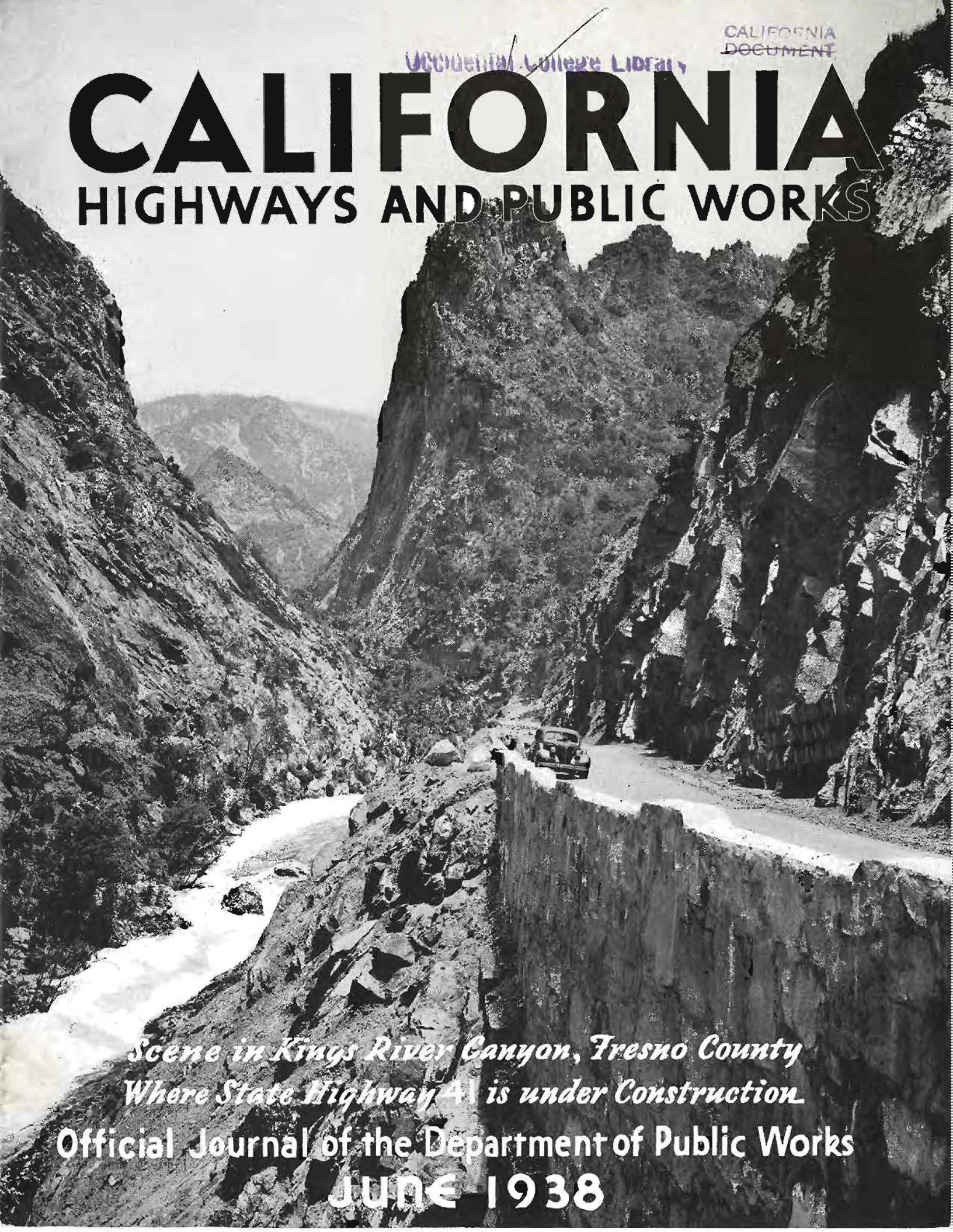


CALIFORNIA HIGHWAYS AND PUBLIC WORKS



*Scene in Kings River Canyon, Fresno County
Where State Highway 41 is under Construction.*

Official Journal of the Department of Public Works
JUNE 1938

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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

EARL LEE KELLY, Director C. H. PURCELL, State Highway Engineer JOHN W. HOWE, Editor K. C. ADAMS, Associate Editor

Published for information of the members of the department and the citizens of California

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

Address communications to California Highways and Public Works, P. O. Box 1499, Sacramento, California.

Vol. 16

JUNE, 1938

No. 6

Table of Contents

	Page
\$35,939,450 Bid for Shasta Dam.....	1
<i>By Edward Hyatt, State Engineer</i>	
Panoramic View of Government Camp near Site of Shasta Dam.....	2-3
Narrow Santa Cruz Highway Doomed, Illustrated.....	4-7
<i>By H. R. Judah, Chairman California Highway Commission</i>	
Highway Safety Being Increased, Illustrated.....	8-9
<i>By R. S. Badger, District Construction Engineer</i>	
Review of Accidents on Rural State Highways During 1937.....	10-11
<i>By H. L. Kile, Assistant Safety Engineer</i>	
Highway Soil Studies, Illustrated.....	12-14
<i>By Thomas E. Stanton, Jr., Materials and Research Engineer</i>	
State Using New Type of Double Line on Crests of Grades.....	15
Construction View of Contra Costa Conduit of Central Valley Project.....	16
Cities Get Gas Tax for Year Ending June 30, 1938.....	17-20
<i>By L. V. Campbell, Engineer of Cities and Cooperative Projects</i>	
Out of the Mail Bag.....	21
World's Fair-Bay Bridge Highway, Illustrated.....	22-23
Towne's Pass Highway into Death Valley Improved, Illustrated.....	24-25
<i>By H. F. Calton, Associate Highway Engineer</i>	
Monthly Report of Division of Water Resources.....	26
Highway Bids and Awards for Month of May, 1938.....	27



Site of Shasta Dam looking downstream. White line shows approximate outline of dam which will be second largest in world, towering 560 feet, storing 4,500,000 acre feet of water and creating a lake 35 miles long.

\$35,939,450 Bid for Shasta Dam

By EDWARD HYATT, State Engineer

THE first day of June, 1938, records an event of outstanding significance in the progress of the Central Valley Project—the opening of contract bids for the construction of Shasta Dam. This leads the way to the building of the major and most important unit of the project. It foreshadows the beginning of large scale construction activities on the project in the near future.

Shasta Dam is the “key unit” of the Central Valley Project. It will store and regulate the waters of the Sacramento River to furnish additional water supplies urgently needed for many purposes in the Sacramento and San Joaquin valleys and the upper San Francisco Bay Region. Practically all of the new regulated water supplies to be made available by the project will depend upon the operation of this major storage unit. It, therefore, constitutes the very heart of the project.

LAKE 35 MILES LONG

The site of Shasta Dam is in the Sacramento River Canyon about 14 miles upstream, north of the city of Redding in Shasta County, California.



EDWARD HYATT

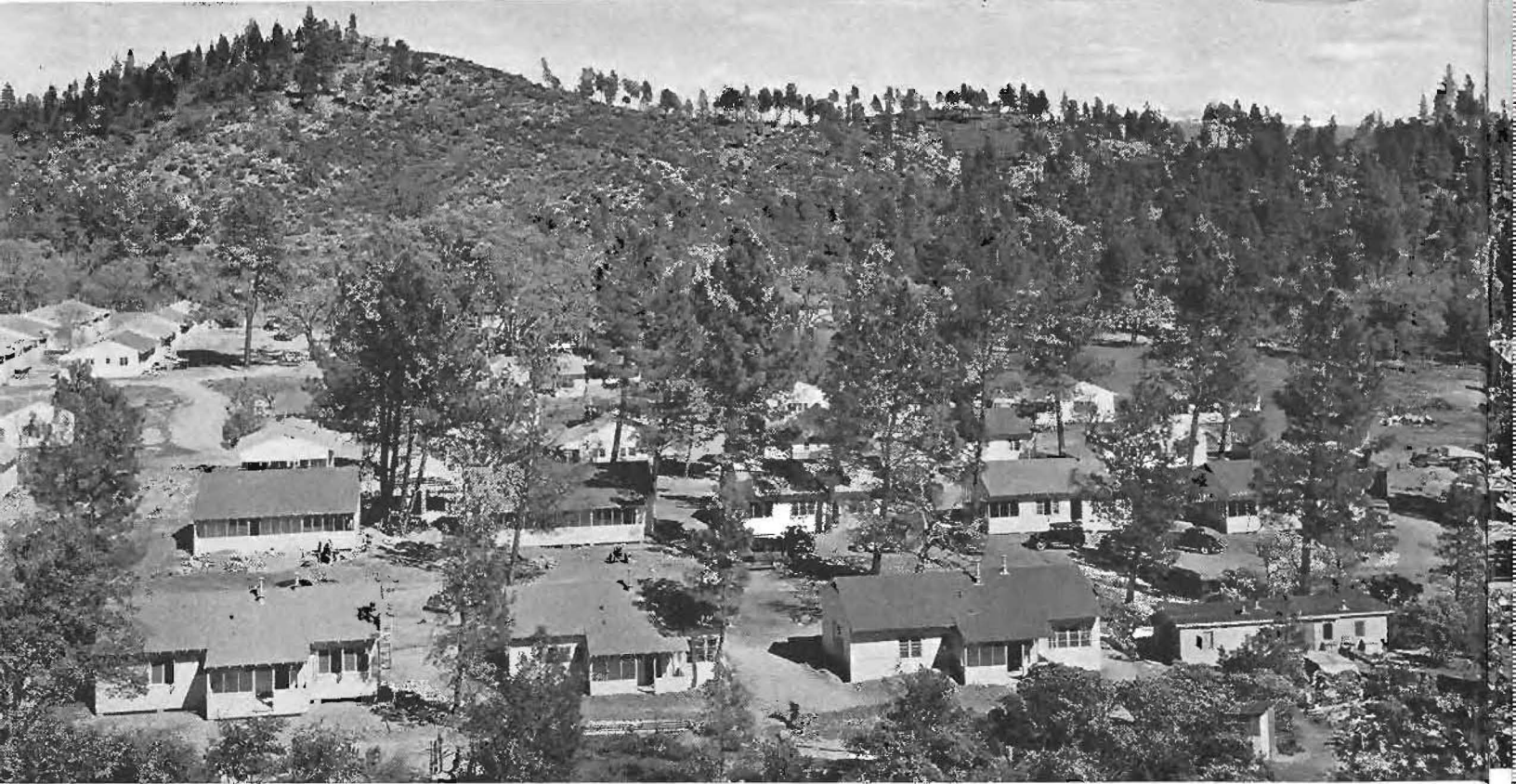
The dam when completed will control the run-off from about 6650 square miles of mountain watersheds

drained by the upper Sacramento River and its tributaries, chief of which are the McCloud and Pit rivers. It will create a great artificial lake 46 square miles in area and 35 miles in length at maximum level.

Situated in the “Shasta Wonderland” in the midst of rugged timber-covered mountains crowned by majestic Mt. Shasta from which the Dam takes its name, this lake will contribute greatly to the recreational advantages of the area, in addition to its more important objectives of water conservation.

SECOND LARGEST DAM IN THE WORLD

Shasta Dam will be one of the largest in the world—a monumental structure which will rank with the recently completed Boulder Dam on the Colorado River, and the Grand Coulee Dam now under construction on the Columbia River in the State of Washington. It will rise to a height of 500 feet above present low stream level and 560 feet above lowest foundation, or nearly one and one-third times the height of the tallest skyscrapers in San Francisco.



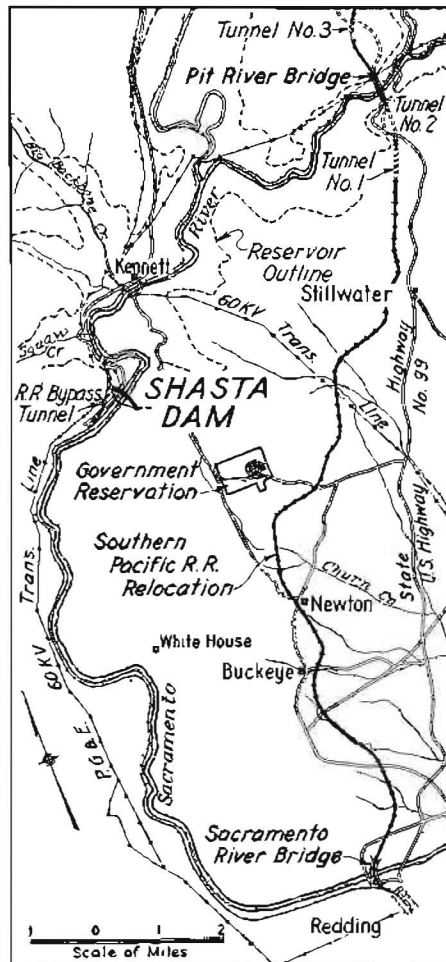
Panoramic view of the government camp near the site of Shasta Dam in which employees of the Bureau of Reclamation are dormitories. Near the center partly hidden by trees is the administration building and the white building behind it.

Its length along the crest will be 3500 feet, equal to about eight ordinary city blocks. It will be a so-called "gravity type" massive masonry structure slightly curved in plan, requiring more than 5,600,000 cubic yards of concrete.

Boulder Dam which rises 726 feet above lowest foundation exceeds Shasta Dam in maximum height but is smaller in mass of concrete required by 2,350,000 cubic yards. Grand Coulee Dam on the other hand will not be as high as Shasta Dam but will have a concrete volume about three quarters again larger. However, in one of its features Shasta Dam will exceed both of these other structures. It will be the highest overflow dam in the world. The water passing over the spillway at the center of the dam will have a fall of 480 feet or approximately three times the height of Niagara Falls.

MANY YEARS OF PLANNING

Many years of investigations, studies and explorations preceded the preparation of final plans and the opening of contract bids for the construction of Shasta Dam. The possibilities of a storage dam at this general location on the upper Sacramento River were first pointed out by Colonel Robert B. Marshall in



connection with a scheme of water development which he projected in 1919, widely known as the "Marshall Plan." Following the initiation of the Water Resources Investigations by the State in 1921, this storage site, formerly known as the "Kennett" site, was carefully investigated among several others along the upper Sacramento River.

As early as 1923 in a report to the legislature it was tentatively selected as one of the major storage reservoirs of a general coordinated plan of water development preliminarily projected for the entire State. More intensive studies and investigations subsequently confirmed the early choice of this site as the best available for storage on the upper Sacramento River. It was included as a major storage unit of the State Water Plan submitted to the legislature in 1931 and was selected as a unit of the initial program of development recommended for the Sacramento and San Joaquin valleys. It was officially authorized and defined as a unit of the Central Valley Project by legislation (the Central Valley Project Act) adopted and approved in 1933.

With the initiation of work on the project by the United States Bureau of Reclamation in November, 1935, one of the earliest tasks undertaken



will live. It is located 2 miles east of the dam site and 9 miles from Redding. The two large structures at the right the garage. The cottages include model duplex dwellings and smaller houses, and with the dormitories will house 500 people.

was the extension of explorations at the Shasta (Kennett) dam site. Additional explorations were essential before final designs could be prepared. At the same time the bureau's engineers considered it advisable to explore other sites for storage on the upper Sacramento River, particularly the Table Mountain dam site located between Redding and Red Bluff, and the Baird dam site located immediately below the confluence of the McCloud and Pit rivers.

Upon the completion of these explorations and further economic studies in the latter part of 1936 and a careful review of the data and analyses by the Bureau's Consulting Board and a special Consulting Board appointed by the State consisting of B. A. Etcheverry, J. D. Galloway, F. C. Hermann and Dr. George D. Louderback, the Shasta Dam site was found to be superior from all standpoints. Its final approval for the main storage unit of the project was announced by Commissioner of Reclamation John C. Page on January 25, 1937.

Studies were continued and further explorations made to provide information required in the preparation of final plans and specifications and to determine the economic height of dam, storage capacity and size of hydroelectric power plant installation.

SHASTA DAM BIDS

Bidder	Amount Bid
Pacific Constructors, Inc.	\$35,939,450
Shasta Construction Company	36,202,357

Pacific Constructors, Inc., is a syndicate composed of the following:

- Griffith Company, Los Angeles, California
- Metropolitan Construction Company, Los Angeles, California
- Lawler and Maguire, Butte, Montana
- The Arundel Corporation, Baltimore, Maryland
- American Concrete and Steel Pipe Company, Los Angeles, California
- Foley Bros., New York City, N. Y.
- D. W. Thurston, Los Angeles, California
- Shofner, Gordon & Hinman, Denver, Colorado
- W. E. Callahan Company and Gunther-Shirley Company, Dallas, Texas
- A. Guthrie & Company, St. Paul, Minn.
- L. E. Dixon Company, Los Angeles, California
- Hunkin-Conkey Company, Cleveland, Ohio

These crystallized into a final decision on December 22, 1937, when the State and the bureau jointly approved a storage capacity of 4,500,000 acre

feet for Shasta Reservoir and a hydroelectric power plant installation of 350,000 kilowatts ultimately.

The Bureau of Reclamation then completed the preparation of the final detailed plans and specifications for the dam and power plant. The general plans therefor were approved by the Water Project Authority of the State of California on April 7, 1938.

RAILROAD AND STATE HIGHWAY TO BE MOVED

The building of Shasta Dam involves major supplemental construction work in the required relocation of the Southern Pacific Railroad and the State highway around the reservoir. Plans have been prepared for a new railway line about 30 miles in length extending from Redding on the south around the easterly side of the reservoir to join the present main line again in the vicinity of Delta. It will replace about 37 miles of the existing main line (Shasta Route) of the Southern Pacific Railroad. The new line will require about 12 tunnels and 8 bridges. The bridge planned for the crossing of the Pit River Canyon will be particularly noteworthy, consisting of a double deck combined railroad and highway bridge about 3300 feet long and spanning the canyon at a height of 470 feet above the

(Continued on page 16)



Heavy grading equipment in operation on Los Gatos-Inspiration Point link of new Santa Cruz Highway.

Narrow Santa Cruz Highway Doomed

By H. R. JUDAH, Chairman, California Highway Commission

ANOTHER important high point was reached in the history of California highway building, when Governor Frank F. Merriam played the leading role in ceremonies on May 22d near Lexington, in Santa Clara County, celebrating the heavy grading work now under way in the construction of the important seven-mile unit of the Santa Cruz-Los Gatos highway. This unit extends from Inspiration Point in Santa Cruz County to the Oaks Road, which lies about one and a half miles southerly from the city of Los Gatos.

Ideal weather, coupled with an interesting program brightened by the music of the champion Los Gatos High School band, served to provide an air of pleasure in the realization that the most important stretch of this highly patronized road, used by tens of thousands of Californians and other motorists from all parts

of the United States and from across the seas, is really under way.

Former State Senator Bertram B. Snyder was the master of ceremonies and all of the arrangements for the successful affair were managed by representatives of the chambers of commerce of Los Gatos, San Jose and Santa Cruz, ably aided by Mayor Marc Vertin of Los Gatos and J. D. Farwell of the Gem City, one of the most enthusiastic highway boosters in the central section of the State.

In the main address at the ceremonies, Governor Merriam spoke in behalf of the excellence of the California Highway System and its efficient personnel throughout California.

The Governor said the gasoline tax is a fairer means of financing highways than "bonds which outlast the roads they built."

Touching on the element of safety which the California Highway De-

partment is now building into the highway system, he said:

"Safety is a personal matter. The highways are being made as safe as the engineers can design them. Accident prevention is an individual problem with every autoist and should be treated as such."

Ceremonies following the speaking program included the breaking of a bottle of prune juice from Santa Clara County over the side of a giant shovel stationed on the grade by pretty Miss Gloria Daily, clad as "Miss Santa Cruz" in an attractive swimming suit.

An important personality in the dedication was District Engineer Jno. H. Skeggs, closely associated for a quarter of a century with highway work in one of California's most important districts, embracing the counties of Santa Cruz, Santa Clara, San Francisco, Alameda, Marin, Napa, Sonoma and Contra Costa.



In upper picture is section of present winding Los Gatos-Santa Cruz Highway which is to be replaced by broad, straight road shown under construction in center. Lower—Portion of huge drainage system for new road.



Official group at dedication of Los Gatos-Inspiration Point Highway. Left to right: Fred G. Swanton, Santa Cruz; Col. Jno. H. Skeggs, District Highway Engineer; H. R. Judah, chairman, California Highway Commission; Governor Frank F. Merriam, Miss Gloria Daily, "Miss Santa Cruz"; Harry A. Hopkins, Assistant State Director of Public Works; J. W. Vickrey, State Highway Safety Engineer.

It was Colonel Skeggs who watched the progress of the original paving job from Santa Cruz to Los Gatos in 1921 when the old style fifteen foot "trail," costing \$39,000 per mile was built, and it was the same man who made a short but interesting talk at the dedication ceremonies on May 22d at Lexington, when he contemplated the work at hand on the magnificent stretch of modern highway, four lanes wide, that will cost \$180,000 per mile.

The Los Gatos-Santa Cruz highway was one of the original 1911 bond issue laterals built to connect county seats with the main state arteries. It has served faithfully hundreds of thousands of motorists passing from the north and from the east, southerly into the marvelous recreational area skirting the north shores of Monterey Bay of which Santa Cruz is the center.

Brief talks were made by Mayor Vertin, J. W. Vickrey, State Highway Safety Engineer; and Harry A. Hopkins, Assistant Director of Public Works. Following the dedication, Governor Merriam and a group of officials who participated were entertained at dinner in the Hotel Lyndon in Los Gatos.

The new highway will have a surfaced width of forty-six feet and will require the excavation of about 2,300,000 yards of dirt. The best

ECONOMY OF HIGHWAYS

"As a rule, citizens think of good roads chiefly in terms of speed, convenience and comfort. The highway research board in Washington has found another advantage—savings in cost of car operations and maintenance. The study was made among rural mail carriers in Iowa. It costs them 3.07 cents a mile to drive their automobiles over dirt roads. Gravel roads, at 2.17 cents per mile, are much better. But a good paved highway is easy enough on gasoline, oil, tires and the like to cut the figure to 1.44 cents per mile. As between the old dirt road and the modern highway is a saving of 1.63 cents per mile—\$163 annually for the driver who covers 10,000 miles a year. So good roads become a matter of good business. Motorists willingly paid for them even before the pocketbook argument was evident. But where special taxes levied for road building are diverted to other needs, the driver may well wonder if one factor doesn't offset the other."

—Fergus Falls Tribune.

routing for the new stretch of highway was not easily solved. An entirely new piece of work, it presented a difficult problem, not only in establishing of acceptable grades and alignment in developing within a short distance a descent from summit to canyon floor before reaching Los Gatos, but also in designing the roadway through large cuts and over deep ravines where the character of soil and the presence of underlying water indicated probable instability.

Approximately two miles were saved on the new grade as against the present distance from Inspiration Point to Oaks Road. The curves will be reduced from 132 to twenty and the total curvature now at 7700 degrees will be reduced to 1118 degrees. The minimum radius on curves on the new road is 500 feet, an excellent sight distance on a mountain highway. The present highway has radii as short as 75 feet on curves.

This new million-dollar road unit will be one of the most fascinating from a scenic standpoint in Western America. It will mean, when entirely completed to Los Gatos, that a motorist can leave the beautiful Santa Clara Valley, cross over the Santa Cruz range through unsurpassed mountain scenery on a four-lane road and arrive on the north-

Road Crews Praised

Big Sur, California.

Governor Frank F. Merriam,
Sacramento, California,

Dear Sir:

Before returning to New York to resume my editorial duties on the staff of the New York Herald-Tribune after a six months' stay here at Big Sur, I want to take this occasion to express to you my appreciation of the splendid work of your highway department. We have lived since November on the new part of the Coast Highway, just three miles south of the Big Sur Lodge, and have seen the terrific rains of this season cause frequent slides and washouts.

What has struck us particularly has been the promptness and persistence with which the road crews have gone out, in all sorts of weather, to clear the roads, and the efficiency with which they have done their work. It has been a tough job for them because of the exceptionally heavy rains, but day after day they have worked hard and long, and, as far as we could see, always cheerfully in the face of many hardships.

Will you be good enough to pass on to the head of your highway department this word of appreciation from an outsider? Such good work is so rare these days that it deserves special commendation.

Sincerely yours,

(Signed) NICHOLAS ROOSEVELT.

AN ACKNOWLEDGMENT

Hon. Nicholas Roosevelt,
Big Sur,
California.

My dear Mr. Roosevelt:

Thank you for your very thoughtful letter of April 20, commenting upon the condition of the highways in and around Big Sur, California.

It is always gratifying to know that the various departments of state government are functioning to the best of their ability, and your courtesy in writing me is greatly appreciated.

Your communication is being referred to the department responsible for this splendid service, the Division of Highways of the State of California, which is under the direction of Hon. Earl Lee Kelly, Director of Public Works.

I am glad that you enjoyed your visit in California and trust you may soon return.

With kindest personal regards, I am

Very sincerely yours,

(Signed) FRANK F. MERRIAM,
Governor of California.

ern shore of Monterey Bay in little over a half hour, probably forty minutes at the most from San Jose to Santa Cruz.

The highway is the main artery from the north into the Santa Cruz mountain and sea recreational area and will carry motorists over easy grades from the great population areas of the San Francisco Bay district and the Santa Clara Valley, where 1,250,000 people reside.

Its completion, scheduled for about July 1, 1939, will follow the completion this autumn of the great Altamont Pass improvement between Greenville and Mountain House. There is a direct relation between these two roads by reason of the fact that seasonal travel from May to November from the great central valleys of the State, passing over the Altamont, normally takes the Los Gatos-Santa Cruz highway to reach Monterey Bay.

Despite all of the inconveniences of the present narrow highway leading southerly from Los Gatos to Santa Cruz covering many years, traffic load records at Los Gatos at peak in recent years revealed 14,000 cars in 16 hours. It is the opinion of the writer that a conservative estimate of traffic on the new highway, when completed, will raise these figures to at least 20,000 cars within thirty days after the job is done, and 25,000 cars within a few years.

N. Y. Federal Projects

In a survey of community improvements in New York City made possible by federal relief projects, Mayor La Guardia of New York says, "A striking illustration is to be found in the field of transportation. In the last four years through federal funds 931 miles of public highways were reconstructed, the Triborough Bridge, the Lincoln Tunnel, and two new bridges over Westchester Avenue in the Bronx and over Wallabout Creek in Brooklyn were built."

Automobiles now use more lubricating oil than all the industrial machinery in the United States. A recent survey by the American Petroleum Institute found that motor cars and trucks used 22,000,000 barrels of lubricating oil last year, while industry consumed slightly more than 20,000,000 barrels.

Highways Come High

Highways in the old days, remarked Governor Merriam in his address last Sunday to an audience of valley and Santa Cruz people, could be built for between twelve and fifteen thousand dollars a mile. That those days are gone forever is due to the fact that roads nowadays have to be built for faster and heavier traffic. The Los Gatos-Inspiration Point road, for instance, when it is completed, will have cost approximately \$180,000 a mile to build. This is an unusually costly project, of course, but it is indicative of the amazing increase in cost of road construction. Roads are built wider and sturdier for present day needs.

The Governor brought out another interesting point in his speech, concerning the actual saving that motorists will make when they use the new road. It will reduce the present distance to Santa Cruz by two and a half miles. Thus each motorist, figuring that it costs him five cents a mile to operate his car, will save 12½¢, or a quarter on the round trip. During the peak season, as many as 15,000 cars will use the highway daily. So in dollars and cents motorists will save—well you figure it out.

Anyway, Mr. Merriam's point makes good sense, in our opinion. Motorists will pay in taxes for the new highway, but they will have the pleasure of getting some of it back.—*Los Gatos Times*.

SNOW REMOVAL APPRECIATED

A portion of a letter from the Susanville Chamber of Commerce, addressed to J. H. Rust, Maintenance Superintendent, Susanville, says:

"At the regular meeting of the board of directors of the Susanville Chamber of Commerce on April 7th, the board went on record as taking this means of thanking you, for the fine work that you and your maintenance crew did this winter in keeping the highways clear of snow."



Contractor's trucks on new future southbound lane of Bakersfield-Grapevine Highway. Cars on present pavement which will be future northbound lane of four-lane divided highway now under construction.

Highway Safety Being Increased

By R. S. BADGER, District Construction Engineer

THE highway which connects the metropolitan area around Los Angeles with California's great central valleys is one of the most heavily traveled and important arterials on the State system. Traveling north from Los Angeles County through the deep gorges of Piru Creek on the modern Ridge Route Alternate highway the motorist arrives at the southern end of the San Joaquin Valley, passes down the recently reconstructed Grapevine Grade and out onto the floor of the valley on the long tangent south of Bakersfield.

While the line of this section is tangent, it nevertheless consists of approximately a 5 per cent grade

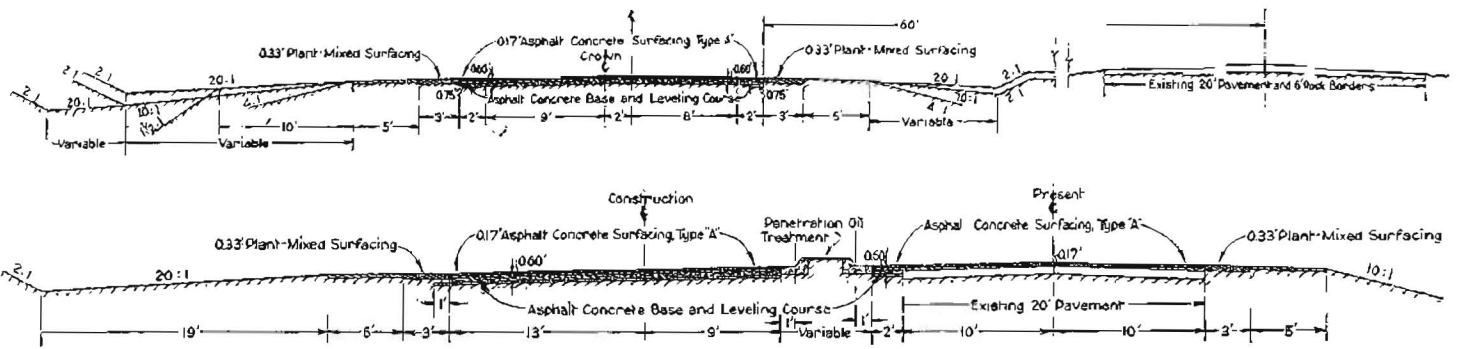
and, because of the high speeds attained in its descent, many accidents have occurred when drivers of both trucks and cars were unable to gauge the speeds at which they and other vehicles were traveling. To remedy, to a considerable extent, this condition by providing more safe highway facilities, the Division of Highways now has under way a construction project 19.1 miles in length between one mile north of Grapevine Station and ten miles south of Bakersfield.

This project consists, in the main, of constructing a new highway parallel to and with its centerline seventy feet to the west of the centerline of the existing pavement. The

purpose of the design being to provide divided traffic ways, northbound traffic to use the existing easterly side and southbound cars to use the new pavement on the west. This division of traffic flow will entirely eliminate the chance of the "head on" collision type of accident and should materially reduce the so-called "side swiping" type.

With the exception of the connecting transitions at each end, the new construction will consist of a 23-foot asphalt concrete pavement with 3-foot plant-mix rock borders on each side. The flat roadbed shoulders beyond the borders will be oil treated for a width of five feet.

The 23-foot pavement will be



A 19.1 mile section of divided four-lane highway proposed for construction in Kern County, between one mile north of Grapevine and ten miles south of Bakersfield. Upper—A wide separation strip which will reduce the opposing light hazard and provide protection to cross traffic at intersections. Lower—Curbed dividing strip where right of way width is restricted and approaching transition of three-lane highway.

divided into an 11-foot travel lane on the outside and a 12-foot passing lane on the left. These widths conform to the new standard construction practice adopted by the Division of Highways in 1937 to provide for greater freedom and safety of movement on the highway.

Various other safety features which have proven themselves on other construction are being incorporated in this project at intersec-

tions and at the transitions where the divided highway connects with the three-lane pavements at either end.

An important esthetic feature of the project consists in the preservation of the row of shade trees which line the west side of the existing road. As they grow larger these trees will not only beautify the dividing strip but will serve to shade the eyes of motorists traveling north

from the rays of the late afternoon sun and will to some extent lessen the headlight-glare at night from traffic traveling in both directions.

IMPORTANT TRAFFIC VOLUME

The divided section will connect at its southerly end with the three-lane pavement placed on the relocation of the Grapevine in 1935 and at its northerly end with the ten-mile

(Continued on page 28)



Looking south on Bakersfield-Grapevine Highway showing present road which is being converted into a four-lane divided highway.

Review of Accidents on Rural State Highways During 1937

By H. L. KILE, Assistant Safety Engineer

IN any attempt at numerical comparison of the motor vehicle accident records as between the current year and any preceding year we immediately become in a sense the victims of our own efforts.

It must be emphasized that only through the proper marshalling of all available facts surrounding the actual occurrence of these accidents can we hope to arrive at a solution of the problem. Every endeavor is therefore made to accumulate more and more data.

We know that in the past many accidents were not reported and that many occur now for which no report is made. However, the growing concern in all walks of life over traffic hazards, and the constant reiteration by those engaged in the search for remedies that we must have all the facts possible, is gradually bringing results.

BETTER COOPERATION

More accidents are being reported, not necessarily because more accidents are happening but because persons involved in these accidents are to a greater extent either submitting reports to the proper authorities or cooperating more fully with the traffic officers, whose complete and carefully prepared reports form an indispensable basis for intelligent study of the hazards of traffic.

Traffic accidents, for purposes of treatment or comment, are in general broadly grouped into three classes according to the gravity of the resulting consequences, as Fatal, Personal Injury, and Property Damage Only.

Provided always that the area under consideration is sufficiently large, and the period of time also sufficiently long, any increase or decrease in the number of fatal accidents for the same amount of travel provides the most accurate guide for comparison for the reason that where a death is involved there is little pos-

sibility that it will escape the attention of all of the many public agencies concerned.

The record of fatal accidents may be considered as being complete in any period and is therefore a reliable basis for comparisons if, as stated above, the data are adequately numerous.

The California Vehicle Code requires that in the event of any motor vehicle accident that results in either personal injury or death, the driver—or if the driver be disabled, another occupant of the vehicle—shall make or cause to be made a report of the same upon prescribed forms.

There is not much doubt that a

TABLE I—ACCIDENTS ON RURAL STATE HIGHWAYS IN 1937

Type	Number	Per Cent (1936 ages)	
Single Motor Vehicle Involved	2,579	29.61	30.97
Two or More Motor Vehicles Involved..	6,130	70.39	69.03
Total	8,709	100.00	100.00
Pedestrian also involved (included in above total).....	576	6.61	6.64

TABLE II—ACCIDENTS INVOLVING SINGLE MOTOR VEHICLES

Type	Number	Per Cent (1936 ages)	
Vehicle vs. Pedestrian	544	21.09	20.47
Vehicle vs. Pole or Tree	313	12.14	11.21
Vehicle vs. Bridge or Culvert	140	5.43	5.64
Vehicle vs. Guard Rail or Posts.....	75	2.91	3.92
Vehicle vs. Animal.....	98	3.80	3.37
Vehicle vs. Bicyclist	85	3.30	2.23
Miscellaneous Collision	199	7.72	9.35
Drove Off Road, Skidded, Turned Over	1,086	42.10	40.86
Miscellaneous Non-Collision	39	1.51	2.95
Total	2,579	100.00	100.00

considerable difference exists between the completeness of the record of personal injury accidents and that of fatal accidents. There is not only lack of knowledge of the legal requirements but also wide variation in the interpretation of how serious an injury must be before it is to be considered as reportable, and in addition there are those cases where reports are purposely left unmade and the chance taken that the omission will not be discovered.

Where such conditions prevail we may naturally expect that with increased pressure from many directions the total of such accidents reported will more nearly approach 100 per cent of those that occur and thus to such degree invalidate comparisons with preceding periods.

In the matter of accidents that result in property damage only, there is in California no legal obligation placed upon the driver to render an accident report. Fortunately, however, and primarily through the efforts of traffic officers, many of these accidents are reported and these reports serve to substantially augment the basic data essential to the determination of those traffic conditions and characteristics that most frequently result in accident.

COMPLETE DATA ESSENTIAL

There is little inherent difference between an accident which produces only property damage and one in which a driver, occupant, or pedestrian also suffers injury or perhaps death. In countless instances the finest thread of chance is all that separates one from the other. Naturally, we encourage in every way practicable the reporting of accidents, whether they be fatal, personal injury, or simply property damage, and make the widest use possible of all the data to be derived from each and every report submitted.

TABLE III—ACCIDENTS INVOLVING TWO OR MORE VEHICLES SHOWING COURSE BEING PURSUED AND LANE WIDTH OF ROADWAY.

Type of Accident by Course Being Pursued	NUMBER OF LANES														
	Two			Three			Four			Miscellaneous			Total		
	No.	%	1936	No.	%	1936	No.	%	1936	No.	%	1936	No.	%	1936
Overtaking.....	1,139	28.69	27.15	391	35.13	34.33	262	38.47	39.34	17	24.64	27.88	1,809	29.51	29.39
Approaching.....	1,926	45.14	46.46	375	33.69	33.06	146	21.44	20.88	8	11.59	34.62	2,455	40.05	41.83
Paths Intersecting— (On same road).....	674	15.80	14.18	216	19.41	19.59	132	19.38	19.12	17	24.64	23.08	1,039	16.95	15.67
Paths Intersecting— (Vehicles traveling different roads).....	496	11.62	11.15	126	11.32	11.29	135	19.83	17.36	27	39.13	10.58	784	12.79	11.70
Undetermined.....	32	0.75	1.06	5	0.45	1.73	6	0.88	3.30	---	---	3.84	43	0.70	1.41
Total.....	4,267	100	100	1,113	100	100	681	100	100	69	100	100	6,130	100	100

The total number of accidents on the rural portion of the State highway system in 1937 for which reports were received, was 8712, indicating an increase of 13.6 per cent over the 7665 reported in 1936. Considered alone, this might present a discouraging picture, since the traffic increase during the same period is estimated to be only 6.7 per cent. However, when we compare fatal accidents only for the two years, we find the increase on rural State highways to have been only 1.2 per cent, in face of a much larger percentage increase in traffic.

Being certain that the record of fatal accidents in both years is practically 100 per cent accurate, the situation then becomes one of encouragement; and instead of disappointment over the increase in total accidents of which we have record, there is the satisfaction of knowing we are acquiring a more complete and comprehensive set of accident facts. Through the increased number of accurate reports, we can better determine how to lessen the number of accidents that are occurring. And that of course is what we want to do.

As the records of accidents accumulate and their various character-

istics are segregated into definite groups and combinations, the patterns become more and more fixed and clearcut. Here, too, situations which on casual thought appear discouraging, are in fact cause for encouragement.

Persistent percentages, almost identical in every period analyzed, of various accident types do not mean that nothing can be done about it. Just the reverse, for if the patterns were constantly changing the effort to reduce the hazards would simply lead to bewilderment.

Constantly recurring patterns point directly to those things that require treatment. What that treatment is to be, very likely is not immediately apparent; but with the problem definitely set up, a long step has been taken toward its solution.

Some tables are presented to show a few of the major groups into which the accidents reported as occurring on the rural State highways may be most easily reviewed. The comparable percentages for 1936 are also shown. The manner in which the two so closely parallel each other more firmly establishes the validity of the patterns outlined. These show where efforts must be concentrated.

SINGLE CAR TYPE

A primary division of all accidents between those in which a single motor vehicle is involved and those where more than one car must be considered, is particularly desirable. In those cases where a second vehicle was not present to contribute either directly or indirectly toward the accident, the matter of traffic as the word is ordinarily used need not be taken into account.

On the other hand, where two or more cars are involved, the question of traffic with all of its varied elements becomes of paramount importance. Intelligent study of such accidents can only be made when there is also available definite and detailed traffic data.

Table I presents the accident pattern covering these two general types of accidents and reveals how fixed the percentages appear to be. A third category is shown, representing the percentage of pedestrian accidents. In the very large majority of instances, pedestrian accidents involve only a single motor vehicle.

Table II shows the breakdown of the single-car accidents into the principal types reported. Here again one

(Continued on page 16)

TABLE IV—GENERAL GROUPING OF CAUSES REPORTED AS CONTRIBUTING TO SINGLE-CAR AND TWO-OR-MORE-CAR ACCIDENTS

GROUP	SINGLE CAR			TWO OR MORE CARS			TOTAL		
	No. of Times Reported	% of Total Causes	1936 Percentages	No. of Times Reported	% of Total Causes	1936 Percentages	No. of Times Reported	% of Total Causes	1936 Percentages
Condition of Vehicle.....	402	12.03	12.94	458	4.81	6.20	860	6.68	8.14
Condition of Driver.....	891	26.86	24.87	1,697	17.82	21.94	2,588	20.11	22.78
Speed Excessive for Conditions.....	828	24.78	22.25	1,286	13.50	12.83	2,114	16.43	15.53
Violation of Right of Way.....	155	4.64	9.84	5,251	55.13	51.80	5,406	42.02	39.74
Roadway.....	331	9.90	8.82	524	5.50	6.00	855	6.65	6.76
Pedestrian Involved.....	542	16.22	16.95	19	0.20	0.32	561	4.36	5.10
Miscellaneous or Undetermined.....	193	5.77	4.63	290	3.04	0.91	483	3.76	1.95
Total.....	3,342	100	100	9,525	100	100	12,867	100	100

Note: Total causes reported are in excess of the total number of accidents because of the fact that in many cases more than one cause is reported as contributing to the accident.

HIGHWAY SOIL STUDIES

By THOMAS E. STANTON, Jr., Materials and Research Engineer

The following article comprises the first part of a paper prepared and presented at a recent meeting of the San Diego County Engineers Association. The second part will appear in a later issue of this magazine.

THE study of soils is by no means a new science, but methods of obtaining accurate information regarding the bearing value and other factors affecting the suitability of the various type soils for road and building foundations and highway subgrades and surfaces are of comparatively recent development.

The performance of soils depends upon the character and grading of the constituents. To determine these characteristics a large number of tests has been devised, only a limited number of which, however, are current routine practice at the Laboratory of the Materials and Research Department of the California Division of Highways.

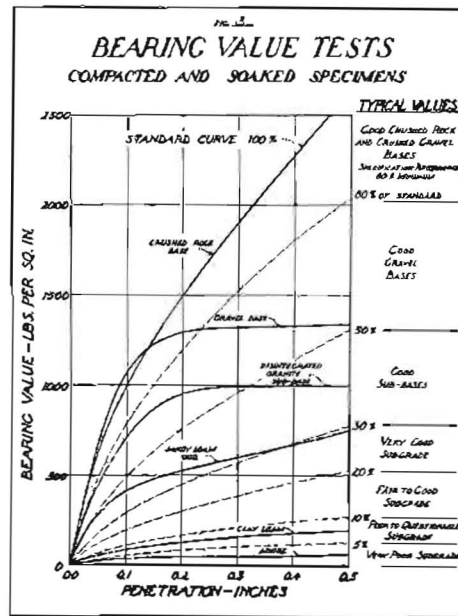
Some of the more common soil tests are the determination of plastic limit, liquid limit, centrifuge moisture equivalent, shrinkage limit, shrinkage ratio, unit weight, void content, moisture content, grain size, mineral composition, consolidation, cohesive strength, angle of internal friction bearing value, and swell.

SIMPLE METHODS FOLLOWED

A complete description of the various identification tests for subgrade soils can be found in a "Report on Subgrade Soil Studies" by the U. S. Bureau of Public Roads, "Public Roads," June to October, 1931.

Consolidation and shear tests are made by California in connection with major foundation investigations for structures and heavy fills. These determinations are necessary to estimate the probable extent and rate of settlement of compressible soils and their resistance to displacement. The methods are also applicable to research studies of subgrade and embankment soils, but the test procedures are not at present sufficiently simplified to be practical for testing thousands of samples yearly.

Due to the large number of soil samples to be tested, our routine methods must be as simple and economical as possible and still furnish



sufficient information to properly evaluate subgrade, embankment, and base materials in relation to their probable roadway performance.

We usually test for field moisture equivalent, lineal shrinkage, cementing value, bearing value, swell and relative compaction.

Chemical tests are also made to detect the presence of injurious salts such as some of the alkalis.

Field moisture equivalent and lineal shrinkage tests assist in identifying soils and estimating probable reduction in volume on drying. These tests are useful as simple field determinations for detecting poor materials. Soils showing a lineal shrinkage value of more than 5 per cent usually consist of heavy clay or adobe, unsuitable for use in the upper portion of embankments or subgrade. Clays having shrinkage values of 3 per cent to 5 per cent may be of a sandy or silty nature requiring a sub-base reinforcement of normal thickness under the pavement surface.

Cementing value tests determine the degree to which a material will

bind and compact under watering and rolling.

The bearing value and swell tests are for the purpose of determining the two most important subgrade properties affecting pavement service, namely, the resistance to displacement under moist to wet conditions and the volume increase and uplift resulting from absorption of moisture subsequent to construction.

The favorable correlation between test data and field service is one of the principal reasons for the continued use of these tests in lieu of practice which is based largely on analyses of the minus 40-mesh particles. We prefer methods that tend to directly measure the basic physical properties of the combined material as used in the work.

Our bearing value and swell tests as adopted in 1930 are suitable for testing both base and subgrade materials including all of the coarse sand and rock particles up to 1 inch in size. With portable equipment, the tests can also be made locally in the field or in district laboratories, if desired.

Test results indicate that clays, adobes, and other adverse soils usually have a good supporting value when in a thoroughly compacted and relatively dry state. This ideal condition, however, does not maintain over a period of years. Such material usually absorbs sufficient moisture from rainfall, ground water, or by capillarity, to cause expansion and as a consequence of the increase in water content, the soil often reaches a state of compaction and wetness comparable with the soaked specimens in our standard bearing value test.

MINIMUM BEARING VALUE

A net bearing value requirement of "Not less than eighty (80) per cent" of standard for untreated crushed rock surfacing and crusher run base is included in the Standard Specifications. Special provision requirements for pit run gravel base, imported selected subbase material, and im-

SHOWING COMPACTION OUTFIT FOR DETERMINATION OF OPTIMUM MOISTURE

AS DEVELOPED BY
O. J. PORTER - CALIF. DIVISION OF HIGHWAYS IN 1929

METHOD

SAMPLE MOISTENED AND
COMPACTED IN 5 LAYERS WITH
20-18" FREE DROPS PER LAYER.

PISTON PLACED ON TOP OF
LAST LAYER AND SEATED BY
5-18" FREE DROPS OF TAMPER.

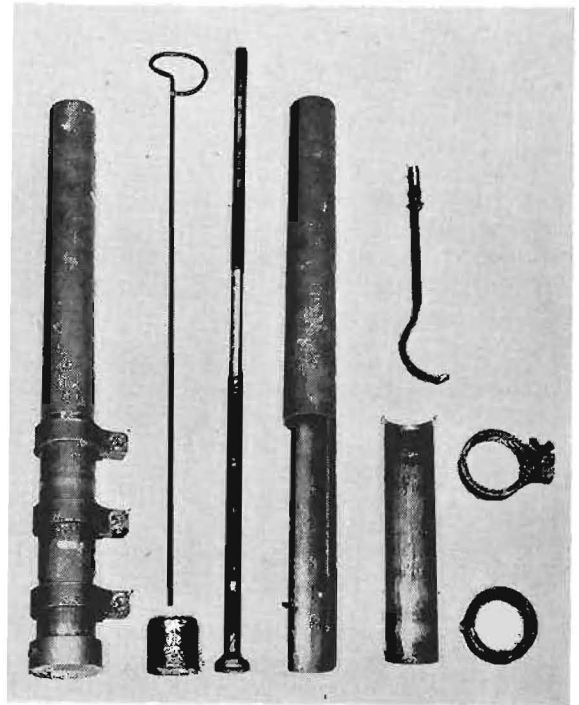
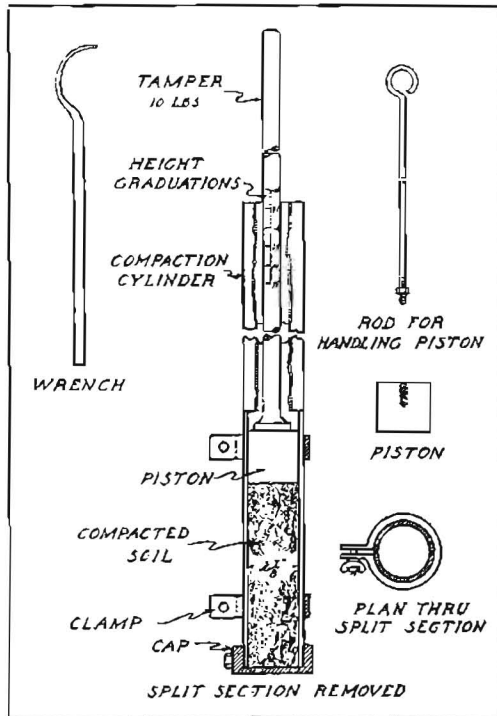
HEIGHT OF COMPACTED SPECIMEN
READ FROM TAMPING ROD AT POINT
LEVEL WITH TOP OF CYLINDER

DRY WT. PER CU. FT. OF COMPACTED
SPECIMEN COMPUTED.

OPTIMUM MOISTURE CONTENT IS
PERCENT OF WATER BY WT. REQUIR-
ED TO OBTAIN MAXIMUM DENSITY.

THE DRY WT. PER CU. FT., COMPACTED
AT OPTIMUM MOISTURE CONTENT, IS
USED AS A STANDARD IN DETERMIN-
ING RELATIVE COMPACTION OF
SOIL IN PLACE

RELATIVE COMPACTION: $\frac{W \times 100}{W_1}$
 W : DRY WT./CU. FT. IN PLACE.
 W_1 : DRY WT./CU. FT. COMPACTED.



ported borrow are varied considerably to fit project conditions and to obtain the best material economically available. For different projects, however, the minimum net bearing value may be set within the following ranges:

Pit run gravel bases and sub-bases	40% to 60%
Imported selected subbase material	20% to 60%
Imported borrow	10% to 30%

Standard practice calls for the rejection of unsuitable soils, having low bearing value and high swell characteristics, in the top layers of roadway embankments and subgrades. It is frequently impracticable and uneconomical, however, to avoid using poor materials in the construction of the main body of embankments and this fact combined with necessity for securing the greatest practicable consolidation of the embankment as constructed was the occasion of studies started by this department in 1929 from which was developed the theory

of optimum moisture content for soils and construction procedure under which our embankments are now being constructed to in excess of 90 per cent of the greatest theoretical density with a given soil.

By optimum moisture in consolidating soils is meant that percentage of moisture which is just sufficient to permit of maximum consolidation under standard construction practice.

Any excess of moisture above the optimum results in excess water voids and consequent lower density.

The first work along this line was done by the California Division of Highways in 1929 when an extensive series of tests was conducted from which was developed field equipment and methods of consolidating soil samples to determine optimum moisture requirements before construction

TYPICAL RESULTS OF BEARING VALUE AND SWELL TESTS

Type of material	Minimum bearing value per cent	Swell per cent
Untreated surfacing—all crushed.....	90 to 150	0 to 1
Good crusher run bases—50% or more crushed..	80 to 120	0 to 2
Good gravel bases—uncrushed.....	40 to 80	0 to 2
Good disintegrated granite.....	30 to 60	0 to 2
Pit run gravel—poorly graded.....	10 to 40	0 to 3
Sandy-clay mixture—well graded.....	15 to 40	0 to 3
Clay—sandy	5 to 15	3 to 6
Heavy clay and adobe... ..	1 to 5	6 to 20

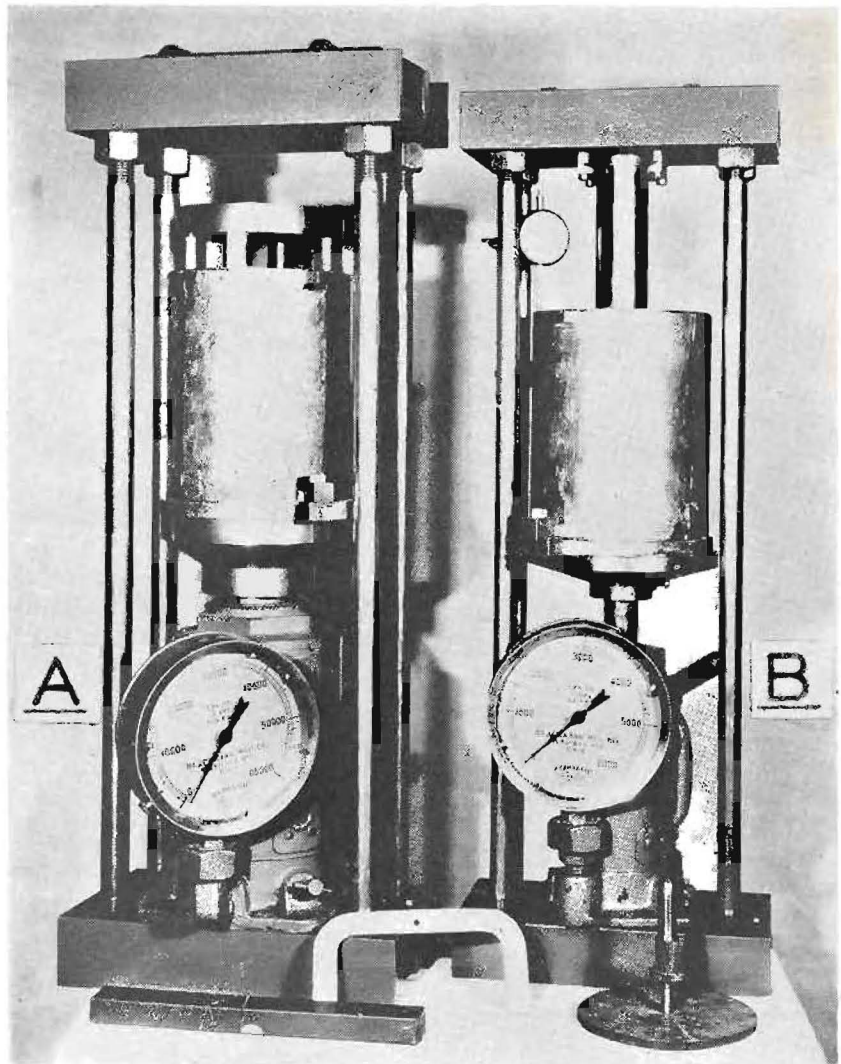
and subsequently the relative compaction of the completed embankment. This procedure and equipment was adopted as standard in August, 1929, and has been in use without substantial change to the present date.

About 1933 the engineers of the bureau of water works and supply of the city of Los Angeles conducted a similar study, the results of which were described in a series of articles by R. R. Proctor, field engineer of the bureau, published in several issues of *Engineering News-Record*, beginning August 31, 1933.

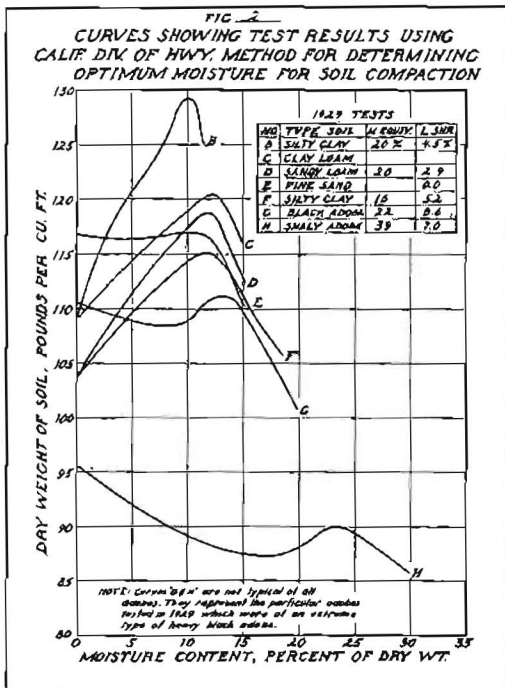
Proctor describes a field consolidation outfit somewhat different from the California Division of Highways equipment but using similar consolidation procedure.

SOIL NEEDLE DESCRIBED

In addition to the consolidation equipment, Proctor developed a method of testing consolidation in place by means of an instrument known as the "soil-plasticity needle" devised to measure soil plasticity in terms of the pressure required to force a rod with a slightly enlarged bearing surface to penetrate the soil at a rate of about 1/2 inch per second. For convenience in hand operation rods of various sizes, usually referred to as needles, are used to keep the applied pressures between 5 and 100 lbs. The pressures are expressed in pounds per square inch on the penetrating area and are known as the plasticity-



Hydraulic jacks compression testing assemblies. A—For consolidating soil sample. B—For bearing test.



needle penetration resistances or the plasticity needle readings.

The very excellent series of articles by Proctor describe the application of the method to the design and construction of rolled earth dams and further describe construction methods of compacting soils so that they will be sufficiently watertight and will not become soft and unstable if completely saturated with water. He points out that the effect of the moisture content of a soil upon the density to which it may be compacted is the most important principle of soil compaction.

This department has never used the penetration needle for control purposes primarily for the reason that it is not deemed practicable for this purpose in the construction of highway embankments where there is considerable variation in grading of the

fill material and considerable coarse aggregate near the surface which will vitally affect the results as determined by the penetration of the needle.

(To be concluded next month.)

CARS ENTERING STATE AVERAGE TWO A MINUTE

Entering the state in a steady stream at an average rate of about two cars each minute of the year, motor tourists established new records for California during 1937, according to official figures reaching the Automobile Club of Southern California touring bureau.

Final tallies revealed that 946,434 passenger cars with 2,588,435 passengers entered the state at the various border stations during 1937.

State Using New Type of Double Line on Crests of Grades

**PASSING PERMITTED
IF YELLOW LINE IN
YOUR LANE**

THIS is a roadside sign motorists in California are beginning to frequently observe as a result of experiments by the State Division of Highways to determine the best type of double line to be used on California highways to prevent passing on grades. The Division has adopted the use of a yellow line placed over one line of the double white stripe.

The original marking at points of limited visibility of sight distance on

passing the slow moving vehicles ahead of them.

EXPERIMENTS MADE

In passing such slow moving vehicles on the descending grade, it was necessary to cross over the double white line, the signs reading, "NO PASSING OVER DOUBLE LINE." In order to meet this situation and follow the policy used in all signing, that is, "to give the correct information at all times with no signs to bluff the motorist," the Division of Highways began experiments to determine the best method to quickly advise the motorist that passing on down grade or at the end of horizontal curves was permitted.

The methods used elsewhere were

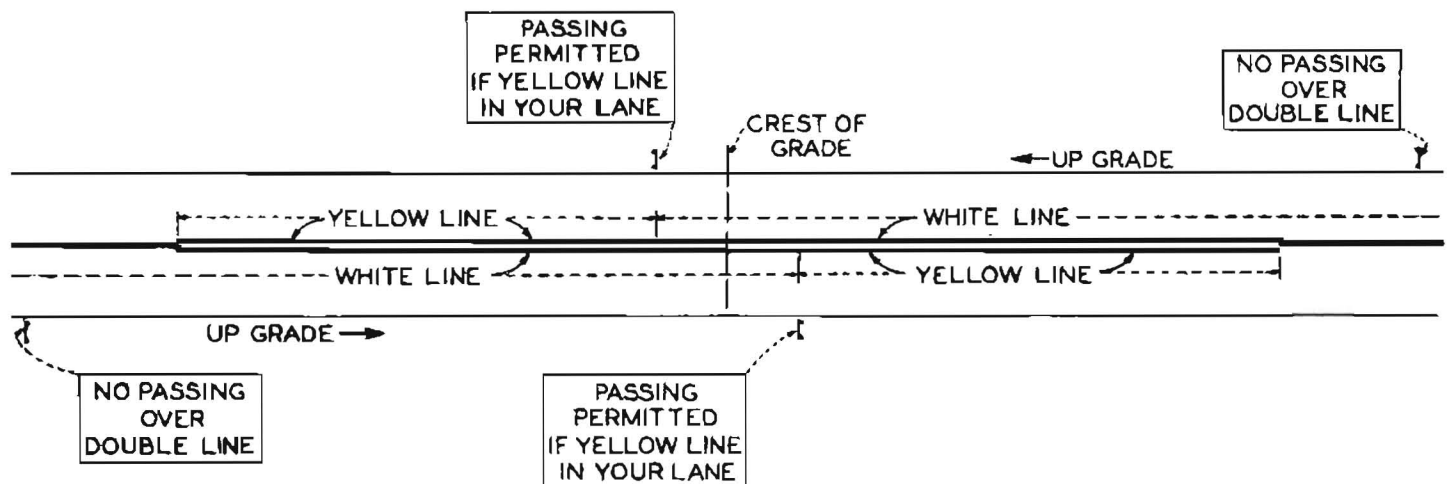
to pass if it is safe to do so, but it continues the use of the double line, and if any confusion exists as to whether it is a double white line or a white and yellow line, and the motorist does not pass, he will always be on the safe side.

At those locations where the visibility is restricted and the passing might be dangerous, the double white line will continue to be used.

NEW SIGNS

On three lane highways, the double striping at crests of grade to give one lane up two lane down, will continue as it is now used.

Signs reading, "PASSING PERMITTED IF YELLOW LINE IN YOUR LANE" will be positioned at



two-lane pavements with the "NO PASSING OVER DOUBLE LINE" signs and corresponding white double lines, restricted traffic to the use of only one lane for the entire length of the double stripe. The observance of this double line was excellent. Motorists recognized that it was placed on these crests and horizontal curves, where the visibility was limited, for their benefit. However, when they had passed the crest, under the terms of the Vehicle Code, if the way was clear there was no reason why they should not pass over the double line and continue on the descending grade,

studied and tried out. From the results of these experiments, the yellow line was selected and is now being placed over one line of the double stripe, beginning at the crest of a grade and continuing on the descending grade to the end of the double line.

WHEN PASSING IS PERMITTED

Signs are also being placed at the point of beginning of the yellow line, advising the motorist that passing is permitted if the yellow line is in his lane. This method of marking not only gives the motorist the permission

the crest near the beginning of the yellow line.

The Division of Highways appreciates the observance given the warning and regulatory signs by the motorist, and will continue to correct any wrong information or regulation so the motorist will be assured that all signs mean just what they say.

"Halt!" cried the young rookie on his first sentry-go. The major halted.

"Halt!" the rookie cried again.

"I've halted," snapped the major. "What of it?"

"Well," faltered the rookie, "in the manual it says, 'Say halt three times, then shoot!'"

State Highway Accidents in 1937

(Continued from page 11)

sees how little is the change in percentages of total between the two years.

SIMILARITY APPARENT

In Table III we have given not only the major types of two-or-more-car accidents as represented by the course of the vehicles but have also shown the apparent influence of the various lane widths upon the accident pattern. A glance at this table brings out the remarkable similarity which exists between 1937 and 1936, not alone for the total but for each separate lane-width type.

The first three tables deal with accident types. In Table IV are shown the "general cause groups," being a compilation of all causes reported as having been contributing influences in the occurrence of all the various types of accidents. No claim is to be made that all causes are in every case reported. Many may be so obscure as to escape attention of even skilled investigators. But all evident causes are taken into account and the importance of each individual cause may to a large degree be determined by the frequency of its appearance over a period of time. The general groups listed in this table reveal the same tendency to follow a fixed pattern as that shown in the case of accident types.

While no attempt has been made in this presentation to prescribe the various remedies necessary, it is thought that by demonstrating factually just what the accident patterns are on our rural State highways, all interested groups can more intelligently cooperate in their efforts to lessen the hazards that confront all of us.

the completion of negotiations for acquisition of necessary water rights and rights of way. It is possible that 1938 will also see the beginning of construction work on one or more of these other units. The general plans have been prepared and approved for Friant Dam; and final locations have been made covering a considerable length of the canals so that the work could be advertised for bids soon after right of way and water right matters are disposed of satisfactorily.



Construction view of Contra Costa Conduit showing syphon under county road and earth canal east of Oakley.

SHASTA DAM BIDS OPENED

(Continued from page 3)

present river level. Preliminary surveys have been made for the relocation of the State highway (U. S. Route 99) and plans are being prepared by the State Division of Highways.

Preparations are well advanced for starting work on Shasta Dam. Construction under contracts let last year is nearing completion on a government camp situated about 2 miles southeasterly of the dam site. This will house the government's forces engaged on the dam and related works. Independent camp facilities will be built by the contractor at a location yet to be selected.

In order to expedite the construction work at the dam prior to the completion of the permanent railroad relocation to replace the present line along the Sacramento River Canyon passing through the dam site, a tunnel will be constructed about 1600 feet long around the right or westerly abutment of the dam to temporarily by-pass the railroad. A contract for this by-pass tunnel was awarded to the Colonial Construction Company of Spokane, Washington, on May 11, 1938. Work thereon is expected to begin shortly and to be completed for railway traffic early in 1939. In the meantime, preparations for starting work on the permanent railroad relocation are progressing.

Commissioner of Reclamation John C. Page has announced that, barring unforeseen difficulties in making an award, work on the dam proper can

be started in August. Thus, nearly 20 years after the possibility of a storage reservoir at the Shasta site was originally conceived, work should be actively underway to transform a dream into a reality.

CONSTRUCTION ON CONTRA COSTA CONDUIT

The first actual construction on the Central Valley Project got under way in October, 1937, when work was started on the initial four-mile section of the Contra Costa Conduit. This initial section is now nearly 80 per cent completed. It is an open unlined earth canal extending from the intake at the westerly end of Rock Slough to the first pumping lift near Oakley, with four reinforced concrete siphons to carry the water under highways and drains.

Bids were opened on May 20, 1938, for an additional eight-mile section of this conduit which will consist chiefly of an open concrete-lined canal, but also one tunnel 1360 feet in length and numerous structures. Seventeen bids were received, the lowest of which was submitted by Pearson, Minnis and Moody and Werner and Webb of Los Angeles, at \$340,992. These bids are now being studied and it is anticipated that an award will be made shortly.

PROGRESS ON REMAINDER OF PROJECT

Start of construction on the remaining units of the Central Valley Project including Friant Dam, the Madera and Friant-Kern canals and the San Joaquin Pumping System, awaits

Cities Get \$7,790,000 Gas Tax for Year Ending June 30, 1938

By L. V. CAMPBELL, Engineer of City and Cooperative Projects

GASOLINE tax allocations for expenditure within the cities of California for the fiscal year ending June 30, 1938, will approximate \$7,790,000. For streets of major importance the apportionment represents the net amount of 1/4c per gallon tax, which amounts to \$3,896,814.22. An equal amount was apportioned for expenditure upon state highway routes within cities.

These gasoline tax allocations to cities result from legislation passed in the 1933 and 1935 session of the state legislature. The State Highway Department's fiscal year ends on June 30, but since the April quarterly apportionment is the last apportionment to be made before that date, the revenue for the fiscal year can be determined upon receipt of the April apportionment.

The fiscal year figures below represent the quarters of July, 1937, October, 1937, January, 1938, and April, 1938. In accordance with a ruling of the Department of Finance, revenue is considered to fall within the fiscal year in which it is paid into the State Highway Fund and becomes available for expenditure by the Division of Highways.

The July apportionment, while considered as coming within the next fiscal year, actually represents collections of the gasoline tax paid into the State Treasury during the months of April, May and June. As the money is not apportioned by the State Controller until July, at which time it becomes available for expenditure, it is considered as revenue of the next fiscal year.

There follows here the final apportionment for each city in California for the fiscal year 1938 and a revised estimate for the fiscal year 1939.

District I

CITY AND COUNTY	STREETS OF MAJOR IMPORTANCE STATE HIGHWAYS		
	Fiscal Year Ending June 30, 1938	Fiscal Year Ending June 30, 1939	Biennium Ending 1937-39
Del Norte			
Crescent City	\$1,559.21	\$1,590	\$3,150
Humboldt			
Arcata	\$1,549.25	\$1,580	\$3,130
Blue Lake	503.11	510	1,010
Eureka	14,279.53	14,650	28,930
Ferndale	805.90	820	1,730
Fortuna	1,123.18	1,150	2,270
Trinidad	97.01	90	190
Totals	\$18,357.98	\$18,800	\$37,260
Lake			
Lakeport	\$1,194.80	\$1,220	\$2,420
Mendocino			
Fort Bragg	\$2,739.51	\$2,810	\$5,550
Point Arena	349.02	350	700
Ukiah	2,831.97	2,900	5,730
Willits	1,290.89	1,320	2,610
Totals	\$7,211.39	\$7,380	\$14,590
Totals District I.....	\$28,323.38	\$28,990	\$57,420

District II

Lassen			
Susanville	\$1,231.06	\$1,260	\$2,490
Modoc			
Alturas	\$2,119.45	\$2,170	\$4,290
Shasta			
Redding	\$3,796.51	\$3,890	\$7,690
Siskiyou			
Dorris	\$690.77	\$700	\$1,390
Dunsmuir	2,366.01	2,420	4,790

District II—Continued

CITY AND COUNTY	STREETS OF MAJOR IMPORTANCE STATE HIGHWAYS		
	Fiscal Year Ending June 30, 1938	Fiscal Year Ending June 30, 1939	Biennium Ending 1937-39
Etna	\$343.57	\$350	\$690
Fort Jones	273.78	280	550
Montague	459.61	470	930
Mt. Shasta	938.93	980	1,920
Tulelake	271.96	270	550
Yreka	1,995.25	2,040	4,040
Totals	\$7,339.88	\$7,510	\$14,880
Tehama			
Corning	\$1,248.28	\$1,280	\$2,520
Red Bluff	3,188.24	3,270	6,450
Tehama	172.24	170	340
Totals	\$4,608.76	\$4,720	\$9,310
Totals District II.....	\$19,095.66	\$19,550	\$38,640

District III

Butte			
Biggs	\$419.72	\$430	\$850
Chico	7,218.81	7,400	14,820
Gridley	1,759.57	1,800	3,680
Oroville	3,352.33	3,430	6,790
Totals	\$12,748.43	\$13,060	\$25,820
Colusa			
Colusa	\$1,918.21	\$1,960	\$3,880
Williams	787.76	800	1,590
Totals	\$2,705.97	\$2,760	\$5,470

Gasoline Tax Apportionments to Cities

District III—Continued

District IV—Continued

CITY AND COUNTY	STREETS OF MAJOR IMPORTANCE STATE HIGHWAYS		
	Fiscal Year Ending June 30, 1938	Fiscal Year Ending June 30, 1939	Biennium Ending 1937-39
El Dorado			
Placerville	\$2,145.74	\$2,200	\$4,340
Glenn			
Orland	\$1,083.30	\$1,110	\$2,190
Willows	1,834.79	1,880	3,710
Totals	\$2,918.09	\$2,990	\$5,900
Nevada			
Grass Valley	\$3,460.19	\$3,660	\$7,010
Nevada City	1,542.00	1,580	3,120
Totals	\$5,002.19	\$5,130	\$10,130
Placer			
Auburn	\$2,412.27	\$2,470	\$4,880
Colfax	826.75	840	1,670
Lincoln	1,898.26	1,940	3,840
Rocklin	656.31	670	1,320
Roseville	5,824.39	5,970	11,800
Totals	\$11,617.98	\$11,890	\$23,510
Sacramento			
North Sacramento	\$1,900.98	\$1,950	\$3,850
Sacramento	84,986.46	87,200	172,190
Totals	\$86,887.44	\$89,150	\$176,040
Sierra			
Loyalton	\$758.76	\$770	\$1,530
Sutter			
Yuba City	\$3,268.01	\$3,350	\$6,620
Yolo			
Davis	\$1,126.81	\$1,150	\$2,280
Winters	812.25	830	1,640
Woodland	5,052.46	5,180	10,240
Totals	\$6,991.52	\$7,160	\$14,160
Yuba			
Marysville	\$5,224.28	\$5,360	\$10,580
Wheatland	434.23	440	870
Totals	\$5,658.51	\$5,800	\$11,460
Totals District III	\$140,702.64	\$144,260	\$284,970

CITY AND COUNTY	STREETS OF MAJOR IMPORTANCE STATE HIGHWAYS		
	Fiscal Year Ending June 30, 1938	Fiscal Year Ending June 30, 1939	Biennium Ending 1937-39
El Cerrito	\$3,508.24	\$3,590	\$7,100
Hercules	355.36	360	710
Martinez	6,870.85	7,360	14,030
Pinola	707.99	720	1,430
Pittsburg	8,711.67	8,930	17,650
Richmond	18,301.78	18,770	37,080
Walnut Creek	919.21	940	1,860
Totals	\$44,281.54	\$45,900	\$90,190
Marin			
Belvedere	\$463.27	\$460	\$910
Corte Madera	930.99	950	1,880
Fairfax	2,651.57	2,720	5,370
Larkspur	1,125.00	1,150	2,270
Mill Valley	3,774.76	3,870	7,640
Ross	1,228.34	1,260	2,480
San Anselmo	4,215.33	4,320	8,540
San Rafael	7,272.12	7,460	14,730
Sausalito	3,324.21	3,410	6,730
Totals	\$24,975.59	\$25,600	\$50,560
Napa			
Calistoga	\$906.51	\$930	\$1,830
Napa	5,835.28	5,980	11,820
St. Helena	1,434.13	1,470	2,900
Totals	\$8,175.92	\$8,380	\$16,550
San Francisco			
San Francisco	\$575,092.25	\$590,090	\$1,165,180
San Mateo			
Atherton	\$1,200.23	\$1,230	\$2,430
Bay Shore	1,041.60	1,060	2,110
Belmont	905.61	920	1,830
Burlingame	12,029.54	12,340	24,370
Daly City	7,648.51	7,840	15,490
Hillsborough	1,714.24	1,750	3,470
Lindvale	334.50	340	670
Menlo Park	2,043.32	2,090	4,130
Redwood City	8,124.26	8,330	16,460
San Bruno	3,272.54	3,350	6,630
San Carlos	1,026.18	1,050	2,070
San Mateo	12,198.17	12,510	24,710
South San Francisco	5,614.09	5,760	11,370
Totals	\$57,150.78	\$58,570	\$115,740
Santa Clara			
Alviso	\$345.37	\$350	\$690
Gilroy	3,174.63	3,250	6,430
Los Gatos	2,871.87	2,940	5,810
Morgan Hill	823.12	840	1,660
Mountain View	2,998.78	3,070	6,070
Palo Alto	12,541.73	12,860	25,410
San Jose	56,224.33	57,690	113,910
Santa Clara	5,712.91	5,860	11,570
Sunnyvale	2,804.79	2,870	5,680
Totals	\$87,497.53	\$89,730	\$177,230
Santa Cruz			
Santa Cruz	\$13,049.40	\$13,380	\$26,430
Watsonville	7,833.26	8,030	15,870
Totals	\$20,882.66	\$21,410	\$42,300
Sonoma			
Cloverdale	\$688.05	\$700	\$1,390
Healdsburg	2,081.36	2,130	4,210
Petaluma	7,474.28	7,660	15,140

District IV

CITY AND COUNTY	STREETS OF MAJOR IMPORTANCE STATE HIGHWAYS		
	Fiscal Year Ending June 30, 1938	Fiscal Year Ending June 30, 1939	Biennium Ending 1937-39
Alameda			
Alameda	\$31,758.20	\$32,580	\$64,340
Albany	7,768.00	7,970	15,730
Berkeley	74,433.63	76,370	150,800
Emeryville	2,117.64	2,170	4,290
Hayward	5,013.07	5,140	10,150
Livermore	2,827.43	2,900	5,720
Oakland	257,509.42	264,220	521,730
Piedmont	8,460.57	8,680	17,140
Pleasanton	1,121.37	1,150	2,270
San Leandro	10,384.21	10,650	21,030
Totals	\$401,393.54	\$411,830	\$813,200
Contra Costa			
Antioch	\$4,086.60	\$4,190	\$8,270
Concord	1,019.84	1,040	2,060

for Fiscal Year Ending June 30, 1938

District IV—Continued

CITY AND COUNTY	STREETS OF MAJOR IMPORTANCE		STATE HIGHWAYS
	Fiscal Year Ending June 30, 1938	Fiscal Year Ending June 30, 1939	Biennium Ending 1937-39
Santa Rosa	\$9,641.78	\$9,890	\$19,530
Sebastopol	1,697.30	1,630	3,230
Sonoma	888.39	910	1,790
Totals	\$22,371.16	\$22,920	\$45,290
Totals District IV.....	\$1,241,820.97	\$1,274,430	\$2,516,230

District V

Monterey			
Carmel	\$2,048.73	\$2,100	\$4,150
King City	1,344.38	1,370	2,720
Monterey	8,286.62	8,500	16,780
Pacific Grove	5,038.46	5,160	10,200
Salinas	9,485.84	9,730	19,210
Soledad	638.49	550	1,090
Totals	\$26,742.41	\$27,410	\$54,150
San Benito			
Hollister	\$3,405.80	\$3,490	\$6,900
San Juan Bautista	699.84	710	1,410
Totals	\$4,105.64	\$4,200	\$8,310
San Luis Obispo			
Arroyo Grande	\$808.60	\$820	\$1,630
Paso Robles	2,332.48	2,390	4,720
San Luis Obispo	7,502.38	7,690	16,200
Totals	\$10,643.46	\$10,900	\$21,550
Santa Barbara			
Lompoc	\$2,579.06	\$2,640	\$5,220
Santa Barbara	30,470.93	31,260	61,730
Santa Maria	6,397.33	6,560	12,960
Totals	\$39,447.32	\$40,460	\$79,910
Totals District V.....	\$80,938.83	\$82,970	\$163,920

District VI

Fresno			
Coalinga	\$2,584.51	\$2,650	\$5,230
Clovis	1,192.98	1,220	2,410
Firebaugh	458.70	470	920
Fowler	1,081.55	1,080	2,150
Fresno	47,933.27	49,180	97,110
Kingsburg	1,198.43	1,220	2,420
Parlier	511.28	520	1,030
Reedley	2,346.99	2,400	4,750
Sanger	2,689.64	2,750	5,440
San Joaquin	147.76	150	290
Selma	2,762.16	2,830	5,590
Totals	\$62,887.27	\$64,470	\$127,240
Kern			
Bakersfield	\$23,583.17	\$24,190	\$47,780
Delano	2,385.97	2,440	4,830
Maricopa	970.89	990	1,960
Shafter	266.96	1,170	1,440
Taft	3,120.26	3,200	6,320
Tehachapi	687.19	680	1,350
Totals	\$30,994.44	\$32,670	\$63,680
Kings			
Corcoran	\$1,602.74	\$1,640	\$3,240
Hanford	6,371.04	6,530	12,900

District VI—Continued

CITY AND COUNTY	STREETS OF MAJOR IMPORTANCE		STATE HIGHWAYS
	Fiscal Year Ending June 30, 1938	Fiscal Year Ending June 30, 1939	Biennium Ending 1937-39
Lamoore	\$1,268.22	\$1,300	\$2,560
Totals	\$9,242.00	\$9,470	\$18,700
Madera			
Chowchilla	\$767.82	\$780	\$1,550
Madera	4,228.92	4,330	8,660
Totals	\$4,996.74	\$5,110	\$10,210
Tulare			
Dinuba	\$2,690.66	\$2,760	\$5,450
Exeter	2,434.02	2,490	4,930
Lindsay	3,515.49	3,600	7,120
Porterville	4,807.29	4,930	9,740
Tulare	5,626.77	5,770	11,400
Visalia	6,584.08	6,750	13,330
Totals	\$25,658.21	\$26,300	\$51,970
Totals District VI.....	\$133,778.66	\$138,020	\$271,900

District VII

Los Angeles			
Alhambra	\$26,717.03	\$27,410	\$54,130
Arcadia	4,728.41	4,850	9,580
Avalon	1,719.67	1,760	3,480
Azusa	4,358.56	4,470	8,830
Bell	7,147.02	7,330	14,480
Beverly Hills	15,799.78	16,210	32,000
Burbank	15,104.47	15,490	30,600
Compton	11,346.03	11,640	22,980
Covina	2,514.69	2,580	5,090
Culver City	5,139.08	5,270	10,410
Claremont	2,464.84	2,520	4,990
El Monte	3,153.79	3,230	6,380
El Segundo	3,175.54	3,250	6,430
Gardena	6,386.54	6,550	12,930
Glendale	56,871.57	58,350	115,220
Glendora	2,502.91	2,560	5,070
Hawthorne	5,979.42	6,130	12,110
Hermosa Beach	4,347.68	4,460	8,800
Huntington Park	22,292.29	22,870	45,160
Inglewood	19,418.61	19,920	39,340
La Verne	2,592.65	2,660	5,250
Long Beach	129,231.99	132,620	261,850
Los Angeles	1,124,608.81	1,153,940	2,278,550
Lynwood	6,638.45	6,810	13,450
Manhattan Beach	1,714.24	1,750	3,470
Maywood	6,158.91	6,310	12,470
Monrovia	9,872.03	10,120	20,000
Montebello	4,984.06	5,110	10,090
Monterey Park	5,807.19	5,950	11,760
Pasadena	69,223.85	71,020	140,250
Pomona	18,859.29	19,350	38,210
Redondo Beach	8,473.27	8,690	17,160
San Fernando	6,859.65	7,030	13,890
San Gabriel	6,616.70	6,780	13,400
San Marino	3,381.32	3,460	6,850
Santa Monica	33,673.68	34,550	68,220
Sierra Madre	3,218.16	3,300	6,520
Signal Hill	2,657.93	2,720	5,380
South Gate	17,796.85	18,260	36,050
South Pasadena	12,446.55	12,770	25,210
Torrance	8,008.20	8,210	16,220
Vernon	1,150.38	1,180	2,330
West Covina	868.11	920	1,790
Whittier	13,458.23	13,800	27,260
Totals	\$1,719,467.43	\$1,764,160	\$3,483,640

District VII—Continued

CITY AND COUNTY	STREETS OF MAJOR IMPORTANCE STATE HIGHWAYS		
	Fiscal Year Ending June 30, 1938	Fiscal Year Ending June 30, 1939	Biennium Ending 1937-39
Orange			
Anaheim	\$9,983.53	\$10,240	\$20,220
Brea	2,207.38	2,260	4,470
Fullerton	9,844.84	10,100	19,940
Huntington Beach	3,345.08	3,430	6,770
Laguna Beach	1,795.82	1,840	3,630
La Habra	2,060.53	2,110	4,170
Newport Beach	1,997.06	2,040	4,040
Orange	7,312.01	7,500	14,810
Piacentia	1,455.87	1,490	2,940
San Clemente	604.65	620	1,220
Santa Ana	27,487.56	28,200	55,690
Seal Beach	1,047.94	1,070	2,120
Tustin	839.43	860	1,700
Totals	\$69,981.70	\$71,760	\$141,720
Ventura			
Fillmore	\$2,622.56	\$2,690	\$5,310
Ojai	1,330.77	1,360	2,690
Oxnard	5,697.49	5,840	11,540
Santa Paula	6,755.41	6,930	13,680
Ventura	10,518.39	10,790	21,310
Totals	\$26,924.62	\$27,610	\$54,530
Totals District VII	\$1,816,373.75	\$1,863,530	\$3,679,890

District VIII

Riverside			
Banning	\$2,508.35	\$2,570	\$5,080
Beaumont	1,207.49	1,230	2,440
Corona	6,361.97	6,520	12,880
Elsinore	1,223.80	1,250	2,470
Hemet	2,026.07	2,070	4,100
Perris	691.68	700	1,400
Riverside	26,920.09	27,620	54,540
San Jacinto	1,220.18	1,250	2,470
Totals	\$42,169.63	\$43,210	\$85,380
San Bernardino			
Chino	\$2,826.54	\$2,900	\$5,720
Colton	7,264.87	7,450	14,710
Needles	2,850.11	2,920	5,770
Ontario	12,313.29	12,630	24,940
Redlands	12,851.77	13,180	26,030
Rialto	1,488.50	1,520	3,010
San Bernardino	35,416.01	36,330	71,750
Upland	4,272.43	4,380	8,650
Totals	\$79,283.52	\$81,310	\$160,580
Totals District VIII	\$121,443.15	\$124,520	\$245,960

District IX

Inyo			
Bishop	\$1,050.65	\$1,070	\$2,120

District X

Amador			
Amador City	\$155.01	\$150	\$310
Jackson	1,817.57	1,860	3,680
Plymouth	310.94	310	620
Sutter Creek	918.31	940	1,860
Totals	\$3,201.83	\$3,260	\$6,470
Calaveras			
Angels	\$829.47	\$850	\$1,680
Mariposa			
Hornitos	\$56.20	\$50	\$110
Merced			
Atwater	\$831.28	\$850	\$1,680

District X—Continued

CITY AND COUNTY	STREETS OF MAJOR IMPORTANCE STATE HIGHWAYS		
	Fiscal Year Ending June 30, 1938	Fiscal Year Ending June 30, 1939	Biennium Ending 1937-39
Dos Palos	\$843.07	\$860	\$1,700
Gustine	921.03	940	1,860
Livingston	727.93	740	1,470
Los Banos	1,699.74	1,740	3,440
Merced	6,405.48	6,570	12,970
Totals	\$11,428.53	\$11,700	\$23,120
Sacramento			
Isleton	\$2,634.35	\$2,700	\$5,330
San Joaquin			
Lodi	\$6,596.76	\$6,760	\$13,360
Manteca	1,463.13	1,500	2,960
Stockton	43,479.53	44,610	88,090
Tracy	3,471.07	3,560	7,030
Totals	\$55,010.49	\$56,430	\$111,440
Solano			
Benicia	\$2,640.70	\$2,700	\$5,350
Dixon	906.52	930	1,830
Fairfield	1,025.27	1,050	2,070
Rio Vista	1,186.64	1,210	2,400
Suisun	820.41	840	1,660
Vacaville	1,410.55	1,440	2,850
Vallejo	13,848.93	14,210	28,050
Totals	\$21,839.02	\$22,380	\$44,210
Stanislaus			
Ceres	\$889.31	\$910	\$1,800
Modesto	12,566.94	12,900	25,470
Newman	1,150.38	1,180	2,330
Oakdale	1,914.58	1,960	3,870
Patterson	820.40	840	1,660
Riverbank	727.93	740	1,470
Turlock	3,878.28	3,970	7,850
Totals	\$21,945.82	\$22,500	\$44,450
Tuolumne			
Sonora	\$2,065.06	\$2,110	\$4,180
Totals District X	\$119,010.77	\$121,980	\$240,990

District XI

Imperial			
Brawley	\$9,463.19	\$9,710	\$19,170
Calexico	5,710.18	5,850	11,560
Calipatria	1,408.74	1,440	2,850
El Centro	7,645.60	7,840	15,490
Holtville	1,593.67	1,630	3,220
Imperial	1,761.37	1,800	3,560
Westmorland	1,338.03	1,370	2,710
Totals	\$28,920.78	\$29,640	\$58,560
Riverside			
Blythe	\$924.66	\$940	\$1,870
Indio	2,357.86	2,410	4,770
Totals	\$3,282.52	\$3,350	\$6,640
San Diego			
Chula Vista	\$3,507.34	\$3,590	\$7,100
Coronado	4,917.88	5,040	9,960
El Cajon	951.84	970	1,920
Escondido	3,101.21	3,180	6,280
La Mesa	2,278.10	2,330	4,610
National City	6,818.52	6,790	13,400
Oceanside	3,185.52	3,260	6,450
San Diego	137,512.05	141,100	278,610
Totals	\$182,072.46	\$166,260	\$328,330
Totals District XI	\$194,275.76	\$199,250	\$393,530



PROPERTIES, INC.

Citizens National Trust and Savings Bank
736 South Hill Street
Los Angeles, California

Mr. S. V. Cortelyou,
Division of Highways, District VII,
808 State Building,
Los Angeles, California.

Dear Mr. Cortelyou:

I presume that most of the letters you receive regarding your work in the field say little about the "effort to please" put forth by your different field organizations. However, I know of one instance where one of your departments certainly exerted more than "the usual effort" to do a good job for the public at large, the State, county, and the owners of Wheeler's Hot Springs, located seven miles from Ojai on the Maricopa Highway, Ventura County.

As you know, the winter floods played havoc with the highway between Ojai and Wheeler's Hot Springs, but your efficient superintendent in charge of maintenance and his loyal and hard working organization, immediately after the flood "went to work," and I know they spared no personal effort and gave no thought to themselves physically in getting the roadway open, which resulted in moving the gate beyond our entrance on Friday morning the 8th instant, for which The Citizens National Trust and Savings Bank, Properties, Inc., and myself and entire organization thank you and your men, and I feel that from the Governor down, including every taxpayer in southern California, we have just cause to be proud of your department.

May the opportunity present itself when we can show our appreciation in some way.

Very truly yours,

JOHN SHERROD HARRIS,
Vice President.

**UNIVERSITY OF ALASKA
COLLEGE, ALASKA**

Mr. Earl Lee Kelly, Director,
California Highways and Public Works,
P. O. Box 1499,
Sacramento, Calif.

Dear Sir:

Will you kindly place my name on your mailing list in order that I may receive copies of the official journal of the Department of Public Works. I find the articles interesting and desire to use the material in our upper division civil engi-

neering courses along with various other references.

Yours very truly,

(Signed) WM. E. DUCKERING,
Dean of Faculty.

Ensenada, Baja Calif., Mexico.

Earl Lee Kelly, Esq.,
Director of Public Works,
Sacramento, Calif.

Dear Sir:

I have had a chance to see the California Highways and Public Works Magazine in the office of our California representative, Capt. A. F. Somellera.

If it is not asking too much, I would greatly appreciate being put on your mailing list. I sincerely believe your magazine to be one of the most interesting publications and one that can teach a lot to all of us highway builders.

My address is:

Ing. Arturo Carrillo,
Construction Engineer,
Federal Highways Bureau,
Ensenada, Baja California,
Mexico.

Thanking you for your kindness, I am
Faithfully yours,

(Signed) ING. ARTURO CARRILLO,
Construction Engineer.

**INTERSTATE TRANSIT LINES
Omaha, Nebraska**

Mr. H. R. Judah,
California Highway Department,
Sacramento, California.

Dear Sir:

The many times when members of your maintenance crews have rendered such able assistance to our drivers, make it a real pleasure to write this letter.

The fine work being done by the Highway Commission in building better highways and in keeping them in first class condition is sincerely appreciated by this Company. When you add to this the splendid feeling of good-will shown our drivers by your maintenance men, it makes us want to exert ourselves to the utmost to cooperate with you.

Kindly express to your men our sincere appreciation for their courtesies.

If, at any time in the future we may be able to reciprocate, please do not hesitate to call on us.

Very truly yours,

PATRICK F. PAYNE,
Director of Safety.

Hayfork, Calif., May 2, 1938.

Mr. F. W. Haselwood,
District Engineer,
Division of Highways,
Redding, Calif.

Dear Mr. Haselwood:

I wish to take this opportunity to compliment your organization for the splendid work you accomplished in the maintenance and the keeping of the roads open during the stormy winter just past.

Especially should the workers in the mountain areas be complimented for doing a tireless and conscientious work without regard for number of working hours or fierceness of storm. * * *

Particularly would I like to compliment the efforts of a worker, in the Hayfork district, a Mr. Archipinti. One night when a slide had closed the road Mr. and Mrs. Vern Hodges, our missionaries, were stranded 20 miles from Hayfork. Mr. Archipinti got up and went out there in his own car, carried their provisions across the mucky slide and brought the couple into Hayfork. The next morning he returned to the slide unusually early and had a road bulldozed over the slide, that communication might be maintained without inconvenience. If Mr. Archipinti was not such a conscientious worker, I am sure that a slide of such proportions and nature would have closed the road and inconvenienced everyone for several days.

I believe that such work deserves commendation, and again, I wish to thank you for the unselfish efforts of your organization in behalf of public service.

Sincerely yours,

(Signed) HOWARD L. GRAY,
Field Director,
Philippian Faith Mission.

May 24, 1938.

California Highways
and Public Works,
Sacramento, Calif.

Dear Sir:

I would appreciate being placed upon your mailing list for receiving "California Highways and Public Works" magazine. In my work I try to develop good citizenship in our boys and girls and to do this, endeavor to let them know what their state is doing to improve the well-being of its citizens. I feel that your magazine has a contribution to make.

Very truly yours,

(Signed) NORRIS M. HARTLEY.



This drawing by Artist Carl Nuese from an aerial photograph shows the contemplated roadways that will lead from San Francisco-Oakland Bay Bridge to the Golden Gate International Exposition in 1939.

World's Fair—Bay Bridge Highway

ONLY highway access to the 1939 Golden Gate International Exposition will be via the San Francisco-Oakland Bay Bridge to Yerba Buena Island and thence on a specially constructed six-lane roadway to Treasure Island. Passenger ferryboats will provide other transportation facilities.

Exposition-bound motorists from Metropolitan Oakland will pass through the Bay Bridge tunnel on Yerba Buena Island, turn right and proceed directly to Treasure Island. They will pay a bridge toll at the Toll Plaza at the Administration Building entitling them to a return trip from the World's Fair.

Returning from Treasure Island, East Bay motorists will proceed over a roadway which will cross the Bay Bridge by means of a steel overhead span directly in front of the west portal of the tunnel. The roadway curves around Yerba Buena

Island connecting with the bridge on the south side of the east portal of the tunnel.

TREASURE ISLAND TOLL PLAZA

Motorists from San Francisco will reach Treasure Island by proceeding through the tunnel on Yerba Buena Island and turning right over the same roadway used by eastbound motorists mentioned above. Bridge tolls for San Francisco motorists will be paid at a toll plaza constructed just south of the steel overhead span. This toll will entitle motorists to a return trip over the bridge. From the island toll gate, the San Francisco motorists will proceed over the overhead and down an easy grade to Treasure Island.

Returning to San Francisco, fair visitors will proceed directly to the Bay Bridge, turning right from the Treasure Island roadway onto the upper deck of the span.

A lower deck connection is also under construction. This will be a permanent three-lane highway which will tap the bridge on the north side of the lower deck just west of the tunnel, and will connect with the artery from the upper deck.

COST IS \$600,000

Traffic lights will be installed at the lower deck connection, which will afford the only left-hand turn in the entire Bay Bridge highway system. The lower deck ramp will be used by trucks only during the fair, but will carry all traffic bound for the air port which will be established on Treasure Island at the close of the exposition.

Only this section of the World's Fair-Bay Bridge highway and three lanes of the six-lane highway between Treasure Island and the bridge connecting with it, will be of permanent construction. All road-



Connection east of Yerba Buena tunnel with World's Fair-Bay Bridge highway. San Francisco motorists having passed through tunnel, will turn right here and circle Island; those leaving Island, bound for East Bay points, will also turn right.

way connections with the upper deck of the bridge will be removed when the exposition is over.

The entire project is being constructed at a cost of \$600,000, part of which is defrayed by funds provided in a PWA grant sponsored by the exposition, and part directly

by the exposition. Lieutenant-Colonel J. A. Dorst, District Engineer, is directing construction on the project for the United States Army, while exposition participation is in charge of William P. Day, Director of Works for the fair.

The entire temporary roadway

system will have six lanes throughout, with a total width of 64 feet. The construction will involve a total distance of 7600 linear feet, including the five separated branches which will serve the different traffic flows.

Included also in the total figure

(Continued on Page 28)

Over this steel overhead motorists will travel returning from the Exposition to East Bay points via the Bay Bridge. San Francisco motorists bound for the Fair will also use the overpass.



TOWNE'S PASS HIGHWAY INTO DEATH VALLEY IMPROVED

By H. F. CATON, Associate Highway Engineer

DURING the past winter a second important improvement has been accomplished on State Highway 127, the western gateway to Death Valley National Monument, by the grading and surfacing of a section of the Towne's Pass road which extends from the Panamint Sink across the Panamint Mountains into the valley near Stovepipe Wells. The improvement covers approximately 3.2 miles of the old toll road on entirely new alignment near the summit of the western slope of the Panamint range. It was begun January 5, 1938, and the road opened to traffic on May 10, 1938. During construction the old road was used as a detour carrying traffic through without delay.

The original road was constructed in 1926 by H. W. Eichbaum, a Death Valley pioneer resident, under a franchise granted him by the Board of Supervisors of Inyo County. A toll of \$2 per car and 50 cents per passenger was charged and the franchise was to be in perpetuity unless the county exercised an option to purchase.

MADE FREE HIGHWAY

Shortly after the inclusion of the Death Valley routing in the State highway system in 1933, negotiations were begun by the California Highway Commission for the purchase of

the road. The negotiations were brought to a successful conclusion and title vested in the State on December 22, 1934, at a cost of \$25,000, making it a free highway.

The toll road was approximately 31 miles in length and extended from the mouth of Darwin Wash, across Panamint Valley and over the Panamint range. The first improvement made by the Division of Highways eliminated the tortuous Darwin Wash sector and was completed in October, 1937.

The original alignment of the toll road was very irregular, of no particular standards and with curves having a radius as low as twenty feet and gradients varying from 10 to 17 per cent. Much of the road was a bladed trail along the gravel bed of various washes and consequently subject to destruction at various points during and after heavy rain storms that occur during summer periods in that area.

THROUGH NARROW CANYON

The first 1.4 miles of this recent improvement traversed the southerly side of a narrow desert canyon consisting of solid and semisolid rock. Drilling and blasting was required through this section. Blasted material was moved with a power shovel

and dump trucks and placed in the embankments.

The next 1.5 miles consisted of stony, sandy clay with scattered boulders underlaid with a strata of caliche. This material was moved with scraper equipment.

As this section of road is through a cloudburst area, and the cost of installing culverts to accommodate all drainage would be prohibitive, the fills across the larger washes were made permeable to allow the water to pass through.

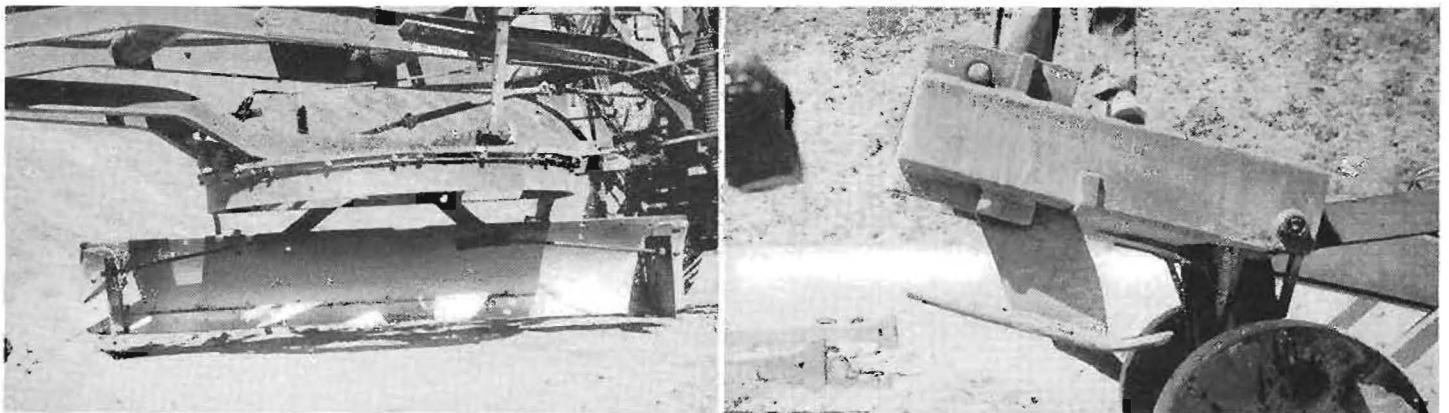
In the larger washes a relief pipe was placed close to the top of the fills. For flood protection of the fills, selected rocky material was placed on the stream side.

The central twenty-foot portion of the roadbed was given a penetration oil treatment consisting of approximately 0.75 gallon per square yard of liquid asphalt, SC-2.

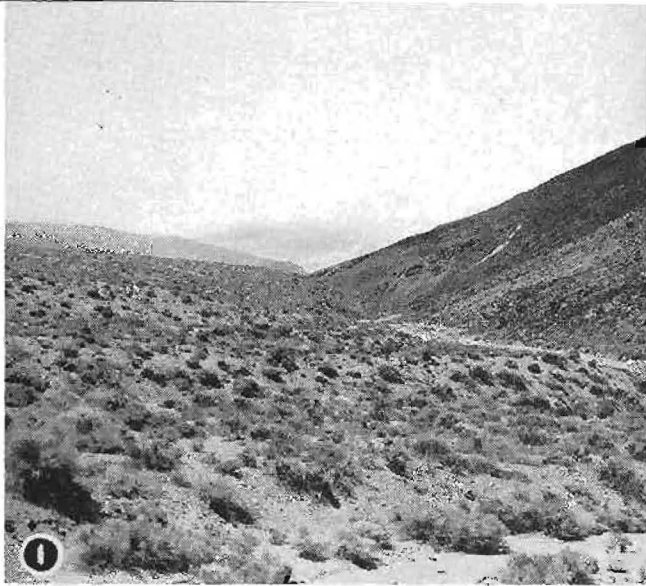
During the progress of the work, certain attachments were made and installed on two pieces of finishing equipment. One attachment consisted of cutting off one rooter tooth and welding a shoe in its place. When the rooter was being used to rip out gutters, this shoe tended to keep the rooter in a level position.

The second attachment was a

(Continued on page 28)



Two attachments that proved very satisfactory were made and bolted on finishing equipment. At left, plates on grader to make scraper. At right, shoe on rooter tooth used in rooting out gutters.



Views of the newly realigned section of Towne's Pass highway entrance to Death Valley National Monument. On the left, views 1, 3 and 5 show conditions before construction that compare with finished highway views 2, 4 and 6 on the right. Drilling and blasting was required through a good portion of the job.



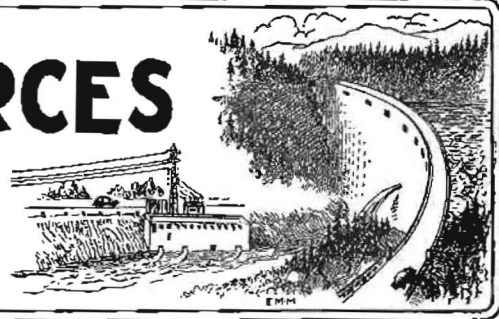
DIVISION OF WATER RESOURCES

OFFICIAL REPORT

FOR THE MONTH OF

May, 1938

EDWARD HYATT, State Engineer



WORK was continued by the Division of Water Resources, representing the Water Project Authority of the State of California, on engineering studies in connection with the Central Valley Project which are being carried on under a cooperative work agreement with the U. S. Bureau of Reclamation. These studies have involved the obtaining of field data to be used in connection with negotiations for the acquisition of water rights of lands along the San Joaquin River which are now being served from that stream. These investigations have included topographic, hydrologic, geologic and soil surveys and studies and the preparation of reports and maps covering these data.

Studies have been continued of matters affecting the disposal of water and power made available by the project including analyses of present ground water conditions and the requirements of certain areas for additional supplies.

Negotiations have been carried on with public utility companies for the relocations of their facilities affected by the construction of certain units of the project.

WATER RIGHTS

Supervision of Appropriation of Water

Nineteen applications to appropriate were received during April: 7 were denied, 18 were approved, 5 permits were revoked and 3 licenses were issued.

Among the permits issued were one to Maxwell Irrigation District for a diversion of 70 c.f.s. at the intake of the Glenn-Colusa Canal for the irrigation of 2000 acres from Sacramento River, and one to Tanner Slough Irrigation Association for the storage of 2600 acre feet per annum on Willow Creek for the irrigation of 8850 acres adjacent thereto.

Because of the continued storms and unusual flood damage, field work started later than usual. However, projects were inspected during the month at the lower elevations from Amador County south to Mer-

ced County; in the valley counties from Sacramento south to Merced and in the coastal counties from San Francisco south to San Benito County.

IRRIGATION DISTRICTS

Shafter-Wasco Irrigation District, recently organized on the line of the Friant-Kern Canal, is conducting water spreading experiments this year with the surplus runoff from Kern River. It is hoped by this means to determine, before Central Valley water arrives, where spreading basins can be placed to best advantage to recharge the underground storage.

Oakdale Irrigation District contemplates construction of a storage reservoir at Beardsley Flat on the Middle Fork of Stanislaus River. Water filings have been made and an application has been placed with the Public Works Administration for a grant and loan in the amount of \$3,500,000 to carry out the project.

East Contra Costa Irrigation District has completed the installation of six additional drainage wells and auxiliary ditches at an approximate cost of \$40,000.

CALIFORNIA COOPERATIVE SNOW SURVEYS

During the first week of May the final scheduled snow surveys for this year were made at all key snow courses. These snow surveys were made for the purpose of determining the amount of snow melting that had taken place in the mountains during the preceding month and to serve as a check on the previously published estimates of stream flow forecast early in April.

The results of these surveys were incorporated in the regular May snow survey bulletin (the final one to be issued this season) released May 11th. A study of these early May snow surveys, with due consideration of April temperature and precipitation conditions, points to the conclusion that no modification of the forecasts issued a month earlier is justified and it is believed that these predicted amounts of runoff will be realized.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project

During this period streams in the Sacramento Valley have remained generally above

bank full stage, and the seepage has continued. Much damage has been done to orchards and alfalfa, and planting of annual crops has been prevented in many places. The extent of the loss from this seepage condition will not be known for several months.

In order to alleviate this condition so far as possible and, after a thorough investigation of all factors related thereto, this office opened the Sacramento weir on the morning of May 14, 1938. At that time the river was rising, but it was immediately reduced about three feet, and since that time the stage at the Sacramento gauge held between 22.0 and 23.0. It seems probable that the stage will not go below 22.0 this month.

Relief Labor Work

During this period from 65 to 80 relief laborers have been employed in cleaning off levees and in miscellaneous work, including clearing for construction on the Sacramento River from Meridian to Butte Slough, construction being done by the California Debris Commission. About 25 men have been available from the SRA Camp No. 7 in the Sutter Basin, up to May 11th, when the camp was closed.

Emergency Levee Repairs

Work has continued in making repairs to levees in Glenn, Shasta, Butte and Tehama counties under Executive Order No. E 177. At this date approximately \$85,000 has been expended.

It has been necessary to do further work in protecting the river bank at Robinson Bend on the Feather River. The work has been done with timber and brush and of an inexpensive type. More permanent protection must be installed later.

Emergency Levee Protection

In order to avert a levee break in the Liberty Farms levee in the Lower Yolo Bypass, this office undertook emergency work on May 17th. At this date no danger exists. The cost of the work has been approximately \$2,000 to date.

Emergency work is continuing on the San Joaquin River near the Banta Carbona Intake and on Reclamation District No. 17.

Flood Measurements and Gages

The radio senders at the stations so equipped have been removed, as the equipment is now needed on water distribution work. The automatic water stage recorders are in operation and the collection of flood data has been continued.

Highway Bids and Awards for the Month of May, 1938

HUMBOLDT COUNTY—An existing bridge across Yager Creek at Carlotta to be repaired and approaches to be graded. District I, Route 35, Section A. Mercer-Fraser Co., Eureka, \$22,070; Albert H. Siemer and John Carcano, San Anselmo, \$26,462; M. A. Jenkins, Sacramento, \$19,888; A. Soda and Son, Oakland, \$24,770; F. J. Maurer & Son, Inc., Eureka, \$20,073; Claude C. Wood, Stockton, \$20,293. Contract awarded to E. E. Smith, Eureka, \$19,423.

LOS ANGELES COUNTY—Between Philadelphia Street and Painter Avenue, about 1.5 miles to be graded and widened with Portland cement concrete and plant-mixed surfacing. District VII, Route 2, Section D. Vido Kovacevich, South Gate, \$36,777; United Concrete Pipe Corporation, Los Angeles, \$41,283; Matich Bros., Elsinore, \$42,852; W. E. Hall Co., Alhambra, \$43,868; C. R. Butterfield-Kennedy Co., San Pedro, \$40,721; L. A. Paving Co., Los Angeles, \$37,976; Bebek and Brkich, Los Angeles, \$40,700; Griffith Co., Los Angeles, \$35,991; Oswald Bros., Los Angeles, \$37,910; J. E. Haddock, Ltd., Pasadena, \$35,196. Contract awarded to George R. Curtis Paving Co., Los Angeles, \$34,413.50.

LOS ANGELES COUNTY—Between Tunnel Station and Placerita Canyon, about 3.7 miles to be graded and paved with Portland cement concrete and plant-mixed surfacing and a reinforced concrete girder bridge to be constructed. District VII, Route 23, Sections L. A., H. I. Daley Corp., San Diego, \$467,314; Macco Construction Co., Clearwater, \$401,020; United Concrete Pipe Corp., Los Angeles, \$438,954; W. E. Hall Co., Alhambra, \$482,018; Winston Bros. Co., Los Angeles, \$560,843; Claude Fisher Co., Ltd., Los Angeles, \$368,027; Sander-Pearson-Minnis & Moody, Los Angeles, \$422,334; Gibbons and Reed, Burbank, \$431,038; J. E. Haddock, Ltd., Pasadena, \$420,378; Oswald Bros., Los Angeles, \$395,741; Ralph A. Bell, Monrovia, \$428,596. Contract awarded to Griffith Co., Los Angeles, \$348,496.75.

MADERA COUNTY—Between Madera-Friant Road and Kelsaw Corners, about 10.9 miles to be graded and penetration oil treatment applied. District VI, Route 125, Section B, C. Guy F. Atkinson Co., San Francisco, \$431,114; United Concrete Pipe Corporation, Los Angeles, \$448,228; Winston Bros. Co., Los Angeles, \$428,321; Geo. K. Thompson & Co., Los Angeles, \$369,297; Granfield, Farrar & Carlin, San Francisco, \$358,441; Clyde W. Wood, Los Angeles, \$391,432; Griffith Company, Los Angeles, \$371,634; George Pollock Co., Sacramento, \$392,072; Ralph A. Bell, Monrovia, \$414,037; Isbell Construction Co., Reno, Nevada, \$421,534. Contract awarded to Piombo Bros. & Co., San Francisco, \$329,779.

MARIN COUNTY—Between Ignacio and San Rafael, about 7.5 miles to be graded, surfaced with Portland cement concrete, asphalt concrete and plant-mixed surfacing, existing structures to be widened and grade separation structures to be constructed. District IV, Route 1, Sections A, S. Rf. Chas. L. Harney, San Francisco, \$379,688; Hanrahan Co., San Francisco, \$385,002; Fredericksen and Westbrook, Lower Lake, \$395,594; Macco Construction

Co., Clearwater, \$422,690; Union Paving Co., San Francisco, \$422,983; Granfield, Farrar and Carlin, San Francisco, \$436,791. Contract awarded to A. G. Raisch, San Francisco, \$359,783.34.

MENDOCINO COUNTY—Twenty-one miles south of Barberville, a bridge across Bridges Creek, consisting of one 38-foot steel beam span, four 19-foot and one 15-foot timber spans, all on concrete footings and timber bents and two 19-foot timber side hill spans on concrete footings to be constructed and approaches to be graded and surfaced with screened gravel surfacing. District I, Route 1, Section K. F. J. Maurer and Son, Inc., Eureka, \$24,818; Albert H. Siemer & John Carcano, San Anselmo, \$25,522; C. W. Caletti & Co., San Rafael, \$26,165; Valley Construction Co., San Jose, \$27,798; J. W. Walker, Berkeley, \$28,740; A. Soda and Son, Oakland, \$32,125; R. G. Clifford, San Francisco, \$34,570; Underground Construction Co., Oakland, \$38,160. Contract awarded Claude C. Wood, Stockton, \$22,790.50.

ORANCE COUNTY—A bridge across Santa Ana River about four miles south of Yorba Linda to be repaired. District VII, Route 175, Section 8. E. S. and N. S. Johnson, Pasadena, \$15,268; V. R. Dennis Construction Co., San Diego, \$15,685; E. G. Perham, Los Angeles, \$16,005.18; Dimmitt and Taylor, Los Angeles, \$17,081; Byerts and Dunn, Los Angeles, \$15,949; R. R. Bishop, Long Beach, \$18,869; G. O. Gartz, Los Angeles, \$16,899; Contracting Engineers Co., Los Angeles, \$16,588; Werner and Webb, Los Angeles, \$15,900; J. S. Metzger and Son, Los Angeles, \$16,985. Contract awarded to Oberg Bros., Los Angeles, \$14,149.

RIVERSIDE COUNTY—Between west city limits of Indio and Route 64, about 2.6 miles to be graded, paved with asphalt concrete and road-mix surface treatment to be applied to shoulders and widened areas. District XI, Route 26, Section Ind., F. V. R. Dennis Construction Co., San Diego, \$99,650; Oswald Bros., Los Angeles, \$100,948; W. E. Hall Co., Alhambra, \$107,547; United Concrete Pipe Corp., Los Angeles, \$111,859; Griffith Co., Los Angeles, \$109,225. Contract awarded to R. E. Hazard & Sons, San Diego, \$94,270.

SACRAMENTO COUNTY—Between Ben Ali and U. S. Air Depot, about 3.1 miles to be graded and surfaced with crusher run base and armor coat and a reinforced concrete bridge to be constructed. District III, Route-Feeder road, Piazza and Huntley and Valley Construction Co., San Jose, \$66,700; J. R. Reeves, Sacramento, \$66,808; Union Paving Co., San Francisco, \$66,844; Claude C. Wood, Stockton, \$70,691; Parish Bros., Los Angeles, \$75,782; J. A. Casson, Hayward, \$77,600. Contract awarded to A. Teichert & Son, Inc., Sacramento, \$63,452.

SACRAMENTO COUNTY—Bridge across Three Mile Slough, 7.4 miles north of Contra Costa County line, to be redecked. District X, Route II, Section C. M. A. Jenkins, Sacramento, \$8,140; Bundesen & Lauritzen, Pittsburg, \$9,822; F. Kaus, Stockton, \$11,038; W. C. Tait, Inc., San Francisco, \$11,317. Contract awarded to C. C. Gilderleeve, Berkeley, \$6,514.91.

SAN BERNARDINO COUNTY—Between New Avenue in Redlands and Crystal

Springs, about 2.4 miles to be graded and paved with Portland cement concrete. District VIII, Route 26, Section Rld. B. A. S. Vinnell Co., Alhambra, \$101,005; George J. Bock Co., Los Angeles, \$103,987; V. R. Dennis Construction Co., San Diego, \$124,288; Oswald Bros., Los Angeles, \$92,287; George R. Curtis Paving Co., Los Angeles, \$89,967; C. O. Sparks and Mundo Engineering Co., Los Angeles, \$103,741; Daley Corp., San Diego, \$93,987; Matich Bros., Elsinore, \$106,563; Basich Bros., Torrance, \$95,971; J. E. Haddock, Ltd., Pasadena, \$94,171; Griffith Co., Los Angeles, \$103,633; United Concrete Pipe Corp., Los Angeles, \$100,808. Contract awarded to Claude Fisher Co., Ltd., Los Angeles, \$89,929.50.

SAN JOAQUIN COUNTY—Reinforced concrete slab bridge, four 20-foot 9-inch and two 15-foot 6-inch spans on concrete pile bents across Littlejohns Creek, about 0.4 mile east of Farmington, to be constructed. District X, Route 75, Section C. F. Kaus, Stockton, \$9,377; Franzini & Fredenburg, San Rafael, \$9,565; Claude C. Wood, Stockton, \$9,580; J. S. Metzger & Son, Los Angeles, \$10,772. Contract awarded to Nelson and Wallace, Escalon, \$9,067.50.

SISKIYOU COUNTY—Between Cougar and Macdoel, about 24.1 miles soil cement base to be constructed and imported surfacing material to be placed on portions of the project and entire project surfaced with road-mix surfacing. District II, Route 72, Section B. Hanrahan Company, San Francisco, \$109,577; Clifford A. Dunn, Klamath Falls, Oregon, \$113,322; Harold Blake, Portland, Oregon, \$134,435; J. A. Casson, Hayward, \$95,703; Claude G. Wood, Stockton, \$100,567; Fredericksen & Westbrook, Lower Lake, \$106,332. Contract awarded to Oilfield Trucking Co., Bakersfield, \$95,479.78.

SOLANO COUNTY—One mile southwest of Cordelia Underpass, about 0.2 mile to be graded and surfaced with plant-mixed surfacing and underdrains to be constructed. District X, Route 7, Section H. Lee J. Immel, Berkeley, \$45,279; Guerin Bros., San Francisco, \$47,848; Chas. L. Harney, San Francisco, \$73,317. Contract awarded to J. L. Connor and Sons, Monterey, \$38,390.30.

STANISLAUS COUNTY—Between Modesto and Salida, about 5.8 miles to be graded, paved with Portland cement concrete and asphalt concrete and reinforced concrete bridges to be constructed. District X, Route 4, Section Mod., B. A. Teichert & Son, Inc., Sacramento, \$240,464; Louis Biasotti & Son, Stockton, \$195,398; Union Paving Co., San Francisco, \$197,313; Macco Construction Co., Clearwater, \$199,839; Griffith Co., Los Angeles, \$211,232; Hanrahan Co., San Francisco, \$211,951; United Concrete Pipe Corp., Los Angeles, \$218,470; Chas. L. Harney, San Francisco, \$220,497. Contract awarded to Fredericksen & Westbrook, Lower Lake, \$194,191.35.

TEHAMA COUNTY—At Red Bluff, about 0.5 mile to be graded and paved with Portland cement concrete and road-mix surfacing on crusher run base to be applied. District II, Route 3, Section D, R. Bl. J. F. Knapp, Oakland, \$53,642; Johnston Rock Co., Inc., Stockton, \$54,235. Contract awarded to N. M. Ball Sons, Berkeley, \$41,625.

TULARE COUNTY—Between Tulare and Visalia, four concrete bridges to be widened. District VI, Route 132, Section A. Franzini & Fredenburg, San Rafael, \$16,562; Valley Construction Co., San Jose, \$17,518; John Jurkovich, Fresno, \$14,812; J. S. Metzger & Son, Los Angeles, \$18,500. Contract awarded to Palo Alto Road Materials Co., Palo Alto, \$13,694.

Highway Safety Shows Increase

(Continued from page 9)

section just south of Bakersfield which was widened to three lanes a year ago.

The portion of U. S. 99 in this semi-arid region of California carries an important volume of traffic between Southern California and the San Joaquin and Sacramento Valleys and San Francisco Bay area. Much of the large volume of truck traffic is of the heaviest nature, consisting of tanks and trailer units, trucks and trailers.

The following detailed traffic count, taken at the junction of U. S. 99 and State Route 57 leading to Maricopa, is indicative of the volume, nature, and growth of traffic during the past three years:

Date	Auto		Trucks					Total
	Calif.	For.	Buses	LL	Hvy.	Trls.		
1-13-35	2920	79	13	95	189	84	3380	
7-14-35	4001	105	15	171	221	120	4633	
7-12-36	4493	214	21	285	270	162	5445	
7-11-37	5149	237	30	238	294	356	6304	

The original road was paved in 1916 with Portland cement concrete 15 feet wide and 4 inches thick. In 1922, concrete borders 2.5 feet wide were placed on each side of the pavement and a second story of asphalt concrete 2½ inches thick was laid over the 15-foot pavement. Because of the high crown on which the asphalt was laid, 2¾ inches in 7.5 feet, it tended to drain to the edge and form rough tongues of asphalt on the concrete borders. In 1931, plant-mix surfacing six feet wide was placed on each side beyond the borders and the earth shoulders were oiled for an additional width of six feet.

The present new construction, which will turn this section into the longest single stretch of divided highway on the State highway system, is being performed under a \$461,000 contract with Griffith Company of Los Angeles. It is estimated that the final cost of the work will be approximately \$500,000 and that the road will be opened to traffic about December 23, 1938.

Doctor: "I'm sorry, but I'll have to open you up again. I can't find my other rubber glove."

Patient: "Don't be silly. Here's a dollar. Go out and buy yourself another pair."

In Memoriam

Ellard Whitney Carson

Ellard Whitney Carson, District Right of Way Agent in District V of the Division of Highways at San Luis Obispo, passed away on May 14, 1938, after an illness of but three days.

Mr. Carson was born September 2, 1877, at San Jose, California. He received his early education in the schools of that city and later prepared himself for the profession of mining engineering. His first employment was in 1897 with the New Almaden Mine, where he rose rapidly to the position of Assistant Superintendent. From 1903 to 1922 he was manager and superintendent of several well known quicksilver properties, notably the Oceanic Mine near Cambria. During this period he also made examinations of many properties in California, Nevada and Arizona. He was a member of the American Institute of Mining and Metallurgical Engineers and retained an interest in this field until his death.

Following the decline in mining after the World War, Mr. Carson entered the real estate business in Los Angeles and San Luis Obispo, gaining the invaluable experience that later was to make him one of the State's outstanding right of way men.

The Division of Highways employed Mr. Carson as District Right of Way Agent on May 13, 1927. During his eleven years of unbroken service in that position, he directed with conspicuous success the many difficult and complex negotiations peculiar to a section embracing old Spanish land grants, rich oil lands and valuable citrus and vegetable farming acreage.

World's Fair Highway Under Construction

(Continued from page 23)

are 536 feet of permanent steel trestle (providing the lower deck connection); 4600 feet of temporary timber trestle; and 460 feet of temporary steel bridge and trestle, some of which comprises the overhead span crossing the upper deck of the Bay Bridge. There is an estimated excavation of 155,000 cubic yards.

Except for special requirements, the general project will be a standard Class A highway construction with regard to banking (on curvatures), runoffs, and breaks of grade. The maximum grade will be 6 per cent and the minimum curvature a

Towne's Pass Road Improved

(Continued from page 24)

plate 18 inches long bolted on each end of the moldboard of the blade grader and at right angles to the blade. This was used as a scraper and worked very satisfactorily during finishing operations. In the through cuts, rocks were bladed to the center of the road, and with this attachment on the blade, were scraped out of the cuts and then bladed over the fill slopes.

Since the completion by the State of the Darwin Cut-Off sector, eliminating the grade over Zinc Hill, the travel using the Towne's Pass entrance into Death Valley has more than doubled the past year.

For the period January 1, 1937, to April 30, 1937, 2255 cars and 6413 people entered the valley. For the same period in 1938, 4688 cars and 13,655 people entered, or an increase of 107.8 per cent in the number of cars and 112.7 per cent in the number of people.

The heaviest traffic recorded entered the valley Saturday, April 9, 1938. On that day 262 cars and 845 people were recorded. At all other checking stations into the valley there was no increase in traffic over previous years.

The cost to the State of this latest improvement was \$33,589.81. The Silva and Hill Construction Company was the contractor.

275-foot radius which is obtained on one curve only.

A 7-inch crushed rock base on ground contacts, and an approximate 2-inch base for the timber deck will be provided for a three-quarter inch black asphaltic surfacing. The timber deck itself will comprise 3 x 4 and 3 x 8 timbers laid on edge.

The permanent construction is designed for H-15 loading, and the temporary sections for H-10. Wheel loads and impacts conform with State highway specifications. Steelwork is designed according to Bay Bridge requirements, and timber construction conforms with recommendations of the Structural Engineers' Associations of California.

Parking facilities for 12,000 cars are provided on Treasure Island. The World's Fair-Bay Bridge Highway is expected to be completed this summer.

STATE OF CALIFORNIA
Department of Public Works

Headquarters: Public Works Building, Twelfth and N Streets, Sacramento

FRANK F. MERRIAM.....Governor

HARRY A. HOPKINS.....Assistant Director

EARL LEE KELLY.....Director

EDWARD J. NERON.....Deputy Director

CALIFORNIA HIGHWAY COMMISSION

H. R. JUDAH, Chairman, Santa Cruz
PHILIP A. STANTON, Anaheim
PAUL G. JASPER, Fortuna
WILLIAM T. HART, Carlsbad
ROBERT S. REDINGTON, Los Angeles
JULIEN D. ROUSSEL, Secretary

DIVISION OF HIGHWAYS

C. H. PURCELL, State Highway Engineer
G. T. McCOY, Assistant State Highway Engineer
J. G. STANDLEY, Principal Assistant Engineer
R. H. WILSON, Office Engineer
T. E. STANTON, Materials and Research Engineer
FRED J. GRUMM, Engineer of Surveys and Plans
R. M. GILLIS, Construction Engineer
T. H. DENNIS, Maintenance Engineer
F. W. PANHORST, Bridge Engineer
L. V. CAMPBELL, Engineer of City and Cooperative Projects
R. H. STALNAKER, Equipment Engineer
J. W. VICKREY, Safety Engineer
E. R. HIGGINS, Comptroller

DISTRICT ENGINEERS

E. R. GREEN (Acting), District I, Eureka
F. W. HASELWOOD, District II, Redding
CHARLES H. WHITMORE, District III, Marysville
JNO. H. SKEGGS, District IV, San Francisco
L. H. GIBSON, District V, San Luis Obispo
E. T. SCOTT (Acting), District VI, Fresno
S. V. CORTELYOU, District VII, Los Angeles
E. Q. SULLIVAN, District VIII, San Bernardino
S. W. LOWDEN (Acting), District IX, Bishop
R. E. PIERCE, District X, Stockton
E. E. WALLACE, District XI, San Diego

SAN FRANCISCO-OAKLAND BAY BRIDGE

C. E. ANDREW, Bridge Engineer

DIVISION OF WATER RESOURCES

EDWARD HYATT, State Engineer, Chief of Division
GEORGE T. GUNSTON, Administrative Assistant
HAROLD CONKLING, Deputy in Charge Water Rights
A. D. EDMONSTON, Deputy in Charge Water Resources Investigation
R. L. JONES, Deputy in Charge Flood Control and Reclamation
GEORGE W. HAWLEY, Deputy in Charge Dams
SPENCER BURROUGHS, Attorney
EVERETT N. BRYAN, Hydraulic Engineer Water Rights
GORDON ZANDER, Adjudication, Water Distribution

DIVISION OF ARCHITECTURE

GEORGE B. McDOUGALL, State Architect, Chief of Division
P. T. POAGE, Assistant State Architect
W. K. DANIELS, Assistant State Architect

HEADQUARTERS

H. W. DEHAVEN, Supervising Architectural Draftsman
C. H. KROMER, Principal Structural Engineer
CARLETON PIERSON, Supervising Specification Writer
J. W. DUTTON, Principal Engineer, General Construction
W. H. ROCKINGHAM, Principal Mechanical and Electrical Engineer
C. E. BERG, Supervising Estimator of Building Construction

DIVISION OF CONTRACTS AND RIGHTS OF WAY

C. C. CARLETON, Chief
CLARENCE W. MORRIS, Attorney, San Francisco
FRANK B. DURKEE, Attorney
C. R. MONTGOMERY, Attorney
ROBERT E. REED, Attorney

DIVISION OF PORTS

Port of Eureka—E. S. MACKINS, Surveyor

Return postage guaranteed.
 PM: If addressee has moved,
 notify sender on
Form 3547
 Division of Highways
 P. O. Box 1499
 Sacramento, California



Occidental College Library,
 Los Angeles,
 Calif.

SEC. 562 P. L. & R.
 U. S. POSTAGE

PAID

Sacramento, Cal.
 Permit No. 152

**MAP
 SHOWING
 STATE HIGHWAY SYSTEM**

LEGEND
 Primary Roads 
 Secondary Roads 



See Detail Map

SAN FRANCISCO AND VICINITY

See Detail Map

LOS ANGELES AND VICINITY