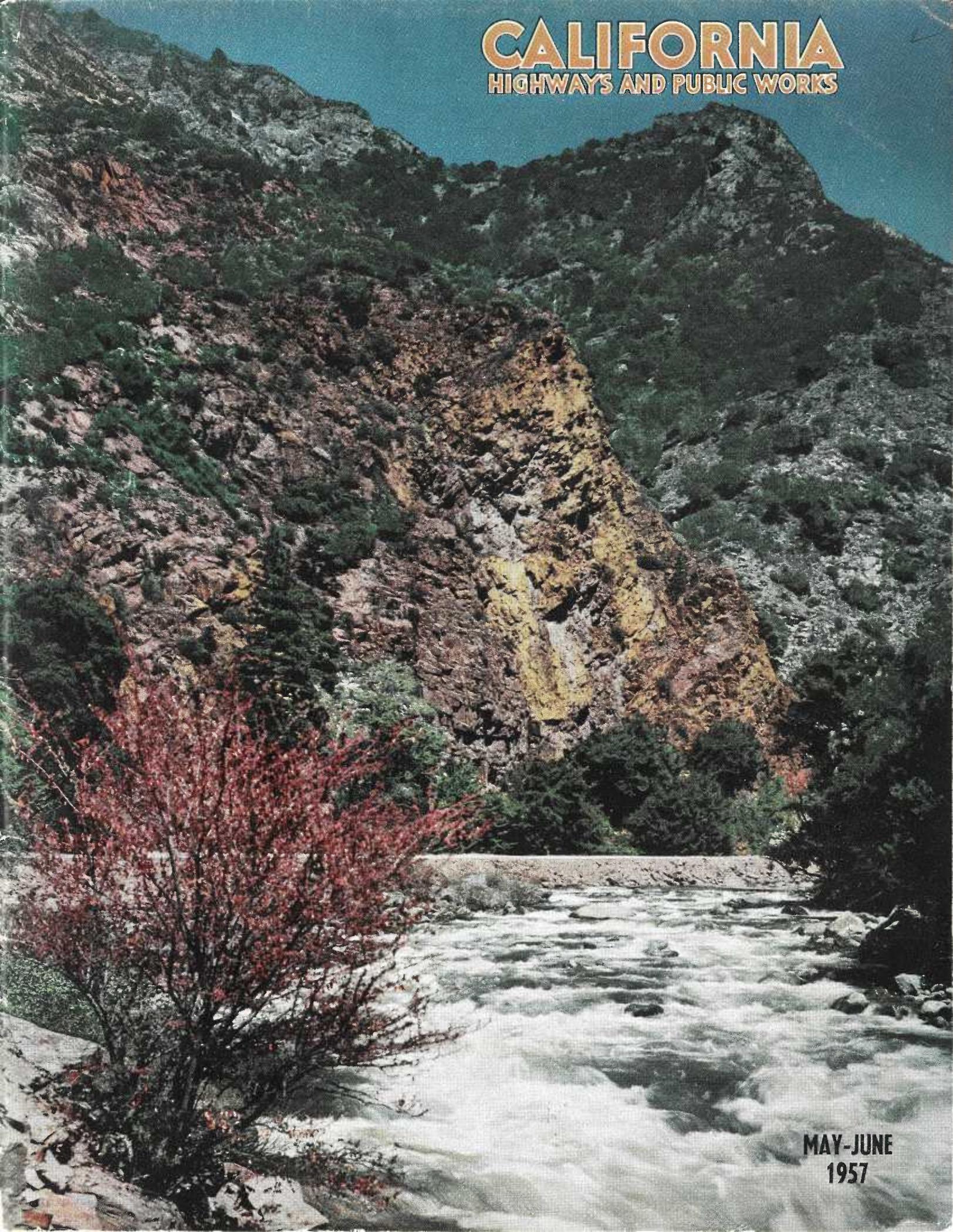


CALIFORNIA

HIGHWAYS AND PUBLIC WORKS



MAY-JUNE
1957

California Highways and Public Works

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Department of Public Works, State of California

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Sacramento

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COVER

Aerial view of Kings River Canyon Scenic Recreational Area Reached by Sign Route 180, East Out of Fresno, California.
Photo by Clay Dudley of Photographic Section, Department of Public Works, M. R. Nickerson, Chief

BACK COVER

View of Coyote Dam area in Mendocino County which will be inundated when dam is completed.
Photo by Robert Rose, Photographic Section, Department of Public Works.

An error crept into the caption for the cover page of our March-April issue. The structure in the foreground is the Ashby Avenue Interchange in Berkeley, not the University Avenue Interchange

Published in the interest of highway development in California. Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request

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Time Limit

By Eugene Calman
Resident Engineer

*Relocation Around
Russian River Reservoir*

On Sign Route 20

A RIGID time limit and tough grading are features of a recently let project situated in Mendocino County, on State Sign Route 20, between US 101 approximately six miles northerly of Ukiah and 0.6 mile west of Potter Valley Road. The project, 4.2 miles in length, consists of a relocation of a two-lane highway around the Russian River Reservoir. This reservoir, approximately five miles in length and as much as a mile wide, will be formed by the completion of Coyote Dam, now being constructed by the Guy F. Atkinson Company for the Corps of Engineers, U. S. Army.

The cost of the highway relocation project, which is largely financed by the Corps of Engineers, will be about \$3,000,000. At the time of award, this was the largest single contract ever awarded in District I, which has headquarters in Eureka and operates under the supervision of District Engineer Sam Helwer. This sizeable single contract has been superseded by a \$6,340,000 single contract on the Redwood Freeway in Humboldt County for which the Guy F. Atkinson Company was also the successful bidder.

The existing State Sign Route 20 consists of a substandard, two-lane highway through Coyote Valley and the East Branch Russian River Canyon. The portion located in the canyon has extremely poor alignment and is subject to heavy icing in the winter months.

Heavy Grading

The new facility now being constructed consists of the standard 32-foot all-paved section. The structural section provides for 0.25 foot of Type B and 0.05 foot of open graded plant-mix surfacing on 0.50 foot of road-mixed CTB, 0.17 foot of untreated



Rugged sidehills are being traversed by relocation of State Highway 20 in canyon of East Branch of Russian River. Existing highway and river will be noted in lower right-hand corner.

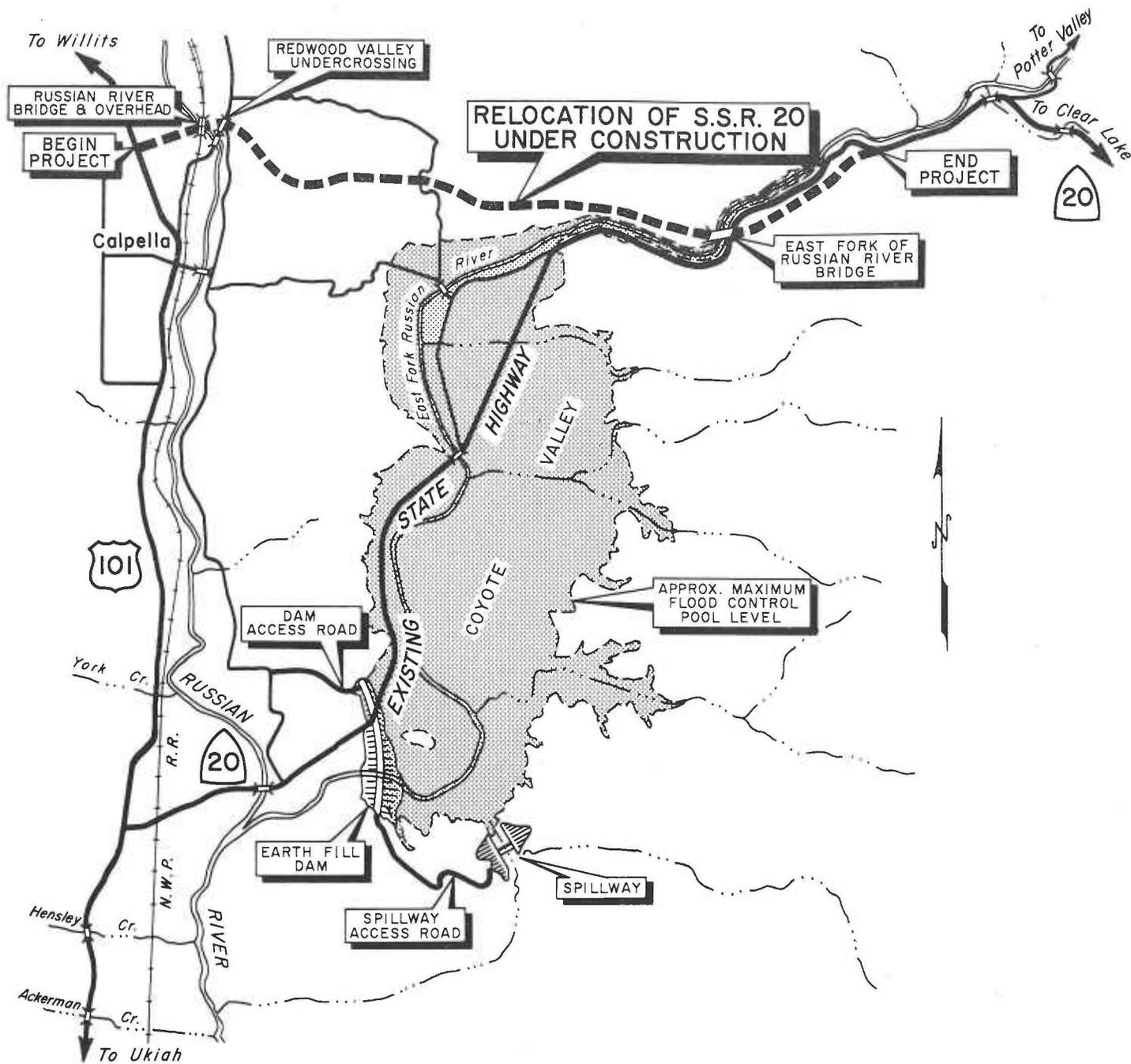
base, 1.00 foot of select material, and, in certain locations 1.00 foot of pervious subbase material. The grading is quite heavy and consists of 1,500,000 cubic yards of roadway excavation in addition to 13 fairly large stabilization trenches, involving some 75,000 cubic yards of trench excavation.

By way of illustration, the section at one station has a two-foot cut at center line, a 230-foot cut on the left, and a 90-foot fill on the right. The job is "stacked" so to speak, in that material excavated from the stabilization

trenches must be used in fills that are to be constructed over other stabilization trenches.

Three Bridges

There are three bridges on the project: the Russian River Bridge and overhead; a plate girder bridge some 440 feet in length; the Redwood Valley undercrossing, a reinforced concrete structure 120 feet long; and the East Fork of the Russian River Bridge, which is a four-span plate girder structure 609 feet long.



Map showing the dam, resultant reservoir area and relationships with existing and relocated portion of Sign Route 20

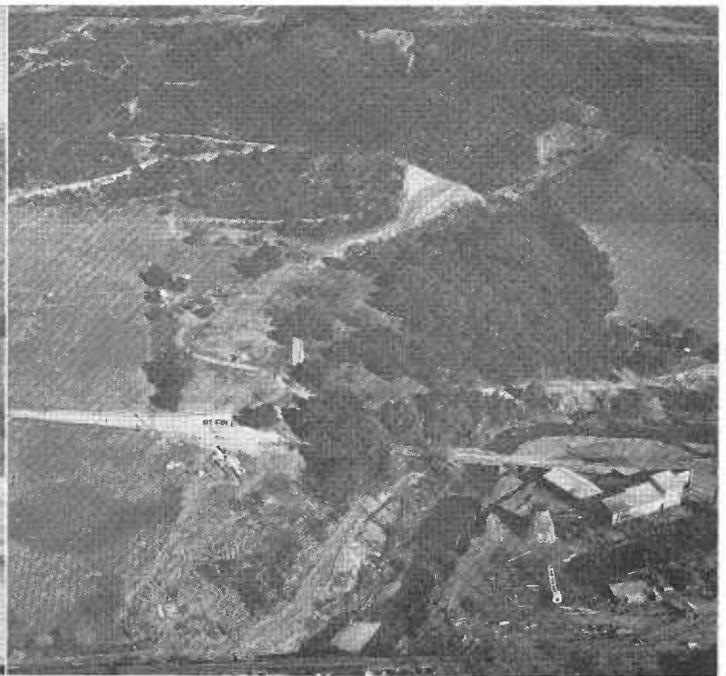
The special provisions call for opening of the new highway for the passage of public traffic by March 31, 1958. There are to be no time extensions because of inclement weather on this phase of the contract. A \$2,100 per day liquidated damage rate will be assessed for delays to this opening date. This is necessary because the existing State Sign Route 20 will be inundated by water in the reservoir on this date. After opening of the

project to traffic, 50 working days will be allowed for completion.

Big Dirt Moving Job

The contractor is moving about 12,000 cubic yards per day at the time of writing and expects to increase this to 20,000 cubic yards in the very near future. Because of the heavy rainfall occurring in this area in the winter and spring months they will

attempt to finish all the road work, including surfacing, by this fall. Because of the current steel shortage, erection of the superstructure on structures will, in all probability, be delayed until 1958. It is planned to use the slip form method developed by the B. M. Heede Company, which was used for the Carquinez Bridge piers, for the construction of the East Fork of the Russian River Bridge piers.



LEFT—Coyote Dam under construction at Coyote Valley three miles northeast of Ukiah. This will dam the East Branch of Russian River inundating the whole of Coyote Valley as shown in left center of picture. State Highway 20 is the main road shown in picture. RIGHT—View looking east at westerly end of Russian River relocation project at Calpella near its intersection with US 101. The railroad bridge and Russian River in lower center will be simultaneously bridged by one highway structure.

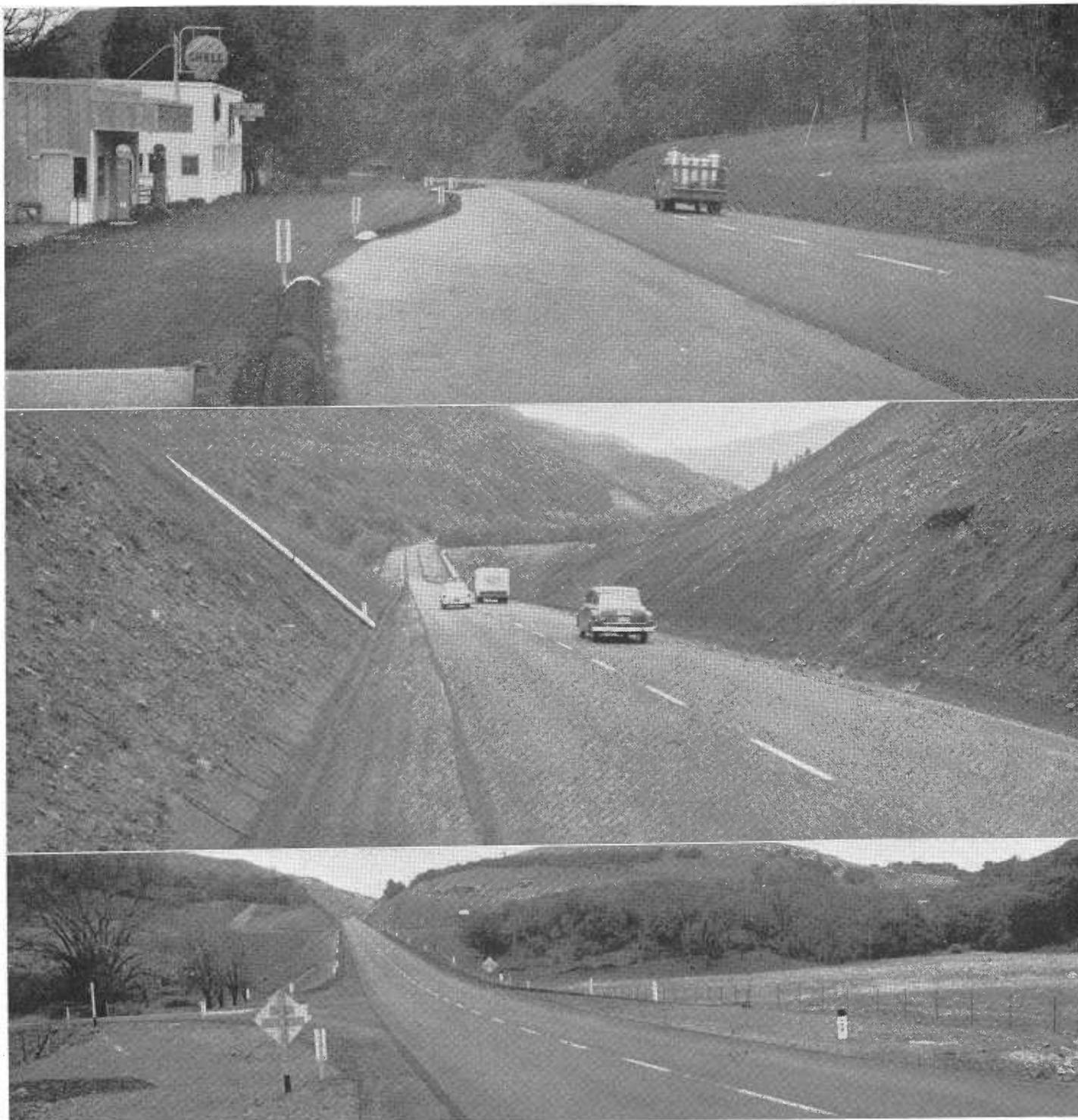
Due to the short design period allowed on this project, design was made on aerial contour maps. Because of the heavily brushed steep terrain aerial contouring suitable for deter-

mining accurate grading quantities was problematical. It was therefore necessary to cross-section the job prior to the start of construction. This work was performed by district crews

during the months of January and February in a very rapid manner, despite heavy rainfall. Cross-sections were taken with Rhodes arcs after initial work of brushing, setting right

LEFT—Looking westerly down rugged canyon of East Branch of Russian River. Note highway construction pioneer roads in lower center. Coyote Valley is first valley seen at north of canyon. RIGHT—Looking easterly at easterly end of Russian River Reservoir relocation project. Equipment in lower center is constructing bridge to cross reservoir.





Sign Route 20 at the Mendocino-Lake County line, originally constructed state highway of 1921 standards, has been replaced by a recently completed improvement. UPPER—Near beginning of new improvement in Mendocino County looking west. CENTER—Modern alignment on relocation replaces old substandard facility. Descending from summit in Lake County traveling easterly. LOWER—In Lake County traveling west approaching summit and Mendocino-Lake County line. Old highway crossed summit in saddle on far right.

angles, and setting reference points with a transit outside the anticipated catch points of the slope stakes. Field data was then submitted to the Tabulating Section in Sacramento, which

computed earthwork quantities and slope stake elevations and distances from center line electronically. Using this slope stake data and the reference points set with a transit, it was then

possible to set slope stakes to grade at a considerable savings in time.

This project is the latest in a series of improvements on Sign Route 20

... Continued on page 19

Welcome Highway

Valley Ford-Bodega Bay
Road Finally Modernized

By VICTOR J. BAILEY, Sonoma County Resident Engineer

THE Valley Ford-Bodega Bay Highway, Federal Aid and Secondary County Route 777, will on July 1, 1957, become an integral part of the State Highway System but in the past has been maintained by the County of Sonoma. The many dairy, sheep and cattle ranches, numerous lumber mills to the north as well as the fishing industry at Bodega Bay are all served by this highway. Tourist and recrea-

tion traffic also use the route during much of the year to enjoy the facilities of the state and county parks along the Pacific Ocean. Not only are these ranchers and tourists benefited by the recent improvements, but the possibilities of the area are thereby greatly expanded.

History of the old road commences with the trail of the Digger Indians

and Spaniards from Tomales to the north coast country and the Russian River. It crossed the Estero Americano at the site of the present town of Valley Ford, hence the name. With the settlement of Valley Ford about the year 1861 came gradual extension of a road system. Before long a stage line operated from Bloomfield and Petaluma terminating at Valley Ford.

This photo shows section of old Valley Ford-Bodega Bay highway prior to recent improvement





*UPPER—Section of the Valley Ford-Bodega Bay highway recently completed by Sonoma County.
LOWER—This photo shows improved section of highway shown in picture on page 5.*

Railroad Goes to Valley Ford

The North Pacific Coast Railroad extended in 1876 through Valley Ford was a welcome relief from the tedious journeys over the roads of the day. Parts of the old trestle south of town still stand where the line crossed the estero and part of the new road was constructed over the old railroad bed north of town.

An early landowner, Hollis Hitchcock, who had prospered steadily

from his arrival without a dollar in 1856, bequeathed upon his death in 1896 a sum of \$20,000 in trust to three prominent citizens for Bodega Township. The funds were to be expended for macadamizing and improving roads in the township at the rate of \$2,000 per year. Elders of the town today who were in their teens at the time recall the long era of dirt and gravel roads that were axle deep in

mud through the winters of those wagon days.

At Bodega Bay the Russians who claimed the area on the north to Fort Ross pushed through a road from Bodega Port, six miles east to the site of the present town of Bodega. This road served to transport wheat from the vast acres of rich valley lands to the ocean vessels at the port. After the Russians left about 1842, a sea captain by the name of Smith running a

thriving trade to San Francisco obtained land around Bodega from the famous John Sutter. He later brought the first steam engine to California and installed it at Bodega in a mill around which the town sprouted. A creamery also added to the activity of the town and before long, roads connected eastward to Valley Ford and Sebastopol.

Relics of Early Days

During construction of the new highway, relics of those early days were unearthed in the stumps of old piling of plank bridges across streams and small redwood box culverts and gutters in the streets of Valley Ford. In making way for the new, weathered old moss covered fence pickets set some 70 years ago and still in service were salvaged by the ranchers who obtained a good price for them from city gardeners and decorators.

Thus we see the lowly road transcend the era of the sailing vessel and the railroad in the evolution of this rich farming land.

Acceptance on February 11, 1957, of the final contract, completed a reconstruction program of FAS Route 777 that has been underway since September, 1951. Four contracts in the program included 8.9 miles of new roadway from just east of Valley Ford to Bodega Bay in Sonoma County. An additional contract provided 1.2 miles of construction over Wiggins Hill four miles west of Petaluma.

The first section starting one mile east of Valley Ford was awarded to a joint venture of Pike and Hill, Cary Bros., and Bailey of San Rafael.

Work Bugged Down by Rains

Roadway excavation which was well underway by November, 1951, suddenly bogged down under early torrential rains, and the little town suffered no little hardship with flood waters and deep mud on either side. However, with stout hearts and friendly cooperation the townspeople bore with the contractor until the roadway could be shaped up for winter suspension of the work.

While construction resumed the following summer, J. Henry Harris of Berkeley worked on the small proj-

ect at Wiggins Hill for which he had been awarded the contract. The long awaited improvements on this section relieved the dangerous curves on a steep grade which had been the scene of several disastrous accidents. An uninterrupted schedule permitted the contractor to complete the work in 66 working days, 24 days less than the time allotted. The fact that a contractor engaged by the United States Government was installing a 6-inch water line along the roadside at the time, made this performance all the more interesting.

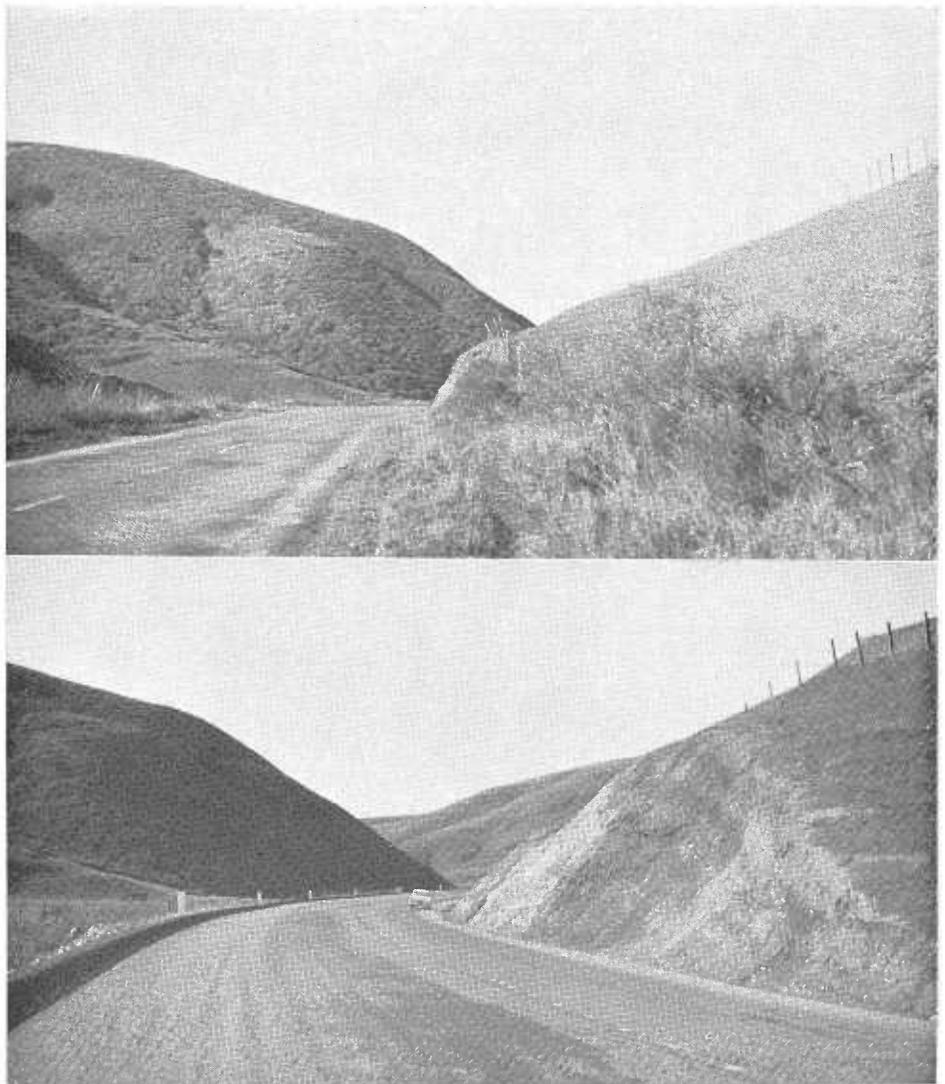
In the fall of 1952, J. R. Armstrong of El Cerrito was successful in the bidding for the next section west of Valley Ford but did not start work

until the following spring. The interesting feature of this project was the high quality of material used in the base structure. The contractor chose a site near the end of the project to develop a hard rock pit and install a crushing plant. However, after the subbase course was completed, it was necessary to suspend work through the winter of 1953-54 for a six-month period. Drivers of lumber traffic traveling into Petaluma and points south were jubilant over completion of this section by September 21, 1954.

Big Clearing Job

Huntington Bros. of Napa picked it up from there. With previous experience further north on State Sign

UPPER—Portion of Valley Ford-Bodega Bay highway before improvement.
LOWER—Same section after modernization.





UPPER—Newly completed highway. Note contrast with old road at left. LOWER—This is another view of new highway, showing old winding road on right.

Route 1 they waded in on the big clearing job of the next two and a quarter miles. By the following May when contract time started, the grade was prepared for full scale roadway excavation. It was evident that this must be a boom year for house trailers and outboard motor boats. The difficult construction area did not appear to dampen the spirits of the traveling public with these cumbersome loads on its eager trek to the Pacific playground only a few miles beyond. The contractor handled both project and traffic efficiently.

It may be mentioned that L. A. Huntington was commended by the people of Bodega for his alertness in dispatching a large water truck to the scene of a fire that threatened the town in view of the failing water supply.

Improved driving conditions between Valley Ford and the coast warranted a new design at this point for the intersection near Bodega. Traffic islands with additional turning and acceleration lanes were installed, and on November 29, 1955, the county supervisors passed an ordinance yielding the right of way to traffic on the new highway by repositioning the "Stop" sign.

Elevated Grade Required

The final section was shown to bidders in October, 1955, a month before completion of the previous project. Transocean Engineering Corp. took the Huntington Bros.' position into account and outbid them by approximately \$8,000. The record rainfalls of that winter took their toll in small slides in cut slopes along the completed work but nothing serious developed. However, the great need for an elevated grade and improved drainage was demonstrated by flooded areas down through the gulch and out through the flat near the bay on the section ahead. The town of Bay was virtually isolated for a short period with the old highway flooded to the south and a section of road washed out in a gulch on the north. Therefore, arrival of men and equipment in the spring was a welcome event to this little fishing village.

In May the largest roadway excavation of the program (54 percent of

the total) got under way on massive thorough cuts through rocky material. A detour over Bay Hill Road was posted and traffic by-passed the rough construction area with little inconvenience.

The contractor followed suit on a scheme initiated by the Huntingtons when, in lieu of developing a rock pit for base material at a designated site near the job, they chose to haul river gravel from the Russian River gravel bar. The haul of 15 miles from Bridgehaven to the job was accomplished in bottom dump double trailer units. The operation afforded quick stockpiling and rapid crushing production to keep easy pace with the grading activities and also provided easy working, good quality material.

Cost of Project

Cost distribution of the program for the three agencies shaped up substantially as follows: Federal aid funds 55 percent; state funds 14.5 percent; county funds 30.5 percent; for a total of \$1,067,000. The county bore an additional estimated cost of \$117,000 for right of way, preliminary surveys, plans and construction engineering.

Quantities involved throughout the program were not extraordinary for this type of highway as indicated here. Approximately 365,000 cubic yards of roadway excavation was performed and a total of 193,000 tons of base and subbase material was placed. With the exception of the Wiggins Hill job which was plant mix surfaced, the roadway was surfaced with a temporary "Class B" double seal coat.

To witness the coordination and cooperative spirit of the three governmental agencies involved in the engineering phases of this program was a gratifying experience. The engineers from the Bureau of Public Roads representing the interests of the Federal Government contributed much from their wealth of experience through helpful suggestions both in planning and construction.

The Division of Highways is certainly to be commended for the persistent diligence with which the contracts were administered, for the prompt cooperative testing of materials, and for the generosity of the

New Division in U. S. Bureau of Public Roads

B. D. Tallamy, Federal Highway Administrator, established as of April 18, 1957, a Division of Development in the Bureau of Public Roads.

The new division will initiate and execute the development work of the bureau and encourage the integration of the results of research and industry development into the highway programs of the bureau, the states and other federal agencies including the foreign aid programs. The work of the division will include the application of electronics and electronic computers, new techniques in aerial photogrammetry, and new road equipment developments and uses to highway work and the simplification and clarification of highway, construction, and maintenance plans and operations.

H. A. Radzikowski, who has been with the bureau for many years, was designated by the Federal Highway Administrator to head the division.

JUSTICE COURT'S WRATH IS TURNED ON 'LITTERBUGS'

TULARE, Tulare County—AP—The wrath of Justice Court Judge Ward G. Rush, known and feared for his stiff penalties against drunken motorists, has been turned on the "litterbugs."

Manuel L. Enos and Grover Webb of Tulare appeared before the judge Wednesday, charged with tossing litter from an automobile to the highway. Both were fined \$100, given 30 day suspended jail terms and ordered to clean up the litter.

engineering staff which could be called upon at any time for advice.

The responsibility of the County of Sonoma was to obtain the necessary additional right of way, to conduct the preliminary surveys, to work out the design and plans and to furnish the construction field engineering necessary to complete the program.

To all those contributing to this monument of progress the people of Sonoma County extend grateful thanks, as well as a hearty invitation to all to visit the Sonoma Coast.

OPERATIONS AND ACTIVITIES OF MATERIALS AND RESEARCH DEPARTMENT

By F. N. HVEEM, Materials and Research Engineer *

INTRODUCTION

With construction now under way on a new building to house the headquarters laboratories of the Materials and Research Department, it seems timely to describe in some detail the scope and activities of this little known branch of highway engineering. The term "little known" is, of course, only relative. Will Rogers once said that "All people are ignorant—only about different things." In this case only a relatively small number of average citizens and laymen have had occasion to learn that the Division of Highways carefully investigates and tests all materials used in the construction of the State Highway System. There is also some reason to believe that many activities or capacities of the Materials and Research Department are not well known or clearly understood even among highway engineers. On the other hand, the department is fairly well known to those who furnish materials to the State and among those interested in new developments in the use and evaluation of highway materials. There are many visitors and a considerable exchange of correspondence with individual engineers and agencies throughout the world.

ORIGIN OF HIGHWAY MATERIALS TESTING

A hundred years ago there were only two varieties of engineers—military and civil, but time has brought subdivisions and specialists too numerous to mention.

Fifty years ago, the equipment of the average civil engineer was still fairly simple. In order to complete a college course in engineering he had to become reasonably proficient in mathematics and in addition to his "sheepskin" he probably graduated owning a few handbooks including a set of trigonometric tables and perhaps a book on the strength of materials.

* This is the first of six articles by Mr. Hveem to be published in successive issues of California Highways and Public Works.—Editor.

WHERE THE WORK COMES FROM

- DIVISION OF HIGHWAYS**
 - 11 Districts
 - Construction Dept.
 - Maintenance Dept.
 - Right of Way Dept.
 - Design Dept.
 - Traffic Dept.
 - Bridge Dept.
 - Office Engineer
 - F.S.S. Dept.
 - Service & Supply
 - Cities & Corps
 - S.F. Oak Bay Bridge
- OTHER STATE AGENCIES**
 - Division of Architecture
 - Bay Toll Crossings
 - Water Resources
 - Finance
 - Purchases
 - Harbor Commission
- FEDERAL AGENCIES**
 - Bureau of Public Roads
 - U. S. Navy
 - Corps of Engineers
 - U. S. Air Force
 - Atomic Energy Comm.
- OTHER GOVT. AGENCIES**
 - Cities
 - Counties
 - Other States
- PRIVATE INDUSTRY**
 - Asphalt Refineries
 - Cement Mills
 - Steel Fabrication
 - Castnet Manufacturers
 - Miscellaneous Commodities
- TECHNICAL ORGANIZATIONS**
 - University of California, I.T.E.
 - Bureau of Public Roads
 - Highway Research Board
 - A.S.T.M.
 - A.A.S.H.O.
 - W.A.S.H.O.
 - A.C.T.
 - A.A.P.T.
 - A.S.C.E.
 - Portland Cement Ass'n.
 - Asphalt Institute
 - American Welding Society
 - American Chemical Society
 - British Roads Research Bd.
 - National Sand & Gravel Ass'n.
 - National Crushed Stone Ass'n.
 - American Wood Preservers Ass'n.
 - A.I.S.C.
 - West Coast Lumbermen Ass'n.
 - Mar's Ass'n Paint & Varnish
 - State Purchase Standards Comm.
 - American Soc. Corrosion Engrs.
 - Numerous other Technical and Scientific Agencies throughout the world

FLOW SHEET

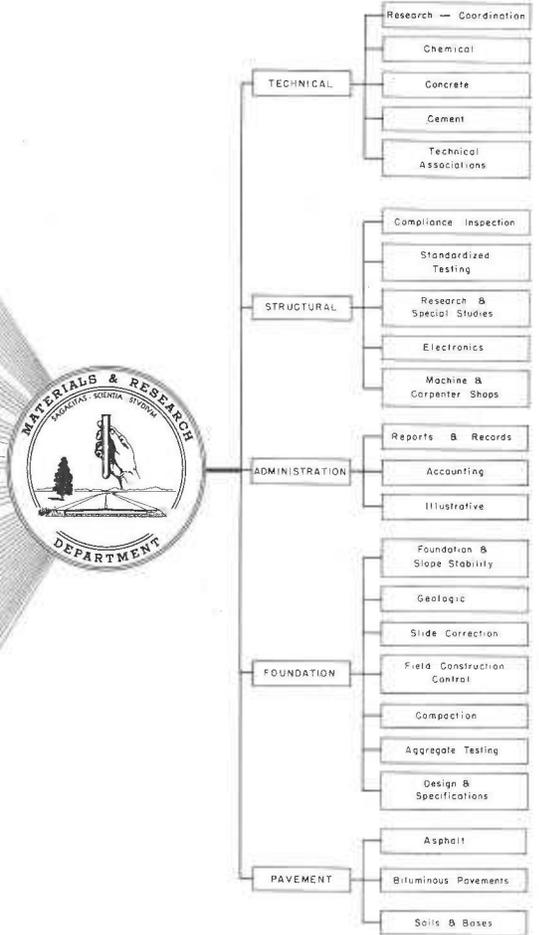


FIG. 1

For equipment, he might have a slide rule and a pocket magnifying glass used to read a transit vernier. As highway construction throughout the County began to expand with the automobile age, many civil engineers began to specialize in the highway field and soon came to feel the need of more and specialized tools. Numerous failures in the early road surfaces soon demonstrated that the ability of a soil to support a highway pavement could not be determined simply by looking at it and it was proven to be impossible to build good concrete or asphaltic pavements or to control any

other type of construction efficiently and dependably by relying solely on rule of thumb, personal opinions and observational powers of the individual. Something more was needed and as the engineer began to acquire more tools and instruments for securing accurate data, he needed a place in which to house and operate them. Such a building constitutes a "laboratory."

MAJOR EXPENDITURES ARE FOR MATERIALS

It is therefore more or less obvious that the so-called "laboratory" is simply an evolutionary development in

the efforts of the engineer to substitute precise measurements for guess work. However, those engineers who have followed the instrumentation and testing presses into the laboratory often are called "specialists"; somehow alien and suspect to their more orthodox brethren who "specialize" in planning, design or construction. However, subdivision of duties and apparent specialization has not been confined to materials engineers.

In recent years there has been a tremendous emphasis on planning and organization of highway programs. The raising of funds, budget allocation to various areas, right-of-way engineering, execution of plans and preparation of specifications occupies the time of a great many engineers. However, it is still true that only a small portion of the funds being spent for highways is spent for the engineering phases. The major expenditures are for construction, and as a matter of background or emphasis on the need for a materials department, it may be pertinent to point out that exclusive of right-of-way costs at least 75 percent of all the money spent for the construction of highways is actually spent for materials and the cost of their transport into final place on the road. It is the function of the Materials and Research Department to make sure that the tremendous sums thus invested in materials are well spent.

HISTORY AND DEVELOPMENT

In the California Division of Highways the Materials and Research Department is virtually as old as the State Highway organization and a testing engineer was established before there was a designated construction or maintenance engineer or any of the numerous specialists now needed to carry on the work. Concurrently with the creation of the State Highway Department the "laboratory" was established under the general direction of Chief Geologist Clarence B. Osborne. The first Testing Engineer, Fred T. Maddocks, assumed his duties in May, 1912. At that time the infant highway department was small; and the first laboratory was definitely primitive, consisting of a small wooden building on

the state fairgrounds. This was enlarged about 100 percent in 1914 by the construction of a "magnificent" clay-tile structure measuring 16 by 18 feet which shocked the highway commission by costing \$800.

In 1922, the laboratory was moved into a one-story brick building at 3435 Serra Way which was enlarged in 1934 and is still the principal building. The old brick building has long since been outgrown and today the department is housed in nine separate buildings, and three office trailers, scattered over several square miles of area. As these improvised arrangements indicate, the laboratory has grown considerably and today the department is impatiently awaiting the completion of a new and modern building located at the corner of Folsom Boulevard and 59th Street.

"State of Mind"

It is probably fortunate for the welfare and advancement of highway departments and for many agencies of private industry that a laboratory does not consist wholly of buildings and scientific equipment. The famous C. F. Kettering, formerly head of the research division of General Motors, contended that a laboratory should be regarded "as a state of mind." It is not, however, an easy matter to pinpoint or describe precisely the state of mind needed by individuals in a modern laboratory organization. For example, the Materials and Research Department staff includes about 60 different civil service classifications. Civil, mechanical, electrical and electronic engineers, chemists, geologists, drillers, instrument makers, draftsmen, photographers, accountants, clerks, laborers and stenographers indicate the variety of work that must be handled by a department such as this.

GENERAL ORGANIZATION

The Materials and Research Department is organized according to approved administrative principles, namely, all the work is allocated among five subdivisions or sections each under the jurisdiction of a section head who is a registered civil engineer of supervising or senior grade. *Figure 1* is a "flow diagram" illustrating the source and flow of work to

the various sections. This chart lists on the upper left hand side the departments of the Division of Highways or the state agencies that submit samples and request information. On the lower left side are the technical and research agencies throughout the Nation with whom the department maintains more or less close contact. The right hand side of the chart shows the department sections and subsections with further detail listing major classes of work handled by each. *Figure 2* is an organization chart showing the lines of authority.

The work of the Division of Highways has been expanding ever since its inception and it has been necessary for the Materials and Research Department to increase its staff and activities in order to keep abreast. However, it is not sufficient for an effective laboratory or research organization simply to keep up or follow along with general growth. It is essential that such a department be ahead of the times so far as possible and that the need for new tests, new measures, and new materials be foreseen in order that the necessary development work can be carried out before the need becomes pressing or imperative. This inevitably means that an effective research organization must at times be working on projects and phases of technology for which the need or necessity may not be immediately apparent to the casual observer.

Major Activities

While these research activities and developments of new methods and techniques are perhaps the most interesting and certainly among the more spectacular accomplishments of a laboratory organization, the control of materials and the routine tests and inspection made to determine whether or not the State is getting its money's worth represents the major part of the activities.

For simplification, therefore, the work can be grouped into four classes as follows:

1. Routine sampling, inspection, testing and reporting on materials actually purchased or proposed for use by the State or by contractors for use on highway work.

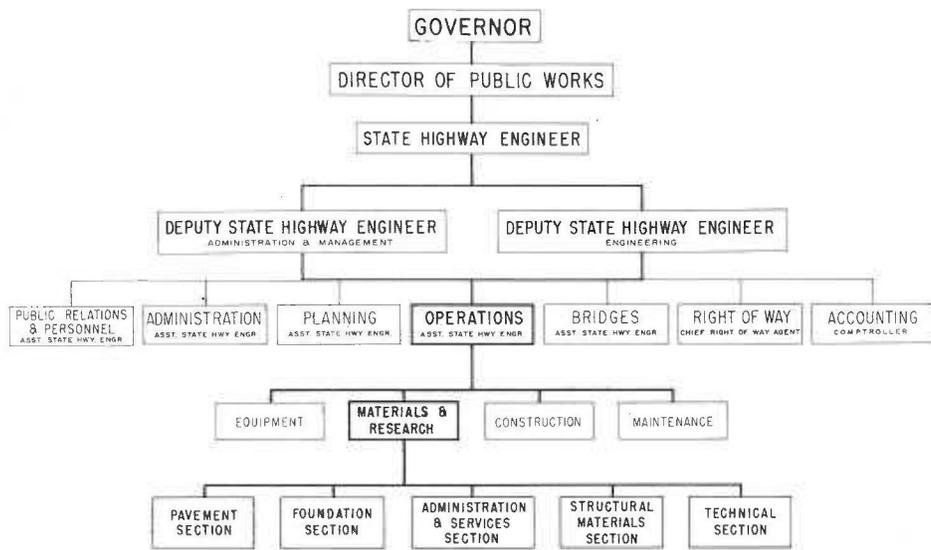


FIG. 2

2. Special investigations, usually to determine the cause for distress or failures. These may also be made to discover the reasons for outstanding good performance.
3. Research and development work aimed at developing new and better test methods, and new designs embodying better use of materials. This includes study of basic principles, and the development of formulas, et cetera.
4. Education and training of engineers who will work in other departments, primarily those responsible for the control of materials during construction. This activity is expected to increase substantially.

BRANCHES AND DISTRICT LABORATORIES

In the case of the foregoing activities, the materials work is divided between Headquarters Laboratory and individual laboratories in each district. The work of the district laboratories is largely confined to Class 1 and Class 4 as listed above. The district laboratories are set up and equipped to perform tests on soils, mineral aggregates, cement treated bases and bituminous paving mixtures. The district laboratories carry on occasional special investigations. It is not intended that they should do much in the way of research or development work but a substantial portion of their time is spent in training men who will

later work in other departments. The work of the Materials and Research Department is handled by the headquarters unit at Sacramento and the four branch laboratories, one of each being located at Los Angeles, Berkeley, Santa Maria and Bakersfield. The work of the branch laboratories is entirely devoted to inspecting and testing manufactured products and commodities, such as, asphalts, structural steel, precast concrete, metal pipe and innumerable other items used in the construction of highways and bridges. The work of headquarters laboratory (including the branches) may be subdivided as shown by chart, Figure 3.

RELATIVE PROPORTION OF HEADQUARTERS LABORATORY EXPENSE FOR THREE PRINCIPAL PHASES OF WORK

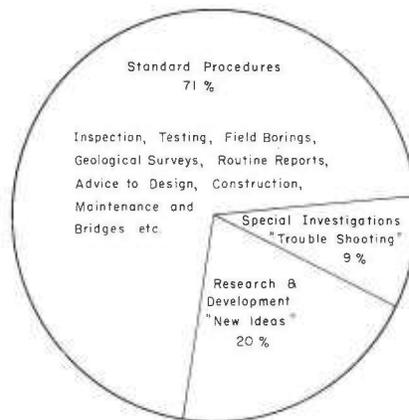


FIG 3

RELATIVE SIZE OF EACH LABORATORY SECTION BASED ON TIME AND MATERIALS DISTRIBUTION

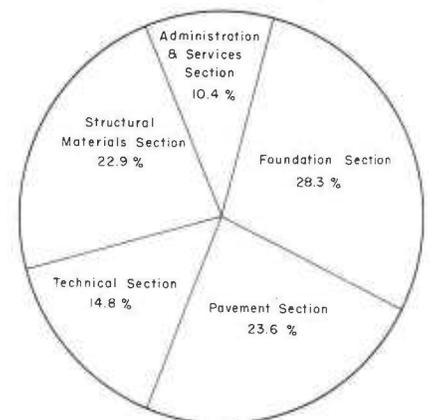


FIG 4

The relative size of the five sections is shown by chart, Figure 4.

HOW THE MATERIALS AND RESEARCH DEPARTMENT FITS INTO THE HIGHWAY ORGANIZATION

Like all large organizations, either public or private, the Division of Highways, has, of necessity, become increasingly departmentalized and engineers have been forced to become specialists. This question of who is a specialist can produce some interesting arguments. It can at times place a designated "specialist" at a marked disadvantage, especially with respect to opportunities for advancement to the better paid positions involving general knowledge, responsibility and administrative skill. It is not widely appreciated that so far as the Division of Highways is concerned the materials engineers are today the least specialized of all units or departments. With the subdivision of work into such groups as planning engineers, design engineers, hydraulic engineers, traffic, construction, maintenance, and many others, it becomes evident that each of these departments deals with some limited aspect of the highway problem but the Materials and Research Department is the one unit which is actively involved in all stages from the beginning to the end of a highway.

Diversified Research

This involvement begins with the initial investigations during the pre-

liminary planning stage for new roads. The laboratory is consulted in the design and preparation of specifications for construction projects. It handles much of the inspection and testing and thus carries a major share of the responsibility for the materials and the manner of use by the construction forces. Finally, it falls to the laboratory to make observations, studies and investigations to determine performance of the completed roads or structures over a period of years, and give advice and assistance to the maintenance department for repair of highways and bridges whenever necessary. In addition to assisting and cooperating with the departments and engineers engaged in traffic, planning, designing, construction and maintenance, the department also handles inspection at the steel mills and fabricating plants and conducts special investigations and research for the Bridge Department. In effect, the Materials and Research Department is invited to share the problems of all other engineering departments and must be prepared to assist anyone needing advice or exact information.

FUNCTION AND WORK OF THE MATERIALS AND RESEARCH DEPARTMENT

While it is customary to speak of "the laboratory" as though it were a single entity, as a matter of fact the Materials and Research Department operates at least 18 different laboratories, each of which employ very different procedures and require different background and training for the personnel. In addition to these distinct laboratories there are inspection forces in Berkeley and Los Angeles and such important units as the machine shop, library and other services in Sacramento. For administrative and supervisory purposes the Materials and Research Department is divided into five sections as shown by *Figures 1, 2 and 4*. These sections are pavement, foundation, structural materials, technical and administrative. The work of each of these sections will be discussed in considerable detail in subsequent issues of this magazine. However, the following brief outline gives some examples of the work of each.

Inasmuch as a modern highway laboratory becomes involved in many

problems it is forced to draw upon a wide variety of skills and special knowledge both within and outside the organization.

Pavement Section

Someone observes that rain washes the asphalt from certain types of stone used in an asphaltic pavement but does not do so when other types of stone are used so the question immediately arises—"Why does this happen, and how can the engineer recognize the satisfactory materials prior to using them?" and more important—"How can he set up specification safeguards to prevent unsatisfactory aggregates being used on the highway?" Pursuing the answer to this problem has led into many branches of science—mineralogy, petrography, chemistry and colloidal chemistry, and within the framework of these sciences there are many special fields which must be explored in trying to find out how to prevent failures.

Another problem which has taxed highway engineers for many years is the question of how thick to build a given pavement. Limitation of funds makes it imperative that pavements not be constructed heavier than is necessary. An intelligent and efficient structural design means that a number of variables must be carefully evaluated. Among these are the nature of the soils, amount of water present, weight of vehicle axle loads, number of repetitions of load and strength of the various pavement components. The formulas currently in use in this State were developed in the pavement section of the laboratory and studies on this problem are continuing. *Figure 5* shows employees of the pavement section measuring pavement deflections using the Benkelman Beam with automatic recording device developed in the department.

Foundation Section

It is trite to point out that all engineering structures, even airplanes, must be supported by something. Highway pavements and structures rest upon the ground and the ability of the various soils, sands, silts and muds to support heavy structures varies considerably. Engineers must be able to evaluate such supporting

power in advance. It is one function of the laboratory to investigate foundations and all areas called upon to support the loads resulting from the increasingly heavy highway embankments and from modern traffic.

Since it is impossible to explore all portions and depths of a foundation site, it is necessary to rely upon borings and soundings and "piece together" the information obtained. To do this, the materials engineer must bring to the problem a knowledge of local geological formations, trends and characteristics of all sorts of soil materials and to make use of all modern techniques which include seismic investigations, earth resistivity measurements and perhaps aerial photographs. The stability of slopes, the prevention and correction of slides is a major responsibility of the Foundation Section. *Figure 6* shows the head of the foundation section and crews on the job ready to correct a serious slipout on a major highway.

Structural Materials

An increasing portion of the highway dollar must be spent for bridges and overcrossings. Today's freeways in urban areas require more bridges over highways and streets than over streams, and while concrete and steel are the familiar materials from which bridges are constructed there are constant changes in composition and technique. The use of prestressed concrete in recent years has opened up new possibilities to the designer but also presents new problems to the materials engineer who must test the various units which are expected to operate under extremely high stress factors. Steel strands or tendons are used that must have an ultimate strength of 200,000 per square inch, and the safety and integrity of a prestressed structure rests entirely upon the ability of these relatively small strands of steel to carry the load. We must also think about stress corrosion and plastic flow or yield in the concrete.

Welding has brought about a considerable revolution in the use of structural steel. It is believed that at the present time California makes greater use of welding than does any other highway agency. It has been necessary to work out entire proce-



FIGURE 5



FIGURE 6

dures to control shop fabrication, to inspect the welding, and to make sure that the welded structure will conform to the designer's requirements. Welded fabrication makes possible a saving in weight and definite over-all economies but it does require continuous and unremitting attention on the part of the testing and inspection forces.

The inspection of steel fabrication is only one of the responsibilities for the structural materials section which must deal with all sorts of manufactured items, including concrete and metal pipe, prestressed concrete, et cetera. *Figure 7* is a photograph showing representatives of the Materials and Research Department joined by engineers from the Bridge Department at the plant of a steel fabricator. These conferences have become an established procedure, and have been very effective in reconciling differences and establishing complete understanding on the part of all concerned whenever work is started on a new bridge or structure.

Technical Section

Consider the performance of portland cement concrete. Here we have a material commonly regarded as virtually synonymous with ruggedness and durability. Nevertheless, large and expensive failures have developed. Engineers have known for many years that certain concrete structures have cracked, spalled and virtually disintegrated. It was not until 1939 that T. E. Stanton, former Materials and Research Engineer, discovered that the alkalis in some portland cements would react adversely with some types of sand or gravel. This discov-

ery earned international recognition including a medal for a major contribution to engineering knowledge, and launched an extensive investigation which is still under way from Australia to Denmark. Both public and private work throughout the United States and other parts of the world have benefited greatly by a knowledge of this potential hazard to the life and durability of concrete structures. The nature of the phenomena could only have been discovered by laboratory work.

The foregoing examples are only a few selected as representing work and advancement in major branches of construction materials. There are

many many more, some of which, while smaller, are very important. For example, all steel bridges require painting to protect the surface from rust and deterioration. Atmospheric attack varies widely throughout the world but is more severe along the ocean or near salt water and especially on a coast such as California where the prevailing winds blow inland from the sea. Certain steel bridges constructed close to the shore line have required repainting at two-year intervals using conventional paints that have been found very satisfactory for inland areas. A number of experimental installations have been made to determine the relative effectiveness and

FIGURE 7



FIG. 7



FIGURE 8

over-all cost of a number of types of paint and paint systems. In a full-scale field trial new products based upon vinyls and epoxy resins, together with combinations of new and old primers, have been tried. In the study of paints no satisfactory laboratory tests have been developed which will accurately simulate or accelerate the type of deterioration that occurs from outdoor exposure. Therefore, it is still necessary to place such trial installations in the field which, of course, means that considerable time must elapse before the merits or limitations of any new installation can be evaluated.

How to develop an economical and effective traffic paint is another major problem because such paints have to withstand the most severe conditions of traffic, rainfall and high temperatures. No substance has yet been discovered that will permanently maintain the high degree of visibility required for traffic safety. If the paint material itself does not darken or wear off, it soon becomes covered with a film of dirt that has heretofore been found to be more costly to remove than to renew the traffic stripe. It is generally true that paints are most durable when the rate of setting is slow but one cannot take advantage of this fact in the formulation for traffic paints which must set up very rapidly to avoid being smeared or tracked by the heavy, fast-moving traffic. The formula for traffic paint used on California highways was developed in the chemical subsection and is believed to represent the most



FIGURE 9

durable and economical traffic paint available commensurate with rapid-setting properties. *Figure 9* shows the laboratory crew installing experimental stripes of traffic paint to compare various formulations under actual traffic conditions.

The research correlation service maintains files on all research projects and retains copies of all contracts in order that data will be available for possible future investigations or studies of performance. A well-equipped reference library is being established as part of this activity. *Figure 8* represents a profilograph unit used for

evaluating pavement roughness and to follow changes in pavement contour.

Administration and Services

There are numerous demands and needs for services which are common to all of the operating units and the bulk of this work is under the direction of the administrative section. Such activities include the accounting department, drafting room and reproduction center which includes photographic equipment for recording test results and other phenomena as necessary. The illustrative arts are an important feature of the laboratory because in the final analysis laboratories



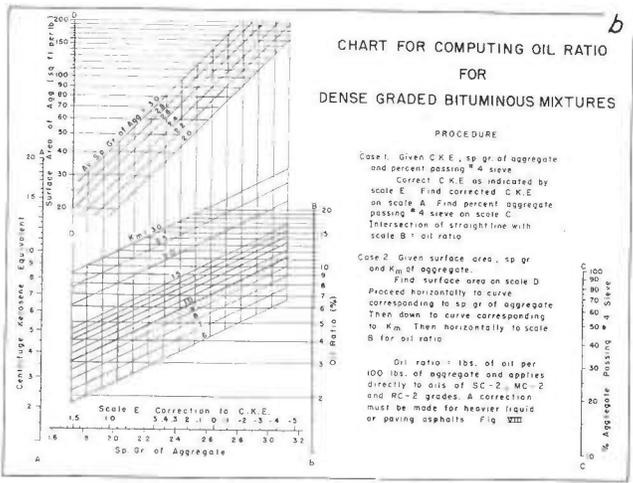
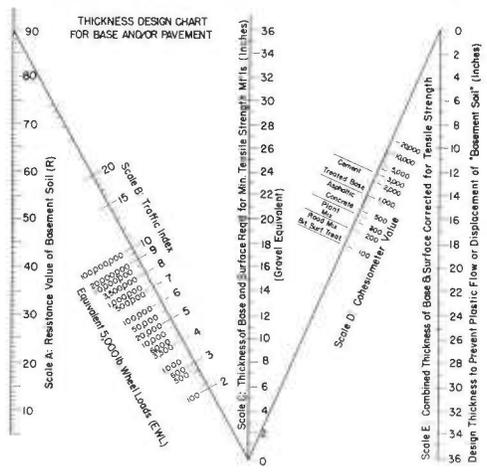
FIGURE 10

PROCEDURE:

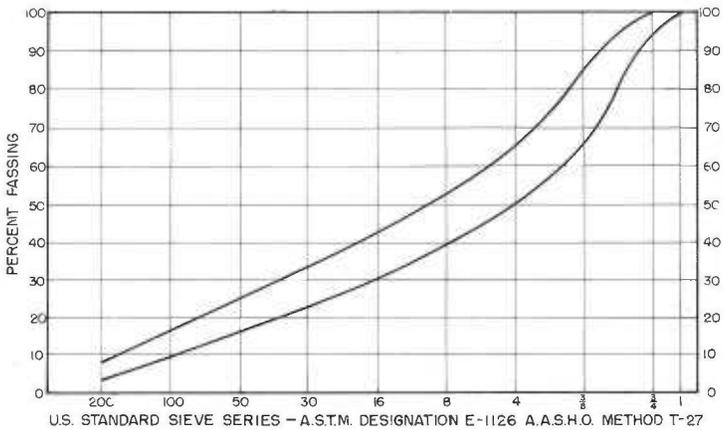
With a straightedge intersect Scale A at the value for R (as determined by the Stabilometer or some other substitute method) and Scale B of the traffic index for the total traffic load for the design life of the highway. The intersection of this line with Scale C is the thickness of gravel required to support the load (neglecting abrasion etc.). From this point intersect Scale D at the cohesion value of the surface. This line will intersect Scale E of the thickness of base and surface required to resist plastic flow of the base soil.

When the thickness of the surface material is to be less than one-half that indicated on Scale C, correct cohesion value for use on Scale D as follows:

- $S = \text{pavement thickness} \times c$
 - $0.5 \times \text{Scale C Reading}$
- Where:
 S = corrected cohesion value
 c = original cohesion value



GRADING CHART FOR BITUMINOUS MIXTURES



U.S. STANDARD SIEVE SERIES - A.S.T.M. DESIGNATION E-1126 A.A.S.H.O. METHOD T-27

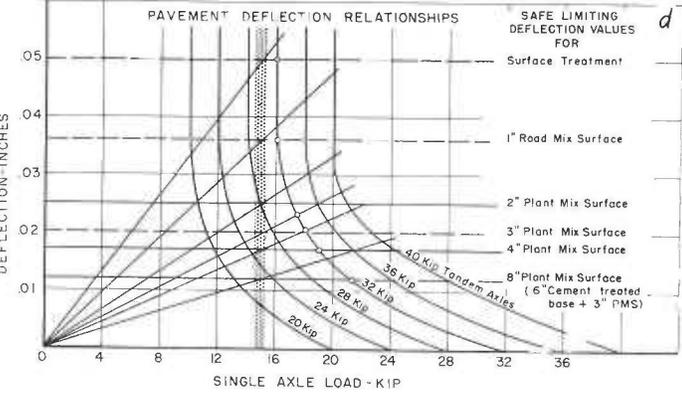


FIGURE 11 Charts developed in the Materials and Research Department dealing with various problems of pavement design

do not manufacture or engage in construction work directly. Hence, all findings must be available in the form of test reports or research reports in order for the information to be available and useful to those who are directly engaged in design, construction or maintenance. Figure 10 illustrates a portion of the activities of the section dealing with administration and services. Illustrated on the wall is a large analytical chart establishing the cause of pavement failures. On the table are technical reports and the complete set of manuals of office procedures prepared by the stenographic and clerical staff.

Following this general outline of the Materials and Research Department,

future issues of this publication will carry discussions of each section describing its functions and activities in greater detail.

The public is now providing very large sums of money for highways through federal and state gasoline taxes, most of which is spent for materials hauled, placed and shaped to form a traveled way. It is the obligation of the highway engineer to see that the materials of which the highways are built are of the proper quality and worth the price paid. The engineer must also be alert to the possibilities of new materials and new methods. These are the responsibilities of the Materials and Research Department.

GLAD YOU LIKE IT
STATE OF MINNESOTA
DEPARTMENT OF HIGHWAYS
St. Paul

MR. KENNETH C. ADAMS, Editor

DEAR MR. ADAMS: We have been receiving copies of *California Highways and Public Works* for many years. This magazine is read by all of the engineers in the Division of Lands and Right of Way. Of particular interest are the articles on acquisition of rights of way, control of access and economic affects on adjacent land values as a result of freeway construction.

Yours very truly,
E. J. ROWLAND
Engineer of Lands and
Right of Way

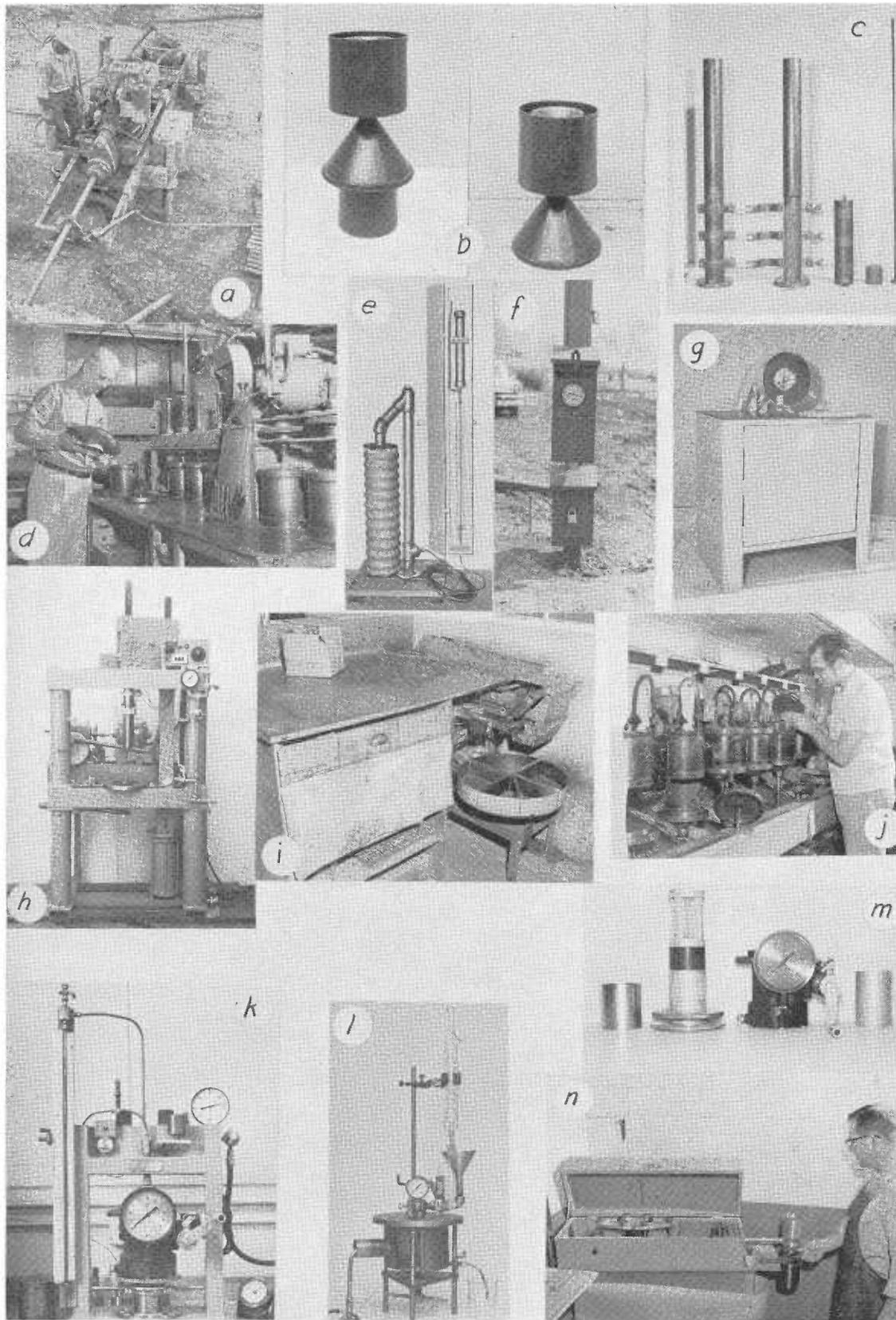


FIGURE 12

(a) California design horizontal drill rig developed in the Materials and Research Department, constructed by the Equipment Department.

(b) Sand volume apparatus for measuring density of compacted soils.

(c) California impact method for establishing standards for soil compaction.

(d) Laboratory mixers for bituminous materials.

(e) Liquid level settlement measuring device to measure the settlement of ground beneath highway embankments.

(f) Bourdon tube gauge for indicating pore pressure measured with piezometer installed in original ground under highway embankment.

(g) Abrasion tester for mineral aggregate.

(h) Mechanical kneading compactor.

(i) Quartering machine for bituminous mixture samples.

(j) Asphalt extractors of the pressure filter type.

(k) Resiliometer with stabilometer in place.

(l) Field extraction device for bituminous mixtures.

(m) Stabilometer assembly.

(n) Cohesiometer.

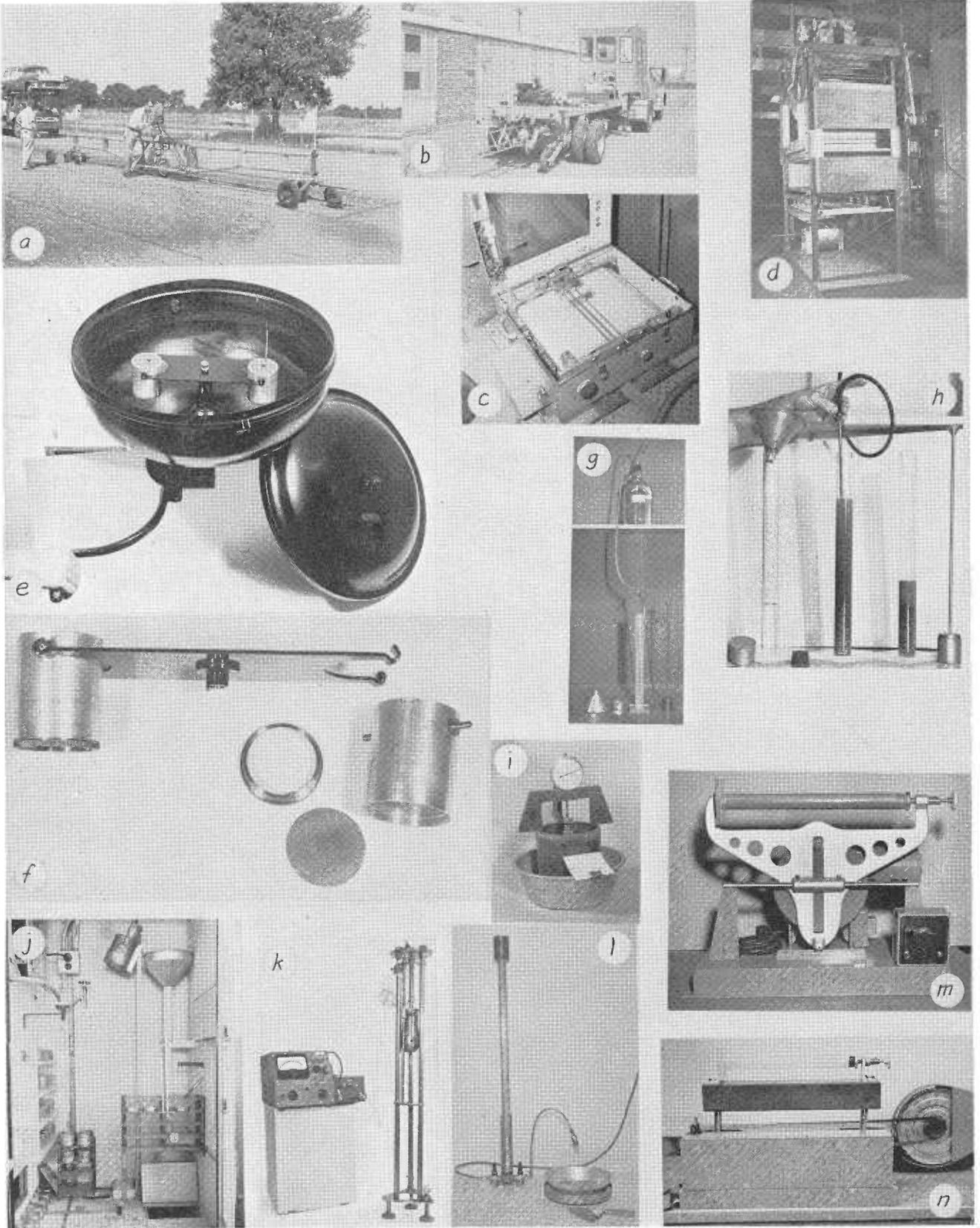


FIGURE 13

- (a) Manually operated profilograph for measuring pavement roughness.
- (b) Traveling deflectometer for measuring pavement deflections under load.
- (c) Recorder unit for profilometer.
- (d) Accelerated weathering machine for aging bituminous mixture samples.
- (e) (f) Hand operated centrifuge and head assembly for determination of centrifuge kerosene equivalent.
- (g) (h) Apparatus for the sand equivalent test.
- (i) Expansion test apparatus.
- (j) Shot abrasion test for durability of asphalts.
- (k) Decelerometer and peak meter for evaluating density of compacted soils.
- (l) Mechanical burette for metering water in soil specimens.
- (m) Sand equivalent shaker designed by Raymond Peltier of the French Department des Ponts et Chaussées, constructed in the Laboratory Shop.
- (n) Sand equivalent shaker designed and built in the Materials and Research Department.

SIGN ROUTE 20

Continued from page 4 . . .

constructed in recent years. The first of these was a 1.7-mile realignment across Tule Lake, in Lake County, completed in 1951. The second project was approximately 2.3 miles in length and was a relocation of the portion between Laurel Dell Lake and Tule Lake, in Lake County. This project was completed in 1955. The third project was a realignment and resurfacing project approximately five miles in length from 0.4 mile east of the North Fork of Cold Creek, in Mendocino County, to Laurel Dell Lake in Lake County. This project was completed in 1956.

The present contract was awarded in February of this year to Guy F. Atkinson Company. The bid price was \$2,695,357.10, and it is interesting to note that there was a variation of only \$4,875, or 0.2 percent, in the bid prices of the first three bidders.

The work is under the direction of Sam Helwer, District Engineer, E. L. Blomquist, District Construction Engineer, and the author for the Division of Highways. Henry F. Quade is the project manager for the contracting firm, and W. F. Hendricks is the project superintendent.

BIXBY CREEK BRIDGE

The Bixby Creek Bridge near Big Sur is the highest single span concrete arch bridge in the world.

In Memoriam

THOMAS H. MacDONALD

Ending a long and distinguished career in public service, death called Thomas H. MacDonald, retired Commissioner of the U. S. Bureau of Public Roads, at his home in Texas on April 7th. His passing is mourned in highway circles throughout the world.

HIS LIFE

Born, July 23, 1881, Leadville, Colorado.
 Graduate of Iowa State College, B.C.E. 1904.
 State Highway Engineer, Iowa, 1907-1919.
 Chief and later Commissioner, U. S. Bureau of Public Roads, 1919-1953.

MILESTONES

Sponsored organization Highway and Highway Transport Education Committee—later the Highway Research Board—1920.

Sponsored organization Advisory Board on Highway Research, 1920. This organization later became the present Highway Research Board.

Chairman, Joint Board of Interstate Highways, 1924. Sponsored organization Pan American Highway Congress, 1924.

Participated in organization of tours of Latin engineers, journalists and engineers to United States throughout the '30s.

Sponsored membership by United States in Permanent Association of International Road Congresses, 1926.

Sponsored meeting of that body in United States in 1930 when representatives of all countries met in Washington, later toured the United States.

Served as chairman and member of official U. S. delegations to meetings of Permanent Association in Italy and Germany prior to World War II.

Served in same capacity on official delegations to South and Central America.

Sponsored creation of official U. S. Interregional Highway Commission, 1941.

Served as member Official Commission on Alaska Highway. Later was charged with responsibility of building that road.

Accompanied members of Congress on official delegations as member in Central American surveys of Inter-American highway problems.

Throughout his term of office, served as member of Executive Committee, American Association of State Highway Officials and took active part in all of its deliberations on part of the Federal Government.

Directed participation of the Bureau of Public Roads in expenditure of federal funds in aiding governments of Philippines, Turkey, Ethiopia, Liberia.

Sponsored first President's Highway Safety Conference—1945.

AWARDS

Honorary degree, Doctor of Engineering and Marston Medal for achievement in engineering, Iowa State College.

Cross of Legion of Honor, Government of France.

Knight of the First Class of the Order of St. Olav, Norway.

Foreign member Masarykova Akademie Prace—pre-war government of Czechoslovakia.

United States Medal of Merit for outstanding service during World War II, awarded by President Truman.

George S. Bartlett Award recipient for major contributions to highways in 1931.

David Beecroft Award for major contribution to safety on highways, 1948.

HONORARY MEMBERSHIPS

American Society of Civil Engineers.

Institute of Traffic Engineers.

ACTIVE MEMBERSHIPS

Served with American Planning and Civic Association and numerous other private organizations.

FRATERNITIES

Beta Theta Pi and Tau Beta Pi.

Presbyterian.

CHURCH

Unusual Project

Four-laning of US 40
Requires Traffic Delays

UNPRECEDENTED steps have been taken in the last several weeks to alert the motoring public to an unprecedented situation in modern state highway construction in California—the expected delaying of traffic for as much as two hours on a major trans-continental highway.

The project is the widening of US 40 to a four-lane freeway through a five-mile portion of the Truckee River Canyon. The section under construction is immediately west of the Nevada state line, in a section of the canyon where no practical detour is available.

Provisions of the contract, which was awarded to Gibbons and Reed of Salt Lake City on March 14, 1957, on their low bid of \$4,976,184, include these unusual requirements affecting public traffic:

Unusual Requirements

The contractor must post signs along US 40 and State Sign Route 20 at four designated locations in California and one in Nevada (west of Reno) stating the hours when the road will be open.

When directed by the engineer, the contractor will distribute to vehicles waiting in line at delay points such explanatory literature as the State may furnish.

In addition, the Division of Highways issued three news releases, which were accorded state-wide publicity through the cooperation of newspapers and other media and the various automobile clubs and touring bureaus, explaining the necessity for the delays and giving the hours and closure and opening to traffic.

The project involves more than 1,000,000 cubic yards of excavation and earth moving. As explained in the State's leaflet which the contractor's flagmen are distributing to the motorists:

Extensive Blasting

"The narrow ledge on which the highway runs must be widened to 64 feet to provide four traffic lanes, a dividing strip, and shoulders.

TRAFFIC SCHEDULE

The weekday opening and closing schedules are as follows: US 40—14 miles east of Truckee:

12 midnight to 8 a.m.	—Road open
8 a.m. to 10 a.m.	—Road closed
10 a.m. to 1 p.m.	—Road open
1 p.m. to 3 p.m.	—Road closed
3 p.m. to 6 p.m.	—Road open
6 p.m. to 8 p.m.	—Road closed
8 p.m. to 10 p.m.	—Road open
10 p.m. to midnight	—Road closed

"To widen the roadbed and cut back the steep slopes, the contractor must first drill holes for explosive charges, then blast the earth and rock loose from above the traveled way. The material must then be loaded into trucks or scrapers and hauled away; it cannot be simply pushed over the side of the 'bench' or roadway. Care must be taken to avoid blocking the river or damaging the railroad tracks,

the telephone and power transmission lines or the flume which also occupy the narrow canyon.

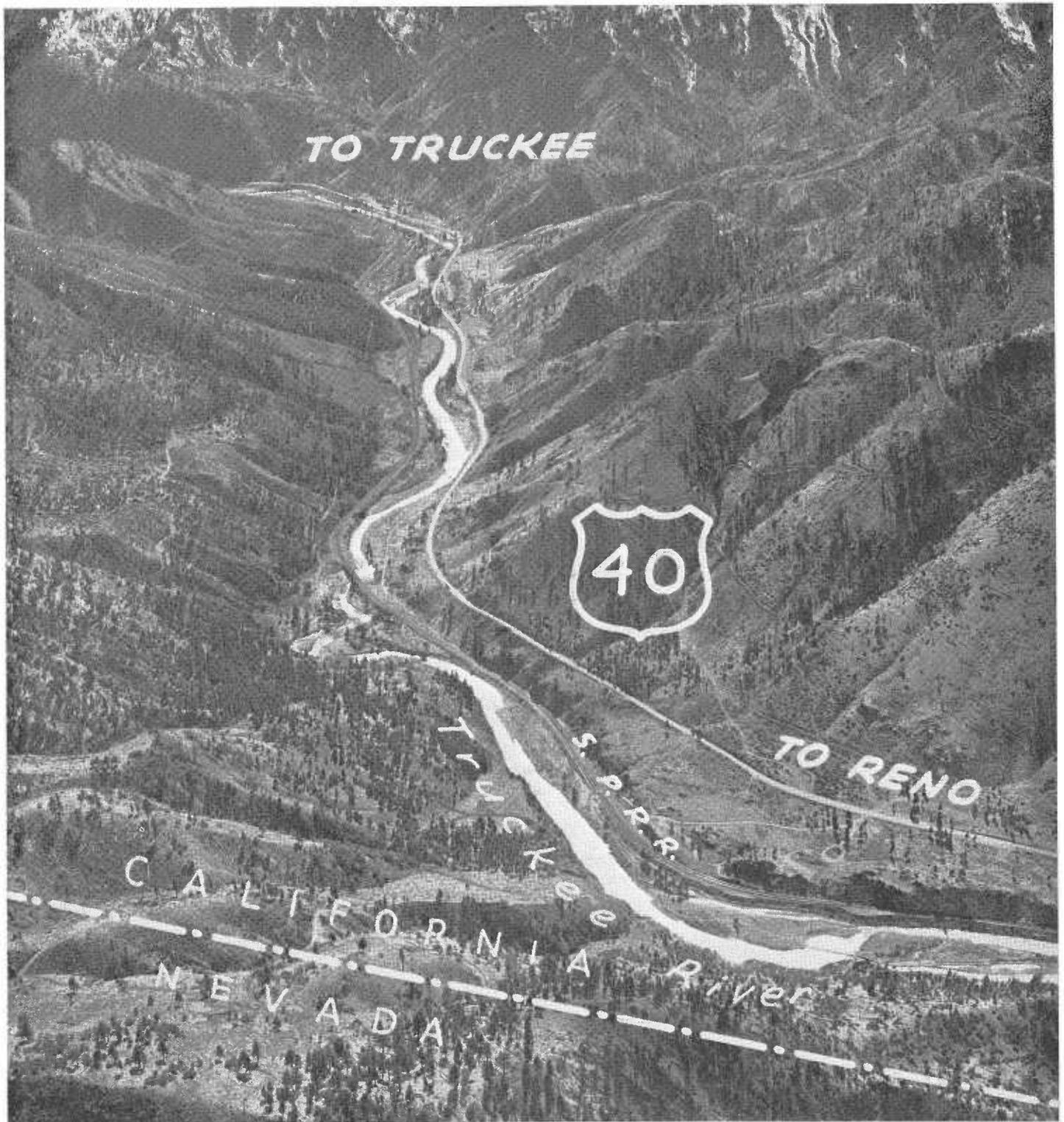
"Obviously, traffic cannot flow freely through the sector while these operations are going on. The inevitable loose boulders rolling down onto the road during blasting, loading and hauling are only one of the hazards."

The leaflet also contains an aerial photograph of the canyon, and a sketch map of US 40 between the Nevada line and San Francisco, showing the over-all progress being made toward developing this interstate route to freeway standards. In mountainous terrain, the leaflet points out, freeway progress "can't always be painless."

The contractor began work about the end of March, although the heavy-duty blasting and excavation did not get under way until the early part of May.

Start of construction in Truckee River Canyon





Artist has indicated on this aerial photograph of the Truckee River Canyon the US 40 relocation project shown by white line on rugged mountainside on the right

Press Tour

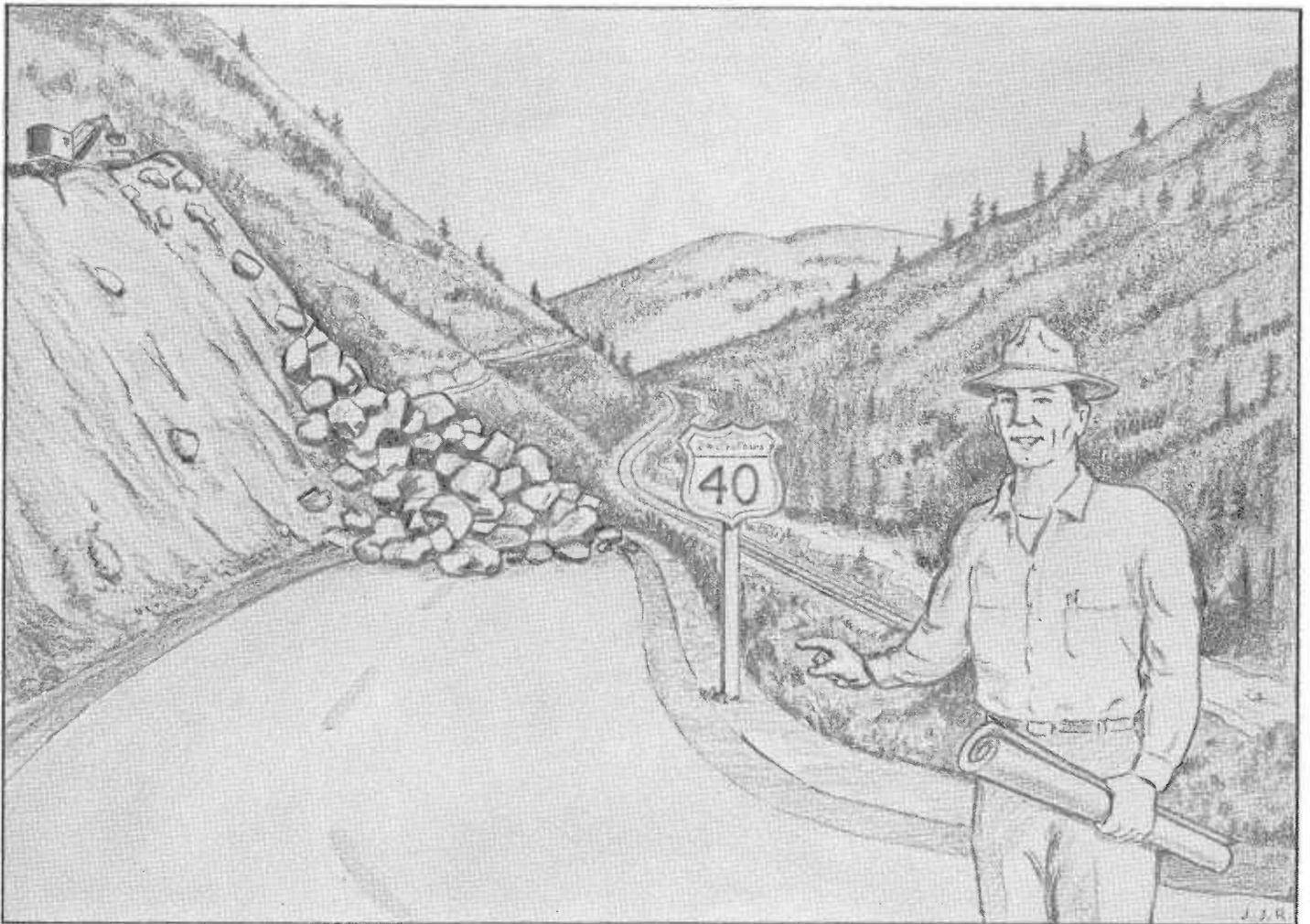
Meanwhile, the Division of Highways held a press tour of the project on April 29th, to give newsmen in Northern California, along with representatives of automobile clubs, tour-

ing bureaus, chambers of commerce and local officials a first-hand view of the job and the area involved.

The group of about 70 newsmen and others met at the Truckee-Tahoe Wye, proceeded to the project area

in two school busses furnished by the Truckee-Tahoe High School District, and returned to Smart's Cafeteria at the Wye for a luncheon meeting. The Truckee Chamber of Commerce was host for the meeting, which was pre-

Sorry you're delayed.....



This is reproduction of cover page on folder being distributed to thousands of motorists using US 40 through the Truckee River Canyon

sided over by District Engineer Alan S. Hart of District III. Hart announced the closure schedules and answered numerous questions about the job.

Also introduced at the meeting were Resident Engineer John C. Petersen of the Division of Highways; Lynn

Nielsen, district manager for Gibbons and Reed; and Afton Bohn, the contractor's project superintendent.

Directional Billboards

In addition to the steps taken by the Division of Highways to notify the public in advance of the restrictions

to traffic, the Truckee and Reno Chambers of Commerce have posted large billboards in their respective communities containing a sketch map of the Tahoe-Truckee area and showing possible alternate routes which the public might wish to use to avoid the construction zone.

In his letter of invitation to the press tour, State Highway Engineer G. T. McCoy pointed out:

"In this case the California Division of Highways finds itself faced for the first time with the unpleasant but compelling necessity to delay a substantial volume of traffic for as much as two hours at a time on a major transcontinental highway. * * *

"We are obviously up against a potentially explosive situation. Delays of this type are a necessary part of the price the public must pay for getting our major highways through mountainous areas modernized as rapidly as possible; this will not be the last of them, although we hope and believe no others will be quite so bad."

Actually, in nearly all other foothill and mountain sections of US 40 where freeway development is under way or planned for the near future, there are not likely to be any major restrictions to traffic.

Either the new construction will be off the present traveled way, as is the case with the construction now under way west of Auburn and west and east of Colfax, or special arrangements can be and are being made to provide detours.

For example, on the section of US 40 through the Truckee River Canyon just to the west of the current project, there will be similar terrain problems encountered in widening to freeway standards; but in this case a detour will be constructed around the most difficult section. Bids for construction of this detour, which will be 2.8 miles long and involve two bridges across the Truckee River, were opened in Sacramento May 22, 1957.

The specifications for the current freeway contract between Floriston and the Nevada state line require the contractor to terminate the traffic restrictions by September 30, 1957. The entire project is not scheduled for completion until the fall of 1958, but the schedule calls for completion of the heavy grading work this year, so that the highway can be left open to public travel during the normal winter shutdown. The remainder of the work, principally the surfacing, is not expected to involve serious delays to traffic.

ACCELERATED HIGHWAY CONSTRUCTION PROGRAM FOR NATIONAL DEFENSE

By MAJ. GEN. LOUIS W. PRENTISS (USA-Ret.)
Executive Vice President, American Road Builders' Association

When we think of the national defense aspects of the highway systems of the United States we are prone to take the narrow or limited view of military requirements and think only in terms of movement of troops, weapons and military supplies. We are apt to think also in terms of civil defense and the possibility of mass evacuation of population from key industrial cities. A broader approach to the subject not only recognizes these uses of our highways in times of emergency but, more importantly, appreciates the tremendous contribution of the highway systems to the insurance of a sound and continuing economy which is the foundation of our Nation's defense.

There has been a gratifyingly close and cordial working relationship between the military staff of the Department of Defense and the civilian staffs of the federal and state highway agencies in working out criteria for our highway systems that will permit them to serve the dual needs of our

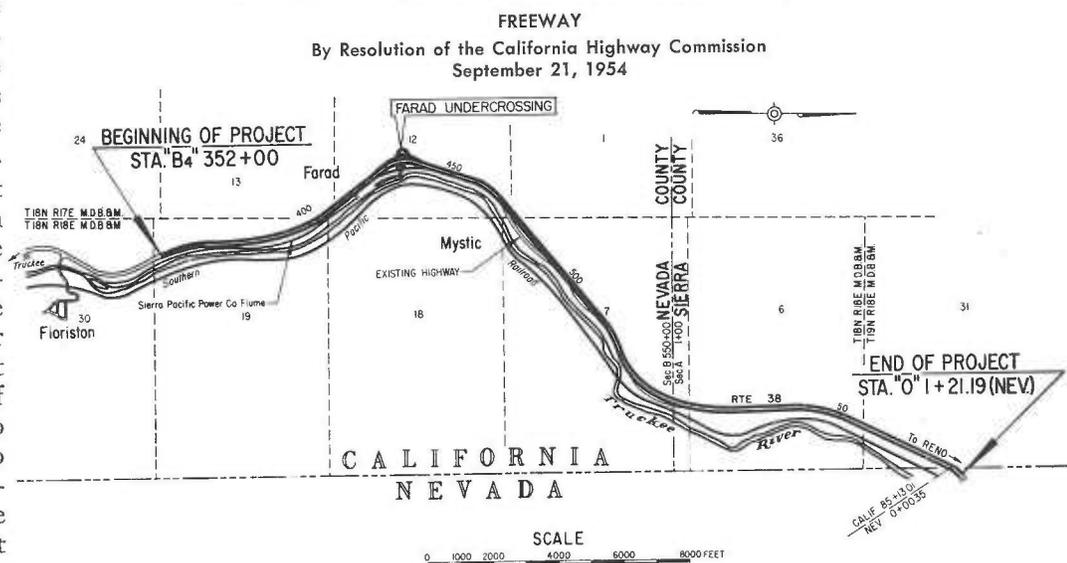
Nation—highways for peace and highways for war. Certainly no country can afford to build two sets of highways—one for the military only and one for civilian use. There may be times when important military movements will necessitate exclusive use of certain sections of a highway system for a limited period but no other priority apparently is anticipated by the Defense Department.

Highways for Defense

The Congress of the United States, ever alert to the importance of our highway systems to the needs of national defense, directed the Bureau of Public Roads to prepare a report on the subject: "Highways for the National Defense." This report, completed and submitted in February, 1941, led to the designation of the National System of Interstate Highways by the Congress in the Federal Aid Highway Act of 1944. It in turn was followed by a second study titled

... Continued on page 49

In Nevada and Sierra Counties, between 0.5 mile east of Floriston and Nevada State Line



Length of Project = 28,330 Feet = 5.37 Miles

Last Link

San Bernardino Freeway
In District VII Completed

By FRANK B. CRESSY, Assistant District Engineer

ON APRIL 26, 1957, State Director of Public Works Frank B. Durkee, acting upon the recommendation of State Highway Engineer George T. McCoy, accepted in the name of the State of California, the four-mile unit of the San Bernardino Freeway from Citrus Avenue in West Covina to Ganesha Boulevard in Pomona, thus marking the completion of the third major District VII freeway. Winston Bros. Company of Monrovia were the contractors. The Pasadena Freeway, 8.2 miles in length, was the first to be completed, and the 10 miles of the Hollywood Freeway was the second.

It is a source of gratification to all concerned when an important and badly needed freeway project is completed. This is particularly true in the case of the westerly portion of the San Bernardino Freeway that extends for 30.7 miles from the junction with the Santa Ana Freeway near the Los Angeles Civic Center, to the San Bernardino-Los Angeles county line at Claremont.

The county line does not, of course, mark the end of the San Bernardino Freeway which is State Highway Route 26 (US 60-70-99). This is the point that marks where jurisdiction of District VII for the Los Angeles County portion ends, and that of District VIII for the San Bernardino County section, begins. Extending easterly from the county line, seven miles of full freeway have already been completed by District VIII and are now in use as far as Archibald Avenue in San Bernardino County. From Archibald Avenue easterly, District VIII is now engaged in converting the existing four-lane expressway to full freeway status and building other sections of freeway as quickly as possible.

Under Way 20 Years

The San Bernardino Freeway in Los Angeles County for which Dis-

trict VII is responsible, has taken approximately 20 years for planning and design, right-of-way acquisition, and construction. During that time hundreds of people on the District VII staff have worked upon various phases of the over-all development that made this freeway a reality. The total cost of this 30.7-mile length of full freeway was \$52,000,000, of which right-of-way acquisition was \$17,000,000, and construction carried out under 43 contracts was \$35,000,000.

Many improvements have been developed during the past 17 years that the San Bernardino Freeway has been under construction, that have increased greatly the efficiency of construction operations in many different fields. Many of these beneficial innovations have had their dress rehearsal on some of the 43 construction contracts that have built this freeway. Examples of construction ingenuity include methods of pipe-jacking, drilling for cast-in-place piling, technique for prestressed, precast, reinforced concrete girders, and road mixing of portland cement concrete paving. Contributions such as these for improving construction technique merit further consideration by calling attention to the previous writeups in *California Highways and Public Works* that have described these special features.

Construction Methods

In Lyman R. Gillis's story on the San Bernardino Freeway, July-August, 1956, issue, James E. McMahan, Principal Bridge Engineer for the southern area of the State, and his construction assistant George L. Laird gave detailed information concerning drilling for cast-in-place piling and other innovations that were developed in connection with bridges and other structures.

Of particular interest on the Kellogg Hills section of freeway was the re-

quirement for jacking a total of 2,000 feet of various size drain pipe under the existing roadway. This was necessary at numerous locations where traffic could not be interrupted to permit trenching. For further information on this phase of work the reader is referred to the story by Resident Engineer R. M. Innis in the September-October, 1955, issue of *California Highways and Public Works*.

Prestressed Girders

Special note should be made of the story in the March-April, 1955, issue by Warren B. James, Resident Engineer, Bridge Department, entitled "Prestressed Girders." This story describes the methods of fabricating and erecting that were carried out in constructing the San Bernardino-Santa Ana Freeway bridge interchange that provided for a direct connection for westbound traffic on the San Bernardino Freeway to proceed southbound on the Santa Ana Freeway.

Other construction information concerning the San Bernardino Freeway will be found in the story in the November-December, 1954, issue of *California Highways and Public Works*, entitled "New Freeway," by George L. Laird, Bridge Construction Engineer, Southern Section, and C. J. McCullough, Resident Engineer, District VII, and E. A. Bannister, Resident Engineer, District VIII.

New developments in structural steel fabrication were described in a story entitled, "Welded Steel Superstructure," by W. R. McIntyre, Associate Bridge Engineer, in the March-April, 1953, issue. This story by Mr. McIntyre covered the construction on the San Bernardino Freeway in Alhambra for the Almansor Avenue overhead. In this same issue under the title "US 70-90 Freeway," L. S. Van Voorhis, Assistant District Engineer, District VII, and Jacob Dekema, Assistant District Engineer, District VIII,



UPPER—Looking westerly along completed San Bernardino Freeway in City of Baldwin Park, showing the Bess Avenue-Frazier Street overcrossing bridge under construction. LOWER—Looking westerly along completed San Bernardino Freeway, showing in foreground construction in progress on Barranca Street overhead bridge in West Covina. In background is shown May Company shopping center now under construction and nearing completion.

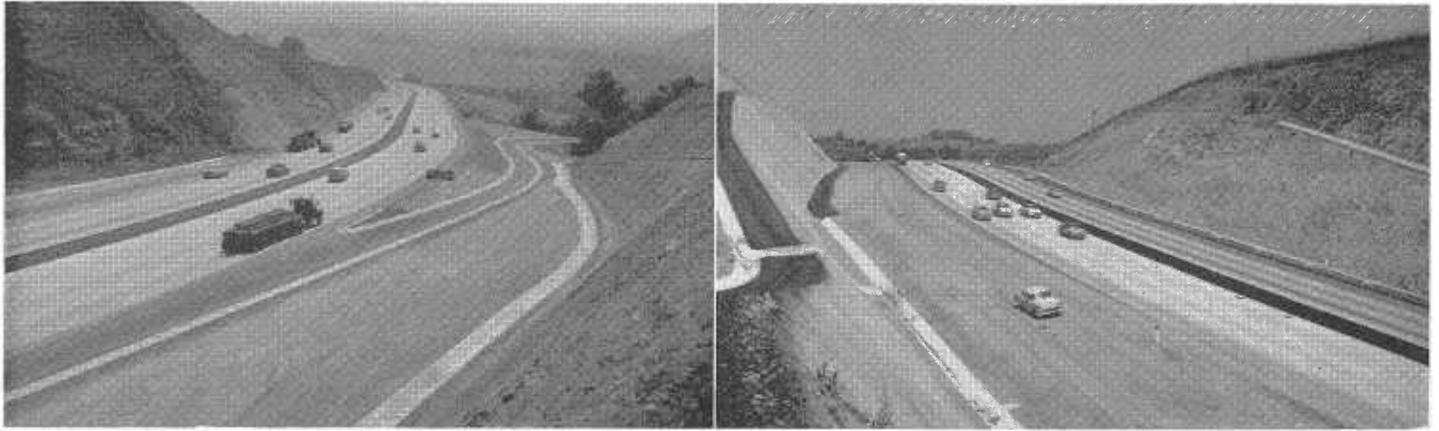
wrote about the design problems on the San Bernardino Freeway.

Contract Engineering Personnel

Another story of special interest that should be mentioned is that by

Basil N. Frykland, written when he was Resident Engineer on section of this freeway in the Alhambra-Monterey Park area. This story was entitled "Ramona Freeway," and written when this freeway had the old local

name before being officially named "San Bernardino Freeway" by the California Highway Commission. Mr. Frykland's story appeared in the January-February, 1952, issue of *California Highways and Public Works* and



LEFT—Looking easterly along completed San Bernardino Freeway from Kellogg Hill summit cut, with City of Pomona in background. RIGHT—Looking westerly along completed San Bernardino Freeway through Kellogg Hill summit cut.

particularly stressed the engineering personnel organization on contracts that were under way at that time.

Valuable from a historical standpoint, describing early construction contracts and the cooperative activities that initiated this freeway, is the story by P. O. Harding, Assistant State Highway Engineer, now retired, published in the September-October, 1951, issue of *California Highways and Public Works*. This story carried the title, "The Ramona Freeway," and reported the accomplishments as of that time.

The great traffic service which this freeway is providing motorists is indicated by traffic counts. Six years ago there were only six miles of the San Bernardino Freeway that were completed and opened to traffic. This was the most westerly section extending from the Los Angeles River bridge to Helen Drive in the City Terrace area just easterly of the Los Angeles city limits. The traffic on the then completed portions of the San Bernardino Freeway has been steadily increasing. The average daily traffic in 1950 was 25,000 vehicles per day, whereas 1956 counts taken at Soto Street in the City of Los Angeles show 88,000 vehicles per day. Ten miles easterly from Soto Street a recent check made on the newly completed section through the City of El Monte indicates an average daily traffic of approximately 80,000 vehicles per day, surprisingly close to the count obtained in Los Angeles City. This tremendous increase in traffic

volume is to a considerable extent due to the unprecedented building program in the areas passed through.

Two Additional Bridges

In the San Gabriel Valley area thousands of new homes have sprung up on both sides of the San Bernardino Freeway. With the development of new residential areas and resulting population increase there have come churches, schools and large shopping centers, often along the freeway frontage roads. Due to the unprecedented growth of the area, deficiencies in design became apparent in the Baldwin Park-West Covina area easterly of the City of El Monte, even while construction was still under way. The State Division of Highways entered into supplemental freeway agreements with the County of Los Angeles and the Cities of West Covina and Baldwin Park, so that additional overcrossing bridges could be constructed at the intersection of Bess Avenue and Frazier Street in Baldwin Park and at Barranca Street in West Covina. These two additional bridge structures with necessary revisions to connecting roadways are now under construction with very little interference being caused to freeway traffic flow.

The designs for these bridges were worked out on the basis of utilizing in the bridge deck precast, prestressed, reinforced concrete girders which are lifted into place during the late night-early morning hours when traffic is light and detouring can be accom-

plished with very little disturbance of traffic flow. In the case of the Bess-Frazier overcrossing, the girders have already been lifted into place, while those for the Barranca Street overcrossing are now in the process of fabrication at the site of the structures.

Even though we now say that the last link of the San Bernardino Freeway in Los Angeles County has been completed, and we do have in operation a six-lane full freeway extending from Los Angeles to Pomona, and a four-lane freeway easterly thereof, there is still much to be done.

There are landscaping and planting contracts for erosion control now under way, with others to be started in the near future. We also have ahead of us the construction of bus ramps at Eastern Avenue that will have to be done very soon.

Revisions Indicated

In the budget for the 1957-58 Fiscal Year is an item of \$8,900,000 for development of the Golden State Freeway in the East Los Angeles area that includes interchange facilities with the San Bernardino Freeway. The designs now nearing completion indicate that approximately one and one-half miles of the San Bernardino Freeway, from Fickett Street to Macy Street, will be reconstructed to provide widening the six lanes to eight lanes and adding interchange roadway ramp. The expenditure chargeable to the San Bernardino Freeway, when this section of the Golden State Free

... Continued on page 64

Ground Breaking

Governor Knight Launches Feather River Project Job

THREE THOUSAND water minded citizens of California, including many state, county, city and federal officials, saw Governor Goodwin J. Knight break ground for the Oroville Dam of the \$1,500,000,000 Feather



PATSY O'NEIL

River Project at Oroville on Saturday, June 1st, and heard him pledge "all my strength to push this vast project to a successful conclusion."

Governor and Mrs. Knight, accompanied by Harvey O. Banks, Director of the Department of Water Resources; Walter Schulz, engineer in charge of the project; Members of the Legislature and other dignitaries boarded a 22-car special train in Sacramento carrying 500 celebrants from Southern California and points in the San Joaquin and Sacramento Valleys, for the trip to the dam site five miles up the Feather River from Oroville.

Parade and Barbecue

The Governor and Schulz spoke briefly from the rear platform of the special train which then returned to Oroville for a parade to Hewitt Claim

Park, where the Governor addressed some 3,000 persons who were served a barbecue as guests of the Oroville Chamber of Commerce. Before the special train departed the chamber sponsored a Fellowship Hour in the Oroville Inn under the direction of Stanley Pittman, chairman of the celebration committee, and Miss Patsy O'Neil, secretary of the chamber, who, with their aides had worked for weeks on plans for the celebration.

Six bands, including the 80-piece Antelope Valley band from the Mojave Desert area of Southern California, participated in the parade.

First units of the Oroville Dam Project will be the construction of two of five tunnels for relocation of the Western Pacific Railroad around the dam at a cost of approximately \$8,500,000, and realignment of US 40 Alternate around the dam and grading 2.6 miles of railroad roadbed for which a contract in the amount of \$7,292,214 has been awarded by Director of Public Works Frank B. Durkee.

Governor Speaks

In his prepared address, the Governor stressed the fact that the Feather River Project in itself "is a water development of vast proportions. Oroville Dam, just five miles upstream from this platform, will be one of the

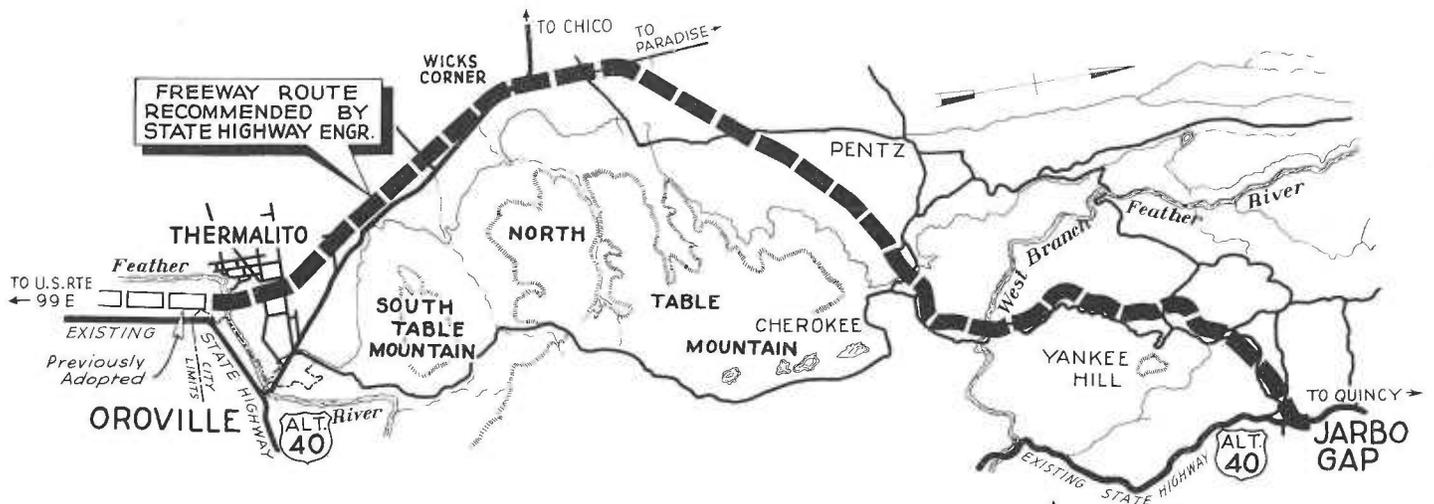
highest dams ever built by man, and the volume of materials brought together will rank close to or exceed that of any structure ever built."

The Governor declared that in ultimately transporting water 700 miles from the Oroville dam site to San Diego "the project in its entirety represents the longest mass transport of water ever conceived.

"It will make available nearly 5,000,000 acre-feet of water each year, or enough to provide for the domestic needs of every man, woman and child in the United States for approximately a week.

"The project will erase forever the fears of disastrous floods here in Oroville, in Yuba City, and Marysville, and in the rich farm lands of the lowlands to the south. It will provide 2,000,000,000 kilowatt-hours of electrical energy each year for project pumping and other purposes and it will incidentally create vast new recreational opportunities.

"Oroville Dam will be one of the most massive dams in the world. It will rise 730 feet above the stream bed of the Feather River. It will contain about 14 million yards of concrete—3.5 million more than Grand Coulee Dam in Washington, now the world's largest—and its crest length will be nearly one mile.



Summary of Project

"In summary, the Feather River Project will:

"Control floods on the Feather River and prevent recurrence of the Yuba City disaster of Christmas, 1955.

"Provide a firm supply of 970,000 acre-feet of water for the local service area downstream from Oroville Dam.

"Produce 1,720,000 kilowatt-hours of power annually.

"Deliver 240,000 acre-feet annually to the water deficient South San Francisco Bay counties.

"Deliver 2,230,000 acre-feet of water annually to the semi-arid western San Joaquin Valley of Central California.

"Deliver 1.8 million acre-feet annually to Southern California.

"It has been established through careful study that the yield of this great project will only erase the water deficiencies of today. There must be, and will be, more projects similar to this and many smaller ones to insure that California attains its destiny as the greatest state of the Union.

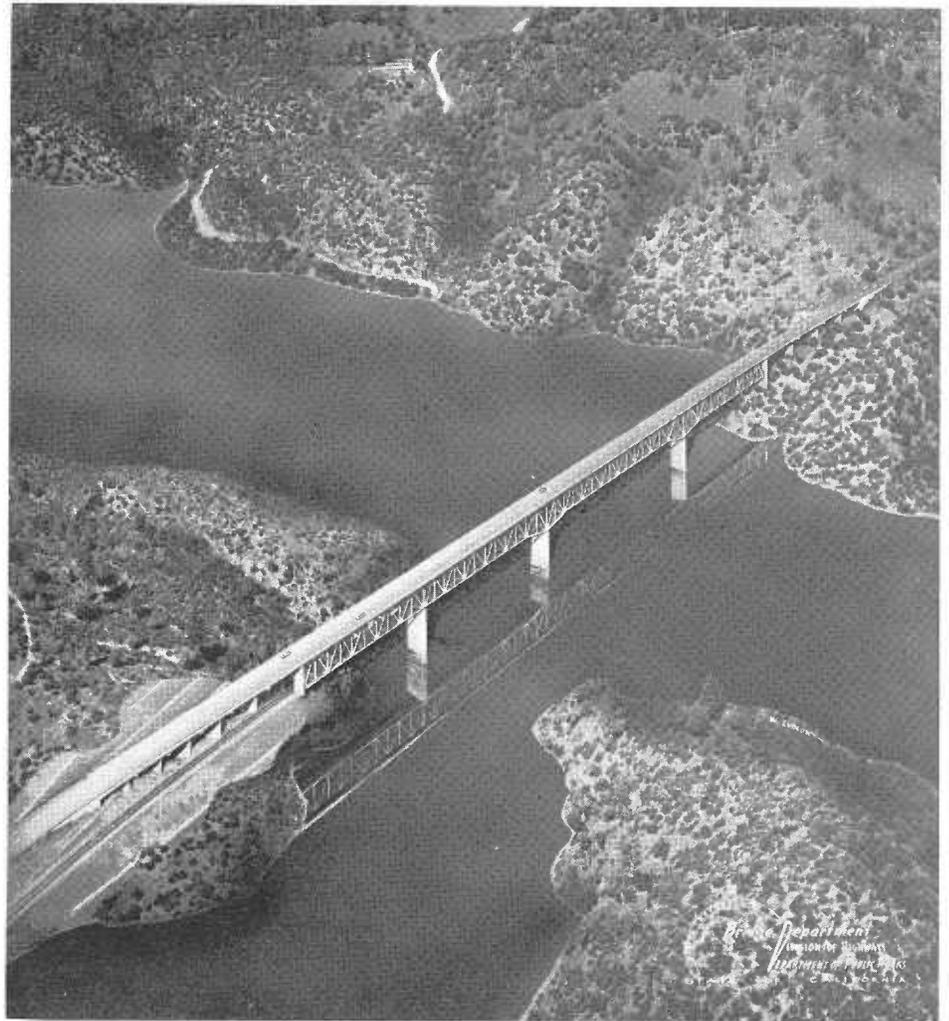
"Because this is just the beginning of state-wide water development, and because the work which is starting today is just the beginning of the Feather River Project, there can be no delay in continuing its construction with the greatest speed and aggressiveness."

First of Three Highway Jobs

When the waters of the Feather River back up behind Oroville Dam to submerge by depths of up to 700 feet present Highway US Alternate 40, motorists already will have become familiar with a new and modern highway which soon will be under construction.

Bids were opened May 15th on the first of three projects which will relocate the highway between Oroville and Jarbo Gap on a route 19.3 miles in length, about a mile shorter than the length of the present highway. The new highway will be well above the level of the reservoir.

This first contract, awarded to McCammon-Wunderlich Co. and Wunderlich Contracting Co., Palo Alto, in the amount of \$7,292,214, provides for the relocation of the highway for



Artist's drawing on aerial photo, showing how proposed West Branch Bridge will look when completed

13.2 miles between Wicks Corner and Jarbo Gap, about 15 miles north of Oroville. The contract does not include a proposed bridge over the West Branch of the Feather. Subsequent contracts will provide for construction of the bridge and for the section of highway from Oroville to Wicks Corner.

Relocation Route Adopted

The relocation will follow a route adopted by the California Highway Commission August 23, 1956, following public meetings held by the Division of Highways and a public hearing held by the commission.

The route starts at the southwest end of Montgomery Street near Oroville, crosses the Feather River and runs through Thermalito, then roughly parallels the Oroville-Chico

Road (State Highway Route 87) to Wicks Corner.

From Wicks Corner the route swings north along Clark Road and then northeast to cross the summit near Cherokee and then crosses the West Branch of the Feather at Vinton Gulch. Between the West Branch and Jarbo Gap the route roughly parallels the Oroville-Concow county road via Yankee Hill.

The Division of Highways is relocating the highway under contract with the Department of Water Resources, which will finance most of the work from legislative appropriations as a "replacement in kind" of the existing highway. Highway funds will be involved only to the extent that the new highway is an improved facility compared with the old. The cost of the entire 19.3-mile relocation

is estimated at approximately \$17,000,-000, including the new bridge over the West Branch.

Aerial Surveys

Making use of the most modern engineering techniques, the Division of Highways contracted for aerial surveys of the route and was furnished with contour maps made by photogrammetric methods. Design was completed from the maps, and calculations, such as earthwork quantities, were made by an electronic data processing machine. These methods saved several months of time over conventional survey and computation procedures.

The relocated highway will traverse rough and scenic terrain in the upper portion, and nearer Oroville will skirt the widely known olive groves of the Berkeley Olive Association.

An excellent view of the lake will be afforded at the north end of the West Branch Bridge, where a point will be "daylighted" to provide parking space at the vantage point. From the vicinity of Cherokee a fine view of the valley may be obtained.

Excavation Item Large

The project from Wicks Corner to Jarbo Gap includes a major item for 4,200,000 cubic yards of excavation. This excavation will include 666,000 cubic yards for the Western Pacific Railroad, where the relocated railroad will parallel the new highway at Vinton Gulch.

Three miles of railroad grading will be involved. Inclusion of the railroad grading in the highway contract permits using surplus material excavated on the railroad relocation for construction of the adjoining highway embankment, thus resulting in a substantial saving on the over-all project.

The Division of Highways contract also includes construction of a 1,285-foot siphon, known as the Vinton Gulch Siphon, located in the Upper Miocene Canal belonging to the Pacific Gas and Electric Company. The siphon will be of 42-inch diameter welded steel pipe, to carry the canal across a canyon and under the new highway.



UPPER—Governor Knight delivering address at Oroville. LOWER—Planners, left to right: Ray Leonard, Oroville Chamber of Commerce; Walter G. Schulz, Chief of Division of Design and Construction, and Harvey O. Banks, Director of Department of Water Resources.

The relocated highway will be built to the standards of a modern two-lane highway, with much of it four lanes, including a four-lane bridge over the West Branch. On the sections which will be two lanes initially, provision has been made for an ultimate four lanes over the entire length.

Designs for Highway

Designs for the various sections of the highway between Wicks Corner and Jarbo Gap are:

Wicks Corner to Pentz Road—initial two lanes, ultimate four lanes divided.

Pentz Road to West Branch Bridge—initial two lanes, ultimate four lanes.

West Branch Bridge to Yankee Hill—four lanes initially.

Yankee Hill to Yarbo Gap—initial two lanes, ultimate four lanes.

A subsequent contract will provide for the section between Oroville and Wicks Corner, which will have two lanes initially with provision for an ultimate four.

The West Branch Bridge, also to be built under a later contract, will carry both the highway and the Western Pacific Railroad over the river.

The bridge will be a double-deck continuous steel truss, with the upper deck a four-lane highway and with a single-track railroad on the lower deck 60 feet below the highway.

Over-all length of the bridge will be 1,800 feet, including a center span of 576 feet, two side spans each 432 feet long, and a 360-foot approach span on the south side of the river.

The bridge will be supported by three main piers, the tallest of which will be 240 feet high above natural ground. The highway grade will be 470 feet above streambed and 100 feet above high water. The railroad grade will be 40 feet above high water.

Plans for the Oroville-Wicks Corner highway and the bridge will be completed by next fall and ready for contract, depending on availability of funds.

OROVILLE-MARYSVILLE FREEWAY PROJECT TO START

District Engineer Alan S. Hart announces that the Division of Highways will soon advertise for bids for construction of two lanes of a future four-lane freeway on the Oroville-Marysville Road (US Alternate 40) between Union School and the junction of the Oroville-Richvale Road (State Highway Route 21).

It is proposed to commence construction on this project early this summer.

The proposed work will consist of grading and surfacing a 40-foot roadway on new alignment beginning at

Union School, and crossing the rolling hills east of the present highway to approximately 1.0 mile north of Adelaide (railroad crossing at the rock crusher). This portion of the project will eventually become the northbound lanes when the route is developed to a four-lane divided highway.

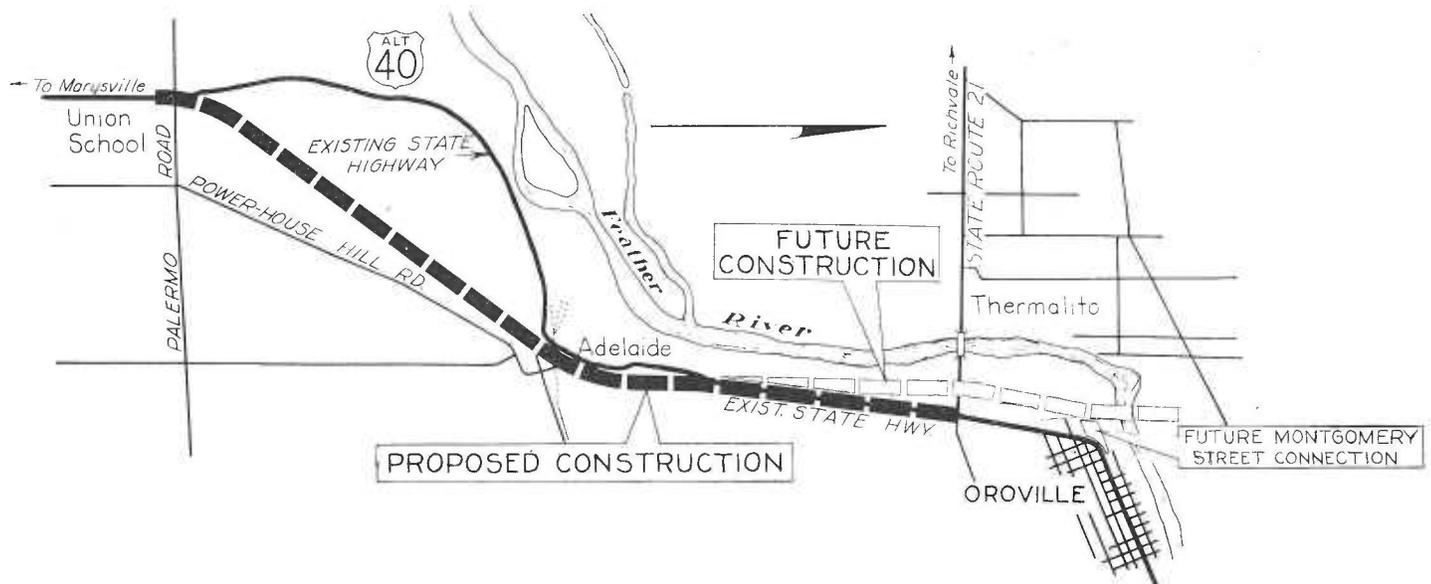
Interim Improvement

From 1.0 mile north of Adelaide (just north of the bridge near the present access road to the county dump) to the junction of Alternate 40 and the Oroville-Richvale Road,

the proposed work consists of widening the existing traveled way to a width of 32 feet. This will provide an interim improvement until such a time as Alternate 40 is constructed on new alignment in this vicinity.

The proposed new alignment of Alternate 40 from 1.0 mile north of Adelaide to Montgomery Street in Oroville will cross the dredger rock piles between the present road and the Feather River. Montgomery Street will ultimately be extended to a connection west of the Oroville city limits.

... Continued on page 63



Sierra Passes

Annual Opening
Presents Difficult Job

THE ANNUAL spring opening of those Sierra Nevada highway passes regularly closed by snow during the winter months is either under way or has recently been completed. As this article goes to press crews are busy removing snow drifts and fallen trees, replacing washouts and slipouts and putting these mountain pass roads in shape for summer traffic.

Except for the main transcontinental U. S. highways and the Red Bluff-Susanville lateral, which carry a relatively large volume of winter traffic and are kept open throughout the year, all other Sierra passes are closed by snow from late fall until early summer. Closing of these mountain roads usually occurs with the first major winter storm, and no attempt is made to reopen them until the following spring.

Passes Closed Annually

Following is a list of various Sierra Nevada passes which are closed to traffic for a period of approximately six months during the winter season.

	Elevation
Sonora Pass	9,626
Carson Pass	8,573
Tioga Pass	9,941
Ebbetts Pass	8,730
Monitor Pass	8,314
Luther Pass	7,740
Lassen Loop Highway.....	8,512

As *California Highways and Public Works* went to press, all the Sierra passes were open.

The actual point of closure on these routes is determined mainly by the location of towns and recreational areas, traffic demands at various locations along the route, and to some degree, by the type and extent of improvement of the roadway section. The elevation at the point of closure varies from about 5,000 to 7,000 feet. As a safeguard to public traffic, locked gates are usually placed across the roadway, and advance road signs are installed to notify the traveling public of the fact the road is closed and of the location of the gates.

The job of opening these mountain passes is not only slow and tedious but requires skill, experience and good judgment in the operation of snow removal equipment. In late

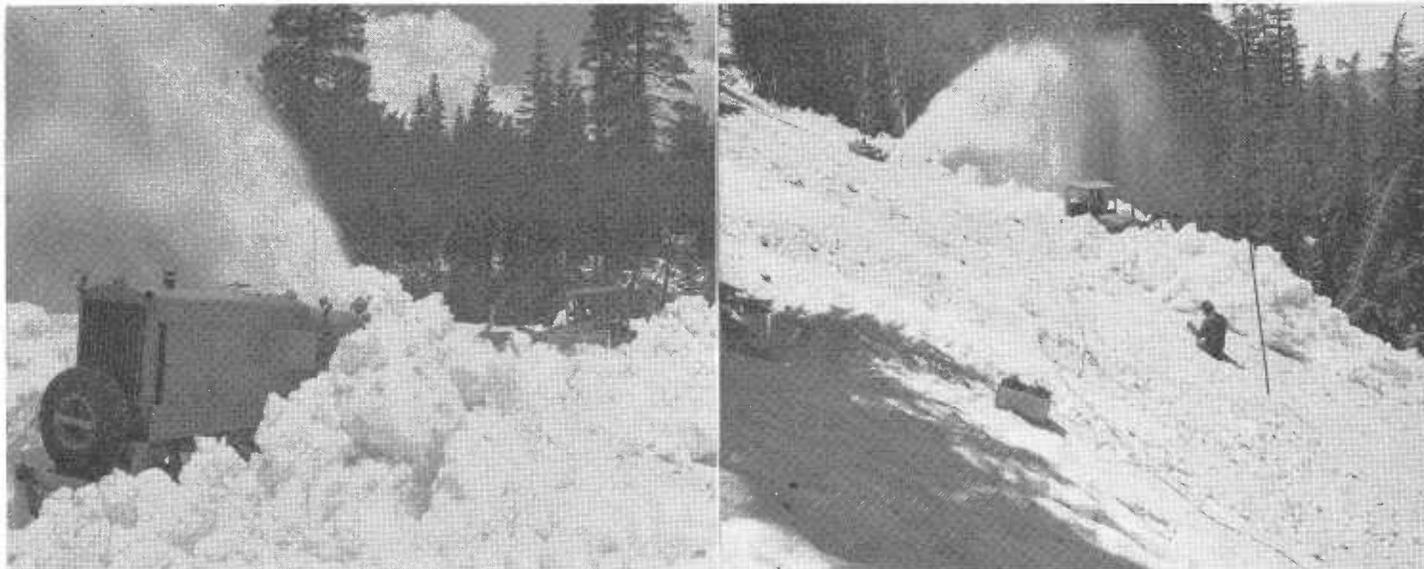
spring as the snow pack begins to melt, a survey is made of snow conditions over the passes, and a determination is made of the dates on which to start the annual spring opening.

At the start of operations, good progress is generally made because of the lighter snowpack at the lower elevations, and under favorable conditions as many as seven or eight miles of road may be cleared in a single day. However, as the crews work their way into higher elevations the snow pack becomes harder and deeper, and it sometimes becomes necessary to employ the use of a bulldozer to break the snow pack and to feed the rotary plow. In extremely heavy drifts where the going is tough it may also be necessary to blast the snow pack ahead of the bulldozer. Under such difficult snow conditions as these where the pack is fairly deep and frozen hard, a single day's progress may not exceed one-half mile.

Crews on Alert

During snow removal with a rotary plow, the crew must be constantly alert for such hidden obstructions as rocks, fallen trees, washouts and slip-

LEFT—Tractor bulldozing snow to rotary plow on Carson Pass Highway. RIGHT—Tough going on Carson Pass Highway showing tractor breaking up snow and ice pack for removal by rotary in background. Man in foreground preparing to loosen pack by blasting.





This aerial photo shows rugged terrain through which Sonora Pass Highway runs

outs that might damage the equipment or result in a serious accident. The rotary plows are equipped with replaceable shear pins that are designed to break when a solid object such as a rock or small log is accidentally picked up in the rotating blades. Some delay is caused by replacing these pins when plowing through a slide area where fallen rocks are a common occurrence.

Where small washouts or slipouts are encountered it is sometimes necessary to make minor temporary roadway repairs so that the snow equipment can proceed past the damaged

area. In the few cases where major washouts or slides occur and a detour is not available it is necessary to curtail snow removal work and concentrate on repairing the damaged road.

The usual practice in opening up a road is to plow a single pass through the snow for a distance of perhaps 10 to 12 miles before widening to full width is undertaken. This allows the snow to melt along the sides of the cut and gives the subgrade a chance to start drying out.

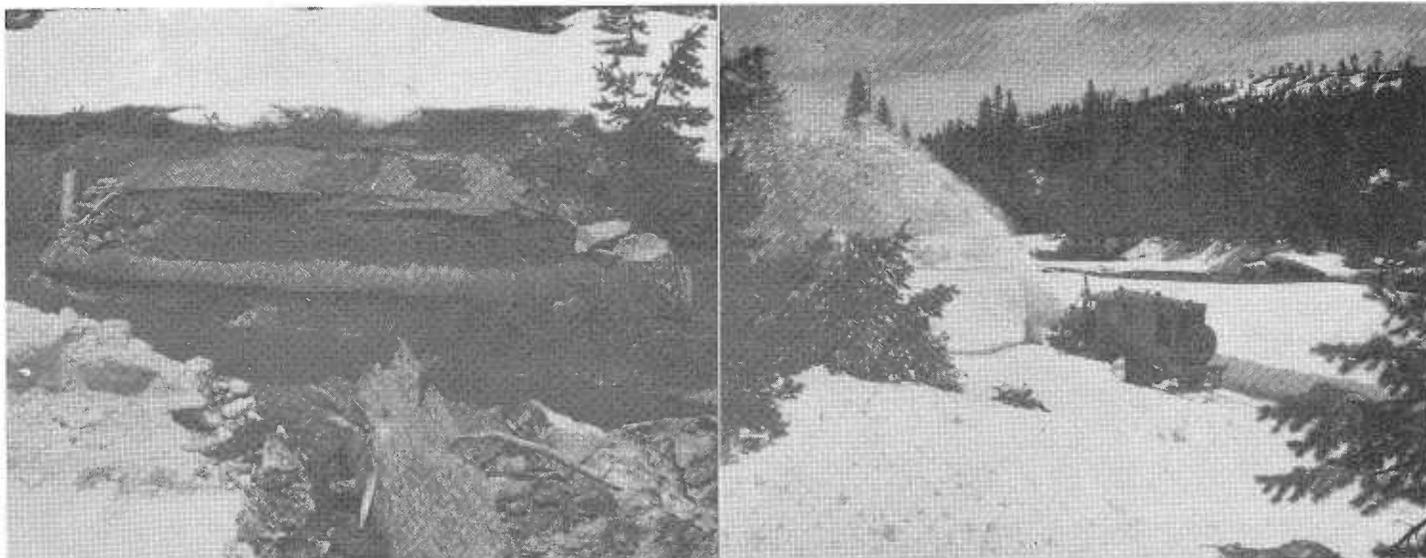
One of the heaviest snow passes in the State, the Lassen Loop Highway through Lassen National Park, is

opened and maintained by the National Park Service. Drifts in excess of 16 feet in depth have been measured on this road.

National Park Work

The portion of the Tioga Pass Road within Yosemite National Park is, like the Lassen Loop Highway, opened and maintained by the National Park Service. The portion of this route from the park boundary to the junction with US 395 near Leevining is perhaps as difficult to open as any pass on the State Highway System.

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LEFT—Photo showing typical damage due to heavy spring runoff on Ebbetts Pass Highway. RIGHT—Rotary plow in operation on Ebbetts Pass Highway.

U. S. Park Service equipment working heavy drift to open Lassen Loop Highway in Lassen National Park



THE OPEN ROAD FOR MOTORISTS IN CALIFORNIA

California motorists taking to the open road this summer will find significant improvements in the State's 14,000-mile highway system since this time last year.

The State's accelerated highway construction program, supplemented by increased federal aid, has added 210 miles of multi-lane, divided highway construction during the past 12 months, bringing the present total to 1,700 miles completed. Other construction now under way will bring this total to more than 2,000 miles.

Of added significance is the fact that of the additional 210 miles, nearly half of it is full freeway with no intersections at grade and all cross traffic handled by interchange or separation structures. California now has 353 miles of these full freeways, with another 260 miles under construction.

Northern California

TRANS-SIERRA ROUTES

MOST SPECTACULAR of the new construction which will confront the motorist in Northern California this year will be along the major trans-Sierra routes, especially US 40, where sections of highway are being four-laned and where, because of the precipitous nature of the terrain, he may find himself subject to some delays.

However, a little forbearance and scheduling on his part this season will be rewarded by future sections of divided, four-lane roadway through some of the ruggedest and most scenic country in the State as, for example, the 5½-mile job now under way along the Truckee River Canyon between Floriston and the Nevada state line which will be completed by summer of next year.

This project is subject to being closed to traffic on weekdays during the summer for a maximum of four two-hour periods spread throughout the day.

Other projects now under way on US 40 will provide freeway and expressway for 12 miles through the Colfax area between Heather Glen and west of Gold Run. These two projects will connect with existing four-lane, divided roadway between Auburn and Heather Glen, giving a continuous stretch of expressway and freeway 23 miles long.

Along another important trans-Sierra route, US 50, work now being carried on by the United States Bureau of Public Roads is widening the highway to four-lane divided standards along the steep slopes bordering the South Fork of the American River between Pacific House and Riverton in El Dorado County. This job, too, because of the precipitous terrain, may subject the motorist to delays of up to 30 minutes during weekday mornings and afternoons, with longer closure periods during the nighttime after 9 p.m. Again, however, the result will be a fine stretch of divided roadway through scenic country for his future pleasure.

Another US 50 project, State-financed, is construction of four miles of divided roadway between Five Mile Terrace and east of Camino. Just east of Sacramento, work started this month on widening a 14-mile section of US 50

Southern California

LOS ANGELES METROPOLITAN AREA

AS IN the past, much of the more spectacular new freeway construction confronting the motorist in Southern California is through sections of the larger cities. In the Los Angeles metropolitan area great strides have been made in the freeway construction program. To date, more than 200 miles of freeways have been constructed of which 24 miles were completed and opened to traffic during the past 12 months. In addition, construction is under way on other major freeway contracts totaling more than 40 miles.

Chief among these major completions and going contracts might be mentioned:

. . . A one-mile extension of the Hollywood Freeway from Lankershim Boulevard to Moorpark Street, which will be completed late this year.

. . . Along the Santa Ana Freeway, three major jobs totaling 15 miles, now under construction between Buena Park and Santa Ana in Orange County. Completion of these projects, plus a fourth project between Laguna Canyon Road and El Toro Road on which construction has recently been started and by the end of 1958 will provide a stretch of unbroken freeway 43 miles long all the way from the Civic Center in downtown Los Angeles to the junction with the San Diego Freeway near El Toro.

. . . On the Los Angeles County portion of San Bernardino Freeway, recent completion of the last five mile gap between West Covina and Pomona.

Harbor Freeway

. . . Extension of the Harbor Freeway four miles southward to 88th Street, recently completed. Major construction work now under way will extend it another 2½ miles all the way to 124th Street.

On the Long Beach Freeway, recently completed construction has opened 3½ miles to traffic southerly of the Santa Ana Freeway to Florence Avenue. From the Pacific Coast Highway in Long Beach, previously completed construction provides seven miles of freeway to Atlantic

NORTHERN CALIFORNIA

between Brighton and Nimbus. It should be completed this fall.

Southwest of Stockton, seven miles of US 50 are being converted to four-lane expressway between the Mossdale Wye and French Camp Road.

The Sacramento-San Francisco section of US 40 is undergoing some of the biggest construction of any section of highway in the State.

Through Vallejo, the existing four-lane divided section is being converted to six-lane full freeway, eliminating the present traffic signals. From Vallejo to Hilltop Drive north of Richmond, 12 miles of full freeway are being constructed, including a new parallel Carquinez Bridge upstream from the existing structure. The south approach to the new Carquinez Bridge requires excavation of a 350-foot deep cut and the removal of more than 11,000,000 cubic yards of earth.

South of the Carquinez Straits the new freeway is being built inland from the present congested highway which winds through the communities bordering San Pablo Bay. A section of freeway in Richmond was opened to traffic last fall.

Both the freeway and Carquinez Bridge construction are scheduled for completion late next year. There will then be a continuous ribbon of four-lane, divided expressway and freeway between Sacramento and San Francisco broken only by a short section north of the El Cerrito Overhead and through the American Canyon area north of Vallejo, and by the three-mile Yolo Causeway west of Sacramento, all of which are four lanes wide but undivided.

In all, a total of \$70,000,000 worth of modernization work is going on along US 40 between the Bay area and the state line. Of the total length of 211 miles, 102 miles are four-laned while another 37 miles of freeway and expressway are under construction.

SAN FRANCISCO BAY AREA

The past year has seen intensive construction activity on the freeway systems on both sides of San Francisco Bay, where there are now 200 miles of freeways in service with 70 miles under construction and another 25 miles to be placed under construction before the end of the year.

Along the Eastshore Freeway construction is under way on the final contracts needed to provide 38 miles of continuous freeway for this heavily traveled route.

Also recently placed under construction is an extension of the Eastshore Freeway through the City of Oakland between the present north end of the freeway at Fallon Street and the overhead structure at Market Street, a distance of approximately a mile. Completion of this contract, along with the Jackson Street-Warm Springs sections, will mean an unbroken stretch of full freeway from San Jose to the El Cerrito Overhead north of Oakland.

The eight-lane, divided section north of the Distribution Structure was completed to the El Cerrito Overhead last November.

... continued on page 36, column 1

SOUTHERN CALIFORNIA

Avenue in Compton. Between these two completed sections there is six miles of construction under way, scheduled for completion early next year.

Current construction is providing five miles of the Golden State Freeway between Glendale Boulevard in Los Angeles and Ash Street in Burbank, to be completed in October, 1957.

Two major contracts now in progress on the Ventura Freeway are building sections of freeway totaling 7½ miles between Sepulveda Boulevard and Encino Avenue, and Kelvin Avenue and Calabasas.

A 2½-mile section of the San Diego Freeway was also recently opened to traffic in the West Los Angeles area.

SOUTH AND EAST OF LOS ANGELES

Of special interest to vacationers in the southland is the completion of the last section of the Angeles Crest Highway north and east of Los Angeles, making it a modern, two-lane mountain highway all the way to the Big Pines recreational area in the Angeles National Forest, a distance of 55 miles.

Along the San Bernardino and Riverside County portions of US 60-70-99, four additional sections of expressway and freeway totaling 23 miles have been completed—through Colton, between Beaumont and Banning, and between Garnet and Thousand Palms. A new section of divided highway has been completed northwest of Indio.

Traffic controls in effect on State Sign Route 18 in the San Bernardino mountains due to construction between Running Springs and Big Bear Lake will be eliminated by June 15th (road presently closed between sunrise and sunset except for weekends and holidays).

On Sign Route 111 in Palm Springs two jobs completed late last year constructed new bridges across Tahquitz Creek and Palm Canyon Wash and two miles of four-lane expressway.

New sections of freeway are also being constructed along Sign Route 18-US 91 through the cities of Riverside and San Bernardino and are expected to be open to traffic this summer.

Also in Riverside County, nine miles of freeway are being built on Sign Route 71 through the City of Elsinore between the San Jacinto River and north of Alberhill.

North of San Bernardino on US 66-91-395 new bridges and freeway are being built across the Santa Fe Railroad tracks in Victorville.

Construction will also begin within the next few weeks on what has been termed the largest single highway project to date in California, the Victorville-Barstow freeway job. This 29-mile job, which will cost around \$7,000,000, will require extensive heavy construction including removal of 3½ million cubic yards of earth. Constructed on entirely new alignment from the existing route, it will save the motorist seven miles of travel in addition to providing him with a continuous stretch of four-lane, divided freeway. The estimated completion date of this job is the summer of 1959.

... continued on page 36, column 2

NORTHERN CALIFORNIA

Other East Bay freeway construction includes the section east of Castro Valley on US 50, scheduled for completion this fall, which will eliminate the last of the two- and three-lane roadway over Boehmer Hill. It is also the last link to be completed in a 51-mile stretch of divided highway between Oakland and Tracy.

The three-mile freeway section connecting US 50 and Foothill Boulevard with the Eastshore Freeway was completed last year.

On State Sign Route 24 a 2½-mile freeway bypass of Lafayette is under construction and will be completed this summer, while a three-mile section north of Walnut Creek was completed in January. Work is also scheduled to begin this summer on the freeway through Walnut Creek itself between Oakland Boulevard and the Lafayette Bypass.

Expressway construction also is being continued between Edgemar on Sign Route 1 and Skyline Boulevard, which will further facilitate traffic service between San Francisco and the residential communities to the south and eliminate a source of costly maintenance and delay due to intermittent slides at Thornton Bluffs.

Of special interest to motorists in the Los Gatos-Santa Cruz area is the two-mile freeway bypass of the Los Gatos business district which was opened to traffic last October, and the completion last December of a freeway section in Santa Cruz between the north city limits and Mission Street. Extension of the freeway in Santa Cruz will be under construction this summer.

North of the bay, a new four-lane bridge is being constructed across Petaluma Creek on Sign Route 37, forerunner of a four-lane freeway to be constructed between Ignacio on US 101 and Sears Point.

In Napa County, on Sign Route 29, a four-mile section of modern two-lane highway between Calistoga and St. Helena was completed in December. This construction will eventually serve as one of the roadways in a future divided, four-lane expressway. This is also true of the recently completed two-lane section on Sign Route 37 east of the Napa-Sonoma county line.

North of the City of Napa, another section of Sign Route 29 between Union Station and Orchard Avenue, a distance of 2½ miles, is being converted to four-lane, divided expressway.

US 101 NORTH

On US 101 north of San Francisco, considerable progress toward realization of a complete freeway between the Golden Gate Bridge and Santa Rosa will be evident to the motorist.

A new six-lane bridge over Richardson Bay was opened to traffic last fall, replacing the old four-lane structure.

Also under construction is the section north of the bridge to beyond the Greenbrae intersection. Scheduled for completion this summer, this stretch of six-lane freeway also includes traffic interchanges and bridges at all major intersections including Alto, Greenbrae and Tamalpais Drive. A portion of the Greenbrae interchange is already in use.

SOUTHERN CALIFORNIA

Farther north, in Inyo and Mono Counties, a 12-mile section of US 395 was constructed on new alignment over Sherwin Hill north of Bishop which provided a modern, two-lane highway with one two-mile section of four lanes for passing.

In eastern San Bernardino County 8½ miles of US 66 are being converted to expressway between Needles and the Colorado River.

In the San Diego area large-scale construction is going on, especially along sections of US 80 and Sign Route 94.

US 80, already a divided highway in and just east of San Diego, is being developed to full freeway standards, with contracts let for separation structures at Fairmount Avenue and 70th Street. A crossing structure was completed last summer at Baltimore Drive north of La Mesa, connecting with the recently completed Fletcher Parkway built by the County of San Diego.

Freeway construction will also be under way this summer on US 80 from Grossmont Summit into El Cajon. This project will include a connection to the recently completed two-mile freeway on State Sign Route 67, which in turn connects with the new eight-mile freeway on State Sign Route 94 extending from Wabash Boulevard in San Diego to Campo Road.

Other freeway developments in the San Diego area include three separation structures under contract on US 101 between National City and the Mexican Border, and the completion of two structures and a frontage road on US 395 in the Linda Vista section.

Two major improvements recently completed in Imperial County are the new railroad underpass at Coyote Wells, including a channelized intersection with the recently completed extension of State Sign Route 98; and the new bridge over the Colorado River at Yuma, Arizona.

US 101—LOS ANGELES TO SAN FRANCISCO

Those heading north along US 101 bound for San Francisco and other north state points, will find many new sections of expressway and freeway either under construction or recently completed.

Construction recently began on widening of the section between the Conejo Grade and Camarillo to a four-lane freeway, eliminating the last remaining two-and-three lane stretch on US 101 between Los Angeles and Ventura.

In western Ventura County a section of the Ojai Freeway on US 399 was completed last December from US 101 in Ventura to a point four miles north.

In the City of Santa Barbara, last August saw the completion of the 2½-mile freeway section on US 101 from Miramar Avenue in Montecito to Park Place. Construction is well along on the section between Los Olivos Street and El Sueno Drive.

West of Santa Barbara two sections totaling 12 miles between Ellwood and Orella, and Refugio and Tajiguas are under construction.

A four-mile section between Arroyo Hondo and Gaviota was completed last summer.

Farther north, expressway construction is being extended north from Wigmore to join with the 11-mile

NORTHERN CALIFORNIA

Also scheduled for completion this summer is a portion of the freeway approach between US 101 and the new Richmond-San Rafael Bridge, which was opened to traffic last September.

Construction of an 8½-mile freeway bypass of Petaluma was completed in December, while extension of the freeway north of Denman Flat for the remaining 13 miles to Santa Rosa is now under way and scheduled for completion this summer.

Farther north, in Mendocino County, the existing expressway on the Ridgewood Grade is being extended over the summit for another two miles. North of Willits, a recently opened two-mile section of expressway in the Hilvilla area is being extended northward for another four miles.

In Humboldt County, construction has already started on the first unit of freeway through the Humboldt Redwoods State Parks, a 4½-mile job on new alignment between south of Dyerville and Englewood. It will involve heavy grading along the bluffs bordering the Eel River.

Immediately north of Fortuna a contract is under way providing structures in preparation for a two-mile length of future freeway. An adjoining project, nearing completion, will provide 4½ miles of freeway between Fernbridge and Hookton Road.

In the Eureka area, the four-lane southerly approach and entrance to Eureka was completed last year. At the same time the route through the city was converted to a one-way street couplet and connected to an extension of the four-lane expressway at the north city limits. North of Arcata work was also completed on the US 101-299 interchange and short sections of expressway, while farther north the grading and structure work for a future section of expressway was started between Patrick's Point State Park and Big Lagoon.

US 99 NORTH AND CROSS-STATE LATERALS

US 99 between Sacramento and the Oregon state line has also seen extensive improvements since this time last year.

Four miles of divided expressway have been completed along a section of US 99-E between Olivehurst and the Yuba River Bridge in Marysville.

Along its sister route, US 99-W, a new bridge and two-mile section of modern highway has been constructed in the vicinity of Cache Creek in Yolo County.

Another project now nearing completion is converting a 1½-mile section of the highway to freeway through Arbuckle in southern Colusa County.

Along the Sacramento River canyon section of US 99 north of Redding some 13 additional miles of the highway are being reconstructed as four-lane expressway. A six-mile section between Crespos and Lamoine has already been completed and opened to traffic. The remaining seven miles from Lamoine to a mile north of Shotgun Creek was recently placed under construction and is scheduled for completion during the summer of 1958.

SOUTHERN CALIFORNIA

section between Los Alamos and Santa Maria which was completed last December.

In San Luis Obispo County, a seven-mile section from Hourihan Grade to Russell Turn was recently completed. The nine-mile section from Russell Turn north to Pismo Beach was completed last summer.

North of San Luis Obispo, the relocated 9½-mile section of expressway from Santa Margarita to Atascadero was opened to traffic in November. Construction is under way on a freeway in the Paso Robles area, to the east of that city.

US 99—LOS ANGELES TO SACRAMENTO

Construction of multilane, divided highway along the 388-mile section of US 99 between Los Angeles and Sacramento is now more than 90 percent complete.

Jobs completed during the past 12 months along the southern section of this route include an 18-mile section between south of Delano in Kern County and Pixley in Tulare County and a six-mile section near Traver in Tulare County.

Still under construction is a three-mile section of freeway near Goshen in Tulare County which is very near completion.

NORTHERN CALIFORNIA

In Siskiyou County, another five miles of high-standard, two-lane highway are being constructed along US 99 immediately south of Yreka.

The east-west laterals, connecting US 101, US 99 and US 395, are also undergoing extensive construction work.

Along US 299 several sections totaling nearly 40 miles have been widened, realigned or resurfaced during the past year.

These include sections totaling 20 miles extending from west of Weaverville to east of Vitzthums in Trinity County; a 1½-mile section entering Redding from the west; a 3½-mile section at Montgomery Creek 35 miles northeast of Redding; a five-mile section over Hatchet Mountain; and a nine-mile section between eight miles north of Adin and the Pit River Bridge in Modoc County.

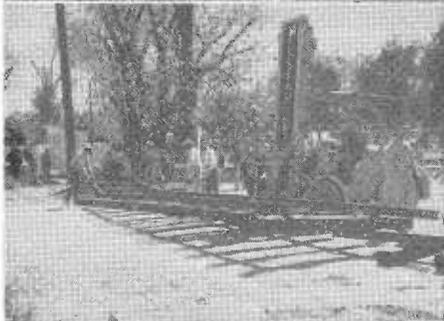
Work is also nearing completion on an 8½-mile widening and reconstruction project between Prairie Creek and Oregon Mountain on US 299 in Trinity County. In Humboldt County, work is continuing on U. S. Bureau of Public Roads contracts between Berry Summit and Willow Creek, a distance of about 10½ miles.

On State Sign Route 20 five miles of highway have been widened and realigned between the north fork of Cold Creek and Laurel Dell in the vicinity of the Mendocino-Lake county line. Construction was recently begun on four miles of expressway between the US 101-Sign Route 20 junction and Potter Valley Road including a new bridge across the Russian River, to relocate Sign Route 20 around a new reservoir.

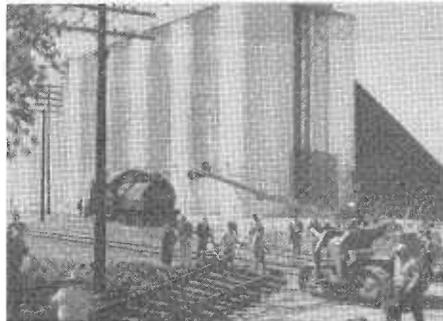
Work also began recently on a six-mile relocation of State Sign Route 53 in Lake County, between the Clearlake Highlands area and the junction with Sign Route 20.

... Continued on page 40

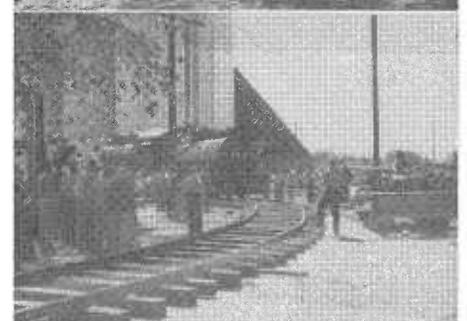
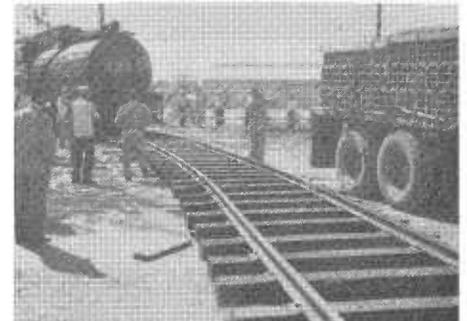
"IRON HORSE" POSES PROBLEM



Setting up track section across US 99W at south city limits of Woodland



Setting up sections of rail across main line of railroad tracks



Pulling Old 1233 around the short line railroad

What do you do with a 140,000-pound gift that must be moved across a state highway?

The district's permit engineer office receives many requests each month for moving various types of over-legal dimension equipment over state highways. One, recently presented to the District III office in Marysville, of-

fered more than the "run-of-the-mill" problem.

The 40th District Agricultural Fair, located in Woodland, Yolo County, received as a gift from the Southern Pacific Company a steam switch engine to be permanently displayed in its fairgrounds. The idea was to preserve for the children of tomorrow an

example of a fast disappearing form of transportation, the "Iron Horse" that played such a large part in the development of the western part of the United States.

The problem—the steam engine could be delivered by rail to one side of the highway and the fairgrounds was on the other.

Through cooperation between the Chamber of Commerce, the Fair Association, the railroad, state and local police agencies, public-spirited citizens, and the State Division of High-



Final repose in Yolo County Fairgrounds

ways, the shortest railroad, in both length and existence, in California's history came into being—the "Snerdville Short Line."

A permit for highway use by an over-legal dimension load was issued by the Division of Highways. A suitable detour route for highway traffic was established and policed. Then, at 10 a.m. on April 7, 1957, construction of the "Snerdville Short Line" across the highway was started. Volunteer

crews and equipment, under the direction of Frank Pucci, Southern Pacific Area Roadmaster; Stuart Waite, Fairgrounds Manager, and Leonard Payne, Secretary-Manager of the



Driving golden spike. In foreground Frank Pucci with hammer; center, Stuart Waite, and kneeling, Leonard Payne.

Woodland Chamber of Commerce, built the temporary track across the highway joining the railroad main line and the fairground. At 1.15 p.m. the golden spike was driven at the crossing of the main line tracks and old "1233" began its journey to its final historic resting place.

Cooperation had found the answer for the future child's question, "Daddy, what was the 'Iron Horse'?"

On Tuesday, July 30th, Art L. Elliott, Bridge Engineer of the Division of Highways, will speak on "Prestressed Bridge Practice in California," and Charles Peterson and A. H. Brownfield, Structural Engineers of the Division of Architecture, will present a talk on "Our Experience With Prestressed Lift Slabs."

A leaflet containing complete information on the conference may be obtained on request from University Extension, University of California, Berkeley 4, California.

Golden Gate Bridge Celebrates Its 20th Anniversary

On May 27th the twentieth anniversary of the opening of the Golden Gate Bridge was marked with a celebration under the joint sponsorship of the Redwood Empire Association and the Golden Gate Bridge and Highway District.

A "salute to travel" was the central theme of the observance and since traveling is often prescribed as a panacea for many ailments, a collateral theme was a "salute to good health." The cosponsors of the celebration pointed out there could well be innumerable themes in the forms of "salutes" to the thousands of individuals and organizations whose skills and backing transformed a dream into a reality.

The Golden Gate Bridge is the longest single suspension type span in the world and is known to travelers from all sections of the world—from the millions who cross it each year in motor vehicles to those who view it from the decks of ships plying the Pacific Ocean, or from aloft in airplanes flying trans-Pacific and other routes.

Total length of the bridge, including approach structure, is 8,981 feet. Length of the suspended structure is 6,450 feet and the main span is 4,200 feet long. Each side span is 1,125 feet long.

Height of each tower is 746 feet and clearance of the bridge above low water is 220 feet. Deepest foundation below mean low water is 110 feet.

Length of each 36 $\frac{3}{8}$ -inch cable is 7,650 feet, containing 80,000 miles of wire, enough to span the world at the equator three times with an overlap of 5,000 miles.

Structural steel for the span, which has a 60-foot roadway between curbs, totaled 83,000 tons, and concrete totaled 389,000 cubic yards.

The bridge has afforded passage to about 165,000,000 toll-paying motor vehicles since its completion and its importance is reflected in the amazing development of the entire Redwood

... Continued on page 51

World Conference On Prestressed Concrete Slated

Engineers of the Division of Highways and Division of Architecture of the Department of Public Works are scheduled speakers at the World Conference on Prestressed Concrete to be held July 29 through August 2, 1957, at the Fairmont Hotel in San Francisco, which is being presented by the Department of Engineering and University Extension, Northern Area, of the University of California.

NORTHERN CALIFORNIA

Continued from page 37 . . .

Along the Feather River Highway (US 40 alternate) a project is now under way which will widen and realign the five miles between Spring Garden and Sloat.

Along the Mother Lode Highway (Sign Route 49) the roadbed has been regraded and resurfaced west of Sierra City in Sierra County, as has a three-mile section between south of Angels Camp in Calaveras County and 1½ miles south of the Stanislaus River in Tuolumne County. Work was also recently begun on a relocation project through Mokelumne Hill in Calaveras County.

East of the Sierra, on the north state portion of US 395, a 3½-mile section between Sagehen Summit and Dry Creek in Lassen County has been widened and relocated while some 21 miles of the existing highway has been resurfaced between Madeline in Lassen County and south of Alturas in Modoc County.

US 101 SOUTH OF SAN FRANCISCO

Those heading south on US 101 from the San Francisco area will find many new sections of expressway and freeway either under construction or recently completed.

In Monterey County, construction has started on a four-lane, divided freeway through Chualar as well as a 5½-mile section north of Greenfield and an eight-mile section between Greenfield and King City which joins a section of freeway west of King City which was completed in February.

US 99—SACRAMENTO TO LOS ANGELES

Construction of four-lane divided roadway along the 388-mile section of US 99 between Sacramento and Los Angeles is now more than 90 percent complete.

Freeway jobs completed during the past 12 months along the northern section of this heavily traveled north-south route include a five-mile section just south of Sacramento; another five-mile section just north of Lodi (except for structures); two sections totaling 5½ miles between Stockton and Manteca in San Joaquin County;

and another two-mile portion of the Fresno Freeway.

Still under construction are two sections totaling 13 miles between Sacramento and Lodi in Sacramento County; 4½-mile section through Atwater; a seven-mile section in the Chowchilla area; and the final one-mile section of the Fresno Bypass, completion of which is expected by September.

SIERRA LATERALS

South of US 50 other cross-Sierra highways have also undergone widening and reconstruction work.

The Carson Pass Highway (Sign Route 88) is being widened and improved between the east side of the pass and Picketts on Sign Route 89.

Work was completed last year which regraded and resurfaced the road and constructed a new bridge east of Valley Springs on Sign Route 4 in Calaveras County.

Improvement of a four-mile section of Sign Route 140 (Yosemite All-Year Highway) west of Mariposa was completed late last summer. A five-mile widening and realignment project is now under way northeast of Mariposa. Another project now under way is reconstructing sections of the highway between Bear Creek and the Yosemite National Park boundary.

FROM THE NETHERLANDS

WEG EN WATERBOUW
P. O. Box 27, Heemstede
Netherlands

THE EDITOR: As editor of *Weg en Waterbouw* (in your language, *Road and Waterworks*), a journal published by three societies of contractors, I have occasionally had the privilege of perusing a number of copies of your publication *California Highways and Public Works*.

Allow me to state that I consider it a remarkably fine publication and of outstanding significance in the field of design and construction of modern highways.

Sincerely yours,

C. JULIUS

At the close of the 1955-56 Fiscal Year, the Division of Highways was operating 151 land radio stations and 674 mobile radio units.

The French Had A Word for It

When the horseless carriage first appeared on the American scene, we had a problem on our hands: We had to figure out what to call it.

It wasn't easy figuring out what to call this new gadget and some of the things that went with it. We made some abortive attempts with such awkward words and phrases as "quadricycle," "motorcycle," "autocar," and "motor wagon," but none of these seemed to sit quite right.

When we began to look around we found that the Greeks had no word for it but the French did. "Automobile," according to the National Automobile Club, seemed to be a natural and we took it for our own.

From the French

The French had words for other things, too. They had "chassis" for the underpart of the automobile, the part comprised of wheels, frame, and machinery. We took "chassis" but had our troubles with the plural. We didn't know how to pronounce it. The French had "garage" for the building in which the car was kept. "Garage" we took over right away.

The French had "chauffeur" for the man you hired to drive your limousine. This gave us real trouble. We couldn't pronounce it. We tried to replace it with "motorman" but this seemed to include the operator of the streetcar or of the "tuppenny tube." Perhaps in desperation most of us took to driving our own cars and left the hiring of chauffeurs and the pronouncing of "chauffeur" to the select few.

One word, however, the French really offered in vain. That air-filled rubber tube that cushioned the wheel they called "le pneumatique." Even when they shortened it to "le pneu" it was too much for us. We settled for "tire." The British stuck with "tyre."

So much for Paris and the parts of your car.

A 10 percent increase in illuminated signs maintained by the Division of Highways was reported during the 1955-56 Fiscal Year.

Harbor Freeway

Governor Knight Opens
New Four-mile Section

ON APRIL 24, 1957, just before noon Governor Goodwin J. Knight, assisted by Mrs. Knight, public officials and community leaders in the Los Angeles area, wielded mammoth shears provided by the Inglewood Chamber of Commerce and snipped a silk ribbon to open the new four-mile length of the Harbor Freeway, extending the previously opened freeway from Santa Barbara Avenue southerly to 88th Place, in Los Angeles.

This was one of the largest and most impressive opening ceremonies ever held in the southern part of the State and rightly so, because of the importance of this link of the Harbor Freeway to the metropolitan Los Angeles area. It was estimated that over 500 enthusiastic citizens were present at the dedication ceremonies.

Since the California Highway Commission was in regular monthly session in Sacramento on the day for completion of this freeway unit it

was impossible for any members of the commission, State Highway Engineer G. T. McCoy or State Director of Public Works Frank B. Durkee to be present at the ribbon cutting. Assistant Public Works Director T. Fred Bagshaw was in attendance as the official representative of Durkee and the Highway Commission.

Investment of \$22,000,000

Representing State Highway Engineer G. T. McCoy at the ceremony,

Governor Knight cuts ceremonial ribbon, signaling opening of new section of Harbor Freeway. LEFT TO RIGHT—Assemblyman Charles Wilson, Supervisor Kenneth Hahn, Governor Knight, Mrs. Knight, Councilman Gordon Hahn, George Gose, master of ceremonies, Charles E. Ducommun, President, Los Angeles Chamber of Commerce, Assistant State Highway Engineer E. T. Telford, and Spencer V. Cortelyou, retired Assistant State Highway Engineer.





Following ribbon cutting auto caravan traveled over new section of Harbor Freeway

E. T. Telford, Assistant State Highway Engineer in charge of District VII, called attention in his remarks to the fact that the new section of eight-lane freeway represents a total investment of \$22,000,000. This included the cost of right-of-way acquisition as well as the cost of the two adjoining construction contracts. J. E. Haddock, Ltd., of Pasadena, the contractor who carried out the northerly unit of construction, and Guy F. Atkinson of Long Beach, the contractor on the southerly unit, were commended by Telford for the expeditious and efficient manner in which they organized their work to the end that all construction on both contracts was completed several months ahead of schedule.

The Haddock contract was 2.3 miles in length and carried a contract allotment of \$4,756,000. The Atkinson

contract was 1.7 miles in length, and carried a construction allotment of \$4,418,000. Details concerning these two adjoining construction contracts will be found in story entitled, "Harbor Freeway Construction Progress," by Morris E. Camp and Ray A. Collins, resident engineers, published in the September-October, 1956, issue of *California Highways and Public Works*.

Simultaneous Construction

It is a common occurrence for adjoining construction contracts on a freeway to be under way simultaneously but it is unusual indeed for two adjoining contracts to finish up on the same day. When this happens there is a big advantage to motorists who get a longer mileage of freeway for use ahead of schedule with less disturbance of established traffic flow

patterns. There was in this instance a direct money saving to the State because simultaneous completion of these two adjoining contracts made it possible to eliminate \$10,000 worth of construction work on temporary on- and off-ramps at the junction between the two contracts that otherwise would have had to be built and put into service.

There are now 11 miles of completed Harbor Freeway out of the total length of 22.4 miles between the four-level interchange structure on the Hollywood Freeway and Battery Street in the San Pedro area, and construction is in progress on a recently started 2.6-mile unit.

Guy F. Atkinson is also the contractor building this 2.6-mile section of the Harbor Freeway from 88th Place southerly to 124th Street where construction is now under way. This

GOVERNOR WANTS STRICTER TRAFFIC LAWS*

contract provides for an eight-lane freeway complete with 12 bridges, three pedestrian overpasses and five pedestrian undercrossings, a pumping plant and four large reinforced concrete retaining walls. The contract allotment is \$5,866,000. The estimated date of completion is September, 1958.

Remaining Link

Taking into account completed construction and the new construction now in progress, of the 22.4 miles total there remains only a nine-mile link of the Harbor Freeway still to be put under contract. Designs and preparation of plans for this remaining link are substantially completed and the right-of-way acquisition program for this future construction is well advanced. Final completion of the Harbor Freeway throughout its entire length awaits allocation of construction funds by the California Highway Commission when future state highway budgets are under consideration.

The dedication ceremonies for the newly completed four-mile unit were conducted under the sponsorship of the Los Angeles Chamber of Commerce, and the chairman of the Chamber's Traffic and Transit Committee, George Gose, acted as master of ceremonies. In his opening remarks of welcome, he said:

"As we gather here today overlooking the great Los Angeles metropolitan area we can, I think, feel very proud of the accomplishments made in transportation. This is the most highly populated automobile center in the world and we have met the resulting traffic problems with a superb freeway system. We wish to thank the representatives of our civic groups and our local government for their diligence in obtaining freeways for this area. Our sincere appreciation is extended to the State Division of Highways and to the California Highway Commission for the outstanding job done on the Harbor Freeway and also our gratitude to them for their vision in the continuing development of a safe, convenient and economical system of highways and freeways for this area."

List of Speakers

The first speaker on the program introduced by Gose was Dr. William Strong, pastor of the Florence Avenue United Presbyterian Church, who gave the invocation and prayed for a more general adoption by motorists of the Golden Rule principle to the

Dedicating the latest section of the Harbor Freeway in Los Angeles, Governor Knight said:

"I must admit that occasions such as this one give me double pleasure, for as a life-long resident of the City of the Angels I am pleased to note such monumental evidence of community progress. As Governor of California, I am pleased to point with pride to such concrete evidence of the State's official concern that it make substantial contributions toward effectively meeting the challenges which must be faced in our expanding and accelerating society.

"This particular dedication marks the completion of another four miles of the already internationally famous Harbor Freeway. It also commemorates the fact that approximately half of the total length of this magnificent roadway has been completed and is open to traffic. The State Division of Highways assures me that the second half will most likely proceed much more rapidly in relation to actual working time involved. I am also told that the more difficult and costly portions of the work are behind us.

"The rights of way for the remainder of the Harbor Freeway have been acquired and the work will be done

* On May 24th, Governor Knight signed A. B. No. 19, which he espoused, providing for a mandatory jail sentence for those convicted two or more times of drunk driving.

end that the usefulness of the Harbor Freeway will not be marred by tragic traffic accidents.

Among those present called upon for brief remarks, in addition to Governor Knight and Telford, were Councilman Gordon Hahn, representing Mayor Norris Poulson of the City of Los Angeles; Police Chief William H. Parker, Assemblyman Charles H. Wilson, Charles E. Ducommun, President of the Los Angeles Chamber of Commerce, and Los Angeles County Supervisor Kenneth Hahn.

The dedication ceremonies were brought to a close by Governor Knight.

as rapidly as possible, consistent with the other freeway needs in the Los Angeles area.

Cost of Project \$22,000,000

"This section which we are dedicating today cost around \$22,000,000 to complete, including costs of construction and rights of way acquisition:

"California, with her magnificent distances and energetic citizenry, has pioneered and led the Nation in the evolution of highway development and planning. When President Eisenhower last summer signed the Federal Highway Act of 1956, opening the way for the most ambitious communications program since the days of Imperial Rome, California was not only ready, she was anxious to get under way on her commitments to the total program.

"Our philosophy of state highway construction had actually anticipated the nationwide projections.

"In a recent report made by Samuel Cummings to the Automobile Manufacturers Association of the United States, the author surveyed the principal urban areas of the entire Nation—detailing such metropolitan highway systems as those in Detroit, New York City, Dallas, Boston, Cleveland, Chicago and so forth.

"His reference to Los Angeles, of course, was of greatest interest to me, and his summary demonstrates why, even as we dedicate this stretch of road, draftsmen are at work on plans for new freeways, contracts are being considered on other sections, while men and equipment are at work rushing to completion even further portions of our highway system for the greater comfort, convenience and safety of the people of California.

Los Angeles Freeways

"Concerning our city, Mr. Cummings reported—and I quote: 'Although Los Angeles has the most extensive system of freeways in the Country, its road builders are finding

... Continued on page 57

FOUR-LANE DIVIDED FACILITY IN USE AHEAD OF SCHEDULE

Freeway construction between Lodi and Lind's Airport, on US 99, in San Joaquin County enabled traffic to use the newly constructed four-lane divided facility early in December, 1956. This was approximately nine months before the final completion date of this contract. The use of the new four lanes of concrete pavement was made available to the traveling public by the whole-hearted cooperation of the contractor and the routing of county road traffic on temporary detours around the various interchange structures.

This 4.8 miles of road was the last remaining portion of two-lane pavement in San Joaquin County on US 99. With the opening to the public of the four-lane divided roadway, the benefits were extensive. The 14,000 daily users of this route experienced immediate relief from the previous congestion on the over taxed two-lane road.

The photographs accompanying this article are as follows:

Picture No. 1: The crossing of the Mokelumne River just north of Lodi

showing the use of the eventual southbound lanes by two-way traffic and the reconstruction of the existing bridge which was used by two-way traffic until the southbound bridge was completed.

Picture No. 2: The Acampo Road Overcrossing and Pumping Plant. The traffic at this location was interrupted, from the use of the four lanes, only temporarily while the structural steel was being placed.

Picture No. 3: Showing the four completed lanes of PCC pavement and

Traffic Safety Program During Month of June

California will be blanketed during June with urgent reminders to motorists that safe driving at sane speeds will save them from the tragedy and often crippling expense of traffic accidents.

This state-wide campaign is the annual "speed kills" effort sponsored by the California Association of Insurance Agents and carried out through its affiliated local associations with the cooperation of the National Automobile Club.

"We hope our program this year will benefit every licensed driver, pedestrian and tourist," Vice President Roger Chickering of CAIA said. "If it serves to reduce our tragic highway death toll even in a small degree, it will be worth all the effort we have put into it."

Local agents' associations now are contacting service clubs, churches, chambers of commerce and other organizations in rural areas and communities of all sizes to enlist support for the month-long program. The California Traffic Safety Foundation and the numerous chapters of the National Safety Council have announced their backing of the campaign.

SCHOOL BUSES

California has 6,364 school busses in operation.



a temporary crossing at grade for county road traffic during the construction of the Peltier Road Overcrossing.

Picture No. 4: Jahant Road Overcrossing. Traffic at this location was also only temporarily inconvenienced during the placing of the structural steel.

This contract was a joint venture of the MJB Construction Co., Inc., and Lord & Bishop, Inc., of Stockton and Sacramento, respectively. The length of the project is 4.8 miles and the contract cost approximately \$2,000,000. The Resident Engineer for the State was Harold E. Atherstone, associate highway engineer.

This Contractor Knows Value of Public Relations

A personally delivered "greeting card" to each resident along the route of a freeway project now under construction in Los Angeles was the method used by a highway contractor recently to express his regrets for any disturbance or inconvenience his operations might cause.

The job on which this gratifying public relations step was taken is the first unit of the Glendale Freeway in Los Angeles, between the Los Angeles River and Eagle Rock Boulevard, a

distance of 1.6 miles, of which over 60 percent is in a residential district. Several major structures are included in the project, one of which is a 461-foot overhead crossing of the Southern Pacific Railroad's Taylor Yard.

The \$2,659,000 contract is being carried on by the Thompson Construction Company of Los Angeles. The president of this firm is J. A. Thompson, who is a past president of the Southern California Chapter of the Associated General Contractors of America, Inc.

Considerate of Property Owners

The Thompson card was delivered by company representatives to the doors of residents along and near the project. Thompson told Resident Engineer Jack Sylvester of the Division of Highways Bridge Department that he considered this action a neighborly approach toward expressing his intention of being considerate of the rights and comfort of nearby residents.

The card was contained in an envelope bearing the contractor's name and the words: "An Important Message—Please Read." It resembled a folded greeting card, with a photograph of the freeway construction on the front.

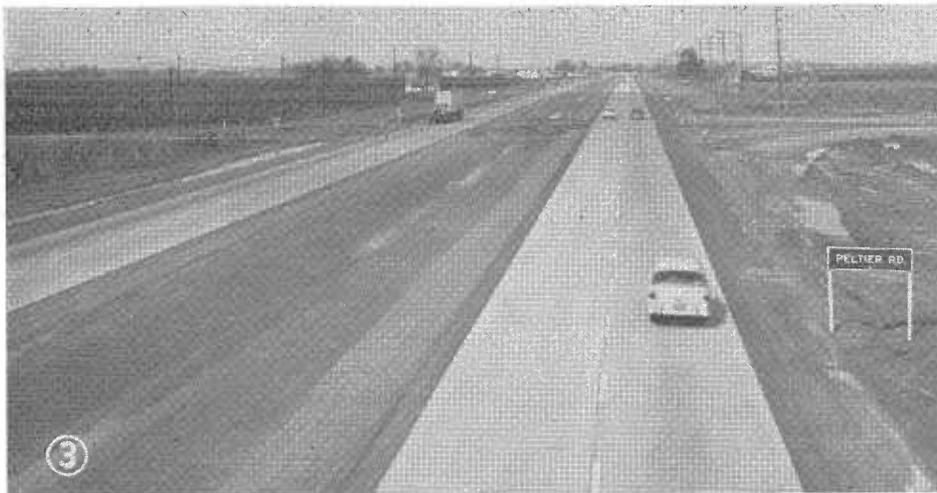
Inside, the card bore a location map of the freeway project, along with this statement signed by Thompson:

"As you have observed, we are just starting construction on the first section of the Glendale Freeway.

"We would like to assure you that we will do everything we can to construct this freeway with as little inconvenience to you as possible. It is, of course, impossible to do this work without creating some noise, dust and dirt. However, we do hope that you will bear with us during this operation and we will do our utmost to complete the job as far ahead of schedule as the availability of certain materials will allow."

Thompson reported that he has received a number of letters from residents expressing a favorable reaction to his good will gesture.

Only 919,000 miles of road, or one-fourth the total, in the United States are paved, according to the U. S. Bureau of Public Roads.



Embarcadero

First Unit of New San Francisco Freeway Open

THE FIRST unit of the Embarcadero Freeway in San Francisco was opened to public traffic at 11.30 a.m., Monday, April 8, 1957.

Ceremonies celebrating the occasion were held at Beale and Mission Streets under joint auspices of the Downtown Association of San Francisco and the San Francisco Chamber of Commerce. Officials of the City and County of San Francisco, the State, members of the California Highway Commission and the Legislature and local civic groups participated.

Among the speakers were: Roy N. Buell, President of the Downtown Association, who presided; State Director of Public Works Frank B. Durkee, who also is chairman of the Highway Commission; Supervisor Henry R. Rolph, representing Mayor George Christopher; State Senator Robert I. McCarthy, Chief Administrative Officer Thomas A. Brooks, B. W. Booker, Assistant State Highway Engineer; Chamber of Commerce President E. D. Maloney, former Speaker pro-tem of the Assembly Tom Maloney, and Highway Commissioner Robert Bishop of Santa Rosa. Music was furnished by the San



B. W. Booker, Assistant State Highway Engineer, at microphone

Francisco Municipal Band. The ribbon stretched across the freeway was cut by Supervisor Rolph.

The new unit will become an integral part of the San Francisco Skyway and with its downtown connections to Mission Street at Main and

Beale Streets, will bring East Bay and Peninsula traffic closer to the heart of the city. The double deck reinforced concrete structure provides an extension of the James Lick Memorial Freeway (Bayshore Freeway), with opposing traffic moving on separate levels. Traffic from the East Bay will be handled on the lower deck of a parallel structure.

The reverse traffic movement from Mission Street to the Bay Bridge and East Bay points will not be opened until the completion of a subsequent contract this summer. All of the original ramps will continue to serve traffic.

The California Highway Commission allotted \$5,400,000 for this initial project and work began early in 1955 by the contractors, McDonald, Young & Nelson Company and Morrison-Knudsen Company. The contract included 45,000 cubic yards of concrete, 73,650 lineal feet of steel piling and 13,000,000 pounds of bar reinforcing steel.

The double deck construction on this project was designed to afford

... Continued on page 63

Supervisor Henry R. Rolph wields scissors to cut ribbon after Embarcadero Freeway dedication, while state, county, and city officials, representatives of civic groups and of the police and fire departments cheer



OPENING OF HIGHWAY PROJECT IN LOS GATOS IS OBSERVED

Brief ceremonies marked the completion and opening to traffic of the Charles Street connection on State Highway Route 5 (Sign Route 17) in Los Gatos, May 1, 1957. Ceremonies were conducted on the Bella Vista Street Bridge at 11 a.m., before a group of local citizens and state and local officials. Mayor Alberto E. Merrill of Los Gatos acted as master of ceremonies and recounted the efforts undertaken by the city to secure this much needed improvement.

In 1954 an effort was made to pass a \$173,000 bond issue to pay for the crossing entirely out of city funds, but this bond issue failed to pass. In

1955 a bond issue in the amount of \$80,000 was approved by the city as a contribution to the construction of the project, the balance to be paid for by the Division of Highways. After the approval of this bond issue, the California Highway Commission allocated funds for the State's share of the construction project.

Frank B. Durkee, State Director of Public Works, represented the California Highway Commission and Governor Knight at the opening ceremonies. In his remarks, he complimented the City of Los Gatos for its part in making this improvement possible through their cooperation.

Route 5 Link

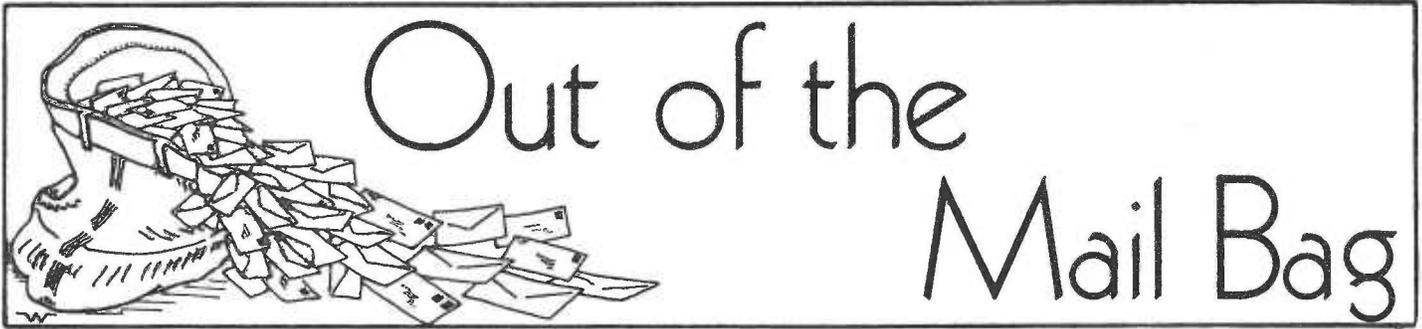
The newly constructed portion is some 0.58 mile in length, extending between San Jose Avenue, the existing Route 5, and the Route 5 freeway in Los Gatos. Work was started on August 27, 1956, and completed with its opening to traffic on May 1, 1957. Cost of the project, including construction, rights of way and utilities, was approximately \$440,000.

The project consists of a two-lane highway with 12-foot lanes and 8-foot shoulders, a reinforced concrete girder bridge 131 feet long, which carries Bella Vista Avenue over the new

... Continued on page 54

Section of new Los Gatos highway which was opened to traffic with dedication ceremonies on May 1





MINNESOTA FREEWAYS

MINNESOTA ENGINEERING CO., INC.
Minneapolis 5, Minnesota

MR. KENNETH C. ADAMS, *Editor*

DEAR SIR: We appreciate very much being placed on the mailing list for the bimonthly publication *California Highways and Public Works*.

Your magazine is of invaluable aid to our staff since it contains information available from no other source for design and layout purposes in connection with the new federal interstate system.

We have recently started design work on the freeway system here in Minnesota.

Sincerely yours,

K. E. MADSEN
Chief Engineer

FROM AN OLD READER

DEPARTMENT OF COMMERCE, BUREAU OF
PUBLIC ROADS
New Mexico District
Santa Fe, New Mexico

MR. KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: I have appreciated your publication very greatly since I first started reading it some eight years ago as a junior engineer in the District VIII office. You are to be congratulated for keeping it a semitechnical publication instead of allowing it to become a travelog of the State.

In my work as area engineer for the bureau I have found many opportunities to use some of the highway construction and design innovations brought to my attention in your magazine.

Yours very truly,

C. F. LINTZ

COME OUT AGAIN

NORTH CANTON 20, OHIO

MR. KENNETH C. ADAMS, *Editor*

DEAR MR. ADAMS: My wife and I have just returned from a visit with our son and family in Palo Alto (our fifth trip, incidentally), and for me to write that I was deeply impressed with the outstanding manner in which your State is meeting the ever present challenge of properly handling traffic is expressing it mildly. Yours is a shining example of what can be accomplished with the proper application of the gasoline tax dollar.

Sincerely,

ROSS M. BAXTER

FROM WEST AFRICA

REPUBLIC OF LIBERIA
DEPARTMENT OF PUBLIC WORKS AND UTILITIES
Division of Highways
Monrovia

GENTLEMEN: I had the opportunity to get one of your wonderful magazines and I have enjoyed myself in reading it. Especially in this country where highway building is of the greatest importance for development it is very interesting to learn about highway building in the United States. As a European engineer contracted with the Liberian Government and acting as a counterpart of an American Bureau of Public Roads engineer I have great interest in your highway program.

Very sincerely yours,

P. A. VAN GORSEL
Highway Design Engineer
Division of Highways, I. C. A.
Camp Johnson, Monrovia
Republic of Liberia, West Africa

IN LINE OF DUTY

ROMOLAND, CALIFORNIA

Division of Highways
Sacramento, California

DEAR SIR: In this busy world of ours comes occasionally a happening of personal nature on the part of a state employee which is very commendable and certainly worth recognition.

My little son, who is four years old, started to hemorrhage from an intestinal disorder. We live 10 miles west of Hemet off Route 74.

My wife was alone at the time as I had gone to San Diego to work. She got into our old auto and started for the hospital in Hemet as fast as she could go. About three miles north of our ranch near Homeland she ran out of gas. My fault entirely. I had neglected to check the tank before I left home.

She tried to hail several motorists but all passed her by. An orange pickup truck stopped and a very welcome state employee asked her what the trouble was. After explaining, he said he would get the car off the road and would take her to the hospital. She asked him to stop at our doctor's office first, which he did. He was most courteous, very sympathetic and did everything to help her in this time of need. She offered him pay which he declined saying it was part of any Highway Department employee's work to give aid at a time like that. We are eternally grateful and will you please seek him out and thank him officially for what he did.

Very gratefully,

Mr. and Mrs. Jack Graham

The employee who is the subject of the letter is H. E. Maynard, a highway foreman in charge of the Division of Highways Hemet maintenance crew.—EDITOR

COMPLIMENT FROM READER

EL CENTRO, CALIFORNIA

*California Highways and
Public Works*

GENTLEMEN: Your magazine, *California Highways and Public Works*, reporting and describing the highway systems of California is the finest I have seen. I read it whenever I can.

Sincerely yours,

J. P. MORGAN

GOOD WORK WILL GO ON

GENTLEMEN:

Please send me a copy of your booklet "Freeway Facts." I saw your announcement in the *California Highways and Public Works* magazine.

Keep up the good work of educating the public to the need for better roads. California has the finest. Thanking you in advance. I am

JOSEPH L. EGAN

2116 Vista Del Mar Drive
Ventura, California

LIKES MAGAZINE

FARMERS INVESTMENT COMPANY
Reseda, Calif.

*California Highways and
Public Works*

GENTLEMEN: For many years I have from time to time been given copies of your excellent publication, *California Highways and Public Works*. Your many articles on freeway right of way and acquisition and location have been of real value.

Of particular interest to us here in the San Fernando Valley where there is so much freeway activity, is the type of article that describes the effect of freeways on property values. The article on the "Wheel Motel" in Ventura County at the junction of Highways 101 and 101A is a good example.

Sincerely yours,

JOSEPH S. LETTIERI
Member

NATIONAL DEFENSE

Continued from page 23 . . .

"Highway Needs of the National Defense."

This report brings out the fact that serious deficiencies exist in "sight distances and in the width of its pavements, shoulders, and bridges. The sight distance deficiencies are the result of defective alignment and vertical curvature." Major General Paul F. Yount, Chief of Transportation, Department of the Army, in testifying before the Committee on Public Works, House of Representatives, in April of 1955, stated that only 15 percent of the designated National System of Interstate Highways meets prescribed standards for military needs and lists the deficiencies as existing in "bridge and slab design and construction, and also as to access."

Priority of Construction

From a national defense point of view there is a very serious subject which I feel has been overlooked. That is over-all control over the priority of construction on the interstate system. So far as I have been able to find out there is no requirement at this time that any one through route be built as the initial coordinated effort of all the states involved. It is certainly desirable that we not proceed with the construction of this nationwide system in a checkerboard fashion with a little piece in this county and a little piece in that. Not only must there be continuing progress on a high priority route in each state but there also must be coordination of route selection and timing of construction between adjacent states.

In order to accomplish this orderly approach to construction it may be necessary for Congress to assign priority to a limited number of transcontinental routes as well as three or four north-south ones. This would insure that the taxpayers would be given an opportunity to collect some dividends from their tremendous investment long before the whole system is completed. It would also insure the defense establishment of early availability of a transcontinental highway for logistical support which might well mean the difference be-

tween success or failure in the early stages of an emergency.

Sound Guide Lines

The great importance of the interstate system to national defense was weighed carefully by the Congress when it departed from the policy of the past and established the 90-10 ratio for federal support of the system. Due to the rapid developments in weapons of war and in the changing methods of waging war, it is admittedly most difficult to project the highway needs of national defense throughout the expected life span of the new highways. It is impossible to predict the force or extent of an enemy attack or the exact demands that will be placed upon highway transportation in order to cope with it. However, sound guide lines have been established which, if adhered to as the highway program develops, will take care of most of the foreseeable needs of national defense.

Nevertheless, in carrying out the program there must be sufficient flexibility to permit adjustments to meet major surprise developments in the science of waging war. Despite the federal interest in the interstate system from the points of view of national defense and sound national economic development, the primary responsibility for route selection, highway design and construction rests with the state engineers. The superimposing of the new interstate system on an accelerated federal-aid program for the primary, secondary and urban systems presents a tremendous challenge to every state. I am sure the state highway officials will continue to discharge this responsibility with the high degree of efficiency that has marked their work in the past. The fullest cooperation and coordination of the states and the Bureau of Public Roads under the leadership of the able, new Federal Highway Administrator, Bert Tallamy, is essential so that these great benefits to national defense may become available to our Country before they are needed.

One out of every seven workers in the United States earns his living directly from highway transport industries.

Retirements *from* Service

Albert L. Lamb

Albert L. Lamb, Location Engineer for the Division of Highways District V at San Luis Obispo, retired on April 1st after nearly 30 years with the State.



ALBERT L. LAMB

Lamb went to work as a junior engineering aid for the State Department of Water Resources in 1922. He joined the Division of Highways as a transitman in District I at Eureka, leaving in 1925 to accept private employment.

He entered state service again in 1931 as an engineer on highway construction work in District IX at Bishop, transferring to the San Luis Obispo district four years later. He was resident engineer on many of the highway construction projects in District V.

During World War II Lamb served as a captain in the U. S. Corps of Engineers. He was promoted to his present position of location engineer for District V in 1950.

Lamb was born in Ouray, Colorado, and came to California in 1909. He went to school in Chico. His first job was as axman for the Yuba County Surveyor in 1915.

Lamb is a member of the American Congress on Surveying and Mapping and the Society of American Military Engineers. He and his wife will continue to live at their home in Shell Beach.

NO TOURIST CARD

Mexican border towns may be visited by Americans for periods not to exceed 72 hours without a tourist card, although personal identification is required, reports the California State Automobile Association.

Henry L. Mahoney

Henry L. Mahoney, Highway Chief Clerk II, with the Division of Highways, Headquarters Accounting Office, retired on March 12, 1957, after 35 years of state service.



HENRY L. MAHONEY

"Hank," as he was affectionately known by his fellow employees, was born in Terre Haute, Indiana, in February, 1897, and spent his early manhood as a timekeeper on construction crews for the Pennsylvania Railroad. After serving with the United States Army Engineers during World War I, Henry was employed by several railroads throughout the United States, finally working as a clerk in the superintendent's office for the Southern Pacific Company in Sacramento where, in 1922, he entered state service as a clerk with the Division of Highways.

In the ensuing years he held various positions in the Headquarters Accounting Office, being promoted to

... Continued on page 63

Guy McKinney

Guy McKinney, Associate Highway Engineer with the Division of Highways District IV office in San Francisco, retired on June 1st after 29 years in state service.

Since 1951 he had been in charge of special projects in the engineering services section.

McKinney's first engineering job was in the coal mining region of Pennsylvania. In 1906 he went to work for the Northern Pacific Railroad in the State of Washington as a draftsman and chainman. He also worked with the Washington State Highway Department, the Spokane County Highway Department and the U. S. Bureau of Public Roads in Oregon before joining the California Division of Highways in 1928.

McKinney served as resident engineer, chief draftsman and office engineer in Districts II and III before coming to District IV in 1936 to assist the District Construction Engineer.

McKinney was born in Shamokin, Pennsylvania, and graduated from high school there. He later studied engineering at the University of California in Berkeley. He is a veteran of World War I.

McKinney is married and has a son in New York City, a married daughter in North Hollywood, and three grandchildren.

McKinney and his wife will continue to live in their home at 3747 Cabrillo Street in San Francisco after his retirement.

PASSPORTS

Some 559,000 passports were issued to Americans last year, reports the Travel Department of the California State Automobile Association. This was an increase of almost 6 percent over 1955.

MERIT AWARD BOARD WINNERS

Following is a list of Department of Public Works employees who received Merit Award recognition during the month of April, 1957:

Sara E. Weisman and *Veloy Allenbach*, Architecture, Los Angeles, received a certificate of commendation for their joint suggestion of a revision of Form 672, Attendance Report. While the exact revision suggested was not adopted, their suggestion led to a revision of this state-wide form which will accomplish the same purpose and make the form easier to use.

Edward Zavala, Highways, Los Angeles, received an award of \$20 for recommending a revision of the Speed Zone Survey Sheet and elimination of the Speed Zone Data Form GS-8. A revised Speed Zone Survey Sheet incorporates a number of the changes suggested and eliminates the use of the Speed Zone Data Form in the districts. The new form presents the data more clearly, and facilitates review and establishment of speed zones.

Gordon A. Morse, Highways, Riverside, received \$150 for his suggestion to eliminate duplication in sampling structure concrete when adjacent contracts are being served with ready-mix concrete from the same

plant. Adoption of this proposal permits the assignment of one man, instead of two, to do the job, and will reduce the number of concrete sample cylinders required by approximately 10 percent, or 600 cylinders per year.

Irene E. Finney, Highways, Eureka, received \$15 for suggesting that the Controller's Office send two copies of pay warrant registers directly to the reporting units. This permits the reporting units to forward one copy to the district office immediately and keep one working copy. Adoption of the idea eliminates extra handling of these documents.

William S. Hudson, Highways, San Bernardino, received a certificate of commendation for suggesting that Planning Manual revisions include instructions for inserting the new pages in the manual.

Mary M. Runnion, Senior Stenographer-Clerk, and *Rolph Chamney*, Supervisor, Reproduction Department, Highways, Los Angeles, were awarded \$100 to be divided equally for recommending the photographs used in appraisal reports be mounted mechanically by a blueprint drier. Prior to this these photographs were mounted by hand, using a heavy heated press whereby a lever lifted the hot irons up and down

and pressed the photographs onto the sheet of paper. It was then necessary to place these prints in a device similar to a waffle iron, each one being processed individually. This new method provides for mass mounting, three prints placed side by side in the drier and a continuous feeding of the print into the drier.

William F. Runge, Assistant Highway Engineer, Eureka, was awarded \$25 for recommending the use of a standard cadastral retracement form for use by field parties. This will make it possible to record the findings in a standard, concise and professional manner, and when certified by the surveyor might be of value as evidenced in condemnation suits. The form will be distributed to all districts for state-wide use.

John M. Hibbard, Assistant Highway Engineer, San Francisco, recommended an improved method of making stabilometers specimen baskets, and will receive a \$15 award. Instead of using two separate pieces of paper, paper stock will be doubled in thickness and die cut in the center so as to save time, materials, and manpower and will use one piece of paper instead of two.

Everts L. Horton, Junior Civil Engineer, San Luis Obispo, proposed the use of colored dots to identify varying functions on traverse sheets. The procedure has an advantage over the conventional method of using arrows on a long series of right-angle courses. With the arrow method it is necessary to trace back through the various arrows to the origin to determine the functions; whereas, with colored dots all one needs to do is identify the color with the function. This procedure is quicker, more positive and more accurate. A \$25 award was granted.

Karl R. Leutner, Assistant Physical Testing Engineer, Sacramento, was awarded \$75 for suggesting the installation of a safety valve on all existing stabilometers in headquarters and district laboratories. This employee suggested the use of a commercial valve (Model 0630-200) set to blow off at 190 psi which will prevent overloading of stabilometer gates.

GOLDEN GATE

Continued from page 39 . . .

Empire in the past two decades. To more adequately care for the patrons of the bridge, a \$7,500,000 Golden Gate Bridge North Freeway was completed last year.

The bridge has been closed but once since it was built. On December 1, 1951, winds of gale force caused the span to develop a sway and it was closed down for three hours. Since then a system of lateral bracing costing about \$3,000,000 has been installed. Engineers report that this has increased the torsional rigidity of the bridge by 35 percent.

Employees Receive Twenty-five-year Awards

Employees of the Division of Highways who have become eligible for 25-year awards are:

Name	Total Service Yrs. Mos. Days	Name	Total Service Yrs. Mos. Days
District I Rogers, Francis H.	25 0 6	District IX Foley, E. R.	25 0 00
District II McCann, Herbert E. Smith, Ora E. Stephensen, Lee R. Wagner, Chester D.	25 0 6 25 0 14 25 0 00 25 0 27	District X John B. Odgers. Effective January 31, 1957	25 0 23
District III Doyle, James R. Hawks, Lewis A.	25 0 28 25 0 13	District XI Decker, Vernon J.	25 0 8
District IV Hendricks, Wade A.	25 0 16	Shop 2 Miller, Edmund K.	25 0 10
District VI Windele, Richard.	25 0 00	Headquarters Office Stanley F. McGill	25 0 24
District VII Charle, Julien R. Greathead, James W. Nahoney, Edward L. Tarwater, Vernon Keith.	25 0 27 25 0 3 25 0 28 25 0 25	Bridge Department Hineman Howard R. Robison, F. Wilbur.	25 0 6 25 0 9

Employees of the Division of Architecture receiving 25-year awards:

	25 years on	Location
Sim Sharp.	25 years on 5-4-57.	Area III, Los Angeles

Cost Index

Substantial Rise During
First Quarter of 1957

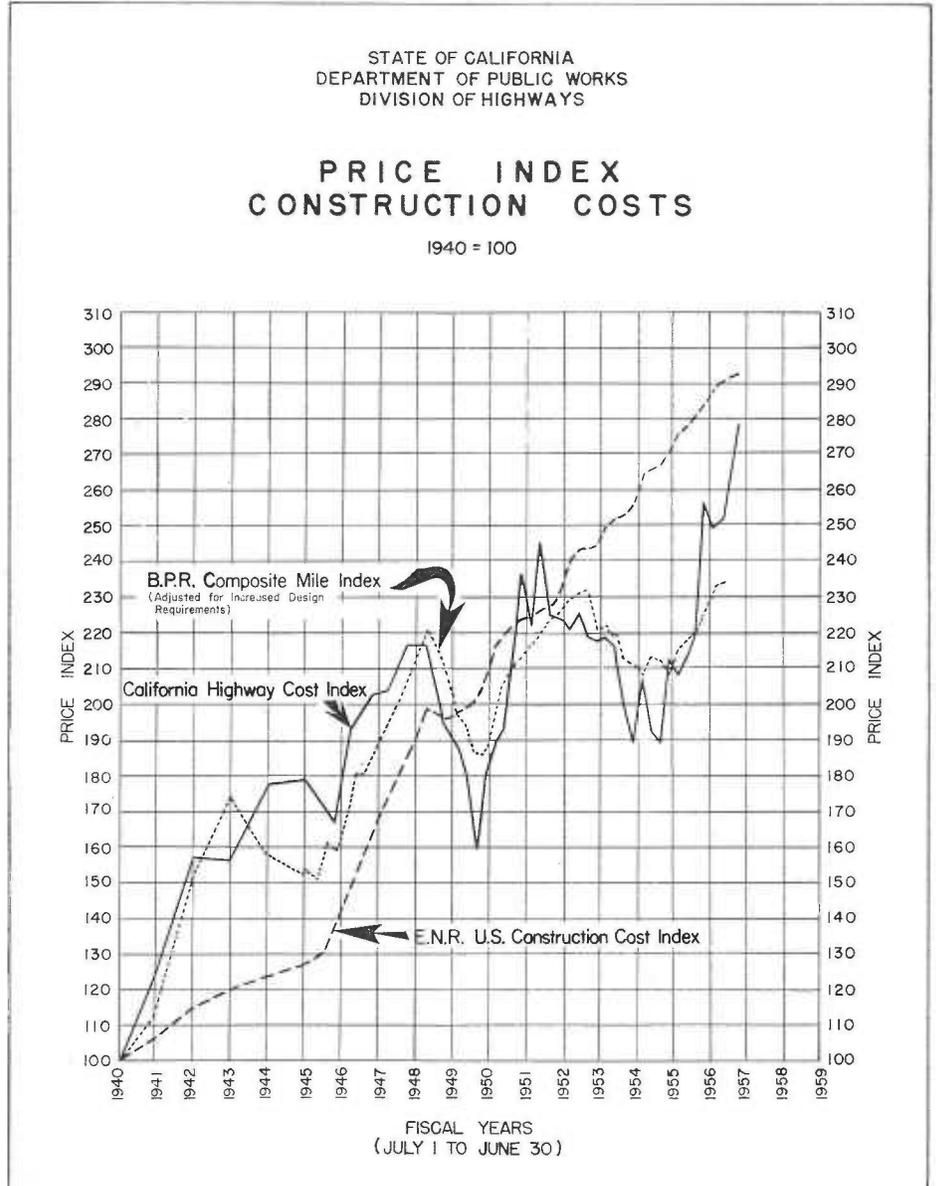
By RICHARD H. WILSON, Assistant State Highway Engineer;
H. C. McCARTY, Office Engineer, and
LLOYD B. REYNOLDS, Assistant Office Engineer

THE CALIFORNIA Highway Construction Cost Index for the first quarter of 1957 made a sharp rise after a gradual return to an upward direction in the fourth quarter of 1956. The Index stands at 277.7 (1940 = 100) which is 25.5 Index points or 10.1 percent above the fourth quarter of 1956. This quarter established a new high in the history of the California Index. The previous high of 255.9 was established in the second quarter last year.

The regularly expressed view of this department that construction costs will continue in an upward direction remains unchanged. Conditions existing in the materials field and with labor are having the effect of reduction in the rate at which costs are increasing. This effect is occasioned by the long-term labor contracts that were negotiated last year in many of the fields affecting highway construction.

While the Index as calculated for this quarter bears out our statement that costs will continue upward, conditions surrounding two extremely large contracts totaling \$12,200,000 that were awarded during the period resulted in unfair weight in this direction.

One of these projects is situated in the Truckee River Canyon near the Nevada state line. The area is subject to heavy snows over long periods and extremely low temperatures during winter months. The canyon walls over considerable of the length of the project are steep and slides are an ever-present hazard due to unstable soils in the most critical locations. The terrain precludes the possibility of constructing detours around construction, and local roads for the purpose are nonexistent, consequently the large volumes of traffic over this route must be taken through construction operations. Other factors affecting con-



struction costs for this project are the enormous volumes of work required in specified short intervals; transportation costs; and long periods of winter shutdown. Costs are also materially affected by the proximity of an operating railroad; flumes supplying

hydroelectric installations; transcontinental telephone lines and electric transmission lines all of which require extreme precautions in all phases of the work.

The other project is located in Humboldt County bordering the pres-

ent Redwood Highway. The redwood region of California is subject to intense rains over long periods and this condition is particularly prevalent at the project location. The Redwood Highway carries large volumes of traffic of which a considerable portion is trucks, mainly devoted to the hauling of logs and finished lumber. The area through which the project passes is heavily forested, with redwood trees predominating, and these forests are under control of the State Park System. The present highway has been outmoded for several years and since it traverses the finest stands of redwood trees, development of the existing road to standards capable of meeting traffic requirements is impossible without destruction of these attractions. An agreement between the Division of Highways and the Division of Beaches and Parks provides that a new highway is to be located where the least disturbance to these natural wonders will occur. The location selected is not ideal for highway construction and higher than average construction costs are the result.

Roadway excavation prices are well above average due to traffic interference where the existing highway is encountered; the ground is interlaced with large tree roots remaining from clearing operations; high slopes are general in many cuts developing small yardage and enormous quantities of material must be moved in a limited time. Transportation to the isolated location of the project is a factor contributing to the above average prices for asphalt, cement, reinforcing steel and structural steel. Mineral aggregates for surfacings and portland cement concrete must be either imported or produced on the job. If produced locally from the adjacent stream bed, the material will have to be stockpiled over the winter to be available for the succeeding short construction season.

Normally during a quarterly reporting period there are sufficient other projects of similar magnitude where item prices have had a countering effect but such circumstances did not prevail in this period.

An alternate determination of the Index was made in which the two

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

(January 1, 1957, to March 31, 1957)

Project volume	Up to \$50,000	\$50,000 to \$100,000	\$100,000 to \$250,000	\$250,000 to \$500,000	\$500,000 to \$1,000,000	Over \$1,000,000	All projects
Road Projects							
No. of projects.....	54	3	24	7	6	4	98
Total value*.....	\$862,133	\$226,202	\$4,258,707	\$2,551,966	\$3,835,094	\$6,402,470	\$18,136,572
Ave. No. bidders.....	6.4	4.7	7.1	10.4	8.2	6.8	6.9
Structure Projects							
No. of projects.....	10		5	1	1	2	19
Total value*.....	\$112,130		\$932,172	\$302,857	\$971,926	\$4,968,314	\$7,287,399
Ave. No. bidders.....	6.8		10.0	8.0	5.0	6.5	7.8
Combination Projects							
No. of projects.....					1	11	12
Total value*.....					\$947,106	\$28,501,580	\$29,448,686
Ave. No. bidders.....					4.0	6.9	6.7
Summary							
No. of projects.....	64	3	29	8	8	17	129
Total value*.....	\$974,263	\$226,202	\$5,190,879	\$2,854,823	\$5,754,126	\$39,872,364	\$54,872,657
Ave. No. bidders.....	6.5	4.7	7.6	10.1	7.3	6.8	7.0

* Bid items only.

Total Average Bidders by Months

	Jan.	Feb.	Mar.	Avg. for first Quarter
1957.....	7.1	7.3	6.7	7.0
1956.....	5.9	5.1	5.1	5.4

CALIFORNIA DIVISION OF HIGHWAYS AVERAGE CONTRACT PRICES

	Roadway excavation, per cu. yd.	Untreated rock base, per ton	Asphaltic and Bituminous mixes, per ton	Asphalt concrete pavement, per ton	PCC pavement, per cu. yd.	PCC structures, per cu. yd.	Bar reinforced steel, per lb.	Structural steel, per lb.
1940.....	\$0.22	\$1.54	\$2.19	\$2.97	\$7.68	\$18.33	\$0.040	\$0.083
1941.....	0.26	2.31	2.84	3.18	7.54	23.31	0.053	0.107
1942.....	0.35	2.81	4.02	4.16	9.62	29.48	0.073	0.103
1943.....	0.42	2.26	3.71	4.76	11.48	31.76	0.059	0.080
1944.....	0.50	2.45	4.10	4.50	10.46	31.99	0.054	0.132
1945.....	0.51	2.42	4.20	4.88	10.90	37.20	0.059	0.102
1946.....	0.41	2.45	4.00	4.68	9.48	37.38	0.060	0.099
1947.....	0.46	2.42	4.32	5.38	12.38	48.44	0.080	0.138
1948.....	0.55	2.43	4.30	5.38	13.04	49.86	0.092	0.126
1949.....	0.49	2.67	4.67	4.64	12.28	48.67	0.096	0.117
1950.....	0.40	2.25	4.26	3.75	11.11	43.45	0.079	0.094
1951.....	0.49	2.62	4.34	5.00	12.21	47.22	0.102	0.159
1952.....	0.56	2.99	5.00	4.38	13.42	48.08	0.098	0.150
1953.....	0.51	2.14 ¹	5.31	4.58	12.74	50.59	0.093	0.133
1st Quarter 1954.....	0.45	2.28	4.23	4.78	14.89	47.52	0.092	0.126
2d Quarter 1954.....	0.38	2.09	4.29	5.18	14.28	47.12	0.093	0.114
3d Quarter 1954.....	0.43	1.85	4.68	7.00	12.63	49.59	0.095	0.162
4th Quarter 1954.....	0.35	1.78	4.83	--	13.13	46.08	0.094	0.135
1st Quarter 1955.....	0.39	1.69	4.55	--	13.44	40.66	0.095	0.140
2d Quarter 1955.....	0.42	1.99	5.39	--	14.46	51.36	0.098	0.136
3d Quarter 1955.....	0.41	2.33	5.43	5.70	13.46	49.64	0.093	0.132
4th Quarter 1955.....	0.37	2.00	5.52	4.00	15.05	52.72	0.099	0.144
1st Quarter 1956.....	0.40	2.08	5.40	6.50	14.05	52.51	0.105	0.166
2d Quarter 1956.....	0.51	2.06	6.27	--	14.64	57.13	0.113	0.219
3d Quarter 1956.....	0.52	2.27	6.12	--	15.57	56.32	0.121	0.178
4th Quarter 1956.....	0.52	2.21	5.93 ²	-- ³	14.95	59.63	0.112	0.197
1st Quarter 1957.....	0.63	2.10	5.94	--	17.28	61.14	0.129	0.235

¹ The item of crusher run base was used before 1953.

² The item of plant mix surfacing was used before fourth quarter of 1956.

³ Asphalt concrete pavement combined with plant mix surfacing in fourth quarter, 1956, and will be identified as asphaltic and bituminous mixes in the future.

projects were eliminated from consideration. The results of this determination were more favorable and

more in line with the apparent general trend shown during the quarter. The alternately calculated Index

shows a standing of 249.6 Index points as against 277.7 noted above. The alternate Index is 2.6 points or 1.0 percent below the fourth quarter of 1956.

Interest of bidders in highway construction during this quarter no doubt accounts for a large portion of the reduced costs reflected by the alternate Index.

The average number of bidders per project is 7.0 for the quarter while the averages for fourth and third quarters of 1956 stood at 5.1 and 3.7 respectively. Projects attracting from 12 to 17 bidders were common during this period. It remains to be seen whether these favorable prices result from the contractors' urgent desire for work or from savings to be accomplished through newly developed practices and techniques.

Average unit prices upon which the over-all Index is based for this quarter show increases in six items and a decrease in one item. Roadway excavation rose from \$0.52 to \$0.63; asphaltic and bituminous mixes from \$5.93 to \$5.94; portland cement concrete pavement from \$14.95 to \$17.28; class "A" concrete structures from \$59.63 to \$61.14; bar reinforcing steel from \$0.112 to \$0.129; and structural steel from \$0.197 to \$0.235. Untreated crushed gravel or stone base dropped from \$2.21 to \$2.10. Calculations for the alternate Index show that the substantial increases in average unit prices for roadway excavation, portland cement concrete pavement, structure concrete and structural steel result from the two projects previously referred to above on which conditions to be encountered are not typical of those generally found on highway construction elsewhere in the State.

Structures, where rolled steel shapes are predominate in the design, continue to have effect on construction costs. This condition will prevail until the steel industry has exhausted the enormous backlog of orders now existing.

The California Construction Cost Index, the Engineering News-Record Construction Cost Index and the United States Bureau of Public Roads Composite Mile Index, all reduced to the base 1940 = 100 are shown on the accompanying graph. The latter two

Indexes are based on nationwide construction costs.

The Engineering News-Record Cost Index again shows a rise but the rate of increase is lower than that of the fourth quarter of 1956. It is up 2.0 Index points or 0.68 percent from the previous quarter.

THE CALIFORNIA HIGHWAY CONSTRUCTION COST INDEX

Year	Cost index
1940	100.0
1941	125.0
1942	157.5
1943	156.4
1944	177.8
1945	179.5
1946	179.7
1947	203.3
1948	216.6
1949	190.7
1950	176.7
(1st Quarter 1950—160.6)	
1951	210.8
(4th Quarter 1951—245.4)	
1952	224.5
1953	216.2
1954 (1st Quarter)	199.4
1954 (2d Quarter)	189.0
1954 (3d Quarter)	207.8
1954 (4th Quarter)	192.2
1955 (1st Quarter)	189.3
1955 (2d Quarter)	212.4
1955 (3d Quarter)	208.6
1955 (4th Quarter)	212.6
1956 (1st Quarter)	219.5
1956 (2d Quarter)	255.9
1956 (3d Quarter)	249.1
1956 (4th Quarter)	252.1
1957 (1st Quarter)	277.7

The Bureau of Public Roads Composite Mile Index for the fourth quarter of 1956, which is the latest available, was up 0.3 Index points or 0.1 percent over the second quarter. The leveling off in the Bureau of Public Roads Index shows that highway construction cost decreases experienced on many California projects is also becoming evident in other parts of the Nation.

MEXICO'S HIGHEST

Mexico's highest peak is the Orizaba volcano which is 18,855 feet above sea level. It is 4,000 feet higher than the highest mountain in the United States.

SIERRA PASSES

Continued from page 32 . . .

This is because the route traverses large rock slide areas in very rugged terrain and considerable cleanup with a power shovel and bulldozer is required prior to opening the road to traffic.

One of the less troublesome passes to open is Monitor Pass between Coleville and Markleeville. This road was constructed only a few years ago and one of the major considerations in the design and location of the route was that of reducing to a minimum the annual problem of snow removal work. The road lies on the easterly side of the main crest of the Sierra, and with the main part of the road situated in a more favorable exposure from the sun than the other mountain passes, it is usually one of the first roads to open in the late spring.

Because of the variation in severity and duration of the winter seasons the opening date of the several mountain passes differs from year to year. However, the Division of Highways attempts to open these mountain passes as early as practicable, consistent with budgetary allotments, so as to allow the motoring public the advantage of several additional months in which to enjoy the beauty and the recreational facilities of one of California's favorite vacationlands.

LOS GATOS

Continued from page 47 . . .

highway, and portions of the interchange at the junction with the Route 5 freeway. Work was done under contract by Lew Jones Construction Company and Leo F. Piazza. R. E. Alderman was the resident engineer on the project, which was designed by District IV, Division of Highways, under the general supervision of B. W. Booker, Assistant State Highway Engineer.

Following the dedication ceremonies and cutting of the ribbon by F. W. Berryman, Senior, Councilman of Los Gatos, and Carol Lindstrom, the five-year-old granddaughter of Mayor Merrill, a motorcade proceeded over the new highway and the Route 5 freeway to a civic luncheon tendered by the City of Los Gatos.

RECORD TOTAL GAS TAX REVENUES TO CITIES

A record total of \$29,219,479 of state gasoline tax revenues has been apportioned to 338 cities in California for city street work and engineering during the current fiscal year, State Director of Public Works Frank B. Durkee announced today.

This is more than \$2,000,000 over last year's record \$26,957,868.

The gas tax distributed to cities for street work is the revenue from five-eighths of a cent per gallon out of the state gasoline taxes paid by highway users and is apportioned by the State Division of Highways from the State Highway Fund according to law on a population basis.

The additional allocation to cities for engineering, also apportioned on a population basis, is taken from other state highway funds and varies from a minimum of \$1,000 for cities under 5,000 population to a maximum of \$20,000 for cities with more than half a million people.

As in previous years, the City of Los Angeles tops the list in the amount of money received with a total of \$6,886,777.69; Amador, the smallest city in the State, is again at the bottom with a total apportionment of \$1,466.55.

Fourteen new communities have entered the ranks of incorporated cities during the past year, making them eligible for a share in the 1956-57 apportionment. They are: Dairy Valley, La Puente, Downey, Rolling Hills and Par-

amount, all in Los Angeles County; Stanton, Garden Grove, Dairy City and Tri-City, Orange County; Monte Vista, San Bernardino County; Imperial Beach, San Diego County; Saratoga, Santa Clara County; Woodside, San Mateo County; and Escalon, San Joaquin County.

Durkee pointed out that this money allocated to cities is in addition to the funds expended on state highways within cities and included in the State Highway Budget by the California Highway Commission. Under certain conditions, however, the city may, in cooperation with the State Department of Public Works, expend portions of these funds upon a state highway.

State law requires the cities to expend at least 60 percent of the $\frac{5}{8}$ -cent gas tax apportionment for construction on streets included in the major street system as designated by the city council and approved by the State Department of Public Works. Up to 40 percent may be spent for maintenance of city streets. The engineering funds may be expended for engineering costs on any city street.

Although these city street projects financed with state gas tax funds require state approval, Durkee pointed out that in actual practice it is a matter of close cooperation between state and local officials to obtain maximum benefit from the funds in terms of service to traffic.

Apportionments to cities are as follows:

City	5/8¢ Gas Tax	Engineering	Total
ALAMEDA COUNTY			
Alameda.....	\$218,264.47	\$7,500	\$225,764.47
Albany.....	54,348.29	4,000	58,348.29
Berkeley.....	351,626.34	10,000	361,626.34
Emeryville.....	8,926.22	1,000	9,926.22
Fremont.....	69,342.74	5,000	74,342.74
Hayward.....	131,313.09	6,375	137,688.09
Livermore.....	31,400.89	3,000	34,400.89
Newark.....	18,640.32	2,000	20,640.32
Oakland.....	1,188,231.63	10,000	1,198,231.63
Piedmont.....	31,674.35	3,000	34,674.35
Pleasanton.....	8,963.46	1,000	9,963.46
San Leandro.....	144,448.40	6,000	150,448.40
Total.....	\$2,257,180.20	\$58,875	\$2,316,055.20
ALPINE COUNTY			
None.....			
AMADOR COUNTY			
Amador.....	\$466.55	\$1,000	\$1,466.55
Ione.....	4,959.01	1,000	5,959.01
Jackson.....	5,805.59	1,000	6,805.59
Plymouth.....	1,180.28	1,000	2,180.28
Sutter Creek.....	3,556.27	1,000	4,556.27
Total.....	\$15,967.70	\$5,000	\$20,967.70
BUTTE COUNTY			
Biggs.....	\$2,422.34	\$1,000	\$3,422.34
Chico.....	42,515.04	3,000	45,515.04
Gridley.....	9,541.08	1,000	10,541.08
Oroville.....	19,666.12	2,000	21,666.12
Total.....	\$74,144.58	\$7,000	\$81,144.58
CALAVERAS COUNTY			
Angels.....	\$3,543.92	\$1,000	\$4,543.92
COLUSA COUNTY			
Colusa.....	\$10,292.02	\$1,000	\$11,292.02
Williams.....	3,583.15	1,000	4,583.15
Total.....	\$13,875.17	\$2,000	\$15,875.17

City	5/8¢ Gas Tax	Engineering	Total
CONTRA COSTA COUNTY			
Antioch.....	\$43,673.57	\$3,250	\$46,923.57
Brentwood.....	5,718.96	1,000	6,718.96
Concord.....	75,770.57	5,250	81,020.57
El Cerrito.....	72,270.93	5,000	77,270.93
Hercules.....	1,059.76	1,000	2,059.76
Martinez.....	26,460.70	2,000	28,460.70
Pinole.....	6,542.01	1,000	7,542.01
Pittsburg.....	51,209.13	4,000	55,209.13
Richmond.....	310,257.24	9,375	319,632.24
San Pablo.....	53,965.05	4,000	57,965.05
Walnut Creek.....	21,057.66	2,000	23,057.66
Total.....	\$667,985.58	\$37,875	\$705,860.58
DEL NORTE COUNTY			
Crescent City.....	\$8,370.07	\$1,000	\$9,370.07
EL DORADO COUNTY			
Placerville.....	\$11,786.25	\$1,000	\$12,786.25
FRESNO COUNTY			
Clovis.....	\$11,982.54	\$1,000	\$12,982.54
Coalinga.....	18,603.25	2,000	20,603.25
Firebaugh.....	3,763.71	1,000	4,763.71
Fowler.....	5,757.28	1,000	6,757.28
Fresno.....	340,303.07	10,000	350,303.07
Huron.....	4,242.20	1,000	5,242.20
Kerman.....	5,512.07	1,000	6,512.07
Kingsburg.....	7,655.71	1,000	8,655.71
Mendota.....	4,952.84	1,000	5,952.84
Orange Cove.....	7,792.28	1,000	8,792.28
Parlier.....	4,384.32	1,000	5,384.32
Reedley.....	15,964.62	2,000	17,964.62
Sanger.....	22,757.56	2,000	24,757.56
San Joaquin.....	1,952.71	1,000	2,952.71
Selma.....	19,249.00	2,000	21,249.00
Total.....	\$474,873.16	\$28,000	\$502,873.16
GLENN COUNTY			
Orland.....	\$7,390.63	\$1,000	\$8,390.63
Willows.....	11,299.04	1,000	12,299.04
Total.....	\$18,689.67	\$2,000	\$20,689.67

City	5/8 ¢ Gas Tax	Engineering	Total	City	5/8 ¢ Gas Tax	Engineering	Total
HUMBOLDT COUNTY				MADERA COUNTY			
Arcata	\$12,609.18	\$1,000	\$13,609.18	Chowchilla	\$13,115.88	\$1,000	\$14,115.88
Blue Lake	3,302.91	1,000	4,302.91	Madera	39,352.01	3,000	42,352.01
Eureka	86,360.96	6,000	92,360.96	Total	\$52,467.89	\$4,000	\$56,467.89
Ferndale	3,188.60	1,000	4,188.60	MARIN COUNTY			
Fortuna	9,939.65	1,000	10,939.65	Belvedere	\$3,880.69	\$1,000	\$4,880.69
Trinidad	580.85	1,000	1,580.85	Corte Madera	8,771.73	1,000	9,771.73
Total	\$115,982.15	\$11,000	\$126,982.15	Fairfax	14,299.25	1,000	15,299.25
IMPERIAL COUNTY				Larkspur	11,756.42	1,000	12,756.42
Brawley	\$40,686.25	\$3,000	\$43,686.25	Mill Valley	24,811.98	2,000	26,811.98
Calexico	23,044.69	2,000	25,044.69	Ross	7,421.52	1,000	8,421.52
Calipatria	6,949.34	1,000	7,949.34	San Anselmo	32,275.29	3,000	35,275.29
El Centro	49,287.70	4,000	53,287.70	San Rafael	51,060.83	4,000	55,060.83
Holtville	10,186.83	1,000	11,186.83	Sausalito	15,278.70	1,000	16,278.70
Imperial	5,434.83	1,000	6,434.83	Total	\$169,556.41	\$15,000	\$184,556.41
Westmorland	3,747.84	1,000	4,747.84	MARIPOSA COUNTY			
Total	\$139,337.48	\$13,000	\$152,337.48	None			
INYO COUNTY				MENDOCINO COUNTY			
Bishop	\$10,103.39	\$1,000	\$11,103.39	Port Bragg	\$12,692.59	\$1,000	\$13,692.59
KERN COUNTY				Point Arena	1,486.16	1,000	2,486.16
Bakersfield	\$145,061.38	\$6,000	\$151,061.38	Ukiah	25,467.57	2,000	27,467.57
Delano	31,910.70	3,000	34,910.70	Willits	10,935.27	1,000	11,935.27
Maricopa	2,471.78	1,000	3,471.78	Total	\$50,581.59	\$5,000	\$55,581.59
Shafter	9,534.90	1,000	10,534.90	MERCED COUNTY			
Taft	12,111.60	1,000	13,111.60	Atwater	\$16,442.81	\$1,750	\$18,192.81
Tehachapi	7,569.83	1,000	8,569.83	Dos Palos	5,335.38	1,000	6,335.38
Wasco	19,437.47	2,000	21,437.47	Gustine City	6,380.29	1,000	7,380.29
Total	\$228,097.66	\$15,000	\$243,097.66	Livingston	5,289.61	1,000	6,289.61
KINGS COUNTY				Los Banos	16,276.27	1,750	18,026.27
Corcoran	\$14,904.84	\$1,000	\$15,904.84	Merced	60,190.97	4,000	64,190.97
Hanford	31,614.09	3,000	34,614.09	Total	\$109,915.33	\$10,500	\$120,415.33
Lemoore	7,208.33	1,000	8,208.33	MODOC COUNTY			
Total	\$53,727.26	\$5,000	\$58,727.26	Alturas			
LAKE COUNTY				\$8,709.93			
Lakeport	\$6,126.93	\$1,000	\$7,126.93	MONO COUNTY			
LASSEN COUNTY				None			
Susanville	\$16,492.97	\$2,000	\$18,492.97	MONTEREY COUNTY			
LOS ANGELES COUNTY				Carmel-by-the-Sea	\$13,477.63	\$1,000	\$14,477.63
Alhambra	\$165,479.59	\$7,500	\$172,979.59	Del Rey Oaks	4,662.39	1,000	5,662.39
Arcadia	106,237.97	6,000	112,237.97	Gonzales	5,882.84	1,000	6,882.84
Avalon	4,653.12	1,000	5,653.12	Greenfield	4,578.98	1,000	5,578.98
Azusa	49,157.81	4,000	53,157.81	King	8,048.75	1,000	9,048.75
Baldwin Park	89,549.55	6,000	95,549.55	Monterey	63,966.56	4,500	68,466.56
Bell	49,963.97	4,000	53,963.97	Pacific Grove	33,186.75	3,000	36,186.75
Beverly Hills	94,060.54	6,000	100,060.54	Salinas	65,295.20	5,000	70,295.20
Burbank	279,564.65	7,500	287,064.65	Seaside	47,523.08	4,000	51,523.08
Claremont	30,149.55	2,000	32,149.55	Soledad	8,459.67	1,000	9,459.67
Covina	196,722.90	7,500	204,222.90	Total	\$255,081.85	\$22,500	\$277,581.85
Culver City	35,775.94	3,000	38,775.94	NAPA COUNTY			
Dairy Valley	96,915.46	6,000	102,915.46	Calistoga	\$4,381.23	\$1,000	\$5,381.23
Downey (1/2 yr.)	10,038.51	1,000	11,038.51	Napa	51,463.06	4,000	55,463.06
El Monte	136,226.03	3,750	139,976.03	St. Helena	7,097.09	1,000	8,097.09
El Segundo	30,010.53	2,000	32,010.53	Total	\$62,941.38	\$6,000	\$68,941.38
Gardena	36,112.73	3,000	39,112.73	NEVADA COUNTY			
Glendale	65,996.57	5,000	70,996.57	Grass Valley	\$16,484.71	\$2,000	\$18,484.71
Glendora	344,958.72	10,000	354,958.72	Nevada City	7,915.87	1,000	8,915.87
Hawthorne	36,140.53	3,000	39,140.53	Total	\$24,400.58	\$3,000	\$27,400.58
Hermosa Beach	87,167.37	6,000	93,167.37	ORANGE COUNTY			
Huntington Park	47,192.49	4,000	51,192.49	Anaheim	\$154,764.28	\$6,375	\$161,139.28
Inglewood	91,020.25	6,000	97,020.25	Brea	18,136.69	2,000	20,136.69
Lakewood	173,997.96	7,500	181,497.96	Buena Park	54,209.25	4,000	58,209.25
La Puente (3/4 yr.)	220,346.95	7,500	227,846.95	Costa Mesa	53,514.07	4,000	57,514.07
La Verne	28,847.57	2,250	31,097.57	Dairy City (3/4 yr.)	3,278.14	750	4,028.14
Long Beach	16,406.45	2,000	18,406.45	Dairyland	880.58	1,000	1,880.58
Los Angeles	997,798.45	10,000	1,007,798.45	Fullerton	128,761.67	6,000	134,761.67
Lynwood	6,866,777.69	20,000	6,886,777.69	Garden Grove	129,642.64	6,000	135,642.64
Manhattan Beach	87,217.32	6,000	93,217.32	Huntington Beach	18,139.79	2,000	20,139.79
Maywood	94,502.39	6,000	100,502.39	Laguna Beach	25,354.29	2,000	27,354.29
Monrovia	41,658.77	3,000	44,658.77	La Habra	38,844.87	3,000	41,844.87
Montebello	72,352.14	5,000	77,352.14	Newport Beach	61,690.96	4,500	66,190.96
Monterey Park	86,561.78	6,000	92,561.78	Orange	51,545.91	4,000	55,545.91
Palos Verdes Estates	90,457.93	6,000	96,457.93	Placentia	9,398.95	1,000	10,398.95
Paramount (1/4 yr.)	20,169.73	2,000	22,169.73	San Clemente	18,597.08	2,000	20,597.08
Pasadena	14,625.01	1,250	15,875.01	Santa Ana	198,077.27	7,500	205,577.27
Pomona	341,337.56	10,000	351,337.56	Seal Beach	10,977.80	1,000	11,977.80
Redondo Beach	158,898.46	7,500	166,398.46	Stanton	7,763.32	1,000	8,763.32
Rolling Hills (1/4 yr.)	124,461.23	6,000	130,461.23	Tri-City (1/4 yr.)	7,889.29	1,000	8,889.29
San Fernando	1,555.57	250	1,805.57	Tustin	4,490.38	750	5,240.38
San Gabriel	46,266.62	3,500	49,766.62	Total	\$995,957.23	\$59,875	\$1,055,832.23
San Marino	67,217.00	5,000	72,217.00	PLACER COUNTY			
San Monica	39,996.51	3,000	42,996.51	Auburn	\$15,059.33	\$1,000	\$16,059.33
Sierra Madre	232,137.34	7,500	239,637.34	Colfax	2,533.59	1,000	3,533.59
Signal Hill	27,041.28	2,000	29,041.28	Lincoln	7,446.24	1,000	8,446.24
South Gate	12,482.49	1,000	13,482.49	Rocklin	3,698.98	1,000	4,698.98
South Pasadena	168,870.66	7,500	176,370.66	Roseville	31,735.02	3,000	34,735.02
Torrance	55,692.32	4,000	59,692.32	Total	\$60,473.16	\$7,000	\$67,473.16
Vernon	232,420.82	7,500	239,920.82	LOS ANGELES COUNTY			
West Covina	111,186.91	6,000	117,186.91	Alhambra	\$165,479.59	\$7,500	\$172,979.59
Whittier	99,541.73	6,000	105,541.73	Arcadia	106,237.97	6,000	112,237.97
Total	\$12,605,256.18	\$266,500	\$12,871,756.18	Avalon	4,653.12	1,000	5,653.12

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STRICTER TRAFFIC LAWS

Continued from page 43 . . .

it difficult to keep pace with the insatiable demands of the automobile. * * * Los Angeles, which already has the most elaborate urban highway system in the world with more than 180 miles of completed expressways and freeways, has plans that call for a total of more than 500 miles.'

"The cost of our freeways is, of course, tremendous, but the construction is based on sound economic principles of financing and they are directly responsible for saving the people of California millions of dollars beyond their original costs.

"From one standpoint alone, it has been estimated that inadequate roads cost motorists more than \$5,000,000,000 each year in the United States.

Traffic Accidents

"The California Traffic Safety Foundation estimates that last year in California we suffered an economic loss of \$456,480,000 from traffic accidents. This amounts to \$1,250,000 every 24 hours. These figures of course, cannot measure the death and injury toll which killed one person every 2¼ hours and injured one every four minutes all through 1956.

"Experience has shown that modern controlled-access highways, such as the Harbor Freeway and other similar arterials in Southern California, are far safer than those highways heretofore classified as 'conventional.'

"The accident rate on freeways is actually only about half of the overall accident rate on all types of highways, while statistics demonstrate that your life is three times as safe on a modern freeway per traveled mile as it is on other types of highways. These figures are based on national surveys but you may be interested in somewhat more specific examples developed by the National Safety Council.

"Using the traffic death rate per 100,000,000 vehicle miles as a basis, we find these rather startling comparisons: In California, freeways, 2.12 as against 9.39 for all State highways; in Virginia, the Shirley Expressway, 6.1 against 20.5 on US Highway 1; in Michigan, the Detroit Industrial

Expressway, 6.7 against 15 for US Route 112.

"I cite these various figures to demonstrate the sound economics of our freeway system in California. Before I leave statistics, I would like to present evidence of the monetary savings to the most careful, accident-free driver in Los Angeles.

"A 1956 study by the Automobile Club of Southern California, appearing last year in—of all places—a publication called 'Inside Michigan' showed that, on the basis of 133 miles of freeway driving versus 124 miles of utilizing ordinary streets and boulevards in Los Angeles, freeways saved over 30 percent in traveling time and over 50 percent in traveling costs.

"To my way of analyzing figures, this certainly seems to be a good investment of your gasoline tax dollars.

"I have talked at length, both here and on other occasions, of the tragic, wasteful impact of motor vehicle accidents upon our society and our economy. I regard this whole area as one of the most serious and pressing challenges faced by your State Government at Sacramento.

"It has been demonstrated that continuing improvement of our streets and highways, in accordance with modern engineering design and practice, will save lives and money. The State of California has been moving as rapidly as physical restrictions and financial limitations will permit to fulfill its obligation in this regard.

Legislative Program

"If this were the only answer—the simple solution—then we could view the traffic accident picture with greater hope and complacency. However, there is no such simple, single solution. We need a balanced, adequate and comprehensive program, attacking the problem from every possible angle.

"In my message to the Legislature and the proposed budget submitted for 1957-58. I have asked more stringent penalties for violators, more general analysis of accident records, more exact standards of driver licensing, more enforcement facilities and more uniform enforcement policies.

In addition, my Advisory Committee on Traffic Safety is carrying on a constant and expanding program of public information and education in vehicle safety and operation.

"In the long run, it is imperative that those who cannot be deterred from childish, dangerous acts by the fear of death or serious injury be hit hard, often and consistently in a manner which even their simple minds can comprehend—through heavy fines and detention in jail.

"Most California drivers, night club comics to the contrary, are careful, courteous and law-abiding. However, many of these innocently err by their passive tolerance of violations of traffic laws. Bear in mind that these, too, are crimes against person and property.

Public Support Needed

"Traffic laws are made and enforced for public safety. Anyone who breaks them deliberately and flagrantly is, at least to a degree, a criminal who has threatened the life and well-being of one or more American citizens. He is not clever. In fact, to the extent of his violation, he is not even intelligent.

"A fine in traffic court, to me, is certainly not something to brag about over dinner or at a cocktail party. Evasion of the law designed to protect you isn't sensible. 'Fixing a ticket' is not a thing of which to boast and it does not measure your importance; it measures the honesty and integrity of yourself as a citizen and of the officer or judge who made it possible for you to escape the penalty for your illegal act. Plainly speaking, 'fixing a ticket' weakens the majesty of our law, the bulwark of our national freedom. The only alternative to supremacy and dignity of the law is tyrannical, capricious dictatorship.

"Your legislators, your Governor and the other administrative officers of your State Government are actively concerned with traffic safety. However, all their efforts will be for nothing if they do not have the active support and cooperation of the vast body of fine, law-abiding, sober California citizens.

"We are anxious to do all we can. We earnestly invite you to join with us and do all you can to minimize death and mayhem on the streets and highways of California."

Historic Weaverville

*Improvements in
Trinity County*

By H. CLYDE AMESBURY, Senior Highway Engineer

LAST YEAR witnessed considerable highway activity in that portion of Trinity County contained in District II. A three and one-half mile contract held by Earl McNutt of Eugene, Oregon and amounting to about \$600,000 was completed. A section 1.8 miles in length containing the Main Street of Weaverville and extending south towards Douglas City was completed by the Mercer-Fraser Company of Eureka at a cost of about \$195,000. The same company completed a paving contract covering portions of the highway between Weaverville and Helena to the west at a cost of \$121,196. These were all routine construction contracts.

The storms of the winter of 1955-56 caused extensive damage along the Trinity River. Reconstruction of a complete washout of the roadbed at Vitzthums, about one and one-half miles east of Douglas City, was covered by a contract held by the Thomas Construction Company in the amount of \$243,916. This is completed. Reconstruction cost on the Douglas City Bridge is covered by a contract held by the Bos Construction Company for \$140,000. This is almost completed.

West of Weaverville between Junction City and Prairie Creek, the cost of storm damage repair is represented by a contract held by Scheumann & Johnson of Eugene, Oregon in the

amount of \$877,800. This contract is nearing completion.

The Bos Construction Company also completed a \$16,000 contract for drainage correction on the road to Hayfork.

All this work is in the Redding District of which H. S. Miles is District Engineer. Joe Fonseca was Resident Engineer on the McNutt and Thomas jobs. Ellis Engle had charge of the Weaverville job and the paving between Weaverville and Helena. Charlie Moss represented the department on the drainage correction work. Bill Smith is resident engineer on the incomplete storm damage reconstruction between Junction City and Weaverville. N. E. Spicklemire is

Reconstruction and riprap along Trinity River near Vitzthums





Relocation on the McNutt job meant heavy grading. Old road on the left.

resident engineer for the bridge department on the Douglas City Bridge. George Barry and Ray Wilson are construction engineers for the district.

Relocation of Highway

The McNutt contract covered a relocation of a section of highway that practically followed a contour around the mountainside. The country was rough and the road was crooked. The relocation substituted a much straighter and shorter location which of course necessitated heavy cuts and fills.

The Mercer-Fraser improvement in Weaverville occurred almost exactly a century after the first wagon road was constructed to reach it.

Originally Shasta, seven miles west of Redding, had been the point reachable by freight wagons. From there pack outfits transported supplies the 38 miles to Weaverville. By 1854 the road had been extended to Tower

House about 10 miles farther west. There still remained about 28 "mountain miles" which are supposed to contain 10,000 feet as against 5,280 for "flat land" miles.

Rush of Settlers

A company named the Shasta-Weaverville Wagon Road Company was founded with a capital of \$20,000 by selling shares at \$100 each. It started building the toll road in 1858.

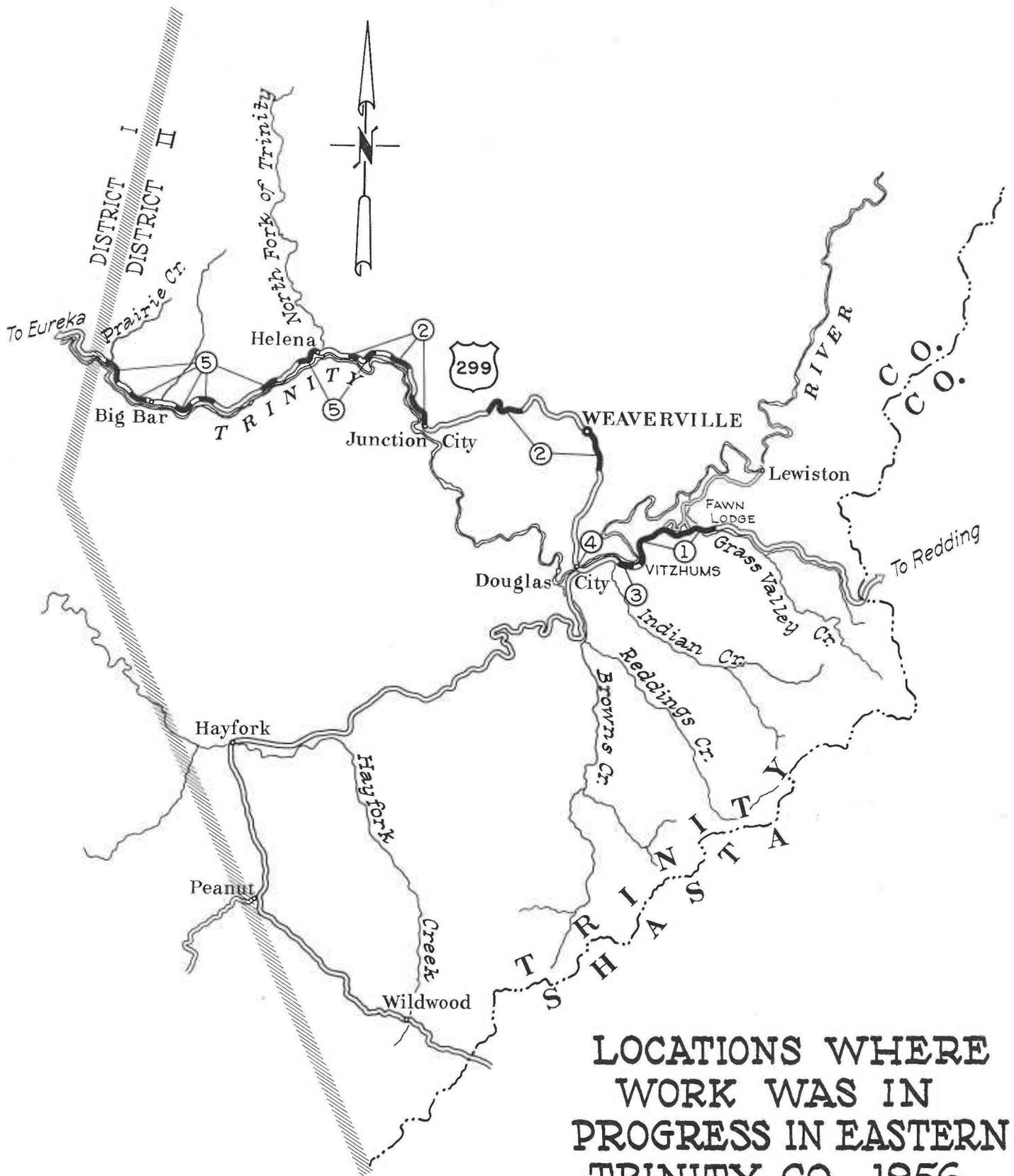
There was a rush of settlers to the Trinity area even before the gold strike. A traveler through the country in 1854 spoke of the productive ranches and says the best settled part of the county is between Weaverville and Douglas City along Weaver Creek. He especially mentioned one ranch near the junction of this creek and the Trinity River.

This is the area through which the first unit of the reconstruction of the Douglas City-Weaverville highway

was built. It is now a wide expanse of gravel. The area was mined by the white miners in the 1850's and 60's, reworked by the Chinese and then about 1930 was reworked again as a "doodle bug" operation. A "doodle bug" is a modified dredger. It has the screens and pumps for washing the gravel, and the recovery equipment, mounted on a hull which floats in a pond dug by a dragline. This same dragline excavates the gravel down to bedrock and dumps it on the screens. The "bug" follows in the pond dug by the dragline and deposits the rejected gravel in the pond behind the boat. This gravel has been handled until it is almost worn out.

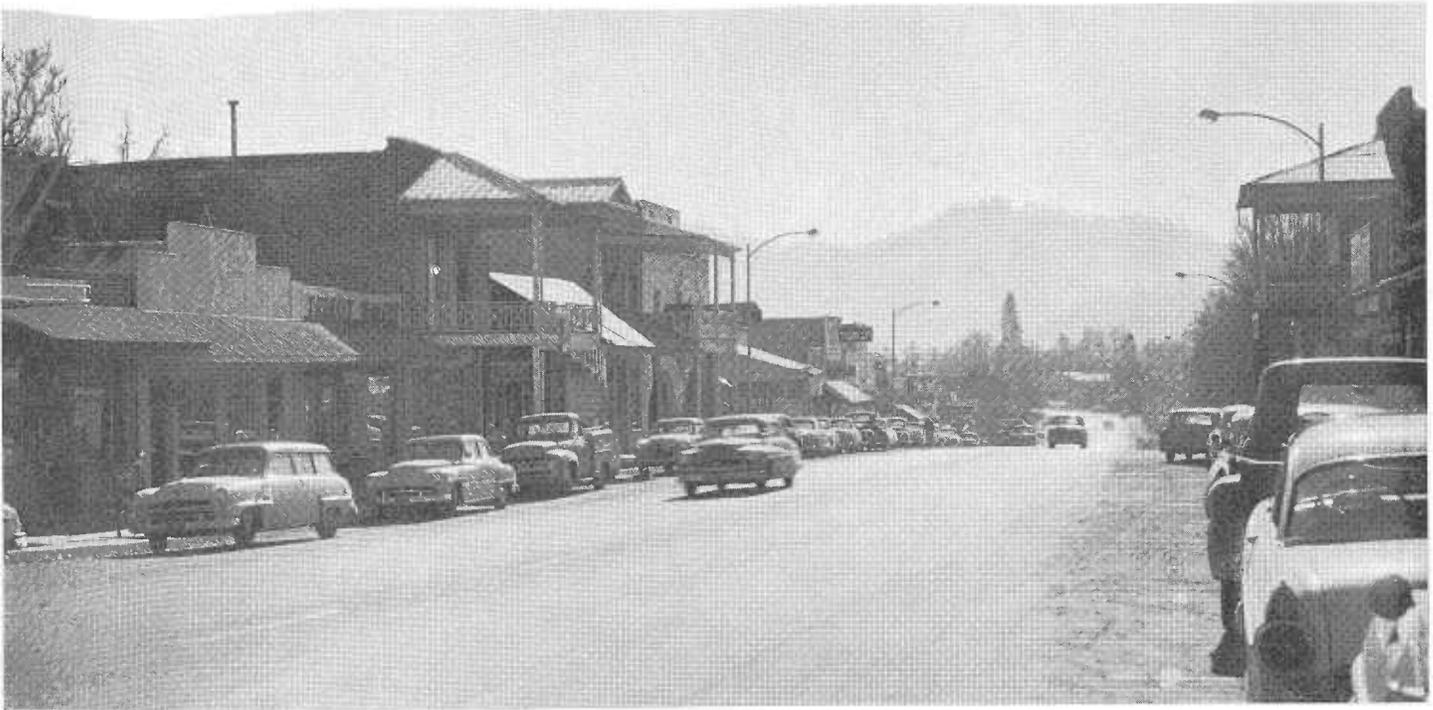
Founding of Weaverville

Weaverville is one of the towns whose existence began and was caused by the discovery of gold in the 1850's. It is an old town. John Weaver came to the area in 1848. The first cabin was



LOCATIONS WHERE WORK WAS IN PROGRESS IN EASTERN TRINITY CO. 1956

Locations of 1956 highway contracts in eastern Trinity County are as follows: 1—a three and one-half mile relocation between Vitzhums and Tom Lang Gulch; 2—paving contracts on portions of the highway from south of Weaverville (including its main street) to Helena; 3—reconstruction of a washout at Vitzhums; 4—reconstruction of Douglas City bridge; 5—repairing damage to roads due to flooding. The last three contracts are the result of the floods of 1955-56.



Main Street of Weaverville after improvements. Two spiral staircases visible in left center.

built in 1850 and by 1852 it was a considerable town. It was built of lumber sawed locally and it burned three times between 1853 and 1858. Brick buildings with iron doors to provide protection against fires were built after 1858. Several of these are still standing and in use.

No one can write about Weaverville and really touch upon it without mentioning its spiral stairways.

We know there was a Bavarian blacksmith living in Weaverville who knew how to build a spiral stairway. Whether he was the promoter of what followed or whether someone else had the idea and availed themselves of the blacksmith's talents, we do not know.

Anyhow, the matured idea resulted in one owner having title to a lot and the lower story, and another person owning the second story which was reached by a spiral stairway set out in the sidewalk in front of the building.

The very thought of drawing up the agreement to cover such a transaction and the proper allocation of responsibilities for roof and foundation repairs, to say nothing of insurance, general maintenance and taxes,

would be guaranteed to give a modern title expert the shakes.

Apparently these legal pitfalls were all ignored and some of the buildings are in use today with their dual but not joint ownership.

Signs of Gold Days Remain

In many ways the evidence of the gold days are still apparent in Weaverville and vicinity. Because development has been slow many buildings and landmarks that otherwise might have been obliterated are still in evidence. The Chinese Joss House still stands in Weaverville. Every gulch shows where some hopeful individual moved a small amount or even up to hundreds of cubic yards of material in prospecting. A trip into the mountains will reveal miles of ditches built to convey water to the "diggins." The amount of work, and it was all done by hand, is truly amazing.

An interesting sidelight concerns the *Trinity Journal*. It recently celebrated its centennial.

In 1856, David E. Gordon and Henry Seaman took over the *Trinity Democrat* that had been recently established. They did not like the name "Democrat" and asked Ed Neblett if he could suggest a better name. Back

east, Neblett had been a steady reader and great admirer of the *Louisville Journal* so he said "Why not call it the *Journal*?" *Weaverville Journal* it has been for over 100 years.

Lumbering Industry

Following the passing of the "gold rush" era, there was not much development in Trinity County. Mining activities tapered off and all but ceased. Stock ranching was carried on rather extensively and a small amount of lumbering was done. The county still has no incorporated town and the only railroad consists of 14 miles of Western Pacific line that cuts through the southwest corner on its route from the Bay region to Eureka. It is entirely dependent upon the highways for its transportation needs.

Changes are occurring. They began after World War II when there was a tremendous demand for lumber. Trinity County had huge stands of timber that were originally not reachable. Now with better highways and improved trucks they could be brought to market.

New Boom Towns

The Trinity dam and diversion tunnels which have been under planning

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RECORD TOTAL GAS TAX REVENUES TO CITIES

Continued from page 56 . . .

City	5/8¢ Gas Tax	Engineering	Total	City	5/8¢ Gas Tax	Engineering	Total
PLUMAS COUNTY				SANTA BARBARA COUNTY			
Portola	\$6,985.88	\$1,000	\$7,985.88	Guadalupe	\$7,690.33	\$1,000	\$8,690.33
RIVERSIDE COUNTY				Lompoc	17,055.29	2,000	19,055.29
Banning	\$25,823.94	\$2,000	\$27,823.94	Santa Barbara	157,460.83	7,500	164,960.83
Beaumont	10,583.82	1,000	11,583.82	Santa Maria	40,527.94	3,000	43,527.94
Blythe	15,612.38	2,000	17,612.38	Total	\$222,734.39	\$13,500	\$236,234.39
Coachella	10,721.35	1,000	11,721.35	SANTA CLARA COUNTY			
Cabazon	2,641.73	1,000	3,641.73	Alviso	\$2,014.50	\$1,000	\$3,014.50
Corona	36,321.14	3,000	39,321.14	Campbell	24,451.42	2,000	26,451.42
Elsinore	6,979.39	1,000	7,979.39	Cupertino	5,394.67	1,000	6,394.67
Hemet	13,084.99	1,000	14,084.99	Gilroy	18,597.07	2,000	20,597.07
Indio	24,192.58	2,000	26,192.58	Los Altos	59,956.61	4,000	63,956.61
Palm Springs	37,771.91	3,000	40,771.91	Los Altos Hills	9,695.56	1,000	10,695.56
Perris	7,032.22	1,000	8,032.22	Los Gatos	15,552.60	1,750	17,302.60
Riverside	219,033.82	7,500	226,533.82	Milpitas	2,576.83	1,000	3,576.83
San Jacinto	5,493.52	1,000	6,493.52	Morgan Hill	5,737.62	1,000	6,737.62
Total	\$415,292.79	\$26,500	\$441,792.79	Mountain View	60,614.59	4,000	64,614.59
SACRAMENTO COUNTY				Palo Alto	126,684.97	6,000	132,684.97
Folsom	\$6,815.93	\$1,000	\$7,815.93	San Jose	358,978.36	10,000	368,978.36
Galt	4,785.98	1,000	5,785.98	Santa Clara	99,813.62	6,000	105,813.62
Isleton	4,934.29	1,000	5,934.29	Saratoga (1/2 yr.)	22,968.02	2,000	24,968.02
North Sacramento	24,549.85	2,000	26,549.85	Sunnyvale	87,106.85	6,000	93,106.85
Sacramento	485,649.43	10,000	495,649.43	Total	\$900,143.29	\$48,750	\$948,893.29
Total	\$526,735.48	\$15,000	\$541,735.48	SANTA CRUZ COUNTY			
SAN BENITO COUNTY				Capitola	\$5,709.81	\$1,000	\$6,709.81
Hollister	\$17,039.84	\$2,000	\$19,039.84	Santa Cruz	70,427.23	5,000	75,427.23
San Juan Bautista	3,185.52	1,000	4,185.52	Watsonville	36,801.74	3,000	39,801.74
Total	\$20,225.36	\$3,000	\$23,225.36	Total	\$112,938.78	\$9,000	\$121,938.78
SAN BERNARDINO COUNTY				SHASTA COUNTY			
Barstow	\$25,494.82	\$2,250	\$27,744.82	Anderson	\$12,124.08	\$1,000	\$13,124.08
Chino	23,070.99	2,000	25,070.99	Redding	36,705.95	3,000	39,705.95
Colton	53,823.03	4,000	57,823.03	Total	\$48,830.03	\$4,000	\$52,830.03
Fontana	42,313.81	3,000	45,313.81	SIERRA COUNTY			
Monte Vista	23,822.94	2,000	25,822.94	Loyalton	\$2,953.78	\$1,000	\$3,953.78
Needles	12,516.48	1,000	13,516.48	SISKIYOU COUNTY			
Ontario	123,453.77	6,000	129,453.77	Dorris	\$2,756.04	\$1,000	\$3,756.04
Redlands	65,706.13	5,000	70,706.13	Dunsmuir	12,148.80	1,000	13,148.80
Rialto	36,396.98	3,000	39,396.98	Etna	2,376.00	1,000	3,376.00
San Bernardino	259,102.64	7,500	266,602.64	Fort Jones	1,622.11	1,000	2,622.11
Upland	36,664.72	3,000	39,664.72	Montague	2,218.41	1,000	3,218.41
Total	\$702,366.31	\$38,750	\$741,116.31	Mt. Shasta	5,898.29	1,000	6,898.29
SAN DIEGO COUNTY				Tulelake	3,176.25	1,000	4,176.25
Carlsbad	\$21,513.77	\$2,000	\$23,513.77	Yreka City	13,009.42	1,000	14,009.42
Chula Vista	96,828.94	6,000	102,828.94	Total	\$43,205.32	\$8,000	\$51,205.32
Coronado	53,053.69	4,000	57,053.69	SOLANO COUNTY			
El Cajon	66,060.54	5,000	71,060.54	Benicia	\$22,505.57	\$2,000	\$24,505.57
Escondido	29,908.80	2,750	32,658.80	Dixon	7,003.26	1,000	8,003.26
Imperial Beach (3/4 yr.)	22,058.66	1,500	23,558.66	Fairfield	32,309.45	3,000	35,309.45
La Mesa	59,118.41	4,250	63,368.41	Rio Vista	7,826.28	1,000	8,826.28
National City	84,632.18	6,000	90,632.18	Suisun City	6,055.87	1,000	7,055.87
Oceanside	61,893.86	4,750	66,643.86	Vacaville	22,718.75	2,000	24,718.75
San Diego	1,382,133.61	10,000	1,392,133.61	Vallejo	117,517.62	6,000	123,517.62
Total	\$1,877,202.46	\$46,250	\$1,923,452.46	Total	\$215,936.80	\$16,000	\$231,936.80
SAN FRANCISCO COUNTY				SONOMA COUNTY			
San Francisco	\$2,395,641.19	\$20,000	\$2,415,641.19	Cloverdale	\$6,514.84	\$1,000	\$7,514.84
SAN JOAQUIN COUNTY				Healdsburg	12,034.23	1,000	13,034.23
Escalon (1/4 yr.)	\$1,533.73	\$250	\$1,783.73	Petaluma	37,561.81	3,000	40,561.81
Lodi	51,360.52	4,000	55,360.52	Santa Rosa	86,975.75	6,000	92,975.75
Manteca	18,285.01	2,000	20,285.01	Sebastopol	8,438.04	1,000	9,438.04
Ripon	5,409.05	1,000	6,409.05	Sonoma	7,464.77	1,000	8,464.77
Stockton	252,110.74	7,500	259,610.74	Total	\$158,989.44	\$13,000	\$171,989.44
Tracy	31,953.10	2,750	34,703.10	STANISLAUS COUNTY			
Total	\$360,652.15	\$17,500	\$378,152.15	Ceres	\$10,971.62	\$1,000	\$11,971.62
SAN LUIS OBISPO COUNTY				Modesto	96,358.82	6,000	102,358.82
Arroyo Grande	\$6,367.92	\$1,000	\$7,367.92	Newman	6,107.92	1,000	7,107.92
El Paso de Robles	19,873.17	2,000	21,873.17	Oakdale	13,479.36	1,000	14,479.36
Pismo Beach	5,963.17	1,000	6,963.17	Patterson	5,541.51	1,000	6,541.51
San Luis Obispo	53,232.90	4,000	57,232.90	Riverbank	8,396.52	1,000	9,396.52
Total	\$85,437.16	\$8,000	\$93,437.16	Turlock	22,309.23	2,000	24,309.23
SAN MATEO COUNTY				Total	\$163,164.98	\$13,000	\$176,164.98
Atherton	\$19,252.09	\$2,000	\$21,252.09	SUTTER COUNTY			
Belmont	36,458.77	3,000	39,458.77	Live Oak	\$6,386.47	\$1,000	\$7,386.47
Burlingame	61,785.26	4,000	65,785.26	Yuba City	31,805.65	3,000	34,805.65
Colma	899.12	1,000	1,899.12	Total	\$38,192.12	\$4,000	\$42,192.12
Daly City	94,255.21	6,000	100,255.21	TEHAMA COUNTY			
Hillsborough	16,143.82	2,000	18,143.82	Corning	\$7,857.18	\$1,000	\$8,857.18
Menlo Park	73,569.47	5,000	78,569.47	Red Bluff	17,157.24	2,000	19,157.24
Millbrae	34,626.56	3,000	37,626.56	Tehama	970.18	1,000	1,970.18
Redwood City	120,375.76	6,000	126,375.76	Total	\$25,984.60	\$4,000	\$29,984.60
San Bruno	61,908.85	5,000	66,908.85	TRINITY COUNTY			
San Carlos	54,298.16	4,000	58,298.16	None			
San Mateo	186,733.81	7,500	194,233.81				
South San Francisco	110,272.34	6,000	116,272.34				
Woodside (1/2 yr.)	7,860.25	1,000	8,860.25				
Total	\$878,439.47	\$55,500	\$933,939.47				

RECORD TOTAL GAS TAX REVENUES TO CITIES

Continued from page 62 . . .

City	5/8¢ Gas Tax	Engineering	Total
TULARE COUNTY			
Dimuba	\$16,771.04	\$2,000	\$18,771.04
Exeter	12,868.71	1,000	13,868.71
Lindsay	16,968.78	2,000	18,968.78
Porterville	24,108.23	2,000	26,108.23
Tulare	40,948.15	3,000	43,948.15
Visalia	42,391.78	3,000	45,391.78
Woodlake	7,801.56	1,000	8,801.56
Total	\$162,358.25	\$14,000	\$176,358.25
TUOLUMNE COUNTY			
Sonora	\$7,563.66	\$1,000	\$8,563.66
VENTURA COUNTY			
Fillmore	\$14,598.96	\$1,000	\$15,598.96
Ojai	12,142.63	1,000	13,142.63
Oxnard	89,228.21	6,000	95,228.21
Port Hueneme	24,402.67	2,000	26,402.67
San Buenaventura	73,903.68	5,250	79,153.68
Santa Paula	35,871.39	3,000	38,871.39
Total	\$250,147.54	\$18,250	\$268,397.54
YOLO COUNTY			
Davis	\$18,692.84	\$2,000	\$20,692.84
Winters	5,159.84	1,000	6,159.84
Woodland	35,761.19	3,000	38,761.19
Total	\$59,613.87	\$6,000	\$65,613.87
YUBA COUNTY			
Marysville	\$24,180.19	\$2,000	\$26,180.19
Wheatland	1,813.67	1,000	2,813.67
Total	\$25,993.86	\$3,000	\$28,993.86
GRAND TOTAL	\$28,219,354.63	\$1,000,125	\$29,219,479.63

EMBARCADERO

Continued from page 46 . . .

maximum service to motorists with a minimum right of way space for the route. It will also provide more safety for the traveling public by the separation of the two directions of traffic.

Two additional projects are presently under way as parts of the Embarcadero Freeway. The portion from Fremont to Mission Street is estimated to be completed about the first of July, 1957, at a cost of \$1,753,545 and the extension to Broadway at Vallejo Street by the fall of 1959, at a cost of \$7,800,000. Charles L. Harney, Inc., is the contractor on both of these projects.

The downtown connections, or ramps, will serve as the terminal of the freeway until the fall of 1959 when the extension of the freeway along the Embarcadero to Broadway at Vallejo Street is scheduled for completion. Thus, some congestion during peak hours is anticipated at the terminal pending completion of the extension. However, the congestion at the present northbound off-ramp at Fourth and Bryant Streets and at the First Street off-ramp should be considerably relieved.

OROVILLE-MARYSVILLE

Continued from page 30 . . .

The southerly end of the Feather River Highway Relocation will join this project at the Montgomery Street connection.

The proposed improvement is a step in the development of this portion of US Alternate 40 to full freeway status. It is in keeping with the planned over-all development of this highway.

The 1957-58 state highway budget contains \$750,000 for this project.

WEAVERVILLE

Continued from page 61 . . .

for several years but upon which work actually started last year, have given a great impetus.

Around 40 million dollars worth of contracts have been awarded for roads, camps and tunnels. Work has been started on all of these items. Later the Bureau of Reclamation advised that the contract for the Lewiston Dam was let for 49 million dollars.

Weaverville is considering incorporation and is planning to install a sewer system. Lewiston, near the dam, is booming and growing like a

HENRY L. MAHONEY

Continued from page 50 . . .

Chief Clerk in the Headquarters Office in 1937, a position which he held for 20 years.

During his career Henry has participated in the tremendous growth of the State Highway System to the point where today average weekly expenditures have surpassed the amount formerly expended in one year when he began state service.

A dinner party honoring Henry's retirement was attended by his family and many friends throughout the organization on April 25th at the University Club.

"Hank" plans to maintain his home in Sacramento but has not formulated any definite plans as to how he will spend his well-earned retirement time.

The Division of Highways extends to him and Mrs. Mahoney congratulations and best wishes for many happy years of retirement.

AUTO INDUSTRY SPENDS RECORD BILLIONS

Motor vehicle and parts manufacturers, anticipating the growing market of the future, spent an estimated \$1,863,000,000 during 1956 on new plants and equipment.

Since World War II, points out the National Automobile Club, the industry has spent 9.7 billion dollars on plant expansion and new equipment. Expenditures climbed steadily from 349 million in 1949 to 1.3 billion in 1956, then dropped slightly before the 1956 budget allocations.

MAKE ALLOWANCES

If you want to drive safely, do not be satisfied merely to do everything you ought to do. You should make allowances for the unexpected and for the mistakes and misjudgments of other drivers. The California State Automobile Association says the best motorists drive defensively.

boom construction town, which it is. Motels are being built, even miles away from the dam. On every side there are signs of progress and development.

Legislature Requests Naming of Bridges

The Department of Public Works has been instructed by resolutions passed by the 1957 Legislature to name two bridges in Northern California, one in honor of Louis De Martin, Sr. of Del Norte County, and the other in commemoration of the late George Leatherwood, a state highway engineer.

A resolution sponsored by Senator Randolph Collier requested that the newly completed bridge across Wilson Creek on US 101 about 12 miles north of the Town of Klamath in Del Norte County be named the "Louis De Martin Sr. Bridge." De Martin is a pioneer and a resident of Del Norte County since 1875. He is said to have built the first bridge across the creek on the highway which is now US 101.

A proposed bridge across the South Fork of the Eel River near Dyerville on the new Redwood Freeway in Humboldt County will be named the "George Leatherwood Memorial Bridge." Leatherwood, who was in charge of advance planning for District I of the Division of Highways, was killed on July 30, 1956, when a helicopter in which he was a passenger crashed on US 299 near the North Fork of the Mad River. He had developed important ideas in planning the location of the Redwood Freeway through the southern Humboldt County redwood groves and this proposed bridge and freeway will stand as a monument to his engineering ability.

VENEZUELA

Venezuela is the leading importer of United States motor vehicles, according to the National Automobile Club.

During 1955, Venezuela received 44,057 vehicles from this Country, including 26,956 passenger cars, 16,895 trucks and 206 busses. Mexico followed with 39,649 units.

Belgium was the No. 1 European importer, with 28,696 motor vehicles.

In Memoriam

GEORGE B. McDOUGALL

George B. McDougall, State Architect from 1913 until his retirement in 1938, died April 20, 1957, in the San Rafael General Hospital after a brief illness. He was 88.

McDougall was born in San Francisco on October 11, 1868, where his father, Barnett McDougall, was an architect. He first worked in the office of Superior Court Reporters in San Francisco and later was private secretary to Wm. Randolph Hearst.

After working five years as an architectural student and draftsman in the office of his father, McDougall became a member of the architectural firm of McDougall Brothers in San Francisco in 1893. He was appointed State Architect on August 22, 1913, by the then State Engineer, Wilbur F. McClure, and served under the administrations of seven different state engineers and directors of public works and under six different governors.

He was past president of the Northern California chapter of the American Institute of Architects, the Marin County YMCA and the San Rafael Rotary Club. He was also an active Mason and a member of the Presbyterian Church.

He is survived by his widow, Louise, of San Rafael; a daughter, Mrs. Arthur Dudman of Sacramento, and a niece, Frances McDougall of Berkeley.

NICE LETTER

Alhambra

MR. KENNETH ADAMS, *Editor*

We have enjoyed your magazine and found it most interesting. We travel quite a little and it is most thrilling to see some of the new highways we have gone over, and to see those we intend to travel in a few weeks.

If everyone enjoys your magazine as we do, your Division of Highways has far surpassed great rewards for its conscientious work and ideas.

Most sincerely,

MR. AND MRS. RAY C. MORRIS

In Memoriam

DAVID A. HOFFMAN

David Arthur Hoffman, Supervising Outdoor Advertising Inspector for the California Division of Highways, died on April 27th, after an illness of several months.

Hoffman had been in state service since 1933 and was one of the first inspectors appointed by the division under the Outdoor Advertising Act which went into effect that year.

He served first in the Sacramento area, later transferring to Los Angeles. He returned to Sacramento in 1947 to become head of the division's Outdoor Advertising Section as supervising inspector.

Hoffman was born at Inglewood, Kansas, and went to school in Wichita. He came to California in 1925. Before joining state service he worked as a printer.

Hoffman is survived by his wife, Rosemary, and son, Bill.

LAST LINK

Continued from page 26...

way is constructed, is estimated at \$3,000,000. Therefore we cannot say at this time that the District VII part of the San Bernardino Freeway is completely finished.

As the areas passed through by the San Bernardino Freeway are more intensively developed as population increases and as traffic volumes become correspondingly larger, other additional construction is certain to be needed. Even now, it is foreseen that before many years have passed, further construction to provide an eight-lane freeway throughout will become necessary.

Thus, the State Division of Highways cannot, even at this late date, close the books on the San Bernardino Freeway and write "Finis."

MOTOR VEHICLES

A total of 66,875,000 motor vehicles, with a wholesale value of \$95,800,000,000, have been produced and sold in the United States during the 10 years since 1947, reports the National Automobile Club.

GOODWIN J. KNIGHT
Governor of California

DEPARTMENT OF PUBLIC WORKS

SACRAMENTO, CALIFORNIA



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I. O. JAHLSTROM Bridge Engineer—Operations
R. R. ROWE Bridge Engineer—Special Studies
J. E. McMAHON Bridge Engineer—Southern Area
L. C. HOLLISTER Projects Engineer—Carquinez
E. R. HIGGINS Comptroller

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E. F. WAGNER Deputy Chief Right of Way Agent
RUDOLPH HESS Assistant Chief
R. S. J. PIANEZZI Assistant Chief
E. M. MacDONALD Assistant Chief

District IV

B. W. BOOKER Assistant State Highway Engineer

District VII

E. T. TELFORD Assistant State Highway Engineer

District Engineers

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H. S. MILES District II, Redding
ALAN S. HART District III, Marysville
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