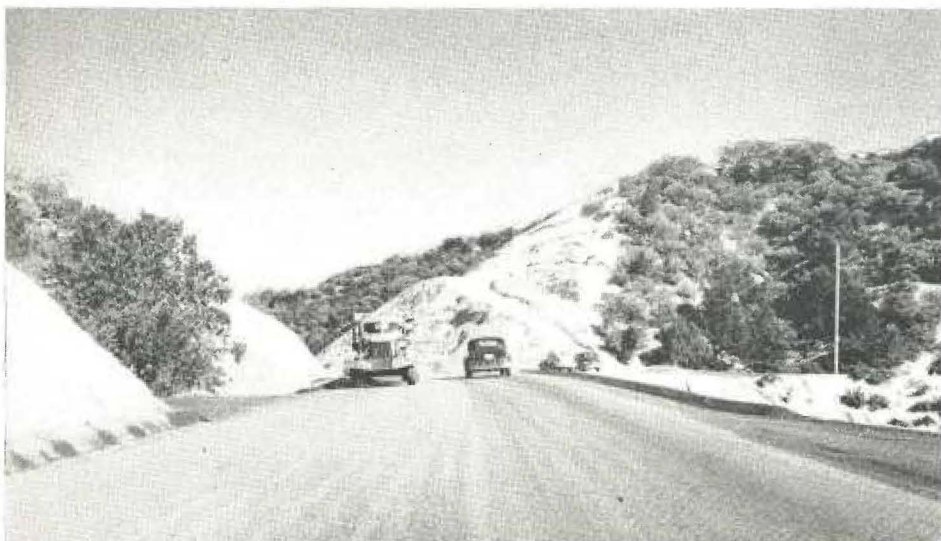
#### ASSOCIATED GENERAL CONTRACTORS ALLOTTED 100 AFFILIATED UNITS

**T**HE ASSOCIATED General Contractors of America will sponsor 100 affiliated units in the Organized Reserve Corps, Lieutenant General R. A. Wheeler, Chief of Engineers, announced today.

The association was invited by the Department of the Army to sponsor the principal reserve construction units needed by the Army in its affiliation program, whereby reserve units are sponsored by civilian organizations performing functions closely allied to the units' projected military assignment.

The 100 units, which at their ultimate strength would comprise a total of approximately 45,000 officers and men, are the first to be allotted by the Corps of Engineers.

Deep cuts were benched to remove unstable material from above the highway



# Orange County Completes Its First Federal Aid Secondary Highway Project

By HAROLD SPRENGER, Road Commissioner, Orange County

**I**T IS doubtful if a single county highway in Orange County serves a greater diversification of users than the recently completed federal aid secondary project known as Harbor Boulevard.

This, the first of five projects contemplated under the three-year Federal Aid Program, is 11 miles long reaching from Anaheim, in the northerly section of the county to Costa Mesa in the southerly coastal section. It passes through farmlands devoted to many varying types of agricultural activity ranging from the small "acre" places of the suburban family to the intensively cultivated orange orchards and truck farms, as well as the larger farm units specializing in lima beans, sugar beets and alfalfa.

Harbor Boulevard is, however, much more than a "farm to market" road. When it was originally improved by the county years ago it immediately came into use by local residents of the northern section of the county as an alternate route to beach areas. Furthermore, traffic originating outside the county seized upon the route as one affording easier driving conditions than the state highways which pass through heavily congested business areas. The traffic load quickly built up



Looking northeast to 800-foot radius curve

as soon as the old two lane highway was completed, ultimately reaching a count of 4,573 vehicles at the Bolsa Avenue intersection in October, 1945.

#### ARTERIAL IMPORTANCE

Because of its arterial importance, Harbor Boulevard was given the No. 1 priority for the first postwar years construction under the Federal Aid

Program. The type of improvement agreed upon by county, state and federal administrators was a three-lane traveled way, 33 feet in width, flanked by six-foot oiled shoulders. The old road had been improved from time to time and varied in type of construction and in width, consisting of concrete, armor coat on decomposed granite and plant-mix gravel from 16 feet to 30 feet in width. Because of its stable condition and bearing qualities, the old road provided an adequate base for the average three inch blanket course of plant-mix surfacing of the new improvement. In the preliminary studies, tests of the bearing quality of the widened roadway areas were made and on the basis of these tests, four combinations of base material were used:

- (1) 6 inches of imported borrow overlaid with three inches of untreated rock base material.
- (2) 12 inches of imported borrow overlaid with three inches of rock base material. (Untreated)
- (3) 6 inches of untreated rock base material.
- (4) 3 inches of untreated rock base material.

(Continued on page 35)

This is another view looking north to 800-foot radius curve



# State Using War Surplus Bridges

By H. D. STOVER, Senior Bridge Engineer

THE CALIFORNIA Division of Highways has found it economical to use surplus United States Army, portable steel highway bridges, fixed type, in permanent structures. To date one such bridge has been completed and a second is under contract.

Photographs 1 and 2 illustrate the completed Mill Crossing bridge on a service road across Lagunitas Creek in Samuel P. Taylor State Park, Marin County. The main span is an H-10 bridge 72 feet long, consisting of two structural steel box girders, made up of light angles welded to subdivided Warren trusses, and a timber deck. The girders were furnished in sections 12 feet long, the sections being bolted together with  $1\frac{1}{4}$ -inch bolts having a minimum yield point of 40,000 pounds per square inch. When assembled, the bridge has a truss depth of 4 feet and provides a single 10-foot clear roadway.

As built for the Army these bridges do not have railings. A steel railing was provided, consisting of a 6 x 4 x  $\frac{3}{8}$ -inch angle top rail and a 4-inch, 5.4 pound channel intermediate rail supported on U frames made up of 6-inch, 12.5-pound I beams. The U frames were reinforced at the corners by  $\frac{1}{2}$ -inch gusset plates and were welded to the top chords of the trusses.

Nailing strips were bolted to the top chords of the trusses and the 3-inch deck planks were nailed to them with two  $5\frac{1}{2}$ -inch x  $\frac{5}{16}$ -inch double grip spikes.

The bolts connecting the lower chords of the girder sections were reinforced by welding a 3-inch x  $\frac{1}{2}$ -inch x 1-foot 8-inch plate across the joint.

Figure 3 is the typical cross section of the bridge now under construction across Big Sur River in Pfeiffer Redwood State Park.

This bridge consists of two parallel, heavy type H-20 bridges 125 feet long with two 12-foot ramps making a total length of bridge of 149 feet and provides a two-lane divided highway with 10-foot clear roadways. The twin superstructure is supported on concrete piers and abutments. Each bridge is composed of two 2 feet x 6 feet steel box girders built in sections 12 feet

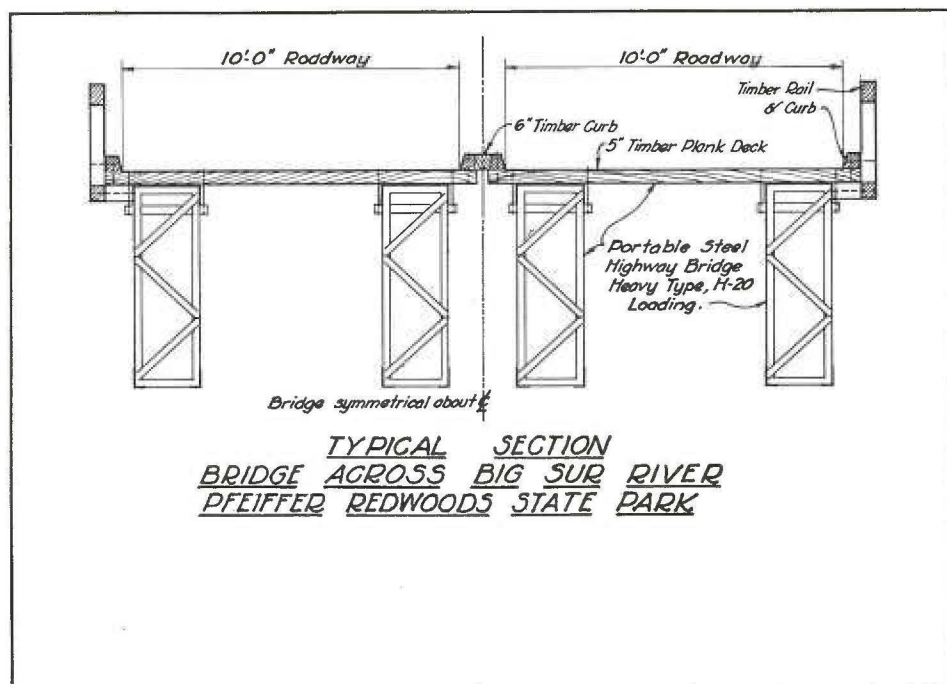


Figure 3

6 inches long, in which the trusses are of the double Warren type.

The girders are supported 12 feet 6 inches from each end, to give a 100-foot main span. The overhangs, plus the ramps, form the 24-foot 5-inch end spans. The launching rollers, furnished with the bridge, were modified to provide the bearing assemblies at the ends of the main span. This method of supporting the girders shortened the span and reduced the stresses in the lower chords so that it was not necessary to reinforce the bolted connections, as was done at Lagunitas Creek.

The deck planks were laid directly on the upper chords of the trusses and held in place by nailing each plank to the wheel guard with one  $\frac{3}{8}$ -inch x 9-inch spike and bolting to the trusses at approximately 6-foot centers, using the deck clamping beams furnished with the bridge.

A timber rail, adzed to give it a rustic appearance, was bolted to the outside wheel guards.

The Mill Crossing Bridge over Lagunitas Creek was so named because it is located at the site of a bridge

built by Marin County in 1862 to provide better access to the paper mill. The only remaining portion of this early day bridge is the steel cylinder pier shown at the left in **Photo No. 1**.

This Pioneer Paper Mill, the first on the Pacific Coast, was built in 1856 by Samuel P. Taylor (1827-1886). Marin County records note that "the mill was built on land purchased from Rafael Garcia and situated on Paper Mill Creek, now known as Lagunitas Creek, some five miles east of Olema. The building, a wood structure, is of sufficient capacity for all required purposes. The power for driving the machinery is both water and steam. About one-half mile above the mill a dam has been constructed across the Creek from which the water is conducted to the mill in a flume. The engine is 100 horsepower and is used in summer time when water power is exhausted.

"Employment was given to 20 hands who received from \$30 to \$50 per month. They manufactured books, news, brown wrapping (hardware) and manila paper and the capacity of

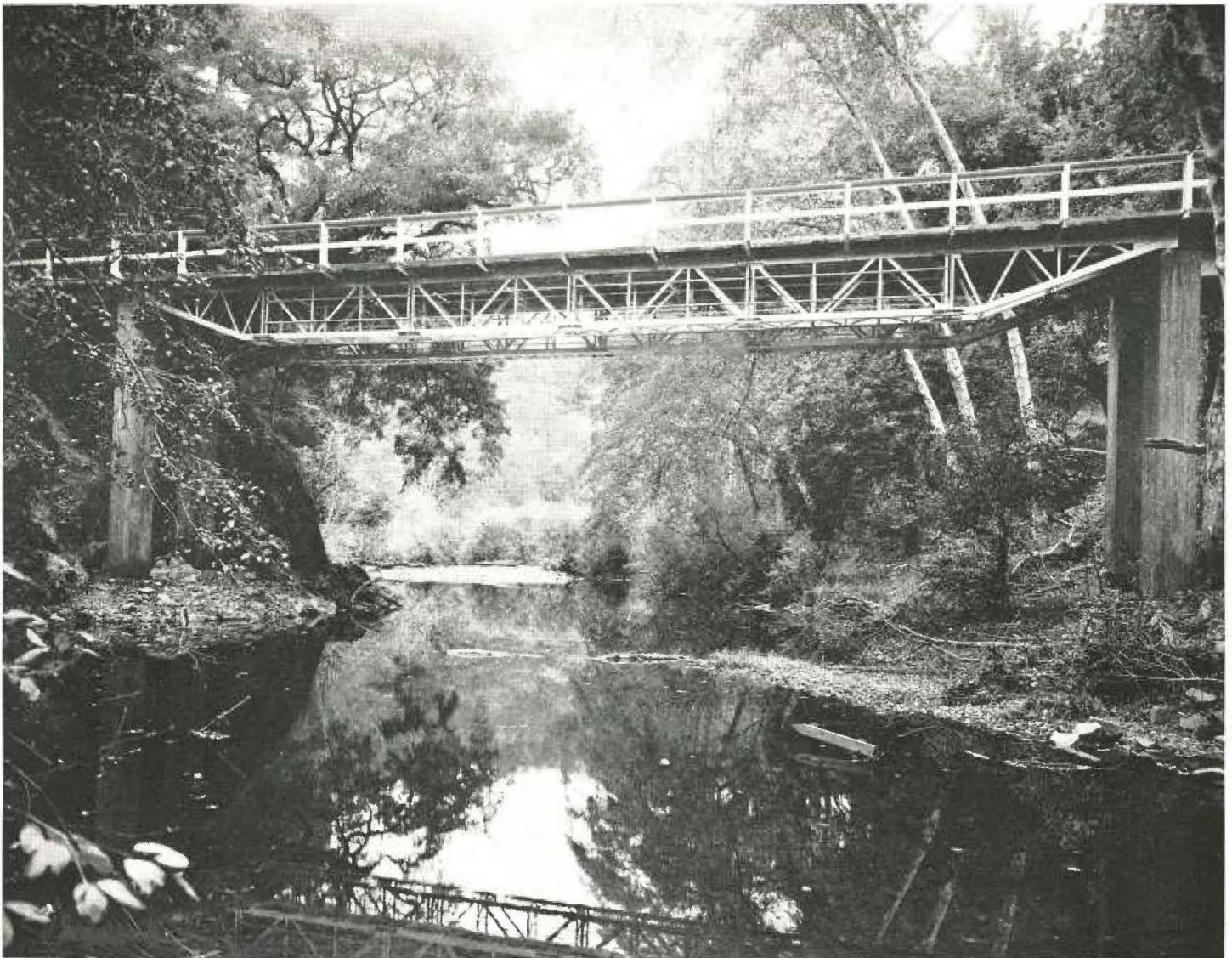


Photo No. 1

Two views of completed war surplus bridge across Lagunitas Creek in Samuel P. Taylor State Park in Marin County

the mill was about 20 tons of paper per month.

“During the year of 1867 the mill manufactured 380 reams of colored paper, 3,500 reams of news and book, 9,250 reams of manila, and the value of the total product was \$64,800.”

The March 28, 1862, issue of the *California Farmer*, a San Francisco paper, has an article describing the mill, as follows: “The works are carried by water power. The main wheel is 30 feet in diameter with 15-foot buckets and very heavy iron lugs. Another wheel is 24 feet in diameter with 6-foot buckets. To Mr. Taylor great praise is due to his zeal and energy in thus perfecting such an enterprise and

(Continued on page 34)



Photo No. 2

# Effect of Freeway Development on Adjacent Land Values in California

By FRANK C. BALFOUR, Chief Right of Way Agent

**T**HIS is the first installment of a paper read by Frank C. Balfour, Chief Right of Way Agent, California Division of Highways, before the Right of Way Committee of the American Association of State Highway Officials at the thirty-third annual meeting of the association in New York City, September 22-26.

**B**EFORE it is possible for me to discuss the topic assigned to me for presentation before this committee—"Effect of freeway development on adjacent land values in California"—it is imperative that I attempt at least for the moment to clear up the confusion that exists between the several state highway departments because of the wide and varied terminology we are using in the several sections of the Nation to describe the same type of highway improvement.

Perhaps it would be well for us to give some serious thought to the crossword puzzle we have created in the minds of the public, a puzzle which should be obvious to you, when it is necessary for the Right of Way Agent representing one of the states to carefully qualify the terminology he uses in presenting his subject today so that all of us assembled here may understand that when I refer to a freeway I am referring to the modern type of highway improvement in some states called a freeway, in others a throughway and in still others an expressway, a controlled access highway, a superhighway, or perhaps some other newly-coined term that has not yet come to my attention.

## FREEWAY DESCRIPTION

For the purpose of this study, the legal description in my State of the type of highway to which I am referring, is as follows:

"'Freeway' means a street or a highway in respect to which the

owners of abutting lands have no right or easement of access to or from their abutting lands or in respect to which such owners have only limited or restricted right or easement of access."

For the purpose of clarification in the presentation of the subject, when I refer to the Arroyo Seco Parkway, I use the term "parkway" for the reason that the Arroyo Seco extending from Los Angeles to Pasadena through most of the distance is constructed through park lands of the Cities of Los Angeles, South Pasadena and Pasadena, and in the main the abutting properties are set aside for recreational facilities for the general public.

## LIMITED FREEWAY

When referring to a limited freeway, I am referring to a highway on which access is controlled and to which the abutting properties may or may not have access to the through lanes of traffic at locations reserved at the time the access rights were acquired, with the width of such openings for access restricted in the conveyance of such access rights, and a highway on which intersecting cross streets and roads may cross at grade or where grade separations may be provided.

A freeway is a highway on which there is positively no access from abutting properties to the through lanes of traffic. There may or may not be outer highways constructed to supply access to abutting properties for the convenience of the neighborhood through which the freeway passes. A freeway is a highway on which all intersecting cross streets or roads cross the freeway on grade separations or on which such intersecting cross streets may be dead-ended at their intersection with the freeway through the creation of cul-de-sac streets.

I feel it is very important for all of us in state highway right of way acquisition work, perhaps through the medium of the AASHO Sub-Committee on Right of Way, to immediately enter into an extensive program of re-

search work for the purpose of determining as soon and as early as possible and on a broad scale, the definite answer to the question—"What is the effect on abutting and contiguous land values when freeways and limited freeways are constructed?"

In a determined effort to learn the answer, we in the California State Highway Right of Way Department are presently carrying on such a program of research work. Unfortunately, however, our progress has been slow because our first concern has been to keep out of the way of the steam shovel and the grader, but we are determined to get the answer to this important question and to this end we are working.

## ARROYO SECO PARKWAY

California's first parkway, the Arroyo Seco, was opened to traffic on January 1, 1941, and is presently being extended a distance of about one and one-half miles from a point adjacent to the north end of the central business district of Los Angeles to a meeting with the Santa Ana, Hollywood and Harbor Freeways at the huge distribution structure we refer to as the "four-level structure," just westerly of and toward the north end of the central business section of the city.

I have previously stated that most of the alignment of the Arroyo Seco Parkway passes through park lands of the Cities of Los Angeles, South Pasadena and Pasadena. However, a very limited section of the parkway is abutted by private lands. The market value of these abutting parcels is in general from three to twelve times more today than was their market value in January, 1941. It is, of course, conceded that a goodly portion of this tremendous increase in value has been due to the fact that the metropolitan area of Southern California has been blessed—or maybe I should say cursed—with the greatest voluntary immigration of population in the history of the world during the period 1941 to 1947 and there has been a huge in-



This photograph was taken looking west on Arroyo Seco Parkway in South Pasadena

crease in the size of the industrial area of Los Angeles and its immediate surroundings.

#### PROPERTY VALUES ENHANCED

However, I believe it is a fair statement that privately-owned properties fronting on the outer highway along the westerly side of the Arroyo Seco Parkway in the City of Los Angeles between Avenue 53 and Avenue 64, have enhanced in value from 1½ to 3 times as a direct result of construction of the Arroyo Seco Parkway.

It is a little more difficult to determine the effect of construction of the Arroyo Seco Parkway through sections which are abutted by private property in South Pasadena, for the reason that the Parkway alignment through this city is constructed in a furrow cut approximately 20 feet below the elevation of the privately-owned properties, but it is the opinion of qualified real estate brokers and top members of the real estate appraisal profession that the construction of this

parkway has resulted in a very definite uptrend in the value of abutting and contiguous private real estate holdings. They are, however, reluctant to say how much of the 200 to 400 percent increase in real estate values in the South Pasadena section since 1941 can be definitely credited to this major highway improvement. (See photographs No. 1 and No. 2, for views of Arroyo Seco Parkway.)

It is my frank opinion that the only possible study of effect of freeway development on adjacent land values available at this time where accurate information can be secured, is perhaps right here in the metropolitan area of New York and along the completed section of the Pennsylvania Turnpike.

#### NORTH SACRAMENTO FREEWAY

Out in California we are presently completing construction of the North Sacramento Freeway, a major project which takes Federal Routes 40 and 99-E around the City of North Sacramento. Construction is also in progress

on the Eastshore Freeway extending from Vallejo through Richmond, past the East Bay Distribution Structure of the San Francisco-Oakland Bay Bridge and thence on through Oakland, San Leandro and Hayward to an ultimate terminus in San Jose; on the Bayshore Freeway extending from the San Francisco terminus of the San Francisco-Oakland Bay Bridge southerly through South San Francisco, San Mateo, Redwood City and Palo Alto, skirting San Jose and terminating several miles south of San Jose, from which point it will extend on southerly as a limited freeway. Also approximately 285 miles further south on this same route, U. S. 101, portions of the Rancheria Freeway are under construction from a point north of Santa Barbara to a point south of that city.

#### HOLLYWOOD FREEWAY

We are now under construction on the Hollywood Freeway carrying U. S. 101 from a point in the upper San Fernando Valley into the heart of

the metropolitan area of Los Angeles where it terminates at the four-level distribution structure; on the Santa Ana Freeway which starts at this distribution structure and extends southeasterly where it rejoins the present U. S. 101 southerly of the City of Santa Ana; and on the Harbor Freeway which starts at the same distribution structure and extends southerly to the San Pedro-Long Beach harbor area. I have previously stated that we are now working on the extension of the Arroyo Seco Parkway to join the three freeways at the four-level distribution structure.

The Cabrillo Freeway is presently under construction extending northerly from the heart of the business district of San Diego to a point northerly of the city.

#### BIG FREEWAY PROGRAM

There is also under construction additional short sections of freeway and completed or under construction a number of limited freeway sections. As a result of the Collier-Burns Highway Act which was passed by the 1947 Session of the Legislature, a very heavy program of freeway and limited freeway construction will be carried on over a period of years with the result that it is a conservative estimate that during the coming 10 years we will have a total of well in excess of 800

miles of freeways including limited freeways in operation in our State and California is only one of a number of states facing a similar heavy program.

It follows that we have an obligation to our citizens as a whole and especially to the property owners who will be affected, to take any necessary steps, regardless of how difficult, through proper study and research to definitely determine the effect of freeway development on adjacent land values. It is my sincere hope that before our committee meetings here in New York are over, the distinguished speaker who will appear before us and discuss this matter as to the parkway and freeway system in New York will get us off to a flying start on this phase of the proposed vitally necessary research work.

I feel much better qualified to present the portion of the subject assigned to me that refers to limited freeways, and here permit me to pause to explain that under the general plan in California our most important north and south state arterials such as U. S. Routes 99 and 101, and our most important east and west arterials such as U. S. 40, 50 and 60, will gradually be converted into limited freeways in the rural areas, and will pass through the urban and metropolitan areas as freeways.

#### MULTIPLE-LANE DIVIDED

Under our plan the limited freeway is always a multiple-lane divided highway with two lanes in each direction and with additional lanes added as traffic increases and makes three lanes in each direction necessary. When you realize the length of California from the Oregon line to the Mexican border and the width from the metropolitan areas of San Francisco, Los Angeles and San Diego to the Arizona-Nevada border, you will appreciate the fact that there will be many hundreds of miles of limited freeway constructed in our State during the coming 10-year period.

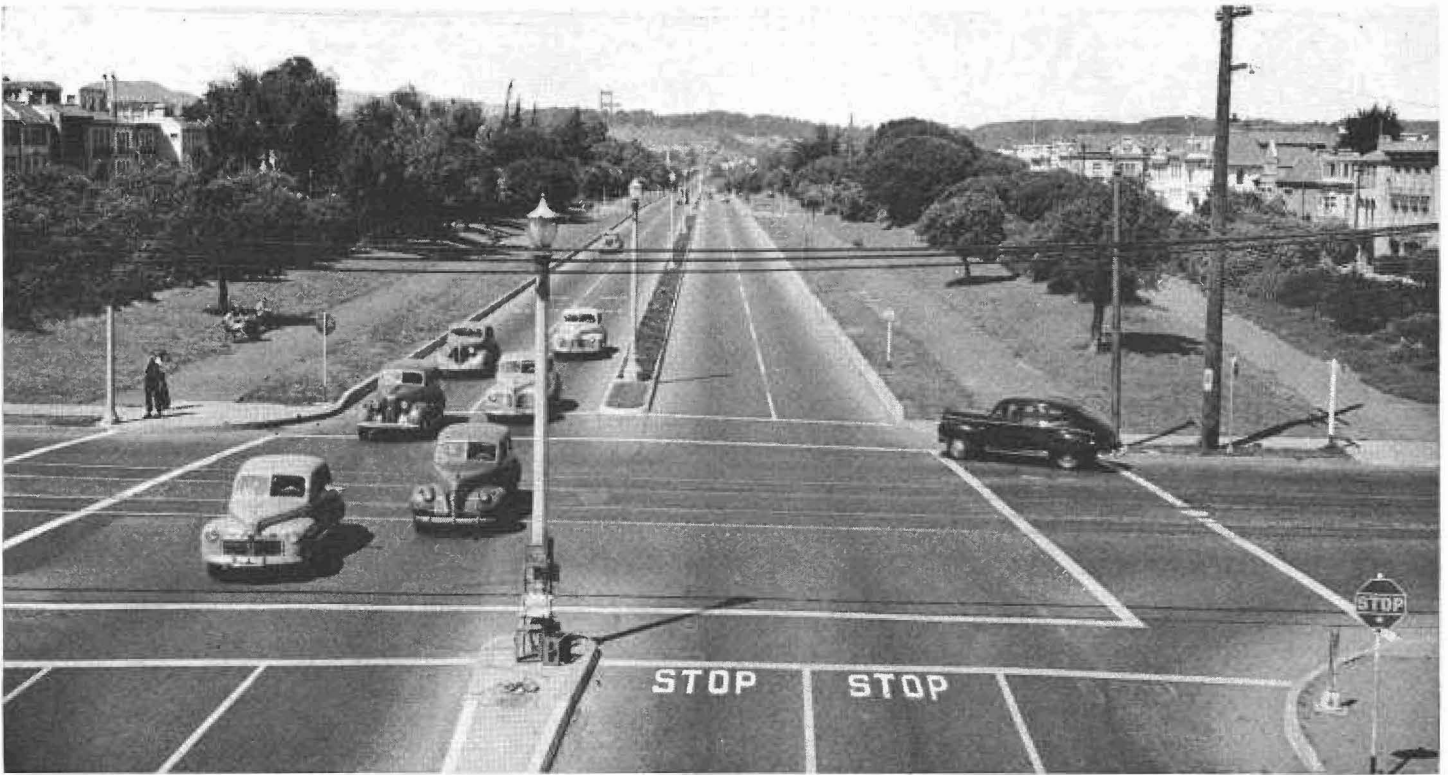
I refer in my presentation to five- and ten-year periods because the Collier-Burns Highway Act of 1947 sets up specific five-year periods during which certain phases of our tremendously expanded highway construction program will be carried on.

In general and, perhaps, to the surprise of some of you assembled state highway right of way representatives, it is my definite opinion that in the great majority of cases the taking of access rights from the abutting property on a controlled basis when you are converting an existing conventional type of highway facility into a limited freeway, represents a nominal damage.

One of many attractive sections of Arroyo Seco Parkway between Los Angeles and Pasadena







Park-Presidio Boulevard in San Francisco. Looking north from Fulton Street

I, of course, concede that the limiting of access to an abutting property represents a definite damage but I contend that the benefits to the abutting property well offset this damage,

granting, naturally, that in many of the states, because of the laws under which you operate, the benefit as a strictly legal matter may be a general and not a special one. Nevertheless, I

repeat that the actual decrease in market value of a specific piece of abutting property will be more than offset by the financial benefit that will actually accrue to the market value

This is another view of Park-Presidio Boulevard through residential section of San Francisco





Junipero Serra Boulevard in San Francisco showing two outer highways

of the particular piece of property. From the experience we have already had in California, I feel that I have the factual information to prove that my opinion is correct.

Before presenting to you statistical information on individual parcels of land that have been affected by lim-

ited freeway construction in California, where actual sales have taken place, and prove the correctness of the opinion I have formed, I would like a few minutes of your time to discuss limited freeways on a general basis.

Long before our State Highway Department embarked on the program of

planning and constructing limited freeways, planners and subdividers with outstanding foresight were thinking along the same lines and transformed their thoughts into action and accomplishment.

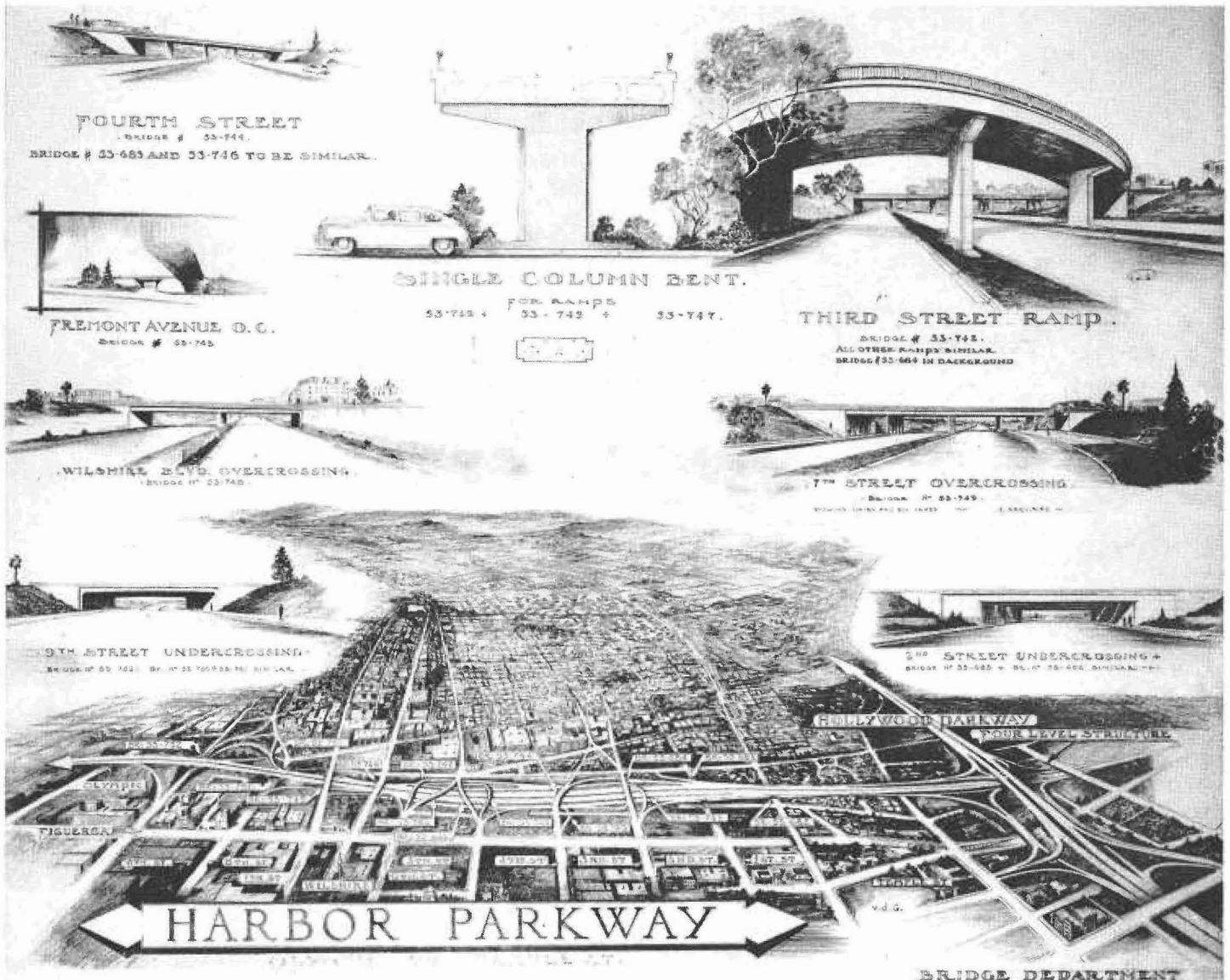
I cite Park-Presidio Boulevard in the City of San Francisco where the

*(Continued on page 34)*

Showing residential property development on Junipero Serra Boulevard



# Harbor Parkway Is Under Construction



**T**HE HARBOR PARKWAY, now under construction in the City of Los Angeles, will be one of the four major traffic arteries radiating from the four-level grade separation structure at the intersection of Hollywood Parkway, Arroyo Seco Parkway and Harbor Parkway.

This photograph of a composition drawing by Van der Goes of the Bridge Department of the Division of Highways shows the proposed location and various structures from Olympic Boulevard to Temple Street.

An attempt has been made to retain some of the lines common to structures now designed or contemplated for other parkways, all in connection with the four-level structure, so as to give the completed network a simple but dignified appearance.

## Bridge Engineer Stewart Mitchell Honored By A.S.C.E.

Stewart Mitchell, senior bridge engineer, State Division of Highways, Sacramento, has been appointed to a five-year term as a member of the executive committee of the Structural

Division of the American Society of Civil Engineers.

The committee heads all activities of this technical division of America's oldest engineering organization.

Under direction of this committee, papers in the field of structure will be prepared for presentation at society meetings, and through it, all structural activities will funnel.

**T**HE CALIFORNIA Highway Commission on November 13th adopted and approved for transmittal to Governor Warren, a budget for the fiscal year July 1, 1948, to June 30, 1949, calling for the expenditure of \$73,938,000 on major highway construction projects. This amount includes cost of right of way and engineering.

In line with its announced policy to convert U. S. 40 from Sacramento to San Francisco to a four-lane divided highway, the commission made provision for the four-laning of all but 10 miles of existing two-lane roadway on this route. When improvements contemplated on the new budget are completed, there will remain only the sections of U. S. 40 from Cordelia Junction to the proposed Fairfield By-pass and from the east side of the by-pass to Vacaville to be widened to four lanes divided.

The budget authorizes a project to four-lane U. S. 40 from one-fourth mile west of Napa County line to Cordelia Underpass and from Ledgewood Creek to 3.5 miles east of Fairfield, estimated to cost \$2,018,000. This means the by-passing of Fairfield to relieve serious traffic congestion on U. S. 40 through Fairfield and will convert the present two-lane roadway on the American Canyon Cut-off to a four-lane divided highway. This item, as do all others in the budget, includes the cost of engineering and right of way.

Long needed improvement of portions of the Black Point Highway from Ignacio in Marin County to the Sonoma County line will be undertaken at an estimated cost of \$375,000, which will provide for a new bridge and the widening, grading, and surfacing of 3.6 miles of roadway.

For engineering, rights of way, and construction the commission authorized expenditure of \$2,319,000 for the underpass under the Southern Pacific railroad tracks in Roseville and the grading and surfacing and widening of U. S. 99E from Roseville to two miles north of Andora Subway.

## MAJOR CONSTRUCTION PROJECTS IN STATE HIGHWAY BUDGET FOR

County	Route	Description	Approximate mileage	Estimated cost including engineering and right of way	County	Route	Description	Approximate mileage	Estimated cost including engineering and right of way
Alameda	5 (US 50)	Toll Plaza, grade, pave and toll facilities	---	\$377,000	Humboldt	46	Perch Creek, grade and culvert	1.0	\$97,000
Alameda	5 (US 50)	Station 640 to 1½ miles west of Livermore, grade and structures	3.6	855,000	Imperial	12, 27 (US 80)	San Diego County Line to Arizona State Line, redeck bridges	---	143,000
Alameda	69 (SR 17)	Oak Street to 38th Avenue, grade and pave	3.7	4,200,000	Imperial	27 (US 80)	East Highline Canal, bridge and approaches	0.5	128,000
Alameda	69 (SR 17)	Centerville Union High School to Davis Street (portions), surface	6.8	252,000	Imperial	198 (SR 78)	Mile 8.2 and Mile 8.3, structures and approaches	---	23,000
Alameda	69 (SR 17)	42d Avenue Interchange, grade, pave and structures	---	1,930,000	Imperial	201, 187 (SR 111)	East of Heber to Brawley (portions) and Curlew Station to Brawley (portions), surfacing	6.0	115,000
Alameda	69 (SR 17)	Elmhurst, Damon, East Creek Slough, structures	---	420,000	Inyo	23 (US 6, 395)	In Bishop, drainage	---	68,000
Alameda	227	Route 75 to Park Boulevard (portions), JHD No. 26, grade, pave and structures	2.3	315,000	Kern	4 (US 99)	Grapevine to Switzers, surfacing	19.6	462,000
Amador	34 (SR 88)	Cooks Station to easterly boundary, grade and surface	7.0	189,000	Kern	4 (US 99)	Hoskins Road to Brundage Lane, grade, pave and signals	4.9	908,000
Amador	97	Dry Creek, bridge and approaches	0.3	54,000	Kern	4 (US 99)	Snow Road to Cowelo, fencing and barriers	2.8	77,000
Bettie, Sutter	3 (US 99)	Lomo Crossing to Fagan (portions), surface	7.0	105,000	Kern	23 (US 6)	Ittners to Ricardo (portions), grade and surface	0.7	78,000
Butte	3 (US 99)	Nelson to Butte Creek, surface	3.3	40,000	Kern	57 (SR 178)	Bodfish Creek, bridge	---	13,000
Butte	3 (US 99)	Chico to north county boundary (portions), surface	11.8	204,000	Kern	57 (SR 178)	Canebrake Creek, bridge	---	25,000
Calaveras	24 (SR 12)	Valley Springs to San Andreas (portions), surface	3.5	123,000	Kern	58 (US 466)	Mojave to San Bernardino County Line (portions), grade and surface	10.0	156,000
Contra Costa	14 (US 40)	Hercules to Oleum (portions), grade and pave	1.5	135,000	Kern	58 (US 466)	East of Tehachapi, grade and surface (cooperative project with city and railroad)	---	35,000
Contra Costa	75 (SR 24)	Line Change to Old River Bridge and Brentwood to San Joaquin County Line (portions), grade and surface	1.6	137,000	Kern, Tulare	129 (SR 65)	Route 4 to Ducor, seal coat	23.3	30,000
Contra Costa	106 (SR 4)	Berry Hill line change, grade and pave	1.6	358,000	Kern	139	Kern River, redeck bridge	---	17,000
Contra Costa	107 (SR 21)	Alameda County Line to Danville (portions), surfacing	4.9	292,000	Kern	140 (US 399)	Buena Vista Creek, bridge	---	21,000
Fresno	4 (US 99)	Selma to Fowler, fences and barriers (outer highways)	---	17,000	Kern	140 (US 399)	Mile 6.53 to Route 4, surfacing	4.4	145,000
Fresno	4 (US 99)	Belmont Circle to Clinton Avenue, grade and pave	1.9	333,000	Kern	140	Through Arvin, grade and surface (cooperative project with county)	0.7	48,000
Fresno, Madera	4	Herndon to ¼ mile north of San Joaquin River, bridge	---	510,000	Kern	142	Granite Canyon, bridge and approaches	0.5	38,000
Glenn	45 (SR 45)	Sacramento River Overflow and Campbell Slough, bridge repair	---	107,000	Kings	125 (SR 41)	Stratford to Route 10 (portions), grade, surface, and structures	4.9	309,000
Humboldt	1 (US 101)	North Scotia Bridge to 16th Street in Fortuna (portions), grade and surface	8.0	926,000	Lake	15 (SR 20)	Essential Products Cattlepass, structure	---	12,000
Humboldt	1 (US 101)	2.6 miles to 7.6 miles north of Orick, base and surface	5.0	224,000	Lake	89 (SR 29)	Middletown to Kelseyville (portions), grade and surface	---	60,000

For a project in Plumas County from Rock Creek to Belden on State Sign Route 24, \$1,003,000 is budgeted, and in Shasta County on U. S. 99 from the south county boundary to Anderson, improvements aggregating \$795,000 will be made.

To complete the improvement of State Sign Route 1 in Santa Cruz County from Watsonville to Santa Cruz, the sum of \$1,631,000 is budgeted for the freeway from Rob Roy Junction to Morrisey Avenue in Santa Cruz.

On the proposed Eastshore Freeway in Alameda County, \$4,200,000 is budgeted for grading and paving 3.7 miles from Oak Street to 38th Avenue in Oakland and on the Bayshore Freeway in San Francisco, \$5,788,000 is set up for grading, paving, and structures from Augusta Street to Army Street.

Two other items provide \$1,930,000 for the 42d Avenue interchange in Oakland, and \$420,000 for Elmhurst, Damon, and East Creek Slough bridges on the Eastshore Freeway.

On U. S. 101 in Santa Barbara County \$725,000 is budgeted for grading, surfacing, and structures from Santa Ynez River to Jonata Park, a major unit of the Buellton project.

Other notable items in the budget are:

Grading, paving and structures on U. S. 99 north of Atwater to Livingston in Merced County, \$669,000; and \$210,000 for grading and surfacing four miles of State Sign Route 140 from Gustine to Merced; \$5,000,000 for grading and structures on the Hollywood Parkway from Alameda Street to Vermont Avenue; \$1,531,000 for grading, paving and structures on the Santa Ana Parkway, Vancouver Avenue to Hoefner Avenue in Los Angeles; \$1,174,000 for grading, paving, and structures on U. S. 101 from San Marcos Creek to Agua Hedionda in San Diego County; and \$1,259,000 for grading and structures on U. S. 395 from Miramar to Lake Hodges, San Diego County; \$1,725,000 for grading, paving, and structures on U. S. 99 from Alamos Creek to Route 59, in Los Angeles County. The budgeted projects follow:

## ONE HUNDREDTH FISCAL YEAR FROM JULY 1, 1948, TO JUNE 30, 1949

County	Route	Description	Approximate mileage	Estimated cost including engineering and right of way	County	Route	Description	Approximate mileage	Estimated cost including engineering and right of way
Lassen	29 (SR 36)	East Westwood Road to Susan River, surfacing	14.1	\$103,000	Los Angeles	168 (SR 19)	Rosemead Boulevard, Beverly Boulevard to Garvey Avenue, grade, pave and structures	4.0	\$1,165,000
Los Angeles	2 (US 101)	Hollywood Parkway, Alameda Street to Vermont Avenue (portions), grading and structures	3.6	5,000,000	Los Angeles	168 (SR 19)	Rosemead Boulevard, Langdon Avenue to Huntington Drive, grade, pave, and structures	1.2	320,000
Los Angeles	2	Hollywood Parkway, Vermont Avenue to Highland Avenue, structures	3.5	2,800,000	Los Angeles	170 (SR 35)	Junction Route 174 to Junction Route 178 (portions), surface	2.0	45,000
Los Angeles	2 (US 101)	Santa Ana Parkway, Aliso Street to Eastman Avenue, landscaping and illumination	4.2	435,000	Los Angeles	174 (SR 10)	Junction Route 167 to Rosscrans (portions) and approaches to Los Angeles River Bridge, grade and pave	4.7	509,000
Los Angeles	2 (US 101)	1.5 miles easterly to 1.6 miles westerly of Malibu Junction, grade, pave, and structures	3.1	1,042,000	Los Angeles	205 (US 66)	In Pasadena and South Pasadena, State Street and Fair Oaks Avenue (portions), grade, pave, and structures (new ramp connections to Arroyo Seco Freeway)	---	144,000
Los Angeles	4 (US 99)	Alamos Creek to Route 59, grade, pave, and structures	10.8	1,725,000	Madera, Fresno	4 (US 99)	Herndon to 1/4 mile north of San Joaquin River, bridge	---	510,000
Los Angeles	4, 79 (US 99)	Through Newhall Ranch, Junction Route 79 to 0.4 mile south of Castaic Creek, grade, pave and structures	2.8	870,000	Marin	1 (US 101)	Ignacio to Sonoma County Line (portions), surface	2.3	112,000
Los Angeles	19 (US 60)	White to Garvey, grade and pave center strip	0.5	63,000	Marin	8 (SR 37)	Ignacio to Sonoma County Line (portions), grade, surface and structures	3.6	375,000
Los Angeles	23 (US 6)	Lancaster to Kern County Line, surfacing	8.1	79,000	Mariposa, Tuolumne	110 (SR 132)	Coulterville Westerly, grade and surface	8.5	30,000
Los Angeles	23 (US 6)	Junction Route 79 to Solamint, surfacing	4.9	94,000	Mendocino	1 (US 101)	3 miles south to one mile north of Rattlesnake Summit, base and surface	4.0	140,000
Los Angeles	26 (US 60)	Willard Avenue to Mountain View (portions), and through El Monte, surfacing	6.4	170,000	Mendocino	56 (SR 1)	St. Ores Creek, grade, surface and culvert	0.5	109,000
Los Angeles	60 (US 101)	Las Flores Canyon to Malibu Creek, grade, pave, and structures	2.7	726,000	Mendocino	56 (SR 1)	Big River, bridge repair	---	90,000
Los Angeles	60, 158 (US 101)	Lincoln Boulevard and Sepulveda Boulevard (portions), grade and pave	---	635,000	Mendocino	56 (SR 1)	Virgin Creek, grade, surface and culvert	0.5	77,000
Los Angeles	61 (SR 2)	Angeles Crest Highway (portions), grade and surface (prison labor)	---	397,500	Merced	4 (US 99)	Southerly Boundary to Black Rascal Canal, barrier posts	9.0	7,000
Los Angeles	77	San Bernardino Road to Junction Route 26, grade, pave, and structures	1.1	575,000	Merced	4 (US 99)	North of Atwater to Livingston, grade, pave, and structures	6.5	669,000
Los Angeles	79	Saugus to Junction Route 4, surface	2.5	39,000	Merced	122 (SR 140)	Gustine to Merced (portions), grade and surface	4.0	210,000
Los Angeles	165 (US 6)	Harbor Parkway, Adobe Street to San Pedro, alteration of city streets	23.5	150,000	Modoc	73 (US 395)	Route 28 to State Line (portions), grade (prison labor)	33.8	315,000
Los Angeles	166 (US 101)	Santa Ana Parkway, Vancouver Avenue to Hoefner Avenue, grade, pave, and structures	0.5	1,531,000	Mono	40 (SR 120)	Park Boundary to Poole Plant Road, surface	8.9	60,000
Los Angeles	168 (SR 19)	Lakewood-Rosemead Boulevard, Firestone Boulevard to Beverly Boulevard, grade, pave, and structures	5.6	780,000	Mono	40 (SR 120)	Sheep Corral to Adobe Creek, surface	16.0	70,000
					Mono	95 (US 395)	Coleville to State Line (portions), grade and surface	2.8	141,000

SR = State Sign Route.

County	Route	Description	Approxi- mate mile- age	Estimated cost including engi- neering and right of way	County	Route	Description	Approxi- mate mile- age	Estimated cost including engi- neering and right of way
Monterey	2 (US 101)	San Ardo to King City (portions), surface	3.0	\$225,000	San Diego	195	East and West Channels Live Oak Creek, bridges and approaches	---	\$32,000
Monterey	56	Salmon Creek, bridge and approaches	0.1	113,000	San Francisco	68 (US 101)	Augusta to Army, grade, pave and structures	1.2	5,788,000
Monterey	56	Prewitt Creek, redeck bridge	---	18,000	San Joaquin	75 (SR 4)	Old and Middle Rivers, redeck bridges	---	92,000
Monterey	56 (SR 1)	3 cattlepasses, replace	---	22,000	San Luis Obispo	2 (US 101)	Deleissigues Creek to Russel Turn, surfacing	2.4	175,000
Monterey	56 (SR 1)	Del Monte Junction to Seaside Junction, curbs and landscaping	2.4	62,000	San Luis Obispo	33 (SR 41)	Rocky Creek, bridge and approaches	0.1	25,000
Napa, Solano	7 (US 40)	¼ mile west of Napa County Line to Cordelia Underpass and Ledgewood Creek to 3½ miles east of Fairfield, grade and pave	8.7	2,018,000	San Luis Obispo	56 (SR 1)	San Luisito and San Bernardo Creeks, widen bridges	---	58,000
Napa	74, 8 (SR 21) (SR 12)	Kelly Curve to Glass House, curve and connection to Napa Wye, grade and pave	2.5	305,000	San Luis Obispo	125 (US 466)	Salinas River, bridge repair	---	30,000
Orange	43 (SR 18)	Santiago Boulevard to Peralta School, grade, pave and structures	5.0	1,399,000	San Mateo	56 (SR 1)	Half Moon Bay to Montara (portions), JHD No. 9, grade and pave	4.±	355,000
Orange	60 (US 101)	Seal Beach to Junction Route 43 (portions), surface	2.6	78,000	San Mateo	105 (SR 17)	Half Moon Bay to Pilarcitos Creek (portions), surface	2.8	85,000
Orange	60 (US 101)	Junction Route 43 to east city limits of Newport Beach, near Irving Street, widening	0.7	108,000	Santa Barbara	2 (US 101)	Santa Ynez River to Jonata Park, grade, surface and structures	3.9	725,000
Orange	178 (SR 18)	Santa Ana River, bridge and approaches	0.6	427,000	Santa Barbara	2 (US 101)	0.7 mile east of Arroyo Quemado to .05 mile west of Arroyo Hondo, grade and surface	2.4	756,000
Placer	3 (US 99)	Roseville to two miles north of Andora Subway, grade, surface and S.P.R.R., underpass in Roseville	3.1	2,319,000	Santa Barbara	56 (SR 1)	Sheffield Drive to San Ysidro Road, grade, and surface (outer highways)	1.5	186,000
Plumas	21 (SR 24)	Rock Creek to Belden, grade and surface	3.7	1,003,000	Santa Barbara	68 (US 101)	Lompoc to Las Cruces (portions), surface	6.0	225,000
Plumas	83 (SR 89)	Sulphur Creek, bridge and approaches	0.4	63,000	Santa Clara	88 (US 101)	Gish Road to Route 5, surface	0.5	51,000
Riverside	26 (US 60)	Edom to 2.9 miles north of Indio, surface	7.4	96,000	Santa Cruz	56 (US 101)	Rob Roy Junction to Morrissey Avenue, grade and pave	7.7	1,631,000
Riverside	43 (US 91)	Corona to 0.5 mile east, bridge and approaches	0.5	198,000	Santa Cruz, San Benito	67	0.2 mile west of Pajaro River to 0.4 mile east, grade, surface, and structure	0.6	188,000
Riverside	64 (US 60)	Junction Route 146 to Blythe, surfacing	3.±	181,000	Shasta	3 (US 99)	South County Boundary to Anderson, grade, surface and structures	5.0	795,000
Riverside, San Diego	77 (US 395)	Escondido to Murietta (portions), grade and drainage (prison labor)	6.0	451,000	Shasta	28 (US 299)	Montgomery Creek to Burney Valley, (portion), surface	16.0	84,000
Riverside	146 (SR 195)	Imperial County Line to Ripley, bridges	---	61,000	Siskiyou	3 (US 99)	Gazelle to 6 miles north, (portion), surface	5.3	102,000
Riverside	187 (SR 111)	0.1 mile to 0.5 mile east of Cathedral City at Rocky Point, grade and surface	0.4	85,000	Siskiyou	72 (US 97)	Cougar to 3.4 miles south, surface	3.4	42,000
Riverside	193	Belgrade Avenue to Route 19, surface	3.0	69,000	Solano, Napa	7 (US 40)	¼ mile west of Napa County Line to Cordelia Underpass and Ledgewood Creek to 3½ miles east of Fairfield, grade and pave	8.7	2,018,000
Riverside	194 (SR 83)	Massacre Creek (Potrero Creek), bridge and approaches	0.1	20,000	Sonoma	1 (US 101)	0.3 mile south to 1.7 miles north of Santa Rosa, grade, pave, and structures	4.3	2,585,000
Sacramento	11 (US 50)	One mile west of Nimbus to railroad crossing near White Rock	5.0	760,000	Sonoma	51 (SR 12)	Laguna De Santa Rosa and Purple Draw, bridge widening, grade and pave approaches	0.4	72,000
Sacramento	54 (SR 16)	½ mile west to one mile east of Slough House, grade, surface and structures	1.6	241,000	Stanislaus	4 (US 99)	Keyes to Salida, barrier posts	11.3	59,000
San Benito, Santa Cruz	67	0.2 mile west of Pajaro River to 0.4 mile east, grade, surface and bridge	0.6	188,000	Stanislaus	13 (SR 120)	Oakdale to easterly boundary (portions), resurface and line change	11.8	284,000
San Bernardino	9 (US 66)	Los Angeles County Line to San Bernardino (portions), surface	9.4	235,000	Stanislaus	41 (SR 33)	Newman to northerly boundary (portions), surfacing	6.0	105,000
San Bernardino	31 (US 91) (US 395)	Through San Bernardino, South City limits to Highland Avenue, widen and surface	4.0	206,000	Sutter, Butte	3 (US 99)	Lomo to Fagon (portions), surface	7.0	105,000
San Bernardino	31, 58 (US 91) (US 66)	Barstow to Nevada State Line, and Barstow to Needles, redeck bridges	---	108,000	Trinity	20 (US 299)	Willow Creek to Whites Bar (portions), grade and surface (prison labor)	15.2	300,000
San Bernardino	59 (SR 2)	One mile east of Cajon to Junction Route 188 (portions), grade	2.8	19,000	Tulare	4 (US 99)	One mile south of Tipton to Tulare Airport, grading and structures	7.8	1,258,000
San Bernardino	77 (SR 71)	Merrill Avenue to Pipe Line Avenue, bridge and approaches	0.6	347,000	Tulare, Kern	129 (US 65)	Route 4 to Ducor, seal coat	23.3	30,000
San Bernardino	190	Base Line Road to Orange Street, grade, pave and bridge	1.5	354,000	Tulare	133	Cutler Bridge over St. Johns River, bridge and approaches	1.0	165,000
San Bernardino	207	0.7 mile east of Plunge Creek to Long Point, grade, surface and structures	1.8	831,000	Tuolumne, Mariposa	110 (SR 132)	Coulterville westerly, grade and surface	---	30,000
San Diego	2 (US 101)	San Marcos Creek to Agua Hedionda Creek, grade, pave and structures	4.4	1,174,000	Ventura	60 (US 101)	South City Limits of Oxnard to junction Route 2 near El Rio, grade, pave and structures and widening of El Rio Underpass	4.0	600,000
San Diego	77 (US 395)	0.5 mile north of San Diego to Junction Murphy Canyon Road, surface	2.9	50,000	Ventura	138 (US 399)	North Fork Matilija Creek, bridge and approaches	0.2	70,000
San Diego	77 (US 395)	Miramar to Lake Hodges (portions), grade and structures	10.±	1,259,000	Yolo	7 (US 99)	Putah Creek to Zamora (portions), surface	13.2	36,000
San Diego, Riverside	77 (US 395)	Escondido to Murietta (portions), grade and drainage (prison labor)	6.0	451,000	Yolo	87 (SR 24)	Woodland to Knights Landing (portions), surface	10.9	30,000
San Diego	77 (US 395)	Three miles south of Riverside County Line to County Line, surface	3.±	82,000					
San Diego	77, 198 (SR 78)	6.4 miles west of Ramona to Julian (portions), grade and surface	1.6	218,000					

SR = State Sign Route.

# Fifty Percent of U. S. Highway 99 in District X Is Four-Lane Divided Roadway

By C. J. TEMBY, Assistant District Engineer

ONE HUNDRED and one miles of U. S. Highway 99, State Highway Route 4, extends through San Joaquin and Sacramento Valleys from the southerly boundary of Merced County to the northerly boundary of San Joaquin County within the limits of District X.

Thirteen miles of this route is through 10 incorporated cities which are continuously connected by U. S. Highway 99; namely, Merced, Atwater and Livingston in Merced County; Turlock, Ceres and Modesto in Stanislaus County and Ripon, Manteca, Stockton and Lodi in San Joaquin County. In addition to these incorporated cities, several unincorporated towns are also connected by this route. Vehicular traffic on this important main state highway artery has been continuously increasing.

The average daily traffic on this portion of U. S. 99 has increased approximately 75 to 80 percent in the last 10 years. The present truck traf-

fic on this highway is about 22 percent of the total volume of traffic.

## CONTINUING IMPROVEMENT

The Division of Highways, recognizing this tremendous traffic volume increase and the resulting congestion, has improved as many miles as revenues warranted, replacing the two-lane traveled way with additional traffic lanes, the first of such work being in 1931 when the existing two-lane highway from Stockton to Old Cherokee Station via Cherokee Lane in San Joaquin County was replaced by a new highway on new location between the same termini via Wilson Way.

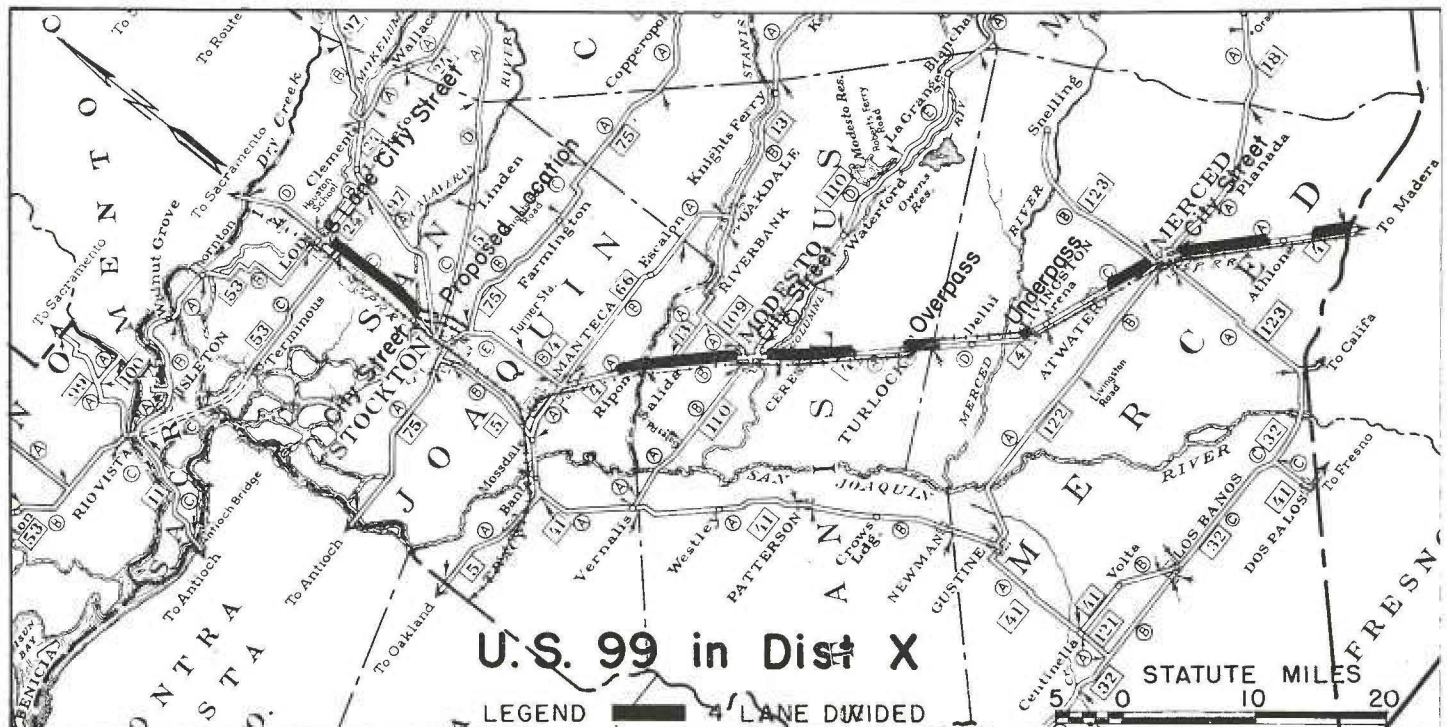
A portion of this, about 1.2 miles in length, from the northerly city limits of Stockton to the diverting canal, was constructed on a 46 foot roadbed width, with Portland cement concrete pavement 30 feet wide, providing for three 10 foot lanes. In 1938, the first divided four-lane unit was constructed

between Modesto and Salida, a total length of approximately 5.8 miles.

The divided four-lanes are the result of constructing a new roadbed and pavement generally parallel to and with the pavement centerline located at a distance far enough away from the centerline of the original pavement to provide an unpaved medium strip between the inside edges of the pavement lanes. Upon completion of the construction on this design, two lanes of traffic are routed in one direction only over the old two-lane pavement and two lanes of traffic are permitted to travel in the opposite direction on the two new lanes of pavement.

## VARIABLE ROADWAY WIDTHS

Variable pavement separation distances have been provided from a general average of 20 feet between edges of pavement on the first construction project to 36 feet between the inside edges of the pavement on the latter constructed projects. Likewise, vari-





Four-lane divided highway and outer highway on left approaching Salida from south. Note wheel tracks of illegal crossing of divisional strip. Concrete barrier posts will be erected at this location

able right of way widths for these improvements have been provided.

The latter projects have been constructed on right of way widths having a minimum of 160 feet with the centerlines of the two lanes of pavements spaced 60 feet apart. An exception to this right of way development plan is used where the project is parallel to the railroad right of way where the distance between railroad right of way and the centerline of the highway is reduced by 10 feet, thus resulting in a minimum full width of right of way of 150 feet. On the most recent projects the plans were developed and rights of way acquired on the limited freeway basis.

To date, with the recent completion of a project between **Black Rascal Canal and Buhach Station in Merced County**, a distance of 3.8 miles in length, **District X has constructed approximately 40.2 miles of divided four-lane highway on U. S. 99 highway outside the limits of incorporated cities and has expended for the additional lanes required to provide the four-lane divided feature, a total of approximately \$3,750,000 for construction purposes only.**

In addition to this, approximately \$400,000 has been expended on three-lane portions and \$200,000 for widening and improving through incorporated cities. Several additional thou-

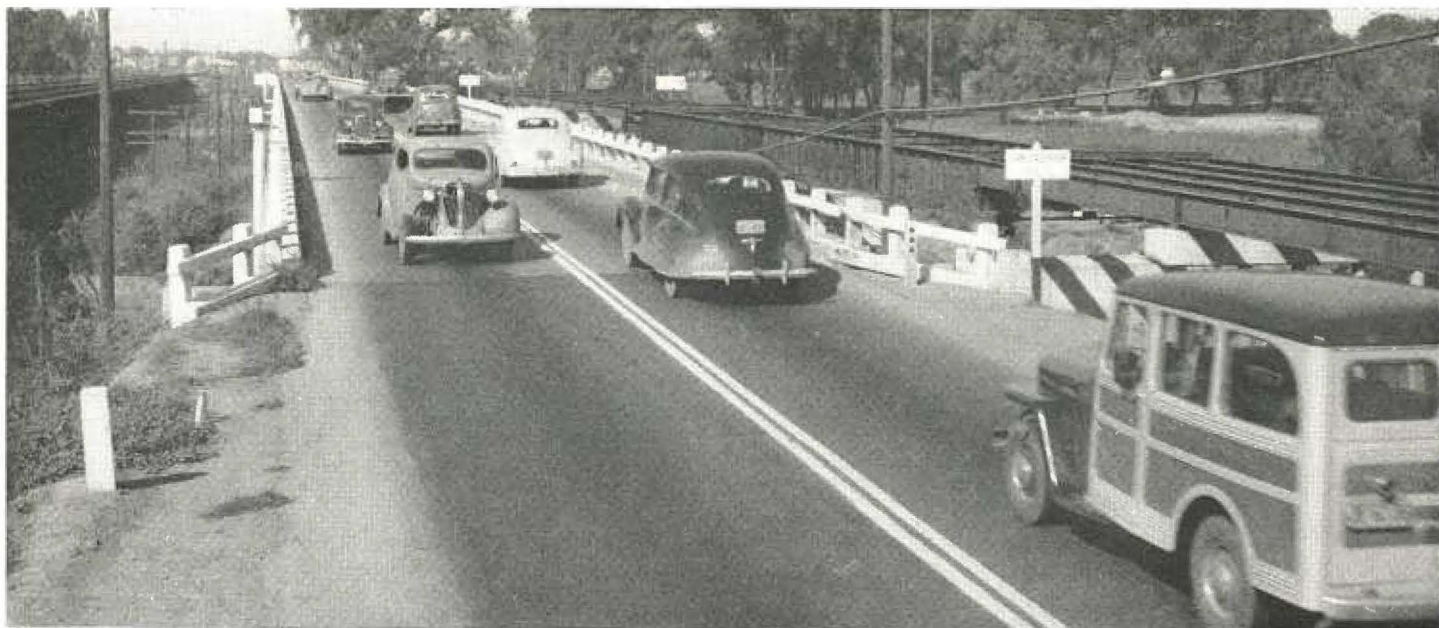
sands of dollars have been expended by the various incorporated cities on portions of U. S. 99 in their respective cities. The work has all been performed under contract and consisted in the main part of grading, select material bases, subgrade treatment and pavement.

The cost of the work has varied from \$37,000 per mile in 1938 to \$110,000 per mile in 1947. This increased cost per mile of construction is partially due to higher unit prices bid by contractors and partially to improved designs, the improvement in designs being dictated from experiences and better knowledge of soil conditions and a better scientific approach to correc-

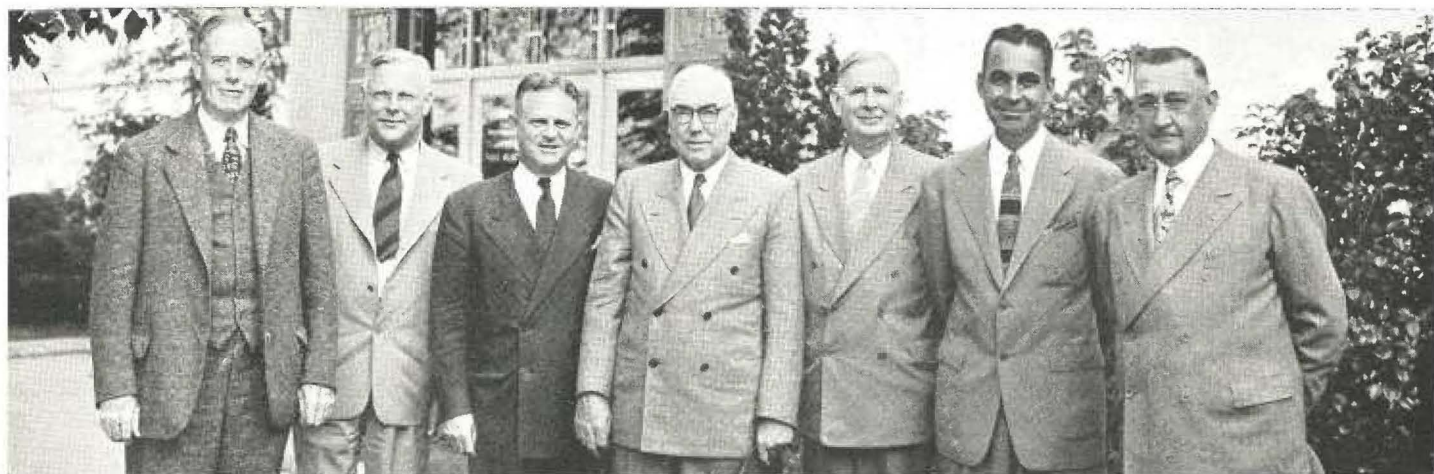
Divided four-lane highway at Buhach, Merced County, showing county road intersection channelization with raised bar island and cross-over between traffic lanes



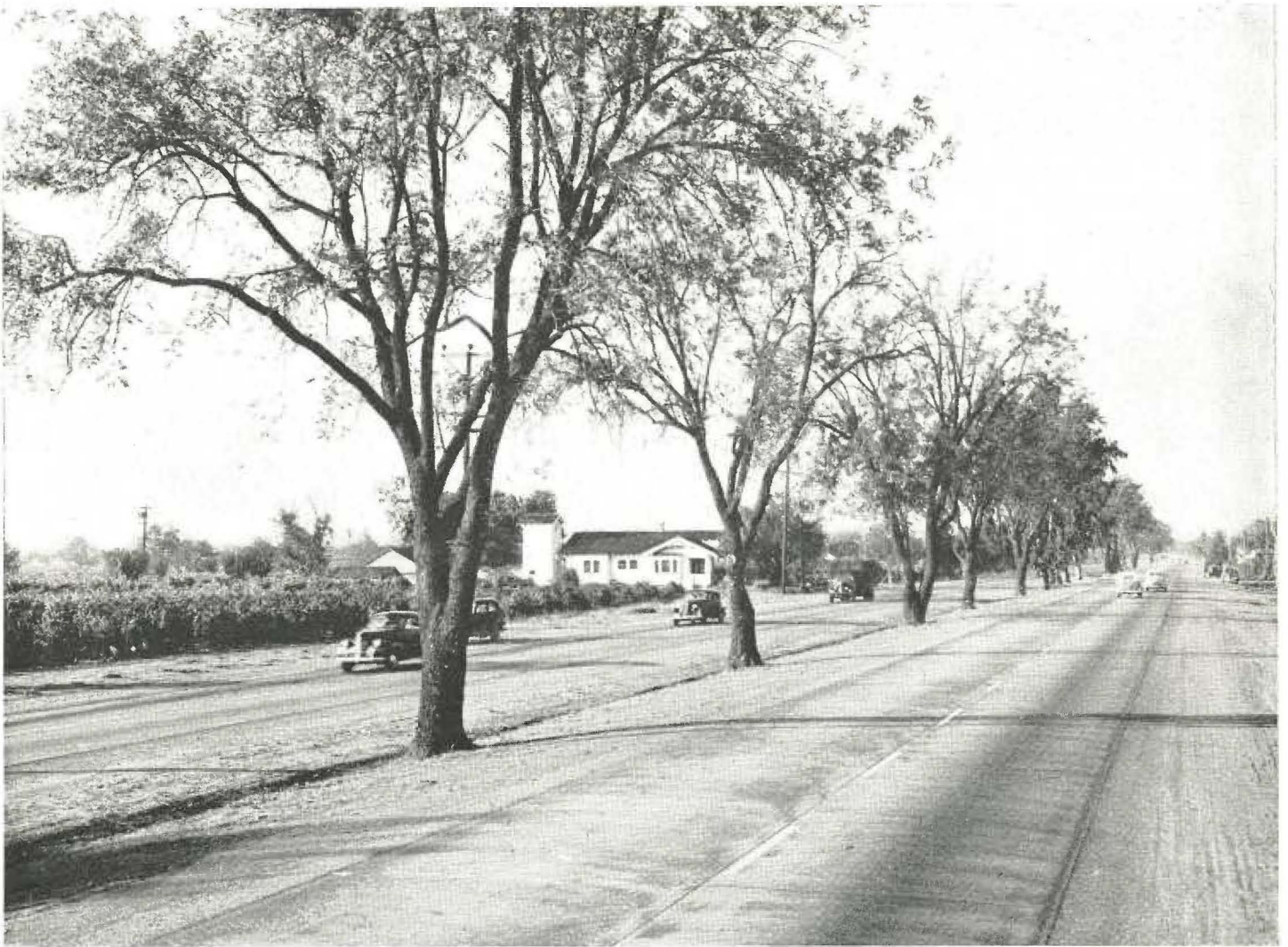




Upper—Traffic using two-lane bridge across Stanislaus River between Salida and Ripon, San Joaquin County. Bridge for additional two lanes to provide four-lane divided highway shown under construction on right.  
Lower—Twin bridges on four-lane divided highway north of Merced



Governor Earl Warren's Highway Commission. These men have mapped a long-range program to convert major highway routes into four-lane divided highways. Left to right: Homer P. Brown, Placerville; C. Arnholt Smith, San Diego; James Guthrie, San Bernardino; Director of Public Works C. H. Purcell, chairman; Harrison R. Baker, Pasadena; F. Walter Sandelin, Ukiah; Chester H. Warlow, Fresno.



Four-laned divided highway between Stockton and Lodi. Walnut trees between pavement lanes provide natural barrier and enhances esthetic appearance

tions of adverse soil conditions based on proper engineering studies. The unit prices bid for construction items has advanced.

A comparison of a few of the major items are about as follows: Roadway excavation \$0.25 to \$0.30 per cubic yard in 1938 and \$0.50 to \$0.60 per cubic yard in 1947; structure excavation \$1 per cubic yard in 1938 and \$1.70 to \$2 per cubic yard in 1947; Class "A" Portland cement concrete pavement \$7.25 per cubic yard in 1938 and \$11 per cubic yard in 1947; Class "A" Portland cement concrete structures \$23 per cubic yard in 1938 and \$45 to \$50 per cubic yard in 1947. These expenditures do not include any costs for rights of way, preliminary or construction engineering.

Two railroad track separation structures for four-lane highways have been constructed, one being a highway

underpass of the Southern Pacific Company's tracks at Livingston and the other a highway overpass of the Southern Pacific Company's tracks immediately south of Turlock. Several new bridges and drainage structures have been constructed.

#### ABOVE FLOOD LEVEL

At several locations, the old two-lane highways have been inundated during peak flood periods. With the construction of additional roadbed to provide for the divided four-lanes, the new roadbed has been located on the upstream side of the existing pavement and constructed to an elevation above flood level with adequate drainage openings provided to result in all-year dry riding pavements.

In addition to the 40.2 miles of four-lane divided highways outside the limits of incorporated cities there has

been constructed 2.4 miles of three-lane pavement. Through the City of Lodi approximately 0.6 of a mile, full width city street is constructed, being 76 feet between curbs, and provides for six 10 foot traveled lanes and two 8 foot parking lanes.

With the constantly increasing traffic, it is the desire of the Highway Department to complete all of U. S. Highway 99 to a divided four-lane standard as rapidly as money can be made available for such work.

There is in the present budget, an item for grading and structures of four-lane divided section on a limited access freeway right of way on new location for a portion of U. S. Highway 99 in San Joaquin County between Mariposa Road and Calaveras River, a distance of 5.3 miles. This proposed project is referred to and known as the Stockton Through Route.

# New Pacific Coast Highway Will Be Portion Of Terminal Island Freeway

By G. L. LAIRD, Associate Bridge Engineer

A PORTION of the existing Pacific Coast Highway, U. S. 101, formerly known as State Street, is being developed as a freeway. The section under development extends a distance of 0.7 miles and lies in the Wilmington district of the City of Los Angeles and in the City of Long Beach. This development is an integral part of the Terminal Island Freeway Access Road Project.

The structures included in the development of the 0.7 miles of freeway consist of a bridge over the official channel of the Los Angeles Flood Control, now called Dominguez Channel, and grade separation structures over the tracks of the Los Angeles City Harbor Department, the Union Pacific Railroad tracks, and the Terminal Island Freeway.

The entire Terminal Freeway Project was divided into seven sections, and bids were called for early in 1946. Contracts for the construction of the approaches and the Cerritos Channel Bridge, between Seaside Boulevard and Station 57, were awarded by the Navy and are being constructed under Navy supervision. The remainder of the project is being constructed under

five separate contracts awarded by the Division of Highways.

## Contracts awarded were as follows:

1. Cerritos Channel Bridge.....	\$5,200,000
2. Approaches Cerritos Channel Bridge.....	340,000
3. Terminal Island Freeway Highway, Sta. 57 to Willow Street.....	1,141,000
4. Union Pacific R.R. Overhead.....	599,100
5. Anaheim Street Undercrossing.....	849,400
6. Nicholson Avenue Overcrossing.....	264,300
7. Pacific Coast Highway.....	1,672,300

Total amount contract awards.....\$10,066,100

Of the one and two-thirds million dollar cost of the Pacific Coast Highway project, approximately 55 percent is for the four bridge structures and the redecking of the Texas Company's pipe line subway.

The new Pacific Coast Highway Freeway will be built to carry six 12-foot traffic lanes, three in each direction; roadways will be of asphaltic concrete pavement, separated by a six-foot safety division strip. Additional widths provide for accelerating and decelerating lanes at interchange ramps.

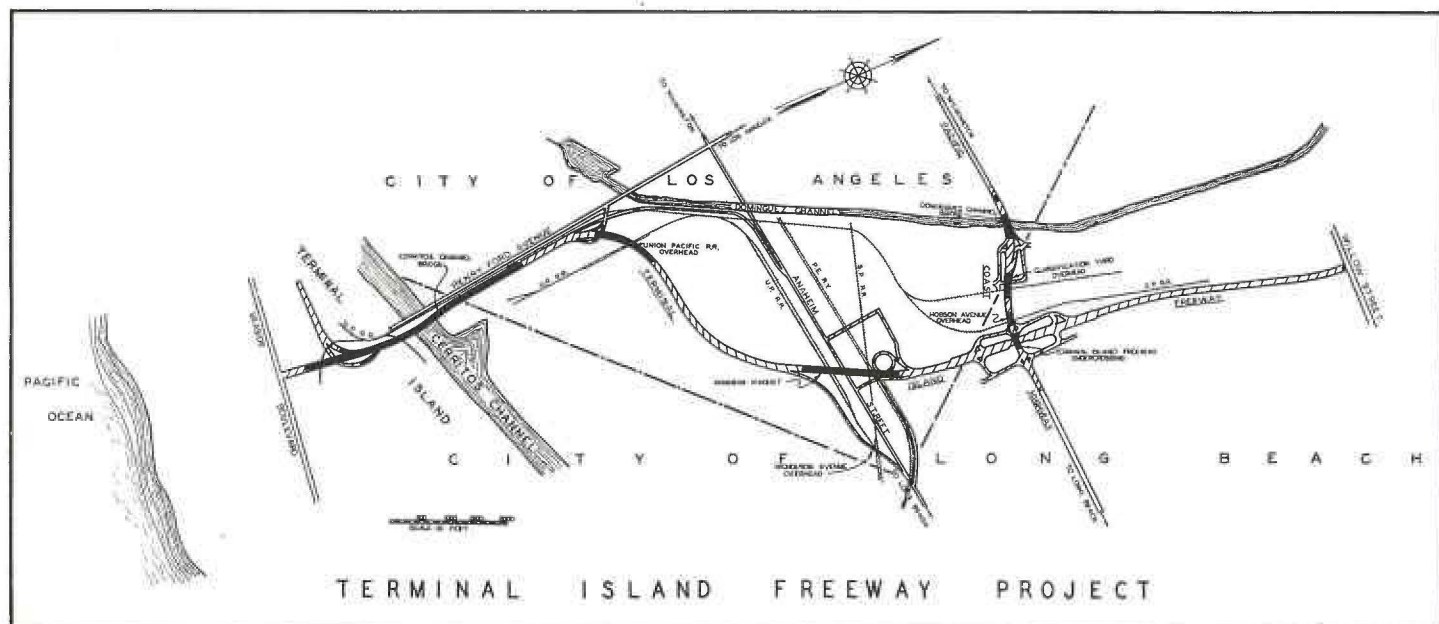
Interchange roadways are designed for "Cloverleaf" operation at the intersection of Pacific Coast Highway and Terminal Island Freeway. Inter-

change roadways have also been provided to serve the City of Los Angeles Harbor Department property and warehouse installations.

The relatively high embankments between overhead structures are built upon earth subject to subsidence and required the installation of vertical sand drains.

Ground settlement tapered off very rapidly upon completion of fills and after seven months has practically reached a standstill. An accelerated settlement of about 0.20 feet took place during the driving of steel H-piling for the bridge abutments. Immediately after completion of pile driving settlement practically ceased adjacent to abutments.

In anticipation of some lateral movement and uneven settlement of the ground, the special provisions stipulated that no bridge bents adjacent to the fill would be built until fills were completed. At bents of the Hobson Avenue and the Classification Yard structures adjacent to the maximum fills, a maximum horizontal movement of one inch was noted. No appreciable movement occurred at the other bridges where the approach fills were not as high.





Terminal Island Freeway undercrossing looking east along State Street (Pacific Coast Highway)

The three grade separation structures (Classification Yard Overhead, Hobson Avenue Overhead, and Terminal Island Freeway Undercrossing) are all similar in design and construction. The intermediate bents consist of six 3-foot square reinforced concrete columns spaced at 16- to 21-foot centers, supported by through concrete footings bearing on untreated Douglas fir piles. The reinforced concrete abutments rest on top of the approach fills and are supported by 12-inch steel H-piling, 62 to 75 feet in length. The timber and the steel H-piling, driven to the same bearing value, penetrated to approximately the same tip elevation although the steel piles were driven through an added 25 to 36 feet of fill.

The superstructures with spans varying from 48 to 60 feet in length have concrete deck slabs supported by rolled WF girder sections.

While the design of these bridges is fairly simple, the short distances between the structures necessitated the widening for the various acceleration and deceleration lanes to occur on the structures themselves. This, together with changes in superelevation to accommodate these ramps, caused some complications both in construction and calculations. As an example, the Hobson Avenue Bridge is 152 feet in length with the centerline on

a curve of 1,600-inch radius. The west end of the bridge is 113 feet wide while the east end is 137 feet. The south gutter has three compounded curves not concentric with the centerline while the north gutter has two. The surface of the deck is broken up into four planes which provides for the varying slopes of the roadway and ramps.

As there were no alternate routes within any reasonable distances by which traffic could be routed around the work, construction operations for the new bridge over Dominguez Channel had to be restricted to part-widths. The southerly portion of the main bridge was constructed first and traffic routed over it. Work on the adjoining portion of the main bridge and the ramp bridge is under way.

Footings for piers for the Dominguez Channel Bridge were constructed at an elevation of minus 16 feet in order to allow for possible future dredging of the channel. In construction of the footings for the south half of bents 2 and 3, the contractor decided to use a well point system for keeping the excavation dry. This system was only partially successful due to a number of reasons, chief of which was probably the limited space available for placing points around the excavation. The necessity of having the well points so near the excava-

tion defeated their purpose, since the water was not allowed sufficient time to collect at the points before it seeped into the excavation. Cofferdams, constructed of steel sheet piling were resorted to and are expected to be used exclusively on the north half.

The piers and abutments of this bridge are similar in design and construction to the grade separation structures. However, the longer spans necessitated the use of built-up, plate girders 72 inches deep. These girders are spaced at approximately 16-foot centers and support a reinforced concrete deck slab 9 $\frac{3}{4}$  inches thick.

Traffic was diverted from the old road and detour on October 28, 1947, to the south roadway of the new freeway, using this 36-foot roadway for temporary two-way traffic. It is expected that the remainder of the work will be finished and the completed freeway in operation by April 1948.

The new freeway was designed under the supervision of F. W. Panhorst, State Bridge Engineer and S. V. Cortelyou, District Engineer. The construction is under the supervision of Frank B. Cressy, District Construction Engineer, W. D. Eaton, Resident Engineer; and G. L. Laird, Bridge Department Representative. James I. Barnes Construction Company of Santa Monica, California, is the Contractor.

# Terminal Island Freeway Structures

By J. M. CURRAN, Associate Bridge Engineer

**T**WENTY air miles south of the City of Los Angeles, lies Terminal Island. A freeway is now being constructed which will eventually extend from Terminal Island north to the intersection of the Long Beach Parkway and the Los Angeles River Parkway.

The section of the Terminal Island Freeway from Seaside Boulevard on the island to Sepulveda Boulevard on the mainland is now being constructed. Early completion of this section is desirable to alleviate traffic conditions on the few outlets from the island to the mainland.

This project was originally initiated by the Federal Government in 1940-1941 as a part of the defense program to provide access to the U. S. Fleet Operating Base on Terminal Island and is now being constructed to provide access to Terminal Island as a permanent Naval Base.

## TRAFFIC CONGESTION

Now, as during the war, there are but three means of vehicular entrance or exit from the mainland to the island. At the easterly end of the island is a small pontoon bridge of a temporary nature built for war time use only; at the westerly end of the island there is a ferry; and at the northerly end of the island there is a Henry Ford Boulevard bascule bridge.

During any hour of the day traffic is heavy in this area. During the shift changes of industries on the island, traffic becomes extremely dense and hazardous.

The new freeway will cross Cerritos Channel, a navigable waterway separating the island from the mainland, with a vertical lift bridge. This structure with its approaches is being constructed by the U. S. Navy Department.

About 2,500 feet north of the Cerritos Channel, the Navy section ends and the state section begins. The State supervised construction on the freeway proper consists of a roadway contract under District VII and three Bridge Department contracts. The roadway contract begins just north of the Cerritos Channel and extends

northerly, under reconstructed U. S. 101, to Willow Street or Sepulveda Boulevard.

## STATE BUILDS STRUCTURES

The Bridge Department contract includes an overhead structure over the Union Pacific Railroad Cerritos yards; an overhead structure continuous over the Union Pacific Railroad Meade Transfer yards, Anaheim Street, the Southern Pacific Railroad tracks, the Pacific Electric Railroad tracks and newly constructed I Street; and an off-ramp and structure over the Union Pacific Railroad, Southern Pacific Railroad and The Atchison, Topeka and Santa Fe Railway tracks.

A difficult and expensive task of clearing right of way and moving and revising existing utilities had to be performed prior to and during construction. On the Union Pacific Railroad Company's oil field property, through which the freeway passes, over \$300,000 was spent on moving office buildings, shops, relocating tracks, removing and relocating oil pipe lines, and relocating overhead power lines. A submarine power cable was relocated beneath Cerritos Channel. North of Anaheim Street, pipe lines were moved and power lines relocated or raised to clear the roadway.

## POWER LINE TOWERS RAISED

Included in these operations were the raising of 200 Kv. 6-wire tower lines and the 60 Kv. 36-wire tower lines of the Southern California Edison Company. The towers were raised 15 feet without interruption to service by cutting the tower legs, jacking them up to the required position and splicing in new sections of tower.

First of the state supervised structures on the freeway is the Union Pacific Railroad Overhead which crosses over five storage or classification yard tracks and one spur track of the Union Pacific Railroad, spans a private road and the ramp roadway of the freeway off-ramp which serves the area including the Ford Motor Company assembly plant.

The Union Pacific Railroad Overhead is a steel girder structure with

reinforced concrete deck, concrete columns and concrete footings supported on untreated timber piles. The structure is 965 feet 3 inches long, consisting of thirteen 74-foot 3-inch spans and two 63-foot 5-inch spans. There are two 35-foot roadways with a 4-foot dividing strip and concrete curbs. The superstructure is practically two separate bridges each supported on three steel girders with an expansion joint placed longitudinally along centerline of deck. Column footings are continuous across the two structures.

## DESIGN OF OVERHEAD

The structure is designed entirely on a 1,350-foot radius curve and a uniform 5 percent superelevation. The bents have a uniform skew off the radial lines, and span lengths are 74 feet 3 inches with alternate spans continuous over two bents, supporting the adjacent spans by hinged connections.

Untreated timber piles were used for pier foundations. Abutment footings rested on the approach fills and were supported on steel piles. All substructure concrete was completed well in advance of structural steel delivery.

Structural steel was delivered by rail to the site. Steel girders were unloaded from the cars, placed on trucks and hauled to proper position in the structure. The American Bridge Company subcontracted the furnishing and erecting of structural steel and used a special built 50-ton crawler crane with a 70-foot boom to erect the girders, the maximum weight of which was 18 tons. A smaller crane followed up with the placing of diaphragms, expansion dams and lighter members. Field riveting was limited to the diaphragms.

A steel railing is to be erected on the bridge and provisions are being made for future street lighting.

This structure was completed November 15, 1947, six months after the original contract completion date. Structural steel delivery for this structure, as with others of this project, was delayed approximately six months thus accounting for the completion date delay.



Looking along Terminal Island Freeway toward Los Angeles and Terminal Island Freeway undercrossing

The Union Pacific Railroad Overhead structure was designed by the Bridge Department of the Division of Highways, Macco Corporation is the General Contractor, J. E. McMahon started the contract as Resident Engineer, but on assuming other duties, was replaced by J. M. Curran as Resident Engineer.

#### NICHOLSON AVENUE OVERHEAD

Just before reaching the Anaheim Street Overhead, an off-ramp from the Terminal Island Freeway leaves the main freeway, travels easterly to cross the Union Pacific Railroad and South-

ern Pacific Railroad on an overhead grade separation structure, and then descends to meet Anaheim Street at grade in the City of Long Beach.

The Nicholson Avenue Overhead is on the off-ramp of the freeway. The off-ramp is a one-way road carrying traffic from Terminal Island to the Long Beach area and will be heavily traveled when the existing U. S. Navy Department pontoon bridge is abandoned.

Included in this project was construction of the separation structure, construction of roadway approach fills, retaining walls and construction of a 48-inch drain across Anaheim Street and under the Pacific Electric tracks.

#### ONE-WAY STRUCTURE

The Nicholson Avenue Overhead is a one-way structure 28 feet wide between concrete curbs, 573 feet long and consists of one railroad span 86 feet long, seven intermediate spans 55 feet long and two end spans 49 feet long.

The superstructure consisting of a reinforced concrete deck resting on structural steel beams is supported on reinforced concrete two-column bents.

A 7 percent grade on the east approach and a 5 percent grade on the west approach is connected on the structure with a 700-foot vertical curve. A 600-foot radius curve on the

Looking north toward Classification Yard overhead which is on left. Hobson Avenue overhead is in center foreground and Terminal Island Freeway undercrossing on right



easterly three spans and 600-foot radius curve in the opposite direction on the westerly spans with six spans of tangent between create a continuously warping surface with superelevation or cross slope rates ranging up to 6 percent.

Substructure design was similar to that of the Union Pacific Railroad Overhead.

All substructure concrete was completed well in advance of structural steel delivery. Concrete was deposited in footing and column forms with a  $\frac{3}{4}$  c.y. concrete bucket, raised with a crane and deposited through hoppers to forms.

Structural steel beams were delivered by rail to the site. The American Bridge Company subcontracted the furnishing and erecting of structural steel. Similar to other structures on this freeway, the spans were hinge connected.

Lateral displacement of end bents was anticipated at this structure and construction of Bents 2 and 10, end bents, was deferred until after completion of approach fills and surcharges. However, accurate measurements failed to show any lateral or vertical structural movement due to forces imposed by the surcharge approach fills.

A steel railing was erected on the bridge and provision was made for future street lighting.

In addition to the structure, approach fill construction was included in the project. Though heights of approach fills were limited to 25 feet, sand drains or sand piles were installed beneath the fills to stabilize them. From actual borings made in the field, a suitably firm subterranean structure was selected upon which to found the sand drains. The stratum decided upon was a sandy formation at approximately 40 feet below the ground surface.

The Nicholson Avenue Overhead and approaches were completed September 26, 1947, but are not yet open to public traffic and will not be opened until completion of the Cerritos Channel Bridge.

Nicholson Avenue Overhead was designed by the Bridge Department, Division of Highways and the roadwork by District VII. Oberg Brothers were the General Contractor and J. M. Curran the Resident Engineer.

#### **ANAHEIM STREET OVERHEAD**

The most northerly structure to carry the freeway is the Anaheim Street Overhead. This overhead structure carries the freeway over oil field roads, over six tracks of the Union Pacific Railroad Company's Meade Yards, over heavily traveled Anaheim Street in the City of Los Angeles, over the Southern Pacific

Railroad Company's Long Beach main line tracks, over the double tracks of the Pacific Electric Railway's Long Beach line and over newly constructed I Street which feeds the on-ramp to the freeway at this location.

Anaheim Street Overhead is 1,544 feet long containing 21 spans and consists of two roadways separated by a 4-foot dividing strip. There is an on-ramp to the west roadway. The east roadway which will carry north bound traffic, is 26 feet wide between curbs and is on tangent for the first two-thirds of its length and then curves westerly on a 3,200-foot radius curve. The west roadway will carry south bound traffic and is 35 feet wide between curbs for most of its length and parallels the east roadway. At the on-ramp entrance, the west roadway widens to 46 feet to provide an accelerating lane.

#### **STEEL GIRDER CONSTRUCTION**

The structure is of steel girder construction with concrete decks, concrete column bents and concrete footings supported on untreated timber piles. Spans are of variable lengths ranging from the 49-foot end spans to the 119-foot spans over the railroad and city streets. Most of the spans are 73 feet 6 inches long. At two locations, Bents 13 and 14, structural steel columns

*(Continued on page 33)*

View of Classification Yard overhead. Dominguez Channel bridge in distance



# HIGHWAY BIDS AND CONTRACT AWARDS

## September, 1947 (Cont'd)

**MENDOCINO COUNTY**—Between 57 and 59 miles north of Willits, the existing bridges across Red Mountain Creek and McCoy Creek to be repaired. District I, Route 1, Section K. Sterling Company, Los Angeles, \$27,550; Butte Construction Co., San Francisco, \$28,485; C. C. Gildersleeve, Douglas City, \$31,868; Evans Construction Co., Berkeley, \$33,960. Contract awarded to J. H. McFarland, San Francisco, \$27,289.

**RIVERSIDE AND SAN BERNARDINO COUNTIES**—Between Cloverdale Avenue in Riverside County and Valley Boulevard in San Bernardino County, about 6 miles to be graded, surfaced with plant-mixed surfacing, on imported borrow and seal coats to be applied. District VIII, Route 695. Griffith Co., Los Angeles, \$175,120; R. A. Erwin & Cee Tee Construction Corp., Puente, \$183,479; E. L. Yeager, Riverside, \$185,808; T. M. Page, Monrovia, \$189,047; Morrison-Knudsen Co., Inc., San Francisco, \$196,654; Matich Bros., Colton, \$197,341; George Herz & Co., San Bernardino, \$203,523; Oswald Bros., Los Angeles, \$211,689; Silva & Hill Construction Co., Los Angeles, \$223,795; Clifford C. Bong & Co., Arcadia, \$225,954. Contract awarded to Peter Kiewit Sons Co., Arcadia, \$170,554.30.

**SAN BERNARDINO COUNTY**—Between City Creek Bridge and 0.7 mile east of Plunge Creek, about 4.3 miles to be graded and surfaced with plant-mixed surfacing, and a bridge to be constructed across East Fork City Creek. District VIII, Route 207, Section A. Bressi & Bevanda Constructors, Inc., Los Angeles, \$793,154; Morrison-Knudsen Co., Inc., San Francisco, \$920,658; Winston Bros. Co., Azusa, \$935,511; Matich Bros. and L. A. & R. S. Crow, Colton, \$971,671; J. E. Haddock, Ltd., Pasadena, \$987,775; Claude Fisher Co., Inc., Los Angeles, \$1,119,341; Guy F. Atkinson Co., Long Beach, \$1,238,531. Contract awarded to Westbrook & Pope, Sacramento, \$743,959.50.

**SAN DIEGO COUNTY**—In the City of San Diego, Washington St., Normal St. and El Cajon Blvd. between Balboa Freeway and Texas St., about 1.1 miles to be graded and paved with Portland cement concrete, and dividing islands to be constructed. District XI, Route 12. Basich Bros. Construction Co. and Basich Bros., Alhambra, \$227,613; R. E. Hazard Contracting Co., San Diego, \$248,742. Contract awarded to Griffith Co., Los Angeles, \$197,311.80.

**SAN JOAQUIN COUNTY**—Across San Joaquin River at Mossdale, the superstructure for a bridge to be constructed and approaches to be surfaced and paved. District X, Route 5, Section B. Lord & Bishop, Sacramento, \$451,259; A. Soda & Son, Oakland, \$481,859; Fredrickson & Watson Construction Co., Oakland, \$482,376; J. H. Pomeroy & Co., Inc., San Francisco, \$493,916; Haas & Rothschild, San Francisco, \$563,976. Contract awarded to Judson Pacific-Murphy Corp., Emeryville, \$416,422.20.

**SISKIYOU, TRINITY AND MENDOCINO COUNTIES**—Four existing steel bridges across Salmon River, Trinity River, South Fork of Eel River and Greenwood Creek, to be cleaned and painted. District I, Routes 46, 20, 1, 56, Sections A,D,K,C. Contract awarded to J. H. Mohr, Inc., San Francisco, \$20,941.

**SISKIYOU COUNTY**—Between Camp Lowe and Bailey Hill, about 7.8 miles to be graded, and drainage and irrigation facilities to be installed. District II, Route 3, Section C. Morrison-Knudsen Co., Inc., San Francisco, \$666,053; McNutt Bros., Eugene, \$737,124; Westbrook & Pope, Sacramento, \$757,418; Frederickson Bros., Emeryville, \$769,483; H. Earl Parker, Inc., Marysville, \$803,282; K. L. Goulter & Co., Seattle, \$885,263; A. Teichert & Son, Inc., Sacramento, \$933,936; N. M. Ball Sons, Berkeley, \$979,475; Natt McDougall Co., Portland, \$989,387. Contract awarded to Fredrickson & Watson Construction Co., Oakland, \$651,030.27.

**SOLANO COUNTY**—Construct ferry ramp extensions at Cache Slough Ferry and at Steamboat Slough Ferry near Rio Vista. District X, Routes 99, 100, Sections A, A. H. F. Lauritzen, Pittsburg, \$8,561; Wm. B. Willett Co., San Francisco, \$8,376. Contract awarded to C. M. Allen, Fairfield, \$6,435.

**SOLANO COUNTY**—Repairing a bridge fender across Napa River at westerly city limits of Vallejo. District X, Route 208, Section A. H. F. Lauritzen, Pittsburg, \$7,386. Contract awarded to Duncanson Harrelson Co., San Francisco, \$6,644.

**YUBA COUNTY**—On Ostrom Road between Plumas School and FAS Route 922, about 1.2 miles to be graded, penetration treatment to be applied and two reinforced concrete slab bridges to be constructed. District III, Route 921. Chittenden & Chittenden, Auburn, \$112,478; Elmer J. Warner, Stockton, \$114,959; Rice Bros., Marysville, \$126,514. Contract awarded to H. Earl Parker, Inc., Marysville, \$96,515.20.

## October, 1947

**ALAMEDA COUNTY**—Installing drainage pump in underpass. District IV, Route 206. Contract awarded to Archer Equipment Co., Oakland, \$1,771.31.

**ALAMEDA COUNTY**—Over East Shore Freeway and the tracks of the Southern Pacific Company and the tracks of the Western Pacific Railroad Company at 19th Avenue in the City of Oakland, an overcrossing and the southerly approach thereto to be constructed. District IV, Route 69. Stolte, Inc. & The Duncanson Harrelson Co., San Francisco, \$361,563; Dan Caputo, San Jose, \$372,280; J. H. Pomeroy & Co., Inc., San Francisco, \$373,662; A. Soda & Son, Oakland, \$373,761; S. J. Amoroso Construction Co., San Francisco, \$376,606; Erickson, Phillips & Weisberg, Oakland, \$379,150; Fredrickson & Watson Construction Co., Oakland, \$379,968; Healy Tibbitts Construction Co., San Francisco, \$409,283. Contract awarded to Carl N. Swenson Co., Inc., San Jose, \$354,098.80.

**BUTTE COUNTY**—Across Sacramento River, about one mile east of Hamilton City, the existing steel highway truss bridge to be cleaned and painted. District III, Route 47, Section A. J. H. Mohr, Inc., San Francisco, \$12,600; Pacific Bridge Painting Co., San Francisco, \$13,703. Contract awarded to Beardsley Painting Co., Los Angeles, \$9,856.

**IMPERIAL COUNTY**—Across New River, a distance of about 0.13 mile, to be graded and bituminous surface treatment applied, and a reinforced concrete slab bridge to be constructed; and across Greeson Wash, a distance of about 0.16 mile to be graded

and bituminous surface treatment applied, and a reinforced concrete slab bridge to be constructed. District XI, Route 202, Sections A, B, E. S. & N. S. Johnson, Fullerton, \$64,296; Catalina Construction Co., Covina, \$71,649; Norman I. Fadel, North Hollywood, \$72,268; Troy Construction, Inc., Los Angeles, \$72,724; Walter H. Barber, La Mesa, \$74,052; The Hogan Co., Riverside, \$76,291; Johnson Western Co., San Pedro, \$76,670. Contract awarded to George W. Peterson, Los Angeles, \$53,198.80.

**LOS ANGELES COUNTY**—On Hollywood Parkway, at Alvarado Street, in the City of Los Angeles, a reinforced concrete box girder undercrossing to be constructed. District VII, Route 2. Oberg Bros., Inglewood, \$346,603; W. J. Disteli, Los Angeles, \$354,040; Carlo Bongiovanni, Los Angeles, \$355,066; Peter Kiewit Sons, Arcadia, \$358,450; Byerts & Dunn, Los Angeles, \$358,573; Haddock Co., Pasadena, \$359,100; Winston Bros. Co., Azusa, \$377,715; Spencer Webb Co., Inglewood, \$382,380. Contract awarded to Guy F. Atkinson Co., Long Beach, \$346,063.

**LOS ANGELES COUNTY**—At the intersections of Figueroa Street and Carson Street, Atlantic Avenue and Rosecrans Avenue, and Firestone Boulevard and Garfield Avenue, furnishing and installing full traffic actuated signal systems and intersection illumination. District VII, Routes 165, 167, 174. C. D. Draucker Co., Los Angeles, \$35,095. Contract awarded to Econolite Corp., Los Angeles, \$33,281.

**LOS ANGELES COUNTY**—On Harbor Parkway, at Temple Street, in the City of Los Angeles, a reinforced concrete undercrossing and retaining walls to be constructed. District VII, Route 165. Byerts & Dunn, Los Angeles, \$359,009; W. J. Disteli, Los Angeles, \$360,640; Haddock Co., Pasadena, \$360,923; Carlo Bongiovanni, Los Angeles, \$368,265; Peter Kiewit Sons Co., Arcadia, \$368,958; Guy F. Atkinson Co., Long Beach, \$373,186; Winston Bros. Co., Azusa, \$387,468; Oberg Bros., Inglewood, \$398,824; Spencer Webb Co., Inglewood, \$414,648. Contract awarded to James I. Barnes Construction Co., Santa Monica, \$357,466.

**LOS ANGELES COUNTY**—On Whittier Boulevard at Durfee Avenue and on Rosemead Boulevard at Mission Drive, Las Tunas Drive and Huntington Drive, furnishing and installing traffic signals and intersection illumination at four intersections. District VII, Routes 2, 168, Sections D, C, C. D. Draucker Co., Los Angeles, \$60,595. Contract awarded to Econolite Corp., Los Angeles, \$55,035.

**NEVADA COUNTY**—Between one and one-half miles north of Rattlesnake Creek and Grass Valley, about 3.8 miles to be graded and surfaced with plant-mixed surfacing on crusher run base. District III, Route 17, Section B. Morrison-Knudsen Co., Inc., San Francisco, \$358,122; Fredrickson & Watson Construction Co., Oakland, \$360,604; A. Teichert & Son, Inc., Sacramento, \$369,545; H. Earl Parker, Inc., Marysville, \$392,875. Contract awarded to Fredrickson Bros., Emeryville, \$341,522.30.

**RIVERSIDE COUNTY**—At Santa Gertrudis Creek, about 4 miles north of Temecula, on the Hemet-Winchester-Temecula Road, a reinforced concrete bridge to be constructed and about 0.35 mile of approaches to be graded and surfaced with bituminous surface treatment. District VIII, Route 720.



E. S. & N. S. Johnson, Fullerton, \$39,963; A. R. Coffeen Co., Corona, \$39,988; Haddock Engrs., Ltd., Oceanside, \$42,049; O. B. Pierson, Bellflower, \$42,300; Geo. W. Peterson, Los Angeles, \$42,912; Walter H. Barber, La Mesa, \$46,034; Clifford C. Bong & Co., Arcadia, \$48,429; Bonadiman-McCain, Inc., Los Angeles, \$49,952; Cox Bros. Construction Co., Stanton, \$53,641. Contract awarded to Foster & McHarg, Riverside, \$36,440.85.

**SAN BERNARDINO COUNTY**—Between Los Angeles County line and 0.6 mile east of Ontario, about 5.7 miles to be graded and surfaced with plant-mixed surfacing on cement treated base. District VIII, Route 19, Sections A, Ont., B. Griffith Co., Los Angeles, \$897,564; Match Bros., Colton, \$916,539; United Concrete Pipe Corp. and Jesse B. Smith, Baldwin Park, \$945,687; George Herz Co., San Bernardino, \$949,983; MacDonald & Kruse-Hensler Construction Corp., Glendale, \$955,508; Peter Kiewit Sons Co., Arcadia, \$961,017; Dimmitt & Taylor and K. B. Nicholas, Los Angeles, \$984,159; J. E. Haddock, Ltd., Pasadena, \$1,035,808. Contract awarded to Morrison Knudsen Co., Inc., San Francisco, \$872,967.

**SAN BERNARDINO COUNTY**—At California Institute for Men, 2 miles south of Chino. Surfacing service roads, walkways, driveways, and a parking area. District VIII, R. A. Erwin, Colton, \$5,050; Peter Kiewit Sons' Co., Arcadia, \$5,275; Herz Paving Co., San Bernardino, \$5,094. Contract awarded to Match Bros., Colton, \$4,625.

**SAN BERNARDINO COUNTY**—In Ontario at the intersection of Route 19 and Euclid Ave., traffic signal system to be furnished and installed. District VIII, Route 19, 192. Tri-Cities Electrical Service, Oceanside, \$12,430; C. D. Draucker Co., Los Angeles, \$13,870; Prescott Electric & Mfg. Co., Los Angeles, \$13,985. Contract awarded to Paul R. Gardner, Ontario, \$12,033.31.

**SAN JOAQUIN COUNTY**—Constructing curb and gutter in the City of Tracy on 11th Street between North B Street and Central Avenue. District X, Route 5. F. Kaus, Stockton, \$1,924; Tornell Co., Tracy, \$4,213. Contract awarded to Charles I. Cunningham, Oakdale, \$1,359.25.

**SANTA BARBARA COUNTY**—Across Nojqui Creek and Santa Ynez River near Buellton, two structural steel girder bridges to be constructed. District V, Route 2, Section D. Carl N. Swenson Co., Inc., San Jose, \$551,705; United Concrete Pipe Corp. & Ralph A. Bell, Baldwin Park, \$569,475; Maceo Corp., Clearwater, \$572,841; Norman I. Fadel, North Hollywood, \$576,032; Haddock Engineers, Ltd., Oceanside, \$608,461; Bent Construction Co., Los Angeles, \$618,561; A. Teichert & Son, Inc., Sacramento, \$623,028; Winston Bros. Company, Azusa, \$630,139; L. E. Dixon Co., San Gabriel, \$731,415; Carlo Bongiovanni, Hollywood, \$743,318. Contract awarded to C. B. Tuttle Co., Long Beach, \$526,034.89.

**SANTA CLARA COUNTY**—Repairing a bridge across Madadero Creek about 15 miles northwest of San Jose. District IV, Route 68, Section A. J. H. Mohr, Inc., San Francisco, \$9,872; Johnson-Western Co., Alameda, \$11,812. Contract awarded to Emsco of San Francisco, \$6,979.08.

**SANTA CRUZ COUNTY**—Between Rob Roy Junction and Morrissey Avenue in Santa Cruz, about 7.7 miles to be cleared and grubbed, portions to be graded and structural steel and reinforced concrete freeway structures to be constructed. District IV, Route 56, Sections D, E. SCR. A Teichert & Son, Inc., & Granite Construction Co., Sacramento, \$1,385,525; Guy F. Atkinson Co., South San Francisco, \$1,393,557; George Pollock Co., Sacramento, \$1,465,994; Parish Bros., Renicia, \$1,467,561; Morrison-Knudsen Co., Inc., San Francisco, \$1,493,694; Fredrickson

& Watson Construction Co. & M & K Corporation, Oakland, \$1,667,587. Contract awarded to Earl W. Heple, San Jose, \$1,373,652.

**SHASTA COUNTY**—Between junction of Route 3 in Redding and 1.5 miles east, about 1.5 miles to be graded and surfaced with plant-mixed surfacing on crusher run base and the superstructure for a structural steel girder bridge with reinforced concrete deck to be constructed. District II, Routes 3, 20, Sections Rdg. C. Dragline Rentals Co., San Francisco, \$666,480; J. H. Pomeroy & Co., Inc., San Francisco, \$670,766; S. J. Amoroso Construction Co. & R. A. Farish, San Francisco, \$702,715; James I. Barnes Construction Co., Santa Monica, \$715,000; A. Teichert & Son, Inc., Sacramento, \$731,957; Fredrickson & Watson Construction Co., Oakland, \$746,266; George Pollock Co. (A Corporation), Sacramento, \$757,478. Contract awarded to Fredrickson Bros., Emeryville, \$625,426.96.

**SISKIYOU COUNTY**—Between Thompson Creek and 1.5 miles east of Beaver Creek. District II, Route 46, Sections B, D. Contract awarded to W. C. Railing, Redwood City, \$4,750.

**STANISLAUS AND SAN JOAQUIN COUNTIES**—Furnishing and installing concrete barrier posts between Salida and one mile north of Ripon. District X, Route 4, Sections B, A, Rip. F. Kaus, Stockton, \$11,020; Kiss Crane Co., San Pablo, \$25,000. Contract awarded to Evans Construction Co., Berkeley, \$9,550.

**SUTTER COUNTY**—At Live Oak, about 1.7 miles to be graded and plant-mixed surfacing to be constructed on cement treated base and seal coat applied. District III, Route 3, Section LIO, A. Harms Bros., Sacramento, \$160,923; W. C. Railing, Redwood City, \$179,152; Rice Bros., Marysville, \$192,284; M. J. B. Construction Company, Stockton, \$193,632. Contract awarded to McGilivray Construction Company, Sacramento, \$158,474.54.

**SUTTER COUNTY**—Replace about 180 lineal feet of bituminous surfacing and timber sub-floor on the existing causeway with new reinforced concrete floor. District III, Route 87, Section B. C. C. Gildersleeve, Willows, \$12,271; A. L. Miller, Sacramento, \$17,550. Contract awarded to William S. Shedd, Yuba City, \$12,111.

**TEHAMA COUNTY**—Across Thomas Creek and across Reeds Creek, about 17 miles and 1 mile south of Red Bluff, respectively, two steel beam span bridges to be constructed and about 0.53 mile of approaches to be graded and surfaced with crusher run base and armor coat applied thereto. District II, Routes 1078 and 1082. Charles MacClosky Co., San Francisco, \$194,730; J. P. Brennan, Redding, \$195,168; A. Teichert & Son, Inc., Sacramento, \$199,232. Contract awarded to G. M. Carr & Bati Rocca, Santa Rosa, \$174,743.50.

**TULARE COUNTY**—About 12 miles northeast of Visalia, the existing bridge across St. Johns River to be reconstructed. District VI, Route 1140. E. S. & N. S. Johnson, Fullerton, \$69,878; Taylor-Wheeler Commercial, Inc., Fresno, \$69,955; Trewhitt-Shields & Fisher, Fresno, \$70,917; R. M. Price Co. & Rex B. Sawyer, Huntington Park, \$70,992; Carl N. Swenson Co., Inc., San Jose, \$73,336; E. H. Peterson & Son, Richmond, \$77,522; Northup Construction Co., Long Beach, \$79,841; C. J. B. Construction Co., Oxnard, \$83,864. Contract awarded to Charles MacClosky Co., San Francisco, \$69,612.

**TULARE AND FRESNO COUNTIES**—Between 0.5 mile south of Kingsburg and Selma about 5.2 miles to be graded and paved with Portland cement concrete and plant-mixed surfacing. District VI, Route 4, Sec-

tion E, D, Knbg, A. Guy F. Atkinson Co., South San Francisco, \$596,551; R. M. Price Co. & Rex B. Sawyer, Huntington Park, \$634,420; Griffith Co., Los Angeles, \$639,010; M. J. B. Construction Co., Stockton, \$640,961; Fredrickson Bros., Emeryville, \$653,867; Fredrickson & Watson Construction Co., Oakland, \$655,022; Charles J. Dorfman, Los Angeles, \$669,927; Morrison-Knudsen Co., Inc., San Francisco, \$684,707; A. Teichert & Son, Inc., Sacramento, \$686,610; A. G. Raisch Co., San Francisco, \$728,727. Contract awarded to N. M. Ball Sons, Berkeley, \$593,491.05.

## November, 1947

**INYO COUNTY**—At Shoshone, about 0.7 mile in length to be graded and surfaced with road-mixed surfacing on imported borrow. District IX, Route 127, Sec. N. Arthur A. Johnson, Laguna Beach, \$26,935.50; Swedlow Engineering Company, Inc., Santa Monica, \$27,405.80; Foster & McHarg, Riverside, \$28,886.90; Browne and Krull, Palo Alto, \$29,475; Anderson Company, Visalia, \$31,877.50; Bishop Engineering & Construction Co., Bishop, \$33,008; Dix-Syl Construction Company, Inc., Bakersfield, \$33,702; Oilfields Trucking Company, Bakersfield, \$36,247.30; Geo. E. France Inc., Visalia, \$38,338.56; MacArthur & Son, Palmdale, \$38,556.50; Laurence M. Schneider, Vista, \$39,914; Bainter Const. Co., Long Beach, \$39,967.60; Roland T. Reynolds, Anaheim, \$41,488.50. Contract awarded to A. A. Edmondson, Glendale, \$26,163.50.

**KERN COUNTY**—Between 15 and 16.5 miles east of Bakersfield, three existing bridges across Walker Basin Creek and Caliente Creek, to be redecked with reinforced concrete. District VI, Route 58, Sec. D. E. S. & N. S. Johnson, Fullerton, \$25,816; F. Fredenburg, Temple City, \$25,932.50; O. B. Pierson, Bellflower, \$26,771.50; Griffith Company, Los Angeles, \$27,351.75; L. V. Mulherson, Glendale, \$27,552.50; C. B. Tuttle Co., Long Beach, \$27,602; E. G. Perham, Los Angeles, \$28,904.50; Repsher Brothers, Gen. Contractors, Bakersfield, \$36,735.35. Contract awarded to N. M. Saliba Co., Los Angeles, \$25,684.

**KINGS COUNTY**—Between Corcoran and 5.3 miles south, about 5.3 miles in length, to be graded, plant-mixed and surfacing to be placed on existing pavement and on crusher run base and bituminous surface treatment to be applied to shoulders. District VI, Route 943. Geo. E. France, Inc., Visalia, \$152,387; R. M. Price Co. and Rex B. Sawyer, Huntington Park, \$159,635; Clements & Co., and Browne and Krull, Hayward, \$167,745; Elmer J. Warner, Stockton, \$169,225; A. Teichert & Son, Inc., Sacramento, \$174,290; Claude C. Wood Co., Lodi, \$180,848; W. C. Railing, Redwood City, \$184,710; Griffith Company, Los Angeles, \$187,093.50; Brown-Doko, Pismo Beach, \$210,325. Contract awarded to C. M. Syar, Vallejo, \$149,866.80.

**LOS ANGELES COUNTY**—Ventura Blvd., between Calabasas and 1½ miles westerly, about 2.2 miles in length to be graded and surfaced with plant-mixed surfacing on imported base material. District VII, Route 2, Sec. LA.C. Silva & Hill Const. Co., Los Angeles, \$316,625.50; Dimmitt & Taylor, Los Angeles, \$319,364; Peter Kiewit Sons Co., Arcadia, \$323,900; Morrison Knudsen Co., Inc., San Francisco, \$327,389.50; J. E. Haddock, Ltd., Pasadena, \$331,335; N. M. Ball Sons, Santa Barbara, \$332,529.50; Arthur A. Johnson, Laguna Beach, \$342,677.50; Griffith Co. Los Angeles, \$343,008; MacDonald & Kruse & Hensler Constr. Corp., Glendale, \$353,875; C. G. Willis & Sons, Los Angeles, \$377,259.50; Clyde W. Wood, Inc., N. Hollywood, \$379,971; Frank T. Hickey Inc. & Frank T. Hickey, Los Angeles, \$396,688.50; Heuser & Garnett & T. M. Page, Monrovia,

(Continued on page 32)

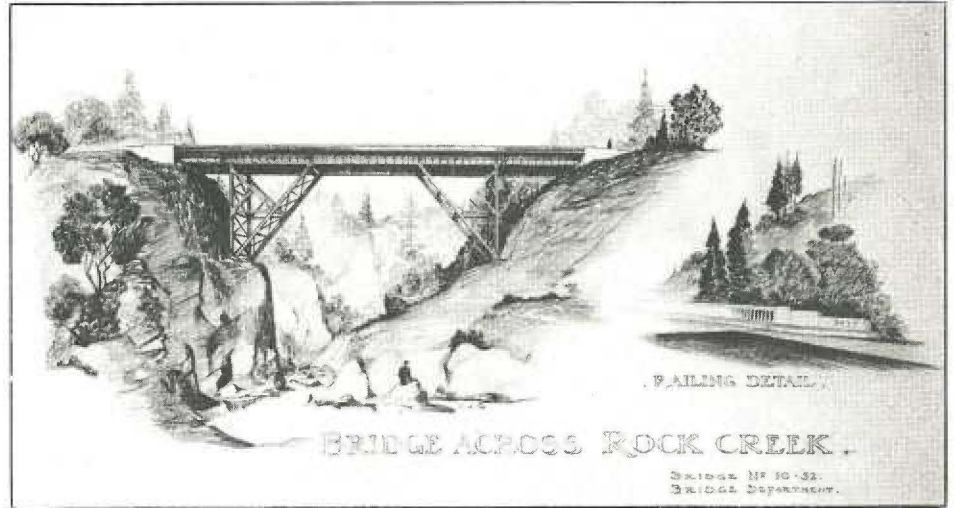
## Eleven Western States Subject of ARBA Study In Expansion Program

LOOKING toward the possible opening of the American Road Builders' Western Association with headquarters in San Francisco, the American Road Builders' Association has retained Floyd O. Booe, of San Francisco, well known in the highway construction field, to conduct a two-months' survey of eleven Western States, Charles M. Upham, engineer-director, announced here today. Booe's report will be presented at the ARBA Highway Conference to be held in Washington, January 26-28, 1948.

Booe's equipment for this job includes 10 years as Secretary of the Nevada Highway Commission and 20 years as Manager of the Northern California Chapter, Associated General Contractors. He has a wide acquaintance among road builders and highway officials in California, Oregon, Washington, Arizona, New Mexico, Montana, Nevada, Wyoming, Colorado, Utah, and Idaho, the states to be surveyed.

Upham explained that because of its distance from the home office in Washington, the proposed association would be autonomous to some extent, while operating closely as a unit of ARBA in matters of policy and administration.

## New Bridge Across Rock Creek



THE NARROW, rugged canyon cut by Rock Creek in Mendocino County near its junction with the Eel River, will be spanned by a permanent bridge. The site is on the Redwood Highway, about six miles north of Cummings, and 25 miles south of Garberville.

Traffic has been required to use a temporary timber bridge erected in 1937 when the original timber arch bridge failed. This temporary bridge is located sufficiently off the line of the highway so as not to interfere with the building of a permanent structure. Construction of the new bridge has been delayed by the war emergency and high postwar construction costs.

The new bridge will consist of a concrete deck supported on two continu-

ous steel plate girders, resting in turn on braced steel columns. A 26-foot roadway width, 1-foot 9-inch curb width and concrete railing will be provided. The span between main column supports is 166 feet. There is a center girder span of 66 feet, two side spans of 50 feet, and approach spans of 32 feet 6 inches and 53 feet 6 inches. The total length of the bridge is 256 feet.

This type of bridge is somewhat unique but has several advantages for this particular location. The girders and columns are of simple, straightforward construction. The bridge can be assembled and erected without the necessity of placing temporary supports in the canyon, the bottom of which is 145 feet below roadway grade.

## Highway Bids and Awards

(Continued from page 31)

\$487,987; Fred D. Chadwick, Lynwood, \$521,521.50. Contract awarded to Spicer Company, Los Angeles, \$311,630.

**MENDOCINO COUNTY**—At Navarro River, about four miles south of Albion, a structural steel bridge on reinforced concrete piers and abutments to be constructed and about 0.8 mile of approaches to be graded and surfaced with road-mixed surfacing on imported base material. District I, Routes 48, 56, Sec. C,C,D. Guy F. Atkinson Co., South San Francisco, \$427,444.75; Johnson Western Co., Alameda, \$532,101; Piombo Construction Co., San Francisco, \$558,151.50. Contract awarded to Johnston Rock Co., Stockton, \$397,578.50.

**MENDOCINO COUNTY**—Across Morrison Creek about six miles south of Ukiah, a reinforced concrete bridge to be constructed. District I, Route 979. Northern California Movers and Builders, Ukiah, \$16,072.50; T. Feibusch Construction Co., Ukiah, \$16,162; Evans Construction Co., Berkeley, \$16,666.25; C. C. Gildersleeve, Willows, \$16,694; W. Lenkeit Construction Co., San Francisco, \$17,

910; Reed and Tuttle, Redwood Valley, \$20,954; James H. MacFarland, San Francisco, \$21,309; Bos Construction Co., Oakland, \$21,820; Klay-Bennett Construction Co., Palo Alto, \$21,970; Butte Construction Co., San Francisco, \$21,999; M. E. Shuper, Stockton, \$23,168; O'Conner Bros., Red Bluff, \$23,880. Contract awarded to Kenneth Whited, Oakland, \$15,819.

**ORANGE COUNTY**—Across branch of Coyote Creek, about three miles west of Brea, a reinforced concrete slab bridge to be constructed. District VII—Route 176, Sec. A. E. S. & N. S. Johnson, Fullerton, \$26,655; Clifford C. Bong & Co., Arcadia, \$27,343.24; H. R. Breeden, Compton, \$27,633.60; Oberg Bros., Inglewood, \$30,729; Catalina Const. Co., Covina, \$32,500.50; C. R. Butterfield Co., San Pedro, \$33,676; Cox Bros., Const. Co., Stanton, \$35,356.50. Contract awarded to O. B. Pierson, Bellflower, \$26,140.25.

**ORANGE COUNTY**—In the City of San Clemente, between San Diego County line and Valencia Street, about 1.8 miles in length to be widened with plant-mixed surfacing on

Portland cement concrete base and a portion to be resurfaced with plant-mixed surfacing. District VII, Route 2, Sec. S.Cle. Cox Bros. Const. Co., Stanton, \$99,988; Griffith Co., Los Angeles, \$125,787.80; Morrison-Knudsen Co., Inc., San Francisco, \$155,617. Contract awarded to O'Brien & Bell Const. Co., Santa Ana, \$94,044.10.

**SACRAMENTO COUNTY**—Between North Sacramento Viaduct and Howe Avenue, a highway lighting system to be furnished and installed. District III, Route 3, Sec. B. Scott-Buttner Electric Co., Inc., Oakland, \$30,891. Contract awarded to Luppen and Hawley Inc., Sacramento, \$29,681.

**SACRAMENTO COUNTY**—Across Three Mile Slough about 4.3 miles south of Rio Vista, the superstructure for a bridge to be constructed. District X, Route 11, Sec. C. J. H. Pomeroy & Co., Inc., San Francisco, \$592,136; A. Soda & Son, Oakland, \$598,796.84; George Pollock Co. (a corporation), Sacramento, \$619,315.20. Contract awarded to Judson Pacific-Murphy Corporation, Emeryville, \$542,914.

# Terminal Island Freeway Structures

(Continued from page 29)

were required to provide the necessary horizontal clearance of railroad tracks.

Structural steel girders were shipped to the site by rail and unloaded at the Union Pacific Railroad Meade Yard over which the freeway passes. Trucks hauled the girders to position on the ground where a crane raised them into position in the structure. Except for the 119-foot spans over Anaheim Street and the railroad yards, all girders arrived completely shop fabricated and the maximum weight for these 98-foot long girders was 18½ tons.

Girders for the 119-foot spans across Anaheim Street and the railroad yards came in three sections. The contractor elected to make the two field splices in each girder on the ground and raise

them each in one piece. After splicing, these girders were 157 feet 6 inches long, weighed 42½ tons and required two cranes to raise them into position.

Kansas City Structural Steel Company furnished the steel and the general contractor erected the steel with his own forces.

COMPLETION DECEMBER 31, 1947

Regardless of the unstable nature of overlying ground formation in this area, there were no vertical or horizontal displacements of end bents due to imposing surcharged approach fill loads adjacent to the abutments of the structure.

The structure will have a steel railing, provision for future lighting and will have aluminum paint for the final coat.

Completion of work on this structure is anticipated for December 31, 1947, three months after the contract completion date. The extended completion date is due to a five months delay in structural steel delivery.

The Anaheim Street Overhead was designed by the Bridge Department, Division of Highways, E. W. Elliott Construction Company is the Contractor and J. M. Curran is the Resident Engineer.

Work covered in these three contracts received a total allotment of \$1,981,341.45 allocated as follows:

Union Pacific Railroad Overhead.....	\$679,077.58
Nicholson Avenue Overhead.....	315,311.67
Anaheim Street Overhead.....	986,952.20

Completion of all work on Terminal Island Freeway is scheduled for January 1, 1948.



Union Pacific Overcrossing on Terminal Island Freeway

## Record Influx Totals Set as Autos Pour Into State

A record-breaking 324-172 out-of-state cars, carrying 942,980 passengers—the greatest three-months' influx in state history—entered California during the third quarter of this year. These totals top by 45,000 cars and 130,000 passengers the previous quarter-year high figures established during 1946.

Ten-month totals also soared to all-time highs this year, with 834,690 "foreign" cars carrying 2,300,605 passengers, entering the State as compared to 783,937 cars and 2,173,473 passengers for the same months of 1946. Touring officials of the Automob-

## LEGISLATION SUPPORTS SCHOOL SAFETY PROGRAMS

Two school safety programs, the School Safety Patrols and Driver Education and Training, approved by the 1947 Legislature have become operative. The new law relative to school safety patrols authorizes establishment of safety patrols by any school district, under rules and regulations to be adopted by the State Board of Education. Patrol members are to be selected by school principals with the consent

of the students and their parents or guardians.

The law limits activities of the safety patrols to giving signals and directions enabling school pupils to cross streets and highways, but it makes violation of such a signal by a motorist a misdemeanor.

The new driver education and training law authorizes secondary schools to give instruction in this subject.

Club of Southern California estimate that nearly 1,000,000 out-of-state cars with 3,000,000 passengers will be checked into California this year by

December 31st. The greatest single-month influx of autos into California was registered in August when 120,234 out-of-state cars entered the State.

## Effect of Freeway On Land Values

(Continued from page 16)

development is a four-lane divided highway with a wide planted strip on each side, and outside of the plant strip an outer highway to serve the abutting properties. By the very nature of the development, vehicular traffic is not permitted access from the abutting property to the through lanes of traffic except at intersecting cross streets established by public authority. You have only to drive along Park-Presidio Boulevard to realize that this type of development actually enhances rather than depreciates real estate values. You will be convinced of this fact if you drive one or two blocks in each direction from Park-Presidio Boulevard and compare building development and real estate values on the paralleling streets. (See photographs No. 3 and No. 4.)

Another typical example is Junipero Serra Boulevard in the city of San Francisco. (See photographs No. 5 and No. 6.) From the pictures themselves you can see that the development along Junipero Serra Boulevard, where the abutting property does not have direct access to the through lanes of traffic, is comparable to or of a slightly higher class than the building development you find on the next paralleling streets. Investigation will satisfy you that the front foot value of residential property on this boulevard is more than double the front foot value of residential lots on the next paralleling street.

*To Be Continued*

## War Surplus Bridges

(Continued from page 11)

it is fortunate also that he has an excellent foreman for the mill, Mr. James Watson, one so competent for the business. Here is one of the secrets of success in all the enterprises of the day, faithful and trusty and competent overseers. We are glad to hear that the supervisors of Marin County have made an appropriation to build a bridge over the Creek for it is not very convenient for all travelers to swim in cold weather! It is not every traveler that believes in hydrophathy, but as the paper mill is carried by cold water we wish it unbounded success."

## Honor Bestowed Upon Two Division Of Highways Bridge Engineers

**T**WO ASSOCIATE Bridge Engineers of the California Division of Highways have been honored by the trustees of the James F. Lincoln Arc Welding Foundation, who last month bestowed upon them jointly the \$1,250 award in the Structural (Buildings and Bridges) Classification of the Design-for-Progress Award Program.

Claud Darby and Geo. W. Smith of Sacramento were co-authors of the winning paper on welded bridges for desert areas. They dealt with prefabricated bridge structures on desert highways to obviate the necessity of hauling concrete materials over long distances.

Previous to joining the Division of Highways, Mr. Darby was in the Navy Civil Engineer Corps and was with the Oregon Highway Commission under G. S. Paxson and the late C. B. McCulloch. He designed the Dr. John McLoughlin Bridge over the Clackamas River, which received the A. I. S. C. award in 1932. He also designed bridges over Alsea Bay, Siu-slaw, Umpqua and Rogue rivers, and Cape Creek on the Oregon Coast Highway. He graduated from Oregon State College in 1924. He is an associate member of the American Society of Civil Engineers, the University Club of Sacramento and American Legion Post 61.

Mr. Darby is married and has one daughter attending the University of California, one daughter at Sacramento College and a son who is in high school.

In the 1938 Industrial Award Program sponsored by the foundation, a paper submitted by Mr. Darby received an honorable mention award.

Mr. Smith has been with the Division of Highways since 1928, the last seven years in the Design Section of the Bridge Department and previous to that he was on preliminary surveys and construction. He attended Sacramento High School and Junior College and furthered his technical education with correspondence courses from the University of Wisconsin.

Mr. Smith is an associate member of the American Society of Civil Engineers and a member of the Structural Engineers Association of Central Cali-



Claud H. Darby



George W. Smith

fornia. He is a registered civil engineer in California. He is married and has two daughters and a son attending Sacramento schools.

# Orange County Completes Its First FAS Project

(Continued from page 9)

A three-inch bituminous treated shoulder of native or imported material six feet in width was included and, where the depth warranted, drainage ditches were graded to a four to one slope.

## WIDTH LIMITED BY FUNDS

Current public and technical opinion is not always in agreement as to the desirability of three-lane construction, and in this case traffic volume would, moreover, have justified four-lane construction.

The width of the improvement was limited, however, by two factors: First, there was a disinclination to use nearly all of the county's federal aid allocation for the three-year program on a single project and, secondly, and more important, a great deal of the existing right of way was only sixty feet in width. To have held the project up until the minimum width of 80 feet had been acquired would have resulted in an unreasonable delay.

In the mean time, the county right of way section has been securing as expeditiously as possible, a minimum right of way width of 80 feet. When this has been accomplished, and if funds are then available, the fourth lane may be added.

This view on Harbor Boulevard is looking north to Bolsa Avenue



Looking north on Harbor Boulevard to Garden Grove Boulevard

## FEDERAL AND STATE HELP

Both preliminary and construction engineering were handled by the county, and in this connection, acknowledgment is made of the invaluable assistance and cooperation given by federal and state personnel. It is felt

here that the excellence of the completed job is due in a large measure to those officials and to the experience and ability of the Griffith Company, Contractors.

The cost of construction, exclusive of engineering, was \$240,000, which was financed in whole with federal aid secondary and state matching funds. The cost of work required in connection with right of way agreements was paid for by the county from county funds.

The advantages of this improvement were apparent even before completion—traffic volume jumped ahead on this modern three-lane highway just as it had done when the county first completed the old two-lane road. A 16-hour traffic count, taken on July 13, a month before the project was completed, although it was passable, showed approximately 9,000 cars passed a single intersection. This count was 98 percent higher than the previous high count taken in October of 1945.

The contractor commenced work on this project on February 11, 1947, and all work was completed on August 18, 1947. The construction was under the supervision of the writer, who was represented on the contract by Resident Engineer Allan S. Koch.

## Two New Bay Crossings Are In Prospect

(Continued from page 1)

"It is not possible to state at this time the probable amount of money, property, materials, or labor to be contributed from other sources in aid of the construction of the proposed additional crossings, and for that reason such probable amount is hereby stated as none.

"The Department of Public Works hereby recommends to the California Toll Bridge Authority that the additional toll bridge and the additional toll highway crossing, together with their necessary appurtenances and approaches, hereinbefore referred to, be constructed and operated as an aid to, and a part of, the public highways of the State, and as state highways, across the Bay of San Francisco, at the locations hereinbefore specified, and that such bridge and such crossing be constructed and operated by the State of California, pursuant to the provisions of the California Toll Bridge Authority Act, Chapter 176, Statutes of 1947, as amended by Chapter 225, Statutes of 1947.

"The Department of Public Works hereby requests that it be authorized to make necessary surveys and prepare detailed plans, specifications and estimates for such additional bridge and such additional toll highway crossing, and for their appurtenances and approaches, in order that the department may be able to advise your honorable board more accurately of the cost of such construction and of the total amount of revenue bonds which are required to be authorized and issued under said act to meet such costs, and for the purpose of retiring any outstanding bonds and other indebtedness (including indebtedness to the State Highway Fund) secured by a pledge of the tolls and revenues of the existing San Francisco-Oakland Bay Bridge; and further that it be authorized to acquire by gift, purchase, or eminent domain proceedings, in fee or in any lesser estate or interest, any real estate, real property, personal property, franchises, rights, rights of way, easements, or other property, or privileges appurtenant thereto, as may be required for said crossings, their appurtenances and approaches."

## In Memoriam Gustave A. Bergren

**T**HE DIVISION of Architecture, Department of Public Works, deeply regrets the death of Gustave N. Bergren on August 9, 1947, as a result of an automobile accident while on state duty near Hopland, California.

"Gus," as he was known to his friends and associates, was in state service for 28 years and at the time of his death held an important key position with the division in the capacity of Supervising Construction Inspector having charge of construction work over a district area including such institutions as the Napa State Hospital, Sonoma State Home, Veterans' Home, San Quentin State Prison, and as far north as the Humboldt State College.

Born in Sweden, February 15, 1888, he came to the States in childhood. Before entering state service he was in the contracting business with his father under the firm name of L. G. Bergren and Son. For the past seven years he resided in Napa and took an active part in local civic affairs. He was exalted ruler of the Napa Lodge of Elks.

He is survived by his wife, Kathleen, his mother Mary J. Bergren, of San Francisco, and the following sisters: Ethel M. Devoto of San Francisco, Mildred Chisholm of Sacramento and Myrtle Gavigan of San Francisco.

## Survey Shows 80 Percent of Highway Trips Are Necessary

Four out of five highway motor trips are still in the "necessary" class, despite the end of gasoline rationing and the tremendous upward surge in motor vehicle usage, according to J. T. Callaway, president of the American Road Builders' Association.

"With an increasing number of vehicles on the highways engaged in necessary travel, and the average motor vehicle traveling almost 10,000 miles a year, speedy attention to our tremendous backlog of highway needs is imperative," Callaway declared.

"Last year, the Nation's drivers piled up a total of 340,655,000,000 vehicle-miles. As new cars and trucks join the 34,000,000 now on our streets and highways, traffic volume, already at its highest peak in history, will make terrific demands on our inadequate transport system."

"For a Nation increasingly dependent upon highway transportation, better roads must be planned, constructed, and maintained. The long-deferred improvement of main highways, county and local rural roads, city and village streets is a necessity."

## The Overload Problems on Our Highways

(Continued from page 4)

they entered into cooperative agreements to share the cost on a 50-50 basis with maximum participation based upon the preliminary estimate of cost.

### STRATEGIC CONTROL SYSTEM

These above-mentioned scales will provide a strategic system to control the long haul trucks entering or leaving the area, but do not furnish proper or adequate coverage for the intercity movements within the district. In Sonoma County, at Cloverdale, a new lumber mill has recently begun operation. The log hauling from Mendocino County to this mill is developing into a problem. Negotiations are under way with the county toward a cooperative agreement covering their participation in a scale installation near Cloverdale to control the log hauling as well as all other hauling on that portion of U. S. 101.

Scales must also be installed in San Mateo County to cover the movements between San Francisco and San Jose where the volume of commercial traffic is of considerable extent as well as in some other localities where the movements cannot be intercepted by the main line scales.

The control of indiscriminate overloading is vital to the development of the highway system on a long range plan. The rapid deterioration and disintegration of roads, which are adequate for legal loads, long before their economic life is reached can and will disrupt the most carefully planned improvement program.

In addition to the control of damaging overloads, traffic safety is improved by the additional checks which are made on the equipment during the weighing operations. Headlights, taillights, clearance lights, turning signals, brakes, and brake couplings, trailer hitches, and safety chains, and other necessary features can be checked, and if found lacking can be required before the vehicle proceeds.

Thus, the roads are protected from unmerciful beatings imposed by excess loads and the traveling public is protected from the difficulties which can result from defective equipment.