Annual Report of the Bureau of Public Roads

Fiscal Year 1960

HIGHWAY PROGRESS 1960

Interstate Route 91, the Hartford-Springfield Expressway, is open for its entire length in Connecticut.

U.S. DEPARTMENT OF COMMERCE

Annual Report of the

Bureau of Public Roads

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HIGHWAY PROGRESS 1960

UNITED STATES DEPARTMENT OF COMMERCE

December 1960

U.S. DEPARTMENT OF COMMERCE

FREDERICK H. MUELLER, Secretary

BUREAU OF PUBLIC ROADS

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HIGHWAY PROGRESS, 1960

ANNUAL REPORT OF THE BUREAU OF PUBLIC ROADS

Summary Review of the Fiscal Year

THE fiscal year 1960[1] was marked by continued vigorous effort in the expanded nationwide highway program inaugurated by the Federal-aid Highway Act of 1956, although the program was slowed somewhat because of Federal financing problems. Across the Nation, in city and country alike, motorists were finding many new sections of the Interstate System available for travel, as well as extensive improvements on major highways and streets and on the vast secondary road mileage.

Capital expenditures by all levels of government on all roads and streets, for engineering, right-of-way, and construction were estimated at $6.80 billion in calendar year 1959 and were expected to total $6.72 billion in calendar year 1960.

Highway usage continued to grow, again exceeding previous records. Motor-vehicle registrations were expected to reach 73.9 million in calendar year 1960, 3.3 percent more than in the preceding year. Preliminary estimates indicated that travel in calendar year 1960 would reach 720 billion vehicle-miles. Travel by the 71.5 million vehicles registered in 1959 was estimated at 698 billion vehicle-miles for that year, an increase of 5 percent over 1958.

Obligations of Federal-aid funds for surveys and plans, right-of-way acquisition, and construction totaled $2.611 billion during the fiscal year 1960, as compared with $3.223 billion obligated in fiscal year 1959.

Passage of the Federal-Aid Highway Act of 1959, providing for increased revenue to the Highway Trust Fund during the next 5 years, alleviated the short-term financing crisis which had threatened to curtail the Federal-aid program at the beginning of the year. Public Roads found it necessary nevertheless to institute a reimbursement planning program, regulating the rate of obligation of Federal funds in relation to anticipated Trust Fund income, so that the States would be assured of prompt reimbursement when they presented their claims following completion of work and State first-instance payment therefor.

On October 8, 1959, apportionment was made to the States of Federal-aid funds for the fiscal year 1961, amounting to $2.725 billion. The total of Federal-aid funds apportioned since passage of the Federal-Aid Highway Act of 1956 was thus brought to nearly $13.3 billion.

Accomplishments of the year

During the year, projects were programed in the Federal-aid and Federal highway programs for the construction of 19,317 miles of improvements. Contracts were awarded during the year for improvements to 21,947 miles of roads and streets. Construction put in place during the year involved $2.718 billion of Federal funds, a decrease of 5 percent from the record of the previous year.

[1] The fiscal year extended from July 1, 1959, through June 30, 1960.

Completions of all classes of Federal-aid and Federal projects during the fiscal year provided improvements on 29,959 miles of roads and streets. Included were 28,830 miles of highways and 6,788 bridges on the Federal-aid systems and 1,130 miles of roads in national forests, parks, and parkways, and on flood-relief and access-road projects.

Hazards at railway-highway grade crossings were removed during the year by elimination of 422 grade crossings, reconstruction of 23 inadequate grade-separation structures, and protection of 366 crossings by installation of flashing lights or other safety devices. These figures include the separation or protection of crossings encountered on new highway locations.

The linear mileage of highway improvements completed is not a full measure of the facilities provided for traffic. Capacity and safety and riding quality are all improved by better alinement, flatter curves and grades, and smoother and wider pavement. The Interstate and some of the other Federal-aid projects completed during the year had access control and grade crossings eliminated. Generally they were four or more lanes wide, replacing old roads with only two lanes. The 28,830 miles of Federal-aid projects completed during fiscal year 1960 included 3,829 miles of 4-lane highways and 237 miles having 6 lanes or more. Thus, the year's Federal-aid project completions provided the equivalent of 66,266 miles of single-lane construction.

At the end of the fiscal year, construction was underway or plans had been approved, in the Federal-aid program, for improvements on 31,362 miles of roads and streets. Included were construction of 10,617 bridges and the elimination, reconstruction, or protection of 1,305 railway-highway crossings. The estimated cost of this work was $8.2 billion, of which $6.0 billion was Federal aid.

In addition, at the close of the year, the programs for construction of national forest, park, and public lands highways, defense-access roads, and flood-damaged roads and bridges, included improvements underway on 1,566 miles, at a total estimated cost of $123 million including $115 million of Federal funds.

Accomplishments of the year on the several Federal-aid systems and in the Federal lands highway programs, and detailed information on other subjects, will be found in individual presentations in other sections of this report. Supporting statistics, both in summary and detail, appear in the appendix tables.

The Interstate System

While accomplishments of the year in improving Federal-aid routes under the primary, secondary, and urban programs were outstanding, the Interstate System continued to be the center of public interest. At the close of the fiscal year, the fourth year of the accelerated program, more than 9,100 miles of the 41,000-mile Interstate System were open to traffic and construction was underway on another 4,700 miles. Motorists everywhere were gaging for themselves the great advantages of the controlled-access freeway, with its greater safety, freedom from crosstraffic, relief from driving tension, and savings in travel time and vehicle operating costs. Industrial, commercial, and residential centers were being attracted to locations adjacent to the Interstate right-of-way.

Locating the Interstate route sections continued to be the subject of intensive effort. The State highway departments conducted extensive engineering and economic studies, coordinating and collaborating in their planning with local officials and planning agencies, to assure selection of locations in the best overall public interest. Public hearings were held so that proposals could be explained and opinions and facts developed by interested groups and individuals could be presented.

During the year a special subcommittee of the House Public Works Committee was appointed to investigate the Federal-aid highway program, with particular

attention to the Interstate System. The subcommittee held two hearings: one concerned with the increase of vertical clearance on the Interstate System from 14 to 16 feet at the request of the Department of Defense; the other with alleged falsification of test reports and other irregularities of project personnel on an Interstate project in Oklahoma. In addition, the President directed his special assistant for public works matters to review the policies and design standards under which the Interstate System was being planned and built. Public Roads provided a large amount of information and data to both of these groups during the year.

Federal-aid financing

Progress of the Interstate System program was threatened with a complete stoppage at the beginning of the fiscal year, due to more rapid use of money accumulated in the Highway Trust Fund than was anticipated in the original legislation, resulting from accelerated spending called for under the Federal-Aid Highway Act of 1958. The 1958 Act had increased the Interstate authorization for fiscal year 1960 from $2.2 to $2.5 billion and directed that it be apportioned in full, disregarding the pay-as-you-go provision of the 1956 legislation. It was recognized that this action would deplete the surplus accumulated in the Trust Fund in prior years and would preclude apportioning any funds for the Interstate System for fiscal year 1961. With passage of the Federal-Aid Highway Act of 1959, however, additional revenue was provided for the Trust Fund, and it was possible to keep the Interstate program going with an apportionment of $1.8 billion for the fiscal year 1961.

There is, in addition, a long-range problem of financing the Interstate System program. The estimate of the cost of completing the system, presented to the Congress in January 1958, showed that Federal and State matching financing required after July 1, 1956, amounted to $37.6 billion, as compared with the $27.6 billion available from authorizations of the 1954 and subsequent Federal-aid acts together with State matching funds.

A new detailed cost estimate for the Interstate System was being completed and will be presented to the Congress in 1961. Early indications were that the new estimate would not differ greatly from the earlier one. From this new estimate and the results of the highway cost allocation study the Congress will have a wealth of information as a basis for consideration of appropriate scheduling and financing of Interstate and other Federal-aid programs, and for the equitable distribution of taxes to support the programs among the classes of highway users and other beneficiaries.

Construction contracts and prices

The Federal-aid highway construction program is accomplished under the traditional American practice of competitive bidding for contracts let by the States. Competition during the fiscal year was generally quite spirited, with an average of 7.6 bidders per contract. Successful bidders on Federal-aid primary contracts averaged less than two contract awards each.

During the fiscal year, 6,472 Federal-aid construction contracts were awarded, of which 3,477 were on the primary system and 2,995 on the secondary system. Forty-six percent of the primary system contracts were for Interstate work. Contracts for urban work are included in the total for the primary system. Included in the totals were 634 miscellaneous contracts for such work as test borings, building demolition, landscaping, storm drainage, etc.

The average size contract was $404,000, and about 90 percent of the contracts were for less than $1 million.

At the end of the fiscal year there were 11,300 different contracting organizations qualified, licensed, or otherwise recognized as competent to bid on highway

and bridge contracts by the highway departments of the 50 States, the District of Columbia, and Puerto Rico.

The trend of stabilization in highway construction bid prices, which began in the second quarter of fiscal year 1957, continued throughout fiscal year 1960 with a slight tendency toward a downward movement. The composite index for the first quarter of fiscal year 1957 was 167.2 (1925–29=100) which was 11.9 percent above the low point of 149.4 at the end of fiscal year 1955. The composite index for the fourth quarter of fiscal year 1959 was 163.1 which was 9.2 percent above the same low point. The index for the fourth quarter of 1960 was 159.1 resulting in a net decrease of 2.5 percent during fiscal year 1960.

Highway construction wage rates increased 4.5 percent during the fiscal year, but as a result of continually improving productivity in highway construction, the cost of labor actually decreased 2.6 percent. The cost of highway construction materials dropped 0.8 percent, but equipment ownership costs rose 1 percent during the year. The weighted average decrease of labor, materials, and equipment ownership costs was 0.9 percent, compared with an increase of 1.7 percent during fiscal year 1959.

Research

Public Roads, in cooperation with the State highway departments and others, continued extensive studies concerning the allocation of highway cost responsibilities and benefits and maximum desirable vehicle size and weight limitations. Final reports on these studies, requested by the Congress, were to be completed in January 1961.

In its own offices and laboratories, and through cooperative research projects, Public Roads continued to carry on research in a wide range of fields related to highways and transportation. Public Roads was also collaborating with the States and others in the AASHO Road Test, an intensive investigation of the performance of portland cement concrete and bituminous pavements and of bridges under varied weights of controlled traffic.

Development of the Federal-Aid Program

For those unfamiliar with the history and operation of the Federal-aid program, a brief account follows.

Federal aid to the States for highway improvement had its modest beginning in the Federal-Aid Road Act of 1916. Through the years, without interruption except in World War II, the program has continued to grow in size and importance commensurate with the explosive growth of motor-vehicle transportation in the United States. For almost two decades, use of Federal aid was restricted to rural portions of what now constitutes the Federal-aid primary highway system, an extensive network including most of the country's main-traveled roads. Since 1934 Federal aid has also been extended to the urban portions of this system, and since 1944 to a Federal-aid secondary highway system of farm-to-market roads.

In 1944 also, the National System of Interstate and Defense Highways was brought into being. This Interstate System, as it is commonly called, is limited to 41,000 miles in extent, and constitutes the most important portions of the Federal-aid primary system. Federal-aid funds, however, were not specifically authorized for the Interstate System, or were provided only in relatively modest amounts, until 1956.

The Federal-Aid Highway Act of 1956, augmented by the Federal-Aid Highway Acts of 1958 and 1959, authorized a tremendously enlarged highway program which, in its entirety, will be the greatest peacetime construction pro-

gram in history. While extending at an increased rate the traditional aid for primary, secondary, and urban highway improvements, the 1956 act authorized Federal aid over a 13-year period for completion of the Interstate System. The 1956 act also established a Federal highway trust fund to receive Federal highway-user excise taxes and from which funds for Federal highway aid are disbursed.

The Federal-aid authorizations are made in four categories: For the Interstate System, and for primary, secondary, and urban highways—the latter group are often referred to as the ABC program. The 1956 act, as amended, authorized $25.1 billion of Federal aid for the Interstate System, spread over the 13 fiscal years 1957–69. Authorizations for the ABC program, usually made biennially, have risen $25 million annually in recent years, from $825 million for fiscal year 1957 to $925 million for 1961. Federal-aid funds for the ABC program are apportioned among the States according to formulas prescribed by law, taking into account population, area, and postal route mileage. Interstate funds are apportioned among the States on the basis of need, to insure simultaneous completion of the system in all States.

Interstate funds are matched by the States on a 90-percent Federal 10-percent State basis; the ABC funds are matched 50–50. States with large areas of public lands match on a proportionately reduced scale. Federal aid may be used only for highway improvements, not for maintenance. The program is a cooperative enterprise in which the States have the initiative and responsibility for the selection, design, and construction of the Federal-aid projects, subject to review and approval of each stage by the Bureau of Public Roads.

As of December 31, 1959, the Federal-aid primary system totaled 264,576 miles in extent, including the Interstate System. There were 589,681 miles in the Federal-aid secondary system. The urban portions of the primary and secondary systems totaled 35,309 miles.

Legislation

The short-term difficulties in financing the Interstate program (discussed later in this report in connection with the Highway Trust Fund) led the President, in his January 1959 budget message, to recommend that the Federal motor-fuel tax be increased by 1½ cents per gallon for a 5-year period. After considerable discussion, the Congress enacted compromise legislation in the Federal-Aid Highway Act of 1959, which was signed into law on September 21, 1959.

Title II of the act increased the motor-fuel tax rate from 3 cents to 4 cents per gallon for the 21-month period from October 1, 1959, through June 30, 1961. Thereafter the act provided that the 1-cent fuel tax increase was to be replaced as a source of additional revenue by the dedication to the Highway Trust Fund of one-half of the existing 10-percent excise tax on the manufacturer's price of new automobiles and five-eighths of the 8-percent tax on the manufacturer's price of motor-vehicle parts and accessories, during the 3 years from July 1, 1961, through June 30, 1964. Revenues from these two taxes normally go in entirety to the general fund of the Treasury.

The taxes earmarked by the 1959 Act for the Highway Trust Fund were expected to provide some $3.4 billion in additional revenue during the 5-year period.

In addition to its revenue provisions, the 1959 Act changed the authorization for the Interstate System program for the fiscal year 1961 to $2.0 billion. Originally set at $2.2 billion by the Federal-Aid Highway Act of 1956, the authorization had been raised to $2.5 billion by the Act of 1958.

Also as an aid to solution of the short-range financing problems of the Federal-aid program, the Congress, in the Mutual Security Appropriations Act approved September 28, 1959, provided for an advance of $359 million from the Treasury to the Highway Trust Fund. Such advances had been contemplated and authorized in the Federal-Aid Highway Act of 1956. The full amount of the advance was repaid prior to the end of the fiscal year.

At the close of the fiscal year the Congress had under consideration bills providing for the traditional biennial authorizations for the Federal-aid primary, secondary, and urban (ABC) programs and the public domain highway programs, for the fiscal years 1962 and 1963. (Legislation was enacted as the Federal Highway Act of 1960 and approved July 14, 1960, authorizing $925 million for the ABC program and about $120 million for public domain roads for each of the fiscal years 1962 and 1963.)

Subsequent to the codification in the previous fiscal year of the many laws relating to Federal aid for highways, in Title 23, United States Code, a complete revision of the regulations for the administration of Federal aid for highways was undertaken and completed. The new regulations became effective on May 11, 1960. Relatively brief in form, the regulations are designed to supplement and implement the Federal-aid laws without restating them.

The National System of Interstate and Defense Highways

The National System of Interstate and Defense Highways is a 41,000-mile planned, integrated network of the Nation's most heavily traveled routes, linking the country's metropolitan areas and industrial centers, serving the national defense, and connecting with routes of continental importance in Canada and Mexico. Comprising little more than 1 percent of the total U.S. mileage, the system when completed will carry over 20 percent of the Nation's traffic.

Status at end of year

The accomplishments of 4 years of concentrated effort on the Interstate program were testimony to the capabilities of the State highway departments, Public Roads, and the contractor, materials, and equipment industries. At the end of the fiscal year, 9,107 miles of the Interstate System were open to traffic and construction was under way on another 4,690 miles.

Of the sections open to use, 3,693 miles were completed to standards adequate for 1975 traffic, the program's objective; and 3,140 miles had been improved and were fully capable of handling current traffic but needed additional improvements to bring them up to standards for 1975. These accomplishments had been achieved with Federal-aid Interstate and other public funds.

In addition, 2,274 miles of toll roads, bridges, and tunnels had been incorporated in the system. Their inclusion is permitted by law, but Federal-aid funds may not be used for their improvement, and they continue to operate as toll facilities.

Almost half of the mileage open to traffic, 4,386 miles, has been built or improved under the Federal-aid Interstate program, most of it since passage of the 1956 Act. Work on the remaining 2,447 miles (other than toll facilities) was financed by the States and localities under other programs—in many cases with Federal aid.

In addition to the sections open to traffic, 4,690 miles were under construction with Federal-aid funds at the end of the fiscal year, and engineering or right-of-way acquisition was in progress on another 10,093 miles. Thus some form of work was completed or underway on 23,890 miles of the 41,000 mile system—over half the total.

Interstate Route 65 bypassing Lebanon, Ind. Access control was acquired along the existing two-lane bypass and it was used as one roadway of the divided freeway.

The status of improvement of the Interstate System is shown in summary in the table on this page and by States in appendix table 12. A map showing the general location of sections completed or underway appears on pages 52–53.

Status of improvement of the Interstate System as of June 30, 1960

Improvements	Financing with—		Total
	Interstate funds [1]	Other public funds [2]	
	Miles	*Miles*	*Miles*
Improved and open to traffic:			
Completed to full or acceptable standards	3,141	552	3,693
Improved to standards adequate for present traffic but additional improvement needed to meet full standards	1,245	1,895	3,140
Toll facilities	----------	----------	2,274
Total improved and open to traffic	4,386	2,447	[3] 9,107
Improvements underway with Interstate funds:			
Under construction	4,690	----------	4,690
Preliminary engineering or right-of-way acquisition underway	10,093	----------	10,093
Total improvements underway	14,783	----------	14,783
Total completed, improved, or underway	----------	----------	[3] 23,890

[1] Including State matching funds.
[2] Including some Federal aid.
[3] Including toll facilities.

Development of the system

The Interstate System was created, with a 40,000-mile limitation, by the Federal-Aid Highway Act of 1944. General locations of 37,700 miles of intercity routes were officially designated in 1947, and 2,300 miles of routes around, into, and through cities were designated in 1955. Taken into account in the selections, made cooperatively by the States and Public Roads, were the basic factors of population service, transportation requirements of industry, commerce, and agriculture, system integration, and needs of national defense.

The Federal-Aid Highway Act of 1956 provided a 1,000-mile increase in the limitation of the Interstate System; and about that time it became evident, as the States selected detailed locations for the routes of the originally designated 40,000 miles, that considerable mileage saving had resulted from adoption of alinements more direct than those of existing highways. As a consequence, 2,100 miles of additional routes were designated in 1957 within the 41,000-mile limit.

At the end of the fiscal year the designated Interstate System totaled 40,594 miles of which 35,570 were rural and 5,024 were urban. The remaining 406 miles within the 41,000-mile limitation were held in reserve for adjustments as final locations are selected and projects built. The States continued economic and engineering studies to determine the most feasible locations for the Interstate route sections, both for the immediate work of right-of-way acquisition and construction and for the revised estimate of the cost of completing the system, which was underway. At the end of the year definite or feasible locations had been selected by the States and approved by Public Roads for all routes.

Until 1956, only limited amounts of Federal-aid funds were specifically authorized by Congress for Interstate System improvement, although Federal-aid primary and urban funds could be and were used to a considerable extent for that purpose. The picture changed radically when the 1956 Act, as now amended by the 1958 and 1959 Federal-Aid Acts, authorized a total of $25.125 billion over the 13-year period 1957–69 for completion of the Interstate System. These funds are matched on a 90-percent Federal, 10-percent State basis.

Federal-aid authorizations for the Interstate System totaling $7.4 billion, for the fiscal years 1957–60, had been apportioned to the States prior to the fiscal year. While the authorized amount for the fiscal year 1961 was $2 billion, the anticipated resources of the Highway Trust Fund did not permit a full apportionment. As a consequence, an apportionment of $1.8 billion was made to the States, on October 8, 1959.

Progress during the year

The details of route selection, making of surveys and plans, acquisition of right-of-way, and construction of projects of the magnitude and complexity involved in the Interstate System often take 3 or 4 years from conception to completion. Many route sections are being built in stages, with an initial project for grading and drainage and a subsequent project for paving. Some existing highways are improved and augmented to attain Interstate standards; for example, by acquisition of access control, or by adding another roadway to a two-lane road, to make a four-lane divided freeway.

Much was accomplished in the Interstate System program during the fiscal year. Improvements were programed during the year on 2,192 miles, with an estimated cost of $1.92 billion including $1.55 billion of Federal-aid Interstate funds.

Improvements involving Federal-aid Interstate funds were completed during the fiscal year on 2,402 miles of the Interstate System at a total cost of $1,718,561,367, of which $1,453,210,937 was the Federal share. Completed work in-

cluded 1,647 miles of bituminous and portland cement concrete surfacing, 702 miles of grading, drainage work, and temporary surfacing, and 53 miles of structures involving 612 bridges over streams, 1,560 bridges over highways to provide traffic grade separations, and 196 railway-highway grade-separation structures.

At the end of the year a total of $790 million worth of work was in program status, and 4,278 projects with a total estimated cost of $5.1 billion were underway or scheduled to start soon.

Excluding projects that have only been programed, a total of $8.4 billion had been obligated for the Interstate System at the end of the fiscal year, of which 6 percent was for preliminary engineering, 25 percent for right-of-way acquisition, and 69 percent for construction. At the end of the previous year $6.5 billion had been obligated, of which 68 percent was for construction.

Interstate System Progress: Case Histories

Statistics show in an abstract way the marked progress of the Interstate System program during the 4 years since passage of the Federal-Aid Highway Act of 1956. Far more impressive to the average motorist or trucker, however, were the many completed sections open for their use, ranging from a few miles to more than a hundred miles in length. The bright new, red-white-and-blue Interstate route marker was becoming widely recognized as a symbol of swift, safe, tension-free travel. Vehicle drivers noted, too, the promise of the future in the big construction jobs they saw underway, paralleling the old, crowded routes they traveled; although sometimes their patience was tried by detours or delays at construction operations. But the individual driver was apt to know only of Interstate progress in his own locale, or along the route of his annual vacation trip. A clearer picture of nationwide progress may be gained, perhaps, by brief glimpses of typical Interstate projects across the land, completed or underway during the year.

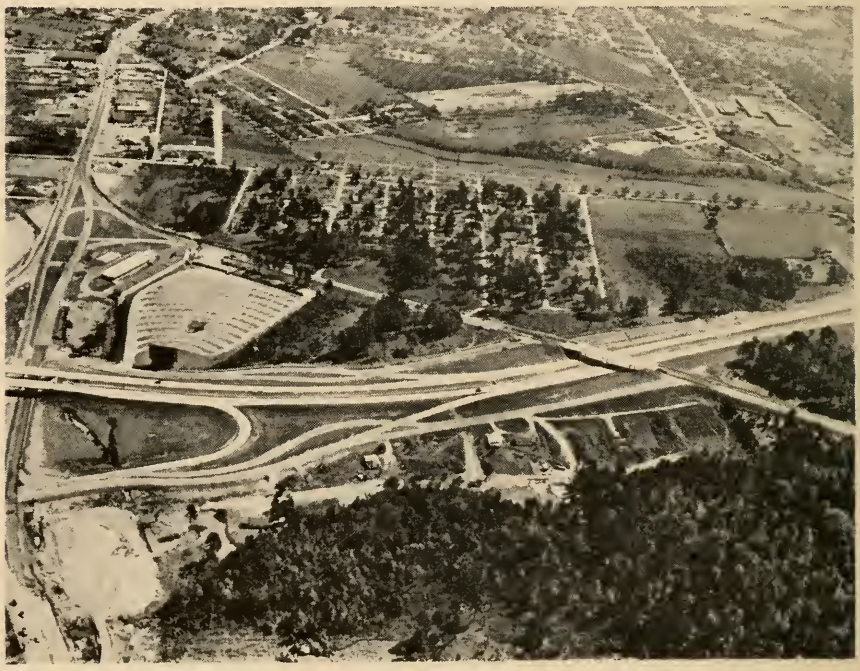
In Arizona, a 55-mile section of Interstate Route 17 from the Verde Valley to Flagstaff, much of it through national forest land, will be completed late in 1960 at a cost of $15.8 million. Ten miles were being built as a four-lane divided highway, with the two roadways independently designed. The remaining 45 miles were being built as a two-lane highway, but will eventually be developed as a four-lane divided freeway. The new route will cut travel time between the Verde River and Flagstaff by 30 minutes.

In Arkansas, construction was started on a major interchange on Interstate Route 30, which skirts the city limits of Little Rock through sparsely populated, marshy lowlands. An estimated 9,000 vehicles a day will be funneled from relocated U.S. Routes 65 and 167 into the Interstate route and into Little Rock at this interchange.

In California, a 2.8-mile section of Interstate Route 680, bypassing the city of Walnut Creek, was completed during the year. The four- and six-lane freeway (ultimately to have six and eight lanes) removed through traffic from a heavily congested four-lane city street. The bypass, part of a circumferential route around the lower portion of San Francisco Bay, was carrying 25,000 vehicles daily, with anticipated growth to 45,000 by 1975.

Another California project completed during the year was a 6.4-mile stretch of eight-lane divided highway on Interstate Route 5 south of Bakersfield. The old four-lane road, with improved alinement and new pavement, carries southbound traffic, and an entirely new four-lane roadway was built for northbound traffic. Because of the rugged terrain the southbound roadway has a long, adverse 6-percent grade, but slow-moving vehicles are restricted to the outside lane, leaving three lanes for faster traffic. The road was being used by over

Interstate Route 5, an eight-lane highway south of Bakersfield, Calif. The old four-lane road was improved and used as one of the twin roadways.



Interstate Route 75 in Georgia bypasses the city of Tifton but provides service through the interchange with U.S. 82.

15,000 vehicles a day, and travel time between southern California and the San Joaquin Valley has been sharply reduced.

In Colorado, the Monument Valley Freeway, part of Interstate Route 25, was opened to traffic at the end of the fiscal year. The 8.7-mile freeway, which cost $9.8 million, parallels a creek through Colorado Springs and continues 3 miles north of the city limits to U.S. Routes 85 and 87. The new route has reduced congestion on the old main cross-town route, a four-lane divided facility which has many traffic-hampering at-grade street intersections. Land on both sides of the northern part of the new freeway was already being developed for industrial and residential use.

In Connecticut, completion of 8.5 miles of four-lane divided highway on Interstate Route 91 opened the whole length in that State of the Hartford-Springfield (Mass.) Expressway. The old, congested two-lane road, now relieved by Interstate 91, carried 13,000 vehicles per day and had a record of 130 accidents per 100 million vehicle-miles of travel.

In the District of Columbia, a short but vital section of the Southwest Freeway, part of Interstate Route 95, was under construction. This ¼-mile, six- and eight-lane elevated facility is a part of the Inner Loop Freeway which will circle the "down-town" area of the Nation's capital. From its inception, the Southwest Freeway has been an integral part of the extensive urban redevelopment plans for southwest Washington, now well underway. The freeway and redevelopment projects have been closely coordinated, to the mutual benefit of both. Right-of-way for the freeway was acquired for the District Department of Highways and Traffic by the Redevelopment Land Agency, the local body administering the redevelopment work.

In Florida, the 8-mile 36th Street Expressway being built to serve the Miami area, when completed, will lead from Miami Beach to Miami and an interchange at Interstate Route 95, thence continuing west to U.S. 27. Daily traffic of 30,000 vehicles was already using the 3-mile completed section from Miami Beach to U.S. 1, with considerable relief of congestion on the other causeways across Biscayne Bay.

In Georgia, a 37-mile section of Interstate Route 75 was completed in Tift and Turner Counties. The four-lane divided highway, built at a cost of $15 million, includes 32 bridges, 41 ramps and separation roadways with a total length of 18 miles, and 11 miles of frontage roads needed for disrupted local traffic service. The route was being extended by a 35-mile construction project to the north and a 55-mile project south to the Florida State line. The potential of this major north-south highway is indicated by a 1956 study at the Florida line, which reported that trans-State trips alone along this route totaled 5,000 vehicles daily.

In Idaho, the 5-mile Coeur d'Alene Belt Route was being built as part of Interstate Route 90. This four-lane divided freeway will relieve congestion on the narrow four-lane street that presently carries U.S. 10 through the city's main business district. One-fourth of the 7,500 vehicles per day now going through Coeur d'Alene are out-of-State passenger cars.

In Illinois, construction was underway all along Interstate Route 80 from U.S. 66, near Joliet, west to Ottawa. (Ottawa is the site of the AASHO Test Road, described elsewhere in this report, whose roadbed is destined to become a part of Interstate 80.) The 35-mile, four-lane divided freeway, costing $16 million, will be 4 miles shorter than the narrow, winding section of U.S. 6 which it will replace. Predicted traffic is about 16,000 vehicles daily.

In Indiana, the Lebanon Bypass on Interstate Route 65 was completed early in the fiscal year. This project involved converting a two-lane road without access control to a four-lane divided freeway. Seven miles of construction

projects, to cost $3.6 million, were underway on this route between Lebanon and Indianapolis.

In Iowa, the first mile of the Des Moines Freeway was under construction. The planned $57 million, 16-mile city-piercing route will carry 14,000 vehicles per day when opened and 40,000 by 1975. Some 41,000 vehicles now go through the central business district daily, many for lack of a more direct or efficient route. Obviously, completion of the freeway will greatly reduce congestion on the already crowded city streets. Annual savings to motorists using the freeway when complete are estimated at $3.1 million, which would pay for the construction cost in 19 years. Clearing the right-of-way for the section being built required razing 350 buildings, many of which were dismantled by individuals to obtain low-cost lumber for building houses elsewhere in the city. Much of the freeway is a depressed section, and the waste excavation material has been used to fill low-lying areas. Land reclaimed in this manner has been used for a playground, a park, a projected shopping center, and a potential industrial site along the river.

In Kansas, the Muncie Expressway in Kansas City, part of Interstate Route 70, was completed except for a new viaduct being built adjacent to the present Intercity Viaduct crossing the Kansas River into Kansas City, Mo. The viaducts also cross a complex of highways and railroads and terminate at a directional interchange which was under construction. The 2.8-mile, six-lane divided expressway connects at the west with the Kansas Turnpike, a part of Interstate 70, and forms an important link in the Kansas City metropolitan area freeway network. Travel time during peak hours on the parallel U.S. 24 from the west city limits to the Intercity Viaduct requires 11 minutes, at a speed of 16 miles per hour, as compared with 6 minutes, at a speed of 45 miles per hour, via the Muncie Expressway: this despite the longer travel distance of 4½ miles via the expressway versus 3 miles via U.S. 24.

In Kentucky, a 12.7-mile section of Interstate Route 65 was completed during the year between Uptown and Elizabethtown, from which the Kentucky Turnpike continues 40 miles to Louisville. Traffic on the new section had reached 4,700 vehicles per day, while that on the old route, U.S. 31–W, had dropped to less than half its former volume. Interstate traffic now avoids the Nolin River bridge on U.S. 31–W, where a number of accidents have occurred.

In Louisiana, construction was well along on an interchange at the junction of Interstate Route 10 and U.S. 90, just west of the Calcasieu River Bridge at Lake Charles. Daily traffic of 15,500 vehicles at this location has been congested, moving at less than 25 miles per hour during rush hours. The completed project will accommodate much more traffic, operating safely at speeds near 50 miles per hour.

In Maryland, a 7-mile section of the southbound lane of Interstate Route 83 was under construction. The rest of this 65-mile freeway from Baltimore to Harrisburg, Pa., was completed and in use. Contracts were let during the year for two complex interchanges and other work on the Jones Falls Expressway, which will extend Interstate 83 into downtown Baltimore. The 6.7-mile, six-lane expressway route runs through the fastest growing section of the metropolitan area, where existing streets are congested throughout the day. Jones Falls Valley was the only corridor into the city where freeway construction was possible without wholesale destruction of property. However, railroads and industries in the valley had to be avoided, adjusted, or shifted in locating the expressway, and the stream itself presented special problems since it drains a large watershed. Seven existing bridges spanning the valley must be reconstructed to provide adequate clearance for the expressway.

In Massachusetts, 14.5 miles of Interstate Route 93 from Circumferential Route 128 around Boston to the Merrimack River were open to traffic during the year, including the Merrimack River Bridge. This is part of the 23-mile, 4- to 8-lane freeway from Boston to the New Hampshire State line, designed to carry 80,000 vehicles per day and due to be completed in 1961 at a total cost of $50 million.

In Michigan, construction of 20 miles of Interstate Route 94 east of Battle Creek was completed at the end of the year, opening a continuous 85-mile stretch of the route to traffic, from Jackson to Paw Paw. The route bypasses the cities of Albion, Marshall, Battle Creek, and Kalamazoo. Traffic is expected to reach 19,000 vehicles per day by 1975. U.S. 12, which Interstate 94 replaces, was hazardous and frustrating to the heavy traffic it carried both because it went through the centers of these cities and because of its many nonpassing sections due to inadequate horizontal and vertical alinement.

In Mississippi, 85 miles of Interstate Route 55 from the Tennessee State line southward were under construction. Grading had been completed on 60 miles of this section, and 30 miles were being paved. This route through the length of the State will lead north to Memphis and south to New Orleans.

In Missouri, a 6-mile section of Interstate Route 70, which will link St. Louis and Kansas City, was completed just west of St. Louis. The four-lane divided highway, bypassing the city of St. Charles, cost $11.3 million including a long bridge over the Missouri River. Travel time over the 6-mile distance has been reduced from 15 to 6 minutes. Traffic on the old route was 17,000 vehicles per day. The new Interstate section was already carrying 12,700 and was expected to reach 31,100 vehicles per day in 1975. Motorists now avoid the five stops, steep grades, and low speeds in St. Charles and the congestion at the narrow river bridge on the old route. Residential developments were springing up along the Interstate route because of its fast travel time to St. Louis.

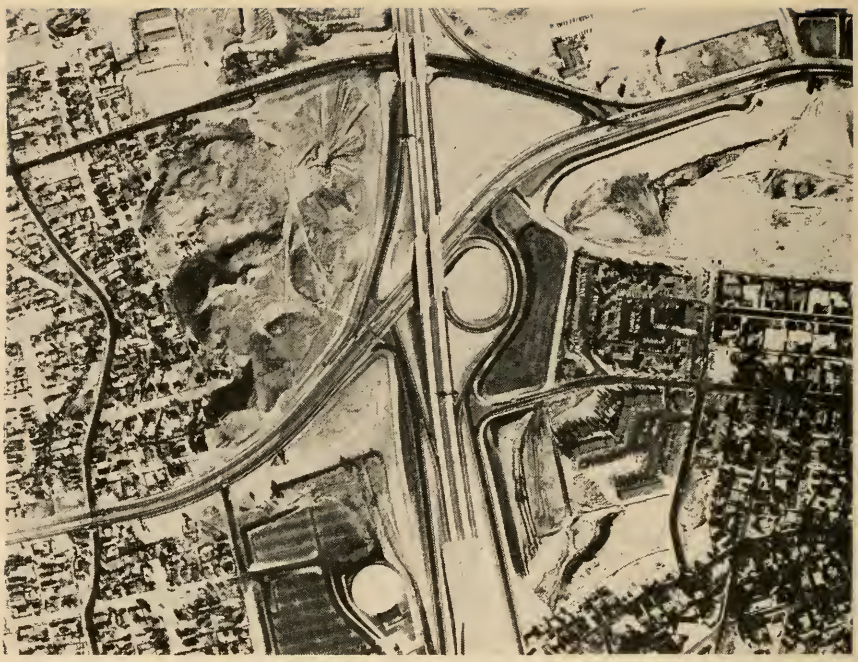
In Nebraska, contracts were let for construction of 31 miles of Interstate Route 80, and it was expected that the entire 53 miles of this route between Lincoln and Omaha will be completed next year as a four-lane divided highway. A 13-mile section already opened to traffic was carrying 3,300 vehicles per day and providing considerable relief to U.S. 6. New housing development continued southwest from Omaha, adjacent to the Interstate route, and land values were rising.

In New Hampshire, construction finished during the year completed the Interstate Route 93 bypass of Concord and the Boscawen spur connecting Interstate 93 and U.S. 3 and 4. The 8.7 mile bypass was saving motorists enroute to the White Mountains 4 minutes of travel time even in offpeak hours, and was relieving congestion in the capital city. The recently completed projects, which included twin bridges over the Merrimack River for the Interstate route and another bridge for the spur, involved Federal-aid Interstate, secondary, and special "D" funds.

In New Jersey, construction was underway on 10.9 miles and was completed on 8.4 miles of Interstate Route 80, which extends west from the George Washington Bridge. An important segment under construction was the seven-span bridge over the Passaic River at Paterson. The 731-foot long structure will have a roadway width of 132 feet. An existing bridge at this location was carrying 50,000 vehicles daily, and the new bridge will carry 114,000 by 1980.

Also in New Jersey, progress continued on the 65-mile Interstate Route 295, paralleling the New Jersey Turnpike and U.S. 130 from Trenton to the Delaware Memorial Bridge near Wilmington. Construction costing $27.9 million had been completed on 11.7 miles and was underway on 12.8 miles. Traffic will reach 84,000 vehicles per day in 1975 on sections of this route.

In New Mexico, the first project on Interstate Route 25 in Albuquerque was completed during the year. While the 0.8-mile divided highway could not be



The first urban section of Interstate Route 25 was completed in New Mexico, in the city of Albuquerque.

Horace Harding Expressway, part of Interstate Route 495 in Queens, New York City, is carrying 100,000 vehicles a day. (Photo courtesy Port of New York Authority.)

opened to traffic until adjacent construction is completed, the improvement of two arterial cross-streets as part of the project has already somewhat relieved traffic congestion in the area.

In New York, a 2-mile section of the Horace Harding Expressway was completed during the year in the Borough of Queens, New York City. The expressway is part of Interstate Route 495, which will cross both Manhattan and Queens. Part of the recently completed six-lane divided highway was financed with Interstate funds and part with Federal-aid urban funds, with a total construction cost of $11.6 million. Incorporated in the section was a cloverleaf interchange built in 1935 with Federal national recovery (NRM) funds. Traffic on the new route has reached 100,000 vehicles per day, approaching the 110,000 originally predicted for 1975. There were 433 accidents involving 144 injuries (but no fatalities) on this route in the previous year. The new expressway will undoubtedly have a far better record.

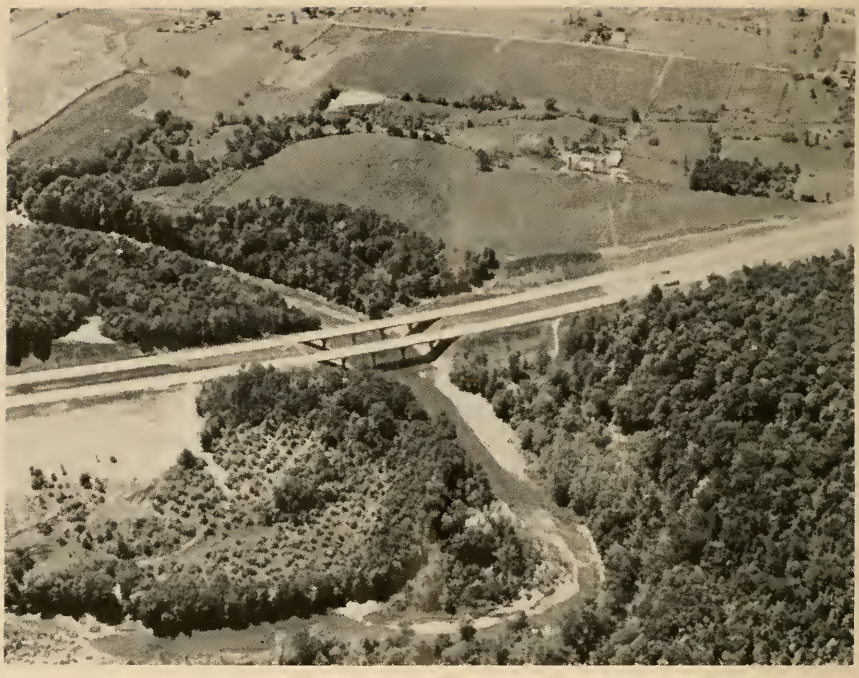
In North Carolina, 46 miles of the 183-mile length of Interstate Route 95 across the State had been completed and were in use. Interstate 95 is the major north-south route along the east coast, running from Miami, Fla., to Houlton, Maine. Along the completed section in North Carolina two pairs of safety rest areas (several more are planned), providing off-highway parking, running water, toilets, fireplaces, and picnic tables in an atmosphere of privacy and scenic surroundings, have proven very popular.

In North Dakota, an 86-mile length of four-lane divided highway on Interstate Route 94 was open to traffic as a result of completion of a 47-mile section from Dawson to Jamestown at a cost of $19 million. The newly completed work included 19 major structures, providing 12 interchanges and 2 highway and 1 railroad grade separations. The new route parallels U.S. 10, which had many restricted sight distances and ran through several towns now bypassed by the new road. U.S. 10 has had load and speed restrictions imposed every spring to avoid surface breakup during the thawing period. Most of U.S. 10 remains as a local service road, but 17 miles of it were used as one roadway of the new divided highway.

In Ohio, a 44-mile section of Interstate Route 90 was completed during the year, providing considerable relief to U.S. 20 which formerly carried as many as 20,000 vehicles daily, as the major traffic artery from Cleveland east to the Pennsylvania State line. The new route was designed with a capacity of more than 30,000 vehicles per day. Along the 44 miles of 4-lane divided freeway are 8 interchanges and 41 bridges over highways, railroads, and streams, including sizable twin structures over the Ashtabula and Grand Rivers. Total cost of the 12 projects under which this route was built, including right-of-way, was $48.7 million.

In Oregon, completion of the 6 miles of paving underway will open to traffic a 19-mile section of Interstate Route 80N from Hood River to The Dalles. One section of the four-lane divided highway has an 8½-foot wide median with a metal median barrier, dictated by high rock bluffs on one side and a mainline railroad and the Columbia River on the other. Elsewhere in Oregon, the 42-mile length of Interstate Route 5 from Albany to Eugene, which was well underway, will have a 76-foot median. Grading was complete and paving contracts had been let for the entire length. All structures, including a $10.4 million bridge over the Willamette River, were under contract or completed. An 11½-mile section of the route, soon to be opened, varies only slightly from a straight line and will save 7½ miles in distance.

In Pennsylvania, extensive surveys have been made for Interstate Route 80, called the Keystone Shortway for its length across the State and construction was begun during the year. This east-west route, through the central part of



Interstate Route 90 crossing the Ashtabula River in Ohio. This is part of a 44-mile section completed east of Cleveland during the year.

Pennsylvania from Ohio to the Delaware River, is in a location where no previous direct travel route existed.

In Rhode Island, a 1.8-mile section of the East Providence Expressway was completed and opened to traffic. This is a part of Interstate Route 195, connecting Providence with Fall River and New Bedford, Mass. Travel time on the newly completed section is 10 minutes less than on the parallel local-road route under congested conditions.

In South Carolina, work was nearing completion on Interstate Route 126, a 3.8-mile spur into downtown Columbia from Interstate Route 26 which bypasses the city to the west. Among the structures built on the $3.3 million spur are a bridge over Broad River and a three-level interchange. Traffic on the route is expected to be over 21,000 vehicles per day by 1975, and road-user savings for the period 1960-75 are estimated at $9 million, almost three times the cost.

In Tennessee, work was underway on a 2.4-mile, $4.3 million project located on Interstate Route 75 in the Knoxville urban area. The project extends from the east-west downtown-Knoxville Interstate route northerly to the north city limits.

In Texas, the 7.9-mile Stemmons Expressway was completed during the year in Dallas as part of Interstate Route 35E, at a cost of $20 million. Some parts of this expressway have five through lanes and three frontage-road lanes for travel in each direction. Right-of-way was donated.

In Utah, projects were underway on Interstate Route 15 in two widely separated locations and under vastly different circumstances. Near Cove Fort in the southwestern part of the State, an 8.6-mile, 4-lane divided highway was being built at a cost of $1.7 million. The road will have a 64-foot median on

the northerly portion and a variable median up to 700 feet wide, resulting from separate roadway design, in the southerly portion through the mountains. Located in a heavy snow area, the tortuous curves and steep grades of the old road have had a high accident history. At Salt Lake City 6.5 miles of Interstate Route 15 were under construction, leading north from inside the city line. An unusual feature of part of this route is provision of a five-lane divided freeway and a five-lane separated expressway connecting to U.S. 91. Southbound traffic destined for the northern part of Salt Lake City via U.S. 91 will leave the southbound Interstate roadway and travel southbound on the Expressway, thus reducing the lane requirements of the southbound Interstate roadway.

In Vermont, construction of a 12-mile section of Interstate Route 89 westward from Montpelier was nearing completion. In the $17 million construction project were 3 interchanges and 11 bridges, including the $1 million, 928-foot dual bridge crossing the Winooski River, a railroad, relocated U.S. 2, and two local roads. Rugged terrain in the narrow river valley required heavy grading and extensive drainage and foundation work. Completion of this section will be followed by construction continuing to Burlington, relieving the heavily traveled and antiquated U.S. 2. Travel time on the 37-mile route will drop from 60 to 40 minutes, and accidents will be reduced by about two-thirds.

In Washington, construction was started during the year on two sections of Interstate Route 5 in Tacoma. One of these will penetrate the city from the south as far as M Street; the other traverses farmland north of the urban area. These freeways will replace U.S. 99, a crowded, four-lane street through the city. Work was also underway on Interstate Route 5 in Seattle, where a 12-lane bridge, 4,400 feet long, was being built across the Lake Washington Ship Canal at a cost of $13.5 million.

In Wisconsin, a 44-mile section of Interstate Route 94 between Hudson and Menomonie was completed during the year. The route is almost wholly on new location a few miles south of U.S. 12, which is now functioning as a service road to the communities that lie along it. The Interstate route bypasses but closely serves these communities, without disturbing their probable pattern of growth. About 75 percent of the traffic formerly using U.S. 12 has been diverted to the new Interstate route, but total traffic on the two routes has increased steadily. Six months after the new route opened, total traffic was 28 percent greater than in the comparable month of the preceding year. Traffic on Interstate 94 alone was 6 percent greater than the previous year's traffic on U.S. 12.

In Wyoming, construction was underway on 42 miles of the 66-mile section of Interstate Route 90 between Gillette and Buffalo. This route section will be 24 miles shorter than the existing road, on which reduced speed limits are posted at frequent intervals because of steep hills and sharp curves. On a 1-mile, four-lane divided highway section completed during the year, at a location where the ground rises abruptly above the valley floor, independent roadway design was used to considerable advantage. By increasing the median width from 120 to 350 feet and using a higher elevation for one roadway, construction costs were reduced and an easier upgrade was obtained.

Also in Wyoming, a 15-mile section of Interstate Route 25, bypassing Cheyenne, was completed at a cost of $1.8 million. Truck traffic formerly routed through the city's choicest residential areas now use the bypass, which also provides access to Warren Air Force Base where an ICBM site is located. The first 5 miles of the new route north from Cheyenne, built as a four-lane divided highway, eliminates the former narrow, hazardous road entrance to the city. Further north the route was built as a two-lane highway which ultimately will be expanded to four lanes.

This section of Interstate Route 94 in Wisconsin was designed as two separate roadways, for safety, economy, and pleasing appearance (photograph taken prior to opening to traffic).

Federal-Aid Improvement of Primary Highways

The Federal-aid primary highway system, as of December 31, 1959, covered 264,576 miles of the principal highways of the Nation and included 241,097 miles of main rural roads and 23,479 miles in urban areas. These mileages include the Interstate System which by law is a part of the primary system.

Federal-aid primary fund authorizations, which may be used for either rural or urban portions of the primary system, have ranged upward in recent years from $247.5 million for fiscal year 1954 to the $416.25 million for fiscal year 1961 apportioned on October 8, 1959.

During the fiscal year, 5,196 miles of improvements, estimated to cost over $691 million and involving nearly $366 million of Federal-aid primary funds, were programed.

Improvements involving Federal-aid primary funds were completed during the year on 5,640 miles of the Federal-aid primary system at a total cost of $656,929,263 of which $340,217,480 was Federal aid. The projects completed included 4,823 miles of bituminous and portland cement concrete surfacing, 975 bridges over streams, and 137 bridges over highways to provide traffic grade separations. In addition, railway-highway crossings were eliminated by construction of 87 grade-separation structures and 6 existing structures were reconstructed; 112 grade crossings were protected by installation of signal devices.

An increasing proportion of the Federal-aid primary system was being built as multilane, divided highways, some with partial or full control of access.

A 6.7-mile section of U.S. 197, south of The Dalles, Oreg., was completed during the year with Federal-aid primary funds. The new route has 13 curves as compared with 87 on the old road, and is 4 miles shorter. A million cubic yards of excavation were involved in this project.

Federal-Aid Improvement of Urban Highways

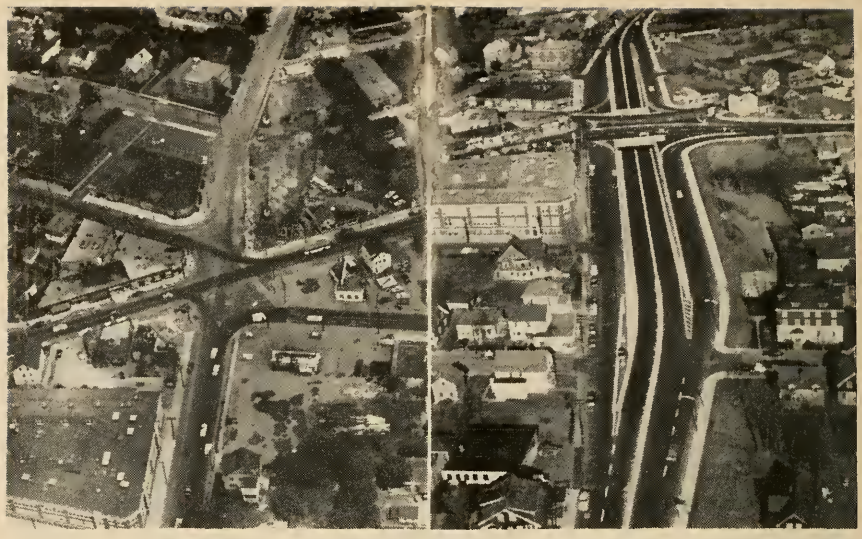
Highways in urban areas eligible for improvement with Federal aid as of December 31, 1959, totaled 35,309 miles of which 23,479 were on the Federal-aid primary system (including the Interstate System) and 11,830 on the Federal-aid secondary highway system.

During the fiscal year 52 percent of all work programed on the Interstate System was for improvement in urban areas. This is commensurate with both the estimated cost of improving the Interstate System and of travel in the United States; in both cases the urban proportion being nearly half.

Federal-aid urban fund authorizations have increased in recent years from $137.5 million for fiscal year 1954 to the $231.25 million for fiscal year 1961 apportioned on October 8, 1959. During the year, in addition to the funds approved for projects from the Federal-aid urban authorizations, 8 percent of all primary Federal-aid highway funds was approved for urban highway work.

Plans approved for Federal-aid construction projects in urban areas during the past fiscal year totaled $1,522,394,704 and covered 1,031 miles of highway improvement. Of this total, $1,010,901,735 was Federal aid, comprised of $207,417,048 from the urban authorizations, $31,747,526 from the primary fund authorizations, and $761,479,104 from Interstate funds.

Federal-aid construction work in urban areas completed during the fiscal year consisted of 1,095 miles of highway improvements costing $1,258,685,087 of which $870,562,101 was Federal aid. The completed work included 966 miles of bituminous and portland cement concrete surfacing, 289 bridges over streams and rivers, 702 bridges to provide traffic grade separations between crossing highways. In addition, 113 railway-highway separation structures were com-



The Six Corners underpass and a one-way street system (on the right) has eliminated the long delays to traffic formerly encountered (on the left) at this midtown location in East Providence, R.I.

pleted and 12 existing ones were reconstructed, and 56 railroad grade crossings were protected by installation of signal devices.

Secondary or Farm-to-Market Roads

The Federal-aid secondary network of farm-to-market, feeder, school-bus, and mail-route roads is the largest of the Federal-aid highway systems. Its length as of December 31, 1959, was 589,681 miles, including 11,830 miles of extensions into or through urban areas. The Federal-aid authorizations for this system have increased from $165 million for fiscal year 1954 to the $277.5 million for fiscal year 1961 apportioned on October 8, 1959.

During the fiscal year, a total of 16,481 miles of improvements, estimated to cost over $657 million and involving $347 million of Federal-aid secondary funds, were approved on the secondary system. Improvements were completed during the year on 17,252 miles of the secondary system at a total cost of $607,402,293, involving $331,652,952 of Federal-aid secondary funds. Of the improvements completed, 11,990 miles involved bituminous or portland cement surfacing, 4,051 miles were gravel or stone surfaced, and 1,148 miles were graded and drained preparatory to receiving surfacing. Also completed were 2,238 bridges over streams and 21 bridges over highways; 53 new railway-highway grade separation structures and reconstruction of 6 others; and protection of 222 other railway-highway crossings by signal devices.

For the 15 years that Federal funds for the secondary program have been apportioned to the States, a total of 47,129 projects involving 185,423 miles of improvements have been completed. The projects have been widely distributed each year through an average of 2,000 counties, with an average of about 3,500 projects being completed each year.

The Federal-aid secondary program differs considerably from the other Federal-aid highway programs. The system is not limited in length by Federal legislation, the only limitations being that mileage which can be prop-

Federal-aid secondary and "D" funds were used to improve 6½ miles of Mississippi Route 18 in Clarke County. Grading, drainage, and a 20-foot bituminous pavement were completed at a cost of $54,000 per mile.

This 4-mile Federal-aid secondary project in South Carolina was built in Aiken County at a cost of $12,250 per mile, using local sand-clay soil to advantage as a base course for the 20-foot bituminous surface. A bad curve in the old road, eliminated by the improvement, appears at the right. Road-user savings in the next 15 years were estimated at $43,000.

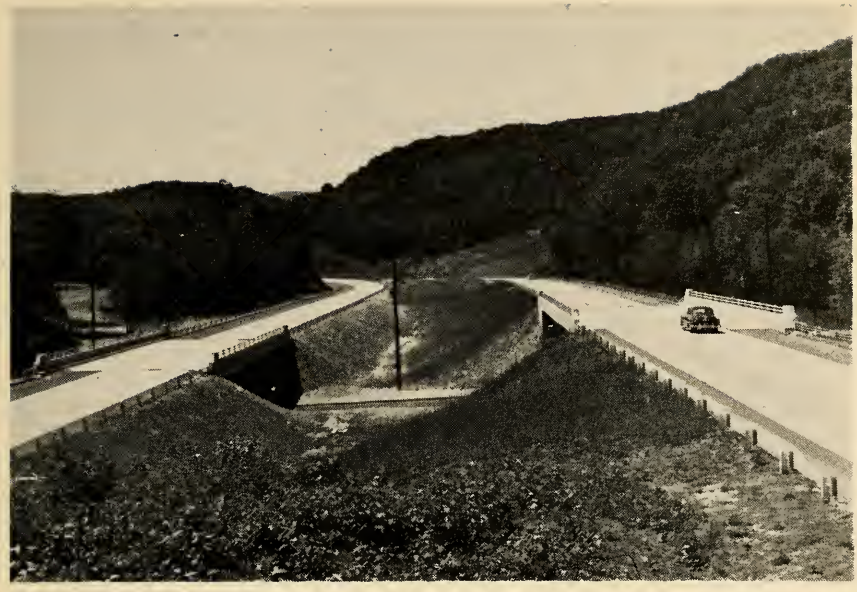
This 2-mile section of 6-lane freeway in California was completed during the year with Federal-aid "D" funds, replacing a congested 4-lane road built in 1943. The route connects Oakland with rapidly developing areas to the east, and is already carrying 40,000 vehicles daily.

erly improved and maintained. The routes of the system and the projects to be constructed are selected cooperatively by the State highway departments and local highway officials. Another difference is that under the 1954 act the administrative procedure between Public Roads and the States in carrying on the secondary program has been simplified, with the States assuming greater responsibility. The procedure is a voluntary one, and at the end of the fiscal year all States except Alaska, Hawaii, Indiana, and the District of Columbia had adopted it.

The Board of County Consultants, reconstituted in the last fiscal year, met with Public Roads officials in October 1959. The nine-member Board, formed to promote better mutual understanding on the Federal-aid secondary program among county engineers, the State highway departments, and the Bureau of Public Roads, has given effective counsel and advice in administrative problems that affect the counties, and has helped to disseminate information on the secondary program to local road officials.

Special Federal-Aid Authorization

The Federal-Aid Highway Act of 1958 provided $400 million (the so-called "D" funds) in addition to the regular ABC fund authorizations, to accelerate the highway program and stimulate the economy. The act provided that the "D" funds should be matched on a two-thirds Federal, one-third State basis. To aid the States in meeting up to two-thirds of their matching share, $115 million (so-called "L" funds) was also authorized as an advance. Any advances requested



Proposed construction of a flood-control dam in Thomaston made it necessary to relocate Connecticut Route 8, an inadequate two-lane road, to this rough side-hill terrain. Cost of the 6-mile, two-roadway project was shared by the State, Federal-aid primary funds, and the U.S. Corps of Engineers.

by the individual States were to be deducted in equal installments from the ABC apportionments for the fiscal years 1961 and 1962, and this was done in making the 1961 apportionment on October 8, 1959.

The 1958 act required that the "D" funds be placed under contract by December 1, 1958, with construction scheduled for completion by December 1, 1959. Some projects were not completed on schedule, because of delays resulting from bad weather and other unforeseen circumstances. A few projects still remained unfinished at the end of the fiscal year but were expected to be brought to completion soon.

Of the $400 million total, $236 million was obligated for primary projects, $128 million for secondary projects, and $36 million for projects in urban areas. Some 12,110 miles of improvements were accomplished with these funds, including 5,842 primary, 6,037 secondary, and 231 urban. The work under the "D" funds is included in the statistics cited in the sections of this report, dealing with Federal-aid improvements of primary, secondary, and urban highways.

Repair of Roads Damaged by Natural Disasters

The Federal Government for many years has furnished financial aid to the States in the repair and reconstruction of highways and bridges on the Federal-aid systems damaged or destroyed by floods, earthquakes, and other catastrophes over a wide area. The Federal-Aid Highway Act of 1956 provided a maximum of $30 million annually for these purposes. The Federal-Aid Highway Act of 1959 amended the legislation to permit the use of these funds for the repair and reconstruction of Federal domain roads, such as those in National forests and parks, damaged as a result of a catastrophe, without the necessity for a declaration of an emergency by the Governor of the State concerned and regardless of

whether the road involved was on one of the Federal-aid systems. The availability of these emergency funds makes prompt assistance possible without the need for special legislative action following each catastrophe.

During the last 5 months of 1959, extraordinary rainfall in New Hampshire, Oklahoma, and Washington, as well as an earthquake in Montana, caused serious damage to highways on the Federal-aid system. Ohio requested allocations of emergency funds for repairs because of a flood during the previous fiscal year. Allocations of emergency funds totaling $4,034,595 were made during the fiscal year to five States for rehabilitation work, estimated to cost $5.4 million. Amounts allocated were: Montana, $85,000; New Hampshire, $2,733,500; Ohio $316,495; Oklahoma, $269,850; and Washington, $629,750.

During the year Public Roads was called upon by the Office of Civil and Defense Mobilization to render assistance in connection with damage to non-Federal-aid roads resulting from natural disasters, such as major floods, which occurred in Arkansas, Hawaii, Missouri, Nebraska, Oklahoma, South Dakota, and Texas. Total damage to such roads, eligible for assistance under this program, was estimated at $3 million. Public Roads personnel provided technical guidance to OCDM and the State and local governments in assessing damage and determining work eligible for Federal assistance.

The Highway Trust Fund and Reimbursement Planning

The Federal-Aid Highway Act of 1956, as amended, provided for a greatly expanded Federal-aid highway program to be financed from revenues accruing to the special Highway Trust Fund established by the Highway Revenue Act of 1956 for the 16-year period from July 1, 1956, through June 30, 1972. The taxes, rates, and net revenues accruing to the Highway Trust Fund during the fiscal year 1960 were as follows:

	Million
Motor fuel; 3 cents per gallon through Sept. 30, 1959, 4 cents per gallon from Oct. 1, 1959	$2,044
Trucks, buses, and trailers; half of the 10-percent tax on manufacturer's price	142
Tires; 8 cents per pound for highway tires and 5 cents per pound for "other" tires	281
Innertubes; 9 cents per pound	19
Tread rubber; 3 cents per pound	15
Heavy vehicle use; $1.50 per 1,000 pounds gross vehicle weight	38
Interest earnings	—3
Total	2,536

The Federal-Aid Highway Act of 1959, which increased the motor-fuel tax rate from 3 to 4 cents per gallon for the period October 1, 1959, to June 30, 1961, also provided that for the period July 1, 1961, to June 30, 1964, the Highway Trust Fund shall receive half of the 10-percent tax on the manufacturer's price on automobiles, and five-eighths of the 8-percent tax on the manufacturer's price on automotive parts and accessories.

The negative amount shown for interest earnings occurred because interest earned on balances in the Trust Fund were less than interest paid on money borrowed from the General Fund of the Treasury to support the Trust Fund during the year.

Highway Trust Fund revenues, expenditures, and year-end balances for the fiscal years 1957–60 are shown in the table on this page.

Highway Trust Fund revenues, expenditures, and balances, 1957–60

Fiscal year	Revenues	Expenditures	Balance
	Million	*Million*	*Million*
1957	$1,482	$966	$516
1958	2,044	1,511	1,049
1959	2,087	2,612	524
1960	2,536	2,941	119
Total	8,149	8,030	119

The 1956 Act contemplated the award of contracts at a rate the Trust Fund could liquidate, in reimbursement to the States for work accomplished, without creating a deficit. Under the provisions of the act it was anticipated that the annual Interstate apportionments to the States, beginning with that for fiscal year 1960 and continuing for 6 or 7 years, would have to be reduced substantially below the amounts authorized; the amounts deferred to be apportioned in the latter part of the program.

However, the 1958 Act, although it provided no additional revenues, directed that full apportionment of the Interstate authorizations for fiscal years 1959 and 1960 be made. These totaled $1.6 billion more than the Trust Fund could liquidate. Consequently, the outlook in the summer of 1959 was that a $500 million deficit would develop in the Trust Fund by June 30, 1960, accumulating to $1 billion by June 30, 1961, even if no Interstate apportionment were to be made for fiscal year 1961 and an apportionment of only $500 million were to be made for fiscal year 1962. It would have been necessary during fiscal year 1960 to stop the letting of new contracts for both ABC and Interstate construction for about 9 months in order to bring the Trust Fund in balance with requirements at the earliest date possible.

This pending short-range financial crisis was alleviated by passage of the Federal-Aid Highway Act of 1959, described elsewhere in this report. It was possible, under the provisions of this act, to apportion the $925 million authorized for the ABC program for fiscal year 1961, and $1.8 billion of the $2 billion authorized for 1961 for the Interstate System. The apportionment was made on October 8, 1959.

Reimbursement planning

The 1959 Act provided a lesser amount of revenue than the President had requested, and as a consequence, careful scheduling of obligations became necessary so that Trust Fund expenditures would not exceed revenues. A procedure was therefore developed by Public Roads and announced on October 6, 1959, that would assure the States of prompt payment on their vouchers from Trust Fund revenues. Originally referred to as "contract control," the procedure has more appropriately become known as "reimbursement planning."

The revenues expected to accrue to the Highway Trust Fund under the 1959 Act were estimated to be adequate to provide for prompt reimbursement to the States for all contract obligations which had been incurred by the States prior to July 1, 1959, plus $2.7 billion of new or additional obligations to be made during the fiscal year ending June 30, 1960. The latter sum was calculated on the basis of $1.8 billion of Interstate funds and $900 million of ABC funds, Interstate fund limitation being distributed among the States on the basis of the

factors used for apportioning Interstate funds, and ABC fund limitation on the factors used in apportioning the 1961 ABC funds. The distributions were adjusted so that no State would lose either Interstate or ABC funds by reason of the lapsing provision of Federal-aid highway legislation. By these means the amounts available for obligation were distributed among the States on an equitable basis. While separate computations were made for Interstate and ABC funds in determining the State shares, each State could use any proportion of its total amount for either category of projects, within the limits of apportioned funds.

The total of the reimbursement obligation schedule for the fiscal year was distributed by periods in accordance with the following schedule for the country as a whole, with the provision that the amounts not utilized during any period would remain available for later utilization on an accumulated basis: July 1–December 31, 33 percent; January 1–March 31, 34 percent; April 1–June 30, 33 percent. This scheduling of a lesser amount in the first half of the fiscal year was necessary to assure repayment to the Treasury before the end of the year of the $359 million advance to the Trust Fund provided in the 1960 Mutual Security Appropriations Act.

The objective of the reimbursement planning procedure was to reduce expenditure requirements for 1960 and subsequent fiscal years to amounts that could be financed from the Highway Trust Fund. The intended effect is indicated by comparison of the $2.7 billion that could be newly obligated during the fiscal year 1960 with the total obligations of $3.163 billion during fiscal year 1959, $2.727 billion during 1958, and $2.212 billion during 1957. Reimbursable obligations actually incurred during the fiscal year 1960 amounted to $2.523 billion. Reimbursable obligation authority totaling $177 million was carried over on June 30, 1960.

The $2.7 billion schedule established the maximum amounts that individual States could obligate during the fiscal year 1960 and still be assured of prompt reimbursement. Under the plan, however, any State could obligate its apportioned funds at a faster rate, with the understanding that when the State wished to claim reimbursement on such projects, the total obligation would be charged against the reimbursable obligation schedule and payments would be distributed over a 3-year period. Obligations totaling about $71 million were incurred during fiscal 1960 under this procedure.

With reimbursement planning, the Federal-aid highway program was being advanced at the level that could be supported from revenues accruing to the Highway Trust Fund under existing legislation. In January 1961 the Congress is to receive two reports relating to the program: One presenting the new detailed estimate of cost of completing the Interstate System; the other presenting the conclusions derived from the 4-year highway cost allocation study.

Thus in 1961, the Congress, with the benefit of these two basic reports, will have the opportunity to consider the equitable distribution of Federal taxes for highway purposes, and to provide for appropriate financing and scheduling of apportionments required to complete the Interstate System and continue the ABC program.

Reports to Congress

The Federal-Aid Highway Acts of 1956 and 1959 called upon the Secretary of Commerce to undertake a number of studies, in cooperation with the State highway departments, and report their findings to the Congress. Each of these reports was designed to provide extensive basic information and serve to guide the Congress in its consideration of the Federal role in highway improvement, use, and financing. Accomplishment of the studies was delegated by the Secre-

tary of Commerce to the Federal Highway Administrator. One study was completed during the year and three others were underway, as described in the following paragraphs. Much of the research described in the latter pages of this report was directly or indirectly related to these studies.

Extension of Interstate System to Alaska and Hawaii

Pursuant to the direction of Congress in section 105 of the Federal-Aid Highway Act of 1959, a report on the possible need for extension of the Interstate System to Alaska and Hawaii was made by the Bureau of Public Roads and transmitted on January 13, 1960, to the Congress by the Secretary of Commerce.

The report recommended that approximately 50 miles of routes in Hawaii, meeting the same criteria as those met by presently designated routes in the other States, should be added to the Interstate System within the present 41,000-mile limitation. The report stated that neither present conditions nor anticipated further developments for the next 15 or 20 years warranted the designation of any Interstate System mileage in Alaska.

Interstate System cost estimate

Section 104(b)5, Title 23, United States Code, requires that the Bureau of Public Roads, in cooperation with the State highway departments, make periodic detailed estimates of the cost of completing the Interstate System. Such estimates, when approved by the Congress, are used in apportioning Federal-aid funds for the Interstate System among the States, each State receiving a share of the total annual apportionment equivalent to its proportion of the total cost estimate.

The first such estimate was reported to the Congress in January 1958, and was used as a basis for apportioning the Interstate funds authorized for the fiscal years 1960–62. The first revised estimate of cost, undertaken during the fiscal year, will be the basis for establishing factors for the apportionment of Interstate funds authorized for the fiscal years 1963–66. The current estimate study is scheduled for submission as a report to the Congress by January 12, 1961.

Uniformity in the preparation of the estimate was required by implication in the legislation and was desired by all States in order that equitable distribution of funds would result. A manual of instruction for the preparation of the estimate was developed by the Bureau of Public Roads, reviewed with representatives of the American Association of State Highway Officials, and field tested, and was then distributed to the States in February 1960, with the request that the individual State estimates be completed and submitted to the Bureau of Public Roads by August 1, 1960. The manual set forth design guides, the base period for unit prices to be applied, and recommended criteria for establishment of the numbers of lanes, spacing of interchanges, and other important elements affecting the design and cost of the system.

A guide for traffic forecasting was also developed by Public Roads and included in the estimate manual. Necessary to such forecasting was a study of present travel volumes and habits, and consideration of probable future population growth and movement, economic development, and changes in patterns of motor-vehicle ownership and use. Statewide forecasts and, subsequently, forecasts for each route section, had to be made by the States as a basis for determining needed capacity in terms of the number of traffic lanes and the design of interchanges required throughout the system.

The importance of a uniform and accurate estimate was fully recognized by Public Roads, and personnel in the field offices were assigned full-time to assist the States in all phases of the work. The States have cooperated fully, and at the close of the fiscal year were concentrating on preparation of the cost estimates

despite the pressure of the construction season, when the workload in all State highway departments is at a peak.

A feature of this second estimate of the cost of completing the Interstate System is that the States will submit all data to Public Roads on punch cards for automatic data processing, making possible the rapid assembly and summarization of the basic data and quick comparisons between the first and the second estimates. The analysis and the summarization of the voluminous material received, and the preparation of a report to the Congress, will be undertaken during the first half of the next fiscal year.

Highway cost allocation study

The highway cost allocation study, required to be made by section 210 of the Highway Revenue Act of 1956, reached its final stages in the fiscal year 1960. There remained primarily the preparation of the final report, due to be presented to the Congress not later than January 3, 1961. This report will provide Congress with information on the basis of which it may determine an equitable allocation of taxes for support of the Federal-aid highway program among motor-vehicle users and other beneficiaries from improved Federal-aid highways.

A *Fourth Progress Report of the Highway Cost Allocation Study* (H. Doc. 355, 86th Cong., 2d sess.) was presented to the Congress on March 7, 1960. This report contained a review of the work accomplished in the three years during which the study has been in progress, and a discussion of the work remaining to be done in order to produce a final report.

An important part of the highway cost allocation study is the determination of the extent of Federal-aid highway cost responsibility that can be ascribed to other than motor-vehicle users. In the pursuance of this phase of the work a series of studies, known as economic impact studies, were made for Public Roads by various universities and research groups. Their purpose was to explore and evaluate to the extent feasible the economic consequences of highway improvements as they affect land values, land uses, and other indicators of economic change and growth. The majority of the studies were limited to analyses of the economic effects observed in the study of individual highway projects. A few studies examined groups of projects in the effort to draw generalizations from the analysis of combined results; and a few were conceptual in character, being concerned with the application of economic theory to the problem of the incidence of highway benefits.

It was felt, however, that sole reliance should not be placed on the economic impact studies for the determination of extent of nonuser responsibility for support of the Federal-aid highway program. Although illuminating as to the nature of highway benefits and the way in which highway improvements affect different sectors of the economy, they do not yield generalizations from which numerical values of the nonuser component of highway cost responsibility can be evaluated. For this reason it was decided to make use of methods of highway cost allocation that have been successfully used in studies of the subject. Two studies of this character were undertaken, the relative-use study and the earnings-credit study.

The relative-use study is based on the concept that highway cost responsibility should be allocated between user and nonuser tax sources in accordance with the extent to which different highway systems provide through-traffic service as opposed to access and neighborhood service.

The earnings-credit study is based upon a mediation between two concepts: (1) That all highway systems should receive user tax support at a rate, per vehicle-mile of travel on them, adequate to support the arterial and primary road and street systems; and (2) that all road and street systems should receive nonuser taxes at a rate, per mile of road, adequate to support the tertiary system of ac-

cess roads and streets. At the close of the fiscal year these two studies were well on toward completion.

The second major task of the highway cost allocation study was that of allocating motor-vehicle-user cost responsibility among vehicles of different dimensions and weights. In order to throw as much light as possible upon this difficult problem, four alternative methods of analysis were being used: the incremental method; the cost-function method; the differential benefit method; and the ton-mile method.

The incremental method is based on the concept that there are certain basic highway costs which should be shared by all vehicles on a uniform basis; and that additional increments of cost, occasioned by the presence in the traffic stream of vehicles of different sizes and weights, should be shared by the successively smaller groups of vehicles in their increasing order of size and weight. To have the benefit of the most up-to-date and accurate information on incremental designs and costs, it is necessary that the study make use of data from the AASHO Road Test (described elsewhere in this report). An important task of the next fiscal year will be that of analyzing the Road Test results and adapting them to the requirements of the incremental study.

The cost-function study sorts highway costs into three categories: (1) those thought to be affected neither by traffic volume nor by size and weight of vehicle and therefore assignable on a per-vehicle basis; (2) those varying with traffic volume but not with size and weight of vehicle and therefore assignable on a vehicle-mile basis; and (3) those varying with size and weight of vehicle and therefore assignable on a basis associated with vehicle dimensions and weight.

The differential benefit study purports to allocate cost responsibility among vehicles of different dimensions and weights in proportion to the benefits received from the highway improvement program. Four classes of user benefits are recognized: savings in operating cost; savings in time cost; savings in accident costs; and reduction in the strain and annoyance of driving under congested conditions. It is the aim of the differential benefit study to estimate the relative magnitudes of these several classes of benefits, as they accrue to the users of vehicles of different dimensions and weights as the result of improvements to the Federal-aid highway systems.

The gross ton-mile method is based on the concept that motor-vehicle responsibility for the support of the highways should be allocated in proportion to the product of operating weight and miles traveled.

The results of these four different studies will be analyzed and compared; and the findings of the study on the subject of motor-vehicle cost-responsibility allocation will be based upon a mediation among these results.

The calendar year 1964, which is in effect the middle year of the program period for the completion of the Interstate System, has been taken as the "year of study," and forecasts of travel on each of the Federal-aid highway systems in that year by vehicles of different types and weights have been prepared. Forecasts of future travel on all systems were supplied by the State highway departments, together with estimates of needs of the systems and corresponding costs. Studies of the classification of registered vehicles in 1956, and of the volume and vehicle type and weight composition of travel in 1957 on all Federal-aid systems, made possible an elaborate subdivision of the 1964 forecasts by vehicle type and weight groups.

The 1964 vehicle and travel data form the basic matrix of the elaborate computer program which is scheduled to give the results of the four cost allocation studies relating to the cost responsibilities of motor vehicles for the Federal-aid program. Analyzed results of this program will, it is hoped, supply the Congress with information leading to an equitable solution of the problem of taxation for support of the Federal-aid highway program.

Maximum desirable vehicle sizes and weights

Section 108(k) of the Federal-Aid Highway Act of 1956 directed the Secretary of Commerce to make recommendations to the Congress with respect to maximum desirable dimensions and weights for vehicles operated on the Federal-aid highway systems. The report is due in January 1961. Public Roads sought and received the cooperation of the American Association of State Highway Officials in developing such recommendations, to insure coordination of the recommended limits with revised policy standards of the Association.

All possible action has been taken to expedite the conduct of tests undertaken by the Highway Research Board, in which Public Roads is participating, and the findings of those and other research studies will be used in determination of the desirable maximum limits and in their economic justification.

Finally, the recommendations to be made will be reconciled with the study and investigation concerning highway cost allocation, undertaken pursuant to section 210 of the Highway Revenue Act of 1956.

Highway Improvements Under Direct Supervision of Public Roads

The Bureau of Public Roads, under existing legislation, receives and administers directly annual appropriations for major highways through national forests, and performs highway engineering and construction services for other Federal agencies as required by law and as may be requested for specific projects. The principal agencies receiving direct appropriations for the construction and maintenance of roads, and requesting assistance from Public Roads, include the Departments of Agriculture, Defense, and Interior. Public Roads (until near the close of fiscal year 1960) has also directly supervised all Federal-aid highway construction work in Alaska since 1956, when Federal-aid funds first became available to that area.

Under this general program, the Bureau of Public Roads makes surveys, prepares plans and specifications, advertises for contract bids, and supervises construction of roads and bridges in a wide range of standards appropriate to serve the estimated traffic needs.

During the past year, improvements under the direct supervision of Public Roads were completed on 183 projects covering 942 miles and involving Federal funds totaling nearly $62 million. The following tabulation indicates the magnitude of highway work in which Public Roads' engineering and construction services were actively engaged at the close of the year (the figures include estimated cost of work in the program, plans approved, advertised, and/or construction stage):

Forest highways[1]	$ 69,548,839
Alaska Federal-aid projects	12,262,721
Parkways	30,688,483
Park roads	13,999,065
Woodrow Wilson Memorial Bridge[2]	7,914,654
Bureau of Land Management roads	10,566,300
Forest Development roads	4,321,760
Department of Defense, access roads	1,143,019
Federal Lands highways	2,428,089
National Science Foundation, Kitt Peak observatory road	2,455,944
Total	$155,328,874

[1] Excludes forest highway construction under State supervision.

[2] Across the Potomac River below Washington, D.C.

Alamogordo-Cloudcroft Highway in New Mexico Forest Highway Route 35.

A brief coverage of the more significant activities under the direct supervision of Public Roads is presented in the following paragraphs.

Forest highways

The forest highway system is composed of main and secondary roads within or adjacent to the national forests which comprise approximately one-tenth the area of the United States. The system, located in 40 States and in Puerto Rico, and totaling 24,623 miles in length at the close of the fiscal year, consists of individual routes of primary importance to the States, counties, and communities within or adjacent to these forest areas. Although not a wholly connected system, it represents the principal means of land transportation into and through the national forest lands. Approximately 88 percent of the forest highway system is coincident with the Federal-aid primary and secondary systems. Table 20 of the appendix shows, by forest road class, the system mileage in each State and in Puerto Rico. More than half the total system mileage is located in 13 Western States.

Approximately 84 percent of all work completed on the forest highway system during the past fiscal year was under the direct supervision of the Bureau of Public Roads. These improvements covered 339 miles and involved Federal funds totaling almost $20 million. At the close of the year, 464 miles (similarly supervised) were under construction, involving Federal funds estimated at $35 million.

The following described activities on some forest highway routes indicate typical improvements underway or completed during the past year.

The Cedaredge-Mesa route in Colorado, 25 miles in length, crosses the Grand Mesa in Grand Mesa National Forest. The old road was a narrow trail, widened by county maintenance. Construction to modern standards began in 1946, and during fiscal year 1960 work was completed on 6 miles, bringing the total length improved to 16 miles. Construction has been heavy due to the rugged terrain, and lakes on the mesa have caused several large slides. During the year, construction was started on a bituminous stabilized base covering the entire 16 miles improved to date.

About one-half of the 107-mile forest highway route in Idaho, coincident with State Highway 21 from the south boundary of the Boise National Forest to Stanley, has been surfaced with a bituminous pavement. The balance of the route is either unconstructed or graded to a very narrow width, requiring reconstruc-

tion to a higher standard. All of the unconstructed mileage is located in the rugged terrain of the scenic Sawtooth Mountains. Improvement of this route will benefit recreation as well as serving the mining and forest industries, and will provide an important link in the State highway network, connecting Idaho's capital city with the Stanley Basin. The distance from Boise to Missoula, Mont., will be 106 miles shorter than the present travel route. During the 1959 construction season an 18-mile paving contract was completed. The first step in improving the unconstructed section will be undertaken shortly with the letting of a 5-mile grading contract estimated to cost $550,000.

The Holman-Taos route in New Mexico, 32 miles in length, is located in Carson National Forest. Work on this route was performed by Public Roads during the period 1929–34, but the recent reconstruction of the northerly 8 miles was the first portion completed to modern standards. Another project 6 miles in length is under construction, and an additional 6 miles is programed for fiscal year 1961. Bituminous surfacing of the northerly 8 miles is also programed for next year. Improvement of this highway will provide an all-weather route of substantial benefit to the livestock, farming, and lumbering interests of the area.

The construction and maintenance of forest highways in Alaska continued during the fiscal year under the direct supervision of Public Roads; however, maintenance of all forest highway routes was financed with Federal-aid funds in accordance with the provisions of the Federal-Aid Highway Act of 1956. Prior to June 30, 1960, a cooperative agreement was concluded among Public Roads, the Forest Service, and the State of Alaska, providing that responsibility for maintenance of all forest highway routes, including the full cost thereof, would be assumed by the State on July 1, 1960.

Public Roads Federal-aid activities in Alaska

The Bureau of Public Roads, in addition to discharging its usual administrative responsibilities, continued to perform the general functions of a State highway department in Alaska, directly supervising the survey, design, and contract construction performed under the Federal-aid program. This direct supervision, first authorized by the 1956 Federal-Aid Highway Act, was further implemented by a contract between the State of Alaska and the Bureau of Public Roads, effective July 1, 1959, which provided for the Bureau to act as the State's contractor in performing highway construction and maintenance activities on the Federal-aid system routes.

The Alaska Omnibus Act, signed into law June 25, 1959, conferred full statehood status on Alaska at the beginning of the fiscal year, together with full responsibility for the Federal-aid program on a basis comparable to that of other States. The Omnibus Act further provided that the fiscal year 1960 Federal-aid allocation, together with remaining balances of unobligated funds, apportioned for prior fiscal years, could be utilized for highway maintenance.

Public Roads activities during the latter half of the fiscal year were concentrated on assisting the State in organizing a complete highway department following a December 1959 decision by the State Department of Public Works to assume active responsibility for all construction and maintenance functions July 1, 1960. In addition to this assistance, all Bureau property and equipment not required in its normal function of administering the Federal-aid program and in the direct supervision of national forest and park projects was transferred to the State prior to the end of the fiscal year.

The Federal-aid highway system in Alaska (as of June 30, 1960) was 5,425 miles in total length, including 2,200 miles on the primary system and 3,225 miles on the secondary system. During the year, new construction or improve-

ments were completed on 152 miles of the Federal-aid system at a cost of approximately $12.3 million. At the close of the year, construction work (under direct supervision of Public Roads) was underway on 181 miles at an estimated cost of $37.4 million.

Due to the provision of the Alaska Omnibus Act which permitted use of fiscal year 1960 funds for maintenance, the 1960 fiscal year Federal-aid construction program was held in abeyance until the fiscal year 1961 funds were apportioned. As a consequence, no new projects of any magnitude were initiated during the year.

By agreement with the State, Public Roads continued to administer to completion all Federal-aid contracts awarded by the Bureau, most of which will be completed during the 1960 construction season. Public Roads also administered the work under seven contracts totaling $2.1 million which were let to consulting engineering firms for surveys, investigations of materials, and highway designs.

National park highways, park approach roads, and parkways

Funds for the construction and improvement of highways within or approaching national parks and monuments, and for parkways specifically designated by legislation, are appropriated to the Department of the Interior, and are administered under regulations jointly approved by the Secretary of the Interior and the Secretary of Commerce. The Bureau of Public Roads collaborates with the National Park Service of the Department of the Interior in establishing systems and developing annual programs. Public Roads engineers make surveys, prepare plans, and supervise construction of major projects on these road systems.

During the fiscal year, improvements were completed on 224 miles of park roads and parkways, involving Federal funds totaling $22 million. At the end of the year, 338 miles of improvements were under construction involving Federal funds totaling over $35 million. Table 21 of the appendix indicates the general locations of this construction activity during the past fiscal year. Some typical improvements are briefly described in the following paragraphs.

Blue Ridge Parkway.—During the past year, approximately 60 miles of construction were completed on this parkway in Virginia and North Carolina at a cost of $6.4 million. Seven new contracts estimated to cost $2.5 million were let for construction on 41 miles. At the close of the year, 77 miles were under construction involving Federal funds totaling $8.2 million. Of the projects completed, perhaps the James River Bridge, 55 miles northeasterly from Roanoke, was the most significant. This bridge, 1,040 feet in length, spans the James River, a railroad, and U.S. 501. The opening of this bridge made 111 consecutive miles of the parkway, from the Shenandoah National Park to U.S. 460 near Roanoke, available to the traveling public.

A total of 210 miles of the parkway was practically completed in Virginia, with only 14 miles in the vicinity of Roanoke remaining to be placed under contract. In North Carolina, completion of a grade-separation structure over U.S. 421 at Deep Gap, and completion of bituminous surfacing from this point to Mountain View, provided 156 consecutive miles of parkway open to traffic from Adney Gap, Va., to Blowing Rock, N.C. Approximately 375 miles of the parkway have been completed and opened to traffic, and it is anticipated that by 1966 the entire 477-mile length from the Shenandoah National Park to the Great Smoky Mountains National Park will have been completed.

George Washington Memorial Parkway.—This scenic parkway lies along both sides of the Potomac River in the vicinity of Washington, D.C. During the fiscal year, two grade separation structures and 5 miles of four-lane divided parkway surfacing were completed on the Virginia side of the river at a cost of $2.1 million. These completions permitted opening the parkway extension

to the Central Intelligence Agency office building, now under construction. Contracts totaling $1.2 million were let during the year for the construction of two bridges and 1.8 miles of grading and base course which will extend the parkway from near the CIA building to a connection with the Washington Circumferential Highway. The widening of a short section of the parkway north of Washington National Airport to six lanes was substantially complete at the close of the year. On the Maryland side of the Potomac, 4 miles of grading were completed at a cost of $1.1 million, and 4 more miles were being graded at a cost of $2.3 million.

Natchez Trace Parkway.—Considerable progress has been made on this parkway, located in Mississippi, Alabama, and Tennessee. During the fiscal year, 13 projects were completed on 74 miles at a cost of approximately $4.4 million. Fifteen new projects, estimated to cost $6 million, were let to contract. Two of these provide for the substructure and the structural steel superstructure for a new bridge over the Tennessee River in Alabama. At the close of the year, 95 miles were under construction involving $8.9 million of Federal funds.

Yosemite National Park.—During the fiscal year, grading was completed on a 20-mile section of Tioga Road located in this California park, replacing an unimproved hazardous section of one-way road. Surfacing will be accomplished in the 1960 construction season. The total cost of constructing this section to modern standards will be about $4.5 million. This work will complete the improvement of this route, other sections of which were constructed during 1932-39.

Woodrow Wilson Memorial Bridge

Construction on the $15-million Woodrow Wilson Memorial Bridge across the Potomac River just south of Washington, D.C., progressed steadily during the year. This 5,900-foot bridge, when completed, will serve as a vital link in the Washington Circumferential Highway. The approach substructures and the piers and fenders for the channel spans were completed at a cost of $5 million. Contracts totaling $1.7 million were let for construction of the upper portions of the bascule piers, the concrete deck, and the bridge railing. Work on erection of the steel superstructure on the approach and channel spans progressed during the year. Completion of the work now under contract will be followed by contracts for paving, lighting, and painting. The structure is scheduled for opening to traffic by early fall of 1961.

Bureau of Land Management roads

Public Roads continued to cooperate with the Bureau of Land Management of the Department of the Interior in its program of road construction in Oregon by making surveys, preparing plans, and supervising the construction of roads providing access to areas for logging operations. During the year, construction was completed on 57 miles at a cost of over $2 million. At the close of the year, 150 miles were under construction with contracts totaling $5.2 million. Typical of this construction was the 10-mile section of grading and surfacing of the Suislaw River Road and Whittaker Creek Road which was completed recently for a cost of $325,366.

Since neither the roads constructed under Public Roads supervision nor the feeder roads constructed by logging companies are on a county or State road system, necessary maintenance operations are performed by Public Roads as requested by the Bureau of Land Management. During the past year, Public Roads maintained 247 miles of roads constructed under its supervision and 320 miles of feeder roads constructed by others, at a cost of $373,000.

Forest development roads

At the request of the Forest Service, Public Roads makes surveys, prepares plans, and supervises construction of roads within national forests which are of primary importance in the protection, administration, and utilization of the forests; or which are necessary for the use and development of the resources upon which the communities within or adjacent to the national forests are dependent. During the fiscal year, construction was completed on 91 miles involving $5.8 million of Federal funds. At the close of the year, 48 miles were under construction at an estimated cost of $3.3 million.

Construction on the Agness Road in the Siskiyou National Forest was typical of this work. This road will serve the logging industry, with some benefit to sportsmen and recreational traffic. All of the 32-mile route lies within the mountainous terrain of the Coast Range, and slides and unusual drainage problems make construction difficult. Low design standards provide for a surfaced roadbed 20 feet wide on approximately 11 miles of the section along the Rogue River, and for one 12-foot lane with turnouts on the remainder. Four grading projects totaling 18 miles in length were let to contract at a cost of $1.5 million. Two of these projects had been completed and one was nearing completion. Construction of four bridges, totaling approximately 1,400 feet in length, were required on the route.

Public lands highways

Federal-aid Acts since 1950 have provided funds to assist the States in developing main roads through unappropriated or unreserved public lands, nontaxable Indian lands, or other Federal reservations. These funds have been allocated on the basis of need to specific projects in 14 States. The $3 million authorized for the fiscal year 1961 was allocated to seven projects.

One of the larger projects was for improvement of the Lewis and Clark Highway in Idaho between Kooskia and Lolo Pass at the Montana State line. Completion of this and previous work undertaken with public lands funds will provide a modern highway following the route traversed by Lewis and Clark in their exploratory trip from St. Louis to the Pacific Ocean.

Defense access, replacement, and maneuver roads

During the fiscal year, funds transferred to Public Roads by the Department of Defense for highway projects serving defense installations included $1,193,000 from the Department of the Army, $1,940,344 from the Department of the Navy, and $17,121,396 from the Department of the Air Force—a total of $20,254,740. This increased the total funds transferred by these three departments since fiscal year 1956 to $70,579,537. The National Aeronautics and Space Administration also transferred $589,620 to finance right-of-way and construction of one project. All transfers by defense agencies, including the Atomic Energy Commission, for defense access, replacement, and maneuver roads since the beginning of the Korean emergency totaled $131,429,024.

During the fiscal year, 91 projects serving defense installations were programed at a total estimated cost of $16,897,160 of which $16,540,121 was provided by defense agencies. This includes preliminary engineering in the amount of $151,135 on seven defense projects having a total estimated construction cost of $2.3 million. At the end of the year there were 40 unfinanced projects having a total estimated cost of $24.1 million and requiring $21.6 million of defense access-road funds which had been certified as important to the national defense or referred to the Department of Defense for certification. The Bureau of Public Roads was evaluating 58 other projects.

The major portion of this activity during the year was for access roads to Air Force Atlas and Titan missile sites at 15 air bases. The needs of 83 different

sites were evaluated. The total estimated cost of access roads at the 52 sites requiring improvements was $7.9 million. At the close of the year 39 sites were under study.

New standard specifications for construction

At the close of the fiscal year, revision of Public Roads' *Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects* was in the final stages of preparation and was expected to be printed in time for use in preparing plans for the next construction season. The new specifications edition, designated as *FP–60*, will supersede the old *FP–57*. The revised specifications represent the coordinated efforts of Public Roads, other Federal agencies, and national technical and industrial associations affiliated with highway construction which contributed through constructive criticisms.

Highway Planning and Design

Public Roads engineers continued to work closely with the State highway departments in resolving difficult highway design problems, particularly those encountered on the Interstate System in urban areas. As a large number of freeway sections were completed and traffic operations were observed, it became increasingly evident that extreme care was necessary in the selection of appropriate interchange types and their proper spacing to avoid operational difficulties and to provide adequately but economically for Interstate and local traffic.

Construction plans showed increasing use of the design of rural divided highways as separate one-way roadways with a variable-width median fitted to the terrain, providing economy of construction and maintenance, reduction of headlight glare, and safety for high-speed traffic. Public Roads design engineers working with the States on project plans continued the analysis, trial, and evaluation of new or adjusted design features that had promise of greater safety, better operations, or greater economy. As such features were proven, they were incorporated in design guides and standards to promote general uniform use across the country under similar design and traffic conditions. Design review of highway plans, interchange layouts, and standards resulted in the development of mutually acceptable design proposals which will effect a minimum of property damage and inconvenience to local interests consistent with good engineering practice, and sound economic principles to provide highways that will safely and efficiently handle the estimated traffic.

Urban planning

The determination of location and design details for major street and freeway developments in urban and suburban areas involves detailed technical processes, parts of which are direct steps in overall city planning. While considerable progress has been made toward accomplishing these proper planning steps, work on the Interstate and other urban system highways made it evident in some cases that desired "regional urban area" planning processes were in need of additional attention in order to insure that arterial highways are located to provide the maximum economic benefit to the metropolitan area and permit the highway program to proceed without delay.

In addition to the continuing series of traffic and other urban research studies to obtain data for planning urban highways, Public Roads focused attention during the year on the need for early accomplishment of cooperative planning work between the States and cities. A general objective is the attainment of a current and realistic urban arterial highway plan for each urban area, cooperatively developed and endorsed by all agencies concerned, upon which the

Federal-aid system can be identified for development of construction projects. Public Roads engineers were actively assisting the States and cities in the attainment of this objective.

A great deal of urban community planning has already been done, but comprehensive information was not available on such accomplishments. Consequently, Public Roads initiated an inventory of urban planning during the year, with indicated priority for all places of over 25,000 population and those over 10,000 on the Interstate System. Data from the inventory will permit evaluation of the specific planning problems and determination of further steps to be taken.

Public Roads has also been closely associated with many urban studies. Through the Statewide highway planning program, using the 1½-percent Federal-aid highway funds earmarked for planning and research, highway and transportation studies were being organized or operated by the States in cooperation with local governments in a large number of urban areas, including Salt Lake City, Jacksonville, Honolulu, Atlanta, Ann Arbor, Benton Harbor-St. Joseph, New Orleans, Joplin, Ypsilanti, Philadelphia-Camden, Fayetteville, High Point, N.C., Portland, Oreg., Sharon-Farrell, Pa., Providence, Chattanooga-Nashville, Houston, Green Bay, Huntsville, Florence-Sheffield-Tuscumbia, Ala., Tucson-Pima County, Ariz., Denver, and Little Rock.

In addition, metropolitan area transportation studies were established on a continuing basis in Detroit, Chicago, Minneapolis-St. Paul, Pittsburgh, and Washington, D.C. It is contemplated that the Philadelphia-Camden regional transportation study will also be on a continuing basis.

Preliminary action had been taken in organizing a cooperative Public Roads-State-local government transportation study of the northern New Jersey area.

There has been continuing improvement in cooperation between Public Roads and the Housing and Home Finance Agency. This has been particularly fruitful in connection with activities of the Urban Renewal Administration in urban renewal and planning. Cooperation at the field level among Public Roads, Urban Renewal, and State highway department personnel is resulting in economy in right-of-way acquisition and construction.

Highway planning studies and research results, discussed elsewhere in this report, have been instrumental in developing procedures for the more effective study of interrelationships of land use and transportation planning for urban areas.

Design policies

Work was continued during the year by the American Association of State Highway Officials, with Public Roads cooperation, on development of additional design guides and policies. Work was completed on and the AASHO adopted and published *A Guide on Lighting Controlled Access Highways, A Policy on U-Turn Median Openings on Freeways, A Guide for Preparing Private Driveway Regulations for Major Highways,* and a revision of the 1952 *Informational Report on Road-User Benefit Analyses for Highway Improvements.* The guide on lighting summarizes available data and opinions on highway conditions where illumination is likely to be warranted and outlines the type and extent of lighting that should be considered. The policy on U-turn median openings indicated the type, location, and extent to which such openings should be provided on freeways for exclusive use by official and emergency vehicles. The guide for driveway regulations outlines the principles that should be included in a specific State or local regulation and lists a range of typical values for layout controls of driveways. Both the safety and efficiency of highway traffic and the interests of the abutting landowners are considered. The road-user benefit analysis report includes revised unit cost tables based on current prices for the items included in the costs of vehicle operations.

Work was completed on a proposed policy on access between controlled-access highways and adjacent existing railroads for rubber-tired railroad service and maintenance equipment in areas where the freeway is the only highway approach. Work continued on studies toward guides on control of headlight glare on divided highways and on services to motorists and patroling on Interstate highways. Preliminary studies for revised primary system highway standards were started.

During the year a special AASHO freeway study and analysis committee composed of six experts of whom two were from Public Roads, made on-site inspections of freeway operation to determine how designs now in use affect freeway utility and safety. The report of this committee was completed and is being used extensively to improve freeway design.

Pavement design

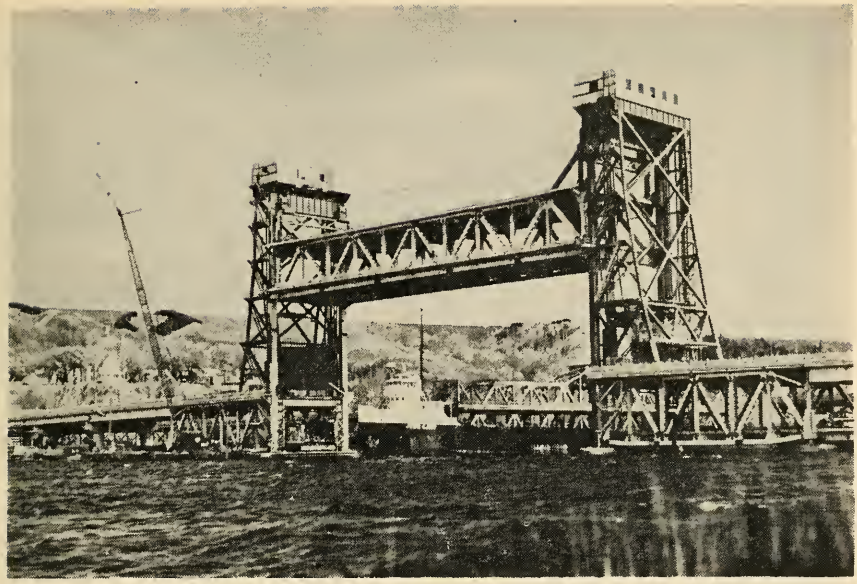
Considerable progress was made by Public Roads in cooperation with the AASHO operating committee on design in the development of recommended guides for the design of pavement structures. They will become part of a handbook on basic concepts of pavement design, including practical methods of evaluating traffic loads, the supporting power of soils, and the strength of pavement structures. Data obtained from the AASHO Road Test in Illinois will be used in developing the guides.

Bridge Design

Construction by the State highway departments of a number of noteworthy bridges, whose plans had been reviewed by Public Roads, was underway or about to start at the end of the year. Among them were the New Albany-Louisville Bridge over the Ohio River which will have two 800-foot tied arch spans with two decks for opposite directional traffic. All truss members and ties are to be high-strength steel welded box sections. The Calcasieu River Bridge in Louisiana will be a four-lane structure with a central high section consisting of a three-span all-welded deck plate girder with a 450-foot center span. The Taunton River Bridge in Massachusetts will have a three-span through cantilever truss with a center span of 840 feet. The two trusses will be 101 feet apart to provide for six lanes of traffic. The Merrimac River Bridge in Massachusetts is being built as a two-level structure, each with two 36-foot roadways and a median divider, to meet heavy traffic needs and unusual site conditions. Different span lengths are being used in the two levels to allow for bearing and pier arrangement. The lower level is shorter than the upper, permitting on and off ramps within the upper structure limits.

Also of interest among the State highway department projects in which Public Roads collaborated were two subaqueous tunnels. The 4,200-foot Estuary Tube, linking Oakland and Alameda, Calif., will function as a twin unit to the existing Posey Tube and is to be constructed by precast section trench method.

An unusual bridge was completed during the year across Portage Lake in Michigan, providing a highway-railroad connection to the Keweenaw Peninsula. The 1,310-foot structure's $11 million cost was financed by the State, Federal-aid urban funds, and the U.S. Corps of Engineers. The double-deck bridge carries a railroad on its lower level and U.S. 41, with current traffic of 11,000 vehicles per day, on the 4-lane upper level. Normally the 250-foot lift span's lower deck is level with the upper deck of the approach spans, providing highway service and a 34-foot vertical navigation clearance. For rail traffic the lift span is lowered, and highway traffic uses its upper deck; there is still sufficient clearance for small craft. Fully raised, the lift span has a 100-foot clearance



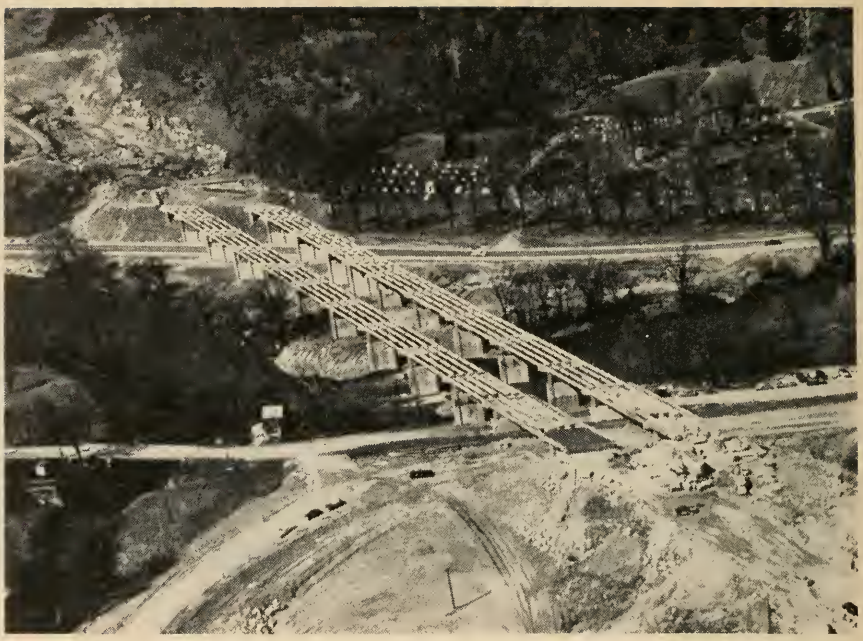
This double-deck bridge across Portage Lake in Michigan carries both rail and highway traffic. Service will be interrupted far less often than on the old, narrow swing-span bridge which appears in the background.

for large ships. The old, replaced structure was only 18 feet wide and its swing span had to be opened for all small craft, causing frequent traffic stoppage.

During the year Public Roads completed a compilation of new bridge construction during calendar years 1957–59 listing by States and by highway system the number, length, and cost, and the percentage constructed of concrete, structural steel, and prestressed concrete.

A study was undertaken of present practice in bridge railing construction, and it was found that great improvement could be made in their effectiveness as barriers for the protection of traffic. Recommended criteria were developed for this purpose, covering the use of materials having high impact resistance and methods of construction which will make the railing assembly effective in collisions more as a unit than as a group of separate parts.

Public Roads in cooperation with the American Association of State Highway Officials committee on bridges and structures, developed a *Criteria for the Design of Sign Supports* which has been presented for consideration as a specification. To determine appropriate wind forces on signs, the Weather Bureau made a statistical study of wind records and developed a map of wind speeds based on probability data. Application of the wind speeds is made by a conversion table to determine wind pressure. This method of wind analysis is unique and is a more valid approach than the use of extreme winds of record. Sign supports are to be designed, according to the criteria, at stress levels considerably higher than those of the AASHO Bridge Specifications, and will use materials and shapes novel in highway structures. Development of the design methods for sign supports resulted from extensive investigation of various analytical methods and study of the properties of different materials with the view of making economy compatible with safety.



Interstate Route 89 will cross the Winooski River, U.S. 2, and a railroad on this twin bridge in Vermont, west of Montpelier.

The American Society for Testing Materials has approved two new steel specifications as tentative standards: A–36, a medium manganese structural steel with 36,000 p.s.i. yield point, and a high-strength low-alloy manganese vanadium steel with yield points up to 50,000 p.s.i. Public Roads assisted in developing these standards. Heat treated alloy steels with yield point values of 90,000 to 100,000 were in use in some States for long-span trusses and welded girders.

A revised edition of the American Welding Society Bridge Specifications was being prepared for publication. The Steel Structures Painting Council completed preliminary drafts of recommendations for painting over welds and for the painting of rusty steel. Public Roads participated in these projects.

During the year a Hydraulic and Hydrological Branch was established in Public Roads' Office of Engineering to review unusual hydraulic design features shown on construction plans, analyze and establish hydraulic design criteria for application in the solution of particular hydraulic problems related to highways, and provide advisory services on hydraulic design to the State highway departments and the Public Roads field offices.

Public Roads participation in research in structural problems connected with bridges continued during the year, with projects in progress at the Universities of Arkansas, Florida, Illinois, Missouri, and Washington; Cornell, Lehigh, and Northwestern Universities; and Texas A. & M. College. These involved research in prestressed concrete, high-strength steel bars for concrete reinforcement, welded plate girders, riveted and bolted joints, experimental bridge truss behavior, and aluminum alloy bridges. Based on information from the research at Lehigh University on the strength of welded plate girders, Public Roads prepared a new specification for an economical design of girders which has been submitted to the AASHO for consideration.

Right-of-Way Acquisition

Public Roads, by the addition at the field office level of personnel experienced in the acquisition of rights-of-way and by the holding of numerous meetings with State personnel, has worked closely with the State highway departments to develop procedures for the efficient and expeditious handling of right-of-way matters. These improved procedures prevent to a great extent delays in the start of construction due to the unavailability of right-of-way. In the meetings with the States, among other things, stress has been placed on the participation of right-of-way personnel in highway location and design activities at the planning stages. Many of the States have adopted such procedures, which have resulted in considerable monetary saving. The close liaison between right-of-way personnel and the location and design engineers is of particular importance where construction items are used in mitigation of severance and other damages.

Outdoor Advertising Control on the Interstate System

No State had yet entered into an agreement with the Secretary of Commerce to control outdoor advertising in areas adjacent to the Interstate System and thus receive the increased share of the cost of construction of Interstate highways provided in section 131 of title 23, United States Code. A large number of States, however, were considering legislation designed to give the State highway departments legal authority to control outdoor advertising consistent with the national standards promulgated by the Secretary of Commerce, and to enter into the prescribed agreement. Five States had enacted legislation which would appear to fulfill the requirements, but only Maryland had officially applied for an agreement. At the end of the year, the form and contents of the agreement were being formulated and reviewed by Public Roads and the State.

Utility Relocation

Public Roads, in cooperation with the several State highway agencies and various groups representing segments of the utility industry, continued during the year to develop practices, policies, and procedures to improve and expedite the administrative and operational activities associated with the relocation and accommodation of utilities necessitated by highway construction projects on the Federal-aid systems. The American Association of State Highway Officials developed, with Public Roads assistance, and adopted *A Policy on the Accommodation of Utilities on the National System of Interstate and Defense Highways*, which has been well accepted by both the utility industry and the highway agencies. This policy provides the general principles to be followed in the adjustment or relocation of utility facilities to protect the stability of the highway, preserve access control, increase highway safety, and provide uniformity of treatment, but with recognition to the public interest in avoiding unnecessary and costly operations to utility owners and consumers.

Establishment of utility engineer positions in the Public Roads field offices and participation in the activities of the AASHO utility liaison committee have strengthened liaison between Public Roads, the State highway departments, and the utility industry.

Highway Roadside Development

Public Roads continued to encourage the State highway departments to coordinate engineering requirements with landscape architectural objectives in highway design. The American Association of State Highway Officials, with

Public Roads cooperation, completed a policy on landscape development for the National System of Interstate and Defense Highways. The policy deals with improvement of right-of-way through conservation of landscape features and appropriate roadside planting to provide protection against erosion, increased safety, improved appearance, reduced maintenance, and preservation of land values.

During the year Public Roads specialists cooperated with the State highway departments and industry in the development of new materials and improved methods of application for controlling erosion on highway slopes. Field demonstrations of new products of the paper, jute, fertilizer, and chemical industries offering possibilities for further reduction in the cost of mulching and seeding were observed. Such cooperative work has already resulted in development of power equipment for application of these special materials on the extensive slopes frequently found along divided highways.

Studies were continued in the use of woody plants for roadside cover and in the design of planting on slopes too steep for mowing, in order to provide a natural cover for control of erosion with a minimum of maintenance.

Aerial and Ground Surveys

Public Roads specialists in aerial surveys and photogrammetry continued to concentrate on improving techniques for establishing basic and supplemental control and for map compilation, and on developing new methods. Several papers on technical aspects of photogrammetry were prepared, including one for the International Society for Photogrammetry. An effective and efficient electronic, photogrammetric, digital scaler was developed, tested, and put into operation by a Public Roads field office for measurement and automatic recording of profile and cross sections from stereoscopic models projected by the double projection type photogrammetric instruments.

Reconnaissance surveys were performed or started as consultant service or special assistance to several of the States and several foreign countries. As an example, one technician spent a month in Costa Rica assisting the Ministry of Public Works in their photogrammetric work. Extensive consultation services were performed during the year for the State of Alaska in preparing and negotiating consultant contracts for aerial surveys and location and design of 320 miles of highway routes. Training courses in photogrammetry and aerial surveys and their adaptation to highway engineering were provided for 97 Public Roads and State engineers during the year.

Beginning in 1957, Virginia and California were the first States to employ electronic methods of measuring distances in the accomplishment of basic ground control surveys for the establishment of geodetic markers in conjunction with highway location surveying by aerial methods. Twelve other States have tested and used such instruments for control surveying purposes, especially on the Interstate System. Extensive tests in cooperation with Public Roads were concluded and reported by Arizona, Maryland, and Mississippi during the year. These tests were performed under a wide range of geographic, climatic, and traffic conditions. Accuracies well above second order requirements (1 : 10,000) were achieved. Costs of basic surveys for highway location purposes were reduced by these new methods to one-half the costs of conventional traverse and triangulation methods.

During the year, Public Roads produced a motion picture, *Safety in Highway Surveying*, which demonstrates safety practices for ground survey crews working in rough country and on highway construction projects.

Highway Needs of the National Defense

Continuing coordination between Public Roads and the Department of Defense was maintained relative to highway needs for national defense. During the fiscal year, following extensive study and consideration, the standard for vertical clearance of structures on the Interstate System in rural areas was changed from 14 to 16 feet at the request of the Department of Defense to permit road transport of missiles, and the selection of routes with 16-foot vertical clearance around large urban places was also coordinated with the Department of Defense. Studies were initiated to select other routes with 16-foot vertical clearance, connecting Interstate routes and port areas designated by the Department of Defense.

Studies were also made to determine the capability of bridges to carry proposed oversized, overweight military vehicles, and their transportability as related to approved highway design standards.

The program for improvement of defense access, replacement, and maneuver roads is discussed elsewhere in this report.

Emergency planning and mobilization readiness

During the year Public Roads continued to advance its emergency planning with the cooperation of the State highway departments, and achieved substantial results in genuine readiness to meet a grave national emergency which would arise from an enemy attack. The American Association of State Highway Officials gave considerable attention to the subject at its annual meeting, and adopted resolutions which, when integrated with the standing policies of the Association, will help establish a uniform approach throughout the highway field to the problem of emergency planning.

A number of State highway departments instituted programs for training their personnel in radiological monitoring. At the end of the year the States and Public Roads had 224 instructors and 4,208 trained monitors in this field.

In Operation Alert 1960, Public Roads requested and received excellent cooperation from the State highway departments in dealing with the simulated problems an enemy nuclear attack would create with respect to highways. The exercise was developed at lower echelons in some highway department organizations, with the result that many more of their employees were made aware of the nature of the problems. In one State, for instance, 100 State highway department employees were occupied, full time, in the exercise. The operation more clearly identified a number of organizational problems as requiring remedial action.

Highway Safety

Public Roads continued its activities in the study and promotion of highway safety during the year. A variety of research projects related to the subject are described elsewhere in this report. The Highway Safety Study Unit, created to prepare the safety study reported to Congress last year, has been assigned responsibility for the study and investigation of highway safety throughout the United States and the coordination of Public Roads and other programs concerned with the subject.

In cooperation with the National Safety Council committee on winter driving hazards, Public Roads produced an educational film, *Winter Driving*, which illustrates safe winter driving techniques for starting, stopping, and cornering on snow and ice, and on avoiding or recovering from skids. The 16-mm. film, in color and sound, runs for 24 minutes. It is appropriate for driver education classes, off-the-job safety programs, and civic gatherings. The film is available to Federal agencies and State highway departments through the Bureau

of Public Roads, and to others through the National Safety Council, 425 North Michigan Ave., Chicago 11, Ill.

Public Roads continued to cooperate closely with the President's Committee for Traffic Safety, providing part of its staff and financing. During the year the Committee's Advisory Council approved a thorough review of the balanced Action Program, with updating as necessary. Technical committees have undertaken this work. Another major project underway was the development of a 5-year traffic safety plan as a long-range guide to all organizations and for more effective cooperation among all those with traffic safety interests and responsibilities.

A highlight of the year was the Committee-sponsored Lawyer-Layman Conference at Miami Beach, Fla., held in cooperation with the American Bar Association to spur improvement of traffic court procedure and upgrading of those courts. Over 1,500 delegates from 43 States, the District of Columbia, Puerto Rico, the Virgin Islands, and Guam attended. Other important Committee activities included sponsoring of four regional Women's Traffic Safety Seminars; active participation in a series of regional Governors' conferences; and at year's end the 52d Annual Governors' Conference where special emphasis was given to the need for stepped-up traffic safety research.

Administration and Management

Progress was made during the year on the comprehensive financial management improvement program begun during the previous year. Planned objectives reached included conversion of accounting to an accrual basis; development of proposed cost accounting and cost-based budgeting patterns; improvement of internal accounting and auditing procedures; and elimination of duplications in recording and reporting. Increased emphasis was placed on cooperation with State highway organizations in the application of uniform accounting and reporting practices. Professional accounting positions were established in the Public Roads field offices.

Significant steps were taken during the year to meet the demands for automatic data processing in Public Roads engineering, research, financial management, and administrative programs. An advisory committee was established to provide leadership and coordination in development and integration of data processing systems under a master plan. Studies were made of up-to-date electronic computer systems and plans were formulated for selection of additional equipment to augment the equipment now installed in the central office. Increased emphasis was placed on utilization of the staff of trained programers in the critical areas of analysis and development of data processing programs, including systems design and feasibility studies. A training program was planned to develop a corps of automatic data processing specialists among Public Roads operating personnel. Substantial benefits accruing as a result of these efforts indicated satisfactory progress toward the long-range objective of maximum application of electronic computer systems and techniques to the program needs of Public Roads and the State highway organizations.

Progress was made in development and issuance of administrative manual material during the year. The manual will provide a complete body of administrative operating procedures and is expected to result in improved administration.

Development of New Practices

Electronic computers

Public Roads representatives reviewed the engineering and administrative operations of the Massachusetts, New York, Pennsylvania, and West Virginia

State highway departments and made specific recommendations for more effective use of their electronic computers and related equipment. A similar study of the District of Columbia Department of Highways and Traffic was underway.

The General Electric Co. and the Bureau of Public Roads developed a complex of electronic computer programs for assignment of traffic to urban networks, which will aid in optimum design of metropolitan area street and freeway facilities for anticipated future traffic. The programs were used during the year in transportation studies in a number of cities, including Washington, D.C., Minneapolis-St. Paul, Minn., and Charleston, W. Va. Advice was furnished to Ohio State University for use of these programs in urban studies in that State. At the end of the year, conversion of these programs to the Public Roads computer library form was nearing completion.

During the fiscal year, 52 new programs were added to the Public Roads computer program library, bringing the total to 348 programs covering all phases of highway engineering. Six programs were converted to universally usable form, making a total of 27 available to State highway departments and other computer users; and 4 additional programs were being converted. Programs in this universal form are readily codable for any make or model of computer, thus eliminating duplication of effort in program development.

For example, the analysis of rigid frame bridge piers is a complex design problem which is frequently faced in most State highway departments and highway consulting firms. A comprehensive computer program for the solution of this problem, covering various loading conditions and pier configurations, was converted to the universal form and distributed. Many man-years of effort were saved by users, through adaptation of this universal program for pier analysis to the different types of computers in common use. At the same time, much earlier use of the computer for this type of problem was made possible.

A short training course on the use of electronic computers for highway and bridge engineering computations was conducted for engineers of the Eastern National Forest and Parks Region, which increased use of computer work in that region.

Data sheets were designed to facilitate the submission of data for electronic computations of a number of types of engineering problems. Several bridge design computer analyses were made for Public Roads offices, demonstrating the effectiveness of computer methods.

A computer program was developed and used for the computation of earthwork quantities for 60 miles of proposed highway in Laos. Electronic computation of earthwork quantities on 170 miles of the Inter-American Highway in Costa Rica demonstrated the substantial savings in time and manpower possible. These operations served as excellent tests of the feasibility of obtaining terrain data for a highway by aerial photography in one part of the world and computer-processing of the data in another part of the world with a minimum of engineering time on the proposed highway site.

Equipment development

Public Roads continued to encourage the development and use of improved and new equipment for highway construction, maintenance, and operation.

Some time ago, Public Roads obtained the cooperation of equipment manufacturers and the U.S. Army Corps of Engineers for the purpose of testing motor graders at Fort Belvoir, Va. With the results of the tests as a basis, a new Federal interim specification for motor graders was completed near the end of the fiscal year and distributed to Federal agencies. As a result of these tests some manufacturers have already made improvements to their equipment to bring them up to acceptable standards, which will benefit not only Federal

agencies but also all highway departments and contractors who purchase and use motor graders.

Public Roads continued to evaluate and consult with industry on further improvements to the slip-form concrete paver and, based upon these findings, has promoted the use of this paving method. One improvement consists of the installation of an electronic control device which automatically guides the slip-form paver in laying the finished surface on the proper line and grade. This device has also been incorporated on a subgrade planer. The control device is guided by a piano wire which has been set to line and grade and can be used successfully for controlling the subgrade as well as the base and surface courses, thus eliminating the cost of restaking for each operation. Because the subgrade can be planed to a truer surface with this new development, the equipment for laying the base and surface courses operates on an even surface and a smoother riding pavement results. A section of pavement placed in California with the slip-form paver and checked with the profilograph showed variations of only 6 inches per mile, as compared with a variation of 7 inches allowed by the specifications. The results of these improvements are an accelerated construction rate, greater economy, and improved quality. This automatic electronic control device was also available for motor graders and in the near future it will probably be adapted to bituminous spreaders and other equipment.

Studies made by Public Roads showed wide variations in the requirements in the specifications of the various highway departments for compaction of highway embankments as well as base and surface courses. In this connection, a conference was arranged by Public Roads and was attended by representatives of equipment manufacturers, tire manufacturers, the Highway Research Board, and national associations of the highway industry. The conference discussions pointed out that improvements could and should be made in compaction criteria so that greater uniformity can be attained. Work was progressing toward this end on a continuing basis.

Manufacturers were more active in holding consultations with Public Roads regarding the self-propelled pneumatic rollers coming into wider use for compaction. Some of these carry an air tank for adjusting the pressure in the pneumatic tires to meet varying conditions in compacting highway embankments, bases, and surface courses.

A demonstration of a new type of wrecker was arranged by Public Roads for highway and police officials. The wrecker, developed by industry, features a sliding-tilting bed on a standard truck chassis and is designed to carry rather than tow disabled vehicles. This type of equipment should reduce the hazards of towing disabled vehicles, particularly at high speed.

Nuclear energy

The Nuclear Energy Branch established in Public Roads last year made an extensive study of industrial applications of nuclear energy in use by some 1,800 firms and compiled a list of 26 potential applications for highway work which was presented to the Atomic Energy Commission for evaluation. In all but two instances the reply was favorable. In most cases it seemed possible that equipment now in use by industry and commercially available could be utilized, with only slight modification and a small amount of development work.

During the year the Michigan State Highway Department reported that the moisture density gage using radioactive material, which it had been testing on highway construction projects, had shown such close correlation with the results of normal tests that the gage had been turned over to the operating forces for use on highway projects. With this gage, the density and moisture content in compacted embankments can be determined in a fraction of the time formerly required and without disturbing the compacted surface.

Steps were taken to initiate cooperative work with several highway departments and universities for the study of a radioisotope gage to measure the thickness of traffic paint, of a sign made luminous by nuclear radiation, and of a gage for measuring the asphalt content and thickness of portland cement concrete and bituminous pavements.

Procedures and operations

Studies made by Public Roads and others have shown the need for improving the criteria for compaction and for the mixing time of portland cement and bituminous concrete mixes. Joint committees of the American Road Builders Association and the American Association of State Highway Officials were organized for this purpose and included Public Roads personnel. Three regional meetings of the joint committee on compaction were held during the year.

Public Roads has noted that highway department specifications require mixing times for portland cement concrete ranging from 50 to 120 seconds. Research mentioned elsewhere in this report has shown that mixing beyond 60 seconds is not warranted by any improvement in quality. During the fiscal year, several highway departments revised their mixing time requirements to conform more nearly to the findings of research. This can effect further economies in highway construction. An analysis made by Public Roads during the year showed that decreasing the mixing time from 90 seconds to 60 seconds could save 92 cents per cubic yard in the cost of concrete production.

An increasing trend continued to develop in the use of end result specifications where feasible for highway construction. This trend will foster further economies in the highway program by allowing contractors to use their ingenuity to a greater degree and to employ the most modern equipment on highway projects.

The use of radio by highway departments, contractors, material suppliers, and the Bureau of Public Roads continued to expand during the fiscal year. Through membership in the American Association of State Highway Officials committee on the use of radio in highway departments, Public Roads actively participated in developing policies and procedures which would foster increased benefits from radio in the highway departments.

At the request of the Association of State Highway Officials of the North Atlantic States, Public Roads assisted in organizing a regional radio committee within the Association. Policies and procedures governing the coordination of frequency assignments were suggested and adopted by the committee, which was actively coordinating the assignment of frequencies for all highway departments within the North Atlantic States.

The establishment by the Federal Communications Commission of a new Special Industrial Radio Service with an allocation of radio frequencies for industrial use, has encouraged contractors, material suppliers, and others in the highway industry to take further advantage of the benefits of radio communication in their operations. The closer coordination of operations that is possible through use of radio facilities results in greater efficiency on highway projects.

Authorizations were obtained from the Federal Interdepartmental Radio Advisory Committee to expand Public Roads' own use of radio communication. These cover the operation of traffic survey equipment, expansion and conversion of facilities in Alaska, and equipment for use on Federal projects in the western States.

Experimental projects

In cooperation with State highway departments and others, Public Roads continued to sponsor experimental projects. During the year, 240 projects involving 40 experimental features were active. Minimum design criteria for continuously

reinforced concrete pavements were established and the development of a guide specification for rubberized asphalt was underway.

AASHO Road Test

Previous annual reports have recorded the significant facts concerning the largest highway research project ever undertaken—the AASHO Road Test being conducted near Ottawa, Ill. The project, now estimated to cost $25 million, is being administered by the Highway Research Board for the American Association of State Highway Officials and is supported by the State highway departments, the Automobile Manufacturers Association, the American Petroleum Institute, the American Institute of Steel Construction, the Department of Defense, the Bureau of Public Roads, and other agencies, providing grants or contributed services. The widespread cooperation stems from the mutual desire of the participating agencies to derive objective answers to questions concerning road-vehicle relations.

Essentially, the test is a study of the behavior of both portland cement and asphaltic concrete road pavements of different thickness and layer composition, and of bridges of varied design, when subjected to traffic of controlled weights applied at uniform rates. An 8-mile section of a four-lane divided, future Interstate route in Illinois is connected by large turnarounds to form a series of test loops. The 836 separate test sections randomly located in the 10 test lanes provide a wide range of pavement structures being subjected to an equally wide range of controlled single and tandem axle loadings. The entire test facility, constructed with precision and uniformity in keeping with the major objective of directly relating pavement thickness to load supporting ability, constitutes an immense field research laboratory.

At the close of the fiscal year, some 800,000 axle-load applications had been made in each test lane and altogether the test vehicles had traveled nearly 12 million miles since they started on October 15, 1958. Initially, test traffic was planned for a period of 2 years and it was anticipated that over a million axle-load applications would be made on surviving test sections. Early in the fiscal year, it became apparent that the planned schedule would not meet these expectations and that financial considerations would compel stopping test traffic on June 30, 1960.

As a result of recommendations made in October 1959 by a special AASHO committee, additional State contributions were provided; and in January 1960 a 7-day-week schedule was started and 48 additional test vehicles were put into operation. Test traffic is scheduled to end on November 30, 1960, and it is expected that total load applications in excess of a million will have been attained in the 2-year period.

While no conclusions will be publicly available prior to final analysis of the millions of items of recorded behavior data, important trends were becoming evident and it is readily apparent that significant findings are in the making. From the research investment will come important new knowledge of pavement and bridge behavior, as well as significant contributions to the art of highway design, the allocation of highway cost responsibility, and the regulation and economy of highway usage.

Highway Planning Research

Traffic volume, classification, and weight information

Traffic data from more than 1,400 continuous-count stations in all States and from other traffic studies were analyzed during the past year. Highway travel

increased by 5 percent during the year, reestablishing the general post World War II trend which had been retarded during the previous 24 months, with annual increases below 3 percent. The travel increase on rural roads was 5.1 percent, slightly more than the 5-percent increase on city streets.

The increased use of small passenger cars was indicated by limited information from 16 States, which showed that 4 percent of all passenger-car travel was by vehicles smaller than the "standard" American passenger car. Plans were made to obtain more comprehensive information.

Special information concerning the weights and dimensions of vehicles was collected by the States and analyzed as part of the annual truck weight survey. This additional information was obtained for use by the American Association of State Highway Officials in formulating a revised policy concerning maximum sizes and weights.

The reliability of the rate of change of traffic volumes on rural roads was tested by statistical methods in three States. The efficiency of traffic counting operations in four States was tested statistically, in a continuing study of improvement of traffic counting procedures.

A comprehensive analysis of the distribution of truck weights with relation to average weights of axles and vehicles for different truck types was initiated in two States and a similar study was continued in a third State. As a result of these studies reduction of effort in obtaining weight information may be possible in future operations. Indications were found that the truck weight characteristics on the Interstate System can differ significantly from those on other State highways.

An appraisal of peak hourly traffic volumes with relation to truck movements was begun in one State and statistical evaluation of urban truck weight characteristics was initiated in another.

Intensive studies of traffic characteristics were begun in New York City, in cooperation with the State and the city.

Numerous origin and destination studies of the multiple screenline type were made by the State highway departments to provide information for estimating traffic volumes for the various sections of the Interstate System.

Motor-vehicle-use studies

Twenty-four States had finished field work on motor-vehicle-use studies, and analyses were almost completed. These statewide studies provide information about the characteristics of motor-vehicle ownership and use such as distribution of vehicle travel by highway systems used, density of motor-vehicle ownership, passenger-car travel classified according to purpose, and methods of transportation used by workers for home-to-work travel.

Data available from 19 States showed that one-fourth of all licensed drivers were 30–39 years of age and an additional one-fifth were 40–49 years of age. Seventy-eight percent of all males and 39 percent of all females of legal driving age had drivers' licenses.

Two-thirds of all workers who traveled to work used private automobiles, and 15 percent used public transportation. Approximately one-eighth of all workers walked to work. Among workers in personal-service businesses, however, one-fourth of the total walked to work. The proportion walking to work varied among other occupational groups from a low of 4 percent for traveling salesmen to 15 percent for semiskilled and unskilled laborers.

Road inventory and mapping

Information showing improvement of individual road sections together with changes of roadside culture on rural roads was brought up to date by 34 States, the District of Columbia, and Puerto Rico through the continuation of road in-

ventory operations. Similar information, but with lesser detail of cultural features, was obtained for the street system in incorporated places in many of these States. These data are used in studies of highway deficiencies and in highway planning and administration.

During the year, 789 county general highway and traffic maps were revised or redrawn by the States under the cooperative highway planning program. Other mapping activities included the preparation of 41 State general highway and traffic maps and 325 similar maps of incorporated places.

Highway statistics

During the year, the fourteenth annual edition of *Highway Statistics* (for 1958) was published. This annual volume includes comprehensive information on motor-vehicle registration, motor-fuel consumption, highway-user taxation, highway finance, mileage of highways, and related information.

Progress was made in obtaining better information, for administrative and legislative use, on revenues and expenditures for highways of all levels of government. A study of the application of sampling techniques to the collection of local government highway statistics was begun during the year. Work was nearing completion on a historical bulletin of local city street finance.

Traffic studies in cities

Comprehensive home interview studies of travel and vehicle use were started in 18 cities, bringing the total of such studies to 158, of which 23 were repeat surveys. Continuing studies were underway in Chicago, Detroit, and Washington and agreement was reached to place the Pittsburgh study on a continuing basis. In addition, numerous external origin and destination studies around smaller cities were conducted.

Urban highway planning and research

Research during the year was directed toward developing procedures for a rational process of preparing comprehensive urban transportation plans; in particular, the development of improved procedures for estimating the future travel demands of our ever expanding urban areas.

A study completed during the year of traffic generated by a regional shopping center provided information on the amount and characteristics of travel that can be expected at such a traffic generator. Another study, based on traffic data from 193 cities, analyzed the destinations of traffic approaching cities and provided information useful to the planning of major highway facilities in and around urban areas.

Research to determine the relation between the sampling rates of home-interview origin and destination surveys and the accuracy of traffic volumes accumulated from such surveys was completed, using the 1957 Phoenix-Maricopa County, Ariz., traffic study as a base. The results indicated that a larger sample is needed to obtain the desired accuracy in accumulated trip volumes than would be inferred from a purely theoretical approach. However, the results agreed qualitatively with theory in that the accuracy varies with the square root of sample size and very nearly with the square root of volume. The results should aid in the selection of a sample rate for such studies commensurate with funds available and the degree of accuracy required. As part of this research, an electronic computer program was developed for tracing trips across a grid of screenlines and accumulating these trips on one-quarter-mile sections of the screenlines.

The 1957 Phoenix-Maricopa survey data were also used to determine the distribution of trip ends by mode of travel and trip purpose. In addition, trip ends for each travel mode and purpose were correlated with area, dwelling units,

population, employment, retail sales, and automobiles owned. These correlations provide equations from which trip ends may be estimated, using the six factors. Results indicated that this method for predicting trip ends is only valid for a rough approximation and that the characteristics of automobiles owned, population, dwelling units, and employment provide the major determinants of trip estimation. In addition, the data showed that automobile driver trip ends can be estimated at least as accurately as total person trip ends.

In research on the use of automobile and transit in urban areas, an electronic computer regression analysis program was tested; and work was in progress on applying this program to the use of those two transportation modes in subdivisions of urban areas.

The electronic computer program developed by Public Roads for assigning traffic to an urban highway network, to predict probable usage of street and highway facilities, was used during the year in numerous cities, including Washington, Columbus, Minneapolis-St. Paul, El Paso, Topeka, and Nashville. In addition to determining the probable traffic volumes on proposed new facilities, planning agencies were finding that the assignment program is a useful tool in selecting the locations of new facilities. The program was originally written to assign 24-hour traffic nondirectionally, but has been modified to allow a directional assignment as well as assignment of traffic for morning and afternoon peak hours and offpeak hours. A procedure was developed for taking into account prohibition of any or all turns at intersections as desired. Also, the origin and destination of all trips assigned to a particular section of a highway system, such as a bridge or ramp, can be determined. The resulting information is so summarized that weaving movements are readily available.

The Fratar method for estimating the future distribution of trips throughout an area was programed for a large high-speed computer. The program can handle up to 1,000 zones. As an example of the speed of the program, the future distribution of trips for a city with 371 zones was obtained in 36 minutes at a computer cost of approximately $125.

Two major urban research projects were initiated during the past year. The first, utilizing information collected by a special survey conducted in the Pittsburgh metropolitan area, was designed to test several interarea traffic models and to develop formulas which can be used to synthesize the zone-to-zone movement of traffic within urban areas. This study will provide a positive evaluation of several procedures now being used to estimate urban traffic movement.

The second project was an analysis to determine the relations which exist between travel characteristics and socio-economic factors such as income, sex, age, race, occupation, and density. These relations will be established for 15 to 20 cities throughout the country which have had recent comprehensive origin and destination surveys. In addition, in those cities with repeat surveys, these relations will be developed for the two time periods. A comparative study of the developed relations will determine their usefulness for estimating urban traffic and thereby form the basis of developing improved traffic estimating procedures.

Preliminary investigations were made in the field of urban land use forecasting and tentative arrangements were made for a research project designed to isolate and measure the effect of the major determinants of urban land use.

Throughout the year, staff assistance was provided by Public Roads to the Joint Committee on Highways of the American Municipal Association and the American Association of State Highway Officials. This committee has been instrumental in promoting cooperation between State and local agencies for the joint preparation of plans for urban highways and urban development. Staff

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assistance was also provided to the AASHO special subcommittee on Urban Transportation Planning and to the National Association of County Engineers.

Traffic Operations Research

Highway capacity research

Research studies of urban arterial traffic operations continued. Analyses were completed in the study of Wisconsin Avenue in Washington, D.C., and a report was being prepared, describing how substantial capacity increases can be obtained on many existing arterial streets by the coordinated use of known traffic engineering techniques which now are often employed piecemeal.

Computer analyses of the intersection capacity data from 1,100 heavily used approaches were completed, producing a single intersection capacity prediction equation. Refinement of this equation, and possible conversion to a series of equations applying to certain specific conditions, was underway.

Collection of field data for a nationwide freeway ramp capacity study was underway at the close of the year and analysis was scheduled to start late in 1960. The importance of this study is demonstrated by observations of an AASHO special committee that most traffic difficulties occurring on freeways originate in design problems at interchanges.

Human factors research

A study was completed during the year of driver tension responses as a measure of the characteristics of different types of highways. The galvanic skin reflexes of the driver of an automobile, recorded from wires attached to his hand, were related by an observer to the traffic incidents that caused the driver to react. It was found that one of two parallel urban routes was more "comfortable" for the driver and this might well dictate his choice of routes. It was also demonstrated that a controlled-access highway induced only one-third to one-fifth as much tension for the driver as an urban street, and about one-half as much as a parallel non-controlled-access highway.

A program of research was started on the needs and techniques for driver-to-driver communication. A preliminary study was conducted to determine the effect of knowledge of proposed maneuvers of a vehicle on the behavior of the following car. The lead car was equipped with a series of signal lights by which the driver could indicate his intentions to the driver of the following car. The headway distance between cars was measured both when the following driver knew what change in speed was to occur in the lead car and when it was to take place, and when the following driver had no information. The results indicated that when signals were used the average distance headway was reduced by about a third.

Highway illumination

Public Roads, in cooperation with the Connecticut State Highway Department, completed a study of the effects of illumination and delineation on the Connecticut Turnpike. Driver behavior was observed under various conditions of highway illumination and delineation at a heavily traveled interchange. In addition, accident data on the 53-mile illuminated section and the 77-mile non-illuminated section of the turnpike were compared. The study showed no significant differences with respect to average vehicle speeds, lateral placements, and clearances between vehicles, under the various conditions of illumination and delineation. The manner of night usage of speed change lanes, particularly the acceleration lane, improved with increased illumination. In general, it appeared that some benefit resulted from full-level illumination in the deceleration

area, and that even greater benefit occurred when illumination was combined with roadside delineation. Illumination of the interchange area only did not appear to be advantageous insofar as the access ramp was concerned. The importance of delineation, with or without illumination, was demonstrated.

Motor-vehicle accident studies

Studies of the economic cost of motor-vehicle accidents were completed in Massachusetts during the fiscal year and were nearing completion in New Mexico and Utah. A study was also underway in Illinois. These studies, conducted by the States with Public Roads cooperation, encompass the driving experience of all motor-vehicle owners in their operation of passenger cars and trucks during 1 year, and provide a mass of data relating accidents and their costs to highway systems, traffic volumes, road conditions, age and sex of drivers, type and age of vehicles, light and weather conditions, etc. The results help pinpoint the major factors contributing to the sizable economic losses resulting from motor-vehicle accidents. During the fiscal year, three reports on the results of the Massachusetts accident cost study were completed and a fourth compared the Utah and Massachusetts data.

During the year Public Roads developed a procedure manual for accident research studies on the Interstate System and invited the State highway departments to undertake such studies. Two forms of study were planned: one to compare accident rates for completed sections of the Interstate System with nearby existing highways selected as control sections; and the other to relate accident experience to various geometric design elements.

Dynamic characteristics of vehicle loads

Public Roads, in two cooperative research projects, undertook the first steps in developing a dynamic theory in road loading mechanics which will permit the prediction of road life from the characteristics of traffic flow, and which will indicate the effect on road life of changes in vehicle suspensions and in other elements of the system. A complete analysis, properly relating the dynamic and static performance factors of both vehicle and road, and utilizing high-speed computer programs, is envisioned. A project at Purdue Research Foundation, using the experimental approach, investigated frequency response of a few passenger cars to determine the effect of pavement profile upon the nature of ride obtained and the relative magnitude of wheel loads imposed upon the road. A project at the Cornell Aeronautical Laboratory, using the theoretical approach, developed preliminary mathematical models of a typical vehicle and of a road. A necessary future step in the overall program will be experiments to confirm the theory or to modify the theory to fit experimental data.

Motor-vehicle economics studies

A study was continued to determine the optimum economic size and weight limitations for commercial motor vehicles and to estimate the changes in highway freight movement that might be caused by the adoption of these limitations. One phase of this study, nearing completion, related changes in vehicular operating costs and changes in gross weights of tractor-trailer combinations. Another phase of the study, comparing gross vehicle and axle weights with the costs of constructing and maintaining highways, was being developed.

Research was continued, in connection with the highway cost allocation study, to establish the differential road-user benefits resulting from improvement of the various rural and urban highway systems. A computer program was developed for analysis of road improvement data received from the States. Additional fuel and travel-time data were obtained from tests completed on buses and heavy

freight trailer combinations by the University of Washington for the Bureau of Public Roads and the Washington State Highway Commission. Similar tests of passenger cars and light trucks were conducted by Public Roads.

Brake research

In a comprehensive study of emergency braking systems for combinations of commercial motor vehicles, undertaken by Public Roads for the Interstate Commerce Commission, road tests were completed and laboratory tests were nearly finished during the fiscal year. Tests of system components on vehicles in service were to be started soon. The study, aimed at resolving controversies concerning the safeguards in motor-vehicle braking systems necessary to prevent "runaway" accidents, had industry participation and advice and assistance of an advisory committee to the ICC.

Manual on Uniform Traffic Control Devices

A major project during the year was the comprehensive revision of the *Manual on Uniform Traffic Control Devices*, to which Public Roads made a large contribution in staff services. Prepared by a joint committee representing a number of national organizations concerned with traffic control and safety, the revised manual, like its predecessors, will be published by Public Roads, to be the official standard for Federal-aid highways. In addition to a general updating of the current standards, the new manual, for the first time, will include specifications for the signing of expressways, control of traffic through construction and maintenance sites, and emergency civil defense signing.

Highway Needs and Economy Research

Construction and maintenance methods

An extensive cooperative study in Iowa of equipment use and performance, work methods, and workloads in State highway maintenance was started early in the fiscal year. The field study of work performance will run a full year.

Research was continued on the drying of aggregates for bituminous admixtures, using a scale-model dryer at Ohio State University. Experimental tests will be made of production model equipment under field operating conditions.

A 30-minute motion picture, *Dual-Drum Paver Productivity*, was completed and distributed to highway construction and engineering groups. This film shows in action scenes why concrete paver production rates ranged from low on some jobs to high on others. Simultaneous views contrasting fast and mediocre batch-truck dumping performance at the paver skip effectively highlight one of the major causes of slow production by the paver.

Field tests were made of a newly constructed recording device which automatically measures the elapsed time of certain cycle elements on a dual drum paver. Job site studies of equipment performance were made on 15 construction projects. Among these were two on the new triple-drum paver introduced in 1959.

Highway management studies

Approximately 6,300 questionnaire forms for a census of highway engineering employment were distributed to highway departments of States, counties, cities, and special authorities, and to consulting engineers. About 85 percent of the questionnaires had been returned and were being tabulated.

Assistance was provided the National Association of County Engineers' research program on methods of county road management in formulating a

procedural manual for the preparation of long-range county road improvement programs. The final draft of the manual was in preparation and a method of priority analysis, for inclusion in the manual, was field evaluated in counties of several States.

The pilot study in the Wisconsin State Highway Commission to investigate the cause and effect of factors, internal and external, on the production of the engineering plans for construction projects, was continued. All delays were to be analyzed and classified, flow charts prepared, and all policies and procedures relating to the production of plans were to be cataloged.

Highway cost studies

In connection with the study of the economics of motor-vehicle sizes and weights, work was undertaken to determine the cost to construct highway facilities of different levels of structural capacities for various sizes and gross weights of commercial motor vehicles.

Annual capital highway costs for 1975 were computed for each of the 12 highway systems for unsurfaced, low, intermediate, and high-type surfaces. These costs were computed at 0 and 5 percent interest rates of capital recovery. Annual ownership costs per vehicle-mile were also determined for the 12 highway systems.

Research in highway economics and finance

Research in connection with the highway cost allocation study was concerned primarily with the allocation of highway costs between users and nonusers according to the relative use and earnings-credit theories, and among various types of users according to the ton-mile theory.

Investigations of the characteristics of motor-vehicle ownership and use included studies of the motor-fuel consumption characteristics of privately owned passenger cars, which were initiated in several States; and a nationwide automobile use study conducted for Public Roads by the Bureau of the Census.

An analysis was completed of the relation of the Interstate System to standard metropolitan statistical areas as indicated by the 1950 and 1960 censuses.

Highway and Land Administration Research

Economic impact studies

For use in connection with route planning, land acquisition, highway design, highway hearings, public relations, and other activities, highway officials were conducting research, in cooperation with Public Roads, on the economic and social impact of highway improvements in urban and rural communities. These studies were concerned with evaluation of the effects of highway improvements on land value and land use, with attention to such subjects as interchange points, central business districts, public services, and tax bases. During the fiscal year, 11 studies were completed, bringing the total to 75 studies completed in 24 States, plus 9 studies nationwide in scope. Segments of broad socio-economic studies in two States, and three nationwide studies, were also completed. At the end of the year 43 studies were in progress in 35 States, plus 5 nationwide research projects; 12 of these were started during the year.

During the year Public Roads developed and distributed a guide for highway impact studies, for use in the planning and conduct of studies of the economic impact of highway improvements.

Interchange studies.—Studies of the problem of land development and land use control at highway interchanges and approach areas were started during the

year in several States, and a study in this area was completed at the University of Washington. Another study was undertaken on the relations between highway interchanges and approaches and adjacent land development for commercial, industrial, and residential purposes; demand by highway users for goods and services; and the prevailing competition for highway approaches.

Central business districts.—Two studies were undertaken to evaluate effects of urban highway improvements on central business districts. A study completed at the University of Washington evaluated a representative number of city centers. A pilot study underway at Clark University based principally on land-use mapping, sought methods of determining land use and central business district changes.

Right-of-way research

With increasing attention to highway right-of-way costs, a number of States, with Public Roads assistance, undertook studies of severance damages and partial takings during the year. Generally these were case-history analyses of parcels along a given highway route, comparing damages paid for partial takings with sales of the remainder properties after the highway improvement was completed. Studies were underway in 18 States. As an aid to such studies, Public Roads developed a form for recording pertinent information.

A short report on the purposes and experience in the use of photogrammetry for highway land acquisition purposes was published during the year.

In cooperation with the American Association of State Highway Officials, a study of liaison between utilities and highway departments was commenced, in an effort to determine weaknesses and causes of delays when utilities must be moved because of highway improvements.

A study of present practices in the preparation and format of maps and plats for right-of-way acquisition purposes was commenced, with a view to suggesting improvements.

In cooperation with the American Bar Association, a review and analysis of all court decisions pertaining to condemnation of land for public purposes made during the year was completed. Also in cooperation with the American Bar Association, a study of the use of the pretrial procedure in condemnation cases was started.

Work on a comprehensive right-of-way training manual continued, and assistance was given to State highway departments in the development of training programs for right-of-way personnel.

Highway administration research

In cooperation with a Highway Research Board committee, revision and updating of two previous publications of the Board were completed: One contains the State highway department organization charts; the other discusses the various types of State highway administrative organization and complementary provisions, such as qualifications, tenure, and method of appointment of officials.

A tabulation of the directing organizations of State highway departments and the terms of office and salaries of officials was revised as of July 1959.

A study was completed on the position of utilities engineers in the State highway department administrative organizations.

Highway laws

Analyses of intergovernmental relations and State constitutional provisions were published as part of the broad study of highway law in which Public Roads, the American Association of State Highway Officials, and the Highway Research Board were cooperating. Reports on contracts and further analyses of property condemnation were prepared for publication.

Research was conducted and three reports were prepared on the application of police power regulations and community planning controls to highway transportation problems.

Hydraulic Research

A study of peak rates of flow from small watersheds, approaching completion, will supply vitally needed information to highway engineers who must anticipate the quantities of stormwater that culverts and small bridges must carry.

Colorado State University, with Public Roads participation, completed a study providing methods for estimating peak floods on streams in Eastern Colorado and adjacent areas.

Research on stormwater flow from urban areas in Baltimore continued at The Johns Hopkins University, in a project jointly sponsored by Public Roads, the City of Baltimore, and Baltimore County.

A basic study on the hydrodynamics of curb-opening inlets for storm sewers was being conducted by Stanford University for Public Roads.

An experimental investigation of the flow capacity of corrugated structural plate metal pipe with 2-inch corrugations was underway at the Waterways Experiment Station, Vicksburg, as a joint project of the Corps of Engineers and Public Roads. No previous work with this type of pipe, commonly used for large culverts, has ever been done.

Studies were completed on capacity of concrete pipe of two distinct types. The research was conducted by the University of Minnesota's St. Anthony Falls Hydraulic Laboratory for Public Roads and the Florida State Road Commission. Effect of poor joints was evaluated for the first time.

The National Bureau of Standards had almost completed an intensive investigation for Public Roads, aimed at improving hydraulic capacity of pipe culverts by modifying their entrances. A great deal of significant data leading to more economical culvert installations has been developed. Attention was being directed to improvement of box culvert flow characteristics.

A motion picture, *Introduction to Highway Hydraulics*, using models and actual scenes, was produced during the year and was widely exhibited to highway departments and others.

Laboratory studies on scour around bridge piers and abutments were concluded at Colorado State University. A preliminary investigation of the use of spur dikes to lessen vulnerability of bridges to damage by scour was also completed. The university was also completing a study on scour at the outlet of culverts. These projects were sponsored by Public Roads.

A seminar conducted at Washington for hydraulic engineers from field offices was devoted primarily to problems associated with relocation of natural channels. Such relocations are becoming very common because of requirements of the Interstate System and other controlled-access divided highways.

Physical Research

Soils, foundations, and flexible pavement studies

The development of laboratory and field methods of measuring the physical characteristics and condition of soil materials more rapidly and efficiently is necessary in order that highway construction operations will not be delayed. Extensive laboratory evaluation and limited use in highway earthwork control tests have indicated that a device involving the reaction of calcium carbide with moisture can be used to measure the moisture content of soil materials within a few minutes. Laboratory and field evaluation of equipment utilizing radioactive materials, detectors, and counting devices for measuring the moisture

content and density of soils was continued in cooperative studies in Colorado, Maine, North Carolina, and Ohio. Similar nuclear equipment was being evaluated and modified for use in measuring the density and asphalt content of bituminous pavements in a cooperative study in Arizona.

A lightweight, single-channel seismic device was being evaluated for determining geologic conditions and depth to bedrock. Field studies with electrical resistivity equipment were conducted to determine its usefulness in identifying geologic conditions beneath bodies of water and in evaluating landslide conditions. Demonstrations and instruction in the use of geophysical equipment in subsurface investigations were made in five States.

Laboratory study of a patented chemical powder showed that it was effective in stabilizing fine-grained soils. Laboratory tests were made to determine the optimum amount of the chemical powder and of phosphoric acid required for stabilizing soils obtained from sites in Maryland and South Dakota where full-scale experimental stabilized-subgrade sections are planned.

Systematic identification of clay minerals in soils of the United States was extended to several counties in various States. Preparation of a report on an intensive study of the properties of soils of Fairfax County, Va., was begun. Basic studies were undertaken concerning clay-organic complexes and soil chlorite.

Cooperative aggregate surveys, in which effective use is made of aerial photographs, soil and geologic maps and reports, and electrical resistivity apparatus, were underway in 10 States and an aggregate survey for the Interstate route in another State was completed. Studies in cooperation with four States for the development of soil maps and reports for engineering purposes were continued and a similar study was started in a fifth State. An aerial photographic study was made of alternate routes for a proposed 50-mile highway in Alaska, followed by a field reconnaissance of the selected route.

The cooperative program with the Soil Conservation Service was continued. Twenty-eight State highway departments were cooperating by testing soil samples and preparing information for the engineering section of the soil survey reports. Public Roads received for testing 1,232 soil samples from 62 counties in 29 States; correlated the test data from State laboratories for 1,016 soil samples from 50 other counties; and reviewed for technical adequacy the engineering sections for 18 county soil survey reports.

Technical assistance regarding analysis and design of foundations on soil was given to nine State highway departments. Change in design plans as a result of this assistance saved over $1 million in construction funds.

The rapid increase in traffic in all States and awareness that extensive pavement performance data would soon be available from the AASHO Road Test led many State highway departments to consider a reevaluation of their respective flexible pavement design procedures. Cooperative field studies to evaluate selected pavements were being conducted in Maryland, Nebraska, Oregon, and South Carolina. Cooperative studies in Georgia, to obtain fundamental data on the mechanics of load support by means of rigid-plate bearing tests on full-depth pavement specimens having base courses of various types, were continued. Comprehensive field investigations in Oklahoma, South Dakota, and Arkansas to obtain information to improve current design procedures or develop new ones, were continued. A field study was made of selected flexible pavement sections on the Natchez Trace Parkway.

Bituminous materials and pavements

Public Roads' research on bituminous pavements has been directed towards the proper selection of component materials, proper mixture design, and the

development of tests to adequately control materials and their use, with the ultimate objective of pavements of higher quality and durability.

The construction of a motorized gyratory compactor, patterned after that developed by the Texas Highway Department and perfected by the Corps of Engineers, was completed and a research study using this equipment was started. Testing equipment to study the fatigue and flexure characteristics of bituminous pavements also was installed and a preliminary study was initiated. A cooperative study of fatigue characteristics of asphalt concrete was underway in Oregon.

A cooperative study was started by North Carolina to obtain some of the information needed on the use of viscosity of asphaltic materials to control plant mixing temperatures and to establish the optimum temperature for compaction of bituminous mixtures on the road. A study proposal was sent to all State highway departments to encourage further studies on this subject.

Laboratory-field correlation studies of asphaltic concrete pavements in Maryland, Virginia, and Delaware were continued. Results of the Maryland study showed that the rate of hardening of the asphalt was affected by the amount of air voids. In general the rate of hardening was highest in pavements having the highest amount of air voids. Technical assistance was furnished to the Georgia Institute of Technology to improve bituminous mixture design procedure in Georgia. A cooperative study to evaluate asphaltic pavements in Texas was initiated at the Texas Transportation Institute.

Studies were made to determine the suitability of certain aggregates and mineral fillers for use in bituminous construction. Techniques using spectrophotometry, X-ray diffraction, and differential thermal analysis were used to determine mineral composition of some of these materials and offer rapid and accurate methods that may be used for the selection of materials.

A second report on the properties of highway asphalts was completed. The data in this report and the report published last year have become a valuable guide to both producers and consumers in evaluating their products and promoting new specifications and test methods.

The practical value of Public Roads' research continued to be demonstrated by the inclusion of its thin-film oven test in the standard asphalt specifications of the American Association of State Highway Officials with recommended specification requirements. The test was also accepted as a tentative standard by the American Society for Testing Materials.

In the field of new materials, a laboratory investigation of the new coal-modified tar binder was conducted, and experimental projects were observed. These studies revealed some undesirable characteristics of the new material that must be overcome before it can be generally used on a large scale.

Chemical investigations

A study and report were completed which extends the application of a rapid instrumental method (flame photometer) to the analyses of water-soluble alkalies and high alkali contents of portland cement. The proposed procedures are more accurate and less time-consuming than present methods.

New rust-inhibitive paints for structural steel appear to offer economic advantages over presently used paints by virtue of greater durability. Field exposure studies of such paints were continued and included such paint types as basic lead silico chromate, zinc-rich, and phenolic wetting additives.

The extremely rapid abrasion of ordinary bridge paints by high wind, sand, snow, and ice presents a critical, costly maintenance problem in some areas in Alaska. A cooperative laboratory study was initiated to determine the type of paint best suited for such conditions.

Thermoplastic materials have been proposed as more economical substitutes for standard traffic paints for the striping of traffic lanes on highways. A questionnaire was sent to State highway departments and large cities to obtain information on the relative durability, safety, and economy of such materials and the findings will be used to determine the degree of Federal financial participation in the cost of such materials for new Federal-aid and Interstate highway construction.

Cement, aggregates, and concrete

A report of a research investigation on the chemical properties and identification tests of retarders and their effects on strength, water and air content, and durability of concrete was completed. The report, with a suggested guide specification for retarders, will be valuable to the States. The study results indicated that retarders increase compressive strength, reduce water content, and do not adversely affect the durability or volume change of air-entrained concrete when used at a rate that retards the setting time 2½ to 3 hours beyond that of similar nonretarded concrete. The results indicated that retarders are of value in concrete by increasing strength or by reducing placement problems under conditions of high temperatures that cause rapid setting or stiffening of concrete.

A study of the use of 14 manufactured lightweight aggregates in concrete was completed and a report was in preparation. Increased use of such materials in the last 5 years in bridge deck slabs and in prestressed concrete beams has raised some questions about volume change, creep, and durability of the lightweight concrete. The manufacturers of the lightweight aggregates have improved their products and the previous research data on the properties and methods of use were not necessarily applicable to their present product. The preliminary test results indicated that most lightweight concretes approach the crushing strengths of concretes made with natural aggregates and equal cement content. The durability of the lightweight concrete in freezing and thawing appears to be dependent on the degree of saturation at the time of freezing.

A report on the study of mixing time of 34–E dual-drum paving mixers was completed during the year. Conclusions were that satisfactorily mixed paving concrete can be obtained with 50–60 seconds mixing time, exclusive of transfer time. In addition, most mixers can mix up to 20 percent above the 34 cubic feet of rated capacity of concrete without a decrease in strength or segregation of the concrete. Time and efficiency studies on all of the mixer study jobs were made and a report on the measurement of mixing time was completed.

Durability tests of concrete slabs exposed to outside weathering or de-icing by chemical salts was continued. The beneficial value of air-entrainment in preventing or minimizing scaling was demonstrated again and checked the observations of previous years.

The work on development of test methods for concrete continued. More data were obtained on the indirect tensile (cylinder splitting) test, and various sulfur mixtures for capping of cylinders were studied. The Proctor needle test for determination of setting time of screened mortars from concrete has proven satisfactory as a measure of the retardation of concrete.

Control of the quality of concrete can be facilitated if the cement content of the fresh concrete can be accurately determined. A study was in progress of a proposed ASTM method for determining the cement content of fresh concrete, using both washing and centrifuging for separation of cement from the concrete. Primary emphasis was placed on determining the accuracy to be expected from the procedure when different types and sizes of coarse aggregates and different kinds of cement are used.

A study of the factors affecting the results obtained in the Los Angeles abrasion test for aggregates was conducted over a 2-year period in cooperation with nine other laboratories. It was determined that nonuniformity of rotational speed during each revolution of the Los Angeles drum was a contributing factor to the observed variability. Precision limits for the Los Angeles test were recommended to the appropriate ASTM committees on the basis of the data obtained.

Structural design of concrete pavements

Cooperative investigations of continuously reinforced concrete pavements were in progress in California, Illinois, Indiana, Pennsylvania, and Maryland. Performance surveys of pavements in service were being conducted in Illinois, Maryland, Michigan, and Oklahoma. Other cooperative projects included investigations in Indiana on the effectiveness of various types and thicknesses of subbases in the control of pumping; in New York on the corrosion of dowels using unprotected steel, stainless steel sleeves, and nickel coatings; and in a study at Purdue University to develop a nondestructive method of measuring moisture gradients in hardened concrete.

In anticipation of cooperative prestressed concrete pavement experimental projects, Public Roads completed a thorough literature survey on the subject during the year. Field tests were also completed on methods designed to reduce friction between the slab and subbase.

Road surface research

A nationwide correlation study of roughometers constructed from Public Roads plans was initiated. Comparison studies between Bureau and State machines were made in nine States. As a result certain minor changes were being considered to improve standardization of the roughometer and its operation. The Public Roads roughometer team worked in nearly one-third of the States during the year.

Progress was made in developing and improving the equipment used to measure the skid resistance of wet pavement surfaces. A forced water system was installed and a sequence timer was included to simplify the control of the various operations and to provide uniformity. Rigorous tests were being conducted to appraise the merit of the equipment. To supplement the locked-wheel skid data developed by the Public Roads machine, a two-wheeled trailer which measures rolling-wheel or incipient friction was acquired.

Bridge research

Work continued on the analysis of data from the dynamic tests on bridges in Missouri, Nebraska, and South Dakota while Public Roads' electronic field testing equipment has been in use on the bridges on the AASHO Test Road. These tests and the cooperative theoretical and laboratory research on this subject at the University of Illinois were clarifying the concept of impact as it affects the design of highway bridges and suggesting the type of testing which will be most productive when the Bureau equipment again becomes available for work in the field.

Wind tunnel tests on one-fiftieth scale section model were made to determine the aerodynamic characteristics of proposed suspension bridges at San Pedro, Calif., and over the Straits of Bosporus in Turkey. Similar studies were in progress to determine the aerodynamic effect of adding rapid transit facilities to the Golden Gate Bridge.

During the past year the continuing cooperative research on structural steel at Lehigh University and the Universities of Illinois and Washington led to important changes in the design specifications for bolted joints and plate girders.

Continuing cooperative studies of fatigue of steel at the University of Illinois and in the field of concrete and prestressed concrete at that university and Lehigh University indicated the desirability of changes in design practices and specifications. Important, possibly far-reaching, cooperative studies of creep and fatigue in concrete were initiated at the Universities of Illinois and Missouri.

Foreign Activities

Inter-American Highway

Since 1930 the United States, through the Bureau of Public Roads, has been assisting the Republics of Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, and Panama in the construction of the Inter-American Highway, which is that section of the Pan American Highway from Nuevo Laredo on our Mexican border, to Panama City at the Pacific terminal of the Panama Canal, a distance of 3,142 miles. Connecting highways from El Paso and Nogales, Tex., to Mexico City now afford more direct routes from the western United States. At the end of the year, 95 percent of the Inter-American Highway was passable in all kinds of weather by motor vehicles, and uninterrupted travel of the entire distance to Panama City was scheduled by the spring of 1962.

Throughout its length of 1,587 miles in Mexico, the highway was open and practically all of it was paved. This section of the highway has been financed and constructed entirely by Mexico.

From the Guatemalan-Mexican border, the highway was also passable at all times over paved or gravel roads for 1,113 miles to San Isidro, Costa Rica. In this distance, many sections were under construction, but the route was open and passable, although with some difficulty. Beginning at San Isidro, Costa Rica, an impassable section of the route extended for about 150 miles through rough and undeveloped territory to Concepcion, Panama. This entire section was under construction. From Concepcion to Panama City, a distance of about 287 miles, the highway was passable at all times, but considerable construction was underway.

On the 1,555 miles of the highway between the Mexican border and Panama City, contracts were awarded during the year for 54 bridges and 186 miles of base and paving. Still to be placed under construction were 460 miles of base and paving, in addition to widening 7 miles of the route in the Selegua Canyon in Guatemala. Widening and partial construction on 11 miles of the highway in the mountainous section between Cartago and San Isidro in Costa Rica and work on 27 miles of a relocation in Panama between Guabala and Santiago remained to be completed.

The condition of the highway in the Central American Republics and the work accomplished during the fiscal year are described in the following paragraphs.

In Guatemala, the entire highway was passable at all times, although occasional slides and washouts may delay traffic in the Selegua Canyon for short periods for several years until the highway becomes stabilized. Construction work continued on the grading and bridge contracts previously awarded. A contract for paving in the northern part of Guatemala awarded last year was delayed pending a study of the most desirable type of surfacing, and was being revised. About 140 miles will be gravel surfaced under present financing plans.

In El Salvador, the entire length of the highway was completed prior to fiscal year 1960.

In Honduras, grading, bridges, and subbase for the highway were completed. A contract for the base and paving of the entire route was signed. Construction had started and should be completed by the end of the next fiscal year.

In Nicaragua, the base and paving were completed on a 35-mile section in northern Nicaragua. A 22-mile section in southern Nicaragua was under con-

struction for base and paving. A contract for the base and paving on the last 48-mile section was awarded during the year. It is estimated that the entire highway in Nicaragua will be completed by the end of the next fiscal year.

In Costa Rica, paving was completed in the northern section between the Nicaraguan border and San Ramon. In southern Costa Rica, grading, drainage, and subbase work were substantially completed on the 133-mile impassable gap. A contract was awarded for the construction of 39 bridges in this section. With completion of these bridges, scheduled for March 1962, the Inter-American Highway will be passable at all times for its full length. Upon completion of this contract, 206 miles of the route in Costa Rica will be paved. An additional 204 miles will have an all-weather gravel surface, but funds are not available for base and paving work.

During the year the engineering and supervision of construction of all future work on the Inter-American Highway in Costa Rica was transferred to the Government of Costa Rica, in line with the policy of the Bureau of Public Roads of assisting the Central American Republics in setting up and maintaining competent highway departments of their own.

In Panama, the highway was passable at all times except for a 17-mile section adjacent to the Costa Rican border. During the year agreements were entered into with Panama which will provide funds for a paved highway from the Costa Rican border to Panama City. Contracts were awarded during the year on 44 miles of base and paving work, and provision had been made for paving an additional 54 miles. On the remaining 62-mile section, between Guabala and Santiago, for which a relocation was being planned, Panama agreed to pave the old road. This will provide a satisfactory temporary route until plans are completed and funds available for the relocation.

Other Latin American projects

In Guatemala, Public Roads continued to furnish technical engineering assistance to the International Cooperation Administration in connection with the construction and improvement of the Pacific Highway from the Mexican border to the border of El Salvador and the Atlantic Highway from Guatemala City to Puertos Barrios, as well as rural development roads.

During the year Public Roads sent three equipment specialists to Panama to furnish technical advice and assistance on the operation and maintenance of road construction equipment and to train equipment operators.

The United States is aiding Nicaragua financially in the construction of the Rama Road, which will form the main transportation link from the settled portion of Nicaragua on the Pacific Coast to the undeveloped, fertile areas of eastern Nicaragua and the Atlantic Ocean. The road extends 158 miles from San Benito on the Inter-American Highway to Rama, a port on the Escondida River. Construction with United States funds in 1943–48 had completed 96 miles of all-weather road from San Benito to Villa Somoza. Work was resumed in 1955 and since then 42 miles have been put under contract, of which 37 miles were completed. Funds were available for only a portion of the remaining 20 miles of construction.

During the year, two engineers were sent to Colombia, two to Chile, two to Costa Rica, and one to Guatemala on temporary assignments to furnish technical advice and assistance in highway matters to those countries, at their request.

The VIII Pan American Highway Congress held in Bogota, Colombia, May 20–29 was attended by personnel from the Bureau of Public Roads.

Other foreign activities

Since the end of World War II the Bureau of Public Roads has furnished technical assistance, advice, and consultation to many foreign countries with the

objective of developing or furthering programs of highway improvement and communications in those countries, thus fostering their economic and social growth. Emphasis has been on aiding the countries to establish competent highway organizations and training nationals to staff them.

At the end of the year Public Roads was actively participating in highway improvement programs in 11 foreign countries, 9 of which were sponsored by the International Cooperation Administration. Programs in Ethiopia and Iran were financed by the International Bank for Reconstruction and Development and the Export-Import Bank of Washington, respectively. A new program of technical assistance was undertaken in Turkey, financed by a loan made to the Turkish government by the Export-Import Bank of Washington for forestry development. An agreement was being negotiated with the Philippines for provision of services and technical assistance in connection with a public works program being undertaken with financing from the Development Loan Fund. Public Roads had 106 persons in its overseas missions and was recruiting for 90 more.

Activities in Ethiopia.—During the fiscal year Public Roads had 13 engineers and technicians assigned to assist the Ethiopian Imperial Highway Authority. Construction by contract was initiated during the year on 500 miles of new roads, and force-account betterment construction was underway on a total of 1,160 miles of roads. A total of 7,300 miles of all-weather roads were under maintenance, of which 2,200 miles were asphalt surfaced.

Training of Ethiopian nationals, organized and directed by Public Roads personnel, has been a major activity.

Benefits to Ethiopia resulting from highway improvement have been outstanding. For example, in 1952 a truck took 2 weeks to make the 440-mile trip from the Red Sea port of Assab to Addis Ababa, in the dry season. The trip is now made in 2 to 2½ days, in both dry and rainy seasons. The cost of truck transport has been reduced from $31 per ton in 1953 to $14 per ton in 1959, a 54-percent saving.

Activities in Iran.—During the fiscal year Public Roads continued technical assistance to the Ministry of Roads of Iran on its highway maintenance program, and began to assist in some design and construction work. The major effort, however, has been toward training equipment operators and mechanics, and developing an organization sufficient to support the routine maintenance of Iran's highway system. Some betterment work, consisting of widening and bituminous surfacing, has been performed.

During the year approximately $3.25 million of highway maintenance equipment has been delivered to Iran, and an additional $1 million of equipment was purchased with Iranian local funds. Some $750,000 of equipment has been supplied from Development Loan Fund sources.

Activities in Jordan.—Public Roads continued to supply technical assistance and special aid to the Government of Jordan for highway construction throughout the year. Five engineers were added to the staff to provide assistance in location and design, specifications and contract forms for bridge construction, highway materials testing and control, development of a cost accounting system, and planning for a highway physical inventory and traffic-count program.

The initial demonstration program of 95 miles of primary and 90 miles of secondary road construction was completed except for the Sweileh-Jarash section of 55 miles. Improvement was made during the year in the better use, maintenance, repair, and operation of equipment.

Advice and assistance was also furnished during the year on a road relief program financed from the sale of wheat under Public Law 480. This program provided work for an average of 10,000 laborers during the year. Training of

mechanics was started in a building completed during the year at the new equipment depot at Wadiseer. The survey and design of the Dead Sea-Jerusalem-Bethlehem highway routes by engineering consultants was completed.

Activities in Laos.—The Public Roads program in Laos was initiated under a preliminary agreement with ICA dated November 12, 1959, providing for a temporary detail to Laos of six men. This agreement was supplanted by a long-term agreement dated March 21, 1960, providing for a full staff of specialists from the United States and other countries to furnish technical advice, assistance, and training to Lao nationals. It also provided that Public Roads would design and supervise construction of a 63-mile road in the central part of the country.

The initial Public Roads team reviewed plans and specifications for the 30-mile Vientiane-Thadeau route, which was turned over to the U.S. Navy to redesign and supervise construction for ICA. Public Roads was given full management of the 63-mile road project on which the French had made preliminary studies and had been building major structures. At the close of the fiscal year the plans and contract documents had been completed and the project was ready for advertising for bids.

A large quantity of component parts of Bailey bridges in Army surplus stocks were inspected in Japan and arrangements were made for their use in Laos. A survey of existing and needed bridges on the Vientiane-Luang-Prabang route indicated need for 67 new bridges. It was expected that 33 of these would be furnished by the British as aid to Laos. The transportation, construction of substructures and approaches, and erection of the bridges was to be done by the Laotian Public Works Department with Public Roads training and supervision.

Equipment specialists completed a survey of the condition of road equipment in the country, and a start was made toward better equipment management.

Activities in Lebanon.—During the year, technical assistance to the Lebanese Highway Department was continued. The Public Roads team in Lebanon worked closely with officials of the Ministry of Public Works in the formation and staffing of an integrated highway department. Progress was made in the fields of design, materials, and equipment maintenance. Training was underway in the preparation of construction plans and specifications for complicated projects in densely populated areas.

A second stage of the Beirut-Tripoli controlled-access highway was completed. Lebanese officials have realized the importance of adequate legislation governing use of controlled-access facilities, and Public Roads technicians aided them in drafting a proposed act covering their design, control, and use.

Activities in Liberia.—The Liberian system of primary and secondary highways continued to expand with the technical advice and assistance of the Bureau of Public Roads. Approximately 120 miles of hard-surfaced roads were completed, 12 miles of which were asphalt, and 26 miles of secondary roads were built. A bridge 300 feet long over the Lofa River and a 500-foot bridge over the Cess River were completed. A 600-foot structure was started at the Farmington River.

The 147-mile Western Province highway, Liberia's first international connection with Sierra Leone, was completed during the fiscal year at a cost of $9 million, financed by an Export-Import Bank loan. On the Eastern Province highway, financed by a $15 million loan from the Italian Government and being constructed by an Italian contractor, 30 miles were completed.

The Liberian Division of Highways surveyed 42 miles of highway in the dense jungle of the interior, and completed 43 miles of new highway design. A materials laboratory established by Public Roads aided the progress. Assistance was

also given by Public Roads in traffic counts, highway signs, mileage charts, highway diagrams, and safety studies. Eight Liberian highway personnel were receiving training as participants in United States colleges and technical schools.

Expansion of the highway network to 1,200 miles taxed existing maintenance facilities, and a Public Roads maintenance study led to reorganization of the Division of Highways. Maintenance personnel training was conducted by Public Roads technicians, but will gradually be turned over to Liberian personnel.

Near the end of the fiscal year Liberia was placing emphasis on a new rural development program, with Public Roads participating in the advance planning.

Activities in Nepal.—Public Roads continued its assistance to the Government of Nepal with a staff of six engineers.

Five highway divisions and a bridge section were set up and construction was underway on 7 road projects and 26 bridges. Lack of competent highway contractors, engineers, and workmen retarded progress.

Over $2.3 million has been obligated for commodity purchases, and $600,000 in additional equipment was ordered. Two mechanized construction units were being set up and limited recruitment of technicians on a worldwide basis was started.

Activities in the Philippines.—During the fiscal year, the Public Roads group of four Americans and two Filipino engineers continued to work in the Philippine Islands in a consulting and advisory capacity on highway matters under the ICA program. The Philippine Bureau of Public Highways, which had been set up with the advice and assistance of the Bureau of Public Roads, was recognized as one of the best highway departments in the Far East.

Construction worth $5.7 million was completed on Mindanao development roads during the year despite adverse weather. Sixty-one miles of roads and 31 bridges were completed during the year. At the end of the year, 144 miles of roads and 20 bridges were still under construction. Only 8 miles of roads and 5 bridges remain to be constructed in this program.

On the national highway program, 520 miles of road improvements and 76 bridges were completed and 540 miles of roads and 38 bridges were under construction during the year, financed solely with Philippine Government funds. In addition, construction of bridges with materials furnished by the United States continued.

Under the barrio (village) and feeder road program, 587 miles were completed and 413 miles were under construction during the year.

Training of Philippine personnel continued. Eight employees were sent to the United States for specialized practical work in administration and design. Emphasis was given by Public Roads personnel to ordinary and preventive maintenance of field equipment, and equipment maintenance seminars were started for project engineers and supervisors in every district. The Development Loan Fund provided $9 million for the procurement of equipment spare parts, and Public Roads agreed to effect this procurement as well as an additional $9.7 million of new equipment and materials.

Activities in Sudan.—Public Roads started a program of technical assistance to the Government of Sudan, sponsored by ICA, in April 1958. Projects in highway development and construction were continued during the fiscal year. The Public Roads staff included four engineers, a construction superintendent, and two equipment specialists. Training through scholarships of nine Sudanese was started, and two officials made observation tours in the United States.

A substantial amount of highway equipment was procured for the Sudan. The heavy equipment repair shop was reorganized and plans for a shop building and a training aids building were completed. On-the-job training was carried out in connection with all activities.

Work was underway on a 13-mile highway construction demonstration project. A map study and preliminary estimate were completed for an additional 100-mile construction project, and a reconnaissance was made of another 100-mile route proposed for construction. Technical advice was given on a project for improvement of streets in Khartoum, including the construction of a multilane street, which will be the only one in Sudan.

Activities in Turkey.—Although the technical assistance program to the Turkish Directorate of Highways was terminated in June 1959, Public Roads continued its assistance to Turkey on two specific projects financed by ICA. One provided for finishing the traffic survey initiated in 1958 and required the services of a specialist for 3 months. The other project was to establish an integrated accounting system and a cost research engineering department. Under a Central Treaty Organization financed project, a specialist was assigned to assist in the installation of an electronic computer and in the development of a program for its use. His Turkish counterpart received training in the United States during the fiscal year.

Preparations were underway for procurement of machinery and equipment to construct adequate forest roads and to facilitate the development of the vast natural forest resources of Turkey under an agreement between Public Roads and the Turkish Forestry Service, with financing by an Export-Import Bank loan.

Activities in Yemen—During the year an agreement was entered into with ICA for a highway improvement program in Yemen, including construction of a 270-mile road from the port of Mocha via Taiz to Saana. Maximum utilization will be made of Yemen nationals and an active training program will be conducted by Public Roads personnel. Surveys have been made and a Public Roads engineer was assigned temporarily to Yemen to make necessary arrangements. Engineers, technicians, equipment operators, and service and shop specialists were recruited and were being prepared for departure to Yemen.

Training of foreign engineers

An increasing number of highway engineers and officials from other countries came to the United States during the year to study and observe at first hand the techniques, methods, and equipment developed for and used in our highway improvement programs. Public Roads, with the cooperation of State highway departments, cities, counties, and private industry, has arranged for or provided programs of training for these visitors.

While a large majority of these visitors are under the sponsorship of the International Cooperation Administration, numerous individuals were sponsored or referred to Public Roads by the Department of State, the United Nations, and private foundations, or came to the United States under the auspices of their own governments. A total of 615 man-months of observation and training were provided for visitors from 43 countries.

During the year, Public Roads produced a motion picture, *Rehabilitation of Philippine Highways*, which shows practical highway work in underdeveloped countries. The film will be instructive to American engineers and technicians going on overseas assignments, and to engineers and officials of other countries that are embarking on road development programs.

Appendix

LIST OF TABLES

Table 1.—Summaries of programs approved and work completed in the fiscal year 1960, by class of highway and by fund

	PROGRAMS APPROVED [1]						WORK COMPLETED					
				Railway-highway grade crossing improvements						Railway-highway grade crossing improvements		
	Total cost	Federal funds	Miles	Crossings eliminated	Structures reconstructed	Crossings protected	Total cost	Federal funds	Miles	Crossings eliminated	Structures reconstructed	Crossings protected
	BY CLASS OF HIGHWAY						BY CLASS OF HIGHWAY					
Primary-rural:												
Interstate	$931,000,855	$814,875,966	1,929.1	65	2	1	$980,136,599	$856,762,269	2,145.8	107	1	2
All other	632,948,078	334,347,098	4,997.6	67	6	93	823,849,992	455,695,847	8,454.0	88	7	98
Secondary-rural	396,851,388	208,953,457	10,368.5	24	1	156	588,824,752	321,444,681	17,134.9	49	3	209
Urban:												
Interstate	999,128,856	738,848,239	267.3	53	1	5	752,413,433	603,976,638	273.4	90	3	5
All other	443,724,900	228,402,252	650.3	59	18	55	506,271,654	266,585,463	821.5	87	9	51
Subtotal	3,403,654,077	2,325,427,012	18,212.8	268	28	310	3,651,496,430	2,504,464,898	28,829.6	421	23	365
Not classified [2]	79,030,489	75,480,666	1,103.9				86,975,714	72,998,810	1,129.6	1		1
Total	3,482,684,566	2,400,907,678	19,316.7	268	28	310	3,738,472,144	2,577,463,708	29,959.2	422	23	366
	BY FUND						BY FUND					
Federal aid:												
Primary	$691,017,826	$365,548,535	5,196.4	81	8	106	$656,929,263	$340,217,480	5,639.9	87	6	112
Secondary	411,263,110	216,019,242	10,419.5	25	1	156	475,634,357	247,464,566	14,096.8	48	4	209
Urban	378,434,901	193,862,458	404.7	46	16	42	381,489,786	195,160,327	375.4	66	6	33
Interstate	1,922,938,240	1,549,996,777	2,192.2	116	3	6	1,718,561,367	1,453,210,937	2,401.8	196	4	7
"D" funds							418,881,657	268,411,588	6,315.7	24	3	4
Subtotal	3,403,654,077	2,325,427,012	18,212.8	268	28	310	3,651,496,430	2,504,464,898	28,829.6	421	23	365
Defense access roads	16,897,160	16,540,121	241.4				13,597,807	11,712,414	222.2			1
National forest highway [3]	30,491,648	28,596,727	483.3				26,167,701	22,687,981	480.6			
National park and parkway [4]	26,125,900	26,125,900	311.3				22,158,344	22,158,344	223.5			
Bureau of Land Management [4]							2,233,537	2,233,537	57.3			
Forest development [4]							5,765,861	5,765,861	91.3			
Public lands	300,532	300,032	3.3				884,063	881,063	3.8			
Emergency flood relief	5,215,249	3,917,886	64.6				16,168,401	7,559,610	50.9	1		
Subtotal	79,030,489	75,480,666	1,103.9				86,975,714	72,998,810	1,129.6	1		1
Total	3,482,684,566	2,400,907,678	19,316.7	268	28	310	3,738,472,144	2,577,463,708	29,959.2	422	23	366

[1] Initial commitment of funds.
[2] Defense access roads, forest, park, Bureau of Land Management, forest development, public lands and emergency flood relief projects.
[3] Includes construction projects only.
[4] Construction supervised by Bureau of Public Roads.

Table 2.—Projects under construction or plans approved on June 30, 1960, by class of highway and by fund

	Total cost	Federal funds	Miles	Railway-highway grade crossing improvements		
				Crossings eliminated	Structures reconstructed	Crossings protected
BY CLASS OF HIGHWAY						
Primary-rural:						
Interstate	$2,710,536,599	$2,397,062,149	4,641.4	224	7	2
All other	1,162,008,970	608,233,840	7,256.8	138	14	112
Secondary-rural	790,242,147	415,548,705	17,563.2	66	4	311
Urban:						
Interstate	2,476,721,887	2,019,471,894	722.4	166	1	8
All other	1,050,544,370	542,937,626	1,178.5	162	25	65
Subtotal	8,190,053,973	5,983,254,214	31,362.3	756	51	498
Not classified [1]	122,995,144	115,499,875	1,566.4	1		1
Total	8,313,049,117	6,098,754,089	32,928.7	757	51	499
BY FUND						
Federal-aid:						
Primary	$1,282,914,918	$671,868,845	7,524.5	157	18	125
Secondary	815,176,737	425,357,828	17,528.7	68	4	311
Urban	916,742,872	472,896,725	736.7	141	21	52
Interstate	5,148,122,174	4,396,221,620	5,357.7	386	8	10
"D" funds	27,097,272	16,909,196	214.7	4		
Subtotal	8,190,053,973	5,983,254,214	31,362.3	756	51	498
Defense access roads	17,300,360	16,429,092	171.1	1		1
National forest highway [2]	48,347,125	45,118,957	704.8			
National park and parkway [3]	35,833,502	35,833,502	337.8			
Bureau of Land Management [3]	7,079,400	7,079,400	195.7			
Forest development [3]	3,570,260	3,570,260	49.2			
Public lands	3,894,075	3,820,415	50.1			
Emergency flood relief	6,970,422	3,648,249	57.7			
Subtotal	122,995,144	115,499,875	1,566.4	1		1
Total	8,313,049,117	6,098,754,089	32,928.7	757	51	499

[1] Defense access roads, forest, park, Bureau of Land Management, forest development, public lands and emergency flood relief projects.

[2] Includes construction projects only.

[3] Construction supervised by Bureau of Public Roads.

Table 3.—Projects financed with Federal-aid funds programed,[1] during the fiscal year ended June 30, 1960, by State

State or territory	Primary			Secondary			Urban			Interstate			Total		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama	$18,694,325	$8,202,983	99.3	$10,468,732	$4,785,389	320.2	$10,276,685	$5,246,110	21.6	$17,020,554	$15,318,498	67.5	$56,460,296	$33,552,980	508.6
Alaska	13,300,244	11,570,486	67.5	8,352,686	7,377,121	25.2	1,222	1,052					21,654,152	18,948,659	92.7
Arizona	7,802,035	5,849,227	36.2	4,031,899	2,898,589	62.0	1,017,774	673,931	3.4	28,960,943	27,359,128	77.9	41,812,651	36,780,875	179.5
Arkansas	15,203,456	7,871,903	162.4	9,062,471	4,529,435	243.2	631,452	341,108	5.5	14,993,451	13,481,853	49.8	39,890,830	26,224,299	460.9
California	18,878,458	10,189,822	25.6	11,994,508	6,086,774	132.8	12,575,486	6,677,273	5.0	347,701,742	181,127,752	97.2	391,150,194	204,081,621	260.6
Colorado	5,725,107	3,078,655	81.0	7,904,697	4,213,209	158.8	4,053,294	2,001,862	4.7	19,759,104	17,147,651	86.8	37,442,202	26,441,377	331.3
Connecticut	4,245,377	2,104,140	7.2	3,245,169	1,669,718	12.5	12,498,504	6,230,249	9.3	35,108,802	30,992,744	8.3	55,097,852	40,996,851	37.3
Delaware	1,626,404	758,802	13.9	2,336,150	1,169,775	28.1	1,761,086	969,193	10.7	4,448,720	3,996,562	.2	10,172,360	6,894,332	52.9
Florida	7,989,145	3,973,253	44.8	2,699,378	1,349,363	62.7	3,289,745	1,644,792	9.9	36,405,567	31,855,255	54.7	50,383,835	38,822,663	172.1
Georgia	11,911,127	5,652,223	174.8	8,598,828	4,010,701	136.6	636,784	324,392	.5	12,234,958	10,861,449	12.0	33,381,697	20,848,765	323.9
Hawaii	2,437,628	857,567	6.0	1,278,134	636,267	5.9	670,132	318,623	.2				4,385,894	1,812,457	12.1
Idaho	6,675,972	4,095,193	48.3	2,886,791	1,573,736	91.0				17,848,428	16,501,412	58.5	27,411,191	22,170,341	197.8
Illinois	33,927,400	17,389,986	170.9	8,487,257	4,234,627	201.0	17,858,409	9,233,892	21.3	95,113,654	85,465,175	80.0	155,386,720	116,323,680	473.2
Indiana	24,812,622	12,666,566	278.4	15,350,152	7,715,466	109.6	13,066,842	7,584,516	12.8	38,020,648	34,218,583	21.0	91,250,264	62,185,131	121.8
Iowa	18,928,781	9,628,333	319.8	8,586,921	4,309,501	328.1	5,319,593	2,721,504	21.3	14,990,463	13,555,042	33.9	47,825,758	30,214,380	703.1
Kansas	15,049,398	7,538,883	216.8	8,954,737	4,515,368	494.7	789,485	398,101	2.4	16,742,358	11,637,916	49.6	41,535,978	24,090,268	763.5
Kentucky	10,051,687	5,179,377	28.5	6,771,974	3,400,387	79.7	125,000	62,500		18,999,349	17,031,361	45.8	35,948,010	25,673,625	154.0
Louisiana	14,541,334	7,363,115	78.1	8,733,577	4,317,406	141.7	6,817,576	3,541,335	7.9	54,038,238	47,776,228	41.8	84,130,725	62,998,084	269.5
Maine	7,402,891	3,931,231	34.9	4,246,958	2,122,879	41.2	1,653,398	823,916	1.2	7,436,569	6,692,912	26.3	20,739,816	13,570,938	103.6
Maryland	1,231,821	620,002	12.6	2,647,594	1,477,315	111.0	12,163,513	6,378,481	13.8	32,621,629	29,408,866	14.5	48,664,557	37,884,664	151.9
Massachusetts	13,547,938	6,679,678	13.6	4,023,441	2,160,192	12.7	35,602,723	17,699,540	12.8	45,946,017	41,150,875	15.9	99,120,119	67,690,285	55.0
Michigan	33,690,749	16,850,951	263.5	11,367,979	5,701,024	423.4	16,492,722	8,215,861	14.4	55,055,672	49,550,103	60.6	116,607,122	80,317,939	761.9
Minnesota	19,812,178	10,369,714	203.7	17,441,206	8,811,165	1,082.7	7,288,695	4,353,140	13.5	90,752,521	40,686,863	43.4	135,294,600	64,220,882	1,343.3
Mississippi	10,730,324	5,408,862	140.4	4,651,389	2,299,744	252.7	396,646	198,823	2.0	19,495,171	17,566,957	63.7	35,273,530	25,474,386	458.8
Missouri	21,513,765	10,939,505	113.2	9,986,046	5,025,364	462.1	12,168,238	6,449,354	16.9	50,534,983	45,721,001	73.5	94,203,032	68,135,224	665.7
Montana	11,179,110	6,614,417	155.0	9,262,697	5,803,917	207.4	506,486	284,896	1.3	18,079,530	16,579,784	60.4	39,027,823	29,283,014	424.1
Nebraska	13,185,289	6,968,222	123.2	8,148,708	4,232,833	251.4	1,156,006	1,060,448	.5	20,440,479	18,426,510	35.9	42,930,482	30,688,013	411.0
Nevada	9,578,949	7,979,203	88.1	1,990,860	1,658,786	44.6	386,817	376,206	.4	10,234,017	9,717,309	24.5	22,190,643	19,731,504	157.6
New Hampshire	4,793,364	2,349,526	18.4	3,043,586	1,501,064	15.8	1,382,624	690,107	2.6	11,448,308	9,693,704	7.8	20,667,882	14,234,401	44.6
New Jersey	7,635,079	3,822,765	14.5	900,043	450,022	13.1	14,564,150	7,253,925	11.5	65,179,339	58,486,356	13.9	88,278,611	70,013,068	53.0
New Mexico	10,968,098	6,838,165	57.5	7,630,334	5,206,439	139.6	793,742	497,763		16,130,250	15,092,597	31.9	35,522,424	27,634,964	229.0
New York	51,656,518	26,371,749	195.0	16,453,894	7,572,726	126.7	53,975,056	24,452,675	37.5	108,070,833	96,868,526	50.2	233,156,301	155,265,676	409.4

North Carolina	13,445,260	6,793,745	82.9	10,274,020	4,585,310	180.8	1,350,370	685,435	3.4	12,390,896	11,113,558	42.5	37,460,546	23,178,048	309.6
North Dakota	7,576,720	3,785,380	167.9	8,013,474	3,989,253	494.2	1,067,990	532,300	3.5	8,074,230	7,310,272	38.0	24,732,414	15,617,205	703.6
Ohio	25,953,060	14,136,436	40.2	14,944,546	8,054,975	115.1	30,439,058	15,817,305	13.8	122,440,722	108,965,179	48.4	193,777,386	143,973,895	217.5
Oklahoma	12,105,014	6,100,452	133.9	7,807,694	3,904,901	245.0	3,326,115	1,654,813	7.1	21,627,321	19,462,069	58.9	44,866,144	31,122,235	444.9
Oregon	11,503,413	6,914,917	87.2	7,776,998	4,669,492	151.3	1,550,383	932,848	1.1	32,647,690	28,806,399	92.4	53,478,484	41,323,656	332.0
Pennsylvania	28,131,222	13,334,300	32.4	24,415,200	12,079,275	106.2	31,242,743	15,592,150	13.3	77,160,766	69,290,145	40.8	160,949,931	110,295,870	192.7
Rhode Island	596,616	298,258	1.3	411,766	205,883	2.4	573,292	286,646	------	9,657,756	8,691,980	.7	11,239,430	9,482,767	4.4
South Carolina	13,345,987	7,006,131	129.0	7,172,465	3,599,232	448.7	1,735,320	867,660	5.6	8,868,273	7,467,666	13.0	31,122,045	18,940,689	596.3
South Dakota	7,407,451	4,097,790	151.2	4,637,241	2,566,033	248.1	208,995	115,615	2.5	21,399,236	19,489,328	102.8	33,652,923	26,268,796	504.6
Tennessee	9,898,188	4,949,094	58.3	12,307,500	6,177,202	542.1	3,501,369	1,750,684	4.6	38,979,179	35,081,257	56.4	64,686,236	47,958,237	661.4
Texas	43,982,841	22,509,900	566.7	32,477,725	16,382,300	989.7	27,664,260	15,216,700	58.5	58,067,566	52,164,500	100.1	162,192,392	106,273,400	1,715.0
Utah	5,119,958	3,848,592	36.4	3,418,198	2,582,263	58.7	633,194	465,939	2.7	17,773,521	16,859,099	21.8	26,944,871	23,755,893	119.6
Vermont	3,778,305	1,888,090	17.4	1,948,364	973,538	10.4	493,833	249,916	1.3	9,509,433	8,558,093	7.4	15,735,935	11,669,637	36.5
Virginia	15,987,715	8,224,496	45.9	14,480,390	7,632,124	305.9	4,949,403	2,532,249	5.7	42,499,398	38,251,405	47.2	77,916,906	56,640,274	404.7
Washington	11,549,202	6,201,596	67.7	9,986,459	5,376,665	264.6	4,846,980	2,599,096	7.4	23,946,388	19,350,758	18.5	50,329,029	33,528,115	358.2
West Virginia	5,646,437	2,856,073	91.3	5,076,875	2,422,130	168.8	2,970,970	1,485,485	1.8	20,377,054	18,303,348	22.8	34,071,336	25,067,036	284.7
Wisconsin	11,334,716	5,877,508	121.8	6,266,669	3,216,796	180.3	3,437,800	1,931,460	2.9	25,477,678	23,098,378	62.6	46,516,863	34,124,142	367.6
Wyoming	6,310,847	4,205,578	64.5	3,883,775	2,499,843	82.8	52,770	35,518	.7	28,804,429	26,849,888	109.1	39,051,821	33,590,827	257.1
District of Columbia	1,577,196	785,194	1.8	3,359,634	1,767,178	.6	5,864,591	3,193,281	------	19,424,407	16,914,483	1.3	30,225,828	22,660,136	3.7
Puerto Rico	4,041,105	2,020,501	5.5	1,065,321	518,517	5.6	2,599,580	1,211,790	3.9	----------	----------	-------	7,706,006	3,750,808	15.0
Total	391,017,826	365,548,535	5,196.4	411,263,110	216,019,242	10,419.5	378,434,901	193,862,458	404.7	1,922,938,240	1,549,996,777	2,192.2	3,403,654,077	2,325,427,012	18,212.8

[1] Initial commitment of funds.

Table 4.—Projects involving Federal funds awarded to contract [1] during the fiscal year ended June 30, 1960, by program and by State

State or territory	Total cost	Total Federal funds	Federal-aid funds				Access funds	Miles
			Primary [2]	Secondary	Urban [3]	Interstate		
Alabama	$61,611,661	$36,484,485	$11,254,716	$3,938,340	$5,947,140	$15,344,289		614.0
Alaska	24,009,619	21,357,444	10,904,430	9,393,836	1,946		$1,057,232	53.1
Arizona	36,950,970	32,221,370	4,725,737	4,557,767	816,420	21,901,227	220,219	227.4
Arkansas	46,197,445	34,164,170	4,413,171	4,860,763	46,459	24,843,777		446.7
California	426,341,745	203,367,014	15,372,865	9,345,620	21,190,430	157,263,478	194,621	355.2
Colorado	35,345,744	23,570,153	6,039,096	4,601,994	2,210,070	10,059,952	659,041	385.8
Connecticut	84,534,002	66,434,940	4,663,382	2,216,526	4,118,417	55,417,265	19,350	55.9
Delaware	7,453,405	4,722,783	931,435	1,242,597	448,599	2,100,152		55.1
Florida	77,486,398	59,256,510	5,296,280	3,626,376	3,192,288	46,053,732	1,087,834	281.0
Georgia	54,497,212	34,688,304	6,206,009	9,424,071	688,778	18,369,446		535.6
Hawaii	3,866,984	1,852,312	573,567	960,122	318,623			10.2
Idaho	23,904,104	18,606,542	5,322,003	1,918,911	4,651	11,355,477	5,500	252.0
Illinois	175,597,569	123,364,415	17,365,408	10,254,542	11,592,772	84,129,293	22,400	680.0
Indiana	110,914,912	79,146,521	13,151,694	7,415,457	7,889,120	50,614,218	76,032	435.0
Iowa	46,748,842	31,618,549	7,139,263	4,737,045	2,109,675	17,159,808	472,758	685.7
Kansas	52,241,246	31,367,689	6,716,273	6,605,015	1,688,331	16,218,130	139,940	1,035.8
Kentucky	51,163,833	36,537,684	6,844,457	5,174,865	1,465,454	23,041,308	11,600	193.9
Louisiana	93,015,545	67,436,139	11,788,925	4,713,276	3,417,205	45,727,288	1,789,445	280.8
Maine	19,808,300	13,909,988	2,518,426	1,835,378	680,716	8,581,112	294,356	95.7
Maryland	44,828,792	33,862,538	1,405,002	1,235,908	5,035,483	26,126,645	59,500	133.0
Massachusetts	66,733,443	44,224,984	4,877,630	2,714,479	11,995,207	23,534,489	1,103,179	50.6
Michigan	158,364,884	116,458,491	15,069,710	8,524,961	9,274,511	82,740,326	848,983	1,005.5
Minnesota	123,903,261	55,750,703	9,613,687	7,944,222	3,478,850	34,598,520	115,424	1,230.5
Mississippi	51,260,494	36,937,836	4,637,435	5,212,228	1,202,550	25,881,996	3,627	699.0
Missouri	100,982,512	70,803,164	14,041,557	7,724,492	5,090,562	43,839,448	107,105	1,001.6
Montana	32,293,146	24,654,746	3,658,763	5,154,161	370,664	15,461,158	10,000	316.9
Nebraska	39,001,488	27,094,951	6,893,845	4,472,172	552,046	14,929,238	247,650	488.7
Nevada	14,699,418	13,081,711	4,807,360	1,836,677	355,819	5,272,887	808,968	132.1
New Hampshire	19,621,332	13,785,192	2,105,455	1,401,587	560,327	9,657,823	60,000	41.7
New Jersey	72,533,893	51,380,849	3,711,265	1,192,297	12,009,701	34,467,586		61.6
New Mexico	32,623,819	25,497,653	4,599,752	5,960,955	840,170	14,096,776		234.7
New York	220,854,784	139,104,789	23,906,967	8,384,983	29,133,936	77,663,903	15,000	450.8
North Carolina	50,787,901	33,125,804	6,232,497	8,727,133	1,560,628	16,605,546		564.6
North Dakota	30,374,954	18,648,336	4,548,073	6,188,046	250,689	7,661,528		1,201.2
Ohio	184,114,987	130,252,794	11,045,895	9,593,791	31,325,903	78,261,805	25,400	194.5
Oklahoma	52,404,962	36,237,282	5,140,774	6,293,297	2,230,658	22,551,553	21,000	635.5

Oregon	50,264,282	38,551,214	5,509,158	5,886,044	1,534,602	25,621,410		333.9
Pennsylvania	112,481,154	75,636,324	14,200,400	6,987,300	8,941,420	45,507,204		137.3
Rhode Island	17,014,475	13,444,838	498,279	1,480,323	185,496	11,050,880	229,860	15.8
South Carolina	30,433,290	18,642,215	6,123,295	4,367,269	264,543	7,887,108		590.7
South Dakota	31,771,274	21,687,341	6,475,422	5,064,909	371,929	9,706,167	68,914	737.6
Tennessee	82,104,976	63,480,105	5,183,418	6,150,962	1,745,004	50,345,721	55,000	672.0
Texas	204,618,628	144,922,580	18,013,600	20,660,200	14,829,100	91,419,680		1,916.5
Utah	36,615,483	31,804,714	5,447,086	3,060,571	412,204	22,854,853	30,000	155.1
Vermont	27,460,093	21,653,542	2,542,251	1,148,719	227,791	16,996,205	738,576	67.7
Virginia	95,893,044	73,207,971	8,593,444	7,214,078	2,226,436	54,042,050	1,131,963	494.0
Washington	42,456,044	31,141,485	4,581,539	3,985,649	2,259,928	19,954,900	359,469	404.9
West Virginia	29,424,443	21,622,293	2,437,250	3,575,512	202,285	15,192,387	214,859	372.5
Wisconsin	48,704,723	32,191,976	5,936,910	6,279,651	1,432,719	18,531,696	11,000	579.6
Wyoming	27,825,699	22,264,568	5,974,538	2,317,419	338,550	12,838,495	795,566	315.0
District of Columbia	30,834,502	21,678,000	2,409,387	1,714,160	2,328,429	15,226,024		9.1
Puerto Rico	8,387,780	4,153,294	3,512,618	298,176	342,500			23.8
Total	3,603,363,496	2,427,091,295	364,961,399	269,574,832	220,737,734	1,558,705,959	13,111,371	21,946.9

[1] Includes preliminary engineering, right-of-way, and force-account projects on which work was started during the fiscal year.

[2] Funds available for either rural or urban portions of the Federal-aid primary highway system.

[3] Funds available for primary system or urban extensions of secondary system.

Table 5.—Status of Federal-aid projects [1] as of June 30, 1960, and projects completed during the fiscal year

State or territory	Programed,[2] plans not approved			Plans approved, not under construction			Under construction			Completed during fiscal year		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama	$56,918,540	$35,415,836	115.2	$25,447,912	$16,990,596	198.9	$153,071,797	$112,956,891	856.2	$54,844,314	$34,931,394	988.1
Alaska	11,400,414	9,799,271	124.0	2,110,180	1,816,653	16.8	37,385,004	32,517,659	181.1	12,289,556	9,832,989	152.4
Arizona	23,209,177	21,229,957	68.5	15,071,651	13,157,602	85.0	53,603,743	47,829,184	191.1	29,318,345	25,448,507	261.3
Arkansas	44,429,234	33,623,929	306.4	12,322,390	9,142,106	124.2	105,346,139	81,142,488	526.9	32,576,666	20,381,571	537.1
California	28,775,374	20,650,193	71.4	88,114,534	68,033,750	3[illegible].4	538,886,803	316,816,780	326.2	288,776,078	167,289,509	437.3
Colorado	10,602,556	7,338,694	69.3	7,934,418	5,478,557	55.0	46,326,070	32,398,673	334.3	42,330,965	30,164,967	410.8
Connecticut				8,684,483	4,555,112	7.9	128,438,185	92,538,459	86.5	35,839,003	23,053,733	49.3
Delaware	8,474,234	7,107,657	7.1	4,137,001	3,339,943	8.0	30,136,500	22,713,251	69.8	9,877,682	6,141,012	63.1
Florida	7,988,000	4,918,800	111.8	7,690,357	5,018,445	25.3	145,472,068	112,687,349	335.6	87,074,291	69,312,147	378.1
Georgia	87,801,904	70,113,807	315.1	18,034,955	11,797,371	93.7	198,533,074	137,743,310	891.5	78,750,000	46,604,845	957.6
Hawaii	2,945,220	1,168,235	5.7	49,229	23,229		16,308,172	4,867,429	14.0	5,824,304	3,139,152	13.4
Idaho	16,420,014	14,481,306	49.8	7,703,848	5,939,073	63.4	41,262,250	33,660,999	252.6	28,911,822	21,742,070	424.1
Illinois	54,069,161	39,522,058	144.2	71,435,384	50,597,911	141.2	396,434,369	306,111,893	931.4	178,810,847	121,557,732	1,088.6
Indiana	45,249,931	32,626,053	81.2	38,591,255	29,073,798	214.8	197,264,584	143,524,268	487.6	73,959,076	46,078,668	477.7
Iowa	11,230,596	8,638,500	64.0	21,478,721	14,653,440	212.5	77,874,103	59,219,638	702.7	77,405,882	56,940,312	1,014.8
Kansas	8,336,129	5,550,970	219.5	11,665,621	8,025,201	199.1	64,787,417	42,259,102	1,200.9	65,024,808	42,362,345	1,463.8
Kentucky	27,762,520	21,442,735	76.3	21,243,682	17,763,313	42.2	140,067,256	104,447,432	348.7	72,255,617	51,452,236	330.3
Louisiana	11,927,851	10,643,697	23.6	40,994,340	29,512,140	83.4	182,216,617	131,638,183	514.9	83,910,495	57,979,873	652.8
Maine	7,402,800	4,469,490	12.5	3,926,130	2,842,917	15.3	38,806,667	31,207,711	112.7	29,981,825	20,108,049	134.3
Maryland	22,644,100	18,826,790	17.9	30,481,646	22,624,123	74.1	65,230,238	49,028,648	163.7	47,293,962	31,637,892	230.4
Massachusetts	12,468,002	10,788,381	2.5	74,570,192	54,499,827	48.4	206,068,471	149,808,920	117.2	69,424,878	48,866,223	60.3
Michigan	21,913,914	12,357,862	115.1	36,247,701	24,278,128	291.1	279,136,444	220,073,114	822.3	114,312,222	76,230,104	912.4
Minnesota	16,746,606	15,054,583	1.0	15,718,812	10,382,281	169.0	256,272,366	160,461,314	1,631.7	48,728,859	30,082,418	1,312.1
Mississippi	43,037,087	33,670,381	235.5	12,163,300	8,740,920	143.3	113,556,001	83,999,690	926.8	54,417,663	34,827,177	1,008.8
Missouri	18,581,688	12,795,766	359.6	21,328,706	15,693,626	189.2	160,558,640	113,781,553	1,020.3	102,087,426	73,857,829	1,152.1
Montana	13,366,813	10,506,266	127.8	14,940,007	11,085,704	161.1	81,073,144	64,523,556	565.4	32,236,552	22,861,328	604.0
Nebraska	4,883,808	3,828,996	31.8	16,427,817	11,397,620	122.8	78,886,926	58,117,963	828.1	40,610,978	24,358,675	805.1
Nevada	8,948,978	8,032,580	35.9	1,771,192	1,476,108	39.1	43,891,405	40,663,914	123.4	14,280,606	12,600,128	169.1
New Hampshire	5,081,828	3,974,254	8.3	5,968,723	4,033,979	15.5	39,892,959	31,633,974	65.7	22,378,278	16,010,463	56.7
New Jersey	46,657,060	35,862,964	58.0	16,860,900	12,980,783	23.1	190,710,033	143,876,052	85.6	45,707,813	30,457,026	102.7
New Mexico	10,140,817	8,506,630	35.3	3,651,057	2,524,020	33.4	41,815,065	34,643,014	208.4	41,616,054	32,956,814	315.1
New York	38,918,476	28,648,134	30.2	71,583,344	51,809,081	107.0	652,795,347	452,616,914	663.7	322,800,161	207,679,599	512.5

North Carolina	22,795,172	16,803,228	124.2	16,573,568	10,989,012	128.9	79,818,399	57,987,170	582.9	65,191,481	43,107,354	718.8
North Dakota	6,517,722	5,239,487	304.4	12,060,190	8,152,147	176.7	40,127,990	27,282,821	1,115.1	37,139,038	26,064,093	1,368.8
Ohio	21,487,310	17,814,469	19.8	52,957,610	37,355,235	84.0	276,722,268	200,779,457	346.9	305,280,889	242,238,342	586.5
Oklahoma	24,909,200	17,650,841	303.2	18,972,361	11,560,442	202.7	71,296,469	50,969,575	679.0	60,002,583	43,922,383	546.6
Oregon	16,141,889	13,090,618	55.9	16,518,081	13,641,650	85.9	105,617,621	87,536,219	377.5	45,689,879	34,538,563	431.1
Pennsylvania	57,206,285	42,144,462	42.8	66,797,164	44,766,551	86.8	248,773,517	182,185,054	324.3	225,195,194	159,636,899	439.7
Rhode Island	2,009,000	1,561,700		476,900	377,210	1.5	42,320,729	30,568,991	25.2	12,476,236	8,450,167	39.5
South Carolina	21,956,338	14,596,100	256.1	13,393,559	9,048,347	265.7	102,562,928	78,446,768	1,197.5	41,384,100	26,425,315	860.5
South Dakota	40,429,486	34,167,357	324.3	10,990,823	8,611,133	200.4	51,167,363	39,541,620	635.5	28,142,344	18,242,382	915.7
Tennessee	45,451,320	35,092,818	243.1	26,427,413	20,212,152	263.4	204,451,489	160,403,494	667.5	55,712,862	35,228,467	905.6
Texas	58,041,600	46,799,700	228.3	24,595,171	17,927,600	160.7	334,312,519	254,280,403	1,687.2	214,396,818	145,877,896	2,443.5
Utah	10,524,413	9,560,946	32.7	12,595,406	10,791,856	95.8	52,194,480	46,555,722	176.6	23,213,024	19,056,979	184.3
Vermont	677,250	339,825	8.6	982,687	491,343	2.1	61,438,959	50,646,901	94.8	12,860,033	7,843,270	67.8
Virginia	9,037,256	6,537,190	20.0	29,816,187	22,323,552	207.6	177,131,537	144,035,318	406.2	43,518,667	26,515,228	424.0
Washington	14,443,876	8,375,510	74.7	23,053,263	16,960,457	131.2	79,319,736	60,296,983	346.1	76,856,718	58,716,861	439.7
West Virginia	50,950,999	38,450,634	61.6	23,479,581	17,008,950	356.7	95,919,428	73,018,825	193.7	22,984,381	14,100,099	126.3
Wisconsin	22,516,063	18,964,883	75.6	17,583,421	13,021,807	165.1	104,020,018	71,550,243	615.4	74,458,467	52,388,915	837.1
Wyoming	17,614,852	16,054,946	56.4	6,564,925	5,449,005	65.6	62,853,616	52,857,886	393.0	36,853,552	30,690,873	346.8
District of Columbia	28,945,651	23,476,411	6.8	7,505,550	5,226,892	.4	64,115,369	47,066,490	13.3	13,729,667	8,066,247	12.1
Puerto Rico	17,591,362	8,405,731	32.9				30,148,393	14,532,248	73.2	12,753,469	6,424,818	32.0
Total	1,217,579,216	926,721,631	5,195.9	1,109,633,288	803,202,698	5,824.4	7,080,420,685	5,180,051,516	25,537.9	3,651,496,430	2,504,464,898	28,829.6

[1] Includes projects financed from Federal-aid primary, secondary, urban, "D" and Interstate funds.

[2] Initial commitment of funds.

Table 6.—Mileage of Federal-aid highway projects completed during fiscal year 1960, by program and by number of lanes

State or territory	Primary program			Secondary program [1]	Urban program			Interstate program			"D" program		
	2 lanes	4 lanes	6 lanes or more		2 lanes	4 lanes	6 lanes or more	2 lanes	4 lanes	6 lanes or more	2 lanes	4 lanes	6 lanes or more
Alabama	127.0	93.0		577.6		7.4			51.8		98.0	33.3	
Alaska	28.5	.8		19.0							102.8	1.4	
Arizona	22.6	3.5		101.3		.4		27.9	58.8		46.8		
Arkansas	97.8	.1		235.5		12.2		.1	26.1	.2	165.1		
California	1.3	55.7		176.0			8.4	15.1	62.7	17.2	81.4	17.0	2.6
Colorado	76.4	5.3	3.6	169.8		1.1		.1	45.1		105.4	4.0	
Connecticut	5.4	3.4		5.8		3.1	1.1		3.1	1.6	19.7	6.2	
Delaware	7.4	1.5		33.1	1.0					.4	19.6		
Florida	21.1	40.8		247.5					30.0	6.7	20.2	8.9	3.0
Georgia	220.6	26.6		399.5	1.0	.7			32.9		274.4	1.8	
Hawaii	3.4			4.5		.5					4.2		.9
Idaho	79.8	2.9		174.6		.3			46.3		119.1	1.1	
Illinois	161.6	17.6		450.0	2.0	33.5	4.1		20.5	5.1	375.1	13.1	6.0
Indiana	45.2	47.7		190.0		7.6		.1	14.4		128.2	44.6	
Iowa	181.9	10.3		525.7		5.3			106.6	4.1	177.4	3.5	
Kansas	323.1	32.1		800.0	.2	9.2			48.0	4.3	245.8	1.1	
Kentucky	37.9	22.6		120.3		7.0			48.1	.6	86.4	7.4	
Louisiana	191.3	6.6		249.5	.1	2.5	.3	8.2	29.3	4.1	161.9		
Maine	32.3	2.5		44.7	1.0	1.5			12.4		36.7	3.4	
Maryland	43.4	3.6		143.2		6.7	.1		8.6	.1	13.0	11.7	
Massachusetts	1.5	2.6		5.2	2.4	3.4	6.0			10.7	21.9	4.7	1.9
Michigan	141.3	28.5	.1	473.5	2.3	2.3	.7	1.0	56.1	6.7	177.1	12.2	10.5
Minnesota	91.7	32.3		950.0	1.5	7.1			8.4		213.6	6.7	.8
Mississippi	190.9	34.8		474.0	2.9	4.4			56.0		245.9		
Missouri	93.0	8.1		880.7	2.5	6.9		.2	64.4	5.0	77.5	13.8	
Montana	64.2	3.1		307.6	.9	.7		10.1	14.8		198.7		
Nebraska	155.5	1.1		465.8	.4	.4			7.1		174.5	.3	
Nevada	25.5			63.1	.1				30.2		50.3		
New Hampshire	16.5			14.7	1.2	.4		6.3	8.8		8.8		
New Jersey		23.8	.7	26.0		3.6	3.8		4.1	2.8	8.1	27.2	2.5
New Mexico	48.0	21.8		151.4				30.7	38.7	3.3	51.2		
New York	112.1	21.7		134.6	12.5	17.5	8.8		26.5	34.7	130.8	12.9	.5

North Carolina	90.0	20.0		370.9	2.2	3.3	.5		97.8	.7	118.3	13.1	1.9
North Dakota	244.4			710.5	.1	1.7		14.9	74.6		322.6		
Ohio	46.1	28.0		86.6	2.6	5.8	.1		150.0	3.2	236.8	27.1	
Oklahoma	67.6	26.6	.1	313.5		6.1		3.8	97.9	1.7	29.1	.2	
Oregon	71.6	.5		147.6		3.0		17.5	110.6		74.9	5.4	
Pennsylvania	44.3	33.9		132.8		26.2	.7		69.0	1.4	88.0	43.3	
Rhode Island	1.4	1.5		11.2						2.5	9.6	13.2	
South Carolina	58.3	30.3		560.7	2.4	4.2	.5		15.8		185.8	2.4	
South Dakota	275.9	10.1		432.8		2.9			14.1		179.9		
Tennessee	80.9	38.5		613.0		2.8			27.0	2.2	137.9	3.2	
Texas	569.8	178.3	.2	1,008.3	1.9	63.6	8.4		197.6	16.1	349.0	50.3	
Utah	19.1	1.6	1.9	113.3		1.3			13.0	5.0	20.1	9.0	
Vermont	21.9			32.4					2.0		11.6		
Virginia	74.4	26.2		207.5	.4	8.9	1.1		6.4		87.6	11.4	
Washington	84.3	19.6		212.8	1.2	2.6	.9	10.5	40.3	8.8	54.2	4.5	
West Virginia	40.8	7.0		28.0	.4				3.2		46.2	.6	
Wisconsin	152.6	29.1		329.0	.6	4.0	.2		143.3	.1	173.1	5.0	.1
Wyoming	24.4	3.8		155.1	1.4	.6		10.1	73.5		77.4	.5	
District of Columbia		.3	3.7	2.7		1.5					1.4	1.6	.8
Puerto Rico	2.5	1.4		13.9		.3					3.1	10.7	.2
Total	4,618.5	1,011.1	10.3	14,096.8	45.2	284.5	45.7	156.6	2,095.9	149.3	5,846.2	437.8	31.7

[1] Total mileage completed, principally 2-lane construction.

Table 7.—Lane classification of mileage of Federal-aid highway projects completed during fiscal year 1960, by class of fund

Number of lanes	Mileage							Total lane miles
	Primary	Secondary	Urban	Interstate	"D" funds			Total
					Primary	Secondary	Urban	
2-lane	4,618.5	[1] 14,096.8	45.2	156.6	2,718.0	[1] 3,116.0	12.2	24,763.3	49,526.6
4-lane	1,011.1		284.5	2,095.9	375.7		62.1	3,829.3	15,317.2
6 lanes and over	10.3		45.7	149.3	14.3		17.4	237.0	1,422.0
Total	5,639.9	14,096.8	375.4	2,401.8	3,108.0	3,116.0	91.7	28,829.6	[2] 66,265.8

[1] Total mileage completed, principally 2-lane construction.
[2] 6-lane-and-over mileage was all converted to lane miles on the basis of 6 lanes.

Table 8.—Apportionment of Federal-aid highway funds authorized for the fiscal year ending June 30, 1961

State or territory	Primary ($416,250,000)	Secondary ($277,500,000)	Urban ($231,250,000)	Subtotal ($925,000,000)	Interstate ($1,800,000,000)	Total ($2,725,000,000)
Alabama	$7,442,365	$6,317,499	$2,955,538	$16,715,402	$35,141,040	$51,856,442
Alaska	22,049,140	14,681,518	37,861	36,768,519		36,768,519
Arizona	5,889,574	3,857,646	866,198	10,613,418	24,342,120	34,955,538
Arkansas	6,057,332	4,657,262	1,278,528	11,993,122	17,695,260	29,688,382
California	17,451,261	9,224,241	19,946,525	46,622,027	181,086,840	227,708,867
Colorado	6,747,455	4,855,274	1,858,997	13,461,726	13,810,500	27,272,226
Connecticut	2,295,419	1,213,581	4,446,738	7,955,738	21,740,400	29,696,138
Delaware	1,904,438	1,266,053	472,264	3,642,755	6,272,640	9,915,395
Florida	5,648,757	4,046,103	4,122,823	13,817,683	46,171,620	59,989,303
Georgia	8,754,735	7,121,855	3,285,847	19,162,437	42,999,660	62,162,097
Hawaii	1,776,483	1,373,625	774,347	3,924,455		3,924,455
Idaho	4,554,103	2,964,277	443,179	7,961,559	12,295,800	20,257,359
Illinois	13,514,886	8,078,909	15,975,253	37,569,048	91,380,960	128,950,008
Indiana	8,197,228	6,549,726	5,509,086	20,256,040	51,392,880	71,648,920
Iowa	8,522,408	6,478,842	2,657,697	17,658,947	16,911,180	34,570,127
Kansas	8,596,906	6,017,373	2,060,994	16,675,273	15,948,900	32,624,173
Kentucky	6,852,530	5,505,718	2,391,368	14,749,616	31,327,560	46,077,176
Louisiana	5,782,447	3,860,670	3,375,566	13,018,683	47,062,620	60,081,303
Maine	2,809,923	2,256,180	962,409	6,028,512	9,159,480	15,187,992
Maryland	3,028,173	2,265,566	3,908,190	9,201,929	40,148,460	49,350,389
Massachusetts	4,438,260	1,935,586	9,347,161	15,721,010	49,628,700	65,349,710
Michigan	12,415,195	7,437,112	10,717,581	30,569,888	70,032,600	100,602,488
Minnesota	10,372,240	7,139,053	3,749,777	21,261,070	33,590,700	54,851,770
Mississippi	6,934,681	5,860,796	1,274,928	14,070,405	19,566,360	33,636,765
Missouri	16,013,756	6,953,814	5,671,088	22,638,658	50,840,460	73,479,118
Montana	7,163,242	5,024,030	542,212	12,729,514	20,261,340	32,990,854
Nebraska	6,869,124	5,043,895	1,350,579	13,263,598	10,994,940	24,258,538
Nevada	4,519,154	3,096,583	175,376	7,791,113	9,319,860	17,110,973
New Hampshire	2,060,438	1,373,625	681,958	4,116,021	9,801,000	13,917,021
New Jersey	4,628,033	1,889,329	9,824,877	16,342,239	57,665,520	74,007,759
New Mexico	6,389,848	4,145,928	755,733	11,291,509	21,348,360	32,639,869
New York	16,991,840	6,925,452	29,838,686	53,755,978	88,262,460	142,018,438
North Carolina	8,706,626	8,353,086	2,938,169	19,997,881	9,658,440	29,656,321
North Dakota	5,087,595	3,505,565	389,378	8,982,538	7,894,260	16,876,798
Ohio	13,066,600	7,395,728	13,010,692	33,473,020	116,079,480	149,552,500
Oklahoma	7,863,874	5,713,132	2,266,894	15,843,900	16,198,380	32,042,280

Oregon	6,260,565	4,373,344	1,745,053	12,378,962	30,882,060	43,261,022
Pennsylvania	14,355,942	9,091,531	17,371,558	40,819,031	72,669,960	113,488,991
Rhode Island	1,836,448	1,259,305	1,646,165	4,741,918	8,304,120	13,046,038
South Carolina	5,446,586	4,541,262	1,584,049	11,571,897	14,683,680	26,255,577
South Dakota	5,331,343	4,092,667	447,263	9,871,273	7,555,680	17,426,953
Tennessee	7,773,453	6,204,559	3,284,489	17,262,501	52,854,120	70,116,621
Texas	22,510,730	15,821,611	10,736,526	49,068,867	80,510,760	129,579,627
Utah	4,617,542	3,053,379	975,749	8,646,670	16,661,700	25,308,370
Vermont	1,859,646	1,318,517	358,552	3,536,715	16,804,260	20,340,975
Virginia	7,160,604	5,272,786	3,590,904	16,024,294	75,503,340	91,527,634
Washington	5,961,996	4,163,968	3,470,365	13,596,329	32,272,020	45,868,349
West Virginia	4,272,815	3,314,913	1,466,825	9,054,553	22,328,460	31,383,013
Wisconsin	8,651,381	5,957,388	4,298,531	18,907,300	18,764,460	37,671,760
Wyoming	4,579,354	3,360,183	250,381	8,189,918	18,514,980	26,704,898
District of Columbia	1,831,428	1,236,697	1,989,381	5,057,506	17,659,620	22,717,126
Puerto Rico	2,015,937	2,270,791	1,703,225	5,989,953		5,989,953

Table 9.—Federal highway funds paid by Bureau of Public Roads during fiscal year ended June 30, 1960, by program and by State

State or territory	Primary [1]	Secondary	Urban	Subtotal	Interstate	"D" fund	"L" fund	Total
Alabama	$7,931,207	$5,240,619	$2,796,720	$15,968,546	$31,838,052	$2,390,438	$714,322	$50,911,358
Alaska	6,533,706	4,756,476	1,178	11,291,360		3,183,364	76,722	14,551,446
Arizona	4,044,402	4,697,592	645,379	9,387,373	19,441,339	481,325	70,251	29,380,288
Arkansas	5,221,841	4,134,538	678,550	10,034,929	19,793,796	997,429	337,769	31,163,923
California	19,528,111	8,065,571	13,181,678	40,775,360	119,283,695	6,745,563	1,699,746	168,504,364
Colorado	4,828,870	3,216,912	1,470,493	9,516,275	20,528,960	2,821,610	731,855	33,598,700
Connecticut	2,629,917	2,202,441	7,235,868	12,068,226	14,469,351	1,651,535	493,712	28,682,824
Delaware	1,584,578	1,979,668	170,897	3,535,143	4,249,308	362,000	102,000	8,248,451
Florida	5,005,645	5,554,096	6,183,611	16,743,352	56,017,897	980,538	301,376	74,043,163
Georgia	11,957,212	7,051,032	3,313,831	22,322,075	32,540,866	4,583,822	933,677	60,440,440
Hawaii	1,765,255	1,400,463	676,736	3,842,454		362,817	116,105	4,321,376
Idaho	3,508,617	2,906,897	344,006	6,759,520	13,992,906	1,125,997	217,541	22,095,964
Illinois	19,177,905	10,877,229	25,921,718	55,976,852	132,392,451	9,190,737	2,431,419	199,991,459
Indiana	10,043,557	8,327,350	3,210,281	21,581,188	46,072,014	5,134,174	1,652,875	74,440,251
Iowa	8,256,897	5,906,659	1,675,435	15,838,991	49,290,043	1,986,654	579,178	67,694,866
Kansas	9,920,523	6,632,073	2,270,483	18,823,079	30,078,628	1,815,958	570,781	51,288,446
Kentucky	9,757,421	7,335,681	2,021,704	19,114,806	42,991,534	2,968,154	895,580	65,970,074
Louisiana	7,506,507	9,165,179	3,960,231	20,631,917	45,907,951	2,298,950	753,790	69,592,608
Maine	1,540,541	1,832,542	348,219	3,721,302	14,402,513	1,389,527	415,282	19,928,624
Maryland	3,767,042	3,021,478	4,565,173	11,353,693	13,116,403	2,116,241	696,706	27,277,043
Massachusetts	5,714,373	2,054,692	8,244,781	16,013,846	45,926,002	4,471,244	384,116	66,795,208
Michigan	11,743,454	7,181,217	8,089,807	27,014,478	62,819,050	6,035,013	109,913	95,978,454
Minnesota	10,112,579	8,081,136	4,370,543	22,564,258	38,596,281	3,012,384	161,745	64,364,668
Mississippi	6,480,693	5,750,053	961,568	13,192,314	20,761,295	2,189,365		36,142,974
Missouri	11,099,855	7,636,543	4,412,640	23,149,038	47,764,724	3,955,829	1,093,098	75,962,689
Montana	6,537,088	5,244,803	257,852	12,039,743	14,555,482	2,232,509	517,878	29,345,612
Nebraska	5,492,498	7,096,764	723,526	13,312,788	9,033,576	3,631,229	1,115,001	27,092,594
Nevada	3,134,142	2,362,017	7,781	5,503,940	3,082,642	902,777	60,198	9,549,557
New Hampshire	2,028,022	1,574,348	591,733	4,194,103	14,360,459	918,710		19,473,272
New Jersey	5,006,471	2,044,113	6,739,015	13,789,599	32,488,799	5,127,826	1,676,828	53,083,052
New Mexico	4,167,593	1,536,535	271,669	8,975,797	13,684,294	1,023,130	174,659	23,857,880
New York	18,364,469	9,789,620	31,091,974	59,246,063	138,227,435	15,019,616	4,463,108	216,956,222
North Carolina	7,924,917	8,594,099	3,200,020	19,719,036	35,575,784	3,140,093	891,029	59,325,942
North Dakota	4,990,079	3,944,628	441,917	9,376,624	20,234,241	2,357,262	692,997	32,661,124
Ohio	18,539,568	8,558,653	15,124,026	42,222,247	105,963,759	8,124,089	2,504,936	158,815,031
Oklahoma	5,619,391	6,430,746	1,237,716	13,287,853	19,024,522	621,153	201,304	33,134,832

Oregon	5,711,924	5,070,298	2,041,153	12,823,375	33,688,280	2,691,531	630,058	49,833,244
Pennsylvania	11,120,745	6,072,247	13,652,768	30,845,760	69,622,447	12,273,134	3,720,473	116,461,814
Rhode Island	1,507,715	1,130,033	1,403,849	4,041,597	7,171,218	979,292	298,621	12,490,728
South Carolina	4,371,338	4,193,791	2,445,091	11,010,220	33,744,276	1,937,381		46,691,877
South Dakota	6,902,299	4,627,018	772,730	12,302,047	10,904,117	2,108,609	433,878	25,748,651
Tennessee	7,202,350	6,634,558	3,382,458	17,219,366	45,468,261	2,006,044	2,056,200	66,749,871
Texas	29,548,700	18,437,340	15,818,310	63,804,350	122,120,477	8,885,220	2,783,172	197,593,219
Utah	3,974,165	3,196,269	1,145,199	8,315,633	22,849,355	1,189,017		32,354,005
Vermont	1,796,840	1,034,697	251,334	3,082,871	12,922,789	395,943	129,030	16,530,633
Virginia	5,675,856	5,774,013	3,357,020	14,806,889	34,732,490	2,809,482	871,295	53,220,156
Washington	6,191,556	3,457,930	3,667,132	13,316,618	25,558,655	2,369,488	665,359	41,910,120
West Virginia	4,939,429	5,054,201	960,631	10,954,261	34,056,376	1,379,003	362,571	46,752,211
Wisconsin	7,945,718	5,762,186	4,148,684	17,856,588	36,434,592	5,373,358	1,599,961	61,264,499
Wyoming	4,066,192	2,843,551	456,778	7,366,521	15,551,900	1,865,774	359,857	25,144,052
District of Columbia	2,028,342	917,393	1,134,280	4,080,015	10,669,370	1,077,004	298,878	16,125,267
Puerto Rico	1,841,902	2,716,053	1,042,924	5,600,879		1,435,267	288,392	7,324,538
Total	376,090,017	272,106,041	222,119,100	870,315,158	1,843,994,655	164,154,609	42,395,242	2,920,859,664

[1] Funds available for either urban or rural portions of the Federal-aid primary highway system.

Table 10.—Balances of Federal-aid funds available to States for projects not yet programed as of June 30, 1960

State or territory	Primary [1]	Secondary	Urban	Subtotal	Interstate	Total
Alabama	$321,998	$2,970,476	$14,758	$3,337,232	$33,331,513	$36,668,745
Alaska	14,661,159	7,290,676	226,048	22,177,883		22,177,883
Arizona	241,092	677,404	114,381	1,032,877	17,874,037	18,906,914
Arkansas	5,541,172	5,545,912	2,027,992	13,115,076	7,808,826	20,923,902
California	8,560,045	8,221,138	13,920,453	30,701,636	65,230,768	95,932,404
Colorado	6,136,871	4,556,483	1,577,690	12,271,044	18,767,903	31,038,947
Connecticut	837,104	833,497	6,634,226	8,304,827	8,070,907	16,375,734
Delaware	2,798,622	1,032,278	630,115	4,461,015	17,242,153	21,703,168
Florida	3,696,591	3,654,134	3,771,530	11,122,255	14,375,153	25,497,408
Georgia	2,273,105	3,460,343	3,725,125	9,458,573	36,844,377	46,302,950
Hawaii	4,487,755	1,584,875	1,155,630	7,228,260		7,228,260
Idaho	2,589,802	5,191,059	617,720	8,398,581	25,428,835	33,827,416
Illinois	1,476,688	5,050,755	8,062,919	14,590,362	37,275,194	51,865,556
Indiana	879,325	3,795,613	6,043,397	10,718,335	76,745,098	87,463,433
Iowa	411,777	2,793,104	931,663	4,136,544	6,136,599	10,273,143
Kansas	3,484,487	3,437,983	2,152,298	9,074,768	30,289,756	39,364,524
Kentucky	1,518,249	2,109,965	2,949,855	6,578,069	24,106,856	30,684,925
Louisiana	189,876	6,205	25,418	221,499	22,833,294	23,054,793
Maine	2,889,471	1,735,395	2,462,559	7,087,425	14,795,776	21,883,201
Maryland	5,028,931	2,003,436	2,356,737	9,389,104	48,181,093	57,570,197
Massachusetts	731,270	801,712	340,556	1,873,538	26,633,637	28,507,175
Michigan	1,578,878	6,850,107	12,706,858	21,135,843	36,866,542	58,002,385
Minnesota	2,288	1,683,925	159,263	1,845,476	36,770,928	38,616,404
Mississippi	1,806,633	4,529,919	1,335,206	7,671,758	6,864,823	14,536,581
Missouri	3,029,339	3,097,889	4,551,937	10,679,165	40,358,457	51,037,622
Montana	3,594,645	2,991,020	1,120,309	7,705,974	53,295,499	61,001,473
Nebraska	2,400,926	3,042,383	3,136,626	8,579,935	39,444,431	48,024,366
Nevada	2,935,493	3,856,261	290,072	7,081,826	23,672,859	30,754,685
New Hampshire	1,377,726	380,505	732,840	2,491,071	4,091,435	6,582,506
New Jersey	5,755,067	2,590,722	16,004,216	24,350,005	67,245,633	91,595,638
New Mexico	556,402	662,087	284,128	1,502,617	16,565,504	18,068,121
New York	1,736,295	6,299,192	24,093,917	32,129,404	34,931,978	67,061,382
North Carolina	9,996,588	9,623,172	3,674,895	23,294,655	29,542,527	52,837,182
North Dakota	633,556	966,478	372,731	1,972,765	13,247,495	15,220,260
Ohio	177,115	6,647,626	526,885	7,351,626	5,612,606	12,964,232
Oklahoma	4,451,736	3,432,772	2,870,480	10,754,988	14,818,267	25,573,255

Oregon	410,657	113,001	1,190,887	1,714,545	10,479,546	12,194,091
Pennsylvania	11,747,930	6,631,975	24,341,281	42,721,186	93,609,536	136,330,722
Rhode Island	3,386,602	1,187,670	2,185,152	6,759,424	9,570,874	16,330,298
South Carolina	1,909,258	3,273,337	1,232,350	6,414,945	6,495,593	12,910,538
South Dakota	954,148	2,046,465	583,300	3,583,913	2,202,576	5,786,489
Tennessee	4,894,317	4,116,229	5,003,083	14,013,629	33,651,780	47,665,409
Texas	1,738,467	15,373,051	269,140	17,380,658	50,614,153	67,994,811
Utah	2,058,856	1,032,658	636,986	3,728,500	10,955,389	14,683,889
Vermont	838,831	697,213	650,594	2,186,638	22,204,737	24,391,375
Virginia	1,291,956	1,684,669	4,848,059	7,824,684	117,732,496	125,557,180
Washington	1,601,832	1,741,091	3,216,747	6,559,670	25,471,148	32,030,818
West Virginia	2,047,311	2,532,587	1,575,076	6,154,974	9,022,176	15,177,150
Wisconsin	3,279,097	6,260,436	2,651,743	12,191,276	34,630,255	46,821,531
Wyoming	851,172	1,897,516	483,955	3,232,643	6,895,425	10,128,068
District of Columbia	2,564,829	1,869,955	2,476,551	6,911,335	12,495,571	19,406,906
Puerto Rico	973,919	2,521,036	1,108,374	4,603,329		4,603,329
Total	149,337,259	176,385,350	184,084,711	509,807,360	1,401,332,014	1,911,139,374

[1] Funds available for either urban or rural portions of the Federal-aid primary system.

Table 11.—National System of Interstate and Defense Highways: Status of improvement as of June 30, 1960.

State or territory	Open to traffic								Work in progress with Interstate funds			Remaining mileage	Total designated system mileage
	Completed to full or acceptable standards			Improved to standards adequate for present traffic			Toll facilities	Total open to traffic	Under construction	Engineering or right-of-way	Total under way		
	With Interstate funds	With other public funds	Total	With Interstate funds	With other public funds	Total							
Alabama	8.0		8.0	19.4	32.1	51.5		59.5	237.5	123.1	360.6	453.8	873.9
Alaska													
Arizona	166.5	0.2	166.7	68.7	278.3	347.0		513.7	41.1	130.1	171.2	476.3	1,161.2
Arkansas	38.4		38.4		2.8	2.8		41.2	76.3	384.1	460.4	16.1	517.7
California	123.0	22.1	145.1	167.8	177.2	345.0	18.9	509 0	111.3	1,063.6	1,174.9	498.9	2,182.8
Colorado	94.1	4.3	98.4	63.3	39.3	102.6		201.0	98.0	113.1	211.1	537.8	949.9
Connecticut	16.8	71.1	87.9	5.6	18.1	23.7	19.5	131.1	28.8	110.7	139.5	27.2	297.8
Delaware	.6		.6	.6		.6	2.3	3.5	.7	27.2	27.9	9.1	40.5
Florida	40.6		40.6				42.4	83.0	141.0	65.5	206.5	852.7	1,142.2
Georgia	26.0	17.5	43.5		89.0	89.0		132.5	147.4	135.4	282.8	696.1	1,111.4
Hawaii													
Idaho	15.1		15.1	23.8	37.4	61.2		76.3	90.4	197.9	288.3	246.2	610.8
Illinois	76.4	20.3	96.7	23.3	133.2	156.5	151.5	404.7	169.4	527.9	697.3	484.3	1,586.3
Indiana	12.0		12.0	3.9	2.8	6.7	156.9	175.6	125.1	304.2	429.3	513.9	1,118.8
Iowa	103.4		103.4	21.5		21.5	3.8	128.7	121.9	218.7	340.6	239.4	708.7
Kansas	95.8		95.8	16.0	46.5	62.5	187.1	345.4	86.0	62.8	148.8	306.9	801.1
Kentucky	19.4		19.4		8.5	8.5	40.0	67.9	101.7	154.7	256.4	373.1	697.4
Louisiana	14.4	2.9	17.3		.8	.8		18.1	101.0	245.4	346.4	315.8	680.3
Maine	11.3	.9	12.2		3.0	3.0	59.8	75.0	42.7	27.7	70.4	166.6	312.0
Maryland	27.0	32.5	59.5	15.8	29.1	44.9	10.5	114.9	17.4	189.4	206.8	32.2	353.9
Massachusetts	22.5	5.4	27.9		27.3	27.3	126.5	181.7	65.7	67.1	132.8	147.4	461.9
Michigan	133.0	127.1	260.1		5.0	5.0	4.9	270.0	179.8	289.3	469.1	335.4	1,074.5
Minnesota	16.2		16.2	56.3	6.3	62.6		78.8	73.8	240.6	314.4	499.6	892.8
Mississippi				15.3	13.8	29.1		29.1	216.2	102.5	318.7	324.1	671.9
Missouri	46.7	1.9	48.6	88.4	168.1	256.5	3.0	308.1	100.6	648.1	748.7	43.5	1,100.3
Montana	60.7		60.7					60.7	71.7	336.8	408.5	710.4	1,179.6
Nebraska	13.2		13.2		12.9	12.9	.3	26.4	42.7	91.5	134.2	328.0	488.6
Nevada	50.7		50.7	5.5		5.5		56.2	12.7	145.9	158.6	319.2	534.0

New Hampshire	23.7		23.7		.3	.3	25.7	49.7	36.1	7.4	43.5	120.0	213.2
New Jersey	7.1	7.8	14.9	7.0	15.0	22.0	52.4	89.3	22.2	72.8	95.0	187.2	371.5
New Mexico	197.3		197.3	94.0		94.0		291.3	40.5	32.2	72.7	638.9	1,002.9
New York	68.8	51.9	120.7	6.2	12.5	18.7	500.3	639.7	126.7	217.5	344.2	243.3	1,227.2
North Carolina	92.0		92.0	68.5	85.2	153.7		245.7	182.2	21.2	203.4	324.1	773.2
North Dakota	114.8		114.8	26.1	33.2	59.3		174.1	43.2	30.5	73.7	320.1	567.9
Ohio	258.4	25.3	283.7		38.0	38.0	173.5	495.2	112.0	329.1	441.1	553.0	1,489.3
Oklahoma	57.3		57.3	27.6	22.6	50.2	175.8	283.3	135.7	143.6	279.3	233.0	795.6
Oregon	143.8	26.4	170.2	27.7	199.7	227.4	.7	398.3	105.4	25.6	131.0	202.1	731.4
Pennsylvania	136.2	58.6	194.8	6.2	12.2	18.4	362.8	576.0	117.6	203.0	320.6	634.4	1,531.0
Rhode Island	10.0	9.7	19.7	.2	.1	.3		20.0	1.4	3.3	4.7	46.4	71.1
South Carolina	43.5		43.5	2.2	7.9	10.1		53.6	241.5	72.0	313.5	311.9	679.0
South Dakota	7.2		7.2	56.5		56.5		63.7	92.1	239.4	331.5	282.4	677.6
Tennessee	5.5	1.7	7.2					7.2	159.4	230.6	390.0	653.4	1,050.6
Texas	465.2	54.2	519.4	117.6	145.0	262.6	30.0	812.0	272.6	1,208.3	1,480.9	738.1	3,031.0
Utah	31.5		31.5	19.9	2.1	22.0		53.5	68.3	129.8	198.1	670.1	921.7
Vermont	7.8		7.8					7.8	33.8	110.8	144.6	168.8	321.2
Virginia	22.4	4.4	26.8	48.0	37.3	85.3	39.2	151.3	107.1	337.0	444.1	471.3	1,066.7
Washington	53.6	2.8	56.4	121.8	111.0	232.8	.6	289.8	36.3	282.0	318.3	118.8	726.9
West Virginia	.2		.2				85.8	86.0	52.5	47.1	99.6	208.8	394.4
Wisconsin	99.3		99.3		39.5	39.5		138.8	57.7	256.0	313.7		452.5
Wyoming	63.7		63.7	20.5		20.5		84.2	140.7	82.4	223.1	608.1	915.4
District of Columbia		2.6	2.6		1.3	1.3		3.9	4.5	7.6	12.1	16.8	32.8
Puerto Rico													
Total	3,141.1	551.6	3,692.7	1,245.2	1,894.4	3,139.6	2,274.2	9,106.5	4,690.4	10,092.5	14,782.9	16,705.0	[1] 40,594.4

[1] The system is limited to 41,000 miles by law. The small balance is held in reserve for adjustments as final locations are selected and projects built.

Table 12.—Interstate System improvements financed with Federal-aid funds: [1] Status of projects as of June 30, 1960, and projects completed during the fiscal year

State or territory	Programed,[2] plans not approved			Plans approved, not under construction			Under construction			Completed during fiscal year		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama	$50,992,313	$32,779,228	101.3	$12,133,500	$10,920,150	53.6	$96,170,107	$85,014,001	191.2	$14,789,798	$13,314,138	51.8
Alaska												
Arizona	19,609,000	18,674,823	57.9	9,948,102	9,387,311	42.8	37,977,350	35,925,573	66.3	18,196,041	17,041,127	86.7
Arkansas	27,886,086	25,097,479	50.0	7,389,890	6,651,881	9.2	72,140,207	64,182,178	74.5	9,811,179	8,153,733	26.4
California	14,458,317	12,672,090	6.1	62,274,308	54,386,850	34.3	415,489,510	250,059,124	121.4	216,893,916	126,644,278	95.0
Colorado	6,016,080	4,741,151	26.1	3,948,609	3,481,000	16.7	19,200,240	17,490,813	82.7	18,363,535	16,612,529	45.2
Connecticut				587,403	525,042	.8	76,369,534	67,741,873	25.9	8,813,284	7,787,751	4.7
Delaware	7,140,234	6,468,057	2.9	3,277,001	2,909,943	.1	21,646,698	18,409,200	.5	1,541,100	1,386,000	.4
Florida	2,312,000	2,080,800	15.0	2,934,397	2,640,678	9.7	101,328,989	90,287,243	131.7	63,326,204	56,815,583	36.7
Georgia	64,838,073	58,352,466	72.3	7,844,902	6,919,772	26.9	112,067,474	94,137,654	117.9	21,385,368	15,817,637	46.1
Hawaii												
Idaho	14,071,626	12,976,624	27.0	3,766,446	3,510,526	8.3	25,707,878	23,660,585	88.4	11,975,504	11,084,787	46.3
Illinois	34,925,527	29,886,758	26.4	37,439,375	29,091,096	32.3	283,423,426	249,294,048	131.3	73,516,726	64,502,379	25.8
Indiana	24,736,837	22,262,866	24.6	21,636,030	19,472,427	21.3	122,945,134	106,277,335	123.3	19,564,475	17,171,273	14.4
Iowa	7,015,604	6,326,954	9.8	9,322,905	8,438,250	25.8	49,026,679	44,374,639	86.0	42,261,191	37,626,059	110.7
Kansas	3,433,075	3,089,768	.9	5,427,475	4,884,725	13.3	33,917,366	26,802,261	79.1	22,915,889	20,565,981	52.3
Kentucky	18,477,936	16,631,043	51.7	17,361,639	15,510,251	28.6	85,936,906	76,390,010	70.8	32,948,814	29,588,355	48.7
Louisiana	11,626,429	10,463,786	23.6	25,931,600	23,338,440	20.4	119,562,103	101,196,687	48.2	38,677,368	34,141,651	41.6
Maine	1,601,500	1,441,350	1.5	2,207,000	1,986,300	5.3	29,621,028	26,505,081	47.6	12,003,368	10,569,216	12.4
Maryland	18,018,100	16,293,290	11.4	18,198,875	16,099,929	4.4	42,391,064	37,523,393	24.2	15,681,749	13,579,000	9.1
Massachusetts	11,416,928	10,275,235	.4	43,926,906	39,180,416	20.6	126,281,329	109,809,813	51.3	32,294,538	28,921,339	10.7
Michigan	3,514,510	3,163,060	.7	15,726,381	13,998,160	16.4	201,375,488	181,261,259	172.6	48,672,913	43,462,471	63.8
Minnesota	15,720,197	14,409,178	.9	5,881,373	5,425,494	5.2	180,856,801	120,282,351	82.0	10,821,198	9,850,127	8.4
Mississippi	30,262,267	27,251,051	100.1	6,460,300	5,834,600	24.5	74,607,112	65,485,900	171.2	18,112,431	15,972,177	56.0
Missouri	8,134,631	7,350,740	11.9	11,962,492	10,770,106	21.7	88,595,923	77,738,197	116.3	53,307,740	48,181,877	69.6
Montana	6,928,161	6,366,497	12.1	6,657,606	6,086,790	18.1	48,589,410	44,397,403	112.7	6,808,934	6,185,854	24.9
Nebraska	3,213,484	2,921,034	1.6	6,155,883	5,541,475	11.8	45,681,183	40,997,907	39.2	5,932,798	4,963,494	7.1
Nevada	4,977,155	4,723,297	11.8				34,528,846	32,803,578	12.7	7,000,433	6,673,210	30.2
New Hampshire	3,583,350	3,225,015	3.1	2,974,002	2,555,383	2.4	31,249,411	27,378,848	33.0	11,955,499	10,329,959	15.1
New Jersey	31,336,210	28,202,589	13.6	11,729,980	10,415,323	2.2	131,057,187	114,111,381	22.8	16,521,608	14,756,948	6.9
New Mexico	7,203,040	6,665,232	17.3	759,271	701,513	8.0	26,503,797	24,640,151	37.3	20,582,907	19,127,025	72.7
New York	20,847,240	18,762,516	8.2	46,977,515	40,220,113	14.1	393,999,502	328,943,048	102.3	159,968,351	128,385,732	61.3

North Carolina	13,317,728	11,985,956	48.9	8,217,090	7,395,370	24.4	44,507,516	39,967,741	175.8	23,188,456	20,797,554	98.6
North Dakota	4,790,068	4,356,060	30.9	5,285,180	4,793,167	18.0	17,260,126	15,619,193	81.4	16,201,453	14,436,699	89.5
Ohio	16,594,500	14,935,050	14.2	21,584,295	18,760,158	15.5	154,178,585	135,616,889	81.9	216,950,782	193,740,259	153.2
Oklahoma	12,921,500	11,446,000	53.2	5,222,360	4,696,290	23.1	38,346,546	34,491,635	83.5	34,147,427	30,690,275	103.4
Oregon	11,092,307	10,061,135	29.5	11,229,142	10,324,200	30.3	74,173,225	68,214,577	134.8	22,865,782	19,865,251	128.1
Pennsylvania	34,678,799	30,897,719	16.5	28,851,661	25,934,346	16.3	147,348,943	132,513,918	107.6	110,773,789	98,520,004	70.5
Rhode Island	1,393,000	1,253,700		346,900	312,210		24,965,287	21,974,711	1.3	4,681,960	4,213,764	
South Carolina	8,336,893	7,502,029	6.1	7,075,020	5,882,674	24.3	67,388,309	60,503,166	242.1	12,509,623	10,718,597	
South Dakota	32,963,170	30,024,612	134.8	7,081,808	6,448,683	41.6	30,701,979	27,947,058	78.2	5,814,664	5,301,115	14.1
Tennessee	30,909,892	27,818,904	43.4	17,479,293	15,731,359	17.7	156,346,229	137,126,719	129.8	16,160,210	14,544,182	29.3
Texas	44,549,500	40,005,450	77.3	12,468,900	11,204,600	46.2	212,569,329	191,172,160	241.3	92,279,731	82,752,776	213.7
Utah	8,108,413	7,685,662	20.7	8,547,066	7,781,587	31.5	39,044,442	36,857,365	60.0	11,967,050	10,937,897	18.0
Vermont	3,000	2,700					50,028,424	44,929,447	34.3	2,918,329	2,625,633	1.9
Virginia	4,988,556	4,489,000	11.1	17,733,030	15,940,519	42.6	138,044,254	123,513,365	133.0	9,226,038	8,271,183	6.7
Washington	7,838,031	4,682,780	1.4	13,020,241	11,425,178	14.4	50,468,354	44,621,244	37.3	45,873,665	41,006,022	59.6
West Virginia	32,391,537	29,152,383	16.4	12,682,580	11,378,322	22.5	67,153,175	58,568,774	50.6	9,332,452	6,642,584	6.4
Wisconsin	17,749,131	16,145,267	38.4	10,233,203	9,188,626	59.3	56,180,381	48,179,640	76.4	36,944,078	32,422,463	143.3
Wyoming	16,067,286	15,045,396	43.3	4,101,168	3,792,684	22.4	42,953,539	39,944,229	196.8	22,989,168	21,303,973	83.6
District of Columbia	20,970,480	19,320,540	1.2	3,598,268	3,058,051	.4	41,753,790	36,808,710	4.0	3,080,516	2,736,986	
Puerto Rico												
Total	793,959,701	700,364,320	1,277.5	605,598,371	534,931,968	949.3	4,581,660,115	3,881,602,075	4,414.5	1,732,550,032	1,460,738,907	2,419.2

[1] Includes projects financed from Federal-aid primary, secondary, urban and Interstate funds. [2] Initial commitment of funds.

Table 13.—Improvement of the Federal-aid primary system in rural areas financed with Federal-aid funds: [1] Status of projects as of June 30, 1960 and projects completed during the fiscal year

State or territory	Programed,[2] plans not approved			Plans approved, not under construction			Under construction			Completed during fiscal year		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama	$23,320,701	$19,227,688	89.6	$13,751,105	$10,870,874	67.0	$101,851,012	$79,316,440	347.2	$34,282,713	$24,079,425	352.9
Alaska	7,050,344	6,011,946	73.8	646,320	556,417	1.1	18,096,831	15,941,925	48.6	7,174,518	5,387,028	75.6
Arizona	15,605,595	14,762,275	49.5	10,436,977	9,254,427	65.0	32,725,106	30,438,940	79.8	15,979,687	14,445,989	111.9
Arkansas	31,530,328	23,251,356	183.3	3,832,510	3,038,767	18.2	50,776,962	41,562,742	168.4	15,840,052	10,756,372	181.6
California	5,447,817	4,218,300	4.3	30,709,643	20,961,645	31.6	176,921,427	112,815,673	142.0	111,817,202	72,597,380	175.5
Colorado	6,969,959	5,705,350	48.0	4,221,809	3,057,208	26.5	27,387,274	21,142,016	175.3	29,585,245	22,374,345	222.7
Connecticut				2,809,714	1,628,775	3.1	52,886,561	39,957,960	35.3	17,793,965	11,986,653	22.6
Delaware	5,794,234	5,139,657	3.3	4,137,001	3,339,943	8.0	15,138,980	10,579,141	33.6	4,445,582	3,052,567	23.5
Florida	3,052,000	2,226,800	20.3	4,924,641	3,579,376	17.5	66,968,042	54,606,768	204.8	29,408,835	22,340,185	93.6
Georgia	48,696,984	39,985,930	248.7	10,637,909	7,968,372	38.8	94,880,868	71,637,665	280.9	49,989,159	31,571,257	468.3
Hawaii	1,223,000	308,000	4.4	26,685	12,475		1,344,668	614,587	1.7	3,320,846	1,866,290	7.6
Idaho	15,103,289	13,597,652	40.4	6,579,948	5,235,998	31.9	29,631,665	25,344,817	120.4	20,101,308	15,723,126	169.7
Illinois	21,810,624	17,153,987	43.4	32,457,994	23,695,738	89.6	172,888,437	135,910,514	342.6	68,362,029	46,008,801	440.1
Indiana	21,773,321	17,432,638	31.6	19,730,274	14,253,446	138.2	132,566,745	103,560,083	337.4	48,264,227	32,003,961	259.5
Iowa	7,782,631	5,968,717	48.2	16,473,179	12,131,552	144.3	44,867,964	34,693,076	279.4	44,319,471	34,043,868	320.1
Kansas	5,838,321	4,232,491	49.4	7,636,143	5,487,081	78.3	24,534,902	17,100,228	249.7	36,697,055	24,221,272	448.2
Kentucky	20,312,700	16,259,325	68.3	14,471,049	12,687,080	29.2	91,483,871	72,912,715	163.6	38,964,834	27,492,671	121.7
Louisiana	11,764,091	10,548,217	23.6	15,916,025	9,135,060	42.2	74,585,849	55,804,062	145.3	40,341,584	29,414,285	270.6
Maine	6,769,400	4,152,790	12.5	1,831,430	1,423,150	8.1	21,309,087	17,444,128	58.2	17,582,319	12,618,185	79.9
Maryland	18,217,100	16,262,790	13.2	281,798	269,607		25,312,552	18,191,058	50.7	19,647,330	13,977,381	69.0
Massachusetts	1,127,914	956,728		40,695,115	33,144,855	26.4	63,462,224	48,815,933	47.4	15,697,302	11,711,269	30.1
Michigan	5,897,089	4,363,549	6.2	25,187,751	17,063,396	130.4	194,707,616	164,591,885	376.6	62,733,444	46,666,095	301.6
Minnesota	5,605,618	4,978,683		7,343,942	5,047,552	38.2	66,361,604	46,107,091	376.3	18,243,359	11,292,852	192.1
Mississippi	32,644,784	25,971,323	165.9	8,985,240	6,749,830	78.1	69,410,758	54,400,155	348.5	28,667,768	20,534,843	276.4
Missouri	7,862,996	6,132,798	20.4	14,076,122	11,040,136	45.5	84,875,739	61,991,386	265.9	46,097,991	34,974,096	193.9
Montana	11,247,177	8,909,216	99.2	9,548,703	7,601,851	81.4	58,042,403	48,494,318	312.4	15,494,437	10,850,100	206.7
Nebraska	3,675,264	3,151,924	1.6	9,623,157	6,423,843	68.6	43,481,167	34,016,014	193.9	22,345,829	14,325,265	266.5
Nevada	8,863,850	7,962,468	35.9	1,279,910	1,066,675	26.9	16,041,699	14,494,449	80.6	11,291,090	10,350,106	86.7
New Hampshire	2,265,162	1,765,921	4.8	3,214,251	2,152,678	8.5	33,539,345	27,908,841	46.3	16,338,840	12,124,260	37.2
New Jersey	15,025,230	11,496,587	15.0	4,973,026	3,333,384	6.4	48,986,492	39,969,886	22.6	32,143,165	22,227,562	15.2
New Mexico	8,531,870	7,125,490	32.5	2,745,435	1,930,778	25.4	13,800,616	11,903,390	50.6	27,865,038	23,283,088	144.1
New York	12,052,940	6,614,886	14.0	13,508,745	9,066,958	65.9	155,003,743	103,506,827	320.1	97,603,019	67,726,973	265.1

North Carolina	17,482,518	13,868,432	84.9	11,923,325	9,256,121	53.2	56,082,005	44,426,839	276.7	43,331,504	31,511,734	337.7
North Dakota	5,166,508	4,550,880	32.4	10,956,290	7,623,909	145.3	25,712,555	19,917,877	255.8	26,470,995	19,904,973	414.7
Ohio	18,976,780	15,554,302	19.3	22,191,618	15,193,843	30.4	128,139,868	97,799,710	157.6	167,658,230	140,541,534	310.9
Oklahoma	19,177,300	14,396,250	142.3	11,886,763	7,862,048	103.8	40,528,020	31,386,920	161.9	37,356,440	29,067,748	195.4
Oregon	13,660,595	11,428,728	47.3	7,081,636	6,170,000	33.9	55,372,898	47,241,925	194.2	33,029,352	26,300,922	226.5
Pennsylvania	25,833,351	21,182,279	21.7	20,784,459	15,822,594	16.5	134,584,944	102,629,766	150.6	91,372,341	65,166,049	209.6
Rhode Island							8,302,360	5,831,800	5.6	799,285	433,002	7.6
South Carolina	13,834,654	8,964,947	108.3	8,676,952	6,293,242	71.1	77,946,045	65,064,897	339.9	22,486,072	15,688,941	183.2
South Dakota	33,607,950	29,154,328	210.4	8,432,820	7,193,761	75.5	33,314,443	27,082,087	291.2	17,027,093	11,836,111	370.7
Tennessee	30,055,724	25,358,964	69.2	13,606,133	12,062,740	21.3	100,458,556	81,009,810	204.8	26,995,697	18,824,365	185.3
Texas	30,144,500	23,567,050	172.9	13,496,571	9,066,650	125.7	146,071,748	113,205,945	626.1	115,907,665	82,499,740	1,148.2
Utah	6,003,313	5,362,396	28.9	9,988,244	8,593,594	53.6	25,021,089	22,279,922	96.5	12,839,289	11,055,868	58.4
Vermont	3,000	2,700		982,687	491,343	2.1	49,480,453	41,448,874	64.0	9,097,646	5,817,658	31.2
Virginia	5,189,256	4,598,790	11.1	21,535,140	17,656,686	63.3	139,576,436	117,404,645	185.2	20,030,219	13,061,927	127.3
Washington	8,949,113	4,417,780	25.8	11,601,942	9,082,966	41.9	32,343,984	25,407,415	100.4	32,878,470	24,077,082	176.3
West Virginia	22,451,950	17,893,058	14.9	12,729,058	11,403,602	22.5	65,800,213	54,495,258	115.2	13,943,218	9,093,891	45.1
Wisconsin	10,392,984	8,315,085	60.2	11,746,646	9,309,603	104.0	40,093,419	30,310,374	192.0	53,135,116	39,791,407	497.7
Wyoming	17,001,719	15,588,964	53.4	4,261,260	3,837,613	39.7	55,685,891	47,813,636	307.0	27,427,023	23,675,922	186.6
District of Columbia	625,000	312,500	.6									
Puerto Rico	5,581,000	2,788,000	10.7				9,583,338	4,724,334	23.3	3,761,693	2,081,692	11.2
Total	676,999,548	543,180,915	2,565.6	544,575,095	410,129,242	2,444.1	3,327,970,474	2,595,166,747	9,454.1	1,803,986,591	1,312,458,116	10,599.8

[1] Includes projects on rural portions of the Federal-aid primary highway system financed from Federal-aid primary, secondary, "D" and Interstate funds. [2] Initial commitment of funds.

Table 14.—Improvements on secondary roads in rural areas financed with Federal-aid funds: [1] Status of projects as of June 30, 1960 and projects completed during the fiscal year

State or territory	Programed,[2] plans not approved			Plans approved, not under construction			Under construction			Completed during fiscal year		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama	$542,855	$263,243	5.9	$3,802,360	$1,811,290	98.2	$13,868,677	$6,631,202	449.4	$12,116,682	$6,240,765	603.6
Alaska	4,349,899	3,787,178	50.2	1,463,860	1,260,236	15.7	16,465,718	14,104,196	128.3	4,806,299	4,176,442	73.6
Arizona	30,000	27,000		1,191,496	856,207	13.1	7,362,531	5,325,299	98.2	6,633,058	5,092,422	144.4
Arkansas	2,685,128	1,345,684	112.3	3,256,690	1,628,345	99.2	10,569,945	5,283,750	319.8	9,846,466	5,319,348	328.9
California	4,840,670	2,969,303	61.8	8,537,000	4,367,900	82.1	12,881,182	6,902,873	113.8	17,805,156	9,170,239	221.0
Colorado	1,121,032	635,089	19.2	1,535,000	642,637	23.1	7,438,613	4,178,666	146.1	8,050,065	4,366,696	175.7
Connecticut				73,333	36,666	.4	8,340,115	4,234,789	27.4	2,798,069	1,589,842	11.4
Delaware							2,256,496	1,129,948	26.4	4,599,894	2,650,295	37.8
Florida	3,426,000	1,713,000	87.9				9,444,582	4,907,072	111.6	10,001,652	4,787,987	255.0
Georgia	2,717,902	1,476,601	31.1	2,244,400	1,185,440	38.4	27,559,989	13,449,425	542.6	22,144,247	11,644,773	469.2
Hawaii	425,350	211,800	.1	20,818	9,939		4,370,494	2,176,237	10.5	928,478	426,762	4.5
Idaho	440,168	303,182	7.2	1,091,037	673,901	31.5	4,957,417	2,922,529	124.3	7,073,891	4,715,575	252.5
Illinois	6,289,854	3,144,927	88.1	2,840,600	1,420,300	31.6	30,243,752	15,084,203	529.2	24,276,571	12,772,784	586.2
Indiana	9,675,236	4,868,668	35.4	3,318,010	1,703,791	61.5	20,441,807	10,239,784	127.6	16,377,957	8,251,133	199.9
Iowa	303,530	188,765	10.0	1,411,420	717,470	49.5	10,623,294	5,376,662	370.2	15,430,555	8,119,426	675.7
Kansas	2,314,896	1,157,423	169.5	2,364,170	1,182,085	119.1	16,222,886	8,208,072	919.9	15,427,545	8,174,974	990.9
Kentucky	363,174	225,187		686,800	343,400	4.7	23,060,682	11,496,238	174.8	13,687,100	7,723,808	196.7
Louisiana	87,932	49,566		1,142,600	580,340	27.6	25,000,817	12,238,256	329.9	20,078,629	10,680,504	361.1
Maine				515,000	257,500	5.1	3,969,796	1,988,200	41.1	5,897,645	3,013,396	49.0
Maryland				2,220,000	1,264,500	55.1	2,801,527	1,412,008	86.4	8,195,981	4,057,792	142.5
Massachusetts	299,022	149,511	2.1	384,000	360,000	.3	8,378,795	4,488,975	19.1	917,170	452,460	5.2
Michigan	3,460,354	1,746,577	99.2	3,946,000	1,979,800	157.2	16,562,255	8,337,506	423.3	15,922,751	8,612,460	580.8
Minnesota	365,668	289,634		2,119,600	1,059,780	121.4	21,192,628	11,039,039	1,184.6	16,399,620	8,387,368	1,105.5
Mississippi	1,385,881	674,691	49.9	1,492,000	694,650	57.0	14,322,120	6,561,677	531.6	21,082,874	11,238,181	719.8
Missouri	4,863,402	2,443,381	333.0	3,427,800	1,744,700	140.5	18,069,623	8,466,215	709.8	14,154,326	7,198,757	915.3
Montana	1,258,700	917,067	27.9	2,869,993	1,847,372	75.8	13,299,163	8,377,901	233.0	11,464,359	7,676,424	390.9
Nebraska	667,108	348,554	28.4	3,040,350	1,535,155	49.9	17,486,111	8,948,451	630.7	17,522,299	9,486,347	537.4
Nevada	55,972	46,647		360,000	300,024	11.2	1,947,739	1,623,806	42.5	2,979,496	2,241,686	82.3
New Hampshire	541,208	270,604	2.0	1,453,466	718,154	6.0	3,480,823	1,707,005	15.9	3,774,059	2,248,086	14.8
New Jersey	1,460,000	730,000	22.4	952,800	476,400	13.6	2,086,018	1,048,414	12.3	2,177,643	1,138,039	15.6
New Mexico	107,863	67,608		824,000	531,996	7.9	8,683,627	5,868,221	148.0	9,620,833	6,396,714	196.9
New York	728,950	364,475	4.8	2,167,880	1,083,941	16.8	32,991,112	15,488,237	212.5	23,350,315	11,569,985	160.1

North Carolina	2,390,796	1,204,398	30.5	2,703,180	754,890	68.3	14,915,119	7,518,271	289.4	14,532,036	7,619,028	368.4
North Dakota	1,328,716	677,358	272.0	314,450	157,225	29.2	13,553,819	6,775,779	855.5	9,600,619	5,486,615	951.1
Ohio				9,505,106	5,188,793	45.5	28,114,790	15,398,935	146.1	26,923,991	15,163,814	238.4
Oklahoma	1,895,800	953,429	147.7	3,089,300	1,544,650	89.7	16,721,986	8,381,397	500.0	11,951,515	6,125,480	339.6
Oregon	916,014	548,942	7.4	2,786,000	1,675,150	44.2	11,372,626	6,964,193	169.7	8,338,648	5,264,015	195.1
Pennsylvania	3,648,222	1,824,111	9.8	7,174,100	3,587,050	46.1	20,649,035	10,336,038	120.1	24,313,826	13,015,292	150.7
Rhode Island				130,000	65,000	1.5	124,868	64,072		1,280,760	640,330	7.7
South Carolina	2,280,722	1,215,561	129.9	3,186,000	1,605,820	189.5	15,334,897	7,832,476	846.5	10,626,056	5,575,079	661.8
South Dakota	2,162,085	1,208,148	107.3	1,762,352	974,923	124.1	7,852,113	4,602,581	327.8	7,659,239	4,485,339	537.2
Tennessee	7,882,146	3,944,273	169.4	6,806,804	3,407,323	236.6	12,586,558	6,328,333	435.2	15,750,396	8,325,707	699.7
Texas	1,037,600	496,000	25.0	240,000	120,000	6.5	34,932,405	17,622,300	923.3	36,294,629	18,653,300	1,141.9
Utah	180,000	169,764	.2	1,310,000	975,950	39.0	4,370,890	3,247,579	70.7	5,628,265	3,870,625	119.9
Vermont	630,000	315,000	8.5				2,856,889	1,435,950	26.5	3,447,321	1,749,348	36.4
Virginia				5,365,907	2,891,132	139.6	14,101,421	7,406,610	208.5	14,276,538	7,482,171	282.8
Washington	890,658	491,050	47.4	5,279,600	2,824,015	84.2	11,011,568	5,934,940	224.7	8,166.014	4,692,784	248.9
West Virginia	6,117,720	3,068,580	36.9	10,485,174	5,472,673	333.8	11,733,080	5,752,060	71.0	4,542,369	2,732,301	70.4
Wisconsin	768,246	440,273	12.4	1,616,837	848,020	57.3	16,077,946	8,144,226	408.3	11,854,772	6,245,412	411.8
Wyoming	315,300	212,422	1.8	1,706,625	1,098,552	24.1	4,562,591	2,945,493	81.0	5,416,524	3,484,510	155.1
District of Columbia												
Puerto Rico	3,515,782	1,458,441	16.5				8,775,294	4,147,531	45.4	2,679,549	1,212,061	13.8
Total	90,767,561	48,643,115	2,271.1	124,213,918	65,465,085	2,972.7	666,028,229	350,083,620	14,590.5	588,824,752	321,444,681	17,134.9

[1] Includes projects on secondary roads in rural areas financed from Federal-aid secondary and "D" funds. [2] Initial commitment of funds.

Table 15.—Improvements in urban areas financed with Federal-aid funds: [1] Status of projects as of June 30, 1960, and projects completed during the fiscal year

State or territory	Programed,[2] plans not approved			Plans approved, not under construction			Under construction			Completed during fiscal year		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama	$33,054,984	$15,924,904	19.7	$7,894,447	$4,308,432	33.6	$37,352,108	$27,009,249	59.7	$8,444,919	$4,611,204	31.7
Alaska	171	147					2,822,455	2,471,539	4.2	308,739	269,519	3.2
Arizona	7,573,582	6,440,682	18.9	3,443,178	3,046,968	6.9	13,516,106	12,064,944	13.1	6,705,600	5,910,096	4.9
Arkansas	10,213,778	9,026,889	10.8	5,233,190	4,474,994	6.8	43,999,232	34,295,996	38.7	6,890,148	4,305,851	26.6
California	18,486,887	13,462,590	5.3	48,867,891	42,704,205	25.8	349,084,194	197,098,234	70.3	159,153,720	85,521,890	40.9
Colorado	2,511,565	998,255	2.2	2,177,609	1,778,712	5.4	11,500,183	7,077,991	12.9	4,695,655	3,423,926	12.4
Connecticut				5,801,436	2,889,671	4.4	67,211,509	48,345,710	23.8	15,246,969	9,457,238	15.3
Delaware	2,680,000	1,968,000	3.8				12,741,024	11,004,162	9.7	832,206	438,149	1.9
Florida	1,510,000	979,000	3.6	2,765,716	1,439,069	7.8	69,059,444	53,173,509	19.2	47,663,804	42,183,975	29.5
Georgia	36,387,018	28,651,276	35.3	5,152,646	2,643,558	16.6	76,092,217	52,656,219	68.0	6,616,594	3,388,816	20.1
Hawaii	1,296,870	648,435	1.2	1,726	815		4,593,010	2,076,605	1.8	1,574,980	846,100	1.4
Idaho	876,557	580,472	2.2	32,863	29,175		6,673,168	5,393,652	7.9	1,736,623	1,303,369	1.9
Illinois	25,968,623	19,223,144	12.7	36,136,790	25,481,873	19.9	193,302,180	155,117,176	59.6	86,172,247	62,776,147	62.4
Indiana	13,801,374	10,324,747	14.2	15,542,971	13,116,561	15.0	44,256,032	29,724,400	22.5	9,316,892	5,823,574	18.3
Iowa	3,144,435	2,481,018	5.8	3,594,122	1,804,418	18.7	22,382,845	19,149,900	53.1	17,655,856	14,777,018	19.0
Kansas	182,912	161,056	.6	1,665,308	1,356,035	1.7	24,029,629	16,950,802	31.2	12,900,208	9,966,100	24.7
Kentucky	7,086,646	4,958,223	8.0	6,085,833	4,732,833	8.3	25,522,703	20,038,479	10.3	19,603,683	16,235,757	11.9
Louisiana	75,828	45,914		23,935,715	19,796,740	13.7	82,629,951	63,595,865	39.8	23,490,282	17,885,084	22.0
Maine	633,400	316,700		1,579,700	1,162,267	2.0	13,527,784	11,775,387	13.4	6,501,861	4,476,518	5.4
Maryland	4,427,000	2,564,000	4.7	27,979,848	21,090,016	19.0	37,116,159	29,425,582	26.6	19,450,651	13,602,629	19.0
Massachusetts	11,041,066	9,682,142	.4	33,491,077	20,994,973	21.7	134,227,452	96,504,012	50.7	52,810,406	36,702,495	25.0
Michigan	12,556,471	6,247,736	9.7	7,113,950	5,234,932	3.5	67,866,573	47,143,723	22.4	35,656,027	20,951,549	29.9
Minnesota	10,774,720	9,786,266	.9	6,255,270	4,274,949	9.4	168,718,134	103,315,184	70.8	14,085,880	10,402,199	14.4
Mississippi	9,006,422	7,024,367	19.7	1,686,060	1,296,440	8.2	29,823,123	23,037,857	46.7	4,667,021	3,054,153	12.5
Missouri	5,855,290	4,219,586	6.3	3,824,784	2,908,790	3.2	57,613,278	43,323,952	44.6	41,835,109	31,684,976	42.9
Montana	860,936	679,984	.7	2,521,311	1,636,481	3.9	9,731,578	7,741,338	19.9	5,277,756	4,337,803	2.4
Nebraska	541,436	328,518	1.7	3,764,310	3,438,622	4.4	17,919,648	15,153,497	3.6	742,850	547,063	1.2
Nevada	29,156	23,465		131,282	109,409	.9	25,901,967	24,545,659	.4	10,020	8,336	.1
New Hampshire	2,275,458	1,937,729	1.5	1,301,006	1,163,147	1.0	2,872,791	2,018,128	3.5	2,265,379	1,638,117	4.7
New Jersey	30,171,830	23,636,377	20.5	10,935,074	9,170,999	3.1	139,637,523	102,857,752	50.8	11,387,005	7,091,425	36.0
New Mexico	1,501,084	1,313,532	2.8	81,622	61,245	.1	19,330,822	16,871,403	9.7	4,130,183	3,277,012	4.1
New York	26,136,586	21,668,773	11.4	55,906,719	41,658,183	24.3	464,800,492	333,621,850	131.0	201,846,827	128,382,640	87.3

North Carolina	2,921,858	1,730,398	8.8	1,947,063	978,001	7.4	8,821,275	6,042,060	16.8	7,327,941	3,976,592	12.6
North Dakota	22,498	11,249	----------	729,450	371,013	2.3	861,616	589,165	3.9	1,067,424	672,505	3.0
Ohio	2,510,530	2,260,167	.6	21,260,886	16,972,599	8.1	120,467,610	87,580,812	43.2	110,698,668	86,532,995	37.1
Oklahoma	3,836,100	2,301,162	13.2	3,996,238	2,153,744	9.3	14,046,463	11,201,258	17.1	10,694,628	8,729,155	11.6
Oregon	1,565,280	1,112,948	1.2	6,650,445	5,796,500	7.8	38,872,097	33,330,101	13.5	4,321,879	2,973,627	9.5
Pennsylvania	27,724,712	19,138,072	11.4	38,838,605	25,356,907	24.2	93,539,538	69,219,250	53.7	109,509,027	81,455,558	79.5
Rhode Island	2,009,000	1,561,700	----------	346,900	312,210	----------	33,893,501	24,673,119	19.6	10,396,191	7,376,835	24.2
South Carolina	5,840,962	4,415,592	17.9	1,530,607	1,149,285	5.1	9,281,986	5,549,395	11.2	8,271,972	5,161,295	15.4
South Dakota	4,659,451	3,804,882	6.6	795,651	442,449	.8	10,000,807	7,856,952	16.5	3,456,012	1,920,931	7.9
Tennessee	7,513,450	5,789,581	4.5	6,014,476	4,742,089	5.5	91,406,375	73,065,351	27.5	12,966,769	8,078,395	20.6
Texas	26,859,500	22,736,650	30.4	10,858,600	8,740,950	28.5	153,308,366	123,452,158	137.8	62,194,524	44,724,856	153.4
Utah	4,341,100	4,028,786	3.7	1,297,162	1,222,312	3.2	22,802,501	21,028,222	9.4	4,745,470	4,130,485	5.9
Vermont	44,250	22,125	.1	----------	----------	----------	9,101,617	7,762,077	4.3	315,066	276,265	.3
Virginia	3,848,000	1,938,400	8.9	2,915,140	1,775,734	4.6	23,453,680	19,224,063	12.5	9,211,910	5,971,129	13.8
Washington	4,604,105	3,466,680	1.5	6,171,721	5,053,476	5.1	35,964,184	28,954,628	21.0	35,812,234	29,946,995	14.5
West Virginia	22,381,329	17,488,996	9.8	265,349	132,675	.3	18,386,135	12,771,507	7.5	4,498,794	2,273,907	10.8
Wisconsin	11,354,833	10,209,525	3.0	4,219,938	2,864,183	3.8	47,848,653	33,095,644	15.1	9,468,579	6,352,095	17.6
Wyoming	297,833	253,560	1.2	597,040	512,840	1.9	2,605,134	2,098,757	5.0	4,010,005	3,530,441	5.1
District of Columbia	28,320,651	23,163,911	6.2	7,505,550	5,226,892	.4	64,115,369	47,066,490	13.3	13,729,667	8,066,247	12.1
Puerto Rico	8,494,580	4,159,290	5.6	----------	----------	----------	11,789,761	5,660,384	4.5	6,312,227	3,131,065	7.0
Total	449,812,107	334,897,601	359.2	440,844,275	327,608,371	407.6	3,086,421,982	2,234,801,149	1,493.3	1,258,685,087	870,562,101	1,094.9

[1] Includes projects in urban areas financed from Federal-aid primary, secondary, urban, "D" and Interstate funds. [2] Initial commitment of funds.

Table 16.—Funds authorized by secs. 2(a) and 2(e) ("D" and "L" funds, respectively) of the 1958 act: Projects completed during the fiscal year ended June 30, 1960, by State

State or territory	Completed during fiscal year			
	Total cost	Federal funds		Miles
		"D" funds	"L" funds	
Alabama	$7,593,275	$5,043,703	$1,517,404	131.3
Alaska	4,991,882	3,676,645	233,516	104.2
Arizona	3,311,799	2,681,955	360,310	46.8
Arkansas	4,422,379	2,866,845	878,593	165.1
California	28,076,749	16,840,323	4,034,088	101.0
Colorado	5,476,714	3,532,327	902,973	109.4
Connecticut	5,099,563	2,973,882	933,556	25.9
Delaware	2,345,000	1,562,285	479,145	19.6
Florida	4,979,567	3,296,553	971,742	32.0
Georgia	12,955,471	8,624,373	2,661,656	276.3
Hawaii	2,157,168	1,403,868	467,956	5.1
Idaho	4,657,876	3,364,625	733,983	120.2
Illinois	21,600,272	13,986,499	3,839,254	394.2
Indiana	11,282,568	7,337,328	2,388,046	172.7
Iowa	4,975,874	3,005,777	877,615	180.9
Kansas	6,264,767	4,098,491	1,264,223	246.9
Kentucky	7,705,465	5,049,820	1,529,743	93.7
Louisiana	8,883,447	5,613,977	1,780,545	161.9
Maine	3,934,414	2,508,801	765,850	40.0
Maryland	7,230,387	4,394,431	1,357,629	24.7
Massachusetts	9,577,489	6,281,255	1,802,231	28.5
Michigan	15,635,656	9,963,353	178,867	199.8
Minnesota	10,074,339	5,979,057	224,152	221.1
Mississippi	8,868,733	5,421,907	18,000	245.9
Missouri	7,274,685	4,760,026	1,485,160	91.3
Montana	7,307,659	4,969,564	1,250,662	198.7
Nebraska	8,934,197	5,815,927	1,784,729	174.8
Nevada	2,439,748	1,952,125	135,497	50.3
New Hampshire	2,378,490	1,462,934		8.8
New Jersey	11,439,760	7,485,532	2,303,432	37.9
New Mexico	3,587,695	2,696,142	556,131	51.2
New York	30,329,481	17,767,592	5,409,343	144.1
North Carolina	7,812,360	5,110,438	1,470,355	133.3
North Dakota	5,573,956	3,658,520	1,133,851	322.6
Ohio	14,055,825	9,100,803	2,867,965	264.0
Oklahoma	1,789,287	1,189,235	367,332	29.3
Oregon	6,996,209	4,968,200	1,042,861	80.3
Pennsylvania	27,622,003	18,324,592	5,639,487	131.3
Rhode Island	2,220,944	1,475,806	450,050	22.8
South Carolina	5,055,256	3,052,936		188.2
South Dakota	3,520,939	2,467,583	439,601	179.9
Tennessee	5,860,132	3,840,424	1,190,918	141.1
Texas	20,171,050	12,149,420	3,744,872	399.3
Utah	2,125,989	1,664,298		29.1
Vermont	2,223,134	1,374,729	417,837	11.6
Virginia	7,392,728	4,270,509	1,330,646	99.0
Washington	4,975,410	3,366,676	925,995	58.7
West Virginia	4,304,531	2,751,571	811,716	46.8
Wisconsin	10,038,639	5,826,694	1,733,005	178.2
Wyoming	4,665,076	3,424,143	652,490	78.0
District of Columbia	2,299,467	1,215,015	347,226	3.8
Puerto Rico	4,386,153	2,762,074	853,324	14.1
Totals	418,881,657	268,411,588	68,545,502	6,315.7

Table 17.—Status of program authorized by secs. 2(a) and 2(e) ("D" and "L" funds, respectively) of the 1958 act as of June 30, 1960, by program and by State

State or territory	Primary			Secondary			Urban			Total			
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds		Miles
											"D" funds	"L" funds	
Alabama	$9,332,540	$8,095,085	178.2	$2,342.958	$2,044,176	73.2	$493,800	$438,929	8.9	$12,169,298	$8,081,616	$2,496,574	260.3
Alaska	3,294,646	2,189.407	59.1	3,870.932	3,422,534	66.8	1,053.869	948,482	3.2	8,219.447	6,178,599	381,824	129.1
Arizona	1,485,195	1,374,794	11.5	4,045,500	3,686,252	63.1	473,213	427,546	2.2	6,003,908	4,806,198	682,394	76.8
Arkansas	3,542,153	3,042,387	141.3	5,512,383	4,575,361	202.3	92,794	79,803	3.2	9,147,330	5,880,738	1,816,813	346.8
California	21,031,503	16,395,768	64.7	8,538,895	5,559,720	130.2	6,782,822	5,407,037	7.7	36,353,220	22,073,488	5,289,037	202.6
Colorado	7,707,797	6,361,230	165.9	1,131,102	917,229	24.9	646,398	556,814	5.0	9,485,297	6,259,199	1,576,074	195.8
Connecticut	4,596,601	3,502,495	28.6	1,532,682	1,280,353	7.1	147,879	104,046	.7	6,277,162	3,733,466	1,153,428	36.4
Delaware	1,404,000	1,248,000	14.9	1,157,000	985,430	7.4	----------	----------	-------	2,561,000	1,706,285	527,145	22.3
Florida	7,718,477	6,785,593	122.7	2,095,159	1,729,989	181.9	57,059	50,719	2.7	9,870,695	6,544,442	2,021,859	307.3
Georgia	9,713,445	8,403,965	209.1	5,353,139	2,971,548	69.7	631,071	560,952	12.0	13,697,655	9,119,163	2,817,302	290.8
Hawaii	2,849,494	2,406,145	13.2	----------	----------	-------	----------	----------	-------	2,849,494	1,838,235	567,910	13.2
Idaho	1,318,725	1,102,930	42.3	4,120,887	3,673,345	123.6	----------	----------	-------	5,439,612	3,936,209	840,066	165.9
Illinois	18,147,174	15,999,682	358.0	8,157,088	5,615,884	206.0	1,138,235	1,008,594	3.6	27,442,497	17,803,047	4,821,113	567.6
Indiana	12,719,022	11,097,578	194.7	1,871,550	1,393,183	55.7	----------	----------	-------	14,590,572	9,542,632	2,948,129	250.4
Iowa	7,977,305	6,617,979	145.7	4,891,992	3,931,251	253.1	689,418	606,952	3.2	13,558,715	8,523,047	2,633,135	402.0
Kansas	6,656,173	5,663,100	136.2	4,798,810	4,129,405	342.7	1,051,619	840,430	3.4	12,506,602	8,123,299	2,509,636	482.3
Kentucky	4,824,188	4,092,281	22.8	6,044,777	5,252,034	93.2	----------	----------	-------	10,868,965	7,138,825	2,205,490	116.0
Louisiana	3,197,441	2,842,130	50.2	6,734,709	5,411,262	149.4	----------	----------	-------	9,932,150	6,205,387	1,948,005	199.6
Maine	4,110,745	3,428,435	50.7	534,784	466,676	4.7	----------	----------	-------	4,645,529	2,975,768	919,343	55.4
Maryland	6,830,387	5,361,560	24.7	----------	----------	-------	400,000	390,500	-------	7,230,387	4,394,431	1,357,629	24.7
Massachusetts	9,578,434	7,556,137	29.5	287,624	253,586	.6	2,194,783	1,899,561	3.2	12,060,841	7,417,652	2,291,632	33.3
Michigan	9,353,558	5,948,152	131.7	6,446,924	4,341,697	223.7	5,844,309	3,770,848	20.4	21,644,791	13,857,433	203,264	375.8
Minnesota	7,365,963	4,617,343	126.9	6,038,727	3,608,081	363.6	2,724,675	1,712,271	7.1	16,129,365	9,544,381	393,314	497.6
Mississippi	----------	----------	-------	10,392,380	6,392,195	296.2	----------	----------	-------	10,392,380	6,374,195	18,000	296.2
Missouri	11,466,058	9,786,530	110.2	5,249,699	4,665,628	298.7	----------	----------	-------	16,715,757	11,041,091	3,411,067	408.9
Montana	5,892,507	4,970,015	146.1	3,295,356	2,950,308	121.7	----------	----------	-------	9,187,863	6,325,284	1,595,039	267.8
Nebraska	6,881,835	5,809,768	135.3	3,291,964	2,866,844	76.8	----------	----------	-------	10,173,799	6,628,717	2,047,895	212.1
Nevada	3,901,893	3,737,602	69.4	658,836	390,558	31.4	----------	----------	-------	4,560,729	3,839,673	288,487	100.8
New Hampshire	1,552,426	907,828	9.4	978,247	652,164	.8	356,832	237,888	3.3	2,887,505	1,797,880	----------	13.5
New Jersey	8,365,131	7,238,325	24.7	951,730	628,260	3.5	2,274,817	2,022,059	11.3	11,591,678	7,585,212	2,303,432	39.5
New Mexico	1,976,844	1,813,241	23.4	5,026,102	4,407,516	83.2	----------	----------	-------	7,002,946	5,170,877	1,049,880	106.6
New York	24,571,184	19,736,245	160.3	7,595,517	5,993,862	45.5	11,104,564	7,994,965	11.7	43,271,265	25,765,119	7,959,953	217.5

North Carolina	11,625,791	10,135,962	303.5	2,270,160	1,946,332	35.3	591,329	431,463	3.3	14,487,280	9,560,200	2,953,557	342.1
North Dakota	2,377,088	2,104,833	123.1	4,493,902	3,800,165	269.8				6,870,990	4,511,272	1,393,726	392.9
Ohio	9,930,092	8,370,976	398.3	12,227,078	9,833,114	269.2	3,127,794	2,577,185	60.4	25,284,964	15,876,379	4,904,896	727.9
Oklahoma	6,017,274	4,953,286	57.6	3,449,060	2,975,400	116.8	2,436,991	2,108,368	6.3	11,903,325	7,668,061	2,368,993	180.7
Oregon	3,645,819	3,275,578	30.9	3,034,360	2,588,372	88.5	1,602,869	1,276,163	5.5	8,283,048	5,898,916	1,241,197	124.9
Pennsylvania	21,473,361	18,637,143	99.4	6,789,955	6,007,717	38.6	697,415	509,200	1.1	28,960,731	19,217,078	5,936,982	139.1
Rhode Island	2,214,140	1,917,240	43.1	1,124,729	978,426	5.7				3,338,869	2,219,046	676,620	48.8
South Carolina	4,936,784	2,963,988	129.3	3,296,324	1,984,312	152.0	457,240	118,572	1.0	8,690,348	5,066,872		282 3
South Dakota	4,488,862	3,935,506	182.7	2,635,205	1,970,850	220.0				7,124,067	4,880,326	1,026,030	402.7
Tennessee	7,803,268	6,533,569	121.7	4,456,782	3,961,584	176.0	408,870	363,440	8.1	12,668,920	8,295,696	2,562,897	305.8
Texas	25,252,276	21,255,692	670.1	10,566,844	8,037,800	345.2	3,017,634	2,559,400	12.1	38,836,754	24,334,820	7,518,072	1,027.4
Utah	3,616,514	2,860,859	48.6	748,866	582,105	19.4	453,930	355,074	4.5	4,819,310	3,798,038		72.5
Vermont	2,159,085	1,748,734	15.7	492,749	419,682	6.7				2,651,834	1,656,616	511,800	22.4
Virginia	5,073,979	3,903,473	197.7	7,383,799	5,817,205	265.1	454,695	303,128	2.5	12,912,473	7,657,939	2,365,867	465.3
Washington	6,042,261	5,306,787	116.2	3,697,817	2,897,329	152.0	37,647	32,377	1.3	9,777,725	6,562,235	1,674,258	269.5
West Virginia	925,534	819,208	23.8	5,120,023	4,377,562	128.1	626,000	463,705	.6	6,671,557	4,324,463	1,336,012	152.5
Wisconsin	7,616,384	5,598,038	170.8	5,794,528	4,625,267	144.0	2,084,003	1,686,038	4.8	15,494,915	9,098,443	2,810,900	319.6
Wyoming	5,272,994	4,635,262	97.0							5,272,994	3,886,714	748,548	97.0
District of Columbia	2,484,347	2,108,480	3.2	1,555,926	992,358	3.8				4,040,273	2,368,963	731,875	7.0
Puerto Rico	1,551,560	1,323,335	7.4				2,894,045	2,340,090	6.7	4,445,605	2,798,766	864,659	14.1
Total	363,870,257	300,519,679	5,841.5	200,085,560	157,991,911	6,036.9	57,048,619	44,182,599	231.0	621,004,436	399,992,431	102,701,758	12,109.4

Table 18.—Mileage of designated Federal-aid highway systems, by State as of Dec. 31, 1959

State or territory	National System of Interstate and Defense Highways			Federal-aid primary highway system [1]			Federal-aid secondary highway system		
	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban
	Miles	*Miles*	*Miles*	*Miles*	*Miles*	*Miles*	*Miles*	*Miles*	*Miles*
Alabama	873	775	98	6,304	5,632	672	20,722	20,292	430
Alaska				2,200	[2] 2,181	19	3,225	3,207	18
Arizona	1,162	1,129	33	2,771	2,687	84	3,943	3,784	159
Arkansas	523	482	41	3,920	3,669	251	14,334	14,127	207
California	2,182	1,625	557	9,394	8,028	1,366	11,219	10,514	705
Colorado	963	905	58	4,263	4,083	180	4,097	4,026	71
Connecticut	297	166	131	1,281	876	405	1,144	986	158
Delaware	40	36	4	585	537	48	1,416	1,400	16
Florida	1,142	1,017	125	5,385	4,845	540	13,097	12,799	298
Georgia	1,110	968	142	8,775	8,088	687	14,062	13,777	285
Hawaii				533	495	38	649	639	10
Idaho	611	595	16	3,219	3,140	79	5,285	5,243	42
Illinois	1,608	1,394	214	10,736	9,497	1,239	13,730	13,471	259
Indiana	1,105	988	117	6,008	5,253	755	16,253	16,031	222
Iowa	711	658	53	10,280	9,701	579	33,065	32,821	244
Kansas	803	692	111	7,803	7,363	440	23,491	23,336	155
Kentucky	696	638	58	4,548	4,239	309	15,239	15,079	160
Louisiana	680	588	92	3,321	2,945	376	7,742	7,599	143
Maine	311	291	20	1,930	1,793	137	2,297	2,241	56
Maryland	354	217	137	2,300	1,855	445	6,759	6,465	294
Massachusetts	462	272	190	2,310	1,509	831	2,175	1,643	532
Michigan	1,074	941	133	7,578	6,894	684	24,937	24,647	290
Minnesota	893	765	128	8,811	8,130	681	30,417	30,193	224
Mississippi	672	608	64	5,789	5,562	227	13,720	13,530	190
Missouri	1,100	977	123	9,294	8,761	533	23,219	23,109	110
Montana	1,180	1,168	12	6,233	6,137	96	5,153	5,130	23
Nebraska	489	479	10	5,793	5,646	147	17,539	17,502	37
Nevada	534	524	10	2,200	2,165	35	2,678	2,665	13
New Hampshire	213	195	18	1,208	1,092	116	1,611	1,560	51
New Jersey	372	212	160	2,093	1,296	797	2,095	1,565	530
New Mexico	1,003	978	25	4,029	3,839	190	5,473	5,423	50
New York	1,227	817	410	10,555	8,366	2,189	19,285	17,708	1,577

North Carolina	773	731	42	7,035	6,583	452	25,712	25,411	301
North Dakota	570	560	10	4,100	4,033	67	13,387	13,367	20
Ohio	1,489	1,265	224	9,506	8,330	1,176	17,827	17,283	544
Oklahoma	796	720	76	8,258	7,800	458	12,605	12,443	162
Oregon	731	679	52	4,028	3,806	222	7,599	7,521	78
Pennsylvania	1,528	1,285	243	8,447	7,103	1,344	13,418	12,350	1,068
Rhode Island	71	32	39	524	284	240	450	309	141
South Carolina	679	662	17	5,386	5,068	318	16,279	16,112	167
South Dakota	679	670	9	6,075	5,983	92	12,352	12,330	22
Tennessee	1,047	927	120	5,582	5,208	374	10,446	10,385	61
Texas	3,029	2,538	491	17,310	15,630	1,680	31,757	31,214	543
Utah	922	879	43	2,277	2,192	85	3,696	3,625	71
Vermont	321	309	12	1,574	1,494	80	1,828	1,805	23
Virginia	1,067	971	96	5,573	5,093	480	18,428	18,224	204
Washington	727	596	131	4,002	3,677	325	10,749	10,494	255
West Virginia	395	375	20	2,771	2,563	208	10,726	10,629	97
Wisconsin	452	420	32	6,367	5,876	491	18,860	18,500	360
Wyoming	915	901	14	3,621	3,565	56	2,314	2,303	11
District of Columbia	33		33	142		142	92		92
Puerto Rico				551	413	138	1,090	1,040	50
Total	[3] 40,614	35,620	4,994	264,608	241,005	23,603	589,686	577,857	11,829

[1] Figures include the mileage of the Interstate system.
[2] Alaska includes 346 miles of ferry routes.
[3] 386 miles within the 41,000-mile limitation are not assigned to routes, and are held in reserve for adjustments of route lengths as final locations are selected and projects built.

Table 19.—Status of national forest highway projects as of June 30, 1960, and projects completed during the fiscal year [1]

State or territory	Programed,[2] construction not yet authorized			Construction authorized, not started			Under construction			Completed during fiscal year		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama				$386,400	$386,400	6.5						
Alaska	$4,935,000	$3,785,000	30.7	1,386,435	1,386,435	6.1	$2,800,500	$2,235,500	16.8	$1,764,240	$1,247,257	8.7
Arizona	965,000	965,000	22.8	563,064	563,064	13.7	1,689,264	1,689,264	33.5	1,364,124	1,364,124	28.1
Arkansas				1,042,982	521,491	16.6	1,348,040	674,020	23.8	368,170	184,085	9.0
California	5,569,000	5,569,000	54.5	2,991,000	2,991,000	9.9	2,946,000	2,876,000	18.4	2,369,367	2,369,367	32.7
Colorado	2,700,000	2,700,000	29.3	1,332,000	1,332,000	41.9	2,276,000	2,276,000	23.8	1,523,000	1,523,000	12.9
Connecticut												
Delaware												
Florida										1,234,030	616,893	27.3
Georgia							194,576	194,576	1.9	470,993	231,553	5.5
Hawaii												
Idaho	4,247,000	4,247,000	76.5	56,250	56,250	15.8	4,318,010	4,318,010	66.5	1,068,994	1,068,994	28.4
Illinois							72,000	36,000	.8	286,100	143,050	3.3
Indiana				88,670	44,335							
Iowa												
Kansas												
Kentucky				196,434	196,434	5.2						
Louisiana										404,820	202,410	8.6
Maine										25,542	25,542	4.0
Maryland												
Massachusetts												
Michigan	727,500	603,750	36.7	271,100	135,550	4.5				976,712	656,254	21.3
Minnesota	340,000	340,000	5.0	431,772	427,258	11.3	473,085	463,038	8.4	161,334	139,848	5.9
Mississippi				632,204	632,204	10.0						
Missouri	51,701	51,701	4.3	106,168	106,168	9.3				245,588	245,588	.8
Montana	2,370,000	2,370,000	53.1	1,825,000	1,825,000	28.9	2,246,000	2,246,000	59.3	1,870,050	1,840,048	48.9
Nebraska							103,105	103,105	3.1			
Nevada	850,000	650,000	6.0				430,000	430,000	12.3	1,131,655	1,131,655	12.3
New Hampshire							232,364	232,364	7.1	302,054	302,054	2.5
New Jersey												
New Mexico	1,603,400	1,603,400	37.3	11,600	11,600	8.2	1,164,000	1,164,000	13.6	1,221,623	1,221,623	39.6
New York												

North Carolina	600,000	300,000	4.6							618,459	309,229	3.4
North Dakota				54,937	54,937	1.4						
Ohio							24,000	24,000				
Oklahoma												
Oregon	4,607,500	4,107,500	58.1	1,562,000	1,562,000	13.7	6,831,590	6,380,500	82.6	2,213,779	2,213,779	56.4
Pennsylvania				491,000	245,500	3.0						
Rhode Island												
South Carolina	33,000	16,000		176,000	89,300	10.6	270,200	149,000	17.1	490,094	225,227	32.0
South Dakota	200,000	200,000	2.9				324,000	324,000	2.7			
Tennessee	228,000	114,000	3.3							716,674	358,337	5.0
Texas							235,600	117,800	4.5	441,267	220,300	17.3
Utah	990,000	990,000	8.0	75,600	75,600	5.5	1,336,000	1,336,000	16.0	360,186	360,186	13.7
Vermont	58,204	58,204	2.0				75,601	75,301	1.0	93,212	93,212	.8
Virginia	217,950	215,450	6.5	500,842	356,221	9.7	500	500		251,029	240,023	8.5
Washington	2,338,750	2,338,750	23.0	538,000	538,000	5.9	2,374,000	2,374,000	14.5	2,263,712	2,263,712	23.7
West Virginia	139,790	139,790	3.7	351,700	351,700	6.9				116,522	76,260	5.8
Wisconsin				322,659	322,659	5.9				285,460	285,460	6.6
Wyoming	1,540,000	1,540,000	27.2				1,188,000	1,188,000	26.6	1,459,632	1,459,632	7.2
District of Columbia												
Puerto Rico										69,279	69,279	.4
Total	35,311,795	32,904,545	495.5	15,393,817	14,211,106	250.5	[2]32,952,435	30,906,978	454.3	26,167,701	22,687,981	480.6

[1] Includes construction projects only. [2] Initial commitment of funds.

Table 20.—Mileage of the national forest highway system, by forest road class and by State, as of June 30, 1960

Region and State or territory	Total	Class 1 [1]	Class 2 [2]	Class 3 [3]
West:				
Alaska	446.2	166.4	245.0	34.8
Arizona	1,059.6	325.8	668.1	65.7
California	2,463.8	1,069.1	837.5	557.2
Colorado	1,486.1	572.8	539.2	374.1
Idaho	1,216.1	658.6	440.5	117.0
Montana	1,207.4	673.8	257.4	276.2
Nevada	368.9	155.0	164.2	49.7
New Mexico	642.3	131.2	431.7	79.4
Oregon	1,443.3	688.6	718.2	36.5
South Dakota	300.2	187.1	101.1	12.0
Utah	732.1	224.2	270.8	237.1
Washington	739.2	480.5	206.2	52.5
Wyoming	470.5	344.4	107.6	18.5
Total	12,575.7	5,677.5	4,987.5	1,910.7
East:				
Alabama	374.4	82.3	258.6	33.5
Arkansas	633.3	96.7	536.6	
Florida	289.8	32.7	248.8	8.3
Georgia	366.7	168.5	169.9	28.3
Illinois	306.2	241.3	45.7	19.2
Indiana	101.2	53.6	47.6	
Iowa	20.0	11.3	8.3	.4
Kentucky	351.4	131.1	211.2	9.1
Louisiana	402.1	53.3	171.6	177.2
Maine	14.0			14.0
Michigan	1,163.2	590.4	555.0	17.8
Minnesota	703.8	311.6	365.4	26.8
Mississippi	547.3	323.9	208.4	15.0
Missouri	978.7	370.7	590.0	18.0
Nebraska	23.5		23.5	
New Hampshire	158.0	61.9	39.6	56.5
North Carolina	830.0	358.0	430.7	41.3
Ohio	133.6	70.4	53.7	9.5
Oklahoma	61.7	45.1	16.6	
Pennsylvania	353.9	118.4	85.9	149.6
South Carolina	774.9	238.2	467.0	69.7
Tennessee	568.7	179.8	329.5	59.4
Texas	355.4	128.3	195.4	31.7
Vermont	119.1	32.7	61.9	24.5
Virginia	1,409.7	379.0	928.4	102.3
West Virginia	495.4	78.4	376.0	41.0
Wisconsin	469.1	75.7	371.5	21.9
Puerto Rico	42.5		42.5	
Total	12,047.6	4,233.3	6,839.3	975.0
Grand total	24,623.3	9,910.8	11,826.8	2,885.7

[1] Forest roads which are on the Federal-aid primary system.
[2] Forest roads which are on the Federal-aid secondary system.
[3] Other forest highways.

Table 21.—Mileage of highway construction in national parks, monuments, and parkways under the direct supervision of the Bureau of Public Roads during fiscal year 1960

Park, monument, or parkway (and State)	Completed during fiscal year	Under construction as of June 30, 1960
	Miles	*Miles*
Badlands (S. Dak.)	10.3	
Big Bend (Texas)	3.4	
Blue Ridge (Va.-N.C.)	60.5	76.6
Colonial Parkway (Va.)		1.8
Foothills (Tenn.)		15.6
George Washington Memorial (Md.-Va.)	9.1	7.0
Glacier (Mont.)		2.0
Grand Canyon (Ariz.)		19.7
Grand Teton (Wyo.)		4.2
Great Smoky Mountains (N.C.-Tenn.)	3.4	21.5
Lassen Volcanic (Calif.)	13.7	
Mammoth Cave (Ky.)		15.3
Mesa Verde (Colo.)	5.3	
Mount McKinley (Alaska)	13.9	22.6
Mount Rainier (Wash.)		3.2
Natchez Trace (Ala.-Miss.-Tenn.)	73.9	94.9
National Capital (D.C.)	0.3	
Olympic (Wash.)	0.1	6.3
Petrified Forest (Ariz.)		5.8
Rocky Mountain (Colo.)	2.5	1.5
Shenandoah (Va.)	0.4	0.4
Theodore Roosevelt (N. Dak.)	6.9	
Vicksburg (Miss.)	1.6	
Yellowstone (Wyo.)		9.5
Yosemite (Calif.)	16.7	20.2
Zion (Utah)	1.5	
Total	223.5	328.1

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