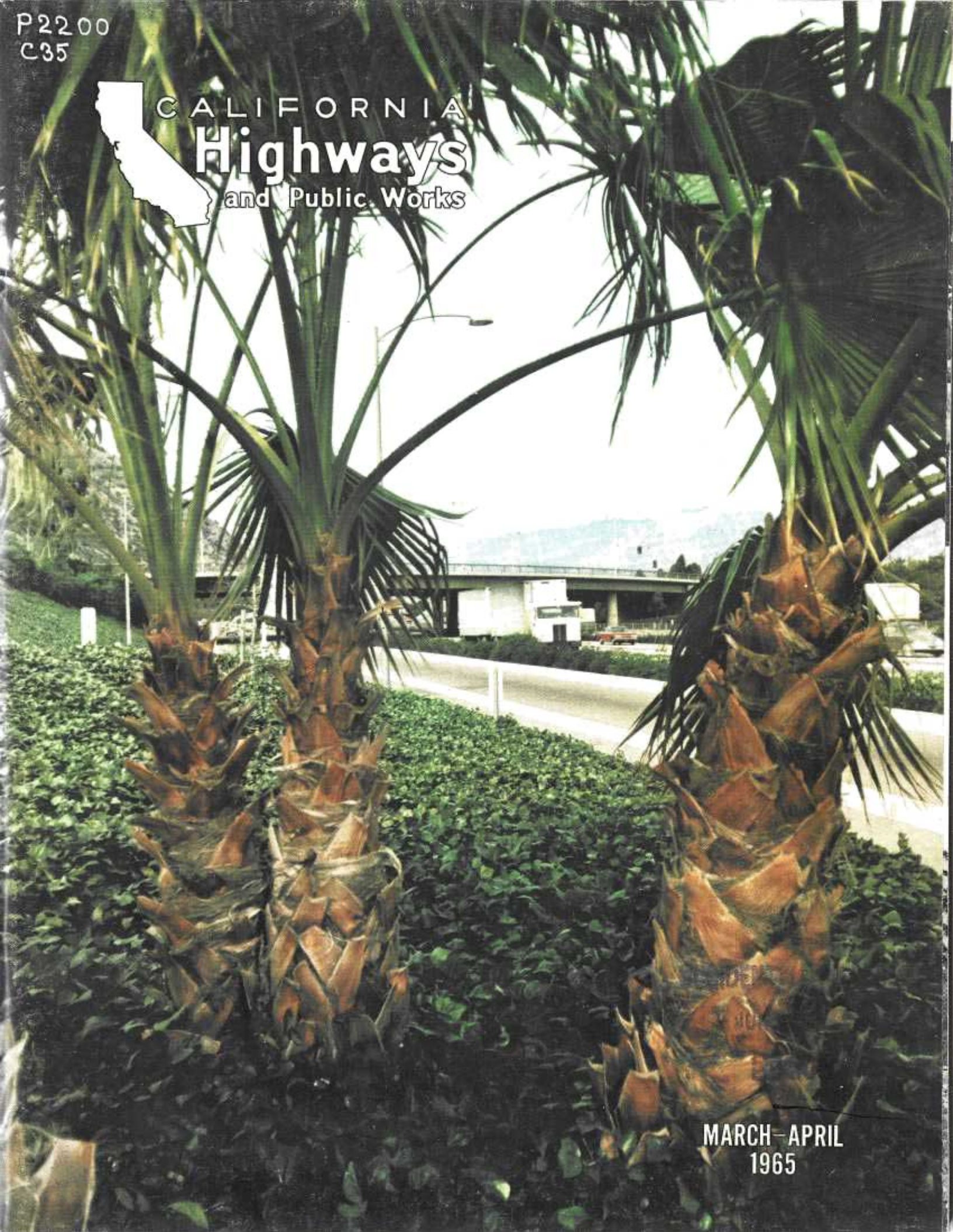
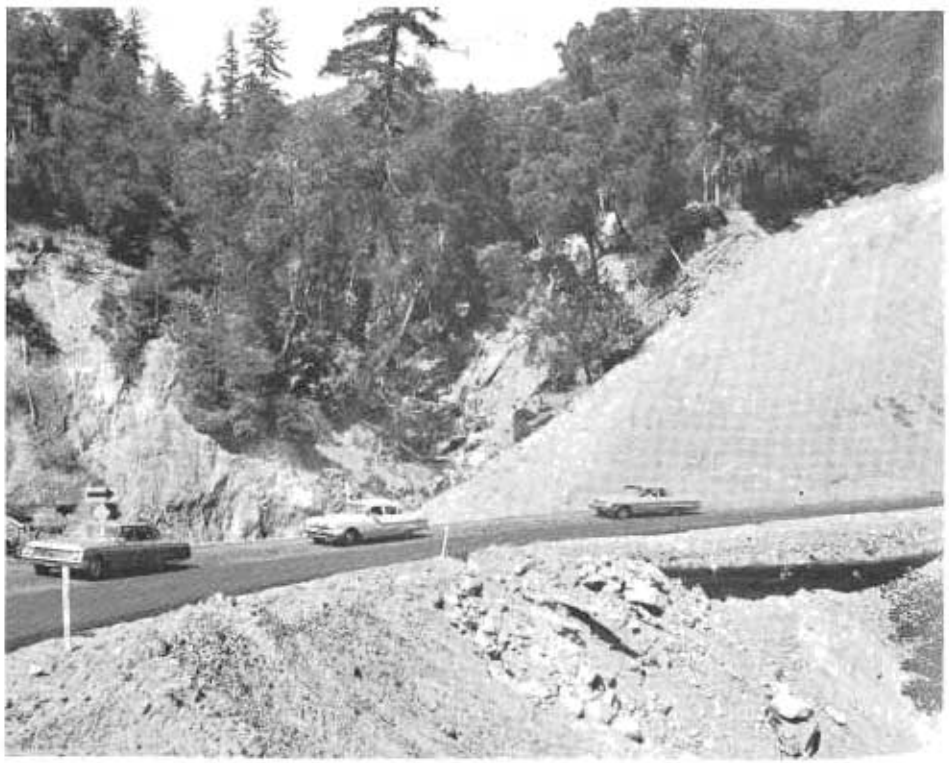


CALIFORNIA Highways and Public Works

MARCH–APRIL
1965

Squaw Creek

At upper left is shown a view of the canyon that Squaw Creek, in Mendocino County, near Cummings, cut across the Redwood Highway during the Christmas storms. Photo was made December 27, 1964, before any reconstruction was yet organized. Photo above shows gulf from other side on January 16, partly filled. Below is a picture of the highway on March 17, 1965, carrying normal traffic. About 25,000 truckloads of fill were required to bring the road back up to grade. (See article beginning on page 14.)



California Highways and Public Works

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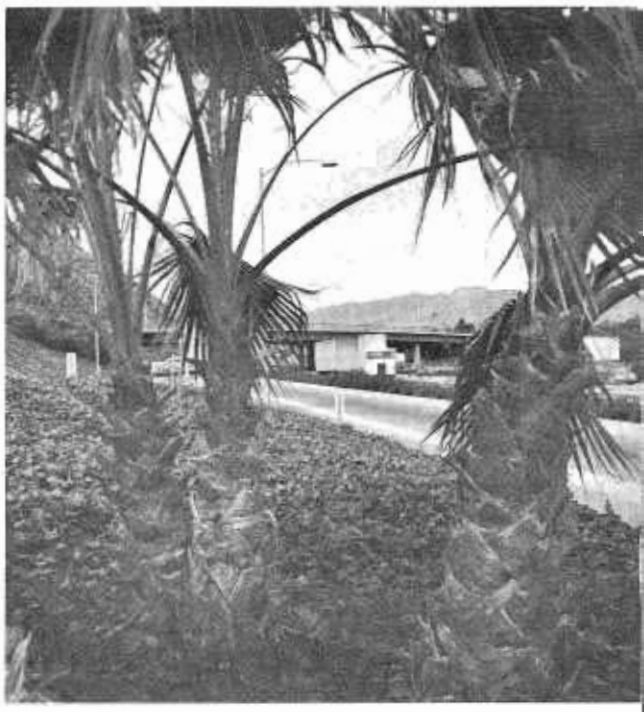


FRONT COVER: View of the Golden State Freeway (Interstate 5) in Los Angeles, showing development of landscaping in six years. Planting was made late in 1958, photograph was made late in 1964. Palms in foreground framing view are Mexican fan palms, Washingtonia robusta, closely related to the California fan palm, but more vigorous and adaptable. Ground cover is Algerian ivy. Trees were 3–4 feet high when planted. Overcrossing is at Los Feliz Boulevard. Photo by Sam Smith, District 7, Los Angeles.

BACK COVER: Photo made exactly two months after disastrous Christmas week floods in northern California shows Bailey bridge in place across washed-out span on Smith River, US Highway 199, between Crescent City and the Oregon line. Torrents tore out several miles of this highway, in addition to three major bridges. Since major traffic load in winter is industrial, reconstruction had to support full legal loads, which road is now carrying. See articles on reconstruction in this issue. Photo by Robert Mulno.

Opening a Lifeline

Temporary Bridges, Mud, Machines and Hard Work

By JOHN ROBINSON, Information Officer

In the aftermath of the Christmas 1964 floods, came an associated economic problem for the areas isolated by the destruction of the transport system. It was a simple chain reaction. If the industry of the affected counties, 75 percent timber products, could not get its production to market, production must cease as soon as all storage facilities were filled. Within two weeks, this was costing the area about $75,000 a day.

The areas of worst damage were in the State Division of Highways District 1, and western portions of District 2. This included Del Norte, Humboldt, Mendocino, Trinity, Siskiyou, and portions of Shasta and Tehama Counties, all of which had isolated sections, some hopelessly cut off from outside help.

Although there were emergencies everywhere, it was obvious that a major object of highway workers must be the earliest possible reopening of a highway "lifeline" into and out of the isolated region.

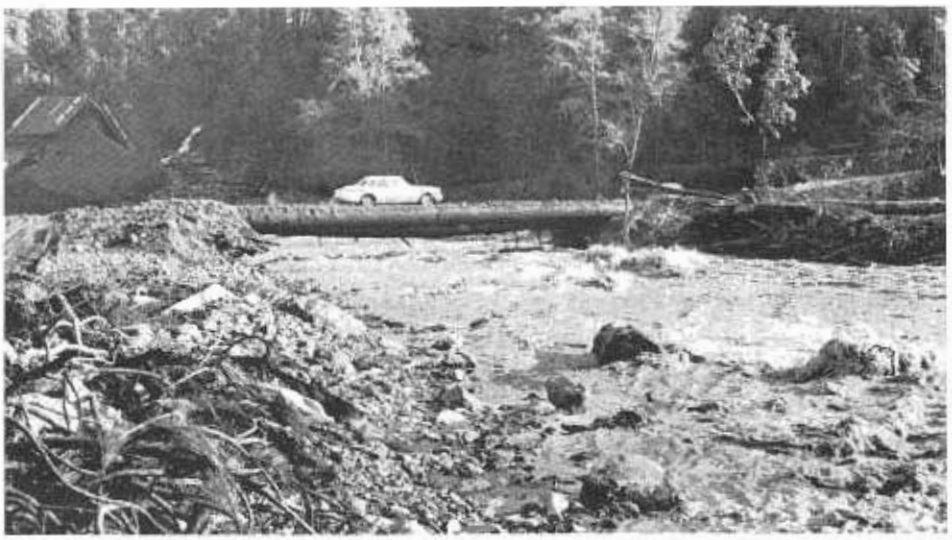
In the initial phase of reconstruction of transport, the same factors that hampered other agencies hampered the highway employees. With the breakdown of vehicular travel, inspection trips that previously took hours suddenly took days. Mud covered the roads, in the form of slides and slumps from rain-softened slopes and knee-deep silt left by receding waters.

While the State Highway vehicles had a well-organized radio system, it does not always function well in the mountainous terrain. Also, many telephone lines had been destroyed. It took a few days to get complete information on which to base decisions, particularly since most early efforts were devoted to opening emergency routes where possible, evacuating trapped motorists, bringing out the sick and injured, and trying to move vital supplies into isolated communities.

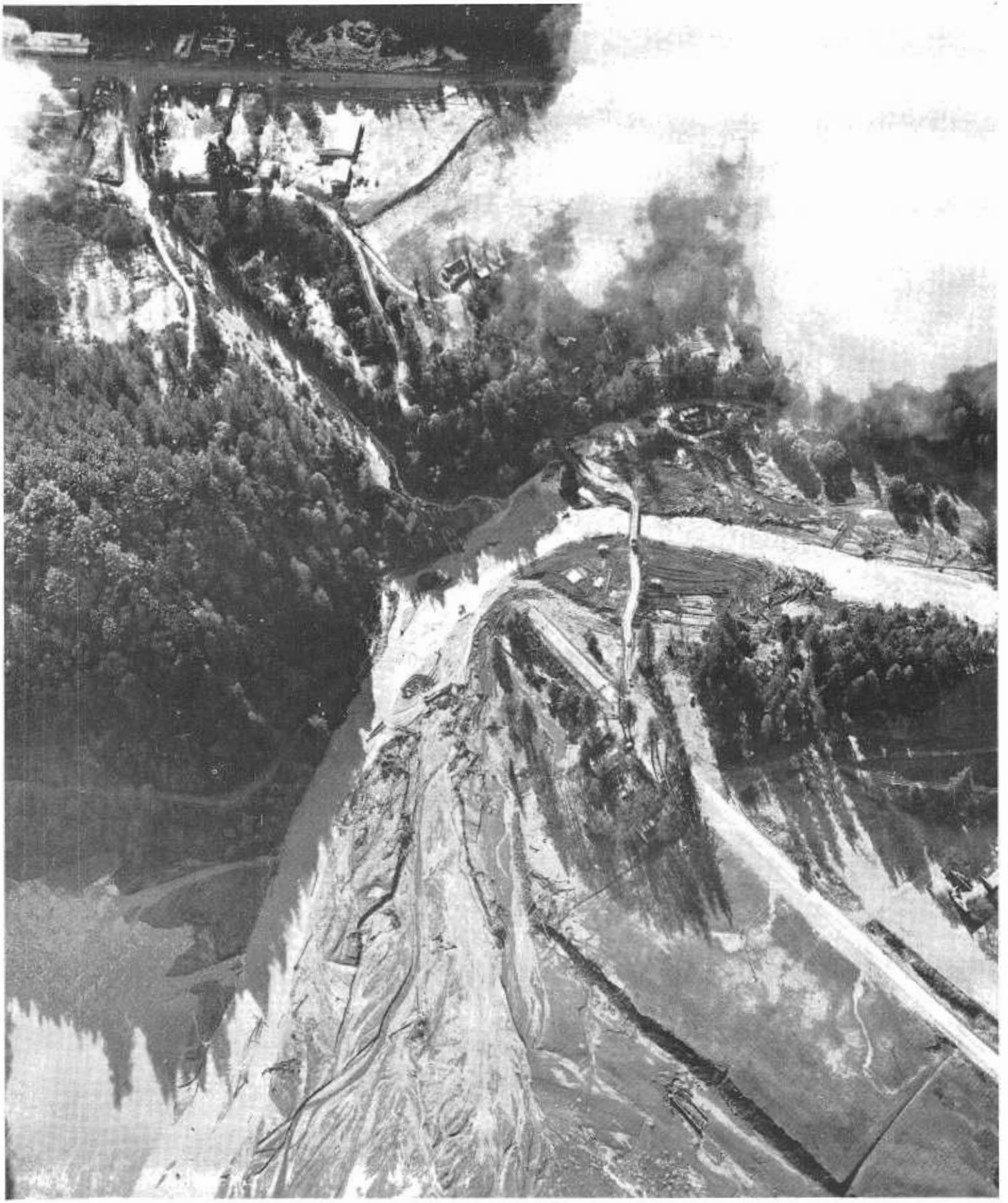
As more and more aircraft moved in, they took over these emergency transport functions. In many cases, ground transport was literally impossible, no matter how geat the effort; and had it not been for the prompt arrival of the aircraft, particularly the helicopters, there would have been much greater privation and suffering.

Helicopters and light aircraft were chartered by the Division of Highways in a number of instances to ferry in small groups of employees with the necessary authority to organize emergency contracts with whatever local equipment was available. Because this was logging country, there usually was enough.

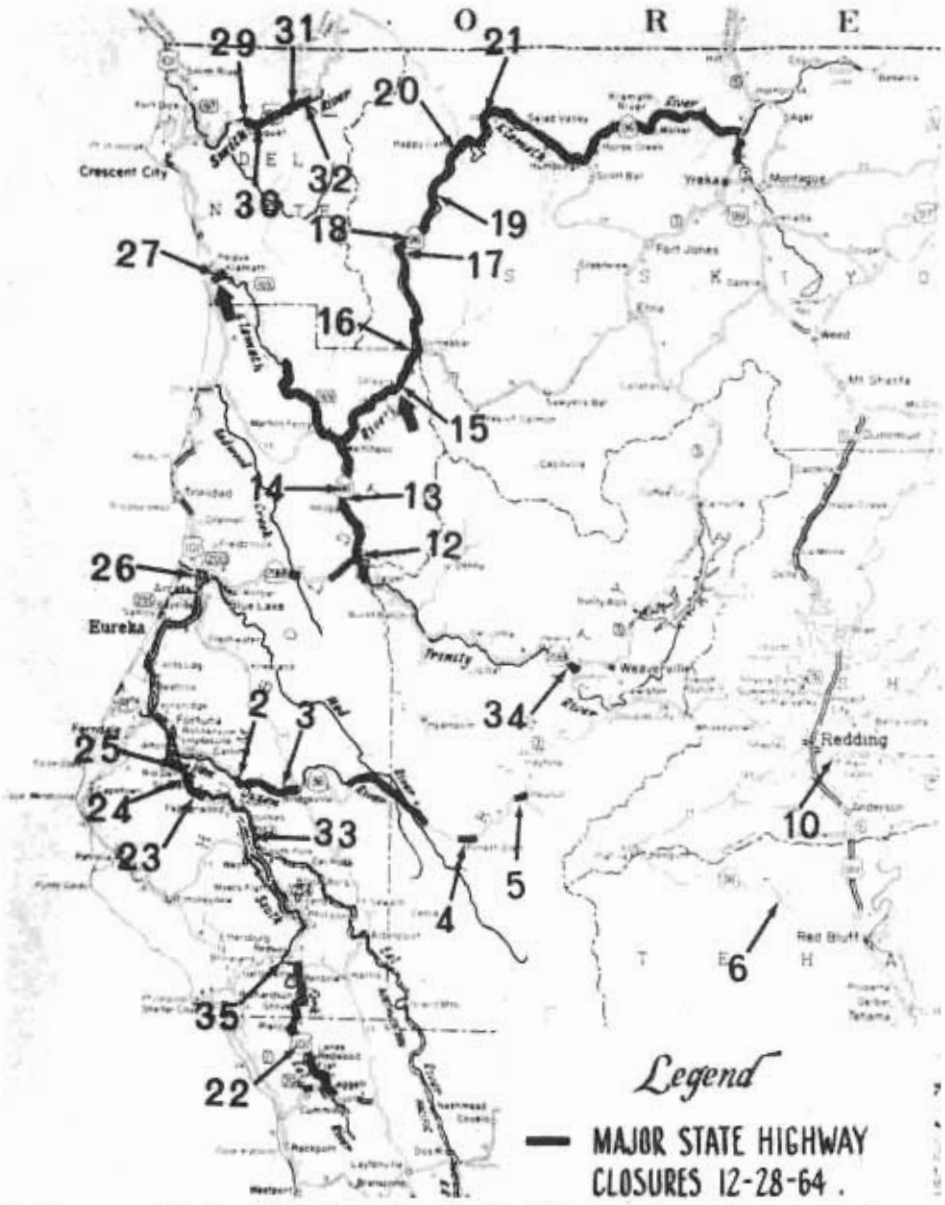
When practicable, these "guerrillas" had radios with them for communications, but these did not always work. One engineer was dropped in at the town of Ti-Bar, far up the Klamath, and then seemed to disappear. A few days later a low-flying aircraft reported considerable truck and bulldozer activity on the roads in the vicinity, so it was assumed he was on the job.



The log emergency bridge at Willow Creek on January 7, 1965. At upper left is collapsed bridge. Photo on opposite page made same day gives aerial view of this area.



View from air of break at Willow Creek Bridge on State Route 96, emergency log bridge and collapsed bridge in center. Trinity River at lower left, town of Willow Creek and Route 299 top of picture.



Situation map, northwestern California, on December 28, 1964. Heavy lines indicate sections of severe damage. Note that all of Routes 96 and 169 are severely damaged. Numbers indicate huge slides or bridge destruction. No. 34 marks bridge destruction at Canyon Creek on Route 299, No. 2 to 6 inclusive, serious bridge or highway destruction on Sign Route 36. (See page 18.)

BELOW: Workers from various agencies clearing highway on Christmas Day. This is State Route 36 at Alton, near its western terminus. (Photo courtesy Eureka Newspapers, Inc.)

By December 24th, teams from Eureka and Redding were out on foot surveying many of the damaged sections, and reporting in by radio or telephone, whichever was most readily available. It was data from these reports added to those coming in from the maintenance stations, that began to fill in the picture of the damage so that a plan of action could be decided upon. On Christmas Day reports were in on most of the routes, and the picture was bleak.

Obstacles on the Redwood Highway to the south included damage to two major bridges which made them unusable without substantial repairs, and great sections of highway washed out and slipped out farther up the Eel River, which meant weeks of laborous reconstruction. To the north the 440-foot gap in the Klamath River Bridge effectively stopped traffic, for the stream was too deep and strong for any quick, temporary bridging.

At Willow Creek, where State Route 96 joins Route 299, a bridge spanning the creek was completely destroyed, and Route 96 beyond this point was impassable at dozens of places. In addition, a number of bridges over the Klamath River were gone. Included was the state's suspension bridge at Orleans, the county's large deck truss bridge at Martin's Ferry, the Somesbar Bridge and the Forest Service suspension bridge at Ishi Pishi, near Somesbar. At best a winding, two-lane road, Route 96 had to be eliminated as an outlet possibility. For the same reasons Sign Route 36 was also eliminated.

On Route 299 there was extensive damage east of Eureka in Willow Creek canyon; six miles virtually washed away, isolating the town from the west. There was a bridge out west of Weaverville, at Canyon Creek, and massive washouts at Grey and Pony Creeks. There were several large slides as well, but compared to the Redwood Highway, the possibilities of reconstruction were much better.

It was thus apparent to the District 1 staff in Eureka that the best hope of reestablishing communications from that city to the rest of the state was via Route 299 east from Arcata

Family with sick child being evacuated by light helicopter for treatment at Eureka.

Operations center at Rohnerville Airport during the first days of operations when many rescue missions were flown.

to Redding. Since District 2 headquarters was in Redding, substantial help from that end could be depended on. The decision was made to concentrate the greatest effort on this route, with crews working on both ends, and using further emergency contracts within the stretch where possible. At the same time, efforts were continuing to organize emergency contracts on other routes, particularly the Redwood Highway, as this was a more direct route to the San Francisco Bay area.

Although Route 299 seemed the best choice for early results, this by no means meant it was going to be easy. From the Eureka end, District 1 crews struggling to replace the road base fought heartbreaking conditions. Several times big sections of the wet fill slid away into the stream, and on other occasions heavy rains caused the stream to rise and wash away the fill footings.

From the Redding end, District 2 crews struck a series of major obstacles. Each of these had to be tackled in sequence. An account of these operations gives an understanding of what was entailed in reopening the roads in these northwest mountain counties.

The first major obstacle was the 200-foot gap left by the washed-out five-span bridge over Canyon Creek at Junction City, still nearly 50 miles from the town of Willow Creek. The only possible detour, a county road and bridge upstream, was also completely destroyed. On December 24, material for a 170-foot Bailey bridge was ordered shipped to Junction City to replace the damaged bridge.

On the 25th it was decided the road could be opened more quickly by using the county road as a detour and on the morning of the 26th two tractors, one with blade and the other a blade plus ripper, were at the site ready to go to work. A drill crew of state workers arrived that morning also, and, with the tractors and drillers working as a team, by the next morning had blasted a bulldozer trail across nearby bluffs to give access to the abutments of the washed-out county bridge.

That same day two 61-foot steel beams and other necessary material for the bridge were moved in, and by 8 o'clock the next evening a one-lane bridge was ready to handle emergency traffic. The equipment was then used to widen and improve the detour road.

Although the next 30 miles toward Willow Creek had several large slides, much debris, and one large washout, it was traversable, with caution. The crews then came to a point

Breeches buoy rigged at Willow Creek Bridge to carry people across during first days of recovery after flood. Note debris and silt left by receding stream. (Photo courtesy of Eureka Newspapers, Inc.)

Light backhoe working in snowstorm, clearing drain on Route 299.

ABOVE: Portable drill rig in operation on Route 299 making holes for charges to blast cliff away to widen road. BELOW: Tractor and blade clearing debris from streambed to increase runoff.

Young highway engineers from Eureka standing by at airport as helicopter pilot loads extra gasoline for flight into Somesbar far up Klamath River. Many small groups such as this were sent by air or on foot to organize emergency road repair contracts in isolated areas.

Boulder which slid down mountainside onto Route 299 must be broken up by blasting before removal.

just east of Grey Creek where another major obstacle, actually a double one, was encountered. Here, where the road travels a ledge along almost perpendicular cliffs several hundred feet above the Trinity River, a huge rock slide had completely covered the road, and the boulders were still dropping from the high cliffs above.

An emergency contract with equipment from a local lumber company was organized, and clearing operations started. These were hampered by the rocks which showered down unexpectedly from time to time.

Five hundred feet west of this slide, drainage had clogged, and Grey Creek had cut a gap 180 feet wide and 170 feet deep across the road. Upstream a slide of millions of yards of earth precluded any chance of constructing a detour road around the opening. When the highway crews arrived, local residents had strung a rope across the ravine which enabled foot traffic to go hand over hand along the rope, wading the creek en route.

The Bailey bridge components ordered for Canyon Creek had arrived in Weaverville on the 28th on five truck and trailer units, and it was decided to use this bridge at the Grey Creek gap. Because the long units could not negotiate the sharp turns on the Canyon Creek detour, the material was reloaded onto three-axle dump trucks. This division split the bridge into 25 loads instead of 5, but by the 30th all the parts were at the site.

The Bailey was not long enough to cross the entire gap, so it was necessary to lower the approaches on either side to reduce the span. A crew had managed to build a dozer trail across a bad gap west of Pony Creek the day before, so that there were tractors available at both sides working as the bridge material was brought up.

On the night of the 30th work on excavating and leveling both approaches was finished, and at 10 a.m. on the 31st construction of the Bailey bridge began. By this time, it had been decided to first complete only a double-girder span adequate for vehicles up to 10 tons so that critically ill persons could be evacuated, with the third girder added later. This saved 36 hours, and the first vehicle crossed at 7 p.m. on January 2.

Small slide such as this on precipitous section of Route 299 can be handled by front-end loader and few trucks. This material is good for subbase and will be used for fill.

A 170-foot span across the gap had been constructed in 57 hours, and the road was open as far as Willow Creek. In the next three days an additional girder was added, increasing the capacity of the bridge to a normal 45 tons and a cautionary 60 tons.

During the entire operation the crews worked around the clock, stopping to eat and sleep when they finally were compelled to, then returning to the job. From December 28 to January 3 it rained and snowed continuously—sometimes as much as 10 inches of snow overnight. Drinking water had to be boiled, and there was no housing, although one lodge owner agreed to open up and provide meals and sleeping room. There was no electricity, and candles and kerosene lamps were necessary. A big kettle of hot soup or stew was brought to the jobs for the evening and midnight

In first days of opening emergency route, assistance from tracked tractors was necessary in places.

ABOVE: Convoy of evacuees working its way around detour on Route 299 at Junction City on December 28, 1964, over one-way bulldozer road. BELOW: Westbound convoy on Route 299 January 7, 1965, at Pony Creek. Note logs used as guardrails and delineators.

meals, and six banks of floodlights powered by portable generators provided illumination.

On the western end the District 1 crews also had been busy, although fighting the same kinds of conditions. By the 2nd of January emergency traffic could get through to Redding from Willow Creek. On the 5th a convoy system of four-wheel-drive, high-clearance traffic was started, but this was interrupted immediately. Snow in the mountains changed to rain, and the Trinity River rose six feet. Pony Creek, just west of the Bailey bridge at Grey Creek, washed out the log bridge and temporary fill there, cutting a gully 100 feet deep and 60 feet across. By 9 a.m. crews were at work on the gap, cutting trees and refilling the road, and 12 hours later trucks were moving across a newly constructed log bridge, although it was only nine feet wide over a 100-foot drop. The next day it was improved to a "good" one-way span.

The road still was open only for emergency traffic in the strictest sense —essentially four-wheel-drive vehicles or powerful units which could negotiate the deep mud and slippery grades on the hastily built road. About the same time a similar road was opened by dint of log bridges and bulldozer trails along Route 96 to the Hoopa Valley.

From this point on, with occasional minor setbacks, progress was continuous. Although there were one or two heavy rains, they did not persist, and the weather, as though repentant for its December violence, remained better than normal.

The Redwood Creek Bridge, on Route 299 west of Berry Summit, was a problem because of slide damage! A mud slide oozing down the side of the canyon actually pushed the abutment out of line, requiring recasting of broken concrete and placement of heavy rock to stop the slide. During this period the bridge damage kept load limits down to 10 tons on Route 299.

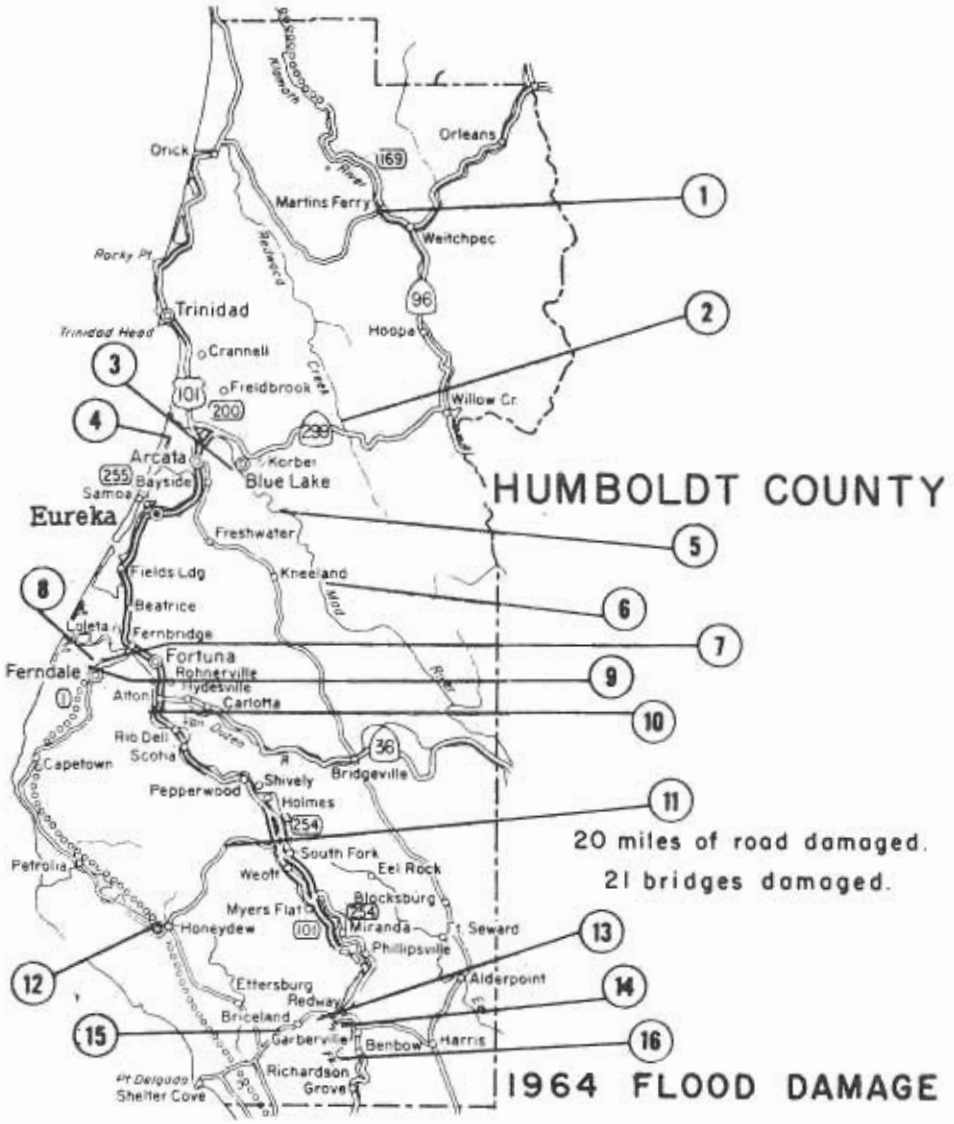
By the 15th of January the road east of Willow Creek was opened to all commercial vehicles. In daylight hours they were restricted to passage at 10 a.m., 12 noon, and 2:30 p.m. There were no restrictions at night.

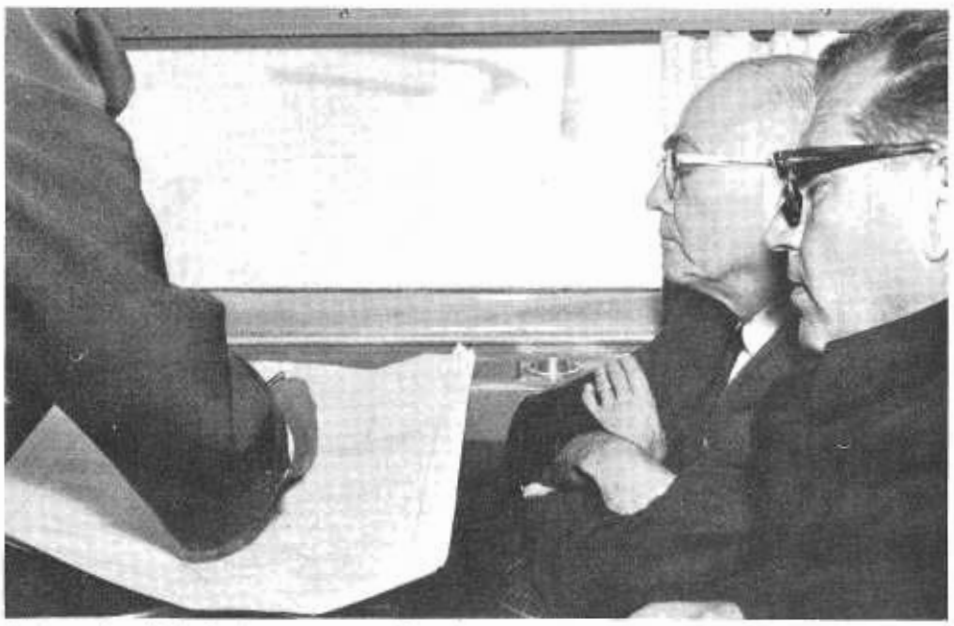
On January 19th the daily convoys were doubled, leaving Berry Summit at 9:30 and 2:30; westbound from Willow Creek at 10:30 and 3:30. Passenger cars and legal loads up to 40-foot maximum length vehicle were permitted. Route 299 east of Willow Creek was opened to all traffic, subject to normal construction delay.

In the meantime the road into Hoopa Valley had been improved to take any legal load and traffic was being allowed on the same three-times-daily schedule with no restrictions at night. The road was not recommended for passenger cars.

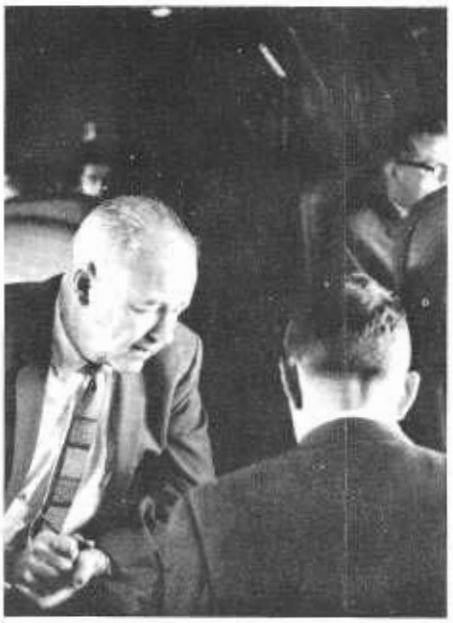
By the 24th of January Route 299 was taking all legal traffic in the scheduled convoys, and on February 2 the schedule was dropped, traffic being convoyed each way through construction areas 24 hours a day as necessary. The traffic count was up to around 250 vehicles daily each way by this time. On weekends there were no restrictions.

By early February both Route 299 and U.S. 101 were open to all traffic, but with convoy traffic still in effect up the Smith River Canyon on Route 199. This route was opened completely on February 14, leaving the Klamath Ferry the only interruption



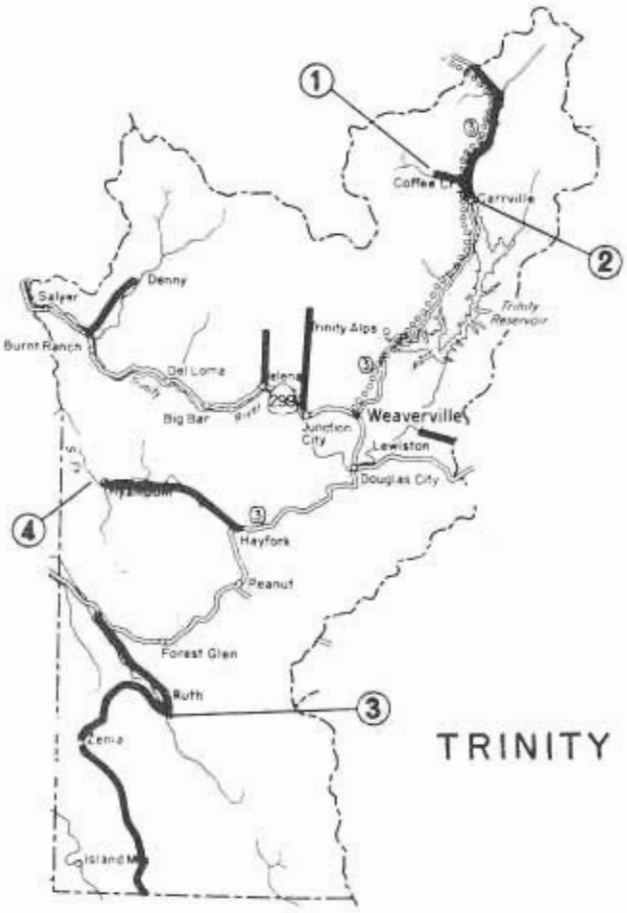


On inspection flight in January to Humboldt County in Governor's plane, Highway Commissioners Abraham Kofman (left) and William S. Whitehurst are briefed on the highway situation by State Maintenance Engineer Edward L. Tinney.



Lyman R. Gillis, assistant state highway engineer for Operations, en route to flood area in Governor's plane, is interviewed by Associated Press Reporter Robert Wood.

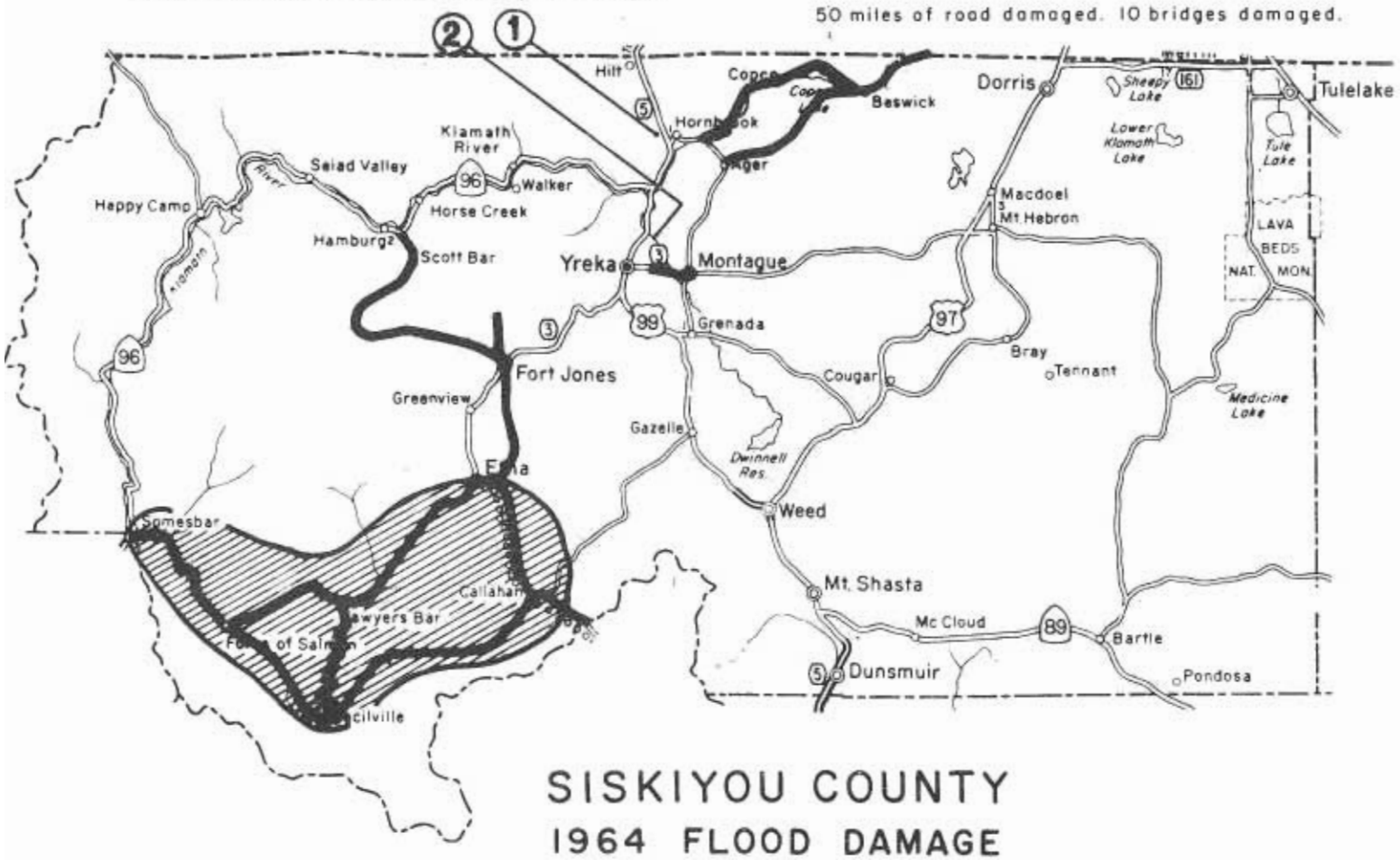
MENDOCINO COUNTY
1964 FLOOD DAMAGE



TRINITY COUNTY
1964 FLOOD DAMAGE

10 miles of road damaged. 14 bridges damaged

50 miles of road damaged. 10 bridges damaged.



SISKIYOU COUNTY
1964 FLOOD DAMAGE

60 miles of road damaged. 20 bridges damaged.

in any of the main routes. The ferry was retired when repairs were completed on the Klamath River Bridge and its was reopened to traffic on March 14. Log bridges and use of a portion of a logging road had also made Sign Route 36 usable. Sign Route 96 still remained closed because of bridge destruction.

This was partly remedied by replacement of the washed out truss of the Somesbar Bridge with plate girders and reopening of the bridge on March 4. A low-level, temporary bridge was opened April 1 at Orleans, and then Route 96 could be traversed its entire length.

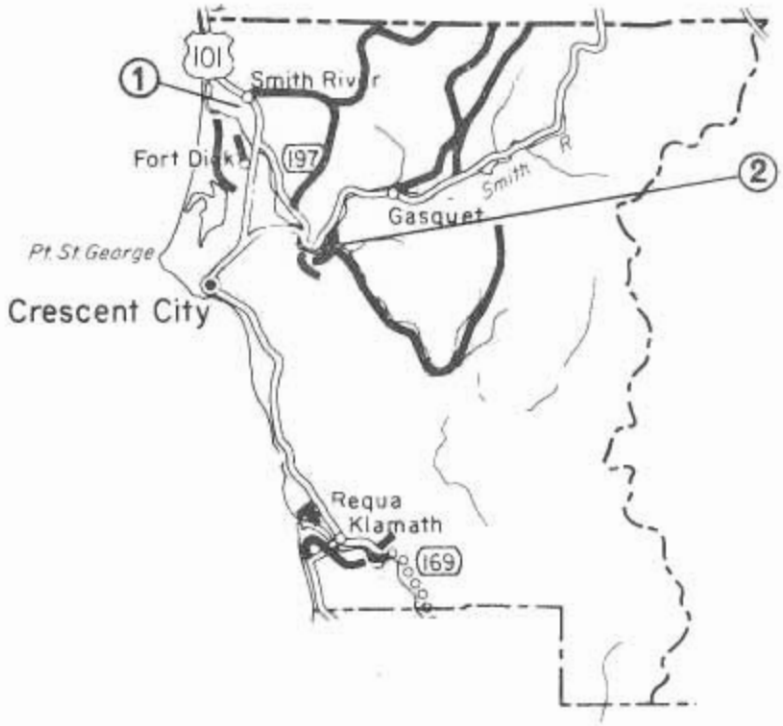
To achieve these repairs, nearly 50 emergency contracts were let, and an additional 180 personnel were hired on the District 1 staff. Also, more than 500 individual service contracts were let to put men and equipment to work on an hourly basis. Since District 1 suffered much the greater part of the damage, this was by far the highest number of emergency contracts in any district—the few negotiated by District 2 were mainly in connection with reopening Route 299, in their assistance to District 1.

Bids were opened on construction of a new Redwood Creek bridge on Route 299 on new alignment March 10 and low bid was $568,648.

This is to be a 674-foot-long steel span 110 feet above the creek bed on

In foreground, left to right, Director of Public Works John Erreca and Highway Commissioners Abraham Kofman, Joseph C. Houghteling, and William S. Whitehurst look at gap in Redwood Highway north of Rio Dell.

BELOW: Four-span log bridge, built as temporary replacement for destroyed bridge in foreground, is carrying legal loads on State Route 36 just west of Bridgeville. Piers are log cribs filled with rock and gravel. Sections are held together with steel cable.



DEL NORTE COUNTY
1964 FLOOD DAMAGE

25 miles of road damaged. 5 bridges damaged.

ABOVE: First stages in construction of temporary crossing over Klamath River to replace washed-out Orleans suspension bridge. BELOW: Construction stage on replacement bridge at Somesbar. With abutments and pier intact, girders were quickly positioned to replace truss which stream carried away.

BELOW: Aerial photo of site of Highway 49 bridge across American River near Auburn. When structure, site of which is marked by dotted line, was carried away by wall of water resulting from Hell Hole Dam failure, detour road was built and emergency traffic was routed across old railroad bridge at upper right. New bridge was opened to traffic May 1, 1965.

four concrete piers. Attention was given in the design to have the bridge complement the natural beauty of its setting. A special rough-textured finish will be applied to the concrete surface of the tall piers.

On March 24 the Highway Commission allocated $1,000,000 to step up construction of the highway relocation on both sides of the bridge. On March 29 bids were advertised for this work.

On March 24 bids were opened for construction of a new bridge on State Route 96 at Willow Creek, low bid $396,693.

The cost? State repairs when recalculated firmly after all information was in, were expected to be $35,000,000, somewhat higher than first estimates. County repairs, however, were somewhat less, slightly below $23,000,000 rather than the $28,000,000 first estimated.

On March 31 both houses of the Legislature had passed and sent to the Governor for signature the Collier Bill, effective April 1, which provides for a 1-cent additional gasoline tax for nine months to collect the amount needed to defray the cost of repairs to flood damaged roads. The Governor signed it the same day. This will make the cost of the road damage about $5 for the average car owner in California.

Reconstructed Sign Route 36 in Van Duzen River Canyon. Height and extent of raw slopes indicate amount of undercutting by stream in flood.

ABOVE: Rebuilt section of Route 299 near Willow Creek, carrying normal traffic in March.

BELOW: Temporary log bridge on pilings on Sign Route 36 east of Carlotta, now carrying legal traffic loads. This is near Grizzly Creek Redwoods State Park.

At right DW-21 loaded with gravel is proceeding to fill point, and at left tractor pushes another unit as it scrapes material from river bar, rebuilding road after Christmas 1964 flood. Scene is along lower Eel River, and some of material being replaced as road base probably previous to flood was road base farther upstream!

The Redwood Highway

Rebuilding After the 1964 Flood

By JOHN ROBINSON, Information Officer

In late December 1964, after the floods subsided, the Redwood Highway north of Laytonville was no longer a highway—it was string of short pieces of local road, with no connections to the outside world. On the southern portion gigantic slides and washouts at Cummings, Leggett, Piercy and Richardson Grove effectively stopped all traffic, and farther north there were broken bridges at Scotia, Rio Dell and Robinson's Ferry. Almost all of this havoc was the work of the Eel River and its tributaries.

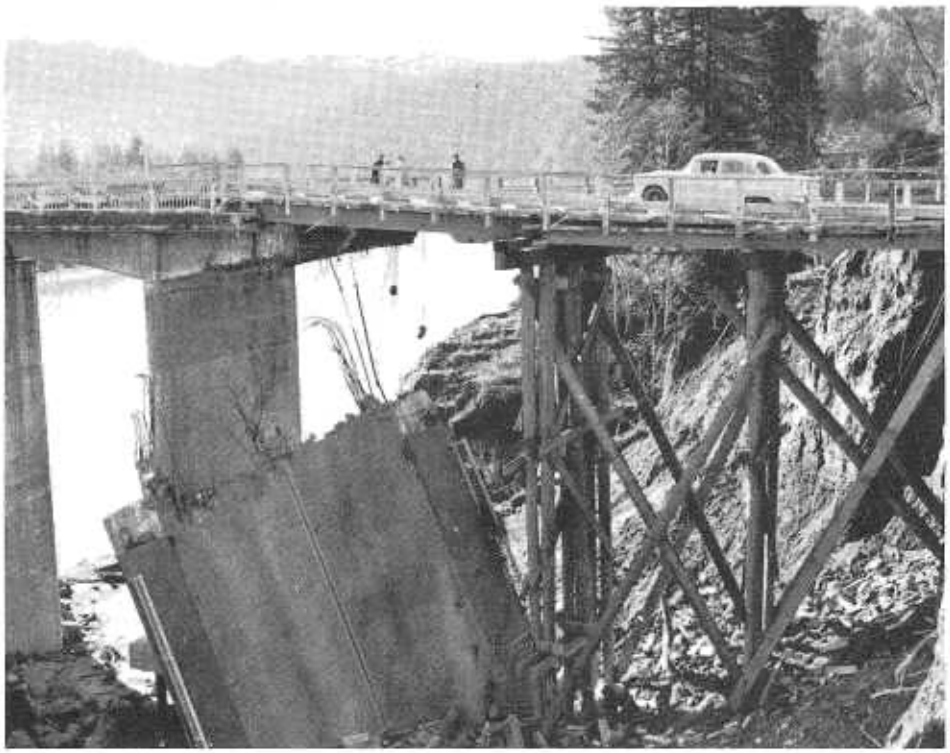
Northward from Eureka there were further breaks at the washed-out Klamath River Bridge on US 101 and in the total destruction of whole sections of US 199, both bridges and roadway, in the Smith River Canyon. Between these major breaks, particularly south of Eureka, there were dozens of smaller places where slides, washouts, slumps, fallen trees, and debris on the road created traffic interruptions or hazards.

It was the job of the highway employees of District 1 in Eureka to repair these places, both major and small, so that motorists once again could follow the long ribbon of the Redwood Highway true and uninterrupted the 250-odd miles from Laytonville to the Oregon state line. Equally important was the need for moving to the San Francisco Bay area

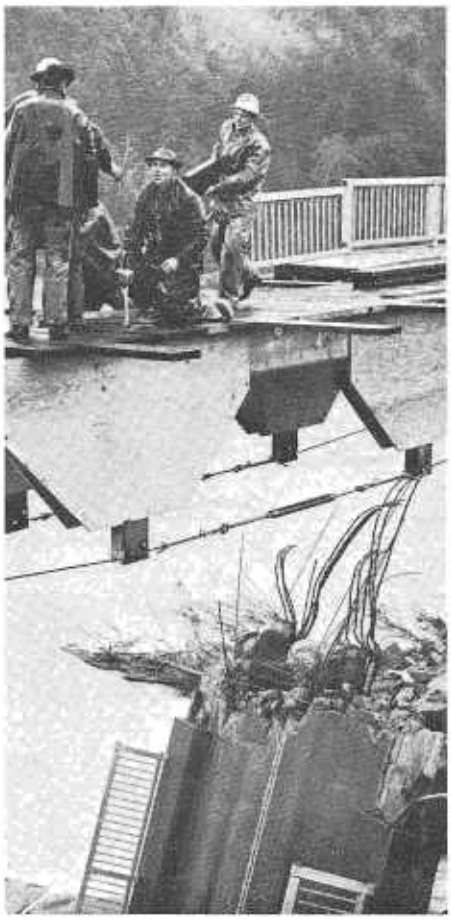
population centers the products of the northwest lumber industry. It promised to be a herculean task, particularly since the major effort first had to include the concurrent reopening of a "lifeline" route to Redding over US 299, which also, along its western sections, had suffered comparably along the Trinity River and in Willow Creek Canyon.

Although destruction was widespread on state and county roads and the area's only railroad, there were several assets. One was the pool of trained construction workers and equipment which existed because the northwestern industry was predominantly logging and lumber products. Lumber companies build their own roads, and hire many catskinners, truckdrivers, and other heavy equipment operators.

Another asset was the well-experienced group of personnel in the Eureka headquarters, many of whom had gone through the 1955 flood, and



ABOVE: Temporary one-way bridge of wooden piles, beams, and planks built across break at north end of Scotia-Rio Dell Bridge carried legal loads for several months. BELOW LEFT: Footbridge was first span over gap and served many needs for two weeks. Requirements of sign were strictly enforced by civil defense officials. BELOW RIGHT: The footbridge, a simple suspension design, being built by Pacific Lumber Co. and P.G. & E. employees. (Both lower pictures Eureka Newspapers, Inc.)



Five photos this page show steps in development of Blue Slide Road detour on Redwood Highway. Upper left is view of road on January 4 after flood; top is traffic moving in one-way convoys above cliffs before lower section repaired; directly above is filling operation on same section as shown in upper left. Directly below, about three weeks later, lumber trucks moving over this section; and bottom, same detour road where it crosses the floodplain, photographed March 17 after asphalt paving laid.

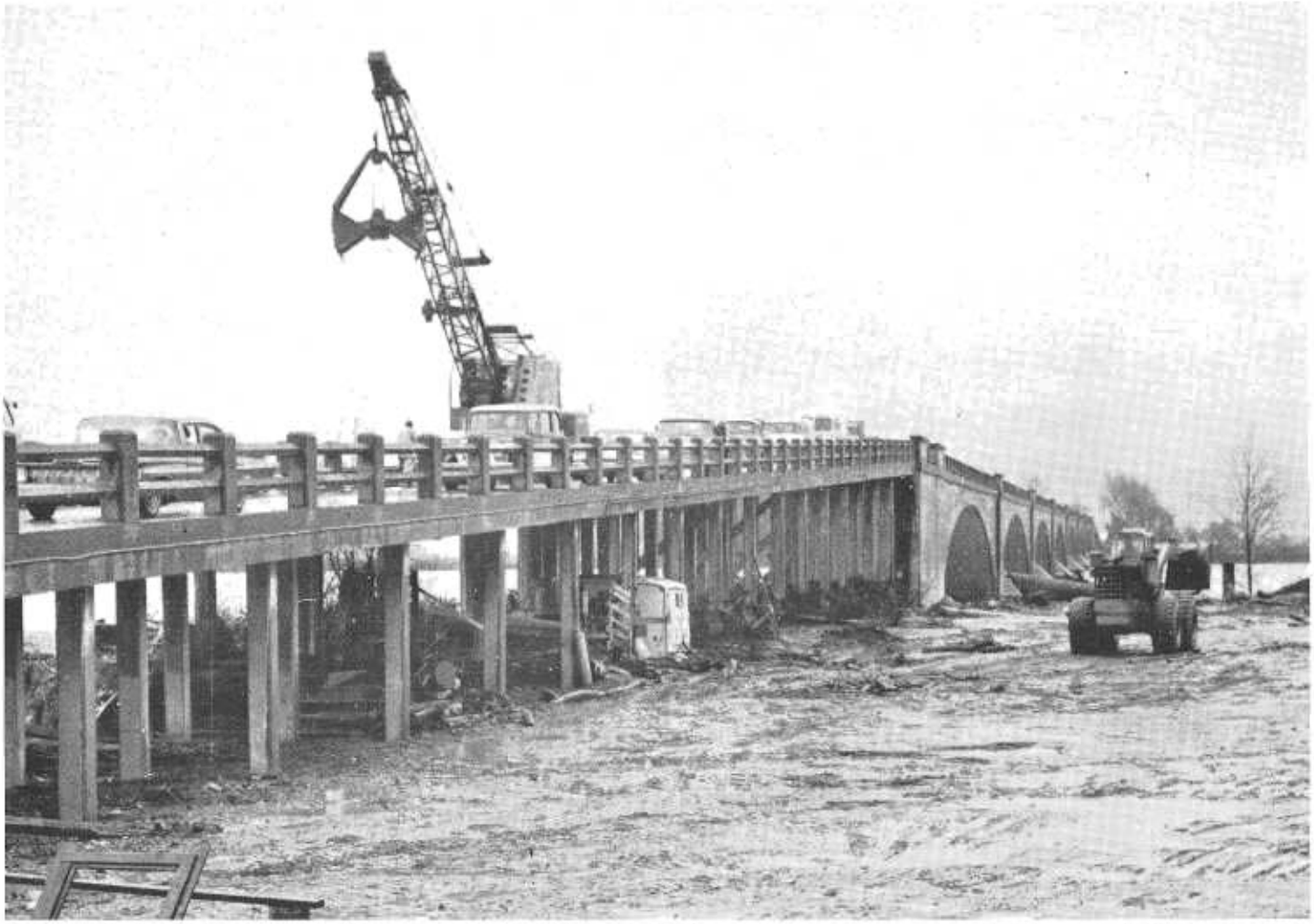
most of whom had learned to take rain and slides as part of their winter lot.

In the realm of luck was the presence of two large contractors with their staff and equipment. Best luck of all was the way the weather cooperated, once it broke in the early part of January.

In these first few days of reconstruction, everything was done with a prayer there would be no more heavy rain. The first stream crossings, low-level log bridges, were vulnerable to any rise. Substantial increases in stream velocities could sweep away in a few hours weeks of work building up road base. The weather held abnormally good, and by March much of the work had been consolidated, but was by no means out of danger.

A very valuable asset was the old concrete arch crossing at Fernbridge. Well out on the floodplain, where the force of the Eel is spent, it had stood through more than 50 rainy winters. When the waters went down, it was the only usable crossing giving access to the south.

Conceivably, the District 1 engineers reasoned, if a route could be opened from the other shore of Fernbridge over county roads to Rio Dell, and if a temporary repair could be made on the Rio Dell-Scotia Bridge, and if the massive slides and washouts could be repaired, a road of sorts



Equipment clearing debris from famous old concrete span at Fernbridge. Panel delivery under approach ramp was washed there, not parked there. This bridge was only way to get across the Eel to the south from Eureka after flood. View is from north side.

through to the south could be opened. The major piece in this connection would be a county route called the "Blue Side Road" which connected Ferndale to Rio Dell along the south side of the Eel. Unfortunately at one place a stream normally a tiny rivulet had torn a great chasm across this road, and in another place where it ran close to the shoreline, the Eel had completely removed nearly a mile, fill and all.

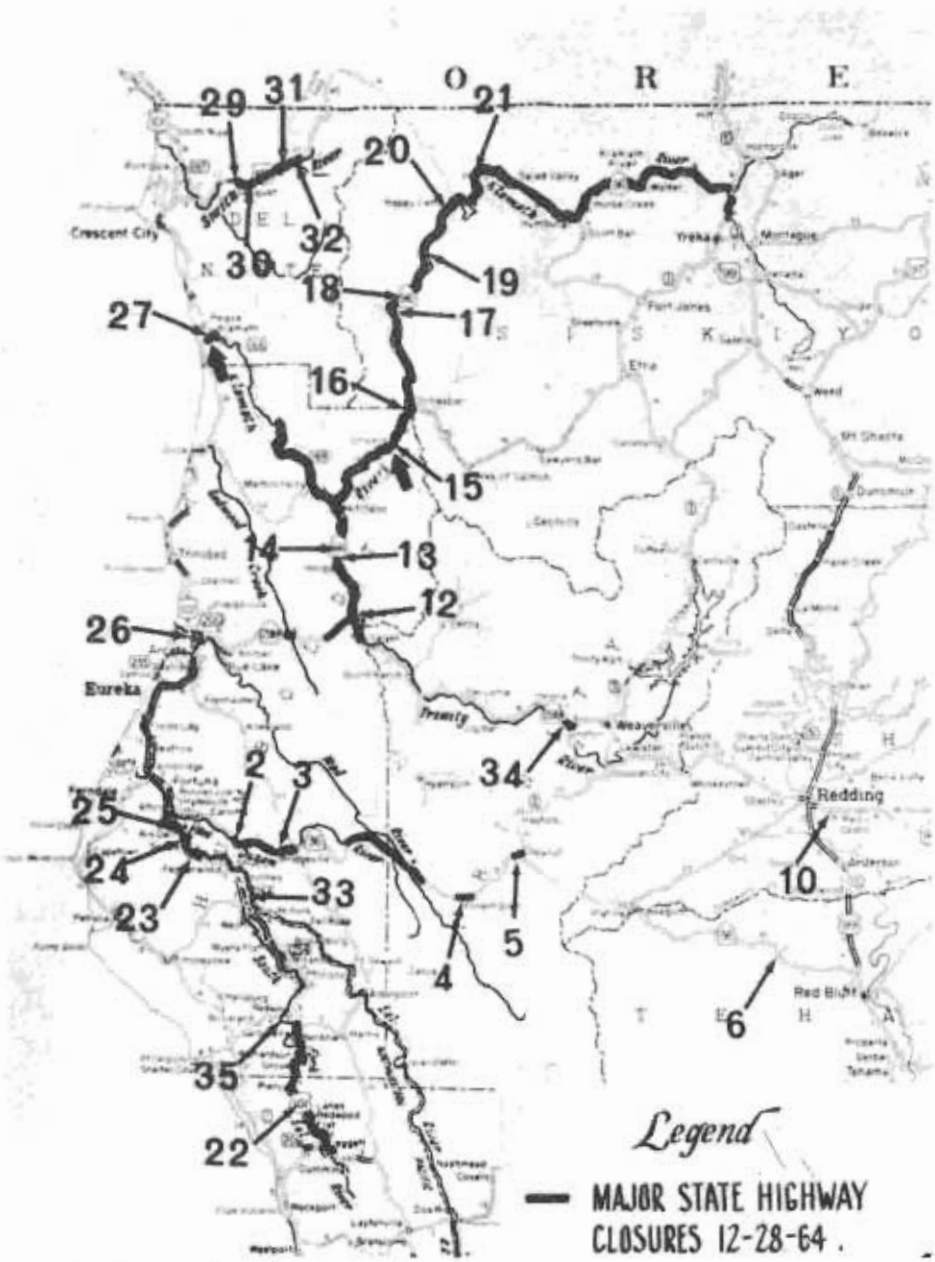
In the first few days of recovery after the disaster, while the engineers were seeking means to once again connect their bits and pieces of shattered highway, movement of people and vital supplies was exclusively by air. In Rio Dell, Scotia, and on Dyerville Bridge the paving was cleared and used for a landing strip for light planes, and something approaching a regular air service was developed. Air Force, Navy, Army and Coast Guard aircraft converged on Eureka. Although operations were marred by two helicopter crashes involving a number of fatalities, there is no doubt the death toll from the floods would have been much greater without the use of modern aircraft.

Shortly after Christmas Pacific Lumber and utility company employees built a small footbridge across the gap in the Rio Dell-Scotia Bridge. Vital materials were hand-carried across this gap, and when roads to the bridge were opened, even gasoline was transferred from one tanker to another with a long hose.

By December 27 the 49th Infantry of the California National Guard had established an emergency route from south of Cummings over the old highway up the Bell Springs grade and along the Mail Ridge route thence down to Garberville. This was the historic route established in the late 1800's and used until superseded by the present Redwood Highway. (See *California Highways and Public Works*, May–June and July–August 1964.)

Much of this route has never been improved. It is narrow, twisting, and climbs to the ridge tops over grades impossible for modern passenger cars under winter conditions. In places it travels along the edge of deep chasms, and large sections are unpaved. After the first few trips the soggy road surface became hub-deep mud. During the heavy snows around New Year's, the drifts were so deep nothing could negotiate the road, and all traffic was forced to stop.

Nevertheless, during the 17 days of operation, the guard brought in 60 tons of vital supplies to the people of



Highway situation map for northwestern California on December 28, 1964. Heavy black lines mark stretches of worst damage. Worst "side water" damage—gulleys, slipouts, slides, and washouts—on Redwood Highway was in vicinity of Nos. 35 and 22 and for several miles to the south of these points. Nos. 23, 24, and 25 were the three bridges damaged in the Scotia-Rio Dell area, No. 26 proved a minor repair problem at a bridge abutment. No. 27 indicates the washed-out Klamath River Bridge, and Nos. 29, 30, 31, and 32 mark the bad washouts and bridge destruction in the Smith River Canyon.

the Garberville area, and brought out dozens of cars of stranded motorists. In places these had to be strung out like mountaineers with tow cables to each passenger car, a military vehicle before and behind it.

On December 30 a contract was let for a temporary, one-lane span across the gap in the Scotia-Rio Dell Bridge and this was completed on January 13. In the meantime, work had been going ahead on the Blue Slide Road.

At first, traffic was forced to use an ancient, slippery, one-lane route which traversed the edge of cliffs above the Eel, while the Blue Slide section along the river was being rebuilt. Working from both ends, with 16 trucks hauling fill on the south end, and several DW-21's hauling riverbed gravel on the north, the crews had replaced the road base and had it carrying traffic in less than two weeks. Since the freeway sections through the redwoods were in relatively good shape, and there were usable bridges at all the Eel crossings south of Scotia, the road was thus open from Eureka to Garberville, but controlled by civil defense checkpoints.

In the meantime, an engineering company of the Fourth Infantry Division had rolled into Crescent City from Fort Lewis, Washington, with 84 men and 41 vehicles. In the trucks were all the parts necessary to build a combat type, pontoon platform ferry. The Office of Emergency Planning had requested their help, in the hope they could do something about the gap at the Klamath River, where the deep channel and swift current precluded any possibility of a temporary bridge. Crossings were then being made by jet boat, which had only sufficient capacity to carry small amounts of supplies and personnel.

By January 8 the Army Engineers had assembled the ferry on the north bank of the river just below the devastated town of Klamath, and State Division of Highways personnel had pushed gravel landing ramps out into the river. The craft, 93 feet long and rated to carry 65 tons, was simple. A steel framework held the six pontoons together, with a steel deck on the framework. Power came from motorboats which pushed against the downstream side, using the current to help push the ferry across the stream.

Tests were made the same day, and several stranded vehicles were ferried over, much to the delight of their drivers. The next day the ferry started regular service.

At first a log boom upstream was considered to protect the craft from drifting logs, but this proved too hazardous, and a "spotter" was stationed to warn of dangerous drift coming down. A guard boat constantly stood by below the ferry lane in case anyone fell overboard.

Rated capacity of the craft was 65 tons, but this would be under combat conditions. In view of the situation, 25 tons was set as the safe load. No vehicle was permitted to cross without a proper civil defense pass issued by either the Humboldt or Del Norte County Sheriff.

Fortunately, several contractors already had big rock trucks such as this in the vicinity, and they were invaluable in replacing road base.

Grader is engaged in cleaning silt and debris off Redwood Highway four-lane section south of Fortuna.

Boom of backhoe is used as crane for lifting sections of culvert into place while repairing washout near Richardson Grove.

ABOVE: Amount of fill required to repair such slipouts was dependent upon how far down "toe" of slope lay. BELOW: Grader, front-end loader, and dump trucks work together to remove silt in Orick, several feet deep in places, as can be seen beyond highway shoulder.

Tractor tows public utilities repair truck around bad spot at slipout on Redwood Highway. This was on December 27, 1964, during first phase of recovery from flood.

Crane removes logs washed up on undamaged section of county road near Ferndale in order to use it for detour for Redwood Highway.

Front-end loader, assisted by tractors equipped with both blades and rippers, keeps stream of material flowing in trucks from "borrow" site selected to provide fill for washed-out sections.

Maintenance crew from Idlewild on US 199 in the Smith River Canyon, clearing debris from bridge which survived the storm.

Minor slide on Redwood Highway south of Cummings being cleared by front-end loader and trucks.

Although hardly more than 100 vehicles were ferried daily during the first weeks, proficiency gradually increased. On February 18 another 30 feet was added to the ferry, and the load limit was raised to the legal highway maximum. By this time the daily lift was more than 500 vehicles.

From its first trip the little ferry caught the imagination of the press, and it got wide publicity over the state. This was well deserved, for it faithfully served traffic during daylight hours for more than two months, with only a few interruptions from river level changes.

When the pile structure filling the broken gap on the Klamath Bridge was opened March 14, the ferry was retired after an estimated 5,527 trips across the turbulent stream. During its slightly more than two months of operation, it had carried nearly 30,000 vehicles.

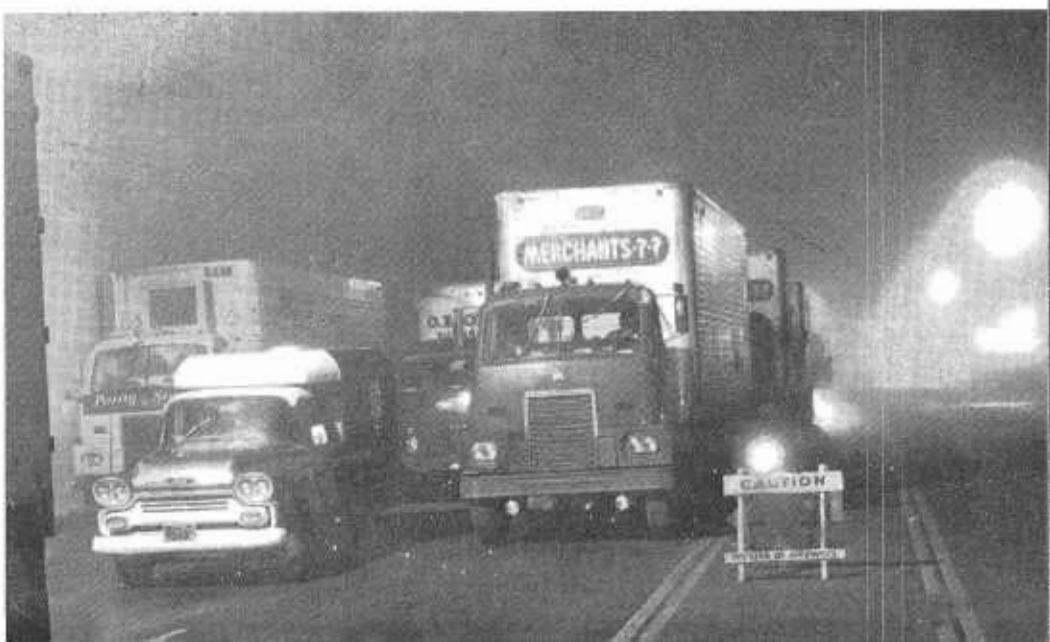
While somewhat less dramatic, the repair of the bridge was also a considerable feat. An emergency contract was let on December 28, but the contractor could do little except size up the job until he had materials, which had to come in from the San Francisco Bay area. On the 9th of January they came in on a barge, and were unloaded and carried by truck the 70 miles from Fields Landing to the south approaches. The barge next went to Crescent City and unloaded the materials for the north end, which needed to be trucked only 21 miles.

Work was started on the 11th of January, and the crossing was opened to traffic on Sunday evening, March 14, after almost exactly two months elapsed time. Since the temporary structure is on piles, with close spacing, it is vulnerable to damage by drift should the river rise. A deflector or buffer of piles was placed upstream for protection.

Meanwhile, on the upper reaches of the Eel scores of tractors and hundreds of dirt carriers were working. The sections south of Garberville began to come under control about the time the Rio Dell-Scotia Bridge was opened, and a few days later the first convoy of four-wheel-drive vehicles was brought through from the south. (The first convoy on Route 299 had come through on January 5th.)

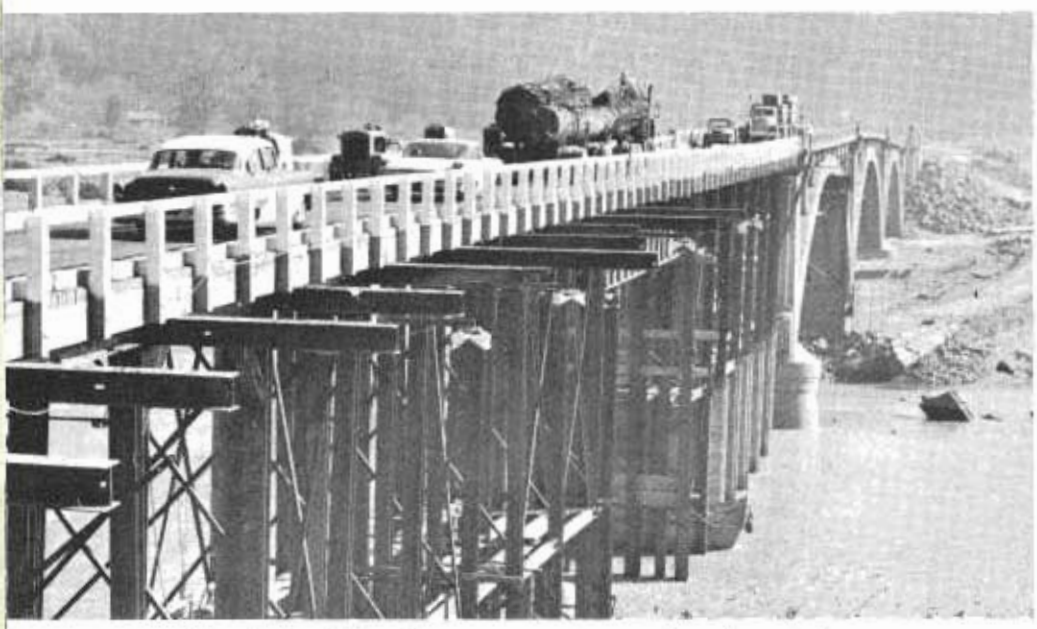
Section of Redwood Highway south of Pepperwood, along main Eel River as it appeared on January 12, 1965. Dirt ridge was used like this wherever paving was destroyed to delineate safe driving area.

ABOVE: Partly rebuilt section of Route 199 in Smith River Canyon. Rock wall was for protection of fill but river rose much too high. BELOW: First truck convoy south from Eureka area on US 101 at Garberville at 2 a.m. on morning of January 16th waiting order to proceed.



Widely publicized Sixth Army pontoon ferry crossing Klamath River; ruined bridge upper left with log spotter watching upstream. Note debris on bridge. (Eureka Newspapers, Inc., photo.) Piers in background are for new highway bridge under construction.

Red Cross girl serving schoolchildren at Klamath crossing, January 8, 1965. Army pontoon ferry in background.



Klamath River Bridge with temporary repairs, opened to traffic on March 14, 1965.

When the first convoy of 48 trucks and pickups made it south from Garberville over US 101, it got big newspaper space all over the state. Leaving Garberville January 16th at 2:30 on a chill and foggy Saturday morning, the long line of rigs, preceded by Highway Patrol and Division of Highways vehicles, skirted washouts and slipouts along 200-foot cliffs for two hours in darkness and bad visibility until it arrived safely at Laytonville at the foot of Rattlesnake Grade. The only casualty was one grocery truck which sank in soft going and ripped off one of its fuel lines. Included in the convoy were several lumber trucks and a "reefer" load of Humboldt crab meat. Due to the road condition, none of these rigs were permitted to tow trailers.

Pontoon ferry landing with load of emergency utility repair vehicles borrowed from Oregon early in January. Ferry had been operating only a few days at this time. High water and current were serious problems.

That evening a similar and much larger convoy started north from an assembly point a few miles above Laytonville, and made it through without serious difficulty. Movements could be made only at night, since reconstruction work obliterated sections of the road during daylight hours.

The daily two-way nighttime convoys were continued for some time, with crews each day repairing any damage and continuing to build up and firm the road. In less than a week legal loads were allowed, and continued to move despite heavy rain in two instances.

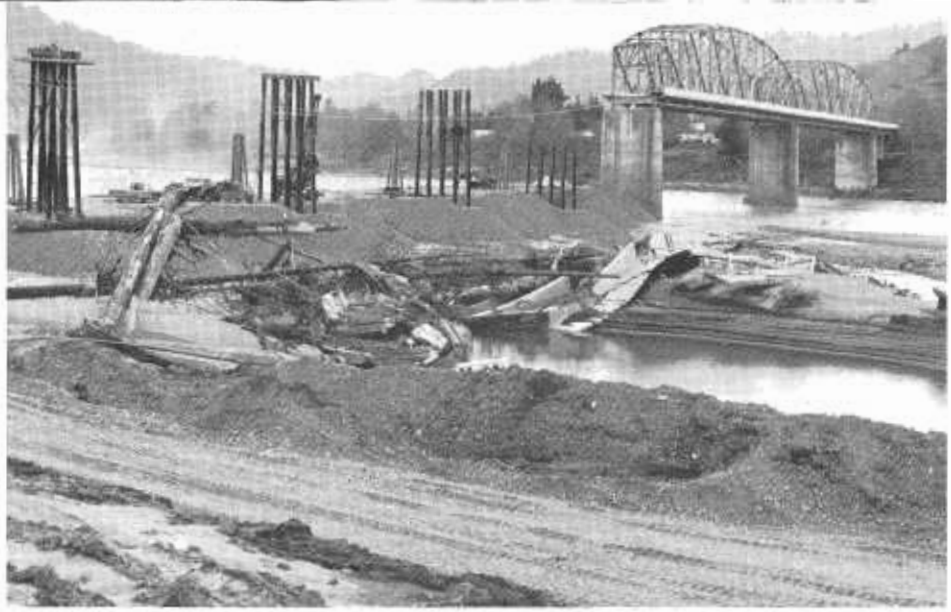
On January 20 Mr. Larry T. Marshall of U.S. Plywood in Eureka wrote Mr. Helwer:

"Today we were greatly delighted to see the first truck and trailer load of plywood roll out of here headed south to join the convoy at Garberville. It was a small beginning, but nonetheless a hopeful one and certainly good for our spirits. Tomorrow we expect to roll five fully loaded rigs. In 10 days or so we can roll nine each day and put all of our people to work."

On the 24th the southbound convoy actually was turned back at Garberville after three inches of rain fell at Rattlesnake Summit, but traffic began moving again the next day. The same day, the North Coast Timber Association announced 12 Humboldt County mills had resumed operation in the previous two weeks and 717 persons had returned to work.

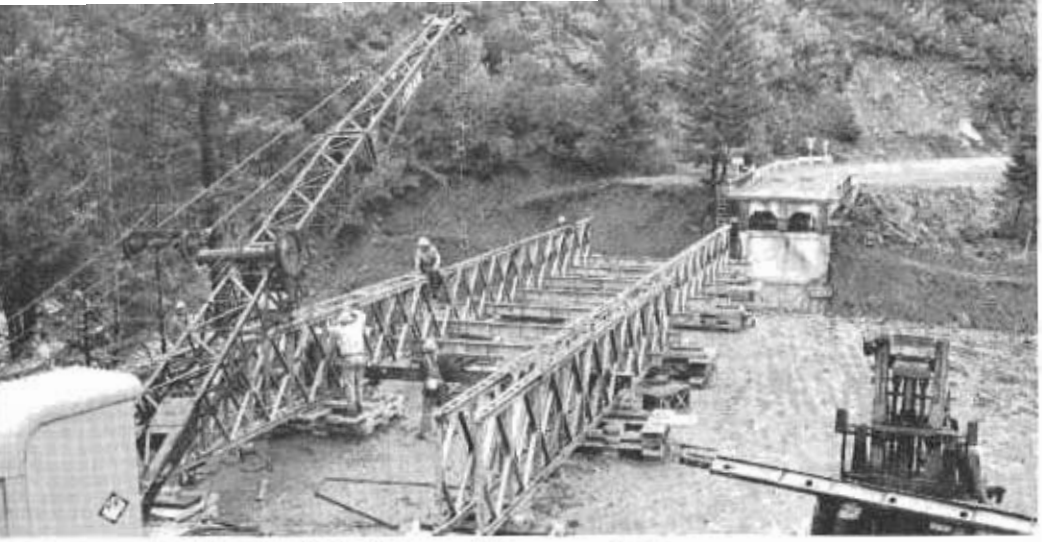
On the 26th there was a massive slide at Piercy, and all movements were held up for 24 hours until it could be cleared. By this time, passenger cars were being allowed in the convoys, and departure times at assembly points were reversed at the request of the truckers.

Two days later the convoy system on 101 south of Eureka was dropped entirely, with no restrictions on nighttime travel. On February 2 this portion of the route was opened to 24-hour traffic, subject to delays at reconstruction points, and with speed and single-vehicle restrictions on the damaged bridges at Big Dann and Cedar Creeks.



Repairs going forward on Robinson Ferry Bridge over the Eel. Crews gambled stream would not flood again this winter, and as payoff bridge will be opened to traffic in May. Wreckage of old spans lies in center foreground.

ABOVE: After first building low-level log bridge to move equipment in, contractor here, using front-end loader as crane, puts logs in place for abutment for higher level crossing. BELOW: The finished bridge, crossing Patrick's Creek, US 199.



First girders of Bailey Bridge being assembled to cross Smith River on US 199. As sections are joined they are pushed out over opening by rollers set on the little platforms. (This is bridge seen on back cover.)

There were still problems on the Blue Slide Road. The little temporary bridge at Howe Creek was rebuilt to handle two lanes and opened February 15, but trucks were still having trouble on the new fill and the slippery, steep grades just outside Rio Dell. This delayed other traffic also. On the 18th a contract for surfacing this route was awarded on a low bid of $140,220 and work started on the 19th. Until this paving was completed on March 13, truck double trailer restrictions were imposed.

Contracts for permanent repairs also have been awarded as follows:

Restoring pavement on the Redwood Highway between Rio Dell and the Mendocino county line, $93,960.

Restoring pavement on the Redwood Highway between Humboldt county line and Rattlesnake Creek, $126,720.

Permanent repairs to the Scotia-Rio Dell Bridge, $223,304.25.

Permanent repairs to the Robinson Ferry Bridge. Estimated cost $650,000 but emergency contract let January 5, 1965 on a cost-plus basis.

The contract has been let on the new Richard Fleisher Memorial Bridge at South Scotia to replace the washed-out parallel structure. This is a major bridge contract, for a four-lane bridge 1,025 feet long and with a clearance of 15 feet above the December 1964 high water. Bids were opened in Sacramento March 31, with the low bid $2,020,023. The bridge is expected to be open for traffic on December 15, 1965.

Other contracts will be let, but the road will be in good condition by the current season, with some delays at construction sites.

The other area of major damage on the Redwood Highway was the section of US 199 in the Smith River Canyon between Gasquet and Idlewild. Because of the difficulties of access, work proceeded here at a slower pace than to the south. Also, since much of the traffic on this section in winter is associated with the lumbering industry, inadequate temporary construction would not suffice.

The bridge crossing Patrick's Creek had been destroyed, and the contractor working on reconstruction from that end was authorized to build a log bridge adequate to carry legal loads until completion of already planned reconstruction of the road could be made on new alignment. Three miles south of here another bridge washout was replaced with a Bailey bridge.

In many places in the canyon reconstruction entailed virtually rebuilding the road, for where the rushing torrents struck the highway on outside curves, nothing was left. Protecting riprap was valueless, for the stream was so high it boiled right over the top of these barriers. This required replacement of many thousands of yards of fill.

As on the other routes, first movements were four-wheel-drive vehicles, followed quickly by convoys. First vehicle to traverse the road was a U.S. mail truck on the Crescent City-Grants Pass run on January 28. As the bridges and the road were improved, the convoy system was extended. By February 4, convoys were including passenger cars and single unit trucks with legal loads. Semis and trailers were excluded because they could not maneuver around the sharp turn leading onto one narrow log bridge.

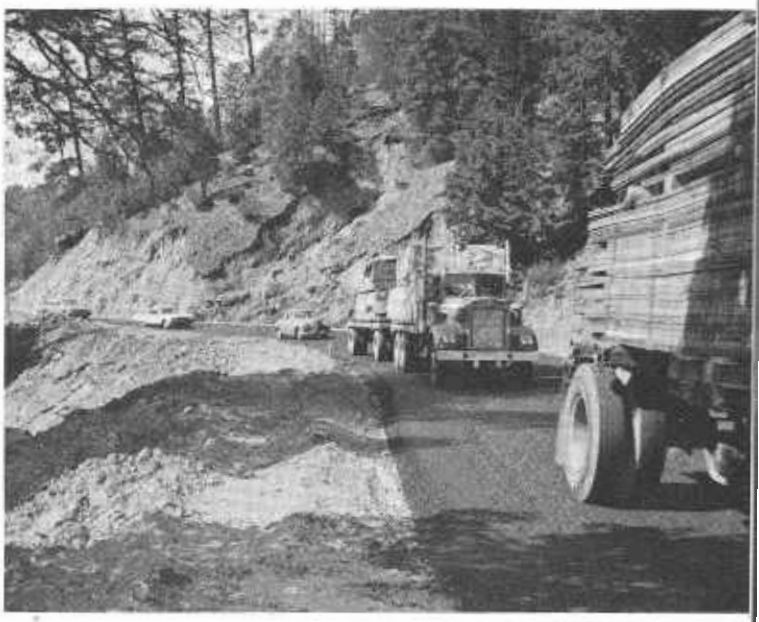
On the 14th of February this condition was improved and restrictions were lifted, with the road open to all traffic on a 24-hour basis, subject to delay at construction sites. A newsman who made the trip over this road about this time reported that except for the delays at construction sites, traffic was moving as fast as ever.

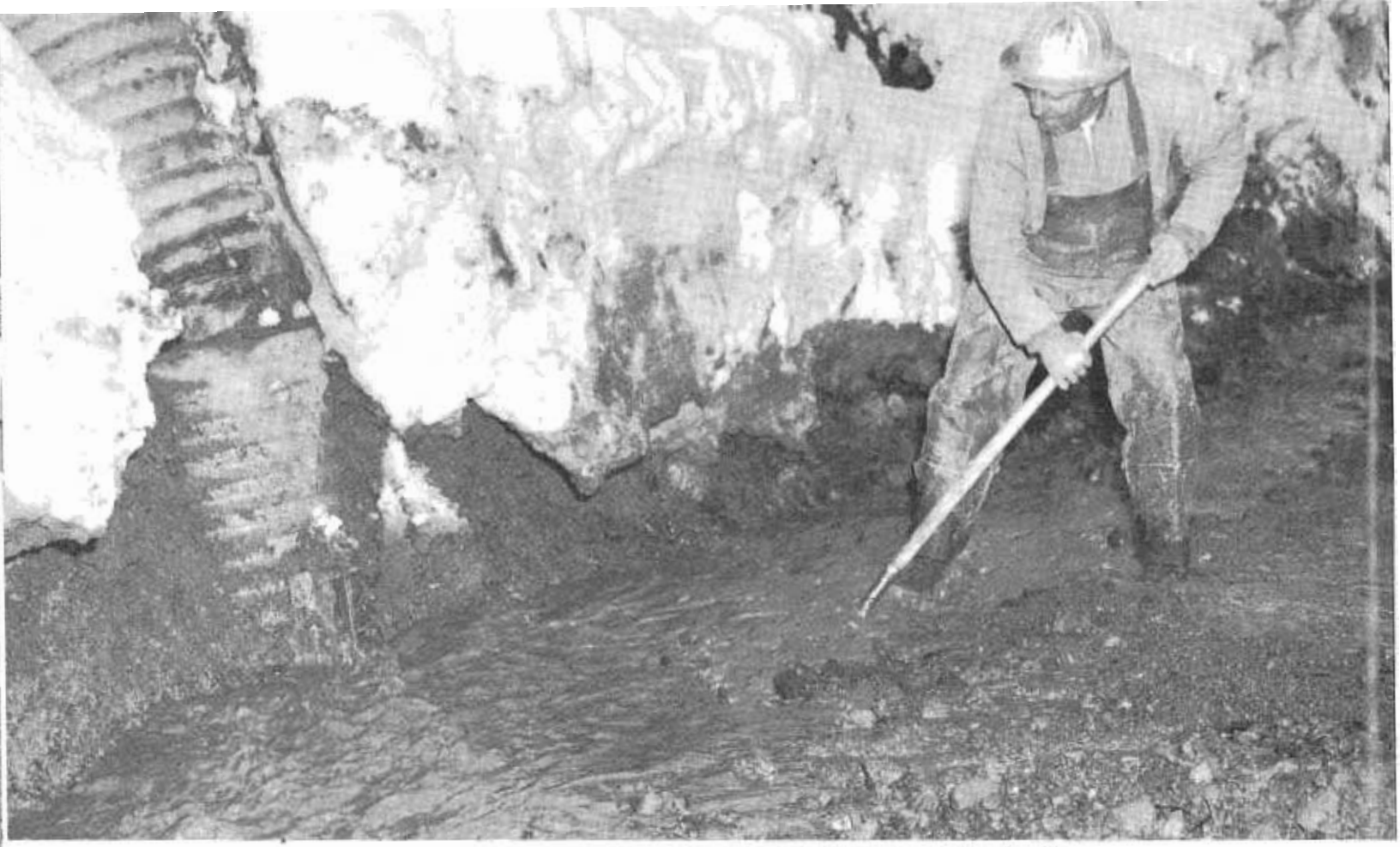
On the afternoon of Monday, the 15th of March, representatives of the Greater Eureka Chamber of Commerce and the Chamber of Commerce of Del Norte County gathered at Klamath for a ceremony celebrating reopening of the bridge the night before. This was the last interruption in the roadway, and the Redwood Highway was once again a single entity.

Another Bailey Bridge replacement on US Route 199 across Smith River. This is only one girder high, but can carry legal loads by virtue of center pier.

MORE "BEFORE AND AFTER" PHOTOGRAPHS

In addition to those inside the front and back covers, these photos show "before and after" views of destruction on the Redwood Highway, and how it looks since repaired. The two upper pairs are in the Cummings-Leggett vicinity, and about two months have elapsed from "before" to "after." The lower pair shows a section of US 199 in the Smith River Canyon, first in mid-January, then about five weeks later.





Much of the work of reopening highways after a disastrous storm is like this—wet, cold, and muddy.

Kudos Tell Story

Nothing But Praise for Highway Workers

A great asset to the Division of Highways in repairing flood-damaged highways was the group of dedicated and experienced personnel in the field at the time. The tremendous effort and achievement of these workers who reopened the roads in northern California after the Christmas 1964 floods are indicated in some of the commendations issued later.

In a special memorandum to all District 1 personnel dated January 4, 1965, District Engineer Sam Helwer said in part:

"The organization and personnel of our own Division of Highways have not only responded to this emergency efficiently but also with characteristic devotion and efforts beyond the call of duty. Most of our people worked without rest, often under extremely hazardous conditions. Some of our people were dropped into isolated areas by small planes and helicopters, after which they covered many miles on foot through snow, hail, and flood in continuing bad weather in order to bring back reliable information on the extent of damage as well as recommendations for procedures on repair and restoration of facilities.

"As usual, the work of our maintenance and construction personnel has been outstanding in every way. Work has been carried on around the clock through Christmas, New Year's, and weekends, and will continue on this basis until this extreme emergency has passed. Some of our initial efforts may be nullified by additional storms that must be expected before spring; however, our efforts will continue undiminished.

"As district engineer, I am grateful to all of our people at every level who are working so hard to restore the highways so badly needed in this area. I am confident this will be done as soon as humanly possible. I am humble in the knowledge that our organization is filled with trained personnel who go to work automatically and efficiently when emergencies arise."

ASSEMBLY RESOLUTION

On February 18, 1965, the State Assembly adopted unanimously House Resolution No. 175 which included these statements:

"WHEREAS, The men of District 1 of the Division of Highways, under the direction of District Highway Engineer Sam Helwer, were faced with the awesome responsibility of maintaining the highways of the severely stricken portions of northern California during the floods of December 1964 and January 1965; and

"WHEREAS, These floods caused unprecedented damage and unfortunate loss of life; and

"WHEREAS, The loss of life and property would have been far greater except for the almost miraculous job of emergency highway repair and maintenance done by Mr. Helwer and his staff in order to keep the highways open to relief-bearing transportation; and

"WHEREAS, This exceptional job was above and beyond the call of duty and in the highest tradition of American heroism; now, therefore, be it

"*Resolved by the Assembly of the State of California*, That the members extend their highest and most heartfelt commendation to Sam Helwer and the staff of Division of Highways District 1 for their role in averting greater disaster, and express the hope that these men will continue their magnificient work; . . . "

At its February 24, 1965, meeting the California Highway Commission unanimously adopted a resolution containing these words:

"WHEREAS, Storms occurring during the latter part of December 1964 caused unprecedented floods in streams and rivers throughout northern California, resulting in tragic loss of life and heavy damage to private as well as public property, including State highways; and

"WHEREAS, Many state highway bridges were destroyed or damaged, and numerous sections of highway closed by slides and washouts, resulting in the isolation of many communities; and

"WHEREAS, The maintenance personnel, engineers and other employees of the Division of Highways of the Department of Public Works, in this grave situation, responded wholeheartedly and heroically to their duty, working long hours in adverse weather under extremely difficult and hazardous conditions;

"*Now, therefore, be it resolved by the California Highway Commission*, That it hereby expresses to these employees its sincere appreciation and admiration for their outstanding service to the people of California in this emergency, and its further commendation to them for the rapidity with which damaged state highways were reopened to public travel."

SENATE RESOLUTION

On March 2 the State Senate unanimously followed suit with Senate Resolution No. 87, which included these paragraphs:

"WHEREAS, The devastation caused by the storm resulted in the destruction or substantial impairment of all means of travel and other communication over vast areas, resulting in the total isolation of numerous communities; and

"WHEREAS, Any undue delay in the restoration of adequate means of travel throughout this vast area could have seriously aggravated the effects of this awesome disaster; and

"WHEREAS, In the true tradition of American heroism, all of the personnel of District I of the Division of Highways, under the most competent leadership of District Highway Engineer Sam Helwer, worked unceasingly during even the most violent period of the storm in a most gallant effort to maintain and to reopen the highways in this devastated area; and

"WHEREAS, These public-spirited state employees performed many actions above and beyond the call of duty in order to aid the citizens of the stricken communities in a number of other ways; and

Henry H. Pickrell, assistant maintenance engineer, District 2, Redding, who took charge of work opening Route 299 from the eastern end.

"WHEREAS, All of the personnel and facilities of the Division of Highways were promptly and efficiently mobilized in an all-out effort to reestablish the vital highway links into the affected area in an amazingly short period of time; and

"WHEREAS, The efforts of these state employees did much to alleviate the impact of the disaster, and did much to support the morale and confidence of the residents of the disaster area; now, therefore, be it

"*Resolved by the Senate of the State of California*, That the members warmly commend Sam Helwer and the staff of District I of the division for their magnificent work in averting greater disaster; . . ."

Although Division of Highways personnel at District Headquarters and in Sacramento spent long hours both in the field and in offices planning and coordinating the reconstruction efforts, the brunt of the work fell upon the men at the scene.

Without exception all highway personnel in the flood areas unstintingly gave of their time and energy, but the following examples of the work done by some of the maintenance personnel will serve to clearly illustrate the caliber of these men and their work:

Samuel A. McCush of Piercy, Retired

A random selection from the personnel files shows that as far back as

Sam Helwer, district engineer of District 1, Eureka, reports on the highway situation to local citizens and members of the Highway Commission at special meeting in January at Scotia Inn, Humboldt County.

December 1928 Samuel McCush, highway foreman, was recommended for a raise of $5 per month in salary because he was "an excellent foreman, thoroughly conversant with all phases of highway construction, including powder, bridges and oil . . . An excellent shovel foreman and above average as an organizer. He is a leader among his men and is respected by his men and the public who know him."

Sam was retired in 1954 and, when the Christmas floods of 1964 struck, had been peacefully ranching in the Piercy vicinity for 10 years. He was then 78 years of age. Nevertheless, horrified at the state the highway was in after the flood receded, he organized men and equipment and, for the several weeks the Piercy area was isolated, labored long hours seven days a week to effect repairs. Because of his retired status, he could not expect pay for his work, and when this was pointed out to him later, he just said, "I wanted to get the road open."

Samuel McCush of Piercy, highway foreman emeritus, retired in 1954 at age of 68, organized crews and worked for 12 days without pay on the Redwood Highway to "get the road open."

In a personal "thank you" letter, J. C. Womack on February 5, 1965 commended Sam for the "excellent work you did on your own initiative during the flood which began on December 21, 1964."

Mr. Womack further said, "Your immediate and intelligent action in obtaining a small crew of men and equipment in connection with removing trees, opening culverts, and other emergency work in the vicinity of Piercy, on US Highway 101, has saved the state, according to Mr. Sam Burrows, Highway Superintendent in Garberville, between $150,000 and $200,000. Your action in this emergency is another fine example of the esprit de corps that has prevailed in the Maintenance Department for years."

Henry H. Pickrell, Assistant Highway Maintenance Engineer, Redding

With several miles of US Highway 299 completely destroyed west of Willow Creek, preventing men and equipment from Eureka getting through to make repairs, Henry Pickrell, of the District 2 office in Redding, at the request of District 1 in Eureka, took charge of operations, and working around the clock, reopened the 49 miles of US 299 east of Willow Creek.

The work included the clearance of numerous slides, filling of many washouts, and construction of three bridges adequate for legal loads. The road was opened for emergency traffic after a total elapsed time of eight days and nine hours, allowing the evacuation of sick and injured people, and the importation of badly needed food and medical supplies. During the entire operation, the workers were harassed by continuous rain and snow.

When the special congressional subcommittee visiting the devastated area commended Mr. Pickrell for his efforts, Mr. Pickrell replied "My boss, Mr. Wilson, told me to get out there and open the road. So we opened the road."

Russell Beckwith, Highway Superintendent, State Honor Camp 41, Siskiyou County

When the bridge at Clear Creek was destroyed by flood waters, Beckwith organized his personnel and materials and in four days reopened the road to Happy Camp so that his personnel might be of assistance to the town during the emergency. To do so included construction of a two-span log bridge with one 99-foot span. Beckwith was commended by the district maintenance engineer for his work.

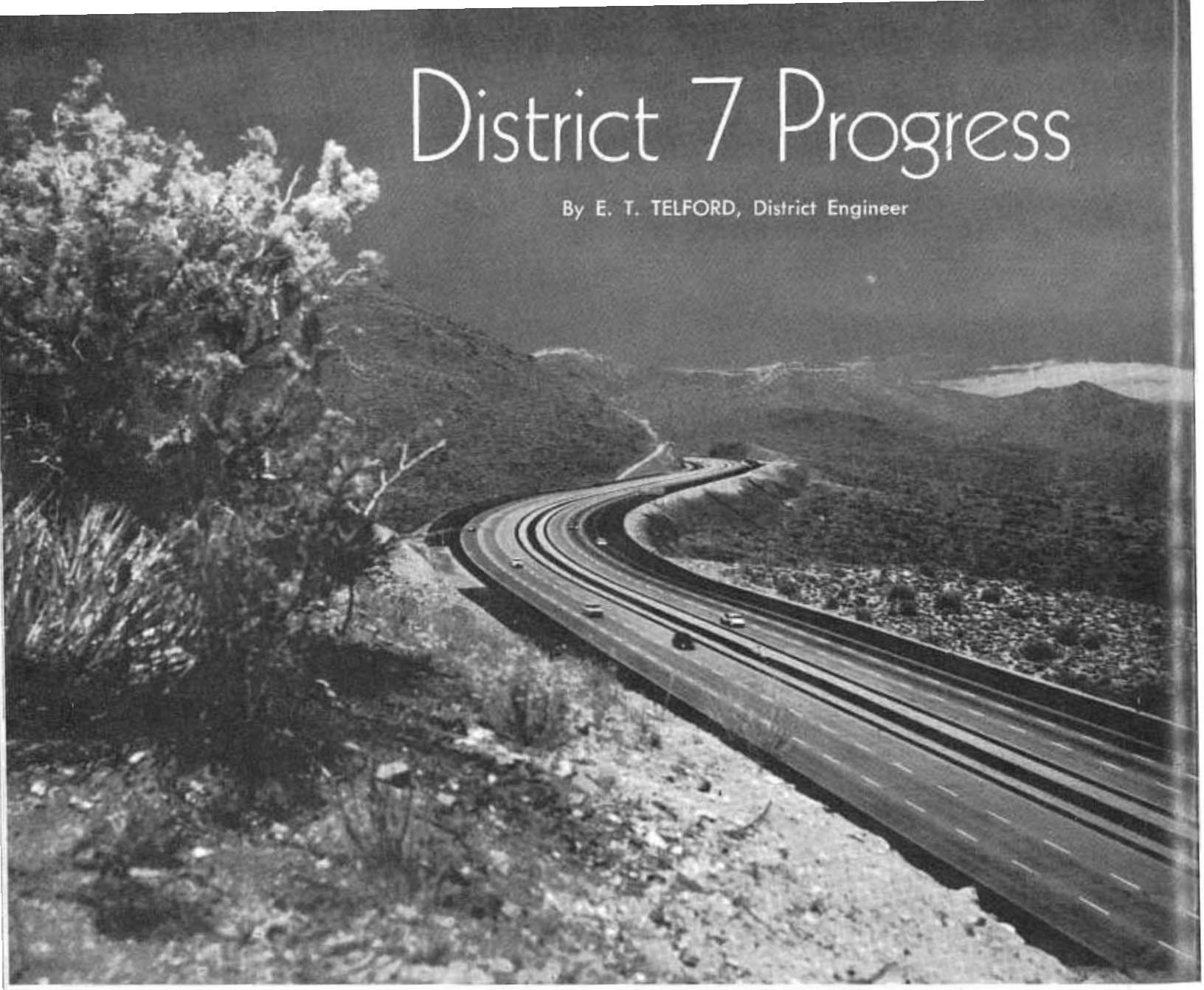
On January 18th, when this same Honor Camp 41 group was building a log bridge at Dillon Creek, Highway Foreman Bud Sheffield was knocked off the structure by a rolling log, and fell 32 feet into the creek. Injured and unconscious, he was being carried downstream by the swift current when James S. Havard, followed immediately by Jack Lee Parvin, dove into the water to rescue him. Since Sheffield is 6'5" tall and weighs about 245, the rescuers were having trouble getting him ashore, so Elmer B. Rhoades and Wayne G. Cassen also entered the stream and helped bring the unconscious man ashore. Sheffield was hospitalized with a cracked pelvic bone and mild concussion, and is presently convalescing. All four honor camp members were commended in writing by the camp supervisor, and by the State Highway Engineer in a letter of appreciation to the Director, Department of Corrections.

Mentioned in the previous issue were those highway employees who saved the bridge at Dyerville, and who discovered the washout on Interstate 5 at Meers Creek. These are only a few examples of the dedication, ingenuity and even heroism with which highway people responded to the emergency. The entire catalogue would fill many issues of this publication.

The Bailey Bridge at Grey Creek photographed on January 7, 1965, when it was already a major factor in movement of convoy traffic on Route 299 between Redding and Eureka.

District 7 Progress

By E. T. TELFORD, District Engineer



Among 23 finalists in Parade Magazine's 1964 scenic highway competition was this portion of the Antelope Valley Freeway which affords scenic vistas, has halved the accident rate, and quartered the fatality rate for motorists crossing the San Gabriel Mountains from Solemint.

In 1964, 30.6 miles of new freeway were opened to traffic in Los Angeles, Orange and Ventura Counties, making District 7's share of the California freeway and expressway system nearly one-third complete.

In addition, another 21.5 miles were under construction, 406 miles were in some stage of design, and 2,500 parcels were acquired for rights-of-way. Route location studies resulted in adoption by the California Highway Commission of another 111.1 miles of freeway, including the last portion of District 7's interstate system—15.4 miles of the Foothill Freeway.

Editor's note: For clarity, freeway names commonly used by the general public are utilized in this report instead of route numbers.

During 1964, more than 4,000,000 vehicles were registered in the tri-county area, about 14,000,000,000 miles were traveled on state highways within the district, of which about 9,000,000,000 miles were on freeways and expressways. Thus, although freeways and expressways comprise only 31 percent of the district's mileage, they carry nearly 68 percent of the traffic using state facilities. Furthermore, freeway travel computations have shown that motorists saved $413,000,000 during the year, including $95,000,000 in operating costs, $18,000,000 in accident costs, and $300,000,000 in time.

District 7 freeways have been highly significant in preparing for the rapid growth of the tricounty area. With the population soaring from nearly 3,000,000 in 1940 to more than 8,000,000 in 1965—and with projections of 12,000,000 by 1980—swift development of a good transportation system has been essential. But in broader perspective, what has made the freeways a dynamic force in planning for the population influx is that the accessibility they provide influences what others do with the land surrounding them. In a very real sense, the freeway system has paved the way for others to revitalize Los Angeles' central city and to develop and unify suburban and rural areas.

Photographs taken in 1933, 1953, and 1964 demonstrate the metamorphosis which occurred in Los Angeles' civic center in just over 30 years. Recently constructed modern government buildings and the new Music Center Pavilion attract ever-increasing traffic volumes to this area, as will the proposed Bunker Hill project. Without access by freeway, many of these developments would have been impractical.

Farther south in the downtown area, accessibility via the freeway loop has encouraged many companies to headquarter in the city's core, which in turn has stimulated construction of new buildings and modernization of older ones. In the past seven years, more than $100,000,000 has been spent annually for construction in the downtown area.

In addition to accessibility, the freeway loop provides landscaped "open space." In many parts of the downtown sector, the landscaped freeway furnishes the only "green" in sight. By nature of its right-of-way width, the freeway precludes the emergence of what urban planners sometimes call the "concrete jungle"—skyscrapers knit together in row after row, shutting out light and air.

In suburban and rural areas, surges in real estate development are occurring as definite plans for freeways, water, and other public necessities unfold. Currently, some of the most discernible surges are occurring in the Saugus-Newhall, Simi Valley, Orange County, and Puente Hills areas.

Spillout from the San Fernando Valley has been attracted to the Saugus-Newhall region, now served by the Golden State-San Diego Freeway complex. By 1970, this area will also be approachable via the Antelope Valley Freeway. Although development is typified primarily by single-family residences now, freeway accessibility is expected to encourage commerce and industry as the population grows.

Also experiencing spillout from the same source is the Simi Valley, an area rapidly growing in single-family residences (with the bulk of the work force commuting to the San Fernando Valley) and in commercial establishments. The proposed Simi Valley Freeway has encouraged this development to such an extent that plans must be given top priority to relieve existing traffic congestion.

In Orange County, the progress of the San Diego Freeway has precipitated rapid growth in Fountain Valley and Huntington Beach, the latter was one of the fastest growing cities in California last year. To the southeast, where the San Diego Freeway route ties into the Santa Ana Freeway, residential development has begun and is expected to continue at a steady pace with the promise of greater freeway service.

Along the route of the future Pomona Freeway, residential development is continuing rapidly in a northeasterly direction from the Whittier-La Habra region and in a southeasterly direction in the La Puente-Walnut area.

Freeway service—present and potential—has also been a major factor in locating new, planned communities. One of the largest, the 93,000-acre Irvine Ranch in Orange County, will be served by six routes: the Santa Ana, San Diego, Garden Grove, Newport, Laguna, and Corona Del Mar Freeways.

Other planned communities under development include: Laguna Niguel, which has an industrial park along two miles of the San Diego-Santa Ana Freeway and advertises the site's rapid access to both the Los Angeles and San Diego markets (1 and 1½ hours respectively); Diamond Bar, which will be served by the east-west Pomona Freeway and the north-south Orange Freeway; and Conejo Village, selected site for two colleges, an airport, shopping and industrial centers,

The downtown district of Los Angeles is becoming more metropolitan in appearance each year. With access to the central city assured by a growing freeway network, both industry and culture are better able to resist decentralization trends observed elsewhere.

which will be served by the existing Ventura Freeway and the future Moorpark Freeway.

The effect of the freeway system on land uses in areas already highly developed is equally interesting. In some instances, a freeway has caused little, if any, change in land usage, particularly where it traverses R-1 housing. In other instances, property abutting a freeway has changed from R-1 to multiple housing, or from residential to commercial, depending upon local desires. At any rate, freeway frontage has been desirable for a wide range of purposes. At random, here are just a few specific examples:

Industrial. New complexes currently being developed adjacent to at least one freeway include Cherry Avenue, El Segundo, Huntington Beach, Rancho San Pedro, San Fernando, Watson, and Whittier Narrows Industrial Parks.

Shopping Centers. In addition to several older shopping centers along the Ventura, Santa Ana, and San Bernardino Freeways, a Broadway center is currently under construction off the San Diego Freeway at Beach Boulevard, and developers are planning a 50-acre May Company-based center near what eventually will be the Pacific Coast-Huntington Beach Freeway Interchange.

Hospitals. Monsignor O'Dwyer, director of hospitals for the Archdiocese of Los Angeles, cites the freeways as being a major factor in locating the 175-bed Holy Cross Hospital (off the Golden State Freeway near Rinaldi), the 200-bed St. John's Hospital in Santa Monica (near the future Santa Monica Freeway), and the Queen of the Valley Hospital (off the San Bernardino Freeway in West Covina).

Golf Courses. Lohman & Lane have located the Arroyo Seco Golf Course off the Pasadena Freeway, the Twin Lakes Golf Course off the San Bernardino Freeway, and, on a former dump site, the Dominguez Golf Course off the Harbor-San Diego Freeway Interchange. Adjacent to the future Pomona Freeway is Los Angeles County's new Diamond Bar County Golf Course; off the Ventura Freeway near Moorpark Road is Los Robles Greens, built with 7 holes on the north side and 11 on the south side of the freeway. Golfers will cross under the freeway via a tunnel.

The Ventura Freeway in Burbank passes near such diverse facilities as Forest Lawn (top), Walt Disney Studios (left center), Providence High School and St. Joseph's Hospital (center), and Buena Vista Park.

Construction of Angel Stadium is flanked by the Santa Ana Freeway (visible at top) and by the artist's conception of the future Orange Freeway (in foreground).

Sports and Sightseeing Centers. The Angel Stadium, scheduled for opening in 1966, will be served by the Santa Ana and future Orange Freeways, as is the Dodger Stadium by the Pasadena and Golden State Freeways. The proposed site for the Hollywood Museum is accessible from the Hollywood Freeway, and Sepulveda Boulevards is the new Carriage Inn.

J. M. Hooper, assistant vice president for Holiday Inns in the 11 western states, says that all nine locations for his hotels in the Greater Los Angeles area lie near freeway interchanges and that these are decidedly the "preferred locations."

75,000 vehicles a day, peaking to 90,000 at Atlantic Avenue, are using this new stretch of freeway at a time savings of approximately one-half that required for a comparable trip via surface streets.

Another interstate opening which aroused considerable public interest occurred last fall when the first sub-

Considerable public interest was evident at the October 1 dedication of this 9.5-mile section of the San Diego Freeway which links Los Angeles and Orange Counties. About 1,000 people were in attendance.

the Greater Los Angeles Zoo will lie adjacent to the Golden State and Ventura Freeways.

Residential. At a recent California Real Estate Association meeting, John Klug, president of Pacesetter Homes, stated that he seeks properties adjacent to freeways for his developments. Custom homes have been rising off the San Diego Freeway in the Santa Monica Mountains ever since that freeway was opened in December 1962. New multiple units have been constructed along almost every freeway in the tricounty area, such as along the one-mile section of the Ventura Freeway between Woodlake and Mulholland Drive.

Hotels. Opened in December 1963 was the 156-room, 6-story Hyatt House off the Santa Ana Freeway at Washington Boulevard. Off the San Diego Freeway at Burbank and

1964 Freeway Openings

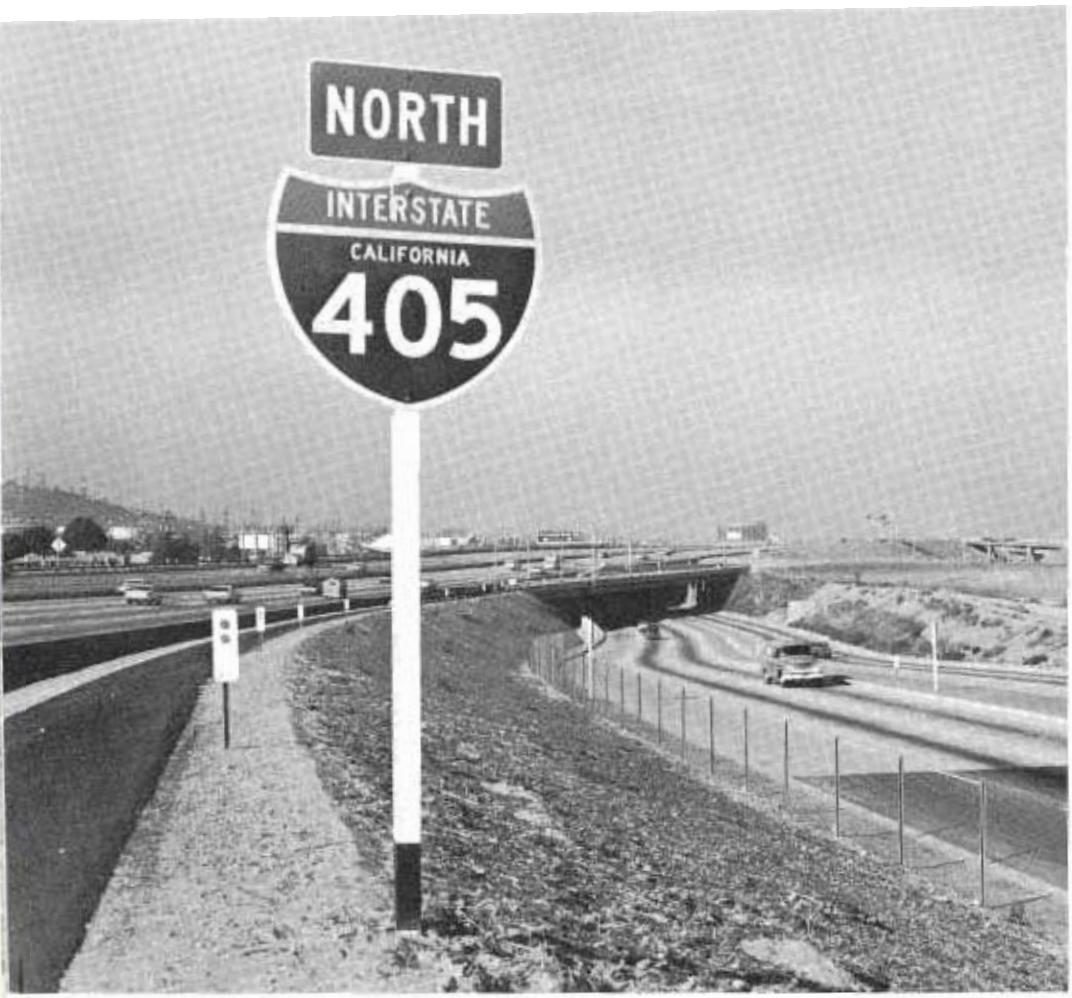
Although the 30.6 miles of freeway opened to traffic during 1964 fall short of the record 54 miles completed in 1963, the mileage is consistent with the district's five-year average of 30 miles opened per year since 1959. All but 4.7 of the miles completed during 1964 are on interstate routes, bringing the district's interstate share to 237.2 miles, or 73 percent of the 324 miles planned.

The longest stretch opened in 1964 —and one of the most heavily traveled—was 11.3 miles of the San Diego Freeway (Interstate 405) between the Long Beach Freeway and Bolsa Chica Road in Seal Beach. Completed from the Long Beach Freeway to Atlantic Avenue in January, and partly completed from Atlantic to Bolsa Chica in October, this segment has greatly improved access between Los Angeles and Orange Counties. An average of

stantial link of the Santa Monica Freeway (Interstate 10) was completed between Vermont Avenue and La Cienega Boulevard, a distance of 4.6 miles. This section averages 90,000 vehicles a day, swelling to 128,000 at Vermont Avenue.

Farther west on the Santa Monica Freeway, a one-mile link between the San Diego-Santa Monica Freeway Interchange and Bundy Drive was opened late in December. This event allowed partial use of the interchange for the first time and improved access to the San Diego Freeway.

The first mileage to be opened on the San Gabriel River Freeway (Interstate 605) was completed last June. This three-mile stretch between Whittier Boulevard and Peck Road, added to a 3.9-mile stretch opened last fall between Peck Road and the San Bernardino Freeway, marks the beginning



This segment of the San Diego Freeway serves the Long Beach Municipal Airport via Lakewood Boulevard. The view is west across the freeway, showing the Willow Street undercrossing.

The view looking eastward on Route 126 shows the interchange with Interstate 5 in the Castaic Junction-Saugus area.

The Santa Monica Freeway stretches ribbonlike toward the Pacific Ocean as viewed from the cloverleaf interchange at La Brea Avenue.

of a new outer loop around Los Angeles. Approximately 36,000 vehicles a day are now using this mileage.

Approximately three miles of the Golden State Freeway were partly converted to full interstate standards late in December with the opening of northbound lanes on a segment between Saugus Junction and a point three miles south of Castaic. Several contracts will be awarded in the next few years to complete conversion of this route (Interstate 5) between Los Angeles and the Kern county line.

Construction of nearly 100 new miles and widening of more than another 50 during the next seven fiscal years should bring District 7's portion of the interstate system to completion by the 1972 deadline. Expenditures for the interstate mileage alone will run approximately $346,000,000 for construction and $149,000,000 for rights-of-way.

Noninterstate openings during 1964 included three portions of the Garden Grove Freeway: a 1.6-mile stretch from Manchester Avenue to Main Street through the Santa Ana Freeway interchange, opened in January; a 0.7-mile segment between Beach Boulevard and Garden Grove Boulevard, opened in July; and another 0.7-mile segment between Manchester and Haster Street, opened in November.

Also opened during 1964 was a two-mile portion of the Newport Freeway from the Santa Ana Freeway to Warner Avenue.

Traffic Diversion and Volumes

While sufficient time has not elapsed to complete full-scale studies, initial traffic counts on these new freeways indicate that they are attracting considerable traffic from (and easing congestion on) many surface streets.

Preliminary checks show that the Santa Monica Freeway between Vermont Avenue and La Cienega Boulevard, for example, may be drawing sizable volumes from paralleling streets as far away as Olympic Boulevard, which lies a mile to a mile and a half

1963 AND 1964 AVERAGE DAILY TRAFFIC

	1963	1964
Hollywood Freeway		
Westerly of the Four-level Structure	185,000	181,000
South of the Ventura Freeway	98,000	110,000
Harbor Freeway		
South of the Four-level Structure	188,000	187,000
At 30th Street Overcrossing	193,000	196,000
At Century Boulevard	136,000	145,000
At San Diego Freeway	63,000	72,000
San Bernardino Freeway		
West of the Golden State Freeway	78,000	80,000
East of the Long Beach Freeway	158,000	159,000
Santa Ana Freeway		
East of Rosemead Boulevard	112,000	116,000
West of Long Beach Freeway	180,000	180,000
Pasadena Freeway		
North of Four-level Structure	92,000	96,000
North of Golden State Freeway	86,000	94,000
Santa Monica Freeway		
Harbor Freeway to Santa Ana Freeway	112,000	120,000
Ventura Freeway		
East of Hollywood Freeway	50,000	65,000
West of Hollywood Freeway	157,000	160,000
West of San Diego Freeway	133,000	143,000
Golden State Freeway		
North of East Los Angeles Interchange	116,000	120,000
West of Pasadena Freeway	130,000	140,000
North of Ventura Freeway	95,000	97,000
Long Beach Freeway	*1963*	*1964*
At Pacific Coast Highway	57,000	62,000
South of Santa Ana Freeway	89,000	98,000
South of San Bernardino Freeway	48,500	54,000
San Diego Freeway		
West of Long Beach Freeway	74,000	96,000
At Harbor Freeway	84,000	102,000
At Olympic Boulevard	125,000	142,000
At Ventura Freeway	105,000	117,000
Colorado Freeway		
At Linda Vista	28,000	27,000
Glendale Freeway		
At Golden State Freeway	35,000	42,000
Riverside Freeway		
At Santa Ana Freeway	50,000	59,000
Using Four-level Structure during a 24-hour weekday	333,000	343,000

north of the freeway. These early counts reveal a 25-percent decrease in Olympic Boulevard traffic since the freeway's opening, and the figure runs as high as 44 percent for parallel streets closer to the freeway.

The extent of traffic diversion from specific surface streets is not as easily discernible elsewhere, however. For example, while it is known that some 90,000 vehicles a day are being diverted to the San Diego Freeway between Atlantic Avenue and Bolsa Chica Road, it is not apparent just where this traffic is coming from. In this instance, the freeway moves diagonally across existing surface streets and may be relieving both east-west and north-south streets to some extent.

An interesting analysis currently underway is the attracting power of the San Gabriel River Freeway between the San Bernardino Freeway and Whittier Boulevard. Much of the current freeway traffic may be a diversion from Workman Mill Road, a circuitous two-lane facility with many sharp curves. While the freeway may be affording some relief to Rosemead Boulevard on its west, it is probable that its power to divert from this major artery will be considerably greater when the freeway is extended farther south to the Santa Ana Freeway.

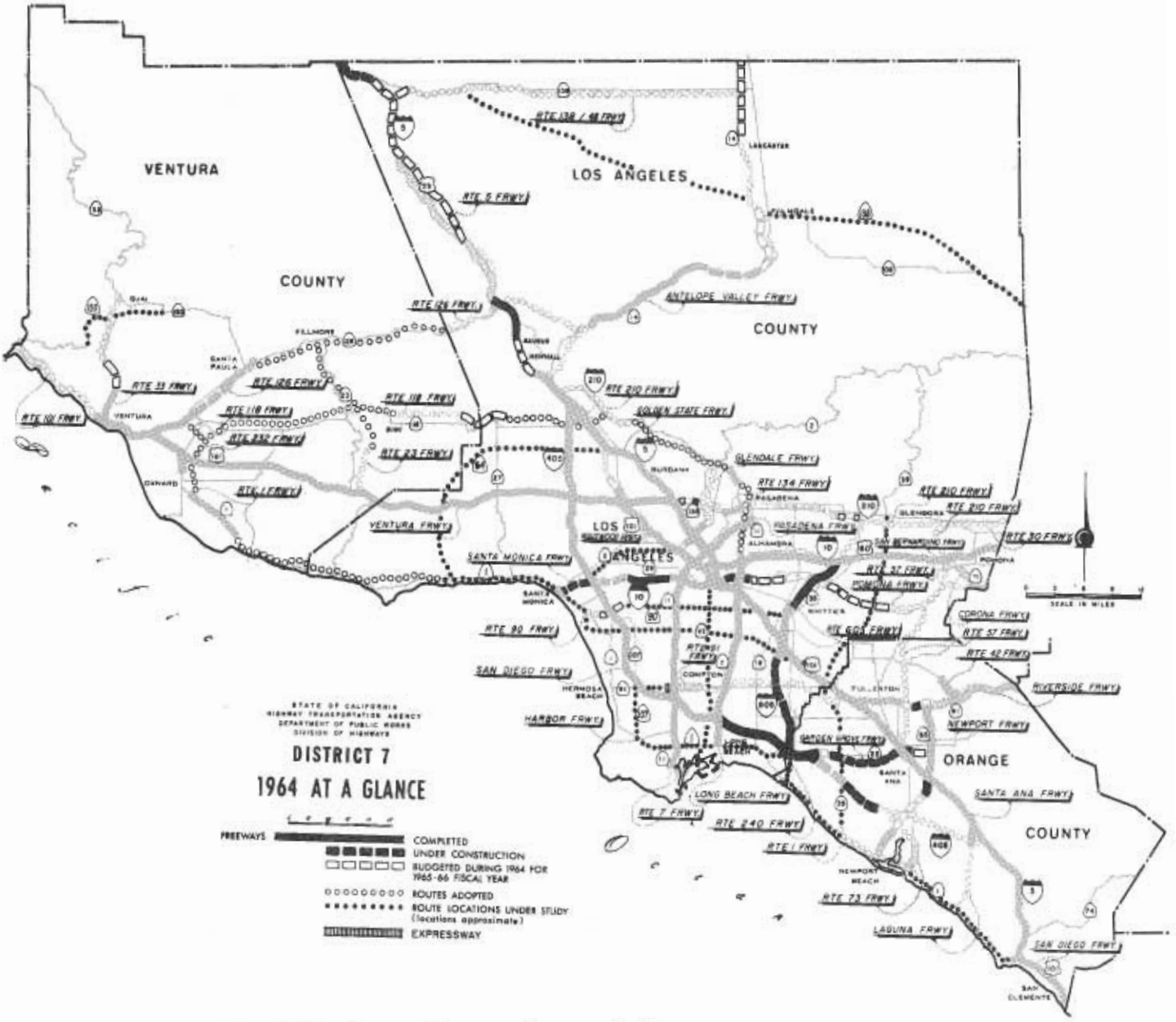
Overall, average daily traffic volumes on the District 7 freeway network increased approximately 5 percent during 1964. A one-year comparison at several strategic locations indicates where traffic is increasing or decreasing (see chart above).

Planning Studies

A number of major planning studies were accomplished during 1964 to evaluate current traffic volumes such as those discussed above and to analyze traffic patterns for determination of present and future needs.

Two of these studies will be incorporated into the State Highway Engineer's report to the 1965 Legislature: (1) a review of the state high-

The San Gabriel River Freeway serves the City of of Industry. This view is looking north.



way system, including the California freeway and expressway system—the first since its adoption in 1959, and (2) a deficiency report on all district freeways and highways. The first report recommends deletions, additions, and technical changes in the freeway and expressway system; the second estimates the minimum expenditures necessary between July 1, 1967, and June 30, 1971, to meet future traffic demands.

Many man-hours were devoted during 1964 to the Los Angeles Regional Transportation Study (LARTS), which transcends district boundaries, and considers the total transportation needs of the area.

Among primary activities was preparation of an agreement to establish a formal relationship among the jurisdictions participating in the study—Los Angeles, Orange, Ventura, San Bernardino, and Riverside Counties, the 123 cities within the region, the Southern California Rapid Transit District, and the Highway Transportation Agency. These participants, along with the U.S. Bureau of Public Roads and the U.S. Housing and Home Finance Agency, have been working cooperatively—but informally—since January 1960 to determine present and future transportation needs within the region by relating movements of people and goods to the distribution of land use, population, employment, and other factors. The formal agreement is expected to be ratified shortly, in compliance with the Federal-aid Highway Act of 1962.

Also in preparation during 1964 was an appendix to the LARTS Base Year (1960) Report, which was completed in 1963, and a brief report containing projections of 1980 population, employment, and land use, along with the resultant travel patterns they will help determine.

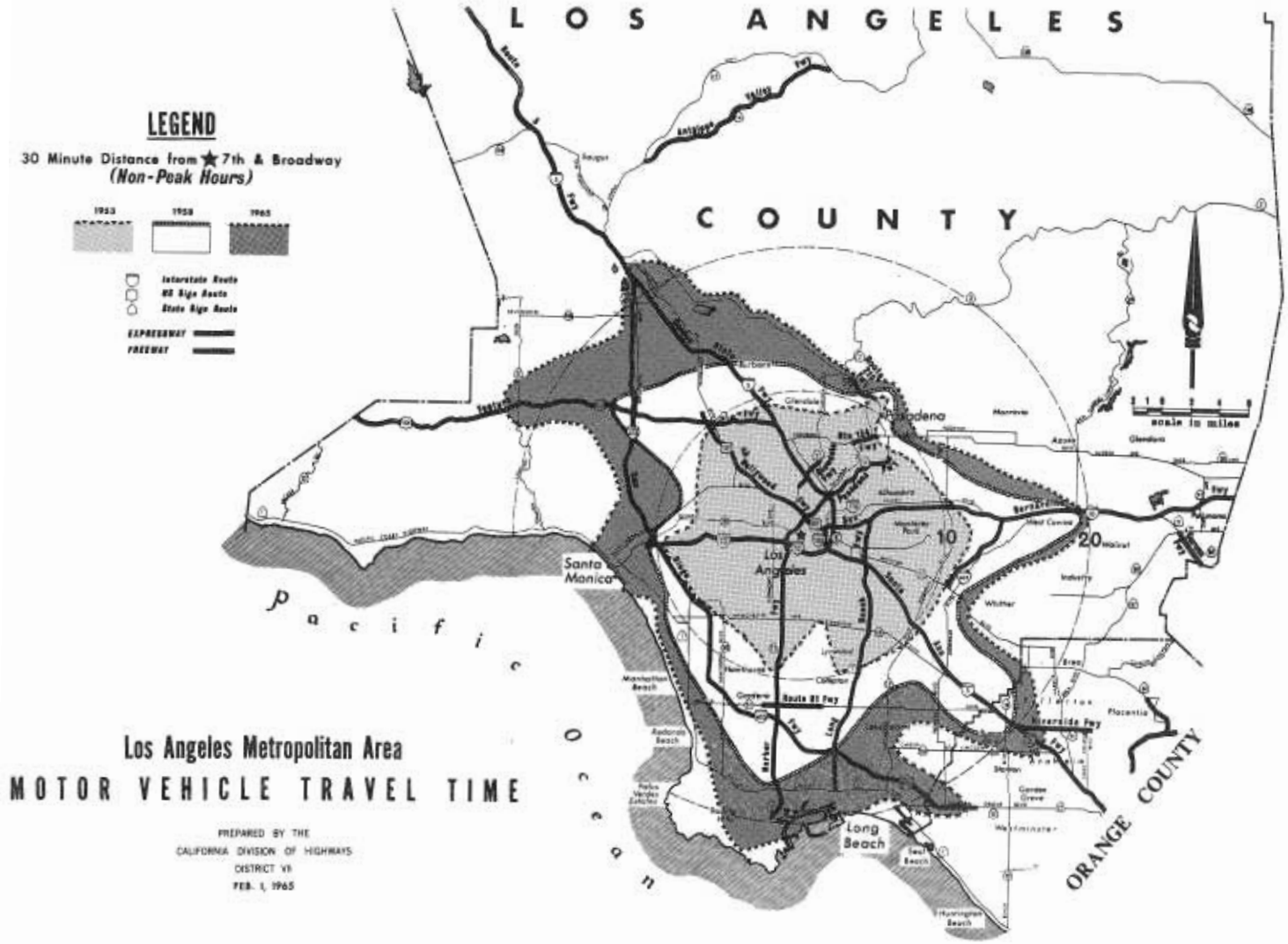
LARTS-developed techniques for assignment of future traffic to specific freeways and surface streets were used by the district for the first time dur-

ing 1964. The resulting traffic estimates are of particular value to the route planning staff, which has the responsibility of conducting studies for the precise location of all routes in the California freeway and expressway system.

Route planning studies last year culminated in the adoption of 111.1 miles of freeway by the California Highway Commission, a figure more than double the average over the past several years. Included in this mileage were the final links of the Foothill, Long Beach, Route 126, Simi Valley, and Moorpark Freeways, as well as a major portion of the Pacific Coast Freeway and a route commonly known as the Oxnard Bypass. Collectively, these portions will represent a future expenditure of $438,100,000, with $269,900,000 for construction and $168,200,000 for purchase of rights-of-way.

Seven public hearings were held by the district on these and other freeway segments during 1964, three public hearings were held by the California Highway Commission.

As of 1964 yearend, 60 percent of the district's freeway system had been adopted, and nearly half the remaining mileage was being studied. Under active study were the Beverly Hills, Huntington Beach, Industrial, and Malibu-Whitnall Freeways, and portions of the Pacific Coast, Century, Hawthorne, and Route 150 Freeways, as well as the final segments of the Garden Grove, Marina-Slauson, Artesia-Riverside, San Gabriel River, and Route 138 Freeways.



A massive bridge column form dwarfs construction men at work building the Long Beach-Pomona Freeway Interchange. When completed in the fall of 1966, this structure will be the second four-level interchange in Los Angeles.

Right-of-Way

Right-of-way acquisition progressed steadily throughout the year on the 406 miles of freeway adopted but not yet under construction. In excess of 2,100 separate parcels were certified for acquisition, another 2,600 were appraised, and still another 2,500 were purchased. In addition, appraisal estimates for route planning studies were completed on 55,725 parcels.

Nearly $80,000,000 was expended for rights-of-way in 1964. Largest amounts went for the Foothill Freeway (approximately $14,500,000, the Glendale Freeway ($11,000,000), Route 134 Freeway ($10,500,000), the Orange Freeway ($6,600,000), and the Pomona Freeway ($4,400,000).

Other expenditures included over $3,500,000 for relocation of utilities—public, quasi-public, or private—in preparation for freeway construction.

A new policy was initiated last year to speed clearance and cleanup of land prior to freeway construction. The new procedure has reduced the length of time a row of empty houses is allowed to remain in a neighborhood. It also provides for cleanup of vacated lots and for their maintenance until start of construction. The program has greatly reduced vandalism on state property during this phase of freeway development.

Contruction

Construction contracts awarded during 1964 totaled 159 at a dollar value of $86,200,000, of which 26 contracts called for freeway construction at a cost of $72,700,000. Completed during the year were 151 jobs at a cost of $89,400,000, including 16 freeway projects costing $64,300,000. Dollar value of all construction projects underway averaged $154,600,000 a month, peaking to $162,600,000 during August.

Notable developments in improving, transporting, and producing concrete for paving operations were advanced during the calendar year. As a check on the use of expansive cement without transverse joints (a test employed during 1963 on a portion of the Antelope Valley Freeway), a 1.5-mile stretch of the Santa Monica Freeway was paved with regular cement and no transverse joints. Preliminary reports indicate that use of expansive cement does result in slower and less random cracking, but existing standards of placing make either method impractical for widespread use at the present.

Expanded use of central mix plants and tilt-bed trucks for transporting low-slump concrete was employed by several contractors last year with successful results. Also proving useful for placing material on the San Diego Freeway was a low-profile batch plant in Long Beach. Production of one-inch high-quality-slump concrete averaged about 2,800 cubic yards per day, with a high of 4,200 cubic yards (or enough material for 6,000 lineal feet of 24-foot-wide pavement).

Bridges and other structures under construction during 1964 totaled 130, including 30 along the Santa Monica Freeway alone. Major structures completed were the San Bernardino-San Diego Freeway Interchanges. The last of these employed a new concept in bridge design, featuring a three-span continuous curved girder. At the end of the year, this type of construction was being used in several other locations.

Improvements to existing freeways during the year included installation of 31 miles of chain link and 7 miles of metal beam median barriers at a cost of approximately $680,000.

Landscaping

In a continuing effort to beautify existing freeways and to blend them into the surrounding neighborhood, District 7 awarded 19 contracts during the year for landscaping and related work such as installation of irrigation systems. The contracts covered 388.5 acres along 38.5 miles of freeway at a cost of $1,500,000, up nearly a half-million from 1963 expenditures.

Approximately $700,000 of the money allotted went for four contracts along the San Diego Freeway. One contract, for $400,000, was the second largest landscaping project ever awarded in California and called for placement of 1,500,000 ground cover plants, nearly 5,000 trees, and over 8,000 shrubs between El Segundo and La Tijera Boulevards.

Other jobs included work at the Ventura-Ojai and Ventura-Route 126 Freeway Interchanges and at five other places along the Ventura Freeway.

Signing and Signals

In accordance with 1963 legislation which renumbered several state routes in this district, approximately 1,700 route shields were replaced between April and June along freeways and other state facilities. In addition, 300 overhead and 160 roadside signs were modified to show the new numbers. Cost of the program was $45,000.

Upgrading the signing on all state highways in the district was continued throughout the year with completion of a project on the Hollywood Freeway between the Four-level Inter-

change and Sunset Boulevard, and with preparation of plans for resigning 16 miles of the Santa Ana Freeway between the San Bernardino Freeway and the vicinity of Firestone Boulevard, a job now underway.

Generally included in the upgrading are more advance warning signs of upcoming off-ramps, greater use of freeway names to supplement route numbers and destinations, and wider use of overhead signs.

In an effort to reduce last-minute lane changes when a righthand lane ends at an interchange, yellow "EXIT ONLY" overlays were affixed to overhead signs at five freeway-to-freeway interchanges on an experimental basis.

A new signing program was also initiated at on-and off-ramps to discourage wrong-way driving. Red and white "WRONG WAY" signs are being posted at all off-ramps, and green and white "FREEWAY ENTRANCE" signs will indicate all on-ramps. Reflectorized pavement arrows will supplement these signs.

During 1964, District 7 also completed signalization plans for 48 intersections on conventional highways and for 51 intersections near freeway construction. Signals were modified at another 311 locations. Total cost of the signalization program was $3,350,000.

Maintenance

Maintenance costs rose as expected during the 1963–64 fiscal year with new freeway mileage and landscaping additions. Expenditures reached $9,200,000, a 3½ percent increase over the 1962–63 fiscal year.

Major expenses were incurred for general maintenance and routine repairs ($2.2 million), landscape maintenance ($1.7 million), maintenance of traffic signals and lights ($1.3 million), and sweeping and hauling ($1 million).

Median barrier repair cost nearly $480,000 and required 43 full-time and four part-time employees. Several experiments are underway to reduce the frequency with which these barriers are hit and damaged, including use of reflectors on fence posts and as edge-of-pavement markers. A new aluminum mesh is being tested (in place of chain link fabric) to reduce headlight glare.

Landscaping along the district's older freeways is sufficiently lush to make this unmistakably a southern California scene. The foliage along the Hollywood Freeway through Cahuenga Pass provides a pleasing view for motorist and freeway neighbor alike.

New Materials Lab

A $406,000 materials laboratory was officially opened June 3, adjacent to the Santa Monica Freeway viaduct near Maple Avenue. The new dust-free, air-conditioned facility was designed to streamline the testing of soils, mineral aggregates, and other construction materials. Testing productivity has risen 40 percent over 1963.

Cooperative Projects

Because of 1963 legislation which increased revenue available to cities and counties for streets and roads, and which revised allocation of the funds, the district's city-county projects activity was more than doubled during 1964.

Of the money available under the Federal-aid Secondary Program, the district reviewed and administered plans for projects amounting to $351,000 in Los Angeles County, $181,000 in Orange County, and $333,000 in Ventura County. Another $600,000 was allocated to Los Angeles County and the City of West Covina under the Federal-aid Secondary Urban Extension Program for construction on Azusa Avenue. An additional $2,800,000 went for railroad separations on Downey Road and Reseda Boulevard-Parthenia Street.

Chain link fencing takes beating from 70 to 75 times a month, requiring extensive fence repair by maintenance crews. This crew is patching a section of the San Diego Freeway near the airport.

The changing face of Los Angeles Civic Center—1933, 1953

DISTRICT PROGRESS FREEWAY BY FREEWAY

Antelope Valley Freeway (Route 14)

Steady construction and design progress was made during 1964 along this 52-mile route between the Golden State Freeway near San Fernando and the Kern county line.

Opened in 1963 for 14.4 miles between Soledad Canyon Road near Solamint and Ward Road Overcrossing, current construction will extend the freeway 7.6 miles easterly to Angeles Forest Highway near Vincent by this summer.

The next contract to be let will carry the freeway from Vincent 5.9 miles north to Avenue P8 in Palmdale. This job has been advertised, and will be 16 months in construction.

Still another project to be advertised this fall is a first-stage grading job between Avenue I in Lancaster and the Kern county line, a distance of eight miles.

Five other projects are tentatively scheduled for construction in the next few years to complete the Antelope Valley Freeway throughout in District 7. (See *California Highways and Public Works*, January–February, 1964.)

Artesia-Riverside Freeway (Route 91)

From the San Diego Freeway in the Lawndale-Torrance area, this route will extend 49.5 miles almost due east in District 7 to the Riverside county line.

Moving from west to east, status of projects along the route is as follows:

From the San Diego Freeway to Normandie Avenue, route location studies are in preliminary stages on the only unadopted portion of the freeway in District 7.

Normandie Avenue to Alameda Street is an expressway now, and conversion to full freeway is expected in the next several years. A first-stage contract at an estimated $750,0000 will be underway this summer on a one-mile section in the slough area between Normandie and Vermont Avenues. This project was advanced in the construction program to cooperate with the City of Gardena in eliminating unsanitary conditions caused by the slough along the freeway's path. The state is also cooperating with Gardena in developing a park on land which will be excess property after the freeway is constructed.

From Alameda Street to the Santa Ana Freeway, seven projects are in design. One construction project is

953.

1964.

underway between the San Gabriel River and Studebaker Road in connection with the Artesia-San Gabriel River Freeway Interchange.

From the Santa Ana Freeway to Placentia Avenue in Anaheim, the route is full freeway now. Construction is currently underway to widen it from four to six lanes between Lemon Street and Placentia Avenue in Anaheim, and to convert it from four-lane expressway to six-lane freeway from Placentia to the Newport Freeway.

Two other projects are in design to convert the remaining expressway mileage to full freeway from the Newport Freeway to the county line.

Late in 1964, an important improvement was made to the facility with completion of a $1,200,000 interchange at Dowling Avenue in Anaheim. This interchange is greatly improving service to traffic generated by the North American Autonetics Division plant and other industries in the area.

Foothill Freeway (Interstate 210, Route 30)

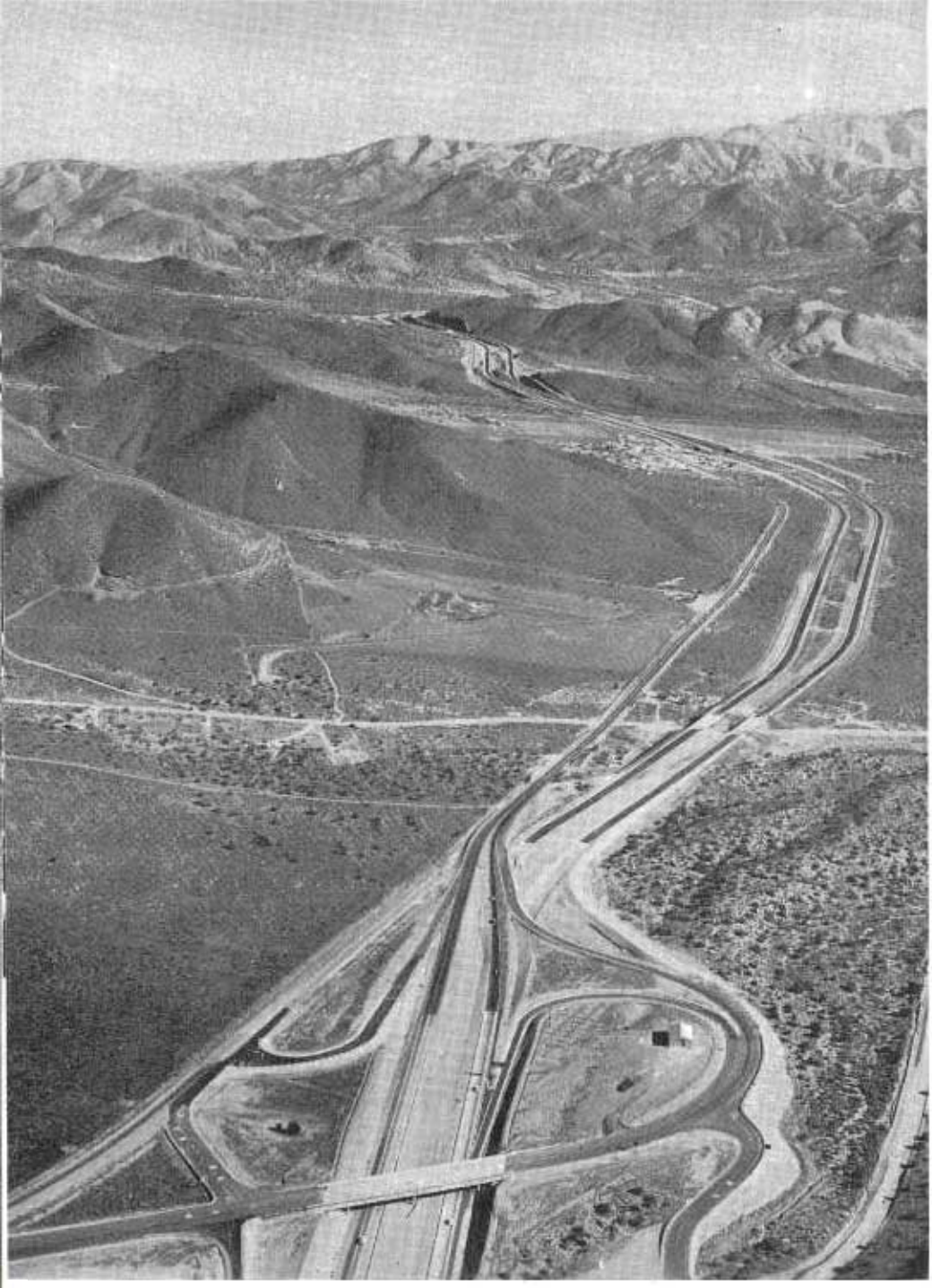
The 15.4-mile section of the Foothill Freeway adopted November 18, 1964, by the California Highway Commission completes adoption of the route for its entire 52.2 miles in this district. The freeway will begin on the north at the Golden State Freeway near Sylmar, run southeasterly to Pasadena, and then almost due east through the San Gabriel Valley to the San Bernardino county line.

Only 1.6 miles of the freeway route are open to traffic—a section north of Pasadena between Hampton Road and Montana Street, constructed prior to inclusion of Route 210 in the interstate system. The next construction scheduled on the route will be 2.5 miles in the Monrovia-Duarte area. The $2,200,000 project, which will be under construction by next fall, will call for construction of eight structures, and for embankment; paving operations will follow under a subsequent contract.

At yearend, approximately $37,500,000 had been spent for rights of way along the route, including the $14,500,000 expended in 1964 in the San Gabriel Valley.

Sixteen separate contracts are presently scheduled for contract award by the 1970–71 fiscal year in order to complete the interstate portion of this route on time.

An unusual design feature in parts of Pasadena and Arcadia will be the utilization of one corridor for two public transportation facilities—the freeway and a railroad. In Pasadena, from Marengo Avenue to Wilson Avenue, the main line of the Atchison,



The present eastern terminus of the Antelope Valley Freeway is located at Ward Road Overcrossing in foreground. In photo center, the freeway construction crosses over Red Rover Mine Road.

Topeka & Santa Fe Railway is to be depressed alongside the freeway. In Arcadia, from Eaton Wash to Santa Anita Avenue, the railroad will be relocated in the freeway median.

Garden Grove Freeway (Route 22)

Except for 2.2 miles at this route's western end, the Garden Grove Freeway is complete, under construction, or budgeted throughout its ultimate 17 miles (2.5 of which are coincident with the San Diego Freeway). An east-west route, this freeway will eventually connect Pacific Coast Highway in Long Beach with the Newport Freeway in Orange County.

Moving from west to east, the freeway's status is:

From Pacific Coast Highway to the San Diego Freeway, construction is tentatively scheduled during the early 1970's.

For approximately 2½ miles easterly, the Garden Grove Freeway is nearing completion in conjunction with a project on the San Diego Freeway. Both routes will utilize the same 11- and 12-lane roadway along this stretch.

From the San Diego Freeway to Garden Grove Boulevard near Knott Avenue, a contract was recently awarded to extend the freeway another 2.5 miles. Completion is anticipated in spring of 1966.

From Garden Grove Boulevard, near Knott Avenue, to Newland Street, a 1.5-mile project was completed last June. Traffic is now using 0.7 mile of this portion, with the remaining mileage to be opened upon completion of the adjacent project to the east.

From Newland Street to Garden Grove Boulevard near Haster Street (a distance of 4.7 miles), three projects costing $9,400,000 are under contract and are scheduled for completion late this year.

A one-mile section between Haster Street and Manchester Avenue was opened last November.

The 1.6-mile segment between Manchester and Main Street in Santa Ana was completed under two contracts late in 1963 and early in 1964. This project included the Garden Grove Freeway interchange with the Santa Ana Freeway.

The final contract between Main Street and the Newport Freeway, a distance of 1.9 miles, will be underway before 1965 ends.

Golden State Freeway (Interstate 5)

This important interstate route will ultimately run from the East Los Angeles Interchange to the Kern county line, a distance of nearly 72 miles in District 7. The route is now continuous as a freeway from the East Los Angeles Interchange to Sierra Highway, a distance of 28.4 miles. From there to the county line it is largely an expressway.

Current emphasis is on conversion of the route to full freeway standards in northern Los Angeles County. During 1964, one project was opened to traffic, another was put into construction, and eight others were in design.

Opened were the northbound lanes of a 3.3-mile job between Saugus Junction and a point three miles south of Castaic. The $5,600,000 contract included construction of a one-mile portion of the Route 126 Freeway at its interchange with the Golden State.

Put into construction last November was a four-mile segment from the Kern county line south. This $5,500,000 project will be completed late in 1966.

A total of six projects, all scheduled for advertising in the first half of 1965, will continue the conversion another 26.5 miles. Three contracts are for first-stage grading and structure work, with final paving projects to follow in the next few years. These three jobs will involve the largest earth moving operation in California highway construction history, as the route moves through the mountains of Angeles National Forest and requires removal of 45,000,000 cubic yards of roadway material. The other three contracts will provide full freeway between Sierra Highway and Saugus Junction and from future Route 138 near the Kern county line to a point 6.8 miles south.

Among improvements planned on the existing freeway south of Sierra Highway is the addition of auxiliary lanes between Colorado Street and Western Avenue, a distance of about two miles, in the vicinity of Griffith Park. The job will be advertised this spring in conjunction with a project to build the Golden State-Route 134 Freeway interchange.

On the drawing board is another project which will introduce a new concept of handling truck traffic in Los Angeles. In the area where the Foothill, Golden State, and Antelope Valley Freeways will converge, trucks will be routed to roadways separate from those carrying passenger cars. This design is considered necessary because of extremely high truck traffic volume within the interchange complex.

Harbor Freeway (Route 11)

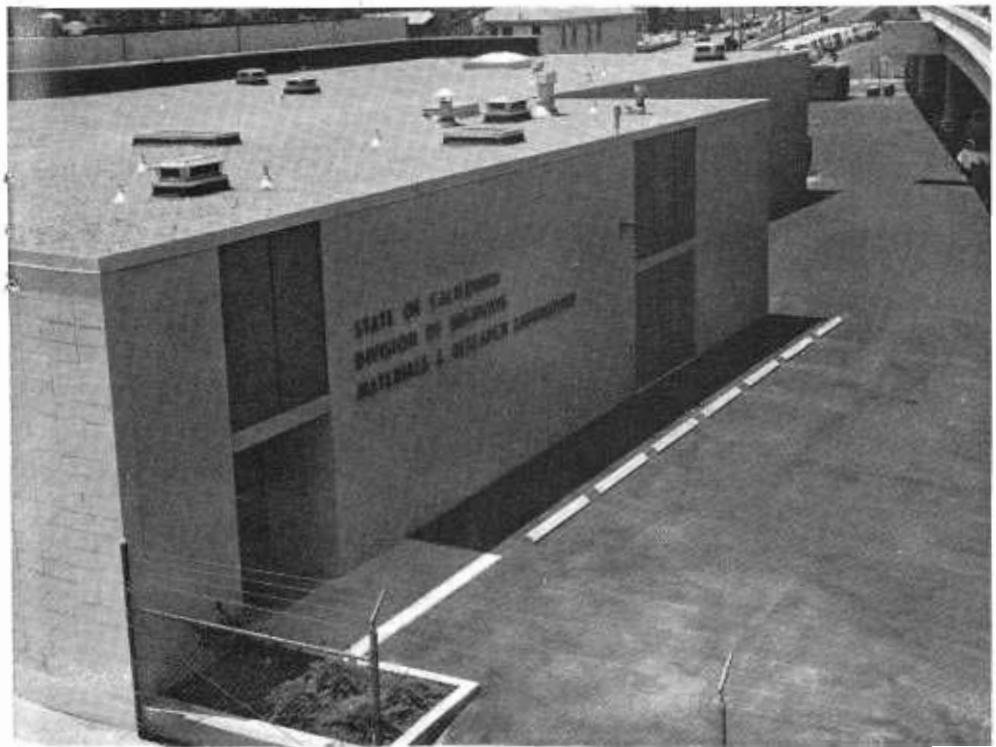
Complete for 22 miles from downtown Los Angeles to Battery Street in San Pedro, the Harbor Freeway will eventually be extended southerly to its interchange with Route 7 just west of the Vincent Thomas Bridge.

During 1964, a freeway agreement was reached with the City of Los Angeles for this extension, and design plans are well under way. All of the right of way requirements for the project have been determined, and about 25 percent of the needed property has been acquired.

Hollywood Freeway (Routes 101, 170)

Extension of this route from its present northerly end at Magnolia Boulevard in North Hollywood to its ultimate terminus at the Golden State Freeway in Pacoima should be accomplished late in this decade.

Quality and uniformity for freeway construction materials require testing. This new materials laboratory is located adjacent to the Santa Monica Freeway viaduct near downtown Los Angeles.



During 1964, a first-stage embankment contract was let along 3.7 miles of the route between Laurel Canyon Boulevard and the Golden State Freeway.

From Magnolia Boulevard to Victory Boulevard, a contract is currently underway with a target date for completion set late in 1966.

Farther south on the Hollywood Freeway, a first-stage widening project on outbound lanes between Franklin Avenue and the Pilgrimage Bridge (a distance of 1.3 miles) is nearing completion. The $681,000 contract calls for adding of one lane to the existing three. Design plans are in progress for adding an outbound lane between Sunset Boulevard and Franklin Avenue and another inbound lane from the Pilgrimage Bridge to Sunset Boulevard. Completion of these projects will eliminate all existing three-lane roadway sections on the Hollywood Freeway.

Long Beach Freeway (Route 7)

Determination of the routing for five miles of this freeway through El Sereno, South Pasadena and Pasadena by the California Highway Commission last November 18 completes the adoption of the Long Beach Freeway throughout its 26-mile length.

With the opening of a 1.1-mile segment between Valley Boulevard and the San Bernardino Freeway early this year, the existing route now extends 20.7 miles.

A project will be advertised this summer to increase capacity from six to eight lanes between Olympic Boulevard in East Los Angeles and Bandini Boulevard in Vernon, a 1.4-mile section that includes the route's interchange with the Santa Ana Freeway. Cost is estimated to be $2,500,000.

Two subsequent contracts will extend this widening from Bandini to the San Diego Freeway, a distance of 12 miles. Combined cost of the projects is estimated at $3,800,000.

Marina-Slauson Freeway (Route 90)

This east-west route, which will be situated almost midway between parallelling Santa Monica and Century Freeways, will stretch approximately 20 miles between the future Pacific

The northward extension of the Long Beach Freeway has brought a new interchange with the San Bernardino Freeway into being. Now open to traffic, the route provides convenient access to California State College at Los Angeles (left center).

The Hollywood Freeway is also being extended. This view shows construction north of the interchange with the Ventura Freeway.

Coast Freeway on the west and the San Gabriel River Freeway on the east.

First contract on the route, which will be awarded this summer, calls for a $3,500,000 project for structures in the San Diego-Marina Freeway Interchange. A second contract in the interchange area will be let in the spring of 1966. Its completion will result in a usable length of freeway between Slauson Avenue and Centinela Boulevard, a distance of 1.5 miles.

Final design of the 1.8 miles from Centinela west to Pacific Coast Freeway is dependent on the adoption of the latter freeway segment.

East of the San Diego-Marina Freeway Interchange, preliminary studies are underway to locate the remaining 18 miles of the freeway, which is popularly known as the Slauson Freeway.

Moorpark Freeway (Route 23)

The 17-mile Moorpark Freeway will provide a north-south link between the Santa Paula Freeway in Fillmore and the Ventura Freeway in Thousand Oaks, skirting the community of Moorpark near its midpoint.

On October 29, the California Highway Commission formally adopted the last portion of this freeway between three miles south of Tierra Rejada Road and the Santa Paula Freeway, a distance of 13.4 miles. The entire route, including a major interchange with the Simi Valley Freeway, is now in design.

Newport Freeway (Route 55)

This route was extended another two miles southward during 1964 with the opening of a segment between the Santa Ana Freeway and Warner Avenue. The freeway is now complete from the Riverside Freeway to Warner Avenue, a distance of 9.2 miles.

Bids were opened on April 1 to continue the four-lane freeway another 3.9 miles south to Palisades Road-Bristol Street. This project includes the San Diego-Newport Freeway Interchange. Two other projects are in design to complete the final stretch between Palisades-Bristol Street and Pacific Coast Freeway. Total length of the ultimate route is 17.5 miles.

Ojai Freeway (Route 33)

The Ojai Freeway will eventually stretch 57.5 miles from the Ventura Freeway in Ventura to the Santa Barbara county line near the Cuyama River. The freeway is open to traffic from the Ventura Freeway four miles north, is budgeted for construction another three miles north to Casitas Pass Road in Foster Park, and is adopted for still another eight miles north to Cozy Dell Canyon.

The three-mile project recently budgeted will be let early in 1966 and will cost about $2,800,000.

Orange Freeway (Route 57)

This north-south route will stretch some 30 miles from the Foothill-San Bernardino Freeway just east of Pomona to the Pacific Coast Freeway near the Santa Ana River, crossing the Pomona, Century, Riverside, Santa Ana, and San Diego Freeways in the process. It will directly serve the Kellogg Campus of California Polytechnic College, Mount San Antonio College, Pomona and other communities in eastern Los Angeles County, linking them into central Orange County.

The route of the Orange Freeway is adopted for 19.4 miles from the San Bernardino Freeway to the Santa Ana Freeway, and design is well underway in eight separate projects. To date, $17,100,000 has been spent for rights-of-way including $6,600,000 expended in 1964.

Pacific Coast Freeway (Route 1)

Adoption last September of a 23.3-mile segment of this route between the Calleguas Creek in Ventura county line and Malibu Canyon Road brings the mileage adopted on Pacific Coast Freeway to 45.1, exclusive of the five

miles which are now open from Pleasant Valley Road to Calleguas Creek, where the route is a full freeway.

This route, the longest in the district, will eventually parallel the coastline from the Ventura Freeway north of Oxnard to Serra Junction in Capistrano Beach, a distance of 114 miles.

Beginning on the north, a 4.1-mile segment of the Pacific Coast Freeway was adopted from the Ventura Freeway to a point near Pleasant Valley Road last June 24 as part of the Oxnard Bypass.

From Calleguas Creek to Malibu Canyon Road, some 24 miles of the route are adopted and currently in design.

Between Malibu Canyon Road and Beach Boulevard in Huntington Beach, with exception of a 10-mile stretch in the South Bay area of Los Angeles County, five route location studies are now underway.

Ten miles of Pacific Coast Freeway between Beach Boulevard and MacArthur Boulevard in Newport Beach are in preliminary design.

Route location studies are underway from MacArthur Boulevard to the freeway's terminus at Serra Junction.

Pomona Freeway (Route 60)

This route will stretch 30 miles through Los Angeles County, beginning at the East Los Angeles Interchange and entering San Bernardino County in the vicinity of South Pomona. When completed, it is expected to provide considerable relief for the San Bernardino Freeway.

The Pomona Freeway is under construction or budgeted under six major contracts from the East Los Angeles Interchange to Jellick Avenue in Industry, a distance of nearly 20 miles, or two-thirds of its ultimate length.

Beginning at its western terminus, these are the active projects:

East Los Angeles Interchange to Third Street, near Downey Avenue, a distance of two miles, has been under construction since October 1963 and is scheduled for completion this fall under an $8,000,000 contract.

Third Street to Woods Avenue, a 1.4-mile stretch including the freeway's interchange with the Long Beach Freeway, was put into construction last July. The $9,000,000 project will be finished in the fall of 1966.

Woods Avenue to Arroyo Drive, near San Gabriel Boulevard, is included in the 1965–66 budget. The 4.2-mile job, expected to cost approximately $5,800,000, will open to traffic in late 1966 or early 1967.

Arroyo Drive to Peck Road, a distance of three miles, was included in the 1964–65 budget. This contract should be completed late in 1966 at a cost of about $4,600,000.

Peck Road to Workman Mill Road, a 2.8-mile job including the interchange with San Gabriel River Freeway, will be completed late in 1966 at a cost of approximately $5,000,000.

Workman Mill Road to Jellick Avenue, a distance of 7.7 miles, will be advertised this summer. Estimated cost is $9,000,000; estimated completion date is fall of 1967.

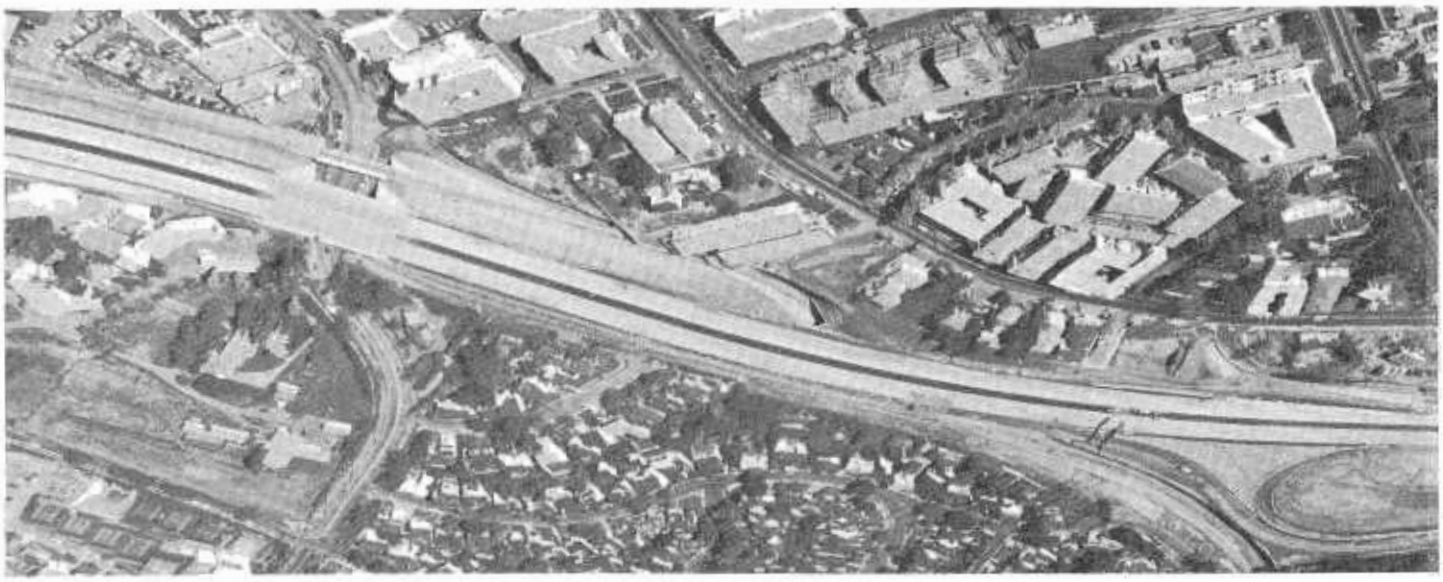
The remainder of the route in District 7, from Jellick Avenue to the Riverside county line will be constructed under three separate contracts.

Route 134

Unofficially known as the Ventura Freeway extension in the San Fernando Valley, and as the Colorado Freeway extension in the San Gabriel Valley, this route will eventually extend from the Golden State Freeway near Griffith Park 8.1 miles east to an interchange with the Foothill and Long Beach Freeways in Pasadena.

A first-stage contract, calling for a structure at Jackson Street in Glendale and the westerly extension of Monterey Road from Kenwood Street to Brand Boulevard at Burchett Street, is nearing completion. This $265,000 project will aid in handling traffic during construction of the main freeway project in Glendale.

Design is virtually complete for the Route 134-Golden State Freeway In-



The newest stretch of the Santa Monica Freeway (from La Cienega Boulevard to the San Diego Freeway) was opened January 29.

Completion of Interstate 5 in the Castaic Junction area leaves the older US 99 (on left) for frontage access. Truck-weighing facility is in foreground.

A resolution by the City Council of Los Angeles (below) honors the designer of the Santa Monica-San Diego Freeway Interchange, Mrs. Marilyn Reece, associate highway engineer.

The Cities of Orange and Santa Ana are serviced by the recently completed interchange of the Garden Grove Freeway with the Santa Ana Freeway.

The last contract to be let on the Santa Monica Freeway takes this route seaward. The project in Santa Monica will be completed this fall.

City of Los Angeles Resolution

WHEREAS, MRS. MARILYN REECE is the first woman associate highway engineer in the entire California State Division of Highways, and

WHEREAS, Engineering in itself has always been considered particularly in the realm of men and Mrs. Reece, by her ability and creative imagination, has made a breakthrough for women in this masculine endeavor, and

WHEREAS, Since 1957 she has headed a team of designers working on the Santa Monica Freeway, and

WHEREAS, The 90-acre swirl of roadways and overheads that form the West Los Angeles Interchange of this freeway is the project design of Mrs. Marilyn Reece, and

WHEREAS, She is credited with the creation and supervision of the overhead and off-ramp design of this West Los Angeles Interchange, and

WHEREAS, Her contribution to the design of this interchange with its momentous economic, social and visual impact on our community makes an important peak in the achievement of outstanding women;

NOW, THEREFORE, BE IT RESOLVED, That the Los Angeles City Council, by the adoption of this resolution, hereby commends Mrs. Marilyn Reece for her outstanding ability and accomplishment as an associate highway engineer, and thanks her for contributing to the safety, utility and beauty of our city.

terchange which will also serve the proposed Greater Los Angeles Zoo in Griffith Park.

Design plans for another major interchange, the Route 134-Glendale Freeway structure, were completed during 1964, and design of the balance of the route is well underway.

Easterly of the Glendale Freeway through the community of Eagle Rock, the freeway will be located mostly on sidehill terrain. With aesthetics in mind, the freeway will be built as a split-level roadway, with fill slopes landscaped to blend into the area through which it passes. The Eagle Rock itself, an historical landmark, will be preserved.

Between Avenue 64 and Orange Grove Avenue in Pasadena, the existing Colorado Freeway will be widened from four to eight lanes. In consideration of Annadale Country Club on the north and the business and residential development on the south, retaining walls will be used to avoid the necessity of acquiring additional right-of-way.

San Bernardino Freeway (Interstate 10 and 110)

Several major improvements are in the design stage to increase capacity along this 30-mile freeway, which has been in service for a number of years.

Most ambitious of these projects is an $11,000,000 expansion job between the Golden State and Long Beach Freeways, a distance of 3.5 miles. Design plans are currently underway to convert the present six-lane section to 10 lanes, with an additional two auxiliary lanes between Soto Street and Herbert Avenue.

Another improvement in the City Terrace area is construction of a pedestrian overcrossing to replace existing subterranean crossings used frequently by children attending the Harrison Street School. The $150,000 project, which is jointly financed by the state and county, will rise over the Pacific Electric Railway, the freeway, and Ramona Boulevard.

Central mix concrete is deposited in slipform paver, thus expediting construction of Garden Grove Freeway. This section of freeway—from Harbor Boulevard to Haster Street—is now complete.

Farther west, a $485,000 contract is now in progress to modify the Vincent Avenue Interchange in West Covina. This work is necessitated by the rapid growth in the area and resulting traffic congestion.

There are plans to widen the San Bernardino Freeway from six to eight lanes between Puente Avenue in Baldwin Park and Holt Avenue in West Covina, a distance of 5.6 miles, and between San Dimas Avenue in San Dimas and the San Bernardino County line, a distance of 6.3 miles.

San Diego Freeway (Interstate 405 and 5)

Major strides were taken during 1964 toward completion of this 93.7-mile interstate route which will eventually extend in this district from the Golden State Freeway north of San Fernando to the San Diego County line at San Clemente.

Two openings during 1964 make this route continuous for 52.1 miles from the Golden State Freeway to Bolsa Chica Road in Orange County.

Opened during 1964 were 1.8 miles between the Long Beach Freeway and Atlantic Avenue, during January; and 9.5 miles from Atlantic to Bolsa Chica Road, during October.

Of the remaining 20.6 miles to be completed, 9.1 miles are being constructed under the following three contracts:

Bolsa Chica Road to Beach Boulevard, 4.1 miles, estimated for completion this fall under an $8,100,000 contract.

Beach Boulevard to Brookhurst, 3.2 miles, construction began in January under a $7,400,000 contract and should be completed in the summer of 1966.

Brookhurst to Harbor Boulevard, 2.2 miles, work began early this year under a $5,400,000 contract and should be completed in the fall of 1966.

Design is in progress on the remaining 11.5 miles, which will be built under four separate contracts.

Two other projects are currently in design to widen the existing four-lane freeway to eight lanes between Laguna Canyon Road southeast of Irvine and the San Diego county line.

San Gabriel River Freeway (Interstate 605, Routes 243 and 240)

Construction activity is in full swing on the interstate portion of this route, which extends from the San Bernardino Freeway at Baldwin Park to the San Diego Freeway near Seal Beach.

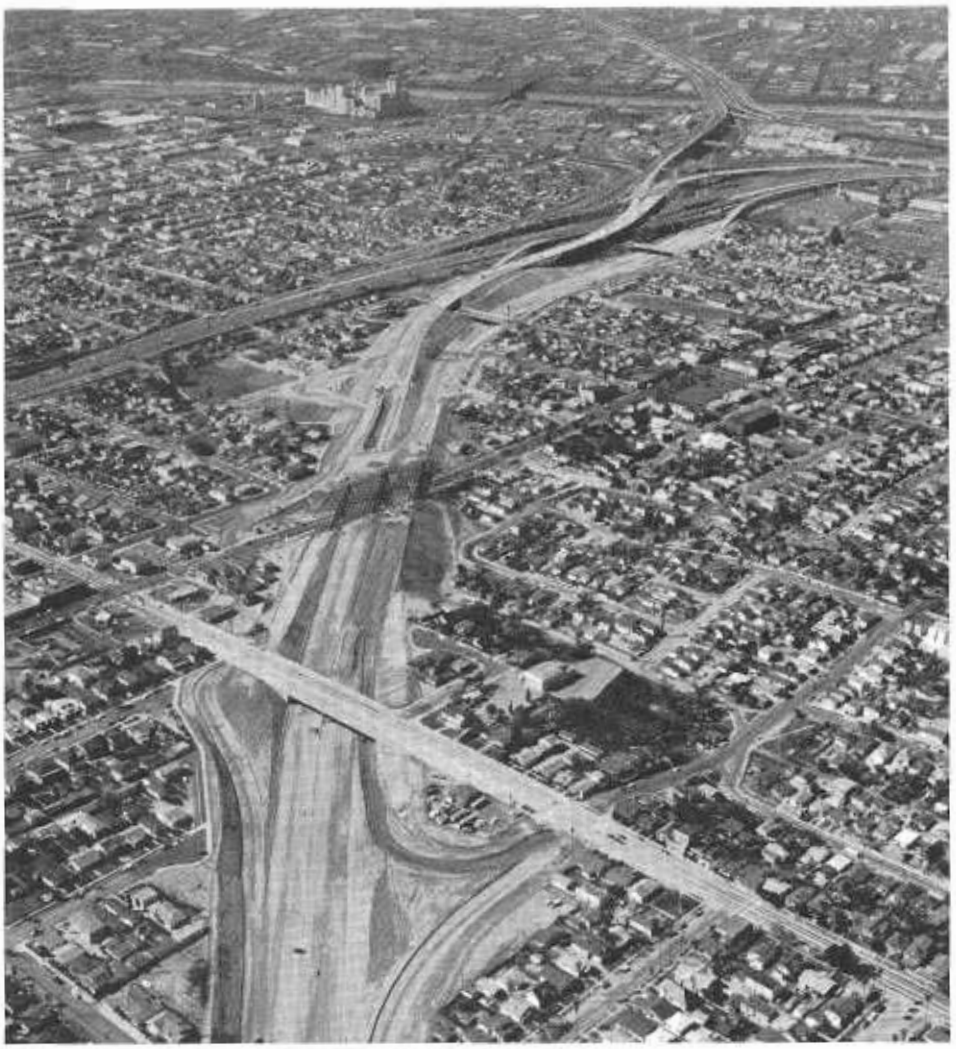
During 1964, nearly seven miles of freeway, built under two contracts, were opened between the San Bernardino Freeway and Whittier Boulevard. The first, a 3-mile segment from Whittier Boulevard to Peck Road, was opened June 10. The second, a 3.9-mile link between the San Bernardino Freeway and Peck Road, was opened this fall in stages.

Contracts currently going between Whittier Boulevard and the San Diego Freeway are:

Whittier Boulevard to Telegraph Road, 3.2 miles, scheduled for completion this summer under a $6,100,000 contract.

Telegraph Road to Cecilia Street, 1.8 miles, scheduled for completion this summer under a $6,700,000 contract.

Cecilia Street to 166th, 3.6 miles, scheduled for completion early next year under a $7,000,000 contract.



A westward view of construction on the Pomona Freeway shows how the new route leads into the East Los Angeles Interchange where it will connect with several major freeways.

166th to 183rd, one mile, a $5,100,000 contract which includes an interchange with the Artesia Freeway, scheduled for completion in the summer of 1966.

183rd to the Orange county line near the San Diego Freeway, 4.3 miles, scheduled for completion in the spring of 1966 under a $7,000,000 contract.

Noninterstate segments will ultimately extend the San Gabriel River Freeway to the Foothill Freeway on the north and to the Pacific Coast Freeway on the south, a length of about 30 miles.

(See *California Highways and Public Works*, July–August 1964.)

Santa Ana Freeway (Interstate 105 and 5 and Route 101)

This route, operational as full freeway for several years, links downtown Los Angeles with Orange County. The Santa Ana Freeway officially terminates at its juncture with the San Diego Freeway route just southeast of Irvine, a distance of 43 miles.

Under a continuing program to increase capacity and improve traffic service, a 10.1-mile stretch between Main Street in Santa Ana and Laguna Canyon Road was widened from four to six lanes during 1964.

Currently underway is a $990,000 project to improve the Katella Avenue interchange in Anaheim near the future Angel Stadium. This project should be complete in the spring of 1966, just prior to the stadium's opening.

Modernization of another interchange will start in about a year at Stanton Avenue in Buena Park. The $250,000 job primarily involves replacing a left-hand on-ramp with a right-hand connection.

Santa Monica Freeway (Interstate 10)

Completion of two contracts and partial completion of another in 1964, and the completion of still another contract in January of this year, make this route continuous from the East Los Angeles Interchange to Bundy Drive in western Los Angeles, a distance of approximately 14 miles.

The remaining portion of the final contract, awarded in February 1964, is scheduled for completion late this year, affording motorists a beeline route of some 16½ miles between downtown Los Angeles and Santa Monica. This final project, between Bundy Drive and the west portal of the Santa Monica Tunnel, should be in operation by the end of 1965—less than four years after the first portion of the Santa Monica Freeway was opened in the East Los Angeles Interchange.

Opened to traffic during 1964 were:

A 4.6-mile segment between Vermont Avenue and La Cienega Boulevard. This stretch was opened by stages in October and November, following dedication ceremonies October 22.

A one-mile portion from Bundy Drive to the San Diego-Santa Monica Freeway Interchange, an opening that permitted partial use of the interchange, which had been completed last August. This segment is part of a 3.6-mile, $7.7 million contract to carry the freeway to the Olympic Tunnel.

The opening of the 2.5 miles between La Cienega Boulevard and Overland Avenue in January 1965 made the interchange fully operable and provided uninterrupted freeway from downtown to west Los Angeles.

Drawn in at the right is the planned route through Santa Susana Pass. The first project on the Simi Valley Freeway will be advertised for bids this fall.

Simi Valley Freeway (Route 118)

Decisions last year on alignment for 35.8 miles of the Simi Valley Freeway completed this route's adoption throughout—from the Santa Paula Freeway on the west to the Foothill Freeway on the east, a distance of 53.4 miles.

Adopted were:

Ventura County: 4.9 miles between the Route 126 Freeway and La Vista Avenue on June 24, and 19.3 miles between La Vista Avenue and First Street in Simi on December 16.

Los Angeles County: 11.6 miles in the San Fernando Valley between DeSoto Avenue and the Foothill Freeway on September 1.

Funds were budgeted for construction of a 4.5-mile segment which will link Ventura and Los Angeles Counties through the congested Santa Susana Pass. This project, the first to be scheduled on the route, will be underway this fall and will include extension of Santa Susana Avenue and widening it to four lanes between the freeway and Devonshire Street. A total of $9,500,000 has been allotted for the work, which will require excavation of about 8,000,000 cubic yards of earth. Contract limits are from near DeSoto Avenue in the west San Fernando Valley to Kuehner Drive in the east Simi Valley.

An adjoining project to the west, from Kuehner Drive to Tapo Street, a distance of three miles, is tentatively scheduled for construction during the 1966–67 fiscal year, subject to future budgeting. It is anticipated that the two freeway projects can be timed for nearly simultaneous completion, thus providing 7.5 miles of freeway service to the community of Santa Susana within a few years.

Meanwhile, traffic relief will be afforded on paralleling Los Angeles Avenue under two contracts running from Smith Road to Tierra Rejada Road, a distance of 8.5 miles. This facility will be widened from two to four lanes by late 1966. Estimated cost is $1,100,000.

Ventura Freeway (Routes 101, 134)

The Ventura Freeway, which will run 75.4 miles from the Golden State Freeway west to the Santa Barbara County line in District 7, is built to full freeway standards in the city of Los Angeles.

During 1964, six projects were put under construction or completed to bring the freeway to full standards between the west city limits of Los Angeles and Thousand Oaks in the Ventura County area. Completed were the Kanan Road and the Triunfo Road Interchanges; under construction were the Craftsman Interchange, Calabasas Overcrossing, Old Ventura Road Interchange, Rondell Park Interchange, Agoura Road Interchange, Hampshire Road Interchange, and Live Oak Undercrossing.

From Thousand Oaks northwesterly to a point near the Route 126 Freeway, a series of design projects are in preparation to complete conversion to freeway standards and to improve the existing freeway facilities. These projects include an improvement of the Borchard Road Interchange; addition of freeway interchanges at Cunningham, Lynn and Ventu Park Roads, Wendy Drive, Reino and Arneill Roads; expansion of Las Posas Road Interchange; and conversion of a three-mile segment to six-lane freeway between Vineyard Avenue and Telephone Road. Constructed in this area were the Central Avenue and Garden Acres Interchanges.

From the Route 126 Freeway to two miles beyond the west city limits of Ventura, the freeway is built to full standards. From that point northwesterly to the Santa Barbara county line, 10.5 miles of freeway are in design, including conversion of 3.5 miles of expressway to freeway.

In Los Angeles County, design is in progress to widen the freeway from six to eight lanes between Topanga Canyon Boulevard and the west city limits of Los Angeles.

STATUS OF DISTRICT 7 FREEWAY-EXPRESSWAY PROJECTS

SUMMARY AS OF JANUARY 1, 1965

Freeway or expressway name	Route number	Miles adopted	Open to traffic	Under construction	Expended to date in $1,000's
Antelope Valley	14	52	14.7	7.7	24,065
Artesia-Riverside	91	37.7	19.8	..	49,128
Beverly Hills	2	..	..	..	..
Century	42	..	..	..	..
Corona	71, 210	8.8	4.8	..	1,197
Corona del Mar	73	6.8	2.2	..	798
Foothill	210, 30	52.2	1.7	..	36,365
Garden Grove	22	14.8	5.3	6.6	37,506
Glendale	2	12	2.5	..	26,290
Golden State	5	71.6	71.6	..	164,881
Harbor	11	22.4	22.1	..	104,880
Hawthorne	107	..	..	..	..
Hollywood	101, 170	16.1	11	..	69,092
Huntington Beach	39	..	..	..	..
Industrial	47	..	..	..	..
Laguna	133	8.2	2	..	673
Long Beach	7	26	19.6	1.1	59,688
Malibu-Whitnall	64	..	..	..	..
Marina-Slauson	90	2.8	..	..	3,288
Metropolitan Bypass	138	21.8	..	..	..
Moorpark	23	17	..	..	168
Newport	55	17.5	13.7	..	24,090
Ojai	33	14	4.1	..	4,803
Orange	57	19.4	..	..	13,407
Ortega	74	..	..	..	..
Pacific Coast	1	45.1	11.4	..	11,011
Pasadena	11	8.2	8.2	..	10,785
Pomona	60	30.3	..	3.5	50,698
Reseda	14	..	..	..	..
Rio Hondo	164	0.9	0.7	..	791
Route 48	48	14.9	..	..	..
Route 126	126	49.5	5.1	8.6	19,503
Route 134	134	8.2	2.3	..	56,709
Route 150	150	..	..	..	..
Route 232	232	2.4	..	..	..
San Bernardino	10, 110	30.6	30.6	..	59,881
San Diego	5, 405	93.7	73.1	11.3	270,098
San Gabriel River	605, 240, 243	28.1	6.6	15.3	89,464
Santa Ana	5, 105, 101	43.1	43.1	..	99,261
Santa Monica	10	16.2	11.9	4.3	181,593
Seaside	7	2.1	1.5	..	19,864
Simi Valley	118	47.1	..	..	30
Ventura	101, 134	75.4	67.3	..	121,376
Yorba Linda	42	3.1	3.1	..	2,517
Totals	..	920	460	58.4	1,613,880

Equal Opportunity

Training Sessions Based On Governor's Code

By MICKEY MATSUMOTO, Assistant Training Officer

While the ink was still drying on the Governor's Code of Fair Practices, the Division of Highways took steps to implement the new code among its nearly 17,000 employees.

In September 1964, the Division of Highways became one of the first state agencies with a statewide management training program focused on equal opportunity employment. As this program got underway, State Highway Engineer J. C. Womack reemphasized the long established policy of the division's equal employment practices, by saying ". . . We have been successful in implementing both the letter and the spirit of the code so far, but projects such as this are excellent insurance that all our employees and those who seek employment with us will continue to receive fair and equitable treatment."

What, then, is equal opportunity employment? What does it mean in terms of hiring practices?

Equal opportunity means just what it says. It is assuring that all employees and applicants are appointed, assigned, trained, evaluated, and promoted on the basis of merit and fitness. Race, color, religion, national origin and ancestry have no bearing in these matters. In the division it means the continuing practice of hiring the best qualified person for the job. In order to appreciate the emphasis this program is receiving, we have to start with the basic principles of social responsibility.

State Assumes Leadership

As an agency of society, the state government has assumed leadership in solving difficult human problems. Specifically, each individual, as a part of society, has an obligation. California has been successful in dealing with many complex problems, but has never stopped striving for improvement. Equal opportunity employment is a reflection of this drive.

Opening a training session on equal opportunity employment at the District 3 headquarters in Marysville, Mickey Matsumoto of Headquarters Training Section talks to a class which includes (facing camera, left to right) District Engineer W. L. Warren, Assistant District Engineer R. E. Biggs, Construction Engineer M. E. Nelson and Assistant District Engineer H. F. Sherwood.

In July 1963, the Code of Fair Practices was issued as the official policy of California's executive branch. It carried with it an outline of positive steps to be taken by all agencies. Among these steps was a requirement for training in the areas of equal opportunity employment and human relations.

In December 1963, Governor Edmund G. Brown called a two-day workshop on equal opportunity in state service. Deputy directors, training and personnel officers from 45 state departments discussed methods of implementing the code. The conclusions reached by the participants led to recommendations and suggestions on how best to avoid pitfalls and, more important, identified areas in which statewide efforts should be concentrated. As a result of the workshop, Ray Varley, assistant director, was appointed human relations coordinator for equal opportunity employment in the Department of Public Works. In the Division of Highways, Scott Lathrop, engineer in charge of personnel and public information, was appointed the division human relations coordinator. With these appointments, the division training section set to work on the task of planning and developing an effective training program. This was in the early months of 1964.

Training Objectives

All through these beginning stages, efforts were directed toward forecasting resistances to the program and planning training objectives. It was known, for example, that there were basic resentments concerning this sub-

ject matter over and above those which are normally anticipated for any general training program. Some managers did not feel training in this area was needed. Moreover, they objected to what some considered an implication that they were not already practicing equal employment principles in their jobs. Most did not have the sense of urgency that stems from an awareness of the problems. Reaction seemed to be in terms of "they," "them," "you" and "others," rather than on an "I" or "we" basis.

Still another barrier was the risk of implying "preferential treatment" rather than equal opportunity employment. The training staff attempted, as much as possible, to anticipate these resistances and resentments. Ultimately, these efforts were rewarded.

Program objectives were to: (1) *Allay fears and concerns among employees about what organizational policy would be.* For example, it was clearly outlined that reverse discrimination was not the intent. (2) *Motivate managers to think, talk about, and act on racial issues.* Too many individuals felt that racial issues were either not to be discussed, or only a subject for philosophical discussion rather than for positive action. (3) *Introduce pertinent social science findings on a practical rather than an academic level.* Initial reaction to the subject of equal opportunity employment indicated a lack of knowledge in this area. (4) *Insure full application of the code on the job.*

Extensive Research

In order to meet these objectives, extensive research was conducted through personal contacts with experts in the field of human relations. Library research presented an almost overwhelming amount of literature that had to be read and screened before a single word of training material could be prepared. The course material was written and rewritten, always keeping in mind the importance of its objectives.

The end result was a seven-hour training session. Prior to these sessions, literature in the area of social sciences, as related to cultural differences, was studied by the persons who would participate. The training session itself concentrated on the ethnic composition of our work force, completion and discussion of quizzes, and case problems relating to actual work situations. By means of these training methods, participants were able to test and improve their ability to apply division policy and philosophy to their jobs. Free discussion in the session also allowed the participants to express their feelings and concerns, and to resolve any misunderstandings of the reading unit or of the policy.

Course Introduced

The course was introduced on September 23, 1964, to the management of District 5 in San Luis Obispo, and was completed in Sacramento Headquarters on January 14, 1965. More than 500 employees participated in the training, from district department heads to the State Highway Engineer. Thus, all persons responsible for hiring practices and enforcement of the policy attended. Also represented were members of the director's staff, managers and staff department heads from the Division of Bay Toll Crossings, and from the Division of Contracts and Rights of Way. Each manager and participant was asked to carry back to the job the basic philosophy of equal opportunity employment, knowledge of the division's policy and motivation to take positive action to carry out the code.

The training was reemphasized by Mr. Womack in a personal letter to each district engineer throughout the state. The letter asked for a personal commitment on the part of each district engineer and requested that he issue a letter to all employees on the pertinent points outlined in the code. Herein lies the key. Without the continuing support of the division's management, the program would not survive.

If you look about you, you will probably see many employees who represent minority groups. This doesn't mean, however, that no problem has existed in the area of equal opportunity employment.

Cannot Relax Effort

It also doesn't mean we can relax and forget the whole matter. For example, we have introduced sessions on equal opportunity employment into our regular management and supervisory training program, so that when new people assume responsibilities for hiring practices and policy enforcement, they will receive a basic understanding of the subject.

The question posed to the division and, for that matter, to society as a whole, is not "Are we doing a good job?" but "What else can we do?"

Where do we go from here and what success can we expect? These questions will only be answered by time, but we look forward to the success anticipated by Mr. Womack when he stated, "It is our hope that equal opportunity courses will promote better understanding among all our employees and that our employee relations in this important area will be even better than they have in the past."

Division Issues New Bridge Design Manual

A revised edition of its *Manual of Bridge Design Practice* has been issued by the Bridge Department of the California Division of Highways.

The revised edition is similar to the 1960 one but is updated to the American Association of State Highway Officials 1961 Design Specifications and the 1963 Interim Specifications.

The section on "Rolled Beam Bridges" has been replaced with one on "Structures Under Roadway Embankments." A new section on tunnels has been added.

Each section follows through the detailed design of its type of structure.

The 8½-by-11-inch clothbound manual has 644 pages of design theory, examples, illustrations and charts and tables.

The publication is available from the Office of Procurement, Documents Section, P.O. Box 1612, Sacramento, California 95807.

The price including postage is $12.50 plus 4 percent sales tax in California and $13.50 outside the United States. Remittance should accompany an order.

ITTE Conference

Legislation and SB 344 Highlight UCLA Sessions

Widespread interest in current proposed legislation was displayed by the majority of persons who attended the 17th Annual Streets and Highways Conference, sponsored by the Institute of Transportation and Traffic Engineering, at the University of California, Los Angeles, January 27–29.

The Thursday morning audience of approximately 550 conferees heard reports from Senator Randolph Collier, Chairman of the Senate Committee on Transportation, and Assemblyman Tom Carrell, Chairman of the Assembly Committee on Commerce and Transportation.

Collier's remarks outlined legislative proposals he intends to sponsor in 1965.

His first is the addition of one cent to the state gasoline tax on a temporary basis to accomplish the dual objective of taking care of emergency needs to highways and bridges damaged in recent floods while still permitting highway construction projects to go forward on schedule.

Among major participants at the conference were (left to right) George Langsner, Deputy State Highway Engineer and general chairman; Harmer E. Davis, Director of the Institute of Transportation and Traffic Engineering; State Senator Randolph Collier, Chairman of the Senate Committee on Transportation; and Assemblyman Tom Carrell, Chairman of the Assembly Committee on Commerce and Transportation.

Clarification Require

The Senator advised that certain aspects of the Collier-Unruh Local Transportation Development Act (Senate Bill 344) require clarification and said he will introduce legislation to make changes that "will assure administrative efficiency and less red tape."

He cited three legislative plans that would have a direct bearing on freeway procedures. The first would provide relocation expenses to families and businesses when properties are acquired by a state agency; the second would place independent hearing officers in charge of freeway route adoption hearings; and the third would call for a study to guide the Governor in making appointments to the Highway Commission in order that a broad spread of professional experience will be represented.

Other legislation would require all road commissioners appointed after December 31, 1965, to be registered engineers and safeguard them from dismissal.

Collier then declared that the fact that only comparatively minor changes in the California freeway and expressway system have been recommended to the Legislature this year by the Division of Highways is a tribute to the original design.

"But," he pointed out, "as always, they will be controversial in individual situations, especially where a deletion of mileage is concerned.

"And we can be assured that in a state as dynamic and changing as California, a rather major overhaul of the system will be due the next time around. Fortunately, by that time we will have results available from the comprehensive transportation studies now under way in our larger urban areas.

"We should also know the nature of the federal interstate program that will continue after 1972. And we will have the results of the transportation study of the aerospace industry has been invited to undertake.

"All in all, once these things have been accomplished, future Legislatures will have a much superior factual and analytical background upon which to base its decisions than we have had in the past."

Interim Studies Cited

Assemblyman Carrell lent further insight to legislative proceedings. He cited interim studies by the Assembly Committee on Commerce and Transportation, and correlated them to new legislation required because "providing road space for a mushrooming automotive population is one of the most vexing problems of our time."

Carrell declared that it is his opinion that the legislative task in the general field of highway transportation is a never-ending one because new legislation is constantly required to cope with a dynamic highway system that continues to develop in size and com-

plexity so that it in turn can keep pace with the ever-increasing number of vehicles utilizing it.

The rapid transit system proposed for the Los Angeles area should alleviate some traffic congestion in that area, according to Carrell. But he removed it from the "cure-all" category with the statement: "I am afraid, however, that by the time the transit system comes into being, the growth of population, coupled with a never-ending demand for motor vehicles, will leave us pretty much where we are today."

While describing testimony heard by his committee, Carrell said that "the committee's findings indicated that the Department of Public Works and the Division of Highways have done exactly what the law says they should do.

"They are charged with the responsibility to provide means to get from one place to another with a minimum of travel distance and at a minimum cost. This they have done."

Route Adoption Problems

In his discussion of problems involved in route adoptions, Carrell declared it inevitable that there should be an outcry from those who would have them go somewhere else and he said this discontent is reflected in recently suggested sweeping changes. "But," he added, "I say instead that a constructive approach to any problem that may exist is preferred to a sweeping abolition of an existing entity . . . and am confident that the Legislature will not be persuaded to throw the baby out with the bath water."

Other topics discussed during the conference ranged from electronic data processing in San Diego to reduced visibility studies in northern California, but two which had particularly broad appeal dealt with vehicles of the future and the highway complexes they will require and an evaluation of the effectiveness of the Collier-Unruh Act.

Vehicles of the future were discussed at a Saturday luncheon meeting by Wilbur Smith, President of Wilbur Smith and Associates.

Smith predicted that the foreseeable future will not be marked by radical changes in either automobiles or highways. He was skeptical of the development of any radically different engine and pointed out that known petroleum reserves will be only 10 percent depreciated by the year 2000.

He does anticipate more types of vehicles with the expansion of leisure time for the individual and his family. Smith used the development of the camper as an example and believes more vehicles designed to provide a service equally specific will reach the market.

Evolution of Auto Traced

Smith traced the evolution of the automobile through various areas. The time prior to 1920 was used in perfecting a vehicle of sufficient mechanical reliability that "it could be trusted to go down the road."

The next 20 years (1920–1940) were marked by the inclusion of safety and comfort factors.

From 1940 until 1960, Smith explained, was the engineering era in which automatic transmissions, power steering and like devices were added.

1960 marked the beginning of the present era which he identified as the "systems approach" and it is personified by the stress directed toward making the relationship between the vehicle and the complex of highways, roads and streets upon which it travels more and more compatible. It is in this present era that the automobile power plants will double in efficiency, Smith believes, but he is equally certain the gain will be tapped off to operate additional accessories.

Senate Bill 344 was the Friday morning theme. It provides for financial assistance from the state to cities and counties in the construction of certain "select" streets and roads. Funds are derived from the state gasoline tax and must be expended exclusively for construction and rights-of-way in accordance with specific criteria.

David K. Speer, San Diego County Road Commissioner, observed "there have been as many suggestions for revision and criticism of portions of the act as there are cities and counties in the State of California."

But in retrospect, Speer believes the act has been successful and that the constructive results to the motoring public are emerging to where they can be seen.

Collier-Unruh Act History

The legislative history of the Collier-Unruh Act was traced by Richard Carpenter, executive director and general counsel of the League of California Cities.

He explained that many administrative problems had been faced by the local agencies during development of the procedural policies, but that fortunately through the corrective efforts of committee representing the "league," the supervisors' association and the state, many of the "procedures" had been modified and are now more workable.

Charles T. Ledden, city and county projects engineer for the California Division of Highways, outlined basic tenets that govern the California Highway Commission and the Division of Highways in allocating the funds and administering the program.

According to Ledden, the more important problems raised were ones not difficult to solve once properly defined. Among them were the tasks of identifying "eligible work" and "eligible matching funds," minimizing red tape, and justifying the state's demand that construction be of such design that it is capable of meeting (or being later adapted to meet) traffic needs of 20 years from now.

Other Speakers

Other speakers at the general sessions included Harmer E. Davis, director, Institute of Transportation and Traffic Engineering, who outlined some of the conference's aims; Newton H. Templin, road commissioner, Los Angeles County, who spoke on the Collier-Unruh Act; Myron Tatarian, director of public works, County and City of San Francisco; and Sheridan E. Farin, regional engineer, Region 7, U.S. Bureau of Public Roads, who discussed future federal planning.

Also Slade Hulbert, associate research psychologist; Albert Burg, assistant research psychologist; Edward Levonian, associate research psychologist; and Harry W. Case, assistant director (all ITTE staff members). These individuals formed a panel and discussed human factors in traffic safety.

General meetings were conducted each morning and delegates attended

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State Parks Chief Clarifies National Tribute Grove Status on Route 199

March 15, 1965

Mr. Sam Helwer
District Engineer
Division of Highways
430 West Wabash Avenue
Eureka, California

Dear Mr. Helwer:

This letter is for your information and to set the record straight regarding the physical relationship of Jedediah Smith Redwoods State Parks' National Tribute Grove and the adopted freeway route through that portion of Del Norte County.

As you know, Highway 199 now traverses nearly two miles of the northwest corner of Jedediah Smith Redwoods State Park. As you also know, the adopted freeway route through this area avoids all but some 5,000 feet of a protruding tip of park land that has been the center of some unfortunate misunderstanding.

It is now agreed that, under the terms of a resolution adopted 20 years ago by the State Park Commission, this narrow neck of park land, presently crossed by Highway 199 and to be crossed by the freeway, is technically a part of the National Tribute Grove.

Acreage records kept by the Save-the-Redwoods League, which recommended the February 1945 resolution of the State Park Commission, had led my staff to advise me that the adopted freeway route would pass one-third of a mile or more from the nearest corner of the National Tribute Grove. I, in turn, so advised you.

The State Park Commission resolution in 1945 described the National Tribute Grove as "the redwood forest lands in the (then) Mill Creek Redwoods State Park, Del Norte County, not yet bearing names as memorial groves, " plus "that redwood forest land added to this state park under terms of the purchase option now in effect."

Thus, according to the resolution which created it, the National Tribute Grove is not a grove at all, but a large area of redwood park lands covering many widely scattered groves in a number of drainages. It even includes several disconnected parcels as far as five miles outside the main body of the park.

The statutes clearly show that the State Legislature has not considered all of this land to be held as the National Tribute Grove. In 1951 the Legislature authorized the exchange of some parcels that were technically part of the Tribute Grove, stating that "the limitation for use for park purposes shall not apply."

In 1963 the Legislature authorized the sale of some lands included in the original description of the National Tribute Grove, noting that they had been "acquired for exchange purposes."

A study of the literature of the Save-the-Redwoods League shows that its primary purpose in sponsoring the National Tribute Grove was to protect what the League described as the "giant trees on Mill Creek in Del Norte County, by many considered the finest of all the redwood groves."

EDITOR'S NOTE

In the third article of the Redwood Highway series, which was published in the September–October 1964 issue of this magazine, the statement was made that the adopted route for the relocation of Highway 199 in Del Norte County passed to the north of the north limit of the National Tribute Grove in Jedediah Smith State Park. This statement was subsequently challenged by representatives of the Sierra Club before a legislative committee.

The statement as published was excerpted from a letter written to District Engineer Sam Helwer at Eureka by Charles A. DeTurk, Chief of the State Division of Beaches and Parks, under date of September 17, 1964.

In the accompanying letter dated March 15, 1965, Mr. DeTurk gives the background of the National Tribute Grove designation and explains that the adopted freeway routing of Highway 199 does cross a narrow neck of park land which is technically a part of the grove.

As you know, the narrow tongue of outlying park land to be crossed by the improved highway is completely outside the Mill Creek drainage, which we firmly insist must be kept inviolate for all time.

In adopting the National Tribute Grove resolution 20 years ago, encompassing nearly all of the main area of Jedediah Smith Redwoods State Park and even some lands miles away from it, the State Park Commission had no way of knowing that the resolution would not work perfectly for all time in the best total interests of the public and the park.

There can be no question that, for the safety of the driving public on this main artery of through traffic, heavily used by huge trucks and buses and crowded with tourist traffic in summer, Highway 199 must be realigned and brought up to safe highway standards.

Most fortunately, the Division of Highways is cooperating fully with the Division of Beaches and Parks to

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Mount Shasta

New Section of Interstate 5 Traverses Spectacular Area

By CHARLES MOSS, Resident Engineer

On October 17, 1964, State Senator Randolph Collier officiated at the dedication of another 6.8 miles of Interstate 5 four-lane freeway from 4.6 miles south to 1.5 miles north of Mount Shasta city limits. With the completion of this section, there are approximately 37 miles of continuous four-lane expressway and freeway from the upper limits of Shasta Lake to Mount Shasta.

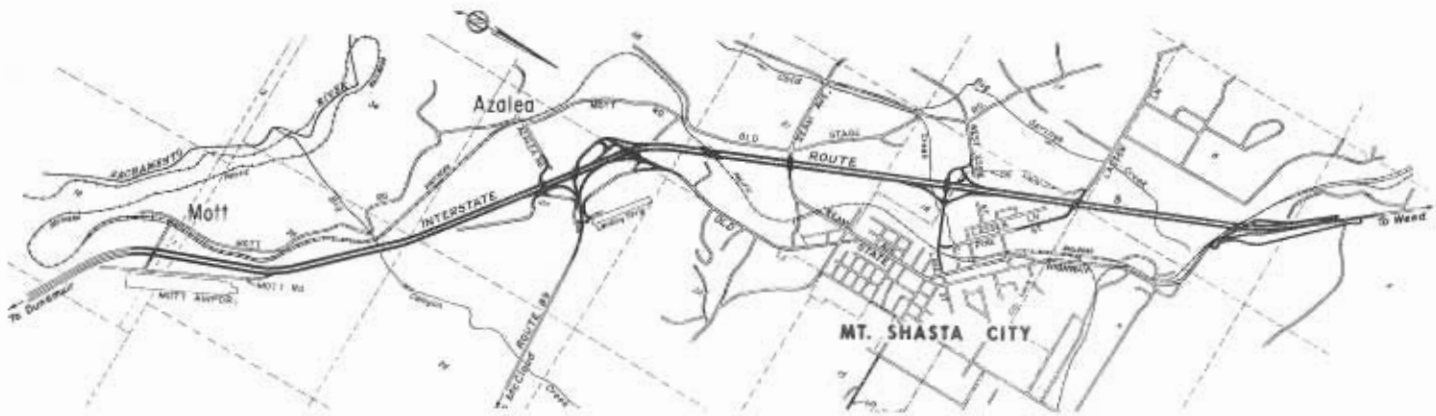
This section of freeway exhibits some of the most beautiful scenery found in California and passes along the west slope of majestic, snow-covered Mount Shasta.

The area is both a winter and a summer playground. The ski lifts on the snow-covered slopes of Mount Shasta attract 80,000 persons each season. It is also recognized as a hunting, fishing, and camping area. The proposed Box Canyon Dam, about two miles southwest of the city of Mount Shasta, is expected to attract many more summer vacationers to the area.

Old Road

In general, the old highway consisted of two 10-foot bituminous-

The completed section of I-5 freeway looking south near Mount Shasta City.



A map showing the location of the new freeway section through the Mount Shasta City area.

Looking toward Mount Shasta from above the completed freeway south of Mount Shasta City.

paved traveled lanes on a 23-foot roadbed with widening only in the major business area of the City of Mount Shasta. Most of the original alignment was on a route constructed in 1922 and 1923.

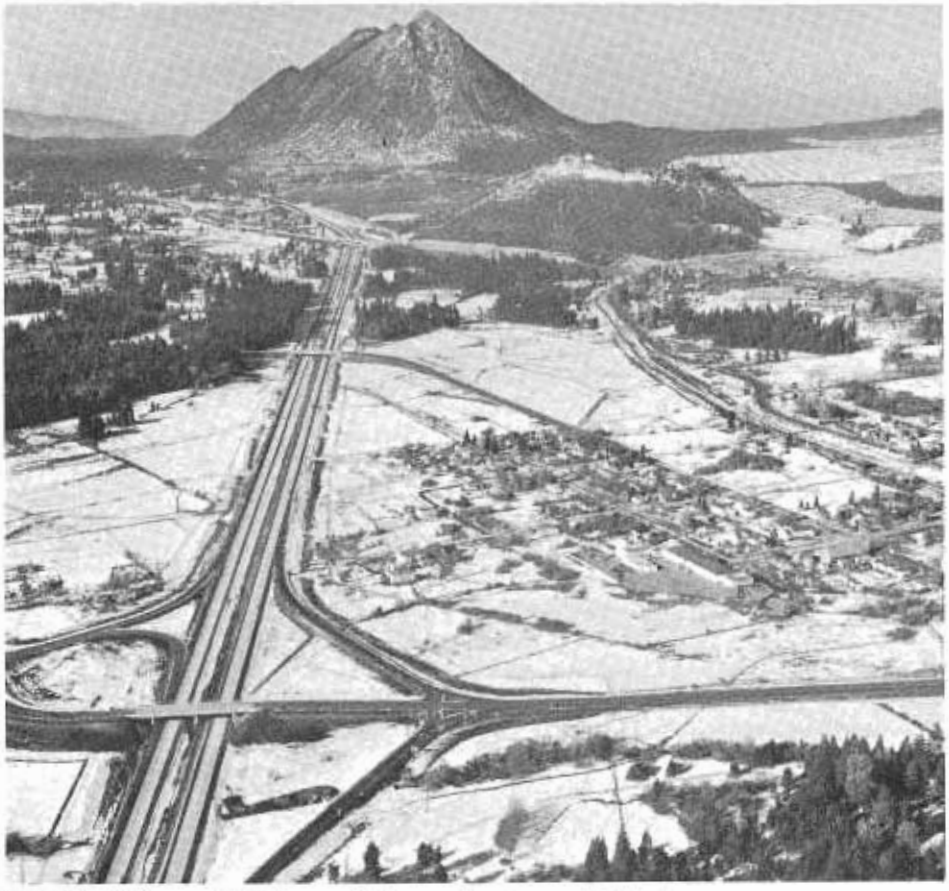
The portion through the rough terrain south of Mount Shasta was very crooked and had many curves of less than 500-foot radius. This old route offered very limited opportunities for passing slow-moving trucks on the steep grade. During heavy traffic flow, it was quite common to have as many as 50 cars and trucks delayed by a slow-moving vehicle for a distance of three to four miles.

During the winter months when snow and ice conditions prevail, sharp curves combined with steep grades would often cause trucks to block the roadway.

New Roadway

The minimum curve radius on the freeway is 3,000 feet and the maximum grade is 4 percent.

The typical section has a 60-foot median, two 12-foot lanes of 8 inches of portland cement concrete in each direction, with 10-foot asphaltic concrete shoulders on the right of traffic.



An aerial of the completed freeway looking northwest toward Black Butte Mountain. Structures are Lake Street overcrossing (foreground), Lassen Lane overcrossing (center) and North Mount Shasta railroad underpass in the distance.

Additional lanes can be constructed in the median for an ultimate six-lane section.

Full interchanges were constructed at the junction of State Route 89 and at the Lake Street intersection, with partial interchanges connecting the freeway to old Route 99 on each side of the City of Mount Shasta. Overcrossings to accommodate local traffic were built at Azalea Road, Ream Avenue, and Lassen Lane.

A total of 850,000 cubic yards of roadway excavation was removed by contour grading the combined system of ramps composing the Route 89/5 separation and the south Mount Shasta interchange. This excavation was used for the 660,000-cubic-yard embankment at Pioneer railroad overhead.

The project required two crossings of the Southern Pacific Company railroad tracks. The Pioneer overhead crossing consists of twin reinforced concrete box girder bridges, 241 feet long, each with deck measurement of 39 feet between curbs.

The north Mount Shasta crossing consists of a riveted steel plate girder railroad bridge underpass which was constructed under a prior contract and completed during the early stages of this contract.

Unusual Conditions

Between the Pioneer railroad overhead crossing and Lassen Lane overcrossing the line traverses an area of marshy, peat, meadowland with numerous artesian springs which are fed from melting snow on Mount Shasta.

The roadway section in this area consists largely of shallow fills. The original ground was excavated to a depth of five feet below finished grade and to a width of three feet beyond shoulders. This mud and peat was replaced with a very porous material excavated from the roadway approximately two miles to the north. To drain and stabilize the foundation, 21,300 feet of perforated pipe was placed and interception trenches, four to eight feet deep, were excavated on each side of the roadway.

The water table in this area is seldom more than two feet below ground. Several artesian springs were covered during embankment construction. The water forced its way up through the shallow embankment to heights of 12 feet above the bottom of adjacent interception trenches. Later, each spring was opened and drained with an additional perforated drainage system.

Extreme care was necessary in the placing of a 60-inch reinforced concrete pipe and construction of the embankment at Big Springs Creek, to prevent silt from entering the stream. This stream, the headwaters of the Sacramento River, is also the water supply of the Mount Shasta State Fish Hatchery, one of California's oldest trout hatcheries. The hatchery reported that it processed 17,000,000 trout and salmon eggs during the time this project was under construction without loss attributable to the highway construction.

In placing the portland cement concrete pavement on this project, the contractor used a central mix plant and hauled the mixed concrete in dump trucks to a slipform paver.

In his efforts to complete construction before onset of winter, the contractor adopted an around-the-clock concrete paving operation. Elimination of construction joints and carryover of finishers coupled with the increased efficiency of a continuous operation were economic advantages of this paving procedure.

This project was constructed by Fredrickson and Watson Construction Company at a cost of $4,800,000. The work was done over a period of 22 months and was completed in December 1964.

Indexes Available For Old Issues

Long-time readers of *California Highways and Public Works* whose files of the magazine antedate 1937 may now obtain copies of a specially printed index to these early issues. A limited reserve supply of this index, covering the issues through December 1936, has been declared surplus and will be sent to interested readers on a first-come first-served basis while the supply lasts.

Requests should be addressed to the editor.

ITTE Conference

. . . Continued from page 55

workshops on Thursday and Friday afternoons.

George Langsner, Deputy State Highway Engineer, was general chairman of the conference. Tatarian and Templin were vice chairmen. Robert E. Cron, Jr., ITTE, was general secretary, and Wayne H. Snowden, ITTE, was in charge of publications.

State Parks

. . . Continued from page 56

not only protect Jedediah Smith Redwoods State Park in every way possible, but to so locate the new highway that it will provide for an even better park.

The present Highway 199 traverses the floor of the Smith River valley through prime redwood forest lands we hope to add to the park. Through the cooperation of the Division of Highways, the new freeway route has been moved to the other side of the Smith River, away from the park, leaving undisturbed the redwood forest we hope to acquire for future park use.

Considering the total package of park values, I am convinced that the basic highway route adopted through the general area of Jedediah Smith Redwoods State Park is the best of the feasible routes that man can devise. Furthermore, I am confident that any possible refinements of this basic route will be worked out by the state agencies concerned to gain the utmost in park and highway benefits.

Sincerely,

CHARLES A. DETURK
Chief

EEL RIVER BRIDGE REPLACED

The State Department of Public Works has awarded a $2,020,000 contract for constructing a bridge across the Eel River on US 101 2½ miles south of Scotia, Humboldt County.

The former bridge was destroyed during the Christmas floods.

The State Department of Public Works has awarded a $1,444,000 contract for widening Interstate 80 (Elvas) Freeway from four to six lanes between A Street in Sacramento and just north of Arden Way.

Experimental Paint Results

By H. A. ROONEY, Senior Chemical Testing Engineer, and
A. L. WOODS, Bridge Painting Inspector

The January–February 1962 issue of *California Highways and Public Works* carried an article describing protective coatings applied to Leffingwell Creek Bridge under a continuing experimental program by the Materials and Research Department and the Bridge Department of the Division of Highways. The report was based on observation of the paint condition in May 1961, about 2½ years after applications were made in 1958.

The Leffingwell Creek Bridge, on Route 1 just north of Cambria, in San Luis Obispo County, was chosen for this series of tests because the incidence of corrosion at the bridge site is the worst encountered in the entire state highway system. This bridge and several others similarly situated close to the ocean present an ideal location where protective coatings may be tested in very corrosive environment of moisture and salt-laden winds. The severity of the corrosion problem is indicated by the painting history of the bridge. Built in 1932, it required eight paint jobs up to 1958. This amounts to an average of one paint job every 3¼ years, and the maximum service life obtained from any one of the eight jobs was 6 years. Figure No. 3 shows what happened when the paint job was allowed to stand for 6 years.

Strong Indication

The May 1961 report made no definitive evaluation of the various systems because the exposure period was too short to permit accurate appraisal. However, there was strong indication of what was to follow. Now,

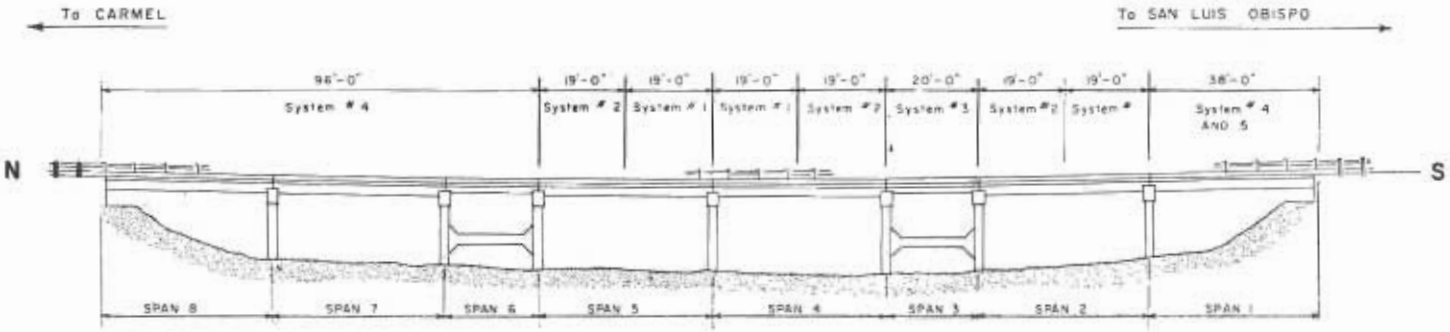


FIGURE 1—A diagram of the Leffingwell Creek Bridge on Route 1 in San Luis Obispo County showing the location on the structure of the various types of paint which were studied.

FIGURE 2—A photo of the actual bridge shown in the diagram above.

FIGURE 3—Condition of average paint system applied in 1952 after six years' service.

after nearly 6 years of service, a conservatively reasonable projection of service life expected from each system can be made.

Rating of the systems and conclusions reached follow:

1964 ANNUAL REPORT ON EXPERIMENTAL WORK

Leffingwell Creek Bridge, No. 49-44
Painted October 1958
Inspection Date February 20, 1964

Ratings are made on an inverse scale of 10 to 0. A rating of 10 would indicate no rust, and lesser ratings indicate more rust.

Span 1—System No. 4, total 6 mils.
Ends of several bracing members showing tubercules. Some rust around bearings. A few spots on bottom of bottom flange and on bottom flange edges. Top flange edge rust growing slowly.
Rating: 8.

Span 1—Four mils red lead primer, State Specification 58-G-53, and two mils of State Specification 58-G-79 green topcoat. More rust than on vinyls in adjacent areas.
Rating: 7.

Span 2—System No. 1, total 6 mils.
Good shape. Rust or rust stain along top edge of top flange does not appear to be growing much. Bracing good. Light rust on steel slivers has not penetrated steel proper.
Rating: 9+.

Span 2—System No. 2, total 8 mils.
Considerable rust throughout on webs. Worst area on webs near pier.
Rating: 6.5.

Span 3—Inorganic zinc silicate—laboratory production. Application too recent to rate properly (1962).

Span 4—System No. 2, total 8 mils.
Freckle rust throughout. This system shows no promise for coastal exposures. Despite additional thickness more rust has occurred. Will discard this one.
Rating: 6.

Span 4—System No. 1, total 6 mils.
Only rust is on abrasions and laminations. Excellent shape.
Rating: 9+.

Span 5—System No. 1, total 6 mils.
Condition similar to Span 4, System No. 1. Very good.
Rating: 9+.

Span 5—System No. 2, total 8 mils.
Better shape than same system in other spans. Some rust on bottom and top flanges and on flange edges.
Rating: 7.5.

Spans 6, 7, 8—System No. 4, total 6 mils.
Very good shape for 6 years' exposure. Light rust scattered throughout mainly on flange edges, bracing member edges and ends and around bearings.
Rating: 8.

Conclusions

All systems are performing better than expected in such a highly corrosive area.

FIGURE 4—Condition of paint system No. 4 applied in 1958 after six years' service. This is the same area as shown in Figure 3. The condition in Figure 4 is typical of system No. 4.

FIGURE 5 Typical condition of paint of system No. 1.

FIGURE 6—Typical condition of paint of system No. 2.

System No. 1 performance is currently the best. The relative absence of breakdown makes it impossible to accurately estimate how long this system will last since there is no way to determine how much zinc has been lost through corrosion processes. A conservative guess is six years longer, or a total of 12 years servicelife.

System No. 4 rates second best, and repainting will probably not be necessary for another four to five years or longer. Servicelife will then be 10 years or longer.

More rust exists in areas covered by System No. 2, but it now appears that no replacement of paint in those areas will be necessary for about two or three more years. It could possibly last longer. This will give a minimum servicelife of eight years or more.

Rust Condition Not Typical

The rust condition along the top flange edges which was discussed at length in previous reports is more or less ignored in this report since it is not typical of that normally encountered. However, it is worth noting that less rust on these edges is found in areas covered by System No. 1. This is probably traceable to galvanic protection afforded by the zinc which tends to inhibit rust penetration or undercutting of sound paint by spreading rust. Results of accelerated tests on scribed sections in laboratory salt-spray cabinets confirm field findings in this respect.

Similar results are found in field applications of zinc-rich coatings in both organic and inorganic vehicles, although they are less pronounced with the organic. A more extensive use of inorganic zinc silicate coatings on our coastal bridges seems to be economically justified. It appears that increased servicelife more than offsets the slight increase in total costs.

TABLE I

COATINGS

System No. 1

3 mills of inorganic zinc pigment-silicate binder cured with a phosphoric acid solution, curing agent scrubbed off with water, vinyl wash primer, State Specification 52-G-52, applied followed by 2 mils of vinyls, State Specifications T58-G-40 and T58-G-41

. . . Continued on page page 66

Highway 395

Construction Continues on Important South State Route

By F. A. THUDIUM, Project Engineer—Design

The California freeway-expressway system, totaling 12,414 miles of road, was signed into law by Governor Brown on June 19, 1959. The 102 mile portion of US 395 linking Riverside and San Bernadino to San Diego is one of the important segments of road included in this system.

In addition to the three major metropolitan areas of Riverside, San Bernardino and San Diego, two new areas have started developing along this route. The Rancho California is now in the planning stage. A population concentration of 400,000 people is envisioned for this 87,500-acre development located south of Perris near the Riverside and San Diego county line.

About 20 miles south of the proposed Rancho California development and 30 miles north of San Diego, we have the Escondido and the North San Diego City area rapidly developing. Escondido is a long established city, but within the last ten years it has been one of the fastest growing areas in San Diego County.

City Limits Extended

Early in 1962 the San Diego city limits were extended approximately 10 miles to the north to include the proposed communities of Rancho Bernardo and Rancho Los Penasquitos. The proposed $300,000,000 Rancho Bernardo Community has an expected population of 50,000 on about 5,000 acres by 1975. The 14,000 acre Los Penasquitos Community is expected to develop a population of about 150,000 in 20 years. Both communities will contain the basic elements of industrial, commercial, recreational and residential areas.

In 1961 it was estimated that the two-lane highway section between

Highway 395 is an important north-south artery in and north of the San Diego area.

San Diego and Escondido was carrying approximately three times the traffic for which it was designed. US 395 was not designed for heavy truck traffic, and the increase of commercial use between San Diego and San Bernardino on the very steep and lengthy grades adds to the congestion.

Construction of the 16-mile section of US 395 between Pomerado-Miramar Road and Escondido was divided into four units. Each unit has an initial four-lane construction of an ultimate eight-lane development with separated roadways and a variable width median.

Design standards established for major freeway routes were used on these projects. The 2,000-foot minimum radius curves and 6 percent maximum grades on the existing highway have been improved to 4,000-foot minimum radius curves and approximately 3 percent maximum grades.

The first unit between 1.7 miles north of Pomerado-Miramar Road and 1.4 miles north of Poway Road will be completed in May 1965 at a cost of $3,400,000. O. K. Mittry and Sons handled this 3.6-mile section.

The second unit between Pomerado-Miramar Road and the Poway Road construction has an expected completion date of December 1965, at a cost of $2,000,000. Daley Corporation is handling this 3.2-mile section which was awarded January 21, 1965.

Poway Road Unit

The third unit, a 5.2-mile section north of the Poway Road construction, is expected to be under contract this summer. This section, estimated at $3,600,000 will complete the freeway through Rancho Los Penasquitos and into Rancho Bernardo to the Rancho Bernardo Road Interchange.

The fourth unit, planned for construction beginning in early 1966, if funds are available, will complete the four-lane freeway between Pomerado-Miramar Road and the four-lane expressway through the City of Escondido. This 4.4-mile section, estimated to cost $3,500,000 will have a southbound map stop just inside the northern city limits of San Diego in the Rancho Bernardo area.

Construction of Unit I involved 2,500,000 cubic yards of excavation of shattered and massive blocks of volcanic rock in the 200 foot "Big Cut" on the south end of the project. The shattered rock combined with a thin

clay layer resulted in a slide in the easterly face of the "Big Cut." This slide of approximately 100,000 cubic yards occurred in three phases. Phase one lasted about six hours and contained the majority of dirt. Phase two was a minor continuation of phase one. The third and last phase was of a larger magnitude and lasted approximately two days. After several weeks, the material was removed and the cut slope was laid back to the slope of an underlying bedding plane of approximately 1½:1.

Two New Bridges

Two bridges of this unit will now carry traffic over Los Penasquitos Creek just south of the Poway Interchange. The new prestressed composite girder bridge to be used for southbound traffic is approximately 135 feet

Looking northeast up Penasquitos Creek from above the present bridge and the piers of the new bridge. Poway Road is in the background.

above the creek bed and 65 feet above the existing concrete arch bridge constructed in 1949. The four piers of the new bridge were constructed by the use of slipforms and continuous concrete pours. A series of jacks and sightings on the centerlines of the end and side of each pier assured true vertical alignment.

Two construction projects in the City of Escondido are converting the existing two-lane conventional highway into an expressway. The first of these projects is now completed and extends the existing Escondido expressway south where it is to be joined ultimately by the earlier mentioned freeway.

The second project, which is in the grading stage of construction, will extend the existing expressway northerly to the point where it will join the future bypass freeway.

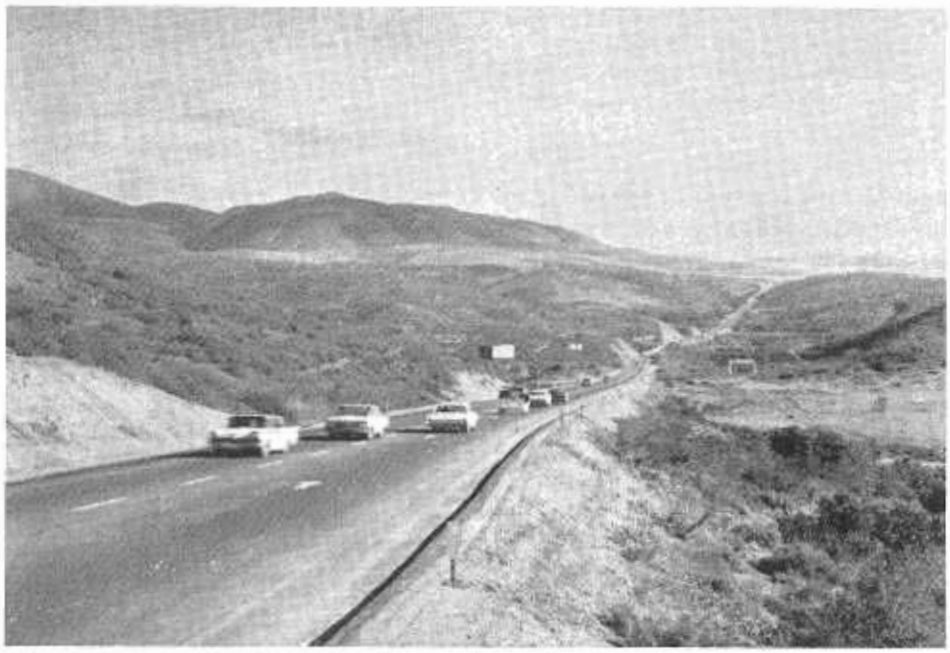
The Escondido Bypass will replace the existing expressway through town. Freeway agreements have been concluded with the City of Escondido and the County of San Diego in their respective areas.

Design Work Started

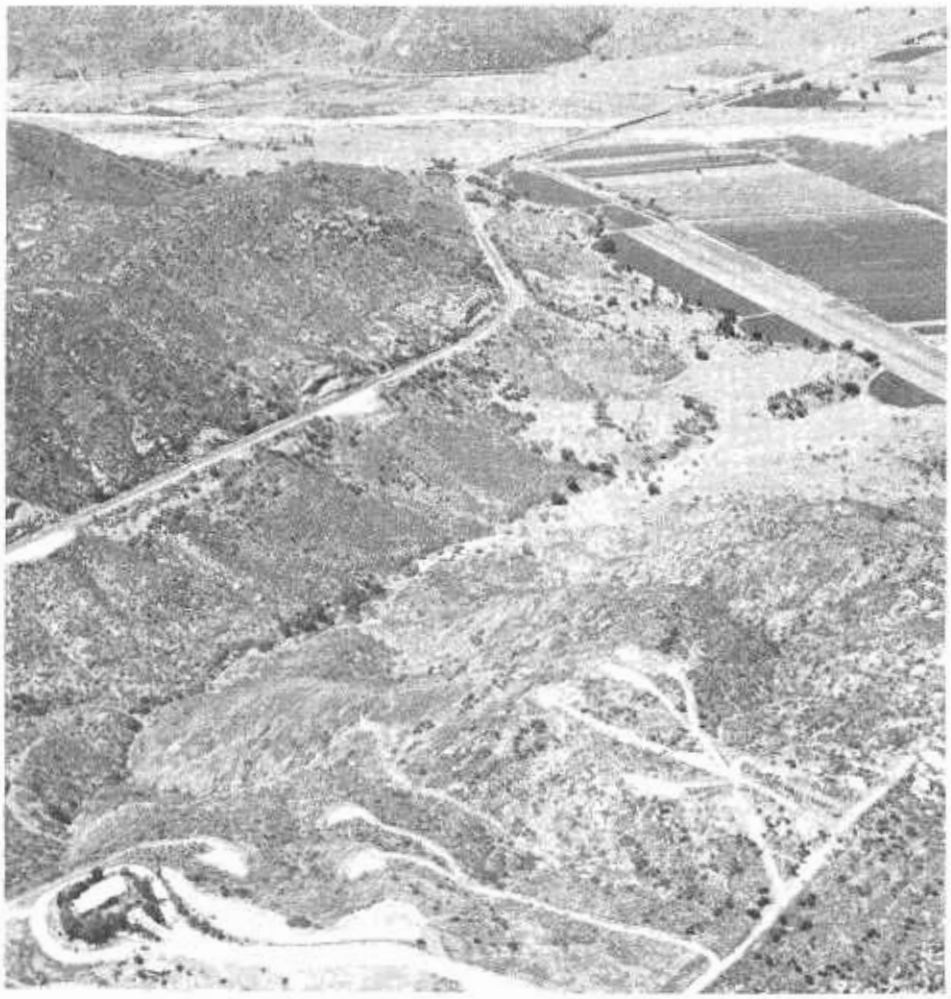
Design of the six-lane freeway has begun on this 10.6-mile section. The relocation will leave the existing route approximately 1½ miles north of Lake Hodges and will rejoin US 395 approximately three miles north of Route 78. This realignment bypasses the business and older residential areas to go through a sparsely settled area of avocado groves approximately one mile west of existing US 395.

The 20-mile section of US 395 north of Escondido to the county line is now in the planning stage. This section is possibly the key to the extent of ultimate use of this route, particularly by commercial traffic. This 20 miles through extremely rough and rocky terrain, crosses two main canyon areas of low elevation which necessitated the heavy 6- to 7-percent grades of extreme length, characteristic of the existing road. The northerly nine miles of this section is on the scenic highway system.

This rugged section is the potential bottleneck in this hundred miles of highway. The gradient and alignment problem has been solved from San Di-



Looking north into Penasquitos Canyon showing the present two-lane highway with 6-percent grade. Poway Road is in the background.



Looking northwest down a 7-percent grade section of present Highway 395 toward the San Luis Rey River. This is typical of the existing route north of Escondido.

ego through Escondido. After crossing the county line the terrain to the north is relatively flat and the existing highway has minimum gradient and good alignment.

Development of the north San Diego County area will be influenced by the solution of the location and design of this important segment of US 395.

EXPERIMENTAL PAINT

Continued from page 62 . . .

in alternating coats and a final coat of 1 mil of State Specification T58-G-49, vinyl paint, aluminum finish coat.

Total film thickness, 6 mils.

System No. 2

Vinyl wash primer, State Specification 52-G-52; 2 mils of semi-quick drying red lead primer, State Specification 58-G-53; 2 mils of white traffic paint, State Specification 55-G-95; 2 mils of vinyl paints, State Specification T58-G-40 and T58-G-41 in alternating coats; 1 mil of State Specification T58-G-49, vinyl paint, aluminum finish coat.

Total film thickness, 8 mils.

***System No. 3** **

Epoxy paint, 100 percent solids, made with an epoxy resin of viscosity 40–100 poise at 25°C and an epoxide equivalent of 180–195, 20 percent TiO_2 and 5 percent Cr_2O_3 cured with an epoxy amine adduct and applied by hot spray 15–20 mils thick.

System No. 4

Vinyl wash primer, State Specification 52-G-52; 4 mils of vinyl paints, State Specifications T58-G-40 and T58-G-41 in alternating coats; 2 mils of vinyl paint, aluminum finish coat, State Specification T58-G-49.

Total film thickness, 6 mils.

System No. 5

Vinyl wash primer, State Specification 52-G-52; 4 mils of semi-quick drying red lead primer, State Specification 58-G-53; 2 mils of phenolic iridescent green, State Specification 58-G-79.

Total film thickness, 6 mils.

INTERSTATE 5 EXTENDED

The State Department of Public Works has awarded a $2,990,000 contract for completing the four-lane Interstate 5 freeway between the Sacramento River north of Anderson and two miles north of Redding, Shasta County.

The project will extend freeway construction now in progress through Anderson another 12 miles northward.

* System No. 3 failed early and was replaced in 1962 with a laboratory formulation of inorganic zinc silicate.

The east face of the "Big Cut" on Unit 1 construction showing the 100,000-cubic-yard slide after the third and final phase.

A continuous concrete pour on the new Penasquitos Creek Bridge with slipforms. Existing two-lane arch bridge is in the background.

WHITEHURST, GUTHRIE REAPPOINTED TO COMMISSION

WILLIAM S. WHITEHURST

JAMES A. GUTHRIE

Governor Edmund G. Brown has announced the reappointment of William S. Whitehurst, Fresno businessman, and James A. Guthrie, retired editor of the San Bernardino *Daily Sun and Telegram*, to the California Highway Commission for a term of four years.

In making the announcement, the Governor praised both men's contributions to the board, and said, "We are fortunate in having the services of two men devoted to guiding the state's growth while maintaining its beauty. Bill Whitehurst has met the demands of commission work with unbiased, forward-looking judgment. He is a conservationist and businessman, and so serves the best interests of the people of California.

"Jim Guthrie has been a pioneer in highway development through three administrations, and has played an integral part in shaping our transportation system.

"I feel we need their help in planning for the growth of the future."

Whitehurst, a licensed mortician, has interests in funeral chapels in Los Banos, Dos Palos, Firebaugh, and Fresno; he is active in real estate and ranching in the Fresno area, and was formerly a city councilman in Los Banos and Dos Palos. He is a member of the Fresno Art Center, the Fresno Sportsmen's Association, the Foresters, the Farm Bureau Federation, the Knights of Columbus, the American Legion, the Veterans of Foreign Wars, the Commonwealth Club, and St. Mary's College Alumni. He was first appointed to the Highway Commission in 1963.

James Guthrie was born in San Bernardino in 1888 and has been a resident there since, working for community and highway improvement as an individual and as editor of the San Bernardino *Daily Sun and Telegram*, of which he is editor emeritus. He served as president of the local chamber of commerce and is a member of its state board of directors. He is a member of the advisory board of the Automobile Club of Southern California, the California Club, and the Sutter Club.

Guthrie was appointed to the Highway Commission by former Governor Earl Warren in 1943 and has served continuously since then.

WASHO Conference Set for Santa Fe

The 44th Annual Conference of the Western Association of State Highway Officials is scheduled for Santa Fe, New Mexico, during the week beginning Monday, June 14, 1965.

C. Taylor Burton, administrative consultant to the Utah Road Commission, is president of the 14-state organization, which held its 1964 meeting in San Diego. Other officers are Charles E. Shumate, Colorado State Highway Engineer, vice president, and George Langsner, California Deputy State Highway Engineer, secretary-treasurer.

General chairman for the 1965 conference is Robert W. De La Rue, administrative engineer for the New Mexico State Highway Department.

IN MEMORIAM

District III

Otto E. Claussen, highway maintenance man III.

Kenneth L. Horgan, highway maintenance man III.

Charles E. Russell, highway engineering technician I.

District IV

Marion P. Cunningham, senior stenographer.

District VII

Vera L. Katzung, delineator.

Ben Kutukian, engineering aid II.

District X

Jethro Cravens, highway maintenance man II.

Mamo Snooks, highway maintenance man II.

District XI

Ned H. Shobert, Sr., highway field office assistant.

Headquarters Office

Robert K. Breece, supervising highway engineer.

Owen W. Russell, highway engineering technician I.

Shop 4

Kenneth R. Hull, garage attendant.

Slipform Paving—2

By L. R. Gillis, Assistant State Highway Engineer, and
L. S. Spickelmire, Assistant Construction Engineer

(Second of two parts. See January–February issue for Part One.)

Delivery of Concrete to Paver

Central-mixed concrete is delivered to the paver in end dump trucks which back into dumping position on the subgrade in front of the paver. Normally, the trucks operate on the subgrade only for the limited distance in front of the paver necessary to line up properly into dumping position. In certain instances where space is limited, the contractors are permitted to use the subgrade as a haul road provided the trucks are not loaded in excess of legal load limits.

CORRECTION

Two numerical errors slipped through the first "Slipform Paving" article in the January–February issue.

On page 63, column 1, line 21, "1,800,000" should be "177,000."

On page 68, column 3, line 12, "60" should be "90."

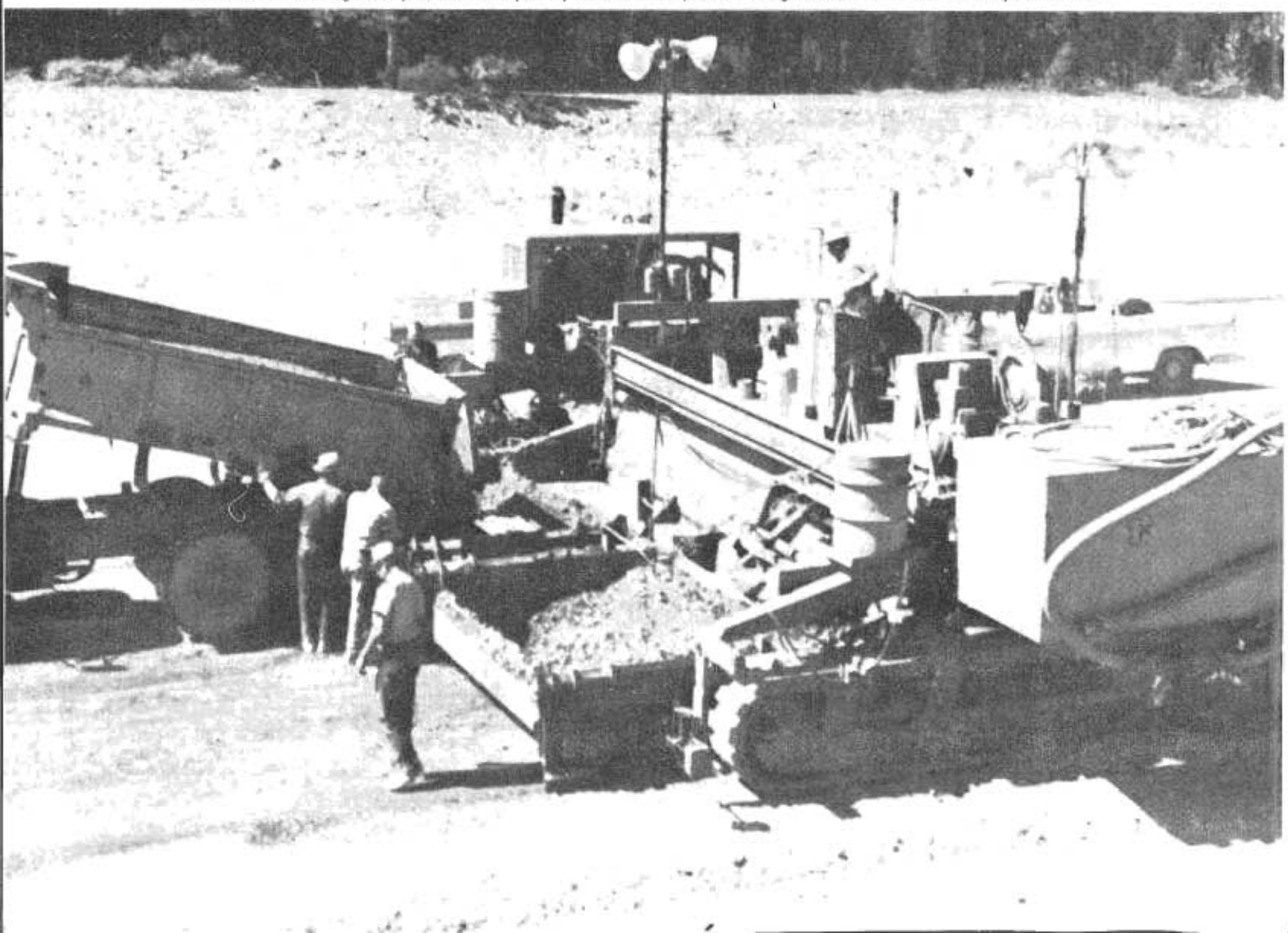
Similar procedures are followed where the tilt-drum truck mixers are used.

Divided Into Bays

The front of the paver is divided into as many bays as there are lanes being paved. Trucks back into one or another of these bays to dump into the receiving hopper. In order to prevent these trucks from coming into direct contact with the paver the front plate of the receiving hopper in each bay is mounted so that it slides freely backward and forward independent of the forward travel of the paver. Five feet of travel between fixed stops is provided. It is the responsibility of the operator to control the forward travel of the paver so that the sliding plate is not against the backstops when a truck moves into dumping position.

The dump men must balance delivery of concrete across the width of

FIGURE 9—The sliding front plate on the slipform paver can seen just to the right of the three men in the photo below.



the paver and control the dumping rate. An unbalanced load on the paver may cause loss of traction at one of the tracks. This is especially true when paving three lanes at a time. Overloads, on the other hand, cause large variations in the forces acting on the concrete under the conforming screed and may well result in loss of traction at both tracks. The net result in either case is an area of excessively rough pavement.

In steep terrain we have found it necessary to run the paver downhill whenever possible for similar reasons. A recent project involving 6-percent grades and 12-percent superelevation is an example of three-lane-at-a-time paving in mountainous terrain illustrating the point. Paving was first attempted in an uphill direction on a 6-percent grade. Difficulty was immediately encountered.

Loss of Traction

The main problem at first seemed to be loss of traction, but with experience the dump men were able to overcome that by balancing the delivery of concrete and controlling dumping rate. While this improved the result, the paving continued to be unacceptably rough. Despite all his efforts, the contractor was unable to consistently meet specification tolerances until he changed the direction of paving. Paving downhill resulted in a reduction of the roughness of from nine to about three inches per mile.

At several points in our discussion we have indicated that the dumping rate must be controlled. This involves maintaining the truck cycle as uniform and continuous as possible and management of the rate at which individual trucks discharge their loads. Reasons for the latter have already been discussed and need no further elaboration. Maintenance of a uniform and continuous truck cycle is important for somewhat different reasons.

The most obvious, of course, has to do with the economics of truck operation. There are others which are equally compelling. Most relevant is the adverse effect on pavement smoothness produced by repeatedly stopping and starting the paver. It is practically axiomatic that the most satisfactory results are obtained where the paver is maintained at uniform speed. Since this, though, is dependent upon a uniform truck cycle, it is not always possible to attain. As a relative matter, it is much better practice to slow the paver to a creep rather than stopping it completely during any break in the truck cycle. But, this is only an expedient and not a substitute for properly balanced and supervised trucking operations.

FIGURE 10—A taut stringline is used to measure subgrade.

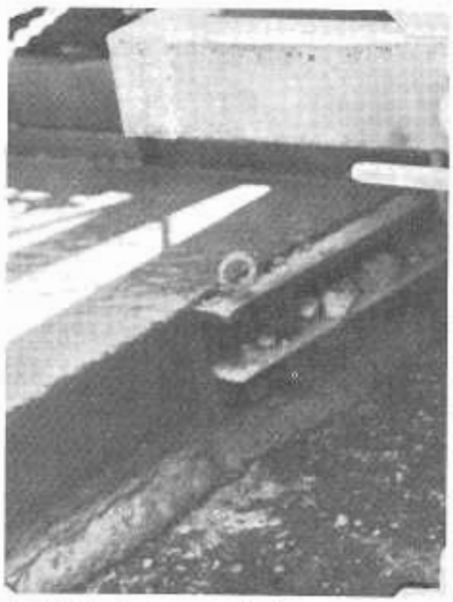


FIGURE 11—A closeup of the pavement edge immediately behind the slide forms.

Grade Wires

Piano wire stretched tautly between steel stakes parallel to, and offset from, each edge of pavement is used to provide grade and alignment control for the paver. These grade and alignment reference lines are commonly called "grade wires." They must closely parallel the desired profile for the edges of pavement. In practice, this means they are installed first by accurate measurement from the engineers' survey stakes and, secondly, by carefully sighting along the wire, correcting for any discrepancy either in the measurement or in the survey stakes.

The grade wires are offset approximately 30 inches laterally to provide room for the paver tracks, and approximately 8 inches vertically because of the location of the grade sensors. Since the position of the grade sensors can be readily adjusted up or down through a range of eight inches or so, the vertical offset to be used must be decided at the beginning of the job.

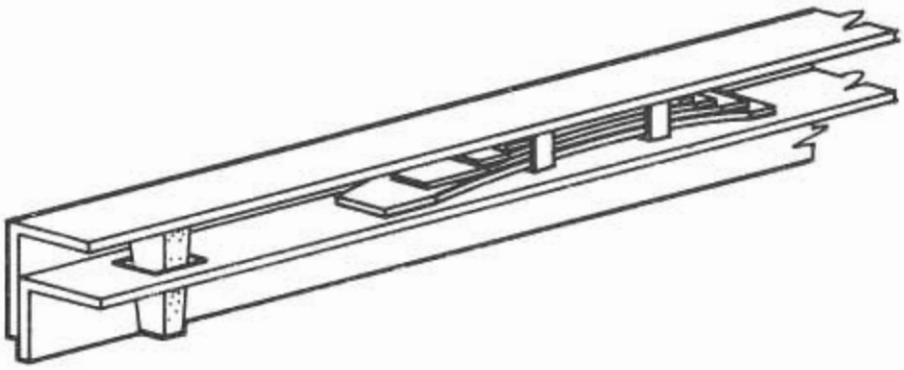


FIGURE 12—This sketch shows the makeup of the spring loaded side forms

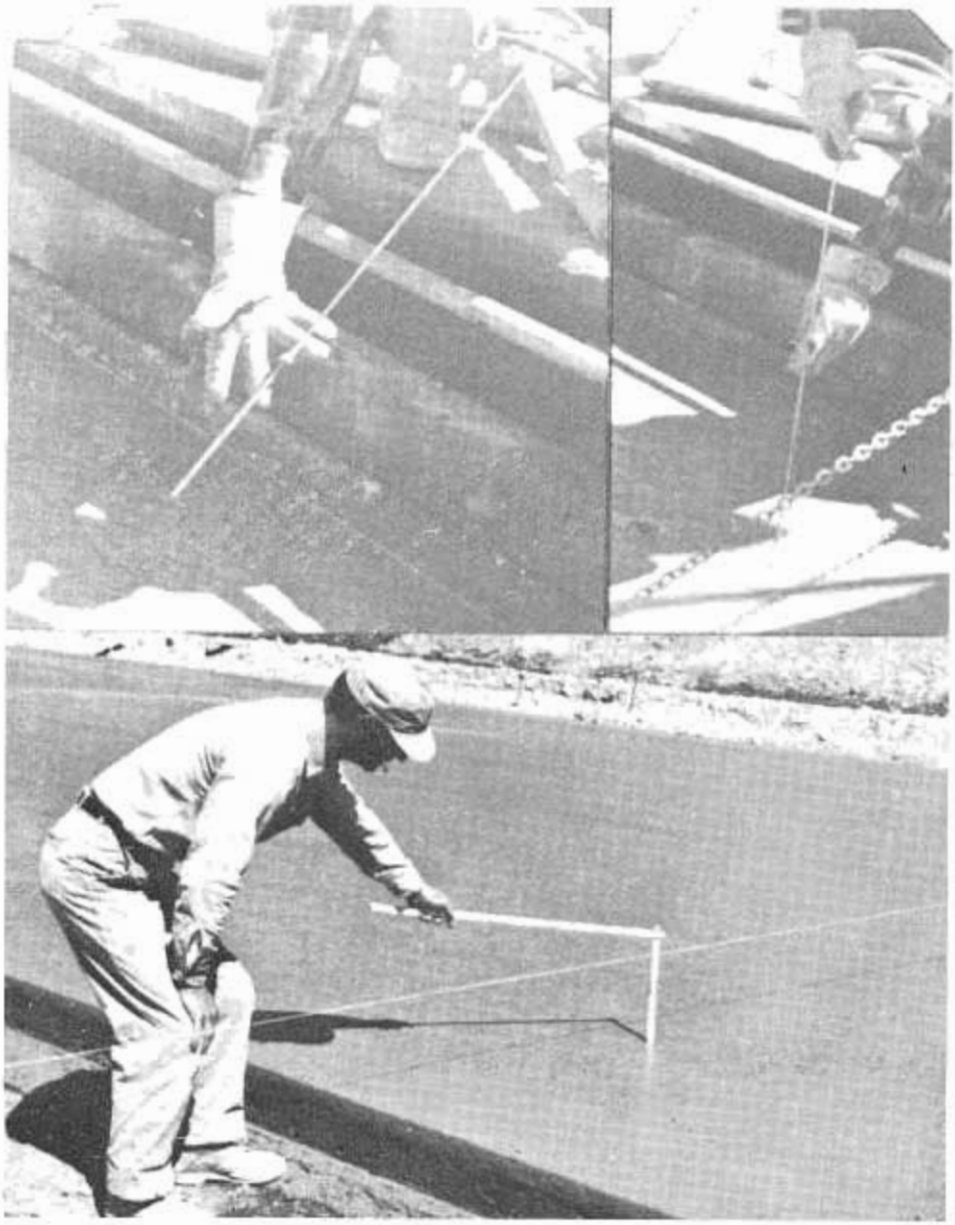


FIGURE 13—Measurement of pavement thickness is accomplished by two techniques as shown in the above photomontage. Measurement by stabbing with a steel rod is shown in top two photos. Measurement of completed surface by measuring down from a stringline is shown in the bottom photo.

Because the pavement on many projects is interrupted, frequently by bridge decks at grade, there may be a tendency, for one reason or another, to use a different vertical offset in the installation of grade wires for some of the isolated segments of pavement. It occurred on one of our projects with very painful results. The vertical offset, in this instance, was established at eight inches. For some reason, the contractor changed the offset to seven inches in the area between two bridges, a distance of approximately 800 lineal feet. Although all key personnel knew of this change and had been briefed to adjust the grade sensors accordingly, it was entirely forgotten in the confusion of moving the paver across one of the terminal bridges. The result was 800 feet of 24-foot-wide pavement one inch deficient in thickness.

Survey Stakes

As mentioned earlier, the grade wires are sighted to detect and correct for any discrepancies in the survey stakes. Needless to say, such discrepancies are an ever-present hazard, and this hazard is incurred with each set of stakes used. If separate sets of stakes are used for the subgrade and the pavement, discrepancies between the two sets will affect the thickness of pavement.

For this reason, it is highly desirable to use the same survey stakes for both purposes. In practice, this means that horizontal offset of the grade wires from edge of pavement is considered when locating the stakes at the subgrade preparation stage. It is preferable that they be at the same offset so that a direct vertical measurement alone is required to set the grade wire.

Subgrade Preparation

In California, subgrade for concrete pavement is prepared by constructing a cement treated base to close tolerances for grade and cross-section. The treated base is required to extend one foot beyond each pavement edge. This is considered sufficient to overcome edge pumping, but it is not sufficient to extend the treated base to the full width of the paver tracks. In some instances, therefore, contractors

have extended it at their cost an additional 6 to 12 inches to provide a smooth, firm track path area for the paver to travel on. These are exceptional cases, though; in most instances, the untreated shoulder material compacted to proper grade has been adequate.

One of the more important problems with slip form paving is the difficulty of subgrading the base to the very tight grade tolerances requisite. It has yet to be completely resolved.

In an attempt to overcome it, most of our contractors are now employing automatically controlled subgrading equipment. Sensors and grade wires similar to those on the paver are used.

The most successful procedure at present involves subgrading for the treated base as carefully as for the pavement. When a uniform thickness of base is placed and compacted only slight trimming is required to obtain subgrade to reasonably close tolerances.

The primary control of pavement thickness is established by making certain that the subgrade is at a minimum offset below the grade wires at all points. This is accomplished by stretching a string taut over the grade wires at periodic intervals and measuring down to the subgrade every two feet transversely. High spots are then cut.

Side Forms

The length of sliding side form was a subject of much concern to us five years ago. Our concern was reflected in a requirement on our initial projects that 90 feet of trailing form be used. The thought was that the pavement edges would slump away if they were not supported by at least that length of side form. We soon learned that reducing the length of side form resulted in less rather than more edge slump. Accordingly, our current practice is to use only that length of form necessary to support the edges under the paver itself.

Proper design of the side form section proved to be a more troublesome problem than the length of form to be used. The original design provided for forms of monolithic cross section rigidly attached to the paver screeds. In depth they were only slightly less than that of the pavement. This was intended to allow them to clear the subgrade but prevent excessive waste of concrete. They were impractical because they "bottomed out" on local high spots in the subgrade or on particles of the coarse aggregate wedged between the forms and the subgrade. The paver would then be lifted above grade, causing roughness in the pavement. A floating action would also be induced by the extra concrete under the screeds, thus extending the area of roughness.

The solution finally devised was a two-piece, spring-loaded form design as illustrated in Figure 12.

With forms of this design, the upper part is attached to the screeds. The lower part slides on and adjusts to variations in the subgrade without exerting excessive uplift pressure on the paver. Excessive waste of concrete either over or under the side form is prevented, and local high spots in the subgrade do not result in rough pavement.

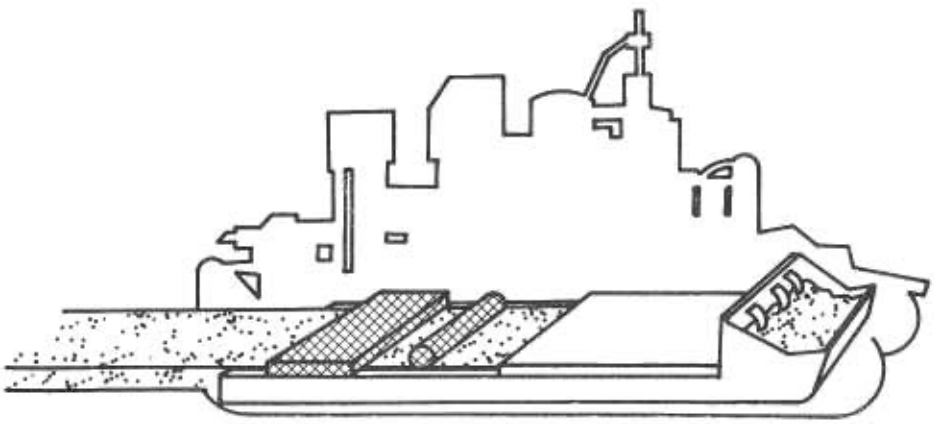


FIGURE 14 A sketch of the rotating screed and pan float arrangement.

Internal Vibration

Internal vibration, as used on slip-form pavers of the type employed for three-lane-at-a-time paving, serves two distinct purposes. It compacts the plastic concrete and overcomes surface tearing under the conforming screed.

Early in our experience we conducted laboratory studies to determine what minimum amplitude and frequency were necessary to adequately compact concrete. These studies indicated that a frequency of 5,000 vibrations per minute is the practical minimum, and that the amplitude should be sufficient to be perceptible on the surface of the concrete more than one foot from the vibrating element.

In practice, these minimum requirements are fulfilled by a series of spud-type vibrators mounted in the receiving hopper of the paver. They are spaced laterally at 30-inch intervals and positioned ahead of the conforming screed at a distance approximately equal to the thickness of pavement. The latter dimension, determined empirically, is somewhat critical. If the vibrators are positioned too closely to the screed, the surge behind the screed is uncontrollable. If moved too far ahead of the screed, the load on the paver is greatly increased and excessive tearing of the surface is incurred.

The second purpose of internal vibration, as stated, is to overcome surface tearing. This is accomplished with a tube-type vibrator mounted along the entire width of the conforming screed at the leading edge. There is approximately two inches of clearance between leading edge and the side of the tube, and the bottom of the tube is about one-fourth-inch lower than the screed.

Manufacturers have made determined efforts to accomplish both of these purposes with either the tube vibrator or the spuds rather than using both. All of these efforts have failed. Either the compaction is inadequate, tearing is not adequately overcome, or the amount of surge behind the conforming screed is uncontrollable. Furthermore, the ability to compensate for variations in the concrete at

the paver, as discussed more fully later on, is impaired.

Frequency of the tube vibrator need not be the same as for the spud-type vibrators. Best results have been obtained where means are provided for the paver operator to readily vary it between 3,000 and 5,000 vibrations per minute. This permits the operator to compensate for variations in concrete consistency; decreasing the frequency when the mix becomes wetter and surge behind the conforming screed increases, or increasing the frequency when the mix is dryer and tearing of the surface is encountered.

When a rotating screed is used behind the conforming screed the operator can judge when and how to vary the frequency by the amount of grout carried ahead of the rotating screed. An increasing amount of grout is a signal to decrease the frequency, and conversely for a decreasing amount of grout.

Several of the paver operators have become very skillful at this and are often able to anticipate adjustments by the appearance of the mix in the receiving hopper. Careful attention to the technique can result in a significant improvement of the pavement smoothness.

Surveillance Sensors

Another technique practiced by contractors is that of stationing men at each side of the paver to continuously attend to the operation of the control sensors. Many things can cause these sensors to get off the grade wires. A few moments of operation with any one of the sensors off the wire can produce roughness in the pavement requiring costly corrective measures. This is so costly as to more than offset the expense of two men to insure that it does not happen in the first place.

Pavement Thickness

Measurement of pavement thickness is accomplished by two techniques: stabbing the actual depth of concrete, and measuring down to the completed surface from a stringline.

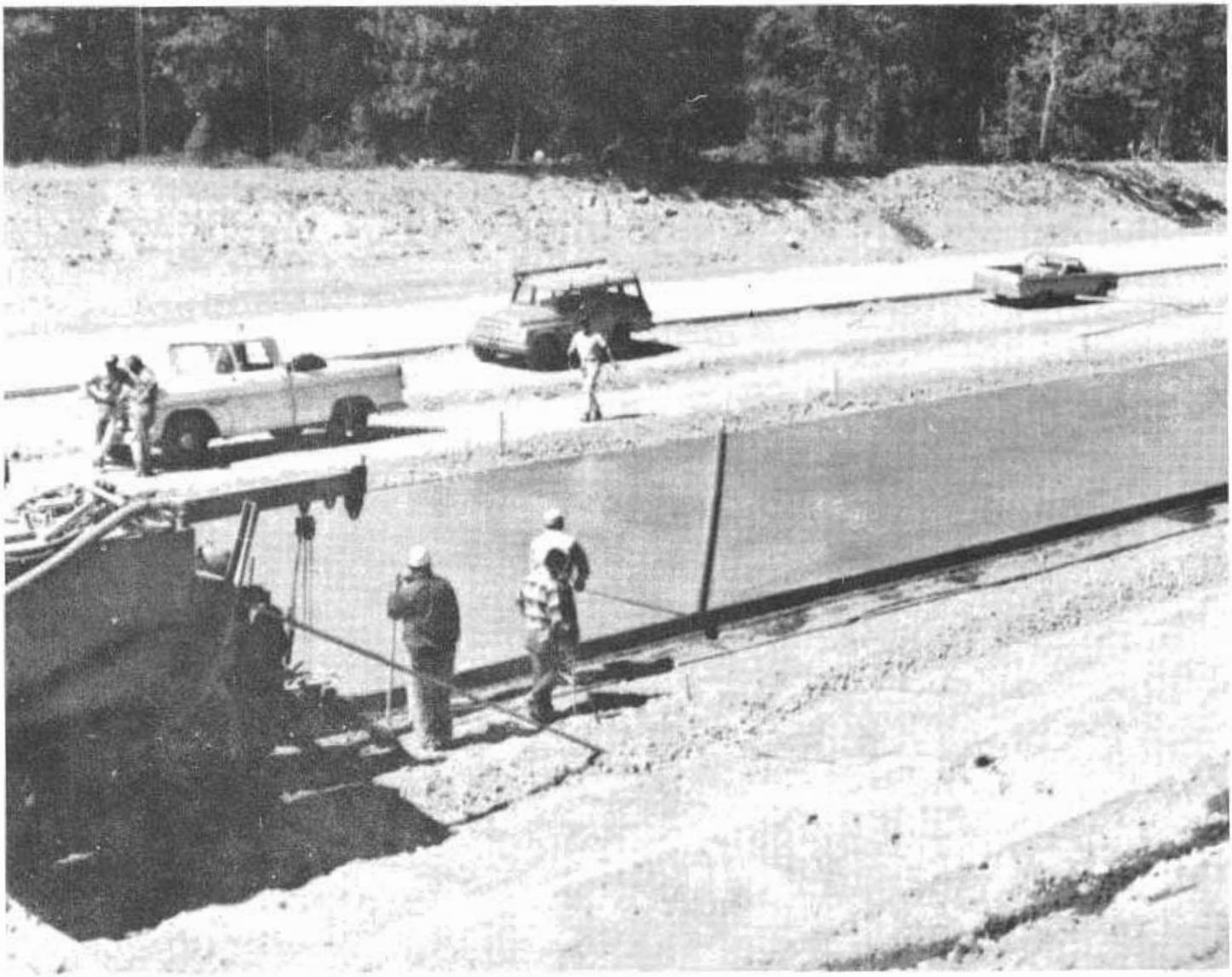


FIGURE 15—Pipe floating is accomplished by manually towing a six- or eight-inch aluminum pipe forward and backward over the surface with the pipe positioned diagonally across the slab.

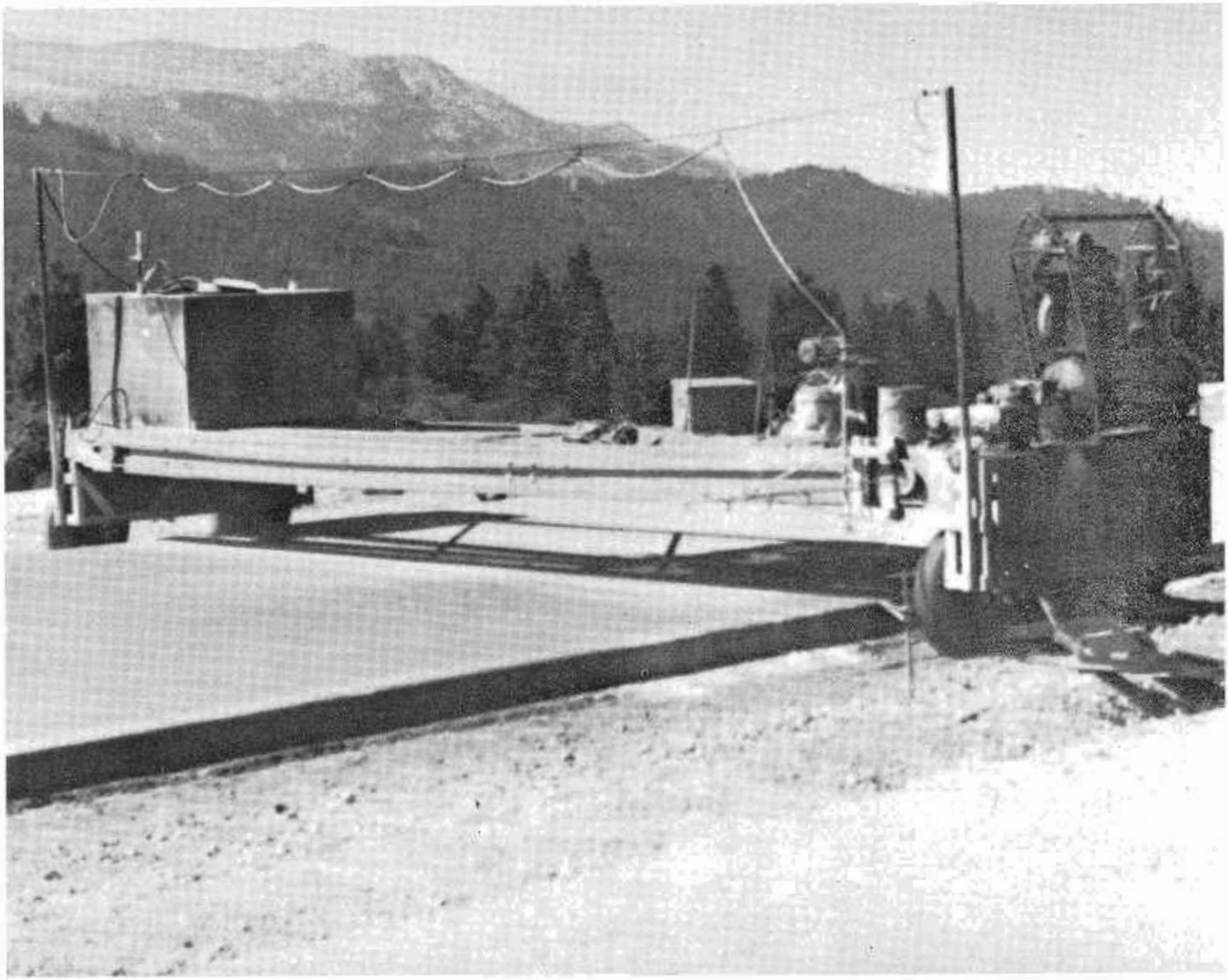


FIGURE 16—Two burlap drags are drawn longitudinally over the surface to produce a nonskid texture.

Stabbing the depth of concrete is performed at random locations immediately behind the paver. A calibrated steel rod one-eighth to one-fourth inch in diameter, which is marked to indicate the proper depth, is inserted carefully into the concrete and worked down until the end touches the subgrade. This technique is not precise, but it will quickly show up gross errors.

For more precise determination, measurements are made of the completed surface from a stringline stretched taut over the grade wires. The same locations at which the subgrade was measured are used so that the pavement thickness can be calculated by direct comparison of the data.

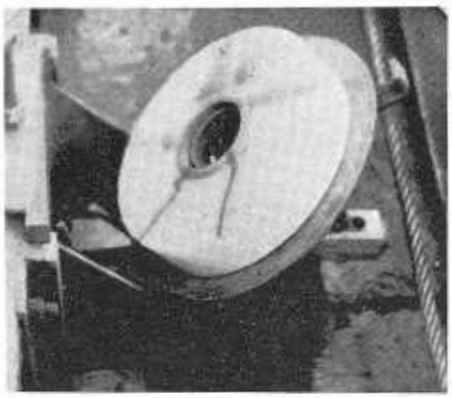


FIGURE 17- A closeup of a longitudinal joint installer.

Final Finishing

The final operation with the slipform paver is to float the surface utilizing several pan floats, or the combination of a rotating screed and a single pan float, which are attached to the paver. This removes minor imperfections and fills torn areas in the surface.

Final finishing consists of floating the surface with a pipe float, touching up and rounding the edges, and texturing the surface.

Pipe floating is accomplished by manually towing a six- or eight-inch aluminum pipe forward and backward over the surface with the pipe positioned diagonally across the slab. This action develops a small amount of

grout to eliminate minor imperfections and produce a uniform surface appearance.

Many contractors find it advantageous to straightedge the surface at this time when irregularities can readily be removed by the finishers. A 25-foot bow-type straightedge which utilizes a piano wire has been found to be effective.

It has been mentioned that reducing the length of side form reduces the amount of edge slump. While this is true, there is normally some slight amount which seems to be unavoidable. It can usually be corrected by careful operation of the edgers used to produce a ¼-inch rounding. Where this is not effective, a slight amount of fresh grout is worked into the surface at the edge.

Finally, two burlap drags are drawn longitudinally over the surface to produce a nonskid texture, and the cure is placed. White pigmented liquid curing compound, sprayed by machine at the rate of one gallon per 150 square feet, is universally used as the curing medium.

Joint Construction

For some years prior to introduction of slipform paving methods, California's joint practice was standardized. Longitudinal and transverse contraction joints were sawed. Contact joints were used between contiguous pavement slabs where they were placed at different periods, and at night joints. Expansion joints were used only where structures interrupted the continuity of the pavement.

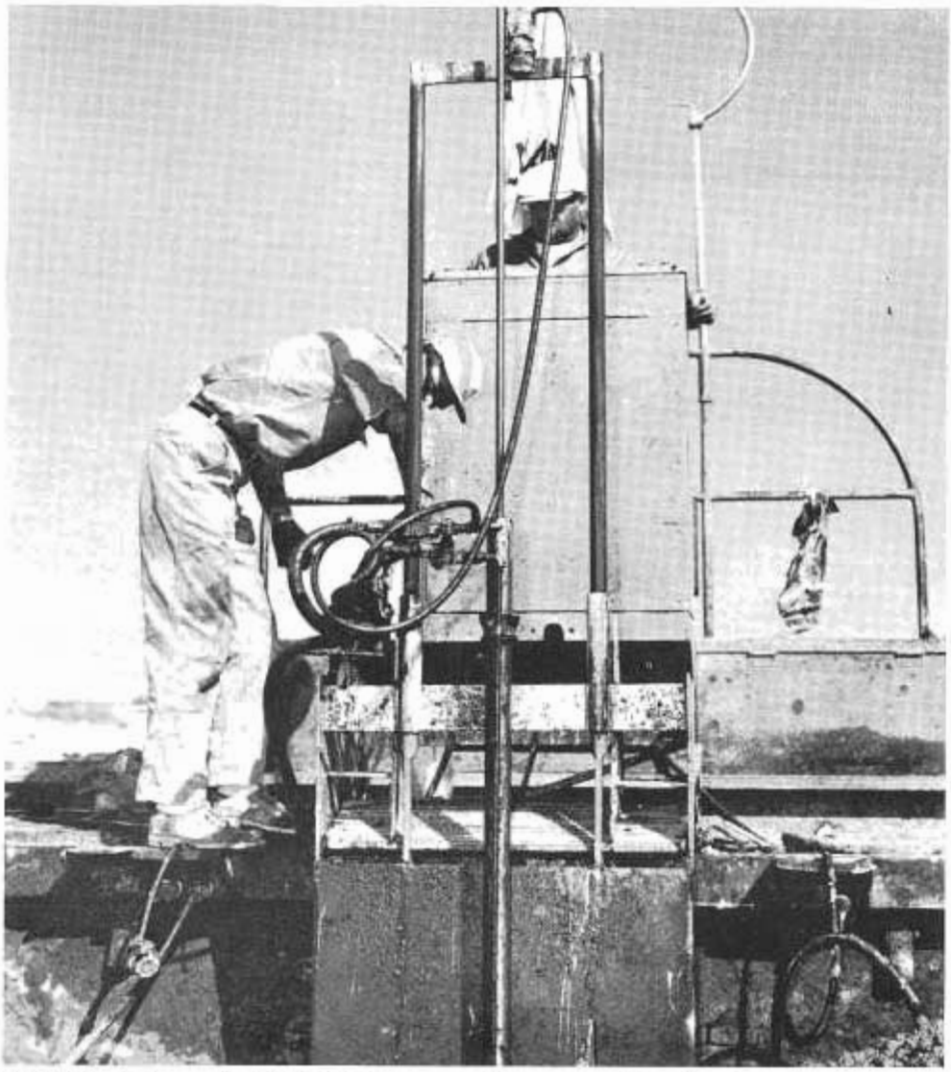


FIGURE 18—Tiebars for longitudinal joints are placed by mechanical installers located in front of the conforming screed of the paver and are automatically actuated by a triggering device on the track assembly.

Dowels and joint assemblies were not used. However, tie bars 30 inches long were placed across all longitudinal joints and at all transverse contact joints. These bars of ½-inch reinforcing steel were spaced at 30-inch intervals.

Slipform methods made it feasible to substitute a joint insert for sawing in the construction of longitudinal contraction joints. A continuous strip of 4-mil-thick polyethylene plastic is now inserted by use of a vibrating keellike device attached to the paver. One of these installing devices is used for each longitudinal joint. The plastic strip is two inches wide and is provided in 3,000-foot rolls. It is installed in a vertical position with the top edge at or just below the pavement surface.

Sawing is still the conventional means of constructing transverse contraction joints.

Expansion joints are used only at structures, as before. However, since the slip form paver cannot place pavement flush against bridge paving notches, the practice has developed of leaving a gap of approximately 20 feet at each structure approach. These gaps are later placed and finished, using hand methods. This operation takes a great deal of care to avoid unacceptable roughness. Often these areas, and the night joints, are the only one requiring grinding to meet smoothness specifications.

Tie bars for the included longitudinal joints are now placed by mechanical installers on the paver. They are located in front of the conforming screed and are automatically actuated by a triggering device on the track assembly. This establishes the 30-inch spacing. The most successful installer used is a hydraulic ram assembly which is mounted on the back plate of the receiving hopper as shown in Figure 18.

Smoothness Measurement

It has been found desirable to determine compliance with smoothness requirements as early as possible. This is accomplished by use of the California-type profilograph which is essentially a 25-foot-long beam with a recording wheel at the midpoint and multiple support wheels at each end. It is operated over the pavement as soon as the concrete has hardened

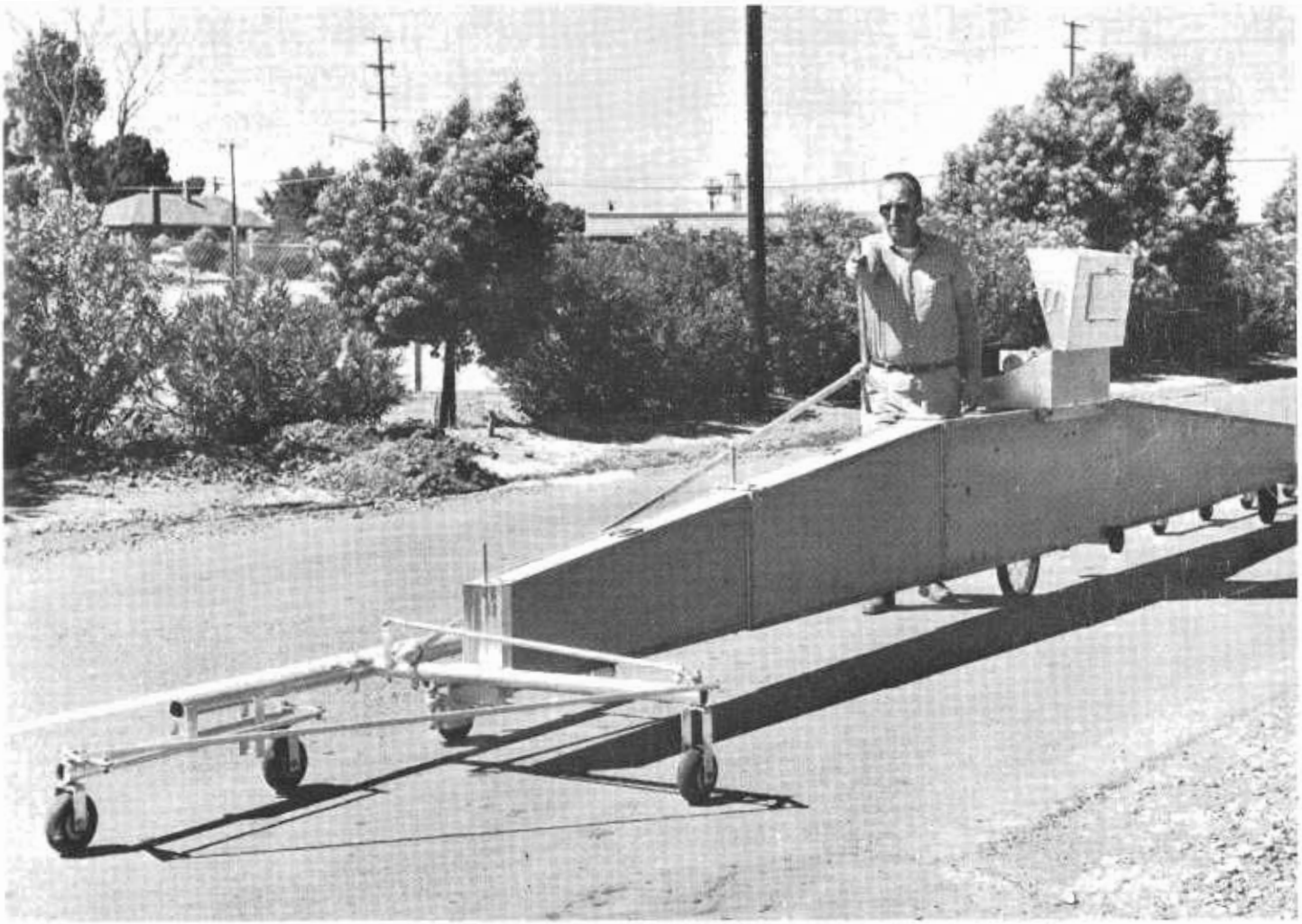


FIGURE 19— A California-type profilograph, used to determine pavement smoothness, is operated over the surface as soon as the concrete has hardened sufficiently to support the instrument.

sufficiently to support the instrument, usually during the morning of the first day following placement.

A continuous chart is obtained which is analyzed quantitatively. The numerical indices derived by this test procedure must comply with specification tolerances.

There is reason to believe that the development and use of this profilograph has had an important influence upon a slipform paving in California. Not only has it made possible the establishment of a standard of acceptable performance; it has also provided a means of qualitatively appraising the paving operation. The trace produced on the profilogram represents a very close approximation of the intimate profile of the pavement. As such, it can be used to examine the effect on pavement smoothness of adjustments of the paver, condition of the track path areas, superelevation and profile grade, operating conditions, and other pertinent factors.

In effect, it is a permanent graphic presentation, foot by foot, of the paver performance with respect to surface smoothness. Used with the log mentioned earlier, and supplemented with a detailed on-site inspection, it has materially contributed to progress.

Summary and Conclusions

1. In five years slipform paving has become the most common technique used to construct concrete pavement in California.

2. Cost estimates and the trend of bid prices indicate cost savings in excess of one dollar per cubic yard.

3. A higher level of technical ability is required of supervisors, operators and maintenance personnel.

4. Equipment manufacturers must be able to provide technical assistance in the maintenance of equipment.

5. Quality and uniformity of the concrete must be carefully controlled.

6. The subgrade must be very accurately graded, and improved subgrading equipment must be developed.

7. Increased production is not only possible but it is necessary to exploit the full advantage inherent in the method.

8. Proper use of internal vibration is essential for satisfactory concrete density and pavement smoothness.

9. Accurate adjustment and constant surveillance of automatic control elements are vital.

10. Pavement smoothness should be measured and recorded in a manner which permits adoption of rational standard of performance requirements and an early quantitative and qualitative appraisal of results.

Dillard Road

Major Highway Job Completed in Sacramento County Master Plan

By A. F. EFFINGER, Resident Engineer, Sacramento County

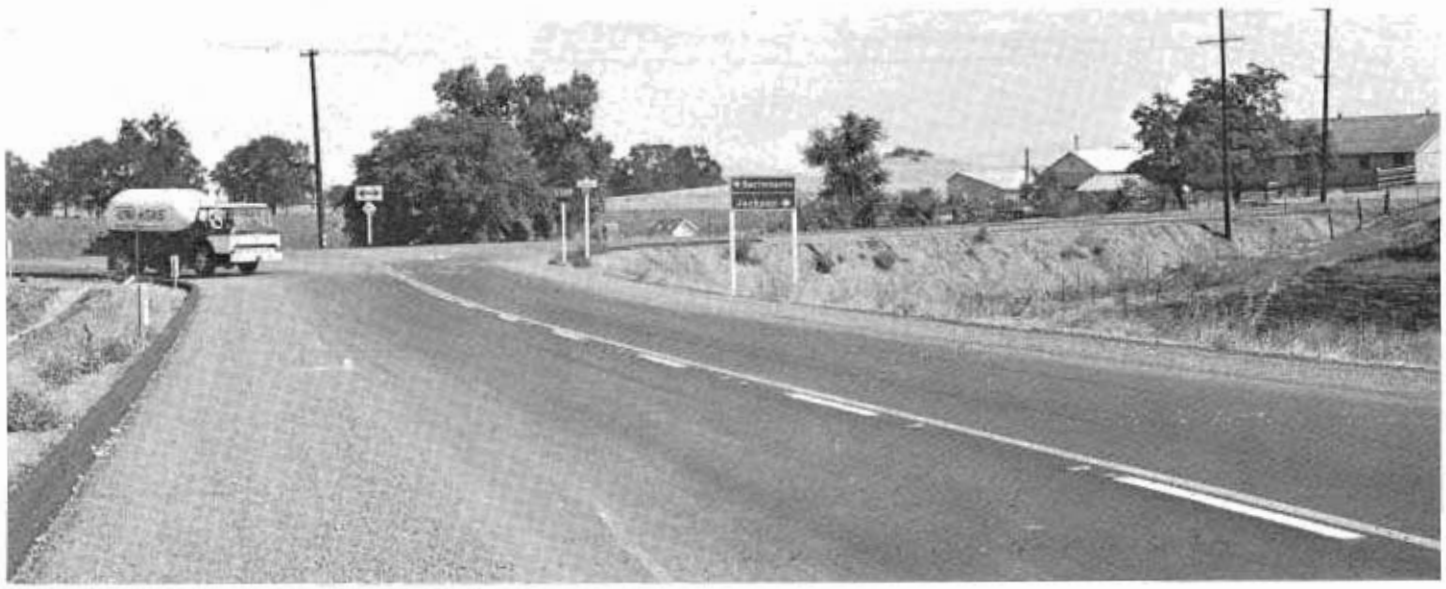
One of the major construction contracts to be completed in the 1964 program for the development of Sacramento County's Master Plan of Streets and Highways, was a federal aid secondary project known as the Dillard Road Extension, two miles east of Sloughhouse.

A portion of FAS Route 1223, located in the eastern part of the county, the extension commences at Meiss Road and continues 1.42 miles north, crossing the Cosumnes River, and connects with State Highway Route 16 (Jackson Highway), as shown on the accompanying map. Ultimate plans call for further extension northerly to a junction with FAS Route 1096 in the Folsom area. With the present rapid growth of Sacramento County expected to continue, an increase in traffic on this route can be anticipated due to development of residential subdivisions, commercial centers and industrial areas.

The project, which connects with Highway 16, also includes construction of a bridge over the Cosumnes River.

Replaces Substandard Road

The new alignment replaces an existing portion of narrow, substandard highway having poor vertical alignment, horizontal curves of 50–100-foot radius, and subject to periods of flooding from Deer Creek, a tributary of the Cosumnes River. Depending on the severity of the flooding, the highway was either closed or its use greatly impaired on an average of twice each year. Lo-



Looking northward along Dillard Road toward the Highway 16 junction.

cated about two miles downstream from the new structure, the existing through steel truss bridge with timber approach spans, was constructed about 1906 and provided the only river crossing for many miles between the community of Sloughhouse and the adjacent agricultural area. Presently posted for a 12-ton load limit, the bridge will continue to serve light local traffic.

Constructed by A. Teichert & Son, Inc., Sacramento, at a cost of $309,200, the new roadway and structure is located on one-half of a 110-foot minimum right-of-way so that a parallel roadway can be constructed in the future to obtain a divided multilane facility. The initial two lanes constructed to FAS standards, consists of 24 feet of asphalt concrete on a 36-foot roadway, minimum curve radii of 2,500 feet and maximum grades of 2.86 percent.

Resting on steel H-piles and supported on concrete wall piers, the five-span reinforced concrete T-beam bridge, 350 feet in length, provides a clear roadway width of 28 feet between barrier railings.

To simplify placement of concrete for the superstructure, the contractor resorted to an elaborate portable conveyor belt system.

Designed for 33-Foot Clearance

Since it is subject to uncontrolled flood discharges, the structure was designed for a streambed clearance of 33 feet with a four-foot minimum high water clearance, capable of passing a 1-in-50-year flood of 55,000 second-foot. A repetition of the 1955 flood occurred in December of 1964 when torrential rainfall produced a discharge estimated to be about 45,000 second-foot without damage to either structure or highway, both of which remained open to traffic.

Standard construction methods were employed by the contractor throughout all phases of the project except in the case of the superstructure concrete. Due to the location of the structure and with expected increases in river flow, the contractor decided to make the entire superstructure pour in one operation instead of several pours. Conventional methods of placing, using cranes or buggies were not considered feasible due to the size of the pour.

To place the 643 cubic yards of concrete, the contractor used twelve 32-foot electrically operated conveyors.

With the conveyors set in position along centerline of the deck, concrete was discharged from the transit trucks directly to the conveyor system at Abutment 6, then carried to its point of final deposit commencing at Abutment 1. The telescopic features of each conveyor, plus pivoting support frames, permitted the girder stems to be poured in advance of the deck section without too much difficulty.

At an average of 56 cubic yards per hour, 11½ hours were required to complete the successful pour. A standard vibrating strikeoff and longitudinal floats were employed for finishing operations.

The Dillard Road reconstruction looking north toward the bridge over the Cosumnes River in the distance. Grading for future addition of northbound lanes can be seen to the right of the roadway.

Route Adoptions

Commission Adds 50 Miles Of Freeways on Five Routes

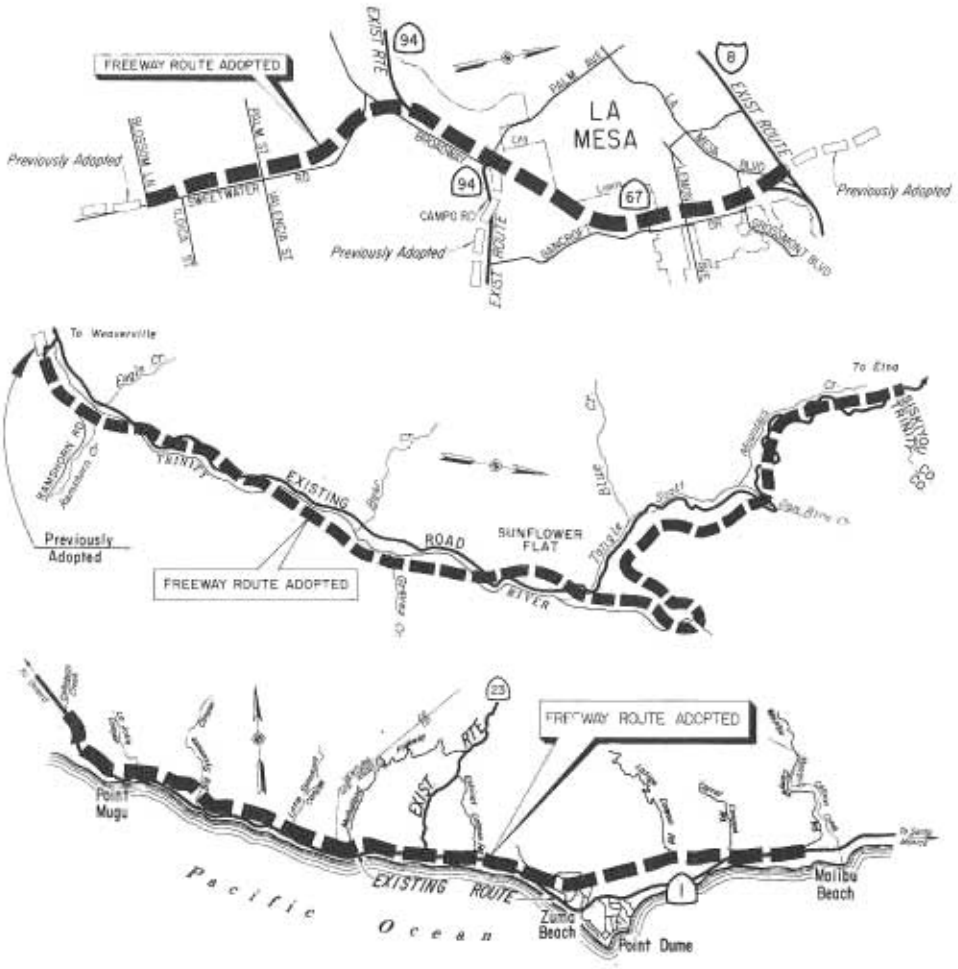
At its meetings in January and February, the California Highway Commission adopted locations for 50 miles of freeways on five routes.

The commission also reaffirmed an earlier adoption of 3.6 miles of Route 118 in Ventura County, following a second public hearing by the commission itself in January, and revised a two-mile section of a freeway location on Route 1 in Los Angeles County that it had adopted last September.

The 3.6-mile segment in Ventura County, between First Street and Patterson Ranch Railroad Spur near Tapo Street in the Simi area, is part of a 12.2-mile section, between Madera Road in Ventura County and 0.3 mile west of De Soto Street in the Chatsworth area of Los Angeles County, that was adopted in March 1962.

The commission had held the second public hearing to consider a possible shifting of the adopted route slightly to the north which had been recommended by the State Highway Engineer. His recommendation, in turn, had followed a public hearing on the matter conducted by the Division of Highways in Simi in March 1964.

In reaffirming the original adoption, the commission concluded that no substantial changes or new evidence had developed to warrant a change. It also noted that while the ownership of the greatest number of acres affected by either routing favored the revision, the greater number of individual property owners favored retention of the adopted route.



The commission had adopted a 23.3-mile location for the Route 1 Freeway, between Malibu Canyon Road in Los Angeles County and Calleguas

Creek in Ventura County, at its September 1964 meeting. However, it had ordered a restudy of the adopted route and a possible alternate for a two-mile section (between east of Busch Drive and west of Trancas Canyon Road) in the Malibu area because of recent residential construction along the adopted line near Trancas Canyon.

Of the two, State Highway Engineer J. C. Womack had recommended the alternate which would bypass the recent development to the south, requiring 36 fewer improvements and saving $3,100,000 in costs. He said the alternate, identified as "Connector Seven" at a public hearing conducted by the Division of Highways in Los Angeles in December, would provide comparable traffic service, and would have more favorable grades, thereby reducing cuts and fills.

In other freeway adoption actions, the commission located routes as follows:

El Dorado County: 24 miles of US 50 between Riverton and one-half mile east of Phillips, completing freeway location for the entire length of this route between Sacramento and the Nevada line.

Trinity County: 13.8 miles of Route 3 between 4.6 miles north of Coffee Creek and the Siskiyou county line.

Imperial County: 6.3 miles of Interstate 8 between west of Algodones Road and the Arizona border at Yuma, connecting with a routing proposed by the Arizona Highway Department.

San Diego County: 4.1 miles of Route 125 between Blossom Lane in the South Springs Valley area and Interstate 8 in La Mesa.

The commission also adopted as conventional highways:

Santa Barbara County: A 0.2-mile revised routing of Route 224 between US 101 and Carpinteria Beach State Park.

Los Angeles County: 0.4 mile of Vineland Avenue in Los Angeles between the Hollywood Freeway and Lankershim Boulevard as Route 170. (In a related action, the commission relinquished the portion of Lankershim Boulevard between the Hollywood Freeway and Vineland Avenue, formerly part of Route 170, to the city.)

DEPARTMENT MARKS RETIREMENT OF 46 EMPLOYEES

District I

George C. Abarr, highway foreman, 36 years; Leonard E. Craig, highway maintenance man II, 30 years; Edward J. Doering, highway maintenance man II, 28 years; Byron A. Griggs, highway foreman, 24 years; Lloyd A. Moore, highway maintenance man II, 31 years; Norman A. Pratt, highway engineering technician I, 9 years; Lyle G. Schlosser, janitor, 5 years.

District II

W. Hiram Bartlett, highway engineering technician I, 39 years; Ora Harold, highway maintenance man II, 18 years; James C. Phipps, highway foreman, 17 years; Chester D. Wagner, highway maintenance man II, 33 years; Arthur F. Waugh, highway maintenance man II, 15 years.

District III

DeWarren Bridges, delineator, 8 years; John W. Colman, highway maintenance man II, 11 years.

District IV

Roy E. Hansen, highway maintenance man III, 29 years; John F. Madden, associate right of way agent, 10 years; Wilder G. Morey, associate highway engineer, 30 years; Joseph J. O'Connor, highway landscape maintenance man, 2 years; William Sadler, highway landscape maintenance man, 5 years.

District V

Gaius W. Abraham, highway foreman, 28 years; Ralph J. Moon, highway maintenance man II, 33 years; Mabel L. Rianda, intermediate clerk, 8 years.

District VII

George C. Ebling, highway engineering technician, 4 years; Eula C. Jacob, supervising account clerk II, 40 years; John R. Rouppe, highway maintenance man III, 26 years.

District VIII

Wayne H. Crawford, senior highway engineer, 35 years; Mary B. Gaffko, varitypist, 9 years.

District IX

Daisy M. Powers, highway field office assistant, 17 years.

District X

Theodore L. Ashworth, highway foreman, 37 years; John T. Houlihan, highway foreman, 36 years; Francis P. McHugh, assistant highway engineer, 9 years; Gloria F. Ruff, dispatcher clerk, 9 years.

Headquarters Office

Wilson A. Madsen, highway engineering associate, 15 years; Henry C. McCarty, principal highway engineer, 34 years; Joseph J. Ralph, audiovisual assistant, 17 years; Ferdinand J. Volkert, senior highway engineer, 30 years.

Bridge

Boyington J. Chrysler, highway engineering technician I, 19 years; Ila E. Stephenson, senior account clerk, 21 years; Everett L. Walsh, supervising bridge engineer, 36 years.

Materials and Research

John R. Vincent, assistant steel inspector, 10 years.

Shop 2

John M. Harris, highway equipment superintendent II, 22 years.

Shop 5

Harry J. Kohlstedt, automobile mechanic, 31 years.

Shop 7

Pierre O. Parish, automobile electrician, 22 years.

Shop 8

Mary F. Milnor, accounting technician II, 37 years.

Headquarters Shop

Harold L. Emrick, highway mechanic foreman, 23 years; Ella Mae Wilson, intermediate account clerk, 14 years.

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JOHN G. MEYER . . . . . District Engineer

District 11, San Diego

JACOB DEKEMA . . . . . District Engineer

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"Before and after" photos of US Highway 199 in the Smith River Canyon. Upper photo was made on January 18, 1965, when subgrade was partially rebuilt, and lower photo, showing completed highway, as yet unsurfaced, but carrying normal traffic, on February 24, 1965. (See article beginning on page 2.)

Smith River


VERTICAL CLEARANCE
13'6"