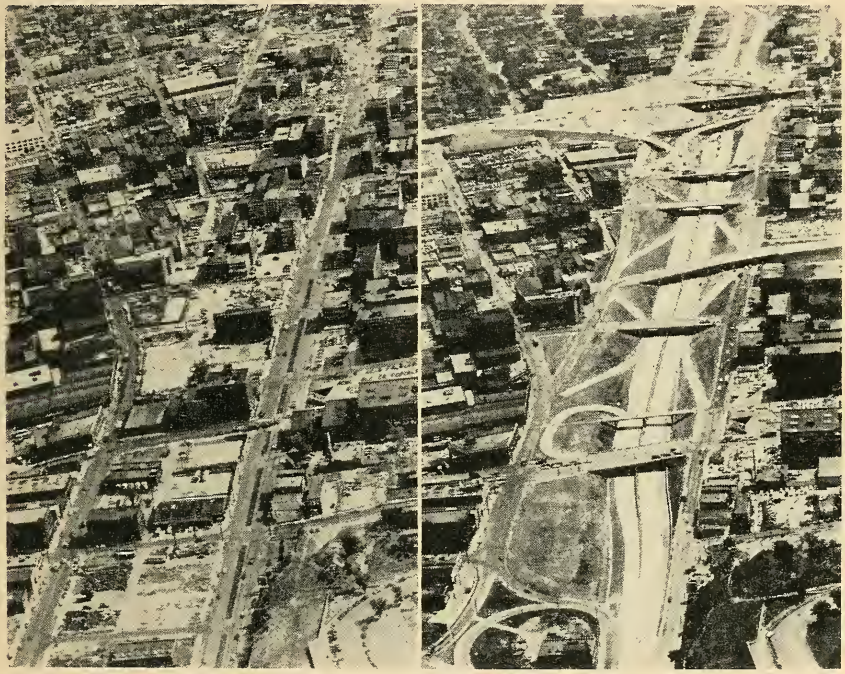
ANNUAL REPORT

Bureau of Public Roads

FISCAL YEAR 1958



A block-wide stretch of old buildings gave way for the Sixth Street Trafficway in Kansas City, Mo., as seen in these before and after pictures. The frontage streets and overpasses latticing this Interstate freeway give full service to local traffic.

U. S. DEPARTMENT OF COMMERCE

December 1958

U. S. DEPARTMENT OF COMMERCE

LEWIS L. STRAUSS, Secretary

BUREAU OF PUBLIC ROADS

WILLIAM D. TALLAMY, Administrator
ELLIS L. ARMSTRONG, Commissioner

Annual Report, Fiscal Year 1958

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ANNUAL REPORT OF THE BUREAU OF PUBLIC ROADS

Summary Review of the Fiscal Year

THE fiscal year 1958[1] saw the greatly expanded, long-range highway construction program launched by the Federal-Aid Highway Act of 1956 reach full stride.

The need was great: motor-vehicle registrations were forecast to reach 68.4 million in the calendar year 1958, 2 percent more than in the preceding year. An increase of about 2 percent was also forecast for travel on all roads and streets in the calendar year 1958.

Expenditures on all roads and streets, by all levels of government, for construction and appurtenant engineering and right-of-way costs were estimated at $5.66 billion in the calendar year 1957 and it was anticipated that they would reach $6.20 billion in calendar year 1958.

Interstate System expressways were being planned and built all across the Nation, on vital cross-country routes and in nearly all large cities. Construction was under way on many other major highways and streets, and rapid improvement of secondary roads continued.

The Federal-aid program was setting the pace. The Bureau of Public Roads had set a fiscal year goal of $2.550 billion in Federal-aid obligations for engineering work, right-of-way acquisition, and construction. Actual obligations of the year totaled $2.749 billion, as compared with $2.223 billion obligated in the previous fiscal year.

Federal-aid operations of the year were supported largely with funds authorized by the Federal-Aid Highway Act of 1956, although minor balances from previous authorizations were also being used. On August 1, 1957, Federal-aid funds for the fiscal year 1959, authorized by the 1956 act and amounting to $2.875 billion, were apportioned to the States. An additional $600 million authorized by the Federal-Aid Highway Act of 1958 was apportioned on April 16, 1958. The total of Federal aid apportioned to the States since passage of the Federal-Aid Highway Act of 1956 was thus brought to $7.150 billion.

Accomplishments of the year

Projects for the construction of 35,698 miles of improvements were programed during the year in the Federal-aid and Federal highway programs. Contracts were awarded during the year for improvements to 25,912 miles of roads and streets. Construction put in place during the year involved $1.656 billion of Federal funds, an increase of 60 percent over the previous year.

Completions of all classes of Federal-aid and Federal projects during the fiscal year provided improvements on 24,204 miles of roads and streets. Included were 23,137 miles of highways and 4,583 bridges on the Federal-aid systems and 1,067 miles of roads in national forests, parks, and parkways, and on flood-relief projects.

Hazards at railway-highway crossings were removed during the year by elimination of 272 grade crossings, reconstruction of 29 inadequate grade-

[1] The fiscal year extended from July 1, 1957, through June 30, 1958.

separation structures, and protection of 383 crossings by installation of flashing lights or other safety devices.

The linear mileage of highway improvements completed is not a full measure of the facilities provided for traffic, since most of the Interstate and some of the other Federal-aid construction were 4 or more lanes wide. The 23,137 miles of Federal-aid projects completed during the year included 2,177 miles of 4-lane highways and 98 miles having 6 lanes or more. Thus the year's Federal-aid project completions provided the equivalent of 51,018 miles of single-lane construction.

At the year's end, in the Federal-aid program, construction was under way or plans had been approved for improvements on 33,421 miles of highways and streets. Included were construction of 9,846 bridges and elimination or protection of 1,130 railway-highway crossings. The estimated cost of this work was $6.6 billion, of which $4.5 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 under way on 1,842 miles, at a total estimated cost of $143 million including $127 million of Federal funds.

The Interstate System

The Federal-aid primary, secondary, and urban highway improvement programs progressed on a larger scale than ever before, but the attention of the public was riveted on the Interstate System. Thousands of people were directly concerned, as hearings on choices of location were held and property for right-of-way was bought. The State highway departments cooperated closely with local officials and planning bodies in selecting locations in the best overall public interest.

As sections of the Interstate System were opened to traffic here and there, more and more of the public was becoming fully aware of the benefits of controlled access and grade-separated cross traffic—reduced travel time, greater comfort and safety, savings in vehicle operating costs, industrial and residential development. During the fiscal year 696 miles of pavement were completed on the Interstate System, but far more was accomplished in surveys and plans, right-of-way acquisition, and grading and drainage construction. At the end of the year $3.6 billion worth of work was under way or scheduled to start soon.

Two major reports relating to the Interstate System were presented to the Congress during the year. One of these, an estimate of the cost of completing the system, involved a detailed survey by the States and Public Roads of the 38,548 miles of routes then included in the system. It was found 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 Federal-Aid Highway Act of 1954 and 1956 together with State matching funds.

The other report was prepared in connection with Congress' declaration of intent to determine whether or not the Federal Government should reimburse the States for toll and free highways on the Interstate System built between 1947 and 1957. It was found that 10,859 miles of the system met the criteria for consideration for reimbursement. Construction of these facilities, which included 1,950 miles of toll roads, had cost $6.09 billion.

The Federal-Aid Highway Act of 1958

A notable event of the year was the passage of the Federal-Aid Highway Act of 1958. Following traditional practice, it authorized Federal-aid primary,

secondary, and urban funds, and funds for construction in Federal lands, for two fiscal years, 1960 and 1961.

The act also increased the Interstate authorizations made in the 1956 act for the three fiscal years 1959–61, and set aside the "pay-as-you-go" clause in the 1956 act so as to permit apportionment of the full amounts authorized for the fiscal years 1959 and 1960. The new estimate of the cost of completing the system was approved as a basis for apportioning the 1960 Interstate funds, each State to receive a share of the total equivalent to its proportion of the total cost estimate. The act also provided for control of advertising along the Interstate System.

In addition, the new act, recognizing the value of highway construction in the Nation's anti-recession efforts, authorized $400 million for immediate apportionment to the States for primary, secondary, and urban work. These funds, to be matched on a two-thirds Federal, one-third State basis rather than the usual 50–50 ratio, were required to be placed under contract by December 1, 1958, with work scheduled for completion by December 1, 1959.

Highway trust fund

Under the Federal-Aid Highway Act of 1956, the Federal-aid program was planned to be financed on a pay-as-you-go basis from Federal highway-user excise taxes which go into a highway trust fund. Net income of the trust fund in the fiscal year was $2.04 billion; expenditures from the fund for Federal-aid highways amounted to $1.51 billion.

The $10-billion increase in the estimate of the cost of completing the Interstate System, and an imbalance between the long-range authorizations for Federal aid and the anticipated trust fund receipts, indicated that Interstate apportionments for some years subsequent to fiscal year 1960 would have to be smaller than the amounts authorized.

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 was spirited during the fiscal year, with an average of seven bidders per contract. Approximately 450 new contractors entered into bidding during the year. Awards for Federal-aid primary contracts approximated slightly better than two contracts per contractor.

During the fiscal year 7,920 Federal-aid construction contracts were awarded: 4,046 on the primary system, of which 34 percent were for Interstate System work, and 3,874 on the secondary system.

The upward trend in highway construction bid prices continued into the fiscal year 1958, reaching an all-time high point in the second quarter when the composite index was 14.2 percent above the low point in 1955 and 2.8 percent higher than the previous peak which occurred in 1953. A drop of 2.0 percent occurred in the third quarter of fiscal year 1958, but the next quarter showed a rise of 0.8 percent. The net decrease during the fiscal year was 0.8 percent. The minor fluctuations of the index in recent quarters appear to be signs of possible stabilization in bid prices.

Highway construction wage rates increased 6.6 percent on Federal-aid highway projects completed during the year, but as a result of continually improved productivity the cost of labor increased only 2.8 percent. The costs of highway construction materials rose 2.2 percent and equipment ownership costs increased 3.7 percent during the year. The weighted average increase of labor, materials, and equipment ownership costs was 2.8 percent, compared with an increase of 4.3 percent in the previous year.

Research

Public roads, in cooperation with the State highway departments and others, continued intensive studies in connection with three reports requested by the Congress. One of these involved explorations in the field of highway safety; the second, the allocation of highway cost responsibilities and benefits; the third, maximum desirable vehicle size and weight limitations.

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

All of these research studies are described in detail elsewhere in this report.

Other subjects of note

Shortages of materials, which had created difficulties in the previous year, presented no serious problem during the fiscal year 1958. The engineering manpower shortage also seemed to have been alleviated in most areas during the year, partly through increased use of engineering aids and technicians and of standardized plans and methods. Even more important has been the widespread adoption of modern techniques, in constantly expanding capability and variety, involving use of electronic computers, aerial photography, and other scientific developments.

For Public Roads and the highway field as a whole, the year was marked by the retirement on December 31, 1957, of Charles D. Curtiss, Commissioner of Public Roads since January 14, 1955, and a member of the Public Roads staff since 1919.

For those who have no acquaintance with the Federal-aid program, a brief recital of its development follows. Accomplishments of the year on the several Federal-aid systems and in the Federal lands highway programs are described individually in other sections of this report. Supporting statistics, both in summary and in detail, appear in the appendix tables.

Development of the Federal-Aid Program

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 three 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 important roads. Since 1944 Federal aid has also been extended to the urban portions of this system, and 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 Act of 1958, authorized a tremendously enlarged highway program which, in its entirety, will be the greatest peacetime construction program in history. While

extending at an increased rate the traditional aid for primary, secondary, and urban highway improvements, the 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 now often referred to as the ABC program. The 1956 and 1958 acts authorized $25.6 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 are apportioned among the States according to methods prescribed by law.

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.

As of December 31, 1957, the Federal-aid primary system totaled 256,333 miles in extent, including the 39,223 miles of the Interstate System for which locations had been determined. There were 553,339 miles in the Federal-aid secondary system. The urban portions of the primary and secondary systems totaled 32,235 miles.

New Legislation

The Federal-Aid Highway Act of 1958

With the signature of President Eisenhower on April 16, 1958, the Federal-Aid Highway Act of 1958 became law. The act combined several purposes of the Congress: providing regular biennial authorizations for the Federal-aid primary and secondary highway systems and their urban extensions (the so-called ABC program); assuring that the Interstate System program would continue at full speed, with apportionment of all of the funds authorized through 1960; and, through these means and by specially authorized funds, aiding in the Nation's anti-recession efforts. A summary of the provisions of the act follows:

The sums of $900 million for the fiscal year 1960 and $925 million for the fiscal year 1961 were authorized for continuance of the ABC program, in the usual ratio of 45 percent for the primary system, 30 percent for the secondary system, and 25 percent for their urban extensions. These funds are to be matched by the States on the traditional 50–50 basis.

The additional sum of $400 million was authorized for immediate apportionment among the States for the ABC program, without limitation as to the proportion used for primary, secondary, or urban work. The matching basis for these funds was changed from the usual 50–50 ratio to a ratio of two-thirds Federal, one-third State funds. Also authorized was $115 million of Federal funds, in the nature of an advance, to aid States in meeting up to two-thirds of their share. Funds thus advanced to the States are to be deducted in equal installments from apportionments for the fiscal years 1961 and 1962. In the use of these funds, contracts must be awarded or work begun before December 1, 1958, with completion of construction scheduled prior to December 1, 1959.

Authorizations for the Interstate System were increased for the fiscal year 1959 from $2.0 billion to $2.2 billion and, for each of the fiscal years 1960 and

1961, from $2.2 billion to $2.5 billion. Interstate funds are matched on a 90-percent Federal, 10-percent State basis. The estimate of the cost of completing the Interstate System, reported to Congress in January 1958, was approved by the act as a basis for apportioning the 1960 Interstate funds. (Shortly after the close of the fiscal year, Congress provided similar authority with respect to the 1961 funds.) Apportionment of full authorizations for Federal-aid highways for the fiscal years 1959 and 1960 was directed under the act, and was made possible by waiver, for those two years, of the "pay-as-you-go" clause in section 209 (g) of the Highway Revenue Act of 1956.

The act also authorized funds for the fiscal years 1960 and 1961 (and certain additional funds for fiscal year 1959) for national forest highways, national park roads and parkways, and other Federal domain roads.

Payment for the Federal share of the value of materials stockpiled in the vicinity of construction work is permitted under the new act. Another section provides that Federal reimbursement for utility relocation shall be made only when the State substantiates that it has paid such cost from its own funds.

Public hearings in connection with Interstate System projects in rural areas were provided for, enabling persons through or contiguous to whose property the highway will pass to express their views concerning the proposed location of the highway. Previous legislation had required hearings only for projects where a Federal-aid highway is proposed to bypass or go through an urban area.

The 1958 act provides for control of advertising along the Interstate System. The act states that, to promote the safety, convenience, and enjoyment of public travel and the free flow of interstate commerce, and to protect the public investment in the Interstate System, it is declared to be in the public interest to encourage and assist the States to control the use of and improve areas adjacent to the Interstate System by controlling outdoor advertising. It is declared to be a national policy that outdoor advertising within 660 feet of the right-of-way edge and visible from the main-traveled way of the Interstate System shall be regulated consistent with national standards developed by the Secretary of Commerce. This policy applies only to construction on right-of-way the entire width of which is acquired after July 1, 1956. States entering into agreements with the Secretary of Commerce, before July 1, 1961, to carry out the national policy on a statewide basis, would be entitled to an increase of one-half of 1 percent in the Federal share of Interstate System project costs. Such increase will come from the general fund, not from the highway trust fund. Federal participation is also authorized in the acquisition of advertising rights along the system.

The standards for outdoor advertising control required by the act to be prepared and promulgated by the Secretary of Commerce received the intensive consideration of the Bureau of Public Roads and of the Department of Commerce during the latter part of the fiscal year.

Codification of Federal highway laws

The Federal laws pertaining to highways are set forth in more than 40 separate enactments, beginning with the original Federal-Aid Road Act of 1916. Many of these enactments, at least in part, overlapped, were contradictory, or obsolete.

In response to the request of Congress made in section 12 of the Federal-Aid Highway Act of 1954, the Department of Commerce recommended to the Congress a draft of a bill to consolidate, in a single codified law, all of the pertinent portions of existing Federal highway legislation. At the close of the fiscal year

the bill was receiving careful attention by the Congress. (The bill was subsequently enacted and approved on August 27, 1958, as Title 23, United States Code, "Highways.")

The National System of Interstate and Defense Highways

The National System of Interstate and Defense Highways is a planned, integrated network of the Nation's most heavily traveled routes, connecting the country's metropolitan areas and industrial centers, serving the national defense, and connecting with routes of continental importance in Canada and Mexico. Created by the Federal-Aid Highway Act of 1944, the general locations of 37,700 miles of city-to-city routes were officially designated in 1947, and 2,300 miles of routes into, through, and around cities were designated in 1955.

The Federal-Aid Highway Act of 1956 provided a 1,000-mile increase in the limitation of the Interstate System, bringing its total extent to 41,000 miles. In connection with this permitted expansion, the States proposed selections for additions to the system totaling 13,775 miles. The proposals were considered on a national basis, as required by law, taking into account as basic factors the needs of national defense, system integration, transportation requirements of industry and agriculture, and population service.

Meanwhile, it was found that a considerable mileage saving had resulted from adoption of more direct alinements than the existing highways, as the States selected detailed locations for the routes of the originally designated 40,000 miles of the system. As a consequence it was possible, during the fiscal year, to select for system designation 1,000 miles of routes under the allowable expansion and an additional 1,102 miles of routes from the mileage savings realized.

As of December 31, 1957, at least general locations had been approved for 39,223 miles of the Interstate System, of which 34,620 were rural and 4,603 were urban. The States continued economic and engineering studies to determine the most feasible locations for the Interstate route sections and by the end of the fiscal year, 33,500 miles of detailed locations had been selected by the States and approved by Public Roads.

Included in the Interstate System were nearly 2,300 miles of toll roads. The Federal-Aid Highway Act of 1956 permits their inclusion, although Federal aid may not be used for their improvement.

Until 1956, no special Federal-aid funds, or only limited amounts, were provided 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 Federal-Aid Highway Act of 1956, now augmented by the Federal-Aid Highway Act of 1958, authorized a total of $25.625 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.

The $2.7 billion total of Interstate authorizations for fiscal years 1957 and 1958 were apportioned to the States in the summer of 1956. On August 1, 1957, the $2.0 billion for fiscal year 1959 was apportioned. An additional $200 million for 1959, authorized by the Federal-Aid Highway Act of 1958, was apportioned to the States on April 16, 1958.

Improvements programed during the year on 3,812 miles of the Interstate System were estimated to cost $2.59 billion, including $2.19 billion of Federal-aid Interstate funds.

Improvements involving Federal-aid Interstate funds were completed during the fiscal year on 987 miles of the Interstate System at a total cost of $486,064,660, of which $384,415,872 was the Federal share. Completed work involved 696 miles of bituminous and portland cement concrete surfacing, 277 miles of grading,

drainage, and temporary surfacing, and 14 miles of structures involving 238 bridges over streams, 427 bridges over highways to provide traffic grade separations, and 59 railway-highway grade-separation structures.

At the end of the year planning and construction were going at a rapid pace across the entire Nation. A total of slightly over $1 billion was in program status, and 2,848 projects with a total estimated cost of $3.6 billion were under way or scheduled to start soon.

Final detailed route selection, surveys and plans, right-of-way acquisition, and construction of projects of the magnitude and complexity involved in the Interstate System often take 3 or 4 years from initial conception to final completion. Many route sections were being built in stages, with an initial project providing for grading and drainage and a subsequent project providing the pavement.

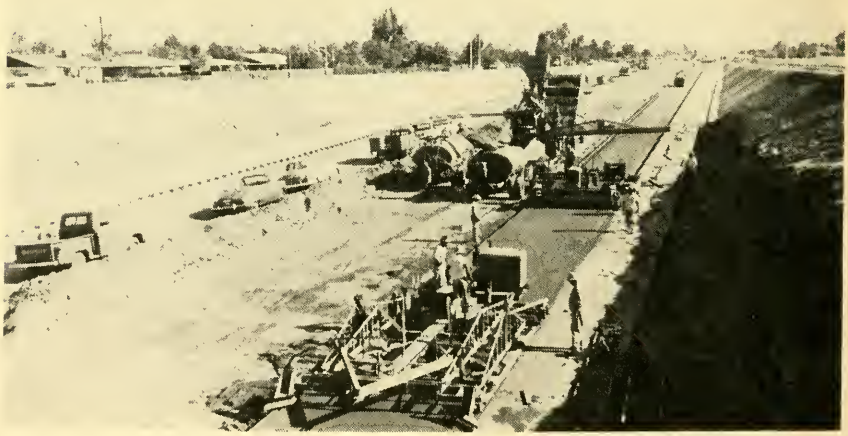
Excluding projects that have only been programed, a total of $4.0 billion had been obligated for the Interstate System at the end of the year, of which 8 percent was for preliminary engineering, 29 percent for right-of-way acquisition, and 63 percent for construction. At the end of the previous year $1.7 billion had been obligated, of which 58 percent was for construction.

Further information of interest concerning the Interstate System is contained in the next section of this report, as well as in the sections on new legislation, reports to Congress, and the highway trust fund.

Interstate System Progress: Case Histories

All across the Nation, in city and country alike, projects on the National System of Interstate and Defense Highways were being planned, built, and completed. Progress was notable, even in terms of statistics on funds obligated, mileage of construction under way, and contracts completed. But perhaps a more vivid impression of the broad sweep, the varied facets of accomplishments to date on the Interstate System can be absorbed from the brief glimpses of individual projects in the paragraphs that follow.

In Arizona, work continued on the Phoenix Freeway, which will carry traffic to and around the central area of the city. An interchange underpassing U. S. 60, 70, and 89 and a mainline railroad was completed during the year, and work was started on the next interchange beyond.



Pavement construction on the Phoenix, Ariz., Freeway, an Interstate route.

Cost of this 4.4-mile section of the Golden State Freeway in the Los Angeles, Calif., area was $8 million, excluding right-of-way cost. The 8-lane freeway is a part of the north-south Interstate route through the metropolitan area.

In California, many freeways have been built or were under construction in the metropolitan areas, but traffic needs in other parts of the State were not neglected. A 4-lane divided highway was recently completed on the main route across the Sierra Nevada Mountains, 45 miles east of Sacramento. The 7-mile long section included frontage roads and five railroad or highway grade separations, and cost $3.8 million exclusive of right-of-way. The new section replaced a tortuous, steep 2-lane highway, with a resultant reduction in driving time from 20 to 7 minutes for the 7-mile distance, plus greater safety and driving ease.

In Colorado, the Valley Highway in Denver was well along toward completion, with 8 miles of its 11-mile length opened to traffic. The route is part of the north-south Interstate highway through Colorado. Cost of the 4-lane freeway through the city will total $31 million, including $10 million for right-of-way alone. In addition to serving through traffic, the freeway speeds suburban traffic to the heart of the city and relieves congestion on local city streets.

In Connecticut, most of the Connecticut Turnpike was complete and open to traffic by the end of the year. While there are 7 toll barriers on the 89-mile section of the Turnpike included in the Interstate System, there are also 84 free interchanges between which there is no toll charge. Three Federal-aid projects, 10½ miles in length, were included in these free sections. Before the Turnpike was opened, the parallel U. S. 1 in the Norwalk area carried 22,000 vehicles daily. The turnpike now carries 15,000 vehicles per day, and traffic on U. S. 1 has dropped to 15,000. In 5 months of operation, the Turnpike had 80 accidents per 100 million vehicle-miles of travel, compared with 370 on U. S. 1.

In Florida, construction was well along on the spectacular 3-mile bridge across Tampa Bay, between St. Petersburg and Tampa.

In Georgia, another section was being added to the Atlanta expressway system as construction proceeded on the Downtown connector, reaching to the heart of

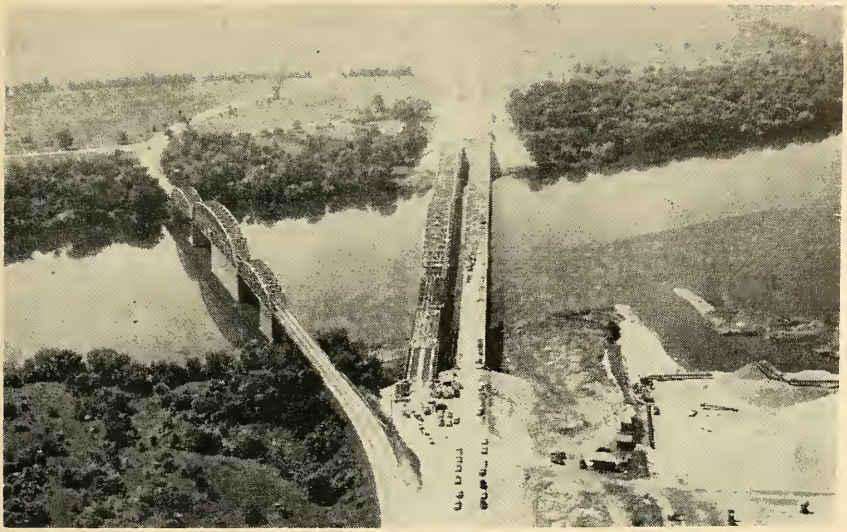
The last gap in the Valley Highway, the Interstate route through Denver, Colo., was under construction.

the central business district. In the southern part of the State, work was underway on an Interstate route which bypasses the city of Tifton, but in close proximity so as to render adequate local traffic service.

In Illinois, a 1,400-foot structure with approaches 1 mile long, over the Des Plaines River near Joliet, was opened to traffic near the end of the year. The new twin bridges, each carrying traffic in one direction, replaced a 2-lane bridge with bad curves at each end, guarded by 35 mile-per-hour signs and flashing lights to warn traffic of the hazard on a rural highway that otherwise allowed high operating speeds. The new bridges provide 486-foot horizontal and 47-foot vertical clearances for river navigation.

In Indiana, completion was undertaken of the bypass of Lebanon, a small town on the route between Chicago and Indianapolis. A 2-lane bypass was finished in 1951, but without access control or highway grade separations. Even so, the bypass relieved congestion on the old route through town and reduced accidents there by 20 percent. The majority of businessmen are certain the bypass is an asset; annual savings to motorists were estimated at $297,000; value of land along the bypass increased 50 percent. However, accidents were occurring at intersections on the bypass. Construction costing $2.6 million was undertaken during the year to provide grade separations and access control, and make the route a 4-lane divided highway.

In Iowa, a recently completed traffic interchange where U. S. 20 crosses the Interstate route in Sioux City has dramatically reduced downtown congestion. U. S. 20 crosses the only bridge over the Missouri River at Sioux City, and in 1956 the bridge carried 19,000 vehicles per day, of which 7,300 passed through the city business area only because no other route existed. This through-travel flow now uses the interchange ramps, with consequent relief to the business district streets.



This new twin-bridge Interstate crossing over the Des Plaines River in Illinois (now completed) replaces the old 2-lane bridge with its bad approach curves, where many accidents occurred.

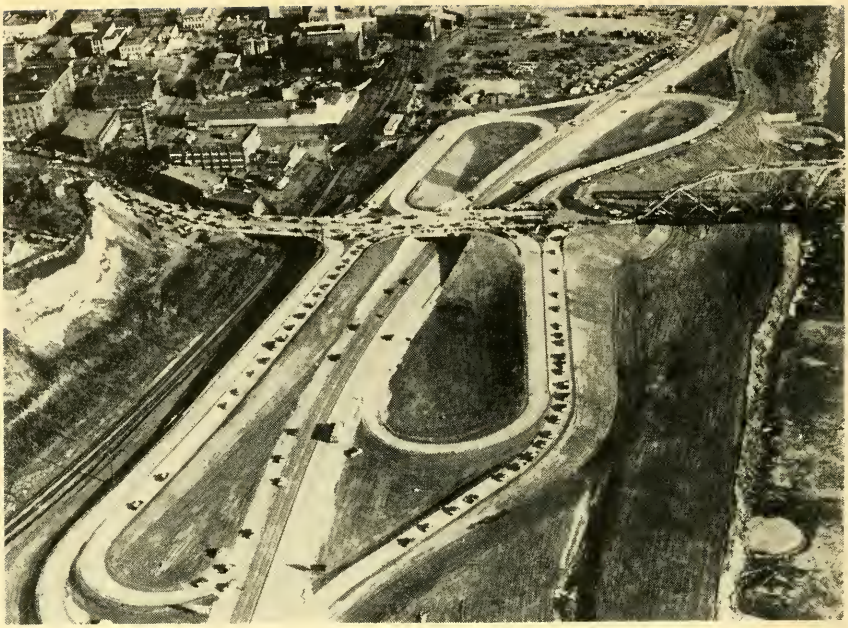
In Kansas, the 60-mile section of the Kansas Turnpike between Topeka and 18th Street in Kansas City (Kans.) is a part of the Interstate System. Work was under way on a 3½ mile, 6-lane expressway from 18th Street to the Missouri State line, and half the mileage was already finished and carrying traffic, at a rate of 16,000 vehicles daily. Completion of the project will link the Turnpike with completed facilities in Missouri.

In Maryland, work continued on the Baltimore County Beltway, which will completely encircle Baltimore City and much of its suburban fringe. The route will serve as a connector and distributor for the four Interstate routes radiating from Baltimore and will connect the many communities and industrial areas that surround the city.

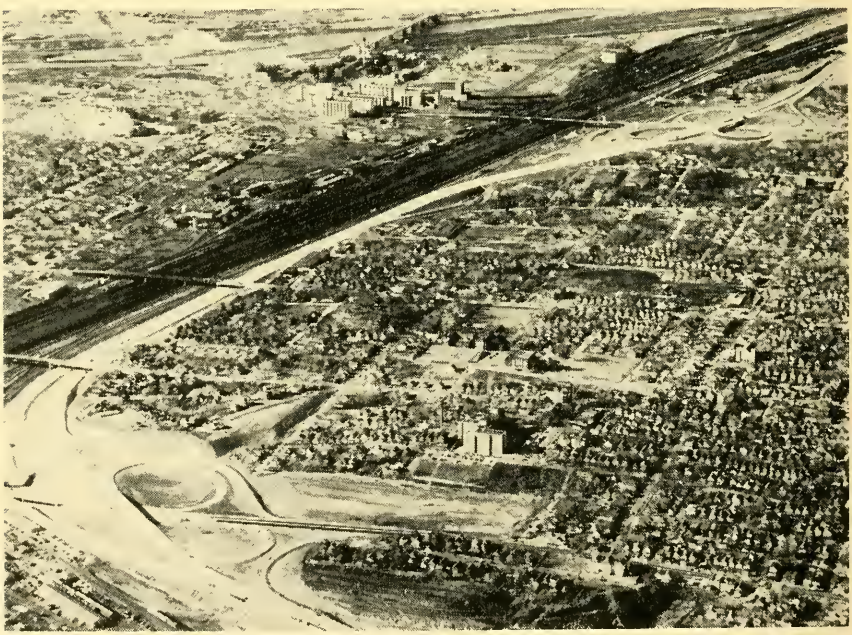
In Michigan, the 23-mile Farmington-Brighton Expressway, on the Interstate route from Detroit to Muskegon, was opened to traffic during the year. This route carries a high volume of commercial traffic as well as heavy resort travel. Weekend conditions on the old 3-lane section of U. S. 16, which the expressway replaced, were so bad that a temporary fourth lane was added even though the new route was already being built. In 3 months of use, the expressway had only one-third as many traffic accidents and injuries as the old road.

In Minnesota, a serious gap existed in the belt line around the Twin Cities, at South St. Paul. Traffic had 3½ miles of indirect travel, and crossed the Mississippi River on a 1,700-foot long highway-railroad bridge only 17 feet wide. An Interstate project under construction will cross highways, railroads, and the river, to close this gap in the belt line.

In Missouri, the Sixth Street Trafficway in Kansas City (see cover picture) was completed during the year. The 0.9-mile, $5½ million freeway is a traffic hub providing direct service to three bridges across the Missouri River and a number of major highway routes. Interchanges, ramps, and frontage roads provide service to these bridges and highways, and to the city's business, commercial, and industrial districts.



U. S. 20 crosses the only bridge over the Missouri River into Sioux City, Iowa, and passes above the new Interstate route along the river. Before this interchange was built, all of the vehicles on the ramps (7,300 daily) had to go through town.



This Interstate freeway in Kansas City, Kans., skirts the railroad yards and industrial district and joins the Kansas Turnpike at the upper right.

The 23-mile Farmington-Brighton Expressway, part of the Interstate route from Detroit to Muskegon, Mich., was completed during the year.

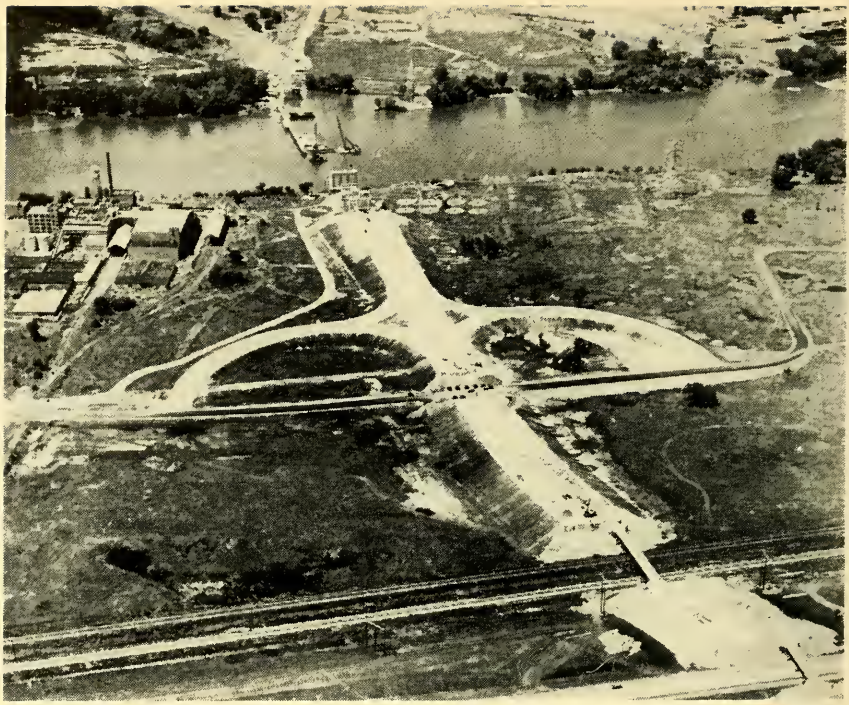
In Nevada, work was progressing on the 4-lane, divided Interstate route through the precipitous Truckee River Canyon, east of Reno. A 6½-mile section was opened to traffic, but access rights along it were still being acquired. Another 10½-mile section was under construction.

In New Hampshire, completion of the 4-lane, divided bypass of the Concord business district was in sight. Planned during World War II, several sections have been completed. Design of the final 8½-mile section was started within a month after passage of the 1956 Highway Act, and construction began during the fiscal year. Since planning and construction have been coordinated with city and town planning officials, and the public was kept well informed, a minimum of objection to the new route has been met.

In New York, the Southern Westchester Connection, linking the Major Deegan Expressway and the New York Thruway just north of New York City, was completed during the year. The 4 miles of the 6-lane divided highway, with service roads and 10 bridges, cost $19 million. Estimated traffic on the facility is 26,000 vehicles per day. The route is an important part of the freeway network which is providing traffic relief in the densely congested New York metropolitan area. A huge shopping center and other commercial enterprises, located along the route, are important local traffic generators.

In North Carolina, a 2½-mile section of the Winston-Salem Expressway was completed during the year. The 4-lane freeway, extending from the downtown area to the city limits, was planned in close cooperation by city, county, and State officials. Twelve miles of further improvements, extending the expressway east and west, were under contract at the end of the year.

In North Dakota, construction was nearing completion on the 4-lane divided highway between Jamestown and Valley City. The 39-mile section includes 35 major bridges, carrying the Interstate route over 2 rivers and separating it from 4 railroads and 17 intersecting highways. On the old 2-lane road which the new facility will replace, speed and load restrictions had to be imposed every spring to prevent surface breakup.



Construction was closing the missing link in the Interstate belt line around the Twin Cities in Minnesota. Here the embankment has been placed, but bridges are yet to be built over two highways, the railroad, and the Mississippi River.

In Ohio, construction was under way all along the Interstate route from Columbus to Cleveland, with 14 contractors at work on 25 construction sections. The 103-mile route will have 12 interchanges and 181 other bridges, and will cost $105 million. Capacity has been planned for the 30,000 vehicles per day expected by 1975.

In Oregon, the 14-mile Banfield Freeway in Portland was completed during the year, after 6 years of construction. The $16-million project, which includes 17 structures to carry cross traffic on key streets, has relieved congestion and substantially reduced the accident rate on city streets in the northeast business section of the city.

In Rhode Island, an 8-lane bridge was completed in Providence, connecting the Maine-to-Florida Interstate route with the Interstate spur to Cape Cod. The new structure relieves terrific congestion on the old swing-span bridge, where 10-minute delays were common and chaos resulted from every bridge opening.

In Washington, a 3.4-mile bypass was completed at the town of Moses Lake, halfway between Seattle and Spokane, in the heart of the Columbia River basin reclamation project. Growth of the community and development of the newly irrigated land surrounding it are certain to be stimulated by the bypass and the planned 4-lane cross-State highway of which it is a part. Another important project completed in Washington was a 3½-mile section of the West Coast's north-south Interstate route, at Fort Lewis, 10 miles south of Tacoma. It has replaced a congested 4-lane undivided highway through this important

This Washington State Interstate route follows the historic path of pioneers through Snoqualmie Pass in the forested Cascade Range, 40 miles east of Seattle.

military area. The new 4-lane divided freeway has sufficient right-of-way width to permit adding two more lanes, which will be needed before 1975, on the outer sides of the roadways.

In Wisconsin, construction had started on a $7-million interchange as part of the planned Milwaukee expressway system. In addition to facilitating through and local traffic, the interchange will provide access to Milwaukee Stadium—the home of the Braves.

In Wyoming, a number of improvements were under way along the main east-west Interstate route across the State. Part of U. S. 30 and the old Lincoln Highway, the route follows the historic trails of the early pioneers. One 18-mile section of 4-lane divided highway, estimated to cost $5.7 million, is being built west of Rawlins. It will replace a narrow, crooked 2-lane road that back in 1925 carried 400 vehicles daily in summer and 25 in winter. Traffic had grown to 800 daily in 1941 and 2,400 in 1957, and is expected to reach 8,000 daily in 1975.

Federal-aid Improvement of Primary Highways

The Federal-aid primary highway system, as of December 31, 1957, comprised 256,333 miles of the principal highways of the Nation, and included 234,506 miles of main rural roads and 21,827 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 on either rural or urban portions of the primary system, have ranged upward in recent years from $247.5 million in fiscal year 1954 to $416.25 million for 1961. The funds for the fiscal year 1959, amounting to $393.75 million, were apportioned to the States on August 1, 1957.

During the fiscal year 6,428 miles of improvements, estimated to cost nearly $784 million and involving over $412 million of Federal-aid primary funds, were programed.

Improvements involving Federal-aid primary funds were completed during the year on 6,799 miles of the Federal-aid primary system at a total cost of $679,517,811, of which $356,269,836 was Federal aid. The projects completed included 5,764 miles of bituminous and portland cement concrete surfacing, 1,142 bridges over streams, and 181 bridges over highways to provide traffic grade separations. In addition, railway-highway crossings were eliminated by construction of 110 grade-separation structures; 16 other structures were reconstructed; and 105 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.

Federal-aid Improvement of Urban Highways

Urban highways eligible for improvement with Federal aid include 21,827 miles comprising urban portions of the Federal-aid primary system and 10,408 miles of urban extensions of the Federal-aid secondary system. Federal-aid urban fund authorizations have ranged upward in recent years from $137.5 million in fiscal year 1954 to $231.25 million for 1961. The urban funds for the fiscal year 1959, amounting to $218.75 million, were apportioned to the States on August 1, 1957.

During the fiscal year, programs involving Federal-aid urban funds were approved for improvements on 456 miles of highways in urban areas, with an estimated total cost of $460 million of which $243 million was Federal aid.

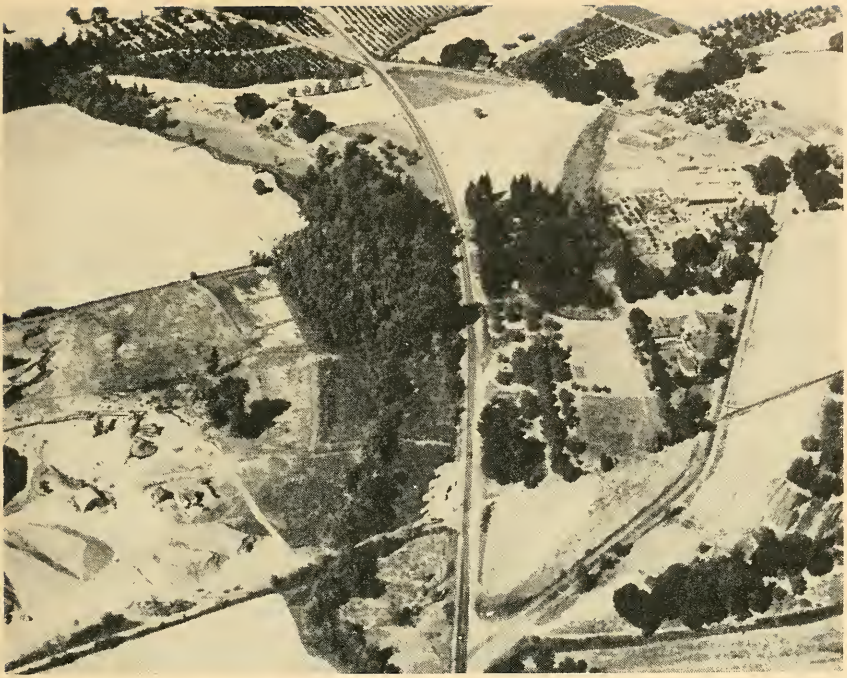
Work financed with Federal-aid urban funds was completed during the fiscal year on 343 miles of urban highways at a total cost of $306 million, of which $154 million was the Federal contribution. The work completed included 296 miles of bituminous and portland cement concrete surfacing, 87 bridges over streams, and 162 bridges over highways to provide traffic grade separations. In addition, railway-highway crossings were eliminated by construction of 70 grade-separation structures; 7 other structures were reconstructed; and 47 grade crossings were protected by installation of signal devices.

The improvement of important urban highways has become an increasingly important objective of the State highway departments and the cities, in which the Bureau of Public Roads joins. During the fiscal year, 39 percent of the total of Interstate System funds programed were for projects in urban areas. In addition, 14 percent of the Federal-aid primary funds were devoted to urban highway improvements.

Urban extensions of the Federal-aid secondary system have been eligible for improvement with Federal-aid urban funds since 1954. Up to the end of the fiscal year 1958, $37 million of the urban funds have been applied to work on the secondary system urban extensions.

Secondary or Farm-to-Market Roads

The Federal-aid secondary highway system is a network of roads which serve as important farm-to-market, school-bus, feeder, and rural mail routes. In length, the system totaled 553,339 miles as of December 31, 1957, including 10,408 miles of extensions into urban areas. Federal-aid secondary fund authorizations have ranged upward in recent years from $165 million in fiscal year 1954 to $277.5 million for 1961. The secondary funds for the fiscal year 1959, amounting to $262.5 million, were apportioned to the States on August 1, 1957.



Far less dramatic than Interstate System construction, but equally needed, are highway improvements such as this Federal-aid secondary project completed during the year in Marion County, Oreg. Nearly 3 miles of 16-foot pavement were widened to 20 feet, and a sharply curved dog-leg (seen to the right) was eliminated by a 1,000-foot long new section.

A total of 14,824 miles of improvements, estimated to cost over $498 million and involving nearly $259 million in Federal-aid secondary funds, was programed during the fiscal year 1958. During the same period improvements were completed on 15,008 miles of the secondary system at a total cost of $444,110,493 involving $229,306,841 in Federal-aid secondary funds. Of the improvements completed 9,105 miles involved bituminous or portland cement concrete surfaces, 4,667 miles were gravel or stone surfaced, and 1,188 miles were unsurfaced but graded and drained preparatory to receiving surfacing. Also involved was the construction of 1,981 bridges over streams and 20 bridges over highways to facilitate the free flow of traffic; the construction of 26 railway-highway separation structures and the reconstruction of 3 others; and protection of 231 other railway-highway crossings by signal devices.

Since the end of World War II, when Federal-aid funds were first provided for an established secondary system, a total of 155,037 miles of improvements have been completed (as of June 30, 1958). The projects have been distributed through almost every county in the United States, with an average of about 2,000 counties each year benefiting from new projects. An average of about 3,500 projects have been completed each year.

The Federal-aid secondary program differs from that for the primary system in several ways. Under the provisions of the Federal legislation, the State highway departments and local highway officials are required to cooperate in the selection of the routes for Public Roads' approval. The roads selected are those of principal community importance in the various counties in which they

are situated. There is no legal limitation as to the extent of the system in either a State or county, the only limitation being that of judgment as to the importance of the routes in question and the financial ability of the State or county to construct, reconstruct, and maintain the routes selected. Under this provision of limitation by judgment only, the Federal-aid secondary system has grown in length each year. Additions in the calendar year 1957 totaled 25,704 miles. The mileage of the system is divided about equally between State and county highways.

In the secondary program all projects are selected jointly by the State highway department and local highway officials of the county in which the project is located. Likewise, where the county contributes to the cost of construction or maintenance of the project, the State and local officials must cooperate in the determination of the improvement specifications.

Another notable difference between the primary and secondary programs is that the administration of the secondary program has been greatly simplified under the provisions of the 1954 Highway Act. The 1954 plan of administration permits the Secretary of Commerce and the Bureau of Public Roads to transfer much of their engineering and administrative responsibilities for Federal-aid secondary projects to the State highway departments, by acceptance of the State's certification upon completion of any project that approved standards and procedures have been used in the course of its design and construction. By the end of the fiscal year all States except Indiana, New Mexico, and West Virginia had elected to use this plan.

Special Federal-Aid Authorization

As described in the section of this report on new legislation, the Federal-Aid Highway Act of 1958 authorized $400 million of Federal aid to accelerate the highway program and stimulate employment.

The $400 million of so-called "D" funds was apportioned to the States on April 16, 1958, in accordance with the usual formula method, but the money may be used without proportional restriction on the Federal-aid primary and secondary systems and their urban extensions. Projects financed with these funds must be under contract by December 1, 1958, and completed by December 1, 1959.

By June 30, 1958, the States had programed projects involving $316 million of these special Federal-aid funds.

Repair of Flood-Damaged Roads

For many years it has been the policy of the Federal Government to aid the States in the repair or reconstruction of highways and bridges damaged or destroyed by floods or other catastrophes of extraordinary character and extent. Such aid is possible under an authorization permitting the use of available emergency funds without waiting for legislative action following each catastrophe. The Federal-Aid Highway Act of 1956 provided a continuing authorization of not to exceed $30 million annually for this purpose.

During the spring of 1958, extraordinary rainfall in California caused major landslides resulting in heavy damage to highways. Flood damage in the previous year led other States also to request allocations of emergency funds to assist in the reconstruction of damaged highways on their Federal-aid systems.

Allocations of emergency funds totaling $8,898,115 were made during the fiscal year to 9 States for rehabilitation work estimated to cost $17,796,230. Amounts allocated were as follows: California, $4,018,585; Kentucky, $378,000; Louisiana, $1,272,282; Minnesota, $158,900; Missouri, $261,451; New York, $191,394; Oklahoma, $2,272,103; Texas, $267,900; and Washington, $77,500.

When major disasters strike, Public Roads provides immediate active assistance and technical guidance to the Federal Civil Defense Administration and State and local governments. During the past year serious flood damages led the President to declare major disaster areas in Arkansas, California, Illinois, Kansas, Louisiana, Minnesota, Missouri, North Dakota, and Texas. Public Roads field personnel aided in estimating damages, determining eligibility for Federal assistance, and establishing procedures of operation.

Highway Trust Fund

The Highway Revenue Act of 1956, companion measure to the Federal-Aid Highway Act of 1956, increased most Federal highway-user excise taxes and created a highway trust fund administered by the Treasury Department to receive funds equivalent to most of these taxes and to disburse therefrom the funds authorized for Federal aid for highways.

During the two fiscal years since enactment of the Federal-Aid Highway Act of 1956, $3,615,733,374 has been made available to the highway trust fund from excise taxes and interest derived from investments of surplus in U. S. securities. The sources of income were as follows:

	Millions
Gasoline	$2,933
Diesel oil	80
Tires and inner tubes	356
Tread rubber	22
Truck, buses, trailers, etc	145
Vehicle use	59
Interest earnings	21
Total	3,616

After deducting allowable refunds of $74 million tax paid on gasoline used on farms and $16 million tax paid on gasoline used for other nonhighway purposes and by local transit systems, a net total of $3,526 million was available for the two years.

Of this net total, $1,482 million was available in fiscal year 1957 and $2,044 million in fiscal year 1958. These net amounts compared closely with the original estimates, presented to the Congress in May 1956, of $1,485 million for 1957 and $2,000 million for 1958. The considerable growth of income from 1957 to 1958 is not entirely a reflection of increased motor-vehicle sales and use. During a transition period in fiscal year 1957, as provided by law, some portions of the excise taxes continued to go to the Treasury general fund rather than to the highway trust fund.

Expenditures from the highway trust fund for Federal-aid highways amounted to $966 million in fiscal year 1957 and $1,511 million in fiscal year 1958. On June 30, 1958, the unexpended balance in the fund was $1,049 million, including $822 million in U. S. securities.

The 1956 act which created the highway trust fund included a "pay-as-you-go" clause (section 209g) providing that only so much of any authorization can be actually apportioned to the States as can be met later by cash balances in the trust fund.

The mechanics of Federal highway aid involve, successively, authorization of an amount by the Congress for a specific fiscal year, apportionment of the amount to the States well in advance of that fiscal year, payments by the States to contractors for the full cost of construction, and reimbursement of Federal funds to the States for the Federal-aid share as construction progresses.

The "pay-as-you-go" clause thus requires estimation, at the time apportionment of Federal aid for any fiscal year is to be made, of the trust fund revenues that

will be available to liquidate such apportionment. If it appears that estimated expenditures would be more than will actually be available in cash in the trust fund when needed, then the apportionment must be proportionally reduced from the amount authorized for the year. Since the 1956 act also provided that Federal-aid primary, secondary, and urban authorizations have first call on trust fund balances, it is the Interstate authorizations which would have to be scaled down at the time of apportionment, if the occasion arises.

The Federal-Aid Highway Act of 1958 set aside the "pay-as-you-go" clause for the fiscal year 1959 and 1960 apportionments, thus permitting apportionment of the full Federal-aid authorizations for those years. Under legislation as it now exists, it appeared at the end of the fiscal year that there could be no apportionment of Interstate funds for the fiscal year 1961 and that apportionments for some years thereafter would have to be drastically reduced from the authorized level.

The cause of this situation does not lie in the trust fund revenues, which have been coming in very closely to the anticipated returns. It is rather that the 13-year Interstate program, providing rapid acceleration of authorizations for 3 years, a sustained high plateau for 8 years, and a tapering off in the last 2 years, does not match the probable rate of trust fund income which, depending on highway-user taxes, should increase gradually but steadily from year to year. The consequence is a surplus in the trust fund during its early life followed by an extended period of deficit.

Reports to Congress

The Federal-Aid Highway Act of 1956 and its companion Highway Revenue Act of 1956, and the Federal-Aid Highway Act of 1958, 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 will provide extensive basic information and serve to guide the Congress in its consideration of important problems concerning the Federal role in highway improvement, use, and financing.

Accomplishment of the studies was delegated by the Secretary of Commerce to the Federal Highway Administrator. Two of the studies were completed during the fiscal year; the others were under way. In addition to the work reported in the following paragraphs, much of the research described in the latter part of this report was directly or indirectly related to these studies.

Interstate System cost estimate

Section 108 (d) of the Federal-Aid Highway Act of 1956 required that, in cooperation with the State highway departments, periodic estimates be made of the cost of completing the Interstate System. Such estimates, with the approval of the Congress, are to be used in apportioning Federal-aid funds for the Interstate System, so that each State will receive a share of the total annual apportionment equivalent to its proportion of the total cost estimate.

The first cost estimate, intended to govern the apportionment of funds authorized for the fiscal years 1960–62, was presented to the Congress on January 7, 1958, in *A Report of Factors for Use in Apportioning Funds for the National System of Interstate and Defense Highways* (House Doc. No. 300, 85th Cong., 2d Sess.).

The task was herculean; it has been estimated that the State highway departments and the Bureau of Public Roads devoted over a million man-hours of work to the study Minimum geometric design standards, already under consideration, were adopted shortly after passage of the 1956 act. Specific detailed locations for about 80 percent of the mileage were selected; for the remainder, the most

reasonable in cost of several desirable alternative routes were used for the purpose of the cost estimates. Economic and engineering considerations both were studied carefully in the course of making these route selections. Forecasts of the types and volumes of traffic anticipated in 1975 necessitated study of present travel patterns and probable future changes in population, economic development, and vehicle use. In the end, the estimates comprised individual study of some 6,000 road sections averaging 6½ miles each in length.

The cost estimate was to encompass the 40,000 miles of Interstate System routes whose general locations had been agreed upon in 1947 and 1955. (The 1,000-mile additional length authorized for the system by the 1956 act was excluded, according to the act, from the study.) The more precise and often more direct locations selected in the course of the study revealed that the routes totaled 38,548 miles in length. Costs were based on the average cost indexes of construction for the last half of the calendar year 1956.

The total cost of work remaining to be financed as of July 1, 1956, was estimated at $39.5 billion, of which $1.4 billion was for preliminary engineering, $5.3 billion for right-of-way, and $32.8 billion for construction. At the time the report was made, unobligated balances of Federal-aid Interstate funds and State matching funds were available through the fiscal year 1959 in the amount of $5.4 billion, and work financed from other sources amounting to $1.9 billion was anticipated. Thus the estimated cost of work remaining, to be financed beginning with fiscal year 1960, was $32.1 billion, of which $29.1 billion would be Federal funds and $3.0 billion, State matching funds.

The total of Federal and State matching financing required after July 1, 1956, as indicated by this estimate, amounted to $37.6 billion, as compared with the $27.6 billion authorized by the Federal-Aid Highway Acts of 1954 and 1956 together with the appropriate State matching funds. The new estimate, then, indicated the cost of completing the system at $10 billion or 37 percent more than the amounts authorized in the 1954 and 1956 acts.

The increase resulted from a variety of causes, chiefly: (1) traffic estimates 15 percent higher than previous forecasts, resulting in need for more traffic lanes and other facilities and accounting for a 5-percent cost increase; (2) the requirement by Congress in section 116 (b) of the 1956 act, which specified that local needs be given equal consideration with interstate commerce needs, thus requiring an estimated 63 percent more interchanges and other facilities and accounting for a 15-percent cost increase; (3) increased need for utility adjustments, lighting, signing, etc., aggregating 3 percent additional cost; and (4) a rise in construction costs of 12 percent.

In presenting the report to Congress, the Secretary of Commerce noted that the work was done by the individual State highway departments, where lie the greatest collection of needed basic data, skills, and experience; and that the estimates, uniformly prepared under a common set of guides and engineering standards developed jointly by Public Roads and the States, represent their best coordinated judgment. The Secretary pointed out that as construction of the Interstate System progresses, future cost estimates will be based on broader experience and will reflect actual cost trends which cannot be forecast as well now.

Statistics from the Interstate cost estimate study

Examination of the detailed estimates of the cost of completing the Interstate System produced some highly interesting statistics which, both for lack of time and in the interest of brevity, were not presented in the report to Congress.

Of the total 38,548 miles studied, nearly 34,000 miles were in rural areas and 4,500 miles or 12 percent were urban. Only 2,100 miles or 5 percent of the

total were toll facilities, including toll roads, bridges, and tunnels. As of July 1, 1956, there were nearly 1,300 miles completed and in service (almost wholly toll facilities) and 600 miles authorized for construction; 95 percent of the system remained to be constructed. About 75 percent of the latter mileage was scheduled to be built on new location.

The bulk of the Interstate mileage, 32,200 miles or 84 percent, will be 4-lane divided highways; 3,200 miles will be 6-lane and 1,300 miles will be 8 lanes or more. Only 1,800 miles, or 5 percent, will be 2-lane. The 38,548 miles of routes will add up to more than 162,000 lane miles of highway. In addition, 4,600 miles of the system will have frontage roads on one side and 3,500 miles will have them on both sides, adding 8,100 miles of construction to the total of the main routes.

On the Interstate mileage remaining to be built as of July 1, 1956, some 12,000 interchanges were planned, accounting for 18,000 individual structures. There were 30,000 other needed structures indicated—highway and railroad grade separations, stream bridges, and tunnels—making a total of 48,000 individual structures. In the rural areas, interchanges will average less than 4 miles apart; other highway grade separations will also average less than 4 miles apart; other bridges, less than 5 miles.

The cost estimate of work in rural areas amounted to $22.3 billion; $17.2 billion, or 44 percent of the total, was in urban areas. The total of $39.5 billion included $1.4 billion for preliminary engineering, $5.3 billion for right-of-way, and $2.9 billion for construction engineering and contingencies. Of the $29.9 billion representing actual construction costs, $7.3 billion was for clearing, grading, and drainage work, $6.6 billion for base, pavement surface, and shoulders, $14.4 billion for structures, and $1.6 billion for miscellaneous items.

In the cost for structures were included $5.7 billion for interchanges, $3.2 billion for highway and railroad grade separations, and $5.5 billion for stream bridges and tunnels.

Average costs per mile varied from $580,000 on existing location to $1.2 million on new location; from $680,000 in rural areas to $4.0 million in urban areas. The overall average was slightly over $1.0 million per mile. Structures, of course, are an expensive element in highway construction. The average interchange cost was nearly $330,000; the average highway grade separation, $160,000; the average railroad grade separation, $270,000.

Estimates of Interstate System traffic indicated a probable rise from 87 billion vehicle-miles in 1955 to 248 billion in 1975, almost a threefold increase. These volumes represent 15 percent of all traffic in 1955, 21 percent in 1975.

Reimbursement study

Section 114 of the Federal-Aid Highway Act of 1956 declared it the intent of Congress to determine whether or not the Federal Government should equitably reimburse the States for toll or free highways on the Interstate System built between 1947 and 1957. To that end, the act directed the Secretary of Commerce to conduct a study, in cooperation with the State highway departments and other agencies, to determine which highways completed or put under construction on the Interstate System between August 2, 1947, and June 30, 1957, measure up to the Interstate standards, and their cost, depreciation, and participation of Federal funds.

With the cooperation of the State highway departments, the Bureau of Public Roads undertook and completed this study during the latter half of 1957. Findings were published in the report, *Consideration for Reimbursement for Certain Highways on the Interstate System* (House Doc. No. 301, 85th Cong., 2d Sess.), presented to the Congress on January 7, 1958.

Of the 38,548 miles of the Interstate System for which detailed location had been approved as of September 1957, it was found that 1,955 miles had been fully completed to Interstate standards. An additional 8,904 miles had partial construction which met Interstate standards. Thus 10,859 miles, or 28 percent of the total Interstate mileage, met the criteria for consideration for reimbursement. In this mileage were included 1,950 miles of toll roads in 26 States and 8,909 miles of free roads in 47 States. On the toll roads, 1,527 miles were rural, 423 urban; on the free roads, 7,405 miles were rural and 1,504 urban.

The total cost of the highways eligible for consideration for reimbursement amounted to $6.09 billion, of which $2.59 billion was for toll roads and $3.50 billion for free roads; Federal-aid funds accounted for $1.13 billion or 32 percent of the latter. By location, $2.41 billion of the costs were in rural areas and $3.68 billion in urban areas. Distribution of costs into major classes of work showed that $1.10 billion went for right-of-way, $1.81 billion for grading and miscellaneous work, $1.02 billion for pavement base and surface, and $2.16 billion for structures.

The computed depreciation of the total $6.09 billion cost amounted to only $174 million. The total cost less depreciation for the 10,859 miles eligible for consideration for reimbursement amounted to $5.92 billion, of which $2.52 billion was accounted for in toll roads and $3.40 billion in free roads.

Since, as prescribed in the 1956 act, only highways completed or undertaken in the last 10 years were considered, their average life span was short: 37 percent of the costs represented work under construction or awarded to contract on June 30, 1957; 30 percent represented completed work less than 2 years old; 33 percent represented completed work 2 to 10 years old. In terms of mileage, 1,955 miles of the 10,859 total were complete. There was a notable difference in this respect between toll and free roads, reflecting the more recent surge in the latter class. Only 383 miles of the 8,909 miles of free roads were completed, as compared with 1,572 miles of the 1,950 miles of toll roads.

Highway cost allocation study

The highway cost allocation study, required to be made by section 210 of the Highway Revenue Act of 1956, is for the purpose of providing Congress with information on the basis of which it may determine an equitable distribution of the tax burden among Federal-aid highway users and the other beneficiaries from improved Federal-aid highways. The collection of basic data for the required analyses of differential cost responsibility for Federal-aid highways and of both direct and indirect benefits that result from their improvement was begun in the fall of 1956. Plans for and progress in the study were subjects of a comprehensive report to the Congress on March 1, 1957, and a brief second progress report was made on March 1, 1958.

The study has been divided into seven major phases. The first phase is an assembly of information covering all registered motor vehicles in each State, showing type of vehicle, annual use, fuel consumption, class of service, and tax payments. At the fiscal year's end, work was at the stage of final tabulation of data, including statistical summaries.

The second phase of the study is a detailed estimate of highway needs for 1975 traffic, reported separately for each of the rural and urban Federal-aid systems in each State, classified by type of construction and maintenance operation and according to the major elements of construction and maintenance costs. Almost all of the needs schedules were ready for summarization, and at the end of the year tabulation of the data was 50 percent completed.

The third phase of the study is the preparation by each State of an estimate of traffic volumes and weights of vehicles on each highway system during 1957, classified by visual type, registered gross weight, type of operation, load on each

axle, and traffic volume group. Summarization of the traffic material by geographical regions was at a satisfactorily advanced stage.

The objective of the fourth phase is determination of the differential highway design, construction, and maintenance requirements for the several classes of vehicles, according to their size, weight, and frequency of occurrence in the traffic of each Federal-aid system. It was being implemented by a series of inquiries presented through Public Roads field offices to each of the State highway departments. Returns from these inquiries were expected to enable a composite formulation, by a selected group of Bureau engineers, of differential cost responsibility factors for roadway construction, for structures, and for maintenance that would be based on the combined practice, knowledge, and judgment of a most informed cross-section of the country's highway engineers. At the end of the year the first two of the series of inquiries, on incremental roadway and bridge design and construction requirements, had been sent to all State highway departments. Responses were received to the roadway inquiry from all but one State. Preliminary review of these returns indicated that in their preparation had gone a great deal of study, conscientious effort, and effective grappling with the problem's most troublesome aspects.

The fifth phase of the study is an analysis of the differential benefits to highway vehicles in each of their several type, size, and weight classes that result from improvements to be made, under the authorized program, in the highway's surface, width, curvature, grade, capacity, and other features that contribute to convenience, comfort, safety, and economy of travel. During the year three studies were conducted with the cooperation of university research groups for the purpose of augmenting existing information on the relationship, differentially according to vehicle classes, between traffic congestion and the costs of vehicle operation, in terms of fuel consumption and travel time. A fourth study was in progress at the close of the fiscal year. Analysis of the data obtained in these studies was in progress. In order to appraise the differential effect, upon the operating ease and economy of vehicles in the various size and weight groups, of the physical improvements that were cost-estimated in phase 2 of the study, it was necessary to obtain somewhat detailed comparisons between the status of the Federal-aid systems in respect to structural and geometric features affecting operating benefits before and after accomplishment of the planned program. A special inquiry on this subject, involving about half of the State highway departments, was begun near the end of the year, through the Bureau's field offices.

The sixth phase of the study deals with the requirement of the 1956 act that there be subjected to study ". . . any direct and indirect benefits . . . from Federal-aid highways in addition to benefits from actual use . . ." of Federal-aid highways. At the end of the year there were in progress about 35 projects of research into the economic impact of highway improvements on other than direct users of the highways. These projects were being conducted by or for the State highway departments within the financial framework of the Federal-State cooperative highway planning programs. In addition, five studies were being conducted on the same subject by direct contracts between Public Roads and regionally representative independent research agencies. These jobs were nearing completion and were expected to produce indications of methods by which something approaching an integration of the many localized studies in this field—including a number conducted prior to the present effort—may be accomplished.

The final phase of the cost allocation study is the interpretation, analysis, and fitting together of two or more of the phases of the work described above. Well advanced in the programing for electronic computation is a procedure

for fusion of data from phases 1, 2, and 3 with the results of the engineering analysis of the data provided by the incremental inquiries (phase 4). Section 210 of the 1956 act calls for submission of a final report on the study to the Congress by March 1, 1959, and the scope and content of the report were being planned at the end of the fiscal year. (Results of the AASHO Road Test, which is described elsewhere in this report, will provide material invaluable to the highway cost allocation study, but will not be available in time for the 1959 date. Consequently, shortly after the end of the fiscal year, Congress extended the due date of the study report to January 3, 1961.)

Highway safety study

Section 117 of the Federal-Aid Highway Act of 1956 directed that a comprehensive study of highway safety be undertaken, and reported to the Congress by March 1, 1959, to determine what action can be taken by the Federal Government to promote this area of the public welfare. Specific directives in the legislation referred to the need and advisability of assistance to States and municipalities on traffic safety regulations and enforcement, as well as to the possibilities of improving safety through better vehicle design, educational aids, highway design, and other measures. The study program was rapidly accelerated throughout the fiscal year to encompass these multiple responsibilities. Guidance from qualified advisors was sought and obtained in all major aspects of highway safety activity.

Several unique areas of the investigation reached the analysis stage and plans for development of their respective contributions to the highway safety study were being made. Among these were some of critical concern to the assessment of the needs for highway safety, such as (1) the relation of selected driver characteristics and known vehicle capabilities to operating speeds and frequency of accident involvement, determined on a miles-traveled basis, (2) the accident prevention and cost benefits being realized on highway developments which approach or equal Interstate System standards, (3) the true dimensions of the social and economic losses occasioned by traffic accidents, and (4) the relative prominence of motor-vehicle injuries as a disabling factor in the Nation's welfare.

Other investigations developed for the highway safety study were progressing in exploratory or data-gathering phases. Perhaps most significant among these was an intensive study of traffic accidents on the scene by an engineer, medical, and social scientist team, the objective being to develop and explore new techniques in accident investigation that will more clearly reveal their underlying cause. A related project involved the analysis and review of a large number of existing accident reports and study of the applications being made of accident report data. The purpose here was also to ascertain how the accident-producing situation is created, and to devise means for better recording and processing of accident data. Another project under way was a socio-psychological comparison of two cities that differ markedly in their safety efforts and accident experience. Public Roads was also engaged in a comprehensive review of the highway safety responsibilities and activities being exercised in Federal agencies. This effort was being complemented with a survey of selected official and important nongovernmental organizations in the field of traffic safety to ascertain their policies and attitudes toward the major elements of need in the highway safety field.

The findings on these and associated phases of the highway safety study will be incorporated in the report to the Congress. Principal attention will be given to existing weaknesses, to the design of an adequate program for the future enhancement of highway safety, and to the definition of appropriate Federal responsibilities in this vital area of the public welfare.

Maximum desirable vehicle sizes and weights

The basic purpose of section 108 (k) of the 1956 act is to direct 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. An extremely important element in the derivation of such recommendations is the American Association of State Highway Officials' Road Test, in which Public Roads is participating. Progress on this extensive test is described elsewhere in this report.

Public Roads, in connection with the purpose of section 108 (k), was also working on an extensive study of the economics involved in the road–vehicle relation. The work is described in this report in the section on traffic operations research.

(Section 108 (k) requires that a report be submitted to the Congress by March 1, 1959. Because the AASHO Road Test will not be completed by that time, the Congress, shortly after the close of the fiscal year, extended the due date to January 3, 1961.)

Forest highways study

The national forest highway system, which includes routes of major traffic importance as well as roads serving the forests themselves and communities in and adjacent to them, has lagged in progress of improvement behind the needs of traffic. Recognizing this situation, the Congress, in section 3 (b) of the Federal-Aid Highway Act of 1958, requested the Secretary of Commerce, in cooperation with the Secretary of Agriculture and the appropriate States and Territories, to make an extensive study of the forest highway system and report findings by January 1, 1960.

The study is to determine:

"(1) the roads of primary importance to a State, county, or community which are within, adjoining, or adjacent to a national forest and have not been designated as forest highways;

"(2) the amount necessary to complete construction of all designated forest highways;

"(3) the amounts necessary for the fiscal year ending June 30, 1962, and for each of the nine succeeding fiscal years to survey, construct, reconstruct, and maintain (A) roads described in paragraph (1) of this subsection if such roads were forest highways, and (B) roads designated as forest highways, in accordance with a program to be recommended by the Secretary of Commerce after consultation with the Secretary of Agriculture; and

"(4) the method by which the amounts determined pursuant to paragraph (3) of this subsection should be apportioned for expenditure in the several States, Alaska, and Puerto Rico."

Public Roads, the Forest Service, and the State highway departments were making plans for the study as the fiscal year ended.

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. Government agencies receiving direct appropriations for the construction and maintenance of roads, and requesting assistance from Public Roads include the Atomic Energy Commission and the Departments of Agriculture, Defense, and Interior. Since passage of the Federal-Aid Highway Act of 1956, which made

Federal-aid funds available to the Territory of Alaska, Public Roads has also directly supervised all Federal-aid highway construction work in Alaska.

Improvements involving the engineering and construction services of Public Roads reached an all-time high during the fiscal year. The following tabulation indicates the volume of highway work as of June 30, 1958, in which such services of the Bureau were actively engaged (the figures include estimated costs of work in the program, plans approved, advertised, and/or construction stage):

Bureau of Public Roads: [1]	
Forest highways	$51,094,821
Alaska Federal-aid projects	16,051,926
Federal lands	350,000
Woodrow Wilson Memorial Bridge [2]	7,780,300
Miscellaneous access roads	145,632
Miscellaneous reimbursable construction	220,613
National Park Service:	
Park roads	20,993,767
Parkways	47,978,383
Forest Service: Forest development roads (including beetle-control roads)	10,448,623
Bureau of Indian Affairs: Indian reservation roads	580,660
Bureau of Land Management	5,160,544
Department of Defense: Access roads	3,260,260
Total	164,065,529

[1] Excludes work performed under State supervision.
[2] Across the Potomac River below Washington, D. C.

Forest highways

The forest highway system, an important segment of the Nation's road network, is located in 39 States, Alaska, and Puerto Rico. It is composed of main and secondary roads within or adjacent to the national forests, which cover one-tenth the Nation's area. At the close of the fiscal year, the system had a total length of 24,518 miles, approximately one-half of which (12,520 miles) lies in the 11 western States, South Dakota, and Alaska. Approximately 81 percent of the system mileage is coincident with the Federal-aid primary and secondary systems. Table 18 of the appendix shows, by forest road class, the system mileage in each State or Territory.

The cooperative efforts of the States, counties, and the Federal Government over many years have resulted in progressive improvements on the Forest highway system, but progress has not been adequate to fulfill traffic needs. At the request of the Congress, a study of forest highway needs has been undertaken, as described elsewhere in this report.

During the fiscal year, improvements were completed on 352 miles of forest highways at a cost of $19,868,587, of which $18,114,404 were Federal funds. Table 17 of the appendix shows, by States, the volume of work completed during the year, and the work programed, authorized, or under construction at the close of the year.

Typical of forest highways and the benefits derived therefrom is the Provo River-Haydens Fork Forest highway route which extends from Kamas, Utah, on U. S. 189 through the high Uinta Mountains to the Utah-Wyoming State line south of Evanston, Wyo. This route is 50 miles in length and is coincident, in part, with Utah State Route 150. Construction on this forest highway began in 1944. Approximately 42 miles of this route have been graded, and 27 miles have a bituminous surface. Each succeeding improvement of the route has re-

sulted in definite benefits, not only to the immediate region, but also to the densely populated areas in Provo, Salt Lake City, and Ogden. More than 12-million board feet of merchantable timber are harvested from this region each year, and this route serves as a valuable haul road for timber products. In addition, the highway provides access to large recreational areas and scenic lakes.

Alaska Federal-aid construction

Federal aid for highways was extended to Alaska in 1956, though on somewhat different terms than to the States. Federal funds may be used for maintenance as well as for construction, and the Territorial Government contributes an amount equal to 10 percent of the Federal apportionment. The Bureau of Public Roads, in addition to discharging its usual administrative responsibilities, performs the general functions of a State highway department in Alaska, including location surveys, design, contract administration, construction supervision, and highway maintenance.

The Federal-aid highway system in Alaska totals 5,204 miles in length, including 1,959 miles on the primary system, and 3,245 miles on the secondary system.

Practically all of the construction on the primary system, and the larger projects on the secondary system, are performed by the contract method. Construction of the smaller and more isolated projects on the secondary system is accomplished by Bureau of Public Roads forces.

During the fiscal year, construction work was completed in Alaska on 162 miles of the primary system in rural areas, involving Federal funds totaling $895,378. Construction was also completed on 44 miles of the secondary system in rural areas, involving Federal funds totaling $585,183. At the close of the year, construction was under way on 111 miles of the primary system, estimated to cost $6,949,338, and on 220 miles of the secondary system, estimated to cost $5,679,177. Improvements in urban areas, estimated to cost $273,831, were also under way at the end of the year.

One of the important projects completed during the year was the grading and pioneer construction of 15 miles of the primary system to connect the town of Nenana with the city of Fairbanks. This road will ultimately provide direct access to the Healy River coal fields and Mt. McKinley National Park from the Fairbanks area. Problems unknown in the States are encountered in Alaska. Because this project was within a permafrost area, clearing and grubbing operations were completed during the previous season by Public Roads forces, to permit aggregate sources and excavation areas to thaw out.

National park highways, park approach roads, and parkways

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

During the fiscal year, improvements were completed on 203 miles of park highways, park approach roads, and parkways, involving Federal funds totaling $15,293,436. The work included grading, surfacing, and bridge and tunnel construction. In the fourth quarter of the year, the National Park Service greatly accelerated its construction program to aid in the relief of the unemployment situation. At the close of the year, 472 miles of the improvements were under construction, involving Federal funds totaling $48,247,338. On the basis of cost,

this represents a 91-percent increase over work in the same status one year ago. Table 19 of the appendix indicates the general locations of this construction activity during the fiscal year. Some typical improvements are described in the following paragraphs.

Blue Ridge Parkway.—Substantial progress was made during the past year in closing the gaps on this scenic parkway located in North Carolina and Virginia. During the year projects estimated to cost $10,300,000 were started. This new work involved 32 miles of grading, draining, and base course, 97 miles of bituminous surfacing, 20 bridges, and 1 tunnel. Outstanding among these projects was the James River Bridge, a prestressed concrete structure of nine 100-foot spans and two 70-foot spans crossing a river, a railroad, and a highway. During the year 27 miles of construction, including bridge and tunnel work, were completed at a cost of $2,867,000. At the year's end, 153 miles of construction were under way at an estimated cost of $13,711,000.

George Washington Memorial Parkway.—Construction on this parkway in Virginia, across the Potomac River from Washington, D. C., progressed steadily to provide access to the new building planned for the Central Intelligence Agency. During the fiscal year contracts were let for 4 bridges and 2 paving projects, involving Federal funds totaling $2,547,702. Also during the year 3.9 miles of grading and drainage work on the Maryland side of the Potomac River near Washington were let to contract at an estimated cost of $1,037,235. At the close of the fiscal year 9 projects were under contract on this parkway, involving Federal funds totaling $6,851,387.

Natchez Trace Parkway.—During the fiscal year, 2 bridges and 10 miles of grading were completed on this parkway, located in Alabama, Mississippi, and Tennessee. Work on grading and drainage contracts let during fiscal year 1957 continued. During the year, contracts involving Federal funds totaling $2,154,472 were awarded for the construction of 29 bridges, 14 miles of grading and gravel base course, and 24 miles of bituminous surfacing. At the close of the fiscal year, 79 miles of the parkway were under construction, involving $8,596,329 of Federal funds.

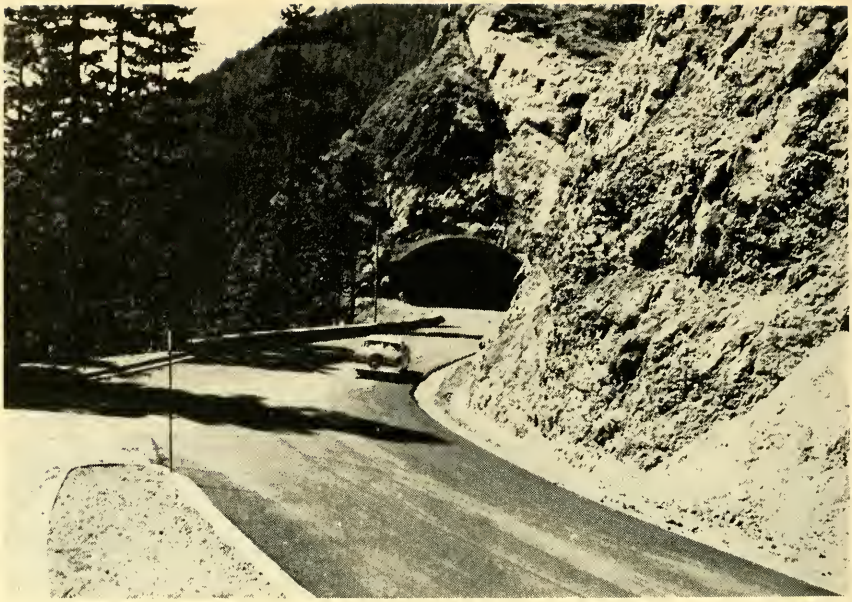
Olympic National Park, Heart O'The Hills Road.—During the year a contract was awarded for the bituminous surfacing of this entire 13.6-mile route. Completion of this project will conclude 8 years of work on this road, which traverses the rugged Olympic Mountains from near Port Angeles, Wash., to scenic Hurricane Ridge. Construction of this roadway cost $3,500,000. In addition to the heavy cuts and fills normally associated with roadway work in mountainous country, tunnels and viaducts were required. Three tunnels, averaging 400 feet in length, are located in a half-mile section of the highway. The Heart O'The Hills Road provides access to Olympic National Park from the city of Port Angeles. In addition to the many summer visitors that may now use this route, skiers will be able to use the facilities on Hurricane Ridge throughout the winter. Completion of the road will make this one of the most popular winter sports areas in the Pacific Northwest.

Woodrow Wilson Bridge

During the year the design and preparation of contract drawings for the Woodrow Wilson Memorial Bridge across the Potomac River south of Washington, D. C., progressed under the supervision of Public Roads to a point where bids were opened on June 30 for the main portion of the bridge, including the bascule span.

Forest development roads

In accordance with a long-standing policy, Public Roads, when requested by the Forest Service, surveys, designs, and supervises the construction of roads



One of the tunnels on Heart O' The Hills Road, Olympic National Park, Wash.

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 communities within or adjacent to the national forests are dependent. During the year, 80 miles of such forest development roads were completed involving Federal funds totaling $5,317,985. At the close of the year, 142 miles were under construction at an estimated cost of nearly $9 million.

Bureau of Land Management roads

Public Roads cooperates with the Bureau of Land Management of the Department of the Interior in its program of road construction by preparing plans and supervising the construction of roads providing access to areas for logging operations, and to areas of beetle-infested timber. During the year, construction was completed on 113 miles at a cost of $3,141,272. At the close of the year, 105 miles were under construction at an estimated cost of $4,750,000.

Typical of this construction is the Smith River Road in Oregon which taps an area with tributary timber of 3.5 billion board feet, and an annual permissible cut of about 120 million board feet. During the period 1953–57, Public Roads developed 83 miles of this route for the Bureau of Land Management. Involved were 18 miles of 24-foot-width bituminous-surfaced roadway costing $3,700,000 and 65 miles of 12-foot-width surfaced roadway, with turnouts, costing $5,600,000. Considerable interest in this construction has developed, because of the unusual strength built into the road and its structures. Since the road is not a State route, it is not restricted to the usual State load limitations. The facility was designed to carry logging trucks which, with their loads, weigh 200,000 pounds. The Bureau of Land Management can thus permit vehicles to haul 20,000 board feet of logs per load. The logs are dumped into the river 10 miles upstream from Reedsport, Oreg., and continue to the Reedsport mills by water. The road is maintained by the Bureau of Public Roads under reimbursement by the Bureau of Land Management. Since the road is not a public

State highway, owners and operators of trucks do not pay the State fuel tax or the State motor-carrier tax.

Indian reservation roads

In accordance with an agreement with the Bureau of Indian Affairs, Public Roads continued to provide general supervision for the programing, designs, and construction of roads and bridges in Indian reservations. During the year, under the direct responsibility of the Bureau of Indian Affairs, there were 985 miles either programed or under construction, estimated to cost $16,700,000. In addition, under the direct supervision of the Bureau of Public Roads, 14 miles of construction were completed at a cost of $497,000, and 6 miles were under way at the close of the year at an estimated cost of $181,500.

Defense, access, replacement, and maneuver road program

No additional funds were transferred to Public Roads by the Atomic Energy Commission during the fiscal year for construction of access roads to plants and mines producing uranium ore, but work continued on projects financed from previous transfers. All of these were more than 50 percent complete.

During the year, 54 projects serving defense installations of the Armed Forces were completed at a total estimated cost of $12,618,129, with $10,960,915 provided by the military departments. Funds transferred during the year included $1,846,862 from the Department of the Army, $1,618,722 from the Department of the Navy, and $5,052,264 from the Department of the Air Force, a total of $8,517,848. This increased the total funds transferred by these departments to $39,910,572, and the total made available for defense access roads since the beginning of the Korean emergency to $100,187,563.

At the close of the year, preliminary engineering in the amount of $96,700 was programed on 9 projects having a total estimated cost of $3,808,900 and requiring $3,664,300 of defense access-road funds. Projects having a total estimated cost of $16,369,016 and requiring $14,597,199 of defense access-road funds had been certified as important to the national defense or referred to the Department of Defense for certification. Additional projects were being evaluated by Public Roads.

Department of the Army funds were used to finance repairs on 162 miles of roads at a cost of $102,076 in Louisiana. These roads were damaged during "exercise Strong Arm" maneuvers in May 1958.

Highway Design

Public Roads engineers cooperated closely with the State highway departments during the year in problems of highway location and design, particularly with regard to the Interstate System. As solutions were worked out in one area for unusual circumstances or difficult problems, other areas were advised so that they could benefit thereby. This cooperative approach and the dissemination of useful information result in considerable time saving and promote national uniformity of practice.

Public Roads particularly stressed the desirability of designing divided highways as two separate one-way roads, and urged the States to make conscious efforts to provide an economical adaptation to natural ground conditions, using variation and imagination in details of design. The fixed cross-section, die-straight to the horizon, hazardously dulls the driver's senses, as well as being unesthetic. Locators and designers were asked to use their skills, good taste, and sound judgment to develop layouts safe and comfortable to drive, and avoid monotony, with due attention to economy in construction and maintenance. Liberal use of marginal-value land, differing levels of the two roadways on

side hills, or placement on opposite sides of a stream, can lend driver-interest to the highway with no more and often with less cost than the ugly straight-edge tangent design.

Separate roadway design, fitted into the natural terrain, often requires much less earth-moving. In addition, ground cover, trees, and other native vegetation can remain undisturbed to a larger degree, so that subsequent maintenance and erosion control costs are kept at a minimum.

Quite different from the economic and esthetic aspects of route selection, primarily a rural problem, are the involvements of urban route design and location. Wherever urban area planning commissions were active and up-to-date city plans existed, Public Roads and the States generally were eager to collaborate with local officials in fitting proposed highway improvements properly into the general urban development plan.

Within the Federal Government, coordination of urban highway route planning and city planning was strengthened during the year through increased collaboration between Public Roads and agencies of the Housing and Home Finance Agency. Field representatives of the latter were advised of Public Roads policies on acquisition of rights-of-way; Public Roads field offices, and through them the State highway departments, were notified of projected housing and planning activities to be financed by grants, loans, and advances made by the Urban Renewal Administration and the Public Housing Administration.

There is hardly a large city in the country which does not have an urban redevelopment project, and in every instance the highway authorities have been made cognizant of the proposed planning. For example, the Crosstown Boulevard in Pittsburgh, Pa., to be built as a Federal-aid project, was planned to conform to the new street pattern of the Lower Hill redevelopment project. In Louisville, Ky., one of the locations being studied for an Interstate route crosses a proposed redevelopment site; if this location is chosen, it will be with the knowledge and consent of the local redevelopment authority.

Bridge Design

As expected, Interstate System bridge projects were submitted in increasing numbers as the year progressed. The need for many structures is evident when it is considered that grade separation of all crossroads is a requirement on the Interstate System. There were a number of important bridges over waterways as well.

Several tunnels, for the most part short, were constructed. Bids were received for a 4-lane tunnel under the New River in Fort Lauderdale, the first tunnel in Florida. It will be a subaqueous type, 1,900 feet long.

The use of welding for bridge construction continued its rapid development. Welded girders 300 feet long, with 4-inch thick flange plates, were under construction. The use of thermit welding for thick plates and for making butt welds in heavy reinforcement steel was being investigated.

For several years, Public Roads has been active in seeking adoption of a new standard high-strength low-alloy steel for riveted construction. The specification for this new steel has been approved by a task group of the American Society for Testing Materials and was being considered by the metals subcommittee. During the year a survey of usage and economy of current structural bridge steels was completed.

The preparation of a master catalog of bridge designs was initiated. Information has been obtained from all State highway departments on their bridge designs of 1950 or later issue, for various types of bridges of H20–S16 loading or heavier. The information was being assembled in tabular form.

Research in structural problems connected with bridges continued during the year, as described in the section of this report on physical research.

Navigational Clearance Requirements

Efforts of the Bureau of Public Roads to reduce navigational clearance requirements for highway bridges, without unduly affecting the reasonable requirements of waterway transportation, have continued to produce results. Estimated savings in highway bridge construction costs during the fiscal year amounted to $8.9 million, including $5.3 million of Federal-aid funds; about double the savings effected in fiscal year 1957. Greatest savings this year were reported for Florida.

During the year, at Public Roads' request, the Corps of Engineers initiated a review of the guide clearances for bridges on the Atlantic and Gulf Intracoastal Waterways, the Arkansas River, and the Missouri River. Arrangements were being made for a similar review for highway bridges on the upper Mississippi River, above the mouth of the Ohio River. At least 12 highway bridges are planned for construction across this reach of the Mississippi River during the next 20 years.

Right-of-Way Acquisition

The impact of the expanded highway program was heavy in the right-of-way field during the fiscal year 1958. Not only was there a tremendous increase in the volume of acquisitions by the States, but the controlled-access features of the Interstate System introduced ramifications in the right-of-way acquisitions that in previous years had not been experienced. Another difficulty has been in the recruiting and training of needed right-of-way personnel in both Public Roads and the State highway departments. In spite of the many difficulties encountered, there were a minimum of instances when construction was delayed because of the failure to obtain rights-of-way in sufficient time.

The Federal-Aid Highway Act of 1956 has been of assistance in this regard, for it authorizes Federal acquisition of right-of-way at the request of those States which are either unable to acquire the necessary right-of-way or are unable to acquire it with sufficient promptness to meet construction requirements. Thus far, requests for Federal acquisition have been received from seven States.

Under the expanded highway program, Federal-aid participation in the cost of rights-of-way has continued to increase each year. Since the passage of the 1956 Federal-Aid Highway Act, right-of-way acquisition involving Federal funds has been authorized at a total cost of $1,158 million for the Interstate System and $180 million for all other Federal-aid systems.

Public Roads has assigned one or more right-of-way appraisers to its offices in each State. Additional right-of-way and legal personnel were being recruited to provide consultation, coordination, and assistance to the States in the handling of all phases of right-of-way acquisition.

Highway Roadside Improvement

Public Roads continued to cooperate with the State highway departments and committees of the American Association of State Highway Officials in formulating policies to guide landscape development on Interstate highways, emphasizing such factors as relation to adjacent land and conservation of landscape features during the preliminary planning stages. A *Policy on Safety Rest Areas for the National System of Interstate and Defense Highways* was adopted and published by the American Association of State Highway Officials in April 1958.

Cooperation with research and educational institutions has also continued throughout the year. Public Roads personnel participated in short courses on landscape development and related phases of highway design at three universities. Public Roads also was actively represented at a series of joint meetings with other organizations interested in the use of chemical sprays for control of weeds and harmful insects affecting highway areas.

Following the issuance of proposed guide specifications for roadside improvement by Public Roads last year, a number of States have revised and improved their standard specifications for roadside improvement items. Public Roads also assisted the States in preparation of standard plan sheets for certain types of cross sections and special areas such as planting at interchanges for headlight glare and traffic delineation, and designs for safety rest area facilities.

New graphic methods of highway plan preparation, based on State use of aerial photographs and contour mapping techniques, were demonstrated during the year at two regional conferences attended by 83 State and Public Roads engineers. These newer methods are definitely aiding in the integration of landscape development in highway design, especially in the preliminary location stage before final decisions are made.

Use of Aerial Surveys

During the fiscal year Public Roads specialists in aerial surveys conducted two 3-week schools in the field and a 6-week school in Washington, at which 65 State and Public Roads engineers received training in the uses of photogrammetry and aerial surveys in locating and designing highways. Special training was also given to four foreign engineers. Conferences were held at which several hundred State and Public Roads highway engineers were given information on the latest aerial survey methods. In addition, consulting services were provided to State highway departments and Public Roads field offices.

All State highway departments were using aerial surveys in the location and design of highways. A few States used aerial survey methods only in the reconnaissance stage to determine route alternatives. Many States were obtaining, by contract, photogrammetrically compiled, large-scale maps for preliminary location of their highways and for design and preparation of construction plans. Thirteen State highway departments had photogrammetric equipment, but continued to contract for many photogrammetric engineering services. Sixteen States own or rent aircraft for performance of aerial photography missions.

An experimental project completed during the year studied the design and placement of photographic targets for marking ground survey control before photography is taken. A formula was developed for determining the optimum size of the various components of a target according to the flight height and the target surroundings. In another experimental project undertaken during the year, cross-section measurements were to be made along a highway route by photogrammetric methods, before and after the grading work, to determine if it is feasible to measure earthwork quantities by this means.

Geodetic Markers for Survey Control

A fourth of the State highway departments have initiated geodetic marker projects under the program initiated and described in last year's report. The markers will provide reliable base points for the control of surveys for highways and other purposes. The U. S. Coast and Geodetic Survey provides technical assistance on these projects under a cooperative agreement with the State highway departments. Markers established to date have proved extremely useful.

Emergency Planning and Mobilization Readiness

In a national emergency the Bureau of Public Roads has the responsibility either directly, through the respective State highway organizations, or otherwise, to preserve in operable condition the entire available highway network of the Nation.

A large proportion of the resources on which Public Roads would call to meet the requirements of its emergency mission lies in the personnel and facilities of the State highway departments; consequently planning for emergency places great emphasis on achieving a high degree of readiness in cooperation with them.

During the past year considerable progress was made in developing plans to meet an emergency, while always keeping in mind the need for flexibility required by changes in weaponry and to meet unexpected situations. Authorities have been delegated to the field offices to carry out all Public Roads responsibilities in the event that communications are severed.

Highway Safety

The Bureau of Public Roads was actively engaged in the study and promotion of highway safety during the year. The highway safety study being conducted at the request of Congress, and a variety of studies in vehicle and driver performance aimed at the development of safe highway design, are described in other sections of this report.

Public Roads continued to cooperate closely with the President's Committee for Traffic Safety, providing financing and staff in part. The Committee sponsored a national conference in December 1957, attended by 400 State and local officials with responsibility for traffic control. The officials established immediate and long-range needs to control traffic accidents and recommended priorities for these needs. On the basis of these recommendations, the Committee organized four regional conferences, attracting about 4,000 citizen leaders into planning sessions aimed at the development of organized public support for the official needs.

At the close of the year the Committee was developing plans for regional seminars for legislators, to assure their support for laws which the public officials considered essential in strengthening and expanding accident-prevention programs.

Encouraging the search for new traffic-safety techniques, the Committee also sponsored a unique conference of scientists representing many fields of research, from psychiatry to city planning and engineering. New research projects were being developed as a result of this conference "to generate new ideas . . . particularly in the field of human behavior."

Administration and Management

Efforts were continued during the year on improvements in the Bureau of Public Roads organization structure and in realinement of functions, in accord with basic plans formulated in previous years. The overall objectives were to establish staff and line organizations with clearly defined management and operational responsibilities, and to obtain better utilization of engineering manpower by relieving technical and staff personnel of auxiliary nontechnical and line matters. Refinement and implementation of the general plan of reorganization approved in 1957 had taken place throughout most of the key organizational units, and were in progress in the remaining units.

A comprehensive field administrative organization and staffing plan was developed for handling administrative functions in the field offices. Recruitment for key administrative positions and basic training in the auditing field were also accomplished, in anticipation of a substantial workload increase in vouchers representing States claims for reimbursement. The gradual emergence of a strengthened and competent field administrative organization was noted during the year.

A study of the entire range of administrative services in the headquarters office resulted in the completion of plans for consolidating all service functions into a single division. The plans will be implemented during fiscal year 1959.

New organizational units were established in the Bureau regional offices in the West for the administration of Federal highway programs under the direct jurisdiction of Public Roads, including those handled in cooperation with or at the request of other Federal agencies. The responsibilities of the units include the complete range of activities, such as location, survey, design, construction planning, contract administration, etc., that are handled by State highway departments in the case of Federal-aid programs.

Physical relocation of the major part of the Washington office was accomplished, over the Memorial Day 1958 weekend, to a new headquarters building at 1717 H Street NW., Washington, D. C. The remaining units will move to the new headquarters building when additional space becomes available. The move relieved serious cramping that existed at the former quarters, and will provide a limited amount of space for expansion planned to meet program needs. Various field offices also moved to more adequate quarters during the year. A major relocation occurred at the end of the fiscal year when the Montana division office, after 40 years in Missoula, moved to the State capital, Helena, where the State highway commission is located.

Further decentralization of responsibility and redelegation of authority, particularly in personnel, auditing, and inspection operations, were placed in effect during the year, and standard guides and other instructions for various functional activities were issued. Training activities were broadened and intensified.

New electronic computer equipment was installed at the headquarters office during the year, and programers were added to the staff to develop machine language programs for application of electronic data processing for engineering, research, and administrative uses.

Federal-aid highway legislation places upon State highway departments the duty of maintaining completed Federal-aid improvements and requires the Bureau of Public Roads to see that such projects are being properly maintained. During the early years of the Federal-aid highway program frequent inspections of every project were necessary. Over the years there has been a marked reduction in poor maintenance, but the rapidly increasing number of Federal-aid projects to be inspected ultimately resulted in an overwhelming workload. To conserve engineering manpower and to further promote improved maintenance practices in those areas where needed, the responsibility of establishing maintenance inspection and reporting procedures that would effectively fulfill the needs of individual States has now been delegated to the Public Roads division offices. Flexible procedures can now be established that will assure concentration of efforts where maintenance is found to be lax or where special problems exist, and at the same time provide substantial reductions in travel and paperwork. National uniformity in the application of maintenance standards was being obtained through joint field spot-check inspections by regional, division, and Washington office engineers.

Development of New Practices

To foster better and more efficient or more economical highway practices, Public Roads continued to explore many fields in its efforts toward development of new and improved methods, procedures, equipment, materials, and products, and to promote the use of such developments in all highway programs.

The integration of these developments into the day-to-day operations of the highway industry is an important objective of Public Roads efforts. Manufacturers of the equipment, materials, and devices applicable to highway work were kept advised of the potential use of their products in the highway field. Cooperative activities are undertaken with appropriate committees of a variety of interested organizations. Technical assistance on the need for new developments and their application to highway work was provided to the State highway departments, foreign highway departments, manufacturing and contractor groups, and others.

Radio

During the year, Public Roads worked with the Federal Communications Commission to obtain expanded use of radio by highway agencies. Permissible use of radio was extended to include "those essential to the official activity of the licensee," allowing highway departments to transmit communications essential to construction, operation, administration, traffic control, or any other official activity.

Additional frequencies were made available for highway use by the FCC during the year. The number in the 47-megacycle band, used by the States for base to mobile-unit transmission, was almost doubled. Five additional channels were made available to highway departments in the 150-megacycle band, and 23 more allocated for future use, for base to mobile-unit transmission in smaller areas. An additional 18 frequencies were made immediately available in the 450–460-megacycle band. The FCC also recognized and was determining the highway needs for additional frequencies to be used for remote control purposes.

Electronic computers

Notable progress was made during the year in fostering the use of electronic computers. Thirty-four State highway departments had installed computers and trained personnel in their use, and others were using computer facilities available commercially or at educational institutions. Thirty highway and bridge consulting engineer firms had installed electronic computers and others were using commercial facilities.

While working toward a greater utilization of electronic computers throughout the highway engineering profession, Public Roads extended its own use of computers in the construction work performed under its direct control. Pioneering work continued in development of computer applications and programs in highway location and design, in bridge design, and in traffic analysis, and technical advice and assistance in the application of electronic computation methods was given to a number of highway departments.

Development of the use of electronic computers in equipment maintenance and construction cost analyses was initiated and carried forward in collaboration with the American Association of State Highway Officials. This effort should result in the adoption of more uniform accounting methods and in the more widespread interchange of cost information.

The Bureau of Public Roads library of electronic computer programs, established early in 1957 to collect and distribute computer programs developed for

use in the highway field, has served to minimize duplication in program development and has expedited the development of electronic computer applications. At the end of the year the library had received 109 programs, contributed by State highway departments, consulting engineers, educational institutions, Public Roads (Washington and field offices), and others. Each program received was analyzed and checked for completeness and clarity. Twelve programs have been converted to a general form usable on any type of digital computer, and seven more were in process of conversion.

Applications of computer programs in the Bureau's library ranged from relatively simple problems, such as the computation of centerline grades for a proposed highway, to highly complex problems, such as suspension bridge analyses, and included applications in highway planning, location, and design, bridge design, soils analysis, surveying, right-of-way computations, traffic studies, and hydraulic calculations.

The increase in engineering productivity resulting from the use of electronic computers has been substantial; on the average, 1 hour of time using electronic computational methods is equivalent to about 30 man-hours of conventional computation work. More importantly, speed and versatility of electronic computers make possible more exhaustive analyses and more refined designs, leading to relatively large savings in construction costs and in highway-user costs.

Public Roads' efforts toward greater use of electronic computers have been extended to include county and municipal highway departments, and the development of computer service facilities adequate to meet their needs. Close liaison has been established with computer manufacturers, commercial service bureaus, and professional associations as well as highway departments, consultants, and computer-user groups.

A fourth national conference on electronic computation and other devices on increasing highway engineering productivity was held in Boston, Mass., September 17–19, 1957.

Location and design

Public Roads has closely observed the development of electronic devices applicable to the engineering work involved in highway location and design and has promoted the integration of these devices into highway engineering processes. A recently developed device that measures long distances with remarkable accuracy has proved valuable in highway surveying, particularly in obtaining ground control for photogrammetric work. An airborne instrument, which records the elevation of a line directly beneath the flight path of an aircraft, has also shown great value in preliminary location work.

Another valuable development observed during the past year was an electromechanical device that automatically orients photographic pairs in the stereoplotter, and then automatically measures the elevations of terrain points on the model.

Another type of electronic device, under development or available in several forms, reads the terrain coordinate and elevation information obtained in the stereoplotter and stores it in computer language on cards or paper or magnetic tapes. This stored information is known as a digital terrain model. Work under way at the Massachusetts Institute of Technology in cooperation with the Massachusetts Department of Public Works was seeking to produce the electronic computer programs needed to determine the earthwork movement required for a proposed highway location through the area covered by a digital terrain model. Additional computer programs would evaluate base and surface costs, right-of-way costs, operational costs, and highway-user benefits on the same location.

In addition, it may be possible to use the computer output in conjunction with still another recent electronic development, the line plotter, to produce cross-section drawings, centerline, shoulder, and ditch profiles, mass diagrams, etc., for the finished road. These, together with the typewritten computer output, could be reproduced photographically and used for bidding and construction purposes. Entirely new highway location techniques and new location analysis methods, using electronic devices available or in development, may result. They could reduce both the time and cost involved in highway location engineering work, reduce the construction costs of the facilities and, of most importance, appreciably increase the service the facility provides.

Efforts were made during the year to establish at the State level the procedures necessary for full cooperation between State highway officials and contractors. Such cooperation extended in many States to full and frank discussions of such things as the content of future highway construction programs and the preparation of construction specifications. Past experience has indicated that such cooperation is most beneficial to the prosecution of the highway program. The extension of this cooperation to all areas of highway construction was being promoted to the fullest extent possible.

The discrepancy in some specifications between the requirements specified and the results possible with mechanized operations was being investigated. These were pointed out as they existed and in many cases steps were being taken to eliminate the differences.

Another item studied was the variance in the size of aggregate specified for various types of surfaces and bases in the same general area. The variation and its effect on construction costs and productivity were being brought to the attention of the States concerned and every effort was being made to compromise the differences.

A study was undertaken of the additional costs involved in the maintenance of traffic through highway construction projects. It is expected that this study will provide a measure of the additional costs incurred by the contractor in maintaining traffic and the costs incurred by the highway traffic due to the delays encountered. The cost to the highway user will be determined both for travel over the construction project and for travel over a detour.

Equipment development

Considerable progress was observed during the year in the field of equipment development. The use of electronic controls for grading and paving machinery has been fostered and encouraged. Such an adaption should result in improved standards of equipment performance which will be reflected both in a better quality of finished work and in reduced unit costs.

The new slip-form concrete paver, which operates on a finished subgrade without preplaced steel forms, was one of the units on which the manufacturer was being urged to develop automatic electronic control of crown and grade. Such a development will add to quality of the pavement surface as well as to the volume that can be finished in a single pass operation. Use of this unit in laying reinforced portland cement concrete surfaces was observed with close interest.

The elimination of restrictive equipment requirements which retard the productivity of conventional construction equipment and hinder the introduction and use of new models having improved performance characteristics and greater work capacity has also been promoted. For example, new criteria were being developed for rating pneumatic rollers to replace existing requirements which furnish little or no indication of the machine's compactive ability and which have retarded their widespread use in those areas of construction to which their

characteristics are best suited. Wherever feasible, the complete elimination of equipment requirements from construction specifications has been encouraged and the use of requirements based on end results promoted.

During the year, emphasis has also been placed on apprising and acquainting the highway industry on new developments in bituminous paving equipment and their influence on existing paving procedures.

Procedures were developed and arrangements made with the Corps of Engineers, U. S. Army, for testing motor graders in connection with the preparation of a Federal specification of these units. These tests will provide information on tractive effort and the ability of the equipment to perform various functional tasks on a quantitative and qualitative basis. Qualification under the test will permit Government agencies to accept these machines without exhaustive factory inspections and field tests to determine their acceptance. The States have expressed considerable interest in the use of these specifications.

Highway operation

During the year, an intensive effort was made to apprise the States of the need for a reevaluation of their maintenance and operation methods and techniques in order to make those methods and techniques applicable to the interstate type of highway. Studies of the activities that are involved in this type of maintenance were under way in cooperation with the cognizant committees of the American Association of State Highway Officials.

Several demonstrations were observed during the year of the "talking highway," an induction-type radio transmission of verbal instructions to the driver regarding traffic conditions, driving instructions, available service facilities, etc. This device allows the driver to obtain such information through his ears and keep his eyes on the road. The information can be received in the vehicle over either the standard car broadcast receiver or a small receiver built into the vehicle for this purpose.

Another development observed during the year sought to provide a means by which the driver on a controlled-access highway can call for assistance in case of emergency. Several devices, consisting generally of battery or internal generator powered impulse transmitters, were under development for this purpose, to be erected along the highway. Another approach to the problem was the installation of a small impulse transmitter in the car itself.

An important development under way which Public Roads was following closely was actual control of the vehicle by means of induction radio transmission. It has been demonstrated that the location and speed of a vehicle traveling on the highway can be determined electronically and that this information can be transmitted into other vehicles, and that signals indicating the transverse location of a vehicle on the highway can be transmitted into the vehicle. It is expected that these and other similar devices will be further developed, but it is recognized that many problems must be overcome before the era of the "electronic highway" arrives.

Experimental projects

During the fiscal year additional promising experimental projects were undertaken in cooperation with the States, involving continuously reinforced concrete pavements, plain and reinforced concrete pavements constructed over soils subject to large volume change, rubberized asphalt seal treatments, subgrade stabilization, etc. Investigations were under way on shoulder design and roughness on bridge decks and approaches, along with studies of methods of improving their construction.

About 15 new experimental projects were initiated and constructed during the year. Approximately 190 experimental projects were under observation and

were being reported on. Observations on 85 experimental projects were discontinued after tentative conclusions were obtained on their experimental features or additional construction had made further inspection impracticable.

AASHO Road Test

Previous annual reports have described the initiation of the AASHO Road Test in Illinois, the largest highway research project ever undertaken. It is a study of the behavior of concrete and bituminous road pavements and bridges of different thickness and varied design when subjected to traffic of controlled weights applied at uniform rates. Conceived and sponsored by the American Association of State Highway Officials, the test is being administered by the Highway Research Board. The Bureau of Public Roads early interest and participation in the project have in effect been endorsed by Congress through its requirements for reporting on maximum desirable weights and dimensions of vehicles and on the equitable allocation of highway cost, called for in the Federal-Aid Highway Act of 1956.

At the outset of the fiscal year, chief concern was with financing and construction of the test road, 8 miles of 4-lane divided highway between Ottawa and La Salle, with sections connected by turnarounds to form a series of test loops. In May 1957, it had become necessary to reject a bid for paving the test road because of inadequate financing. Shortly after the start of the fiscal year, however, additional financing was successfully arranged. Assured sources of financing totaled nearly $22 million, including $7,399,200 from the State members of the American Association of State Highway Officials, $1,300,000 from the Automobile Manufacturers Association, $875,000 from the American Petroleum Institute, $700,000 in contributed services from the Department of Defense, $81,400 from other agencies, and $7,305,700 in grants and contributed research from the Bureau of Public Roads. In addition, the Federal Government and the State of Illinois are providing $4,042,000 as a Federal-aid project for the cost of construction salvagable as an ultimate Interstate System improvement.

The readvertised paving contract was awarded in August and by late November, when the winter shutdown occurred, all grading and major structures were substantially complete and considerable progress had been made on paving. A concerted effort was made to compress into a single year construction which had been originally programed for 2 years, but because of adverse weather and other conditions, this proved impossible. Paving was resumed in April, on turnarounds, test tangents, and deck slabs of test bridges. At the end of the year construction was proceeding on the planned schedule and the target date for completion was August 15, 1958.

The Bureau of Public Roads arranged procurement of the 70 test vehicles and combinations and deliveries to the site were expected to be completed during July 1958. Eighteen different makes of vehicles assure operation representative of normal traffic. At the test site, some 1,150 tons of concrete blocks were being made up for loading the test vehicles.

Construction was completed on quarters and facilities for a 300-man Army contingent assigned by the Department of Defense to operate the test vehicles. At year's end, the command group of officers were on the site.

Most of the major electronic and mechanical devices specially developed by the Bureau of Public Roads and contract consultants for recording and analyzing test data were delivered to the project and were undergoing proof tests. These include, for example, profilometers to measure slope in the vehicle wheel paths and to detect rut depth in flexible pavement. Devices installed in the pavement or roadbed, which change measured phenomena into electrical potential, permit

automatic recording of traffic effects such as strain, deflection, curvature, and slab warping, and of such environmental effects as temperature variations. Instruments to record data from these devices were being installed in mobile trailers.

Data reduction and analysis equipment installed at the site included a digital electronic computer and punched card equipment. Certain analyses, too cumbersome to be handled efficiently with the project computer, will be programed for a computer at Purdue University.

Full-scale operation of the test traffic was scheduled to start in September, following completion of paving and test installations and the application of light conditioning loads to the test sections. Controlled-load traffic will continue for 2 years. Normal maintenance will be applied to the test sections under loading. Failed sections will be excluded from further consideration in the test, but will be reconstructed to carry the test traffic and will be kept under observation. Surviving sections will be subjected to more than a million load applications in the test period. A program of special tests, including heavy military vehicles to establish design requirements for their accommodation, will follow the controlled load tests.

Highway Planning Research

Traffic volume, classification, and weight information

Extensive information concerning volumes and changes in highway traffic, needed for planning highway programs, was obtained during the year from over 1,400 continuous-count stations and other operations conducted by the State highway departments. The extensive traffic volume studies covering the Federal-aid systems, both rural and urban, as well as many local roads and city streets, conducted by all States to provide the necessary traffic information for the highway cost allocation study, have provided a new base for estimating traffic trends.

During the year, traffic in rural areas increased at the lowest rate since World War II; traffic in urban areas increased even more slowly. The trend of greater traffic growth in rural areas than in cities continued. Rural travel increased 2.6 percent over the previous year, while urban travel increased 2.0 percent. A decrease in travel during the same month in successive years occurred for the first time since World War II, when total travel during October 1957 was found to be 0.5 percent less than during the same month in 1956.

Information for the highway cost allocation study concerning weights and other vehicle characteristics was collected for over 600,000 cargo-carrying vehicles, including buses, trucks, and combinations. This was accomplished by an expansion of the annual weighing and classification studies conducted by the States. Preliminary examination of the data indicated a general leveling off of truck travel and ton-miles hauled during 1957 as compared with the increases during 1956.

An engineering evaluation of efficiency of traffic-counting procedures, conducted in eight States during the year, resulted in substantial improvements in efficiency of procedures for obtaining the information and disclosed new facts of importance.

Valuable practical conclusions concerning the determination of frequency and duration of traffic counts for maximum efficiency in urban areas were drawn from studies conducted in the field and the Washington office. Investigations for improving procedures in truck weight sampling were begun during the year, using a high-speed electronic computer.

Motor-vehicle-use studies

Motor-vehicle-use studies conducted in cooperation with the State highway departments were continued during the year. Each study is statewide in scope,

and is designed to develop information on many characteristics of the use of motor vehicles. Among these are the rural and urban ownership of motor vehicles, the proportion of travel performed on the various highway systems by residents of the several population groups, both rural and urban, the methods of transportation used for home to work travel, the purpose of travel, and the frequency and length of trips. At the close of the fiscal year, field work for these studies had been completed in 22 States and Hawaii. Field work was in progress in one additional State.

Data available from some of these studies showed that 75 percent of all passenger-car trips made were related to earning a living and family business. An additional 6 percent of the trips were for educational, civic, or religious purposes, while the remaining 19 percent were for social and recreational purposes. The average car occupancy for trips related to earning a living was 1.3, while for social and recreational trips the average was 2.5. The average car occupancy for all trips was 1.8. The data showed that 58 percent of all persons of driving age were licensed drivers: 79 percent of the males and 49 percent of the females. The highest proportion of drivers was found in the 30–39 age group. As might be expected, a higher proportion of persons living in the rural areas were licensed to drive than in urban areas.

Road inventory and mapping

Road inventory operations in 45 States and Hawaii produced data concerning the degree of improvement of individual rural road sections that are being used in studies of highway deficiencies and needs, as well as statistical data of a more general nature for entire systems and areas. Based on this inventory, 301 new county general highway maps were produced in 27 States and Hawaii. Other mapping activities of the cooperative Bureau-State highway planning activities included the publication by the States of 29 State general highway maps, 35 State traffic maps, 232 county traffic maps, 63 city traffic maps, 490 city maps, and 42 urban area maps.

The Department of Defense was furnished information as to the load-carrying capacity and vertical and horizontal clearances of all structures on the Federal-aid primary highway system and other important through routes.

Highway statistics

During the year the annual *Highway Statistics* (for 1956) was published. Also published was *Highway Statistics, Summary to 1955*, which reported motor-vehicle, motor-fuel, taxation, finance, and mileage data from the earliest years of record through 1955. A report of receipts, disbursements, and debt status by all governmental units for highway purposes in the years 1948–57 was prepared. Analysis of local road and street finance data was continued.

Traffic studies in cities

During the year comprehensive home-interview studies of travel and vehicle-use were started in 5 additional cities, bringing the total of the comprehensive studies made to 136, of which 10 were repeat surveys.

The continuing study of the Detroit area, which began in 1956, will maintain and augment the findings of the 1953 origin and destination study and will broaden basic traffic research findings. Trip volumes have been brought up to date and traffic assigned to an adjusted expressway network. A program for assigning traffic to arterial streets, utilizing an electronic computer, was developed and considerable basic research was done toward improving methods for estimating number of trip origins and destinations per zone and the characteristics of trips in terms of distance, direction, and purpose. Similar studies were under

way in Chicago and Washington, where analysis of the basic data was nearing completion, and another study had been started in Pittsburgh.

In addition to the home-interview origin and destination studies, several cordon-type interview studies had been completed or were under way, including one in Anchorage, Alaska.

Forecasting traffic

Problems in connection with the planning and designing of the urban portions of Interstate System routes have provided the impetus for increased research in the field of traffic forecasting for specific sections of highway and for the use of high-speed electronic computers to achieve desired results. Methods have been developed for making forecasts of this kind that may be generally grouped in two types, a growth factor method and an inter-area travel formula. Data from the Washington, D. C., traffic surveys of 1948 and 1955 provided the means for investigating forecasting methods.

A prime object of this research was to evaluate and test the methods of forecasting future trip distribution between zones. To achieve the desired accuracy and minimize the computation time required for a test of this type, studies were made of the feasibility of using electronic computers for solving forecasting problems. Follow-up research on the use of computers led to the development and implementation of a program for an electronic computer to forecast zone-to-zone trip distribution for 1980 Washington, D. C., traffic.

Research is also under way on methods of estimating future traffic in urban areas, through the relation of present travel to land use. Knowledge of planned future land use may then permit traffic forecasting for the rational planning of street systems as well as individual routes. Studies completed during the past year as a result of the continuing analysis of data from the 1948 and 1955 origin and destination traffic surveys of the Washington, D. C., metropolitan area have been useful in estimating future trips in the Washington area, and the basic research and planning techniques established through the analyses will be applicable elsewhere.

In one study, indexes were developed and tested for estimating residential land-use trip generation. The data indicated that at a given time there is a close correlation between the number of automobiles owned by the residents of an area and the total number of trips to and from that area by both residents and nonresidents. For different years, however, this relation varied, as the number of trips per automobile owned tends to decrease as family car ownership increases. Since total residential land-use trip generation per capita remains fairly constant over a period of years, population distribution and density also appear to be good factors for predicting future trips generated by residential land.

An even closer relation was found between car ownership and the number of automobile driver and passenger trips generated by residential land use. The numerical association between these two factors is indicated to be constant over time, enabling the development of indexes for estimating automobile trip generation for future years. On the other hand, a study of four independent variables—automobile ownership, population density, family income, and distance from the city center—did not reveal any satisfactory results for estimating mass-transit passenger-trip generation by residential land. However, tests of the mass-transit trips destined to certain land uses and for particular purposes showed promise of more definitive relations to residential characteristics.

A much broader study of mass-transit usage in relation to land use, car ownership, transit service, and other factors was under way, based on data being obtained from a large number of cities. This study gives promise of yielding important results.

Urban highway planning

In planning urban highway systems, the transportation plan must be integrated with urban area growth to the benefit of the whole community as well as to the benefit of the highway users. During the past year staff assistance was provided by Public Roads to the Joint Committee on Highways of the American Association of State Highway Officials and the American Municipal Association. This committee, through the holding of State and regional meetings and through the dissemination of examples of effective coordination between highway planning and city planning, seeks to aid community development through planning.

The National Committee on Urban Transportation, to which Public Roads has contributed financial aid and technical assistance and advice since its formation in 1954, achieved an important goal at the end of the fiscal year with publication of a handbook, *Better Transportation for Your City.* The publication outlines practical methods for a community to systematically collect basic facts, analyze its transportation problems, develop a plan, attain public approval, and obtain necessary financing. A number of Public Roads personnel were among the 175 transportation experts from 9 national organizations who developed the program and tested it with 2 years of pilot studies in 7 cities. At the year's end the Committee was planning issuance of a series of technical manuals for use in implementing the program. Included will be manuals on home-interview origin-and-destination transportation surveys and parking studies, developed by Public Roads.

Traffic Operations Research

Instrumentation development

Studies made in connection with electronic scale research and the AASHO Road Test indicated that dynamic wheel loads may vary as much as 35 percent from their static value. A special research was conducted to determine the best method of continuously measuring the load on a truck wheel. The method developed and reported will be used in obtaining load shift data from some of the vehicles on the AASHO Road Test.

A mobile traffic analyzer unit, developed by Public Roads, was placed in operation early in the year. The electronic equipment, mounted in a panel truck, is capable of measuring in each of four lanes the speed, transverse placement, and time spacing of individual vehicles up to a volume rate of 8,000 vehicles per hour. Recording is done automatically in digital code on standard adding machine tape and in standard teletype code on 5-channel punched paper tape.

Traffic behavior research

Studies of traffic behavior on expressways were conducted in Chicago, Detroit, and on the Connecticut Turnpike, utilizing the Bureau's mobile traffic analyzer unit. The sites selected included locations at ramps and merging areas, at weaving sections, and on through portions of the expressways. In Connecticut, the studies involved "before" and "after" studies of the effect of expressway lighting and edge striping on driver behavior. The results of similar studies conducted last year in Texas were being prepared by the Texas Transportation Institute.

The mobile unit was also operated on freeways in the Los Angeles and San Francisco areas to study the effect on capacity of rollover and sustained grades and the effect on traffic operations of different designs of off ramps.

Highway capacity research

Collection of new data for use in the preparation of a revised edition of the widely used *Highway Capacity Manual* continued during the year. Data collec-

tion was primarily centered about expressway operations, including not only the capacities of the through roadway portions of such facilities, but also the capacities of associated ramps, merging areas, and weaving sections. Studies were conducted in Chicago, Detroit, and on the Connecticut Turnpike, in conjunction with traffic behavior studies. In addition, data were received from several State highway departments.

The analysis of intersection capacity data obtained from over 1,100 heavily traveled intersection approaches continued during the year. Further preliminary analyses were conducted of specific variables. At the end of the year, a full analysis of all data by means of a high-speed electronic computer was well into the programing stage.

Accident experience related to control of access

During the past 7 years, data have been compiled for accidents on 2,500 miles of highway, relating accident experience with the degree of access control maintained. Over 17 billion vehicle-miles of travel have been reported in this continuing study, for which many States supply annual data. The information is analyzed and summarized periodically to provide current statistics on comparative accident, fatality, and injury rates on the various highway types, in urban, suburban, and rural areas. Enough data have become available to permit limited investigations of the effects of access control on the manner of accident, within each of the above groups. To accomplish this, a high-speed electronic computer program was worked out in cooperation with the National Bureau of Standards to permit an evaluation of the relations between such factors as speed, number of lanes, lane width, shoulder width, and median type, and the frequency of accidents.

The most recent summaries continued to show that accident and fatality rates on highways with full control of access ranged between one-third and one-half of those on roads having no control of access. Head-on collision and angle collision rates on fully controlled highways were only one-fifth to one-tenth as great as on noncontrolled highways. Almost all other types of accident categories showed reductions where access is controlled, though in lesser degree.

Driver and vehicle characteristics related to accidents

Comprehensive studies of the characteristics of drivers and vehicles in relation to accidents were conducted in cooperation with 11 State highway departments during the year. Speeds of nearly 300,000 drivers were recorded on 36 sections of rural highway, and the drivers were then stopped and interviewed in order to determine their age, sex, residence, and other driver characteristics. The horsepower, body style, and model-year of the vehicles were also recorded. In addition, these characteristics were tabulated for drivers and vehicles involved in accidents on the same highway sections during a period of several years.

By combining these data with other traffic information, accident exposure rates for various combinations of driver and vehicle characteristics will be derived, using a high-speed computer. The information will form a useful part of the highway safety study. It will provide a new insight into the effect of speed, horsepower, driver's age, and other factors on accident rates, useful to highway, motor-vehicle, and police officials, legislative groups, the courts, and many other public and private groups concerned with highway traffic operations and safety.

Economic cost of motor-vehicle accidents

Cooperative studies of the economic cost of motor-vehicle accidents by the State highway departments and Public Roads were nearing completion in three States. These studies relate accident costs to the more important characteristics of the driver, the vehicle, and the highway, and are producing a mass of useful

information regarding the direct costs of accidents of various types and severity under different conditions of location, road, weather, light, methods of traffic control, size, weight, and age of vehicle, and age and sex of drivers. These results are applicable in numerous ways to many different aspects of highway safety problems and the programs aimed at reducing the number of accidents, the accident rate, and the ensuing economic losses. The relative costs of accidents at different locations, for example, will add an important factor in determining priorities for reconstruction, installation of traffic controls, and like matters.

Economics of motor-vehicle size and weight

For a systematic determination of optimum size and weight limits of motor-freight vehicles for highways of the future, it is necessary to evaluate jointly the economic factors relating to the vehicle and the highway. These include the costs of owning, maintaining, and operating various types and capacities of vehicles, plus such costs of constructing and maintaining compatible highway facilities as may be properly assigned to freight vehicles.

In collaboration with the Highway Research Board Committee on Economics of Motor Vehicle Size and Weight, research programs on three phases of this problem were under way. With the cooperative assistance of the State highway departments, vehicular operating costs and other data were collected by personal interview with motor carriers throughout the country. Records of 4,734 carriers in 36 States and the District of Columbia were reviewed. Approximately 17 percent of these carriers had records which were useful to the study, and analysis of these data was in progress.

A second phase, completed and reported during the year, was a study of the shipping density characteristics of the tonnage volumes of the various classes of commodities that are transported in the United States. The study of shipping densities and respective annual tonnages for commodities transported in line-haul freight service shows the relative amounts of freight in each of the significant density groups that are moved by highway. These data indicate the maximum limits that need be contemplated in the overall solution of the problem.

A third phase, under way at the end of the year, is a study of the costs of building and maintaining pavements and bridges designed for different levels of maximum axle and gross vehicle weights, and for different intensities of commercial and general traffic. Data from many States will be brought together to develop the highway cost trend data.

Differential road-user benefit analysis

Work was initiated during the year on studies to establish methods, procedures, and values that can be used to evaluate, on a road system basis, the differential road-user benefits accruing to passenger cars and commercial motor vehicles as a result of highway improvement. These road-user benefits include reduction in driving annoyance, savings in time, and savings in operating and accident costs that result from physical improvements in a highway such as reduction in distance, reduction in rise and fall, improvement in alinement, separation of opposing traffic lanes, elimination of intersections at grade, and reduction in number of access points.

Through cooperative agreements with several universities, data have been collected to measure fuel consumption and travel time of motor trucks in line-haul service under traffic conditions that range from restricted movement to free operation, and in city pickup and delivery service under a variety of traffic conditions. A field program was developed for determining the differences in travel time and fuel consumption and for measuring the amount and nature of traffic impedance for passenger-car operation over selected sections of toll roads

and paralleling, less adequate free roads. This study was designed to evaluate the amount of money people will pay to save time and to gain comfort and convenience.

A number of States were requested to determine by road systems the amounts and types of improvements in geometric and surface characteristics that are planned up to the year 1971. Replies were just beginning to be received and analyzed at the end of the year. With the assignment of cost values for each benefit of highway improvement and with the amounts of highway improvements, it will be possible to forecast the total value of the benefits that accrue to the various road-user groups.

Brake research

At the request of the Interstate Commerce Commission, Public Roads has undertaken a comprehensive study of emergency braking systems for combinations of commercial motor vehicles. Tests were being conducted to collect information which will resolve substantial areas of controversy concerning the safeguards in motor-vehicle braking systems necessary to prevent "runaway" accidents on the highways. The study was undertaken with the advice and assistance of an Advisory Committee to the Interstate Commerce Commission, constituted of representatives of other Government agencies and vitally interested nongovernmental organizations.

The program for study provides for three phases of tests. The first phase consists of laboratory tests to ascertain the magnitude of delays inherent in various power braking systems, and to determine which components of various emergency braking systems operate compatibly with one another. Tests in this phase of the study were under way at the Public Roads laboratory.

The second phase of the study will consist of actual vehicle stopping tests, including stops made under conditions of simulated brake failure. The third phase will consist of service tests to determine the reliability and need for maintenance of various emergency braking systems.

Highway sign standards

An intensive program of sign legibility tests, with particular attention to colors and reflectorization of large directional signs, was conducted in the vicinity of Washington, D. C., during October and November 1957. The results of this work were reflected in a new *Manual for Signing and Pavement Marking for the National System of Interstate and Defense Highways*, published by the American Association of State Highway Officials. Drawings for a new standard series of lower-case alphabet letters for use on interstate highway directional signs were prepared by Public Roads. International uniformity in traffic-control devices was advanced through participation in the Pan American Conference of Traffic Experts in July 1957, held in conjunction with the Seventh Pan American Highway Congress in Panama.

Highway Needs and Economy Research

Finance and taxation studies

Study of the problems of highway taxation continued during the year. A report estimating for 1954 and 1955 average payments of State road-user taxes made on vehicles of various types and weight groupings was published. The study of so-called "third-structure taxes" was continued, and material dealing with the characteristics of existing State systems of highway-user taxation was prepared.

Consultant assistance was given to two States on the allocation of the highway tax burden and the development of revenue structures adequate to finance

expanded highway programs. Technical assistance was given on fiscal policies, cost accounting, and financial programs to the six cities included in the pilot studies of the National Committee on Urban Transportation.

Work under way in connection with the highway cost allocation study included preparation of forecasts of population, vehicle registration, travel, fuel consumption, and highway tax revenues for the period 1955–75, and a study of the economic impact of the highway program on industry.

Highway cost studies

High-speed computer programs were designed for solving certain highway cost research problems, one of which was the development of depreciation rates of the various elements of the highway. Information obtained from an analysis of the investment in grading, surfacing, and structures for eight States was programed on the high-speed computer for use in determining the depreciated investment remaining, for construction built from 1914 to the present date, for various highway systems. Analytical estimates of highway needs based on the relation between the growth trends in traffic and corresponding growth in highway investment were being undertaken for the various highway systems.

Highway needs data submitted by the States were reviewed, correlated, and preliminary listings made preparatory for use in the highway cost allocation study.

Production cost studies

Thirty field studies were completed during the year on efficiency and performance of equipment used in highway construction. Field work was completed on a unit cost study involving several types of bridges. Attendant analyses of the field data were under way.

A 30-minute motion picture, *Power Shovel Productivity*, was completed and widely distributed among highway engineering and construction groups. This film highlights many job conditions which determine the yardage output of power shovels on highway grading jobs. It shows trouble spots and how production is affected by the speed of the dipper cycle, the size of the dipper load, and the frequency and duration of minor delays. Extensive work was also completed on two motion pictures on concrete paving operations.

Analyses of batch truck performance data relating to the effect of dumping time on production rates of dual-drum concrete pavers were completed. Analyses and reports relating to hourly cost of large crawler tractors and to performance of power shovels were also made.

Findings of a special analysis on precast construction of box culverts indicated possible savings in cost and time by this method.

Administrative studies

A local rural road organizational study was completed during the year in cooperation with the Highway Research Board. Tables showing the directing organizations of State highway departments and the salary ranges of principal officials were revised as of July 1, 1957. At the end of the year, work was under way on a revision of the Highway Research Board publication of State highway administrative bodies, a study of the management aspects of plans preparation, and a new inventory of State highway engineering manpower.

Highway and Land Administration Research

Land acquisition, control of access, and related studies

A survey of salaries of personnel engaged in the acquisition of rights-of-way for highway and other public purposes was completed during the year, in coopera-

tion with the Highway Research Board, the American Right of Way Association, and the American Association of State Highway Officials.

A survey of State highway department accounting procedures for right-of-way acquisition was commenced. A study of existing practices in the several States was under way, in cooperation with the American Association of State Highway Officials Committees on Right-of-Way and Uniform Accounting Procedures, with a view to developing standards in the right-of-way field for inclusion in an ultimate manual on uniform accounting procedures.

A study of all court decisions in which control of access was at issue was continued. Digests of all cases, with illustrative sketches, were prepared. An effort will be made to ascertain judicial trends in this field.

Consultant assistance was given to States in connection with practices relating to land acquisition, control of access, regulation of the roadside, and the provision of parking facilities.

Highway laws

A report on the legal aspects of the condemnation of property for highway purposes was completed during the year. Preliminary reports on system classification, Federal aid, and legislative purpose in highway law were also completed. These studies are part of a comprehensive study of highway law, conducted cooperatively by the Highway Research Board, the American Association of State Highway Officials, and the Bureau of Public Roads. Other reports in progress relate to intergovernmental relations and constitutional provisions pertaining to highways. Assistance to States in connection with State highway laws surveys was continued.

Economic effects of highway improvements

Technical assistance was rendered to State highway departments in connection with studies of the economic impact of highway improvements on urban and rural communities. At the close of the year, 41 of these economic studies were under way in 26 States. A special conference on economic impact research was sponsored in cooperation with the American Association of State Highway Officials and the Highway Research Board.

Hydraulic Research

Hydraulic research for highways is concerned with storm water and how to get rid of it: both water on the roadway, which must be drained away quickly to avoid interference with traffic, and water flowing in rivers, which must be passed under the highway without damage to bridges, roadway, or adjacent property.

Research in urban runoff was under way for Public Roads in cooperation with Baltimore City and County at Johns Hopkins University. Continuous recordings were being made of peak rates of runoff from a selected group of watersheds on which there were also rain gages to record rainfall. These records will be studied to develop better methods of drainage design.

In past years, effort has been concentrated on improving statistical methods of analyzing stream-flow data as available from records of the Geological Survey. These methods have made it possible to prepare regional flood frequency curves which enable the highway engineer to estimate how big a flood can be expected on any stream in that region.

In a region which is geologically homogeneous, peak rates of runoff correlate well with rainfall intensity and topographic index. For example, in New England it was found that the percentage of the area of the watershed covered by lakes or swamps was a very significant factor affecting the peak rates of runoff.

The effect of geologic factors on peak rates of runoff has been further demonstrated by studies made for the eastern half of the United States on watersheds under 25 square miles in area. Drawing on the science of geomorphology, it has been possible to classify the small watersheds into five groups, each having distinctly different peak runoff characteristics.

The problem of scour around bridge piers and abutments was being investigated for Public Roads by means of small-scale models, at Colorado State University and at the University of Iowa, the latter being carried on in cooperation with the Iowa State Highway Commission. A fundamental understanding of the scour mechanism was beginning to emerge, and with it the explanation of many bridge failures. Further measurement of scour in the field is needed to extend the results of the model tests to more complex situations.

Scour around the end of an embankment built on the flood plain can be alleviated by building a guide or spur dike extending upstream from the bridge abutment. The States of Alabama and Mississippi were sponsoring research on the proper design of such structures at Colorado State University. Scour also affects the amount of backwater (rise in water surface) caused by a bridge. Research at Fort Collins has demonstrated that for short bridges in alluvial channels the enlargement of the waterway opening by scour tends to reduce the backwater previously found for bridges placed on a rigid bed.

Colorado State University has completed an investigation on backwater caused by bridges on rigid beds, and Public Roads has developed a working method of designing bridge waterways based on these results, checking the method against backwater measured by the Geological Survey on actual bridges. Another problem which Colorado State University was investigating for Public Roads is that of scour at the outlet end of a culvert. This is aimed at making use of the natural scour hole as a means of dissipating the excess energy. Scour is controlled by placing a relatively small quantity of graded gravel in the hole.

An intensive investigation of the hydraulics of culverts has been under way for several years at the National Bureau of Standards under a project sponsored by Public Roads. It has now proved that any of the ordinary culvert entrance designs are inefficient when the culvert is on a steep grade. By enlarging the entrance of the culvert, it is possible in certain cases to increase the capacity of a given culvert by as much as 60 percent. Industries manufacturing culvert pipe were preparing to develop precast or prefabricated end sections conforming to criteria established by this research. Such sections will eliminate the use of cast-in-place headwalls which are more expensive to build and less efficient hydraulically.

By reason of the work done at the Bureau of Standards, Public Roads has developed a new type of culvert design charts which will greatly facilitate the work of the field engineer in determining the size of culvert necessary to carry a given peak discharge.

A full-scale investigation of pipe roughness as affected by joints, sponsored by the Florida State Road Department and the Bureau of Public Roads, was completed at the St. Anthony Falls Hydraulic Laboratory of the University of Minnesota. In modern concrete pipe, it has been found that the usual irregularities at joints have a surprisingly small effect upon the roughness factor. On the other hand, it has also been discovered that differences in the capacity of concrete pipe depending upon the smoothness of the surface texture are larger than indicated by earlier data.

An investigation of the pressure changes at junctions in storm drains, financed by the Missouri State Highway Department and Public Roads, was completed at the University of Missouri. Not all of the possible geometric combinations were investigated. For those that were, it was found that the pressure changes

(and thereby head losses) may actually be much larger than heretofore anticipated. This research will help to explain why some storm drain systems which supposedly had pipe of ample size did not have the expected capacity, and allowed water to flow on the street surface.

Physical Research

The physical research of the Bureau of Public Roads has, for its goal, development of the best use of materials and the employment of the best practices for building durable highways in an economical manner. Some of the studies are basic research; others are directly related to problems confronting those actively engaged in construction. The expanded highway program has increased both the number and the urgency of such problems, by causing the rapid depletion of top quality aggregates in some localities, by providing an incentive for the production and use of new materials, and by creating the need for more rapid and better methods of construction. Participation of Public Roads in studies of these matters promises an impartial approach to highway problems which is valued by State highway departments and commercial interests alike.

Soils, foundations, and flexible pavement studies

The huge current highway construction program has created keen interest in two rapid methods of locating natural sources of aggregates: (1) the use of aerial photographs, agricultural soil maps and reports, and geologic maps and bulletins, for locating probable sources of sand and gravel; and (2) use of earth-resistivity measurements, supplemented by auger borings, to determine the extent and nature of the material in such deposits.

Statewide aggregate surveys in cooperation with State highway departments were under way in Arizona, Maine, North Dakota, Oklahoma, Oregon, Washington, and West Virginia. Public Roads made aerial photographic locations of probable sources of gravel for two highway locations totaling about 50 miles in Alaska. Training was given to 43 Public Roads and State highway department engineers and geologists in the use of aerial photographs for identification of sand and gravel deposits and interpretation of soil conditions having importance in highway location and design.

Geophysical methods for disclosing ground conditions likely to affect the design and maintenance of highways were demonstrated to 54 Public Roads and State highway department engineers and 4 foreign engineers. Demonstrations and practical work with earth-resistivity equipment were done in eight States, and on Public Roads projects in national parks. Three States began the construction of resistivity equipment during the year, making a total of 33 States that either own such equipment or have it available.

Development and production of soil maps and reports for engineering purposes were continued in cooperation with the State highway departments of Illinois and Maine, and a similar study was started in Pennsylvania.

A nationwide program of making engineering interpretations in county soil surveys, begun in 1951 in cooperation with the Soil Conservation Service of the U. S. Department of Agriculture, was expanded to include cooperation with 16 State highway departments. Reports regarding the engineering interpretation of soil survey data were prepared for inclusion in SCS soil survey bulletins for 10 counties. Samples of soil for testing were received from 32 additional counties or areas located in 22 States and Alaska, making a total of 106 counties from which 3,050 soil samples have been obtained since 1951.

A cooperative study with the Soil Conservation Service to determine the engineering characteristics of the major soil series of the United States was

continued. The in-place or environmental characteristics of the soils are being correlated with the laboratory soil data obtained in clay-mineral analyses and classification, compaction, volume-change, and strength tests.

Cooperative investigations with several State highway departments to correlate flexible pavement design and performance with soils, environmental conditions, and loadings were continued. A comprehensive series of load-deflection tests were made on several pavements in Maryland. The originally programed field investigation of 321 miles of flexible pavements in Oklahoma was completed and part of the final report prepared.

The flexible pavement investigation in South Dakota, patterned after the Oklahoma study, was continued. Historical information and performance data on the 42 selected pavements totaling 380 miles were compiled, and information was prepared regarding the engineering properties of soils in 2 counties.

Development of methods to improve plastic soils and other low-strength earthy materials, for use in highway subgrades and base courses, was continued. A cooperative investigation to determine the economy and practicability of improving various soil materials by the use of portland cement or other admixtures was started in Georgia.

The cooperative program with several chemical manufacturing companies to develop and evaluate chemicals for the stabilization of clayey and silty soils was continued.

Further basic studies were made on soil-clay constituents to determine their physical and chemical properties.

A preliminary study of the relation between the percentage of portland cement required for stabilization of soils and the surface area of the soil particles as measured by the glycerol retention method was completed. This method should reduce the need for the more costly freeze-thaw and wet-dry tests on portland cement-soil admixtures.

Movement of water through base courses of pavements is affected by temperature and other climatic factors. An analysis of moisture movement data, temperature, and other climatic data, and a discussion of the effect of pore pressure in a dense-graded base course were prepared for publication.

Bituminous materials and mixtures

Study of the quality of asphalt was continued as a major research project. Analysis of asphalts representing current production from most of the refineries in the United States was nearly completed. Another phase of this study is the planned series of cooperative field experiments designed to establish the relation between the properties of asphalts from different sources and their performance in asphaltic concrete pavements. One such field project was constructed by the Virginia State Highway Department this year, and was being studied jointly by the State, the Asphalt Institute, and Public Roads. Preliminary arrangements were made with several other States for establishing similar projects in different geographical areas of the country, using asphalts from a number of sources.

The final report on a study of sheet asphalt pavements in service and under observation in the District of Columbia for 19 years was completed.

A report on the laboratory study of antistripping additives for bituminous materials was completed and prepared for publication. The study evaluated 13 commercial additives used to promote better adhesion between aggregates and asphaltic materials.

A laboratory study to evaluate three methods of design of bituminous pavements currently used in the United States was under way. Bituminous pavements constructed in Maryland and Virginia were being studied to obtain information on the relation of some of the design methods to field performance.

A laboratory study to determine the effect of the temperature of bituminous mixtures at the time of compaction on the results of Marshall stability and compressive strength tests was completed.

Chemical investigations

Studies of methods of chemical analysis and the evaluation of the chemical properties of highway materials continued. During the year a study of the method for determining the insoluble residue in portland cement was completed and published. Based on this study, standard methods of tests have been revised and should result in better reproducibility.

A study of methods for determining the loss on ignition of portland blast-furnace slag cement was completed and a report was prepared. This study resulted in a new, direct, and rapid method for making the test.

A report on a chemical test for determining the alkali reactivity of aggregates was completed. The study showed the deficiencies of the present standard method and suggested means of classifying the test results to avoid erroneous conclusions.

The chemical analyses of concrete retarders were continued. This work included development of methods of analysis where no suitable means exist. The recently acquired infrared spectrophotometer will be used to establish the characteristics of proprietary products that will permit comparisons of one shipment with another for uniformity, both qualitatively and quantitatively.

Cement, aggregates, and concrete

Variations in the strength and finishing characteristics of concrete for highway paving have been attributed to variations between different shipments of portland cement from the same mill. Some State highway departments have attempted to obtain more uniform cements by imposing restrictions on chemical composition beyond those normally specified for Type I cement. An analysis was made of the mortar strengths obtained with cements accepted by a State highway department having such additional requirements, to determine whether variations in strength were significantly reduced. Although it was found that control of chemical composition lessened variation in strength for some cements, manufacturing controls generally had the most marked influence. For most cements, specifications limiting the chemical composition were ineffectual for controlling variations in strength.

Methods of determining the absorption of crushed fine aggregates were investigated. It was concluded that for fine aggregates composed of crushed rather than naturally rounded particles, separation of the sample into its various size fractions gave the most realistic value for absorption, regardless of how the saturated-surface-dry condition was determined. Use of a dye which fluoresces under ultraviolet light when wet was found to be a definite aid in determining the saturated-surface-dry condition of fine aggregates. A method for determining the susceptibility of aggregates to polish when used in a pavement surface has been studied in connection with the problem of slippery road surfaces.

An investigation was completed of three procedures for measuring the durability of aggregates by freezing and thawing. It was found that the addition of a small amount of alcohol to the water in which the particles were frozen and thawed increased the severity of the test considerably. A freezing and thawing test using this procedure and conducted in a home-type deep freeze unit can be completed in about the same length of time as the present sulfate soundness test for aggregates.

The proposal to use lightweight aggregates such as expanded clay or shale in concrete pavements for highways provided impetus for a study to determine

the most suitable method for measuring the effect of these materials on the abrasion resistance of concrete. The first phase of this study, consisting of tests on the aggregate particles before incorporation into concrete, was completed. It was found that the Deval abrasion test indicated large differences among the nine materials tested which were not shown by the more widely used Los Angeles abrasion test.

Work was continued on three different phases of the problem created by expansion of concrete as a result of the attack of reactive aggregates by the alkalies in cement. Tests of a proprietary pozzolan showed it to be effective in preventing detrimental expansion when used in the proper amount. A study involving five different portland blast-furnace slag cements indicated that such cements are less likely to cause detrimental expansion in concrete by reacting with aggregates than the portland cement used in their manufacture. However, these tests showed that excessive expansion is still possible with portland blast-furnace slag cements. Testing of aggregates from various locations to determine their susceptibility to reaction with the alkalies in cement has been continued.

In the investigation of retarders for portland cement concrete, studies of methods for measuring the effectiveness of the retarders were completed. Tests of the effect of the retarders on the strength of concrete have been made, as well as tests of revibration of concrete. Tests were in progress to determine the effect of each retarder on the durability of concrete.

Study of the use of portland blast-furnace slag cements in concrete was completed. A report of the study will include data obtained in tests in which some of the cement was replaced by fly ash.

A lengthy study of the durability of concrete subjected to alternate wetting and drying has been completed. Concrete beams, prepared with aggregates having questionable or good service records, were first subjected to 325 cycles of controlled wetting and drying in the laboratory. This was followed by 600 cycles of wetting and drying outdoors over a 5-year period. The outdoor treatment did not prove very effective, probably because the beams were not dried thoroughly each day by solar heat. These tests showed that the durability of concrete is affected more by the characteristics of the coarse aggregate than those of the fine aggregate. They also showed that concrete exposed to the weather may possess a remarkable ability to regain strength even after being considered to have incipient failure.

Studies of the scaling of concrete due to the use of calcium chloride to remove ice have been continued. Some 200 specimens were under test at the laboratory during the winter, including various combinations of cements, aggregates, and admixtures. Specimens coated with several different liquids designed to protect the concrete from attack by chlorides were included in the tests. Some of the materials used showed promise of decreasing the severity of the scaling and a report covering this work was being prepared.

Reports were prepared on the effect of capping materials on the strength of concrete cylinders, and on a pocket-size apparatus for determining the air in concrete.

With the cooperation of State highway departments, an extensive study of the mixing time required and the permissible amount of overload for 34–E concrete paving mixers was begun. Fifteen highway departments indicated interest and field work for one study was completed. This investigation may be instrumental in effecting a major change in the practice of preparing concrete for pavements using movable mixers. It is anticipated that a reduction in the mixing time and an increase in the volume of concrete mixed will be found possible.

Structural design of concrete pavements

Research to develop information on the structural design of concrete pavements was continued. Some of the research was conducted by Public Roads alone and some was cooperative with several States.

One important contribution during the year was the publication of a comprehensive report on a laboratory study of the structural characteristics of doweled joints for concrete pavements. This work provided valuable new information on the influence of dowel diameter, dowel length, and width of joint opening on the structural capacity of the load-transfer system.

Continuously reinforced concrete pavements have been the subject of investigation since the construction, in 1938, of a pioneer cooperative experiment by Public Roads and Indiana. Thus far, seven continuously reinforced pavements containing numerous variations in design and other features have been built and are now in service in other States. The promising performance of these pavements has stimulated considerable interest in the subject. During the year Pennsylvania constructed a cooperative experimental pavement of this type. Four other States have planned or are seriously considering the construction of experimental projects. Public Roads is cooperating in two of these.

Interest is also increasing in prestressed concrete pavements. At the Missouri School of Mines, cooperative studies were completed that provide basic information relative to the design of such pavements.

Development or improvement of embedded strain-gage devices for the measurement of strain in concrete pavements was undertaken during the year. About 120 of these devices, consisting of 2 types, were made and installed in a test pavement especially constructed for the purpose. Strains measured with the embedded gages will be compared with those measured with SR–4 gages cemented to the surface of the pavement. Other information pertinent to the structural design of present-day concrete pavements will be obtained in this study.

Bridges

Progress was made in the preparation of reports on the dynamic testing of bridges. An analysis of the data taken on a simple span bridge tested cooperatively with the South Dakota Department of Highways was made and a report was prepared. The analysis of data from a similar test in Missouri was checked for that State. In both cases use was made of new time-saving electronic data-reduction equipment, which also provided increased accuracy of data processing. Reports by Iowa and Missouri, covering findings made on cooperative bridge tests conducted in those States, were in preparation. Nebraska and South Dakota continued work on the preparation of reports on the remaining bridge tests conducted in the previous 2 years. The combined analytical and laboratory research on the same subject has continued at the University of Illinois with participation by Public Roads.

The Bureau's mobile electronic equipment unit was transferred to the AASHO Road Test in Illinois for use in the bridge test program. The equipment was first expanded to permit more data to be taken and certain modifications were made to facilitate the gathering of data. AASHO Road Test personnel are being trained in the use of this equipment by Public Roads experts.

An unusual study under way during the year was the design, fabrication, and testing of an aluminum bridge by an aircraft manufacturer in cooperation with Public Roads and a number of aluminum producers. Three 50-foot beams of triangular cross-section, made of thin aluminum sheets stiffened with aluminum extrusions, were joined together to form a structure 24 feet wide. Testing of the structure was under way at Lehigh University. The application of aircraft

design principles to aluminum bridges may well prove to be a means for the economical use of aluminum in highway bridge construction, at least for some types and lengths.

Public Roads' wind tunnel for determining the aerodynamic behavior of suspension bridges has been more fully equipped and preliminary tests were made. Models of various types, spans, and sizes of structures were being designed and fabricated for an investigation of their susceptibility to wind-induced vibrations. Qualitative studies of wind action on a section model of an existing suspension bridge were made to determine avenues of approach and methods of gaging to be used in future testing. The wind tunnel was also being used for studies of the possible aerodynamic oscillation of overhead highway signs.

Cooperative research in the various problems of bridges and structures carried on at several universities was continued and effective results were being obtained over a wide area.

With the large number of steel highway structures being built, interest in the properties of suitable paints has increased. Public Roads expanded its investigations relating to paints, especially those of the corrosion-inhibitive types. A report published during the year showed the advantages of using a red-lead, iron-oxide type paint when long delays before final painting are anticipated. A new study was begun on the weathering properties of a basic lead silicon-chromate pigment, which shows promise of providing greater protection to steel at a lower cost than the paints now in use.

Special research equipment

Public Roads designs and builds special research equipment required for particular purposes when it is not available elsewhere. Typical of such equipment, developed and fabricated for use on the AASHO Road Test, were four truss-type, all aluminum, profilometers for obtaining the transverse profile of a roadway by means of a pantograph mounted on a power-driven carriage; lever-type Benkelman deflection indicators to permit taking deflections of roadways between setups under a moving load; and equipment for the mechanization of seven Benkelman deflection indicators suspended beneath a semitrailer to permit taking intermittent deflection readings of a flexible type pavement under a moving load.

Public Roads continued its interest in developing means for evaluating the smoothness and slipperiness of pavement surfaces. At present one-third of the States as well as some other road groups have road-roughness indicators similar to the one developed by Public Roads. Research was being focused on improving the equipment. Skid resistance equipment has been designed and built by Public Roads to measure the forces that result from both straight and side skids. The equipment can be used to determine the skid resistance of various types of pavement surfaces, under various conditions.

Foreign Activities

The 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 about 3,200 miles. Connecting highways from El Paso and Nogales, Tex., to Mexico City now afford more direct routes from the western United States. The section of the highway in Mexico has been financed and constructed entirely by Mexico.

At the end of the year, 95 percent of the Inter-American Highway was passable in all kinds of weather by motor vehicles, but uninterrupted travel to Panama City was still an impossibility. Throughout its length of about 1,600 miles in Mexico, the highway was open at all times and practically all of it was paved. In Guatemala, starting at the Mexican border, construction continued on a difficult impassable gap of 25 miles. This gap could be bypassed by rail. Beyond this gap, the highway was passable at all times as far as San Isidro, Costa Rica, a distance of about 1,100 miles. In this distance, many sections were under construction, but the route was open and passable without undue difficulty.

Beginning at San Isidro, Costa Rica, a formidable impassable section of the route extends 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 300 miles, the highway was passable at all times but several sections were being constructed to modern standards.

During the 1958 fiscal year, the following was accomplished:

Congress authorized $10 million toward the completion of the Inter-American Highway.

Complete designs were prepared by the Bureau of Public Roads for several bridges on the highway, and steel fabrication for other structures was supervised.

In Guatemala, all of the highway not presently paved was under construction to bring it up to modern standards for a 2-lane road. During the year good progress was made on the grading and drainage of the new highway and placing of a subbase. The work is being done by contract. Several projects were completed and the others were nearing completion. Several permanent bridges remained to be built but good detours were available in all cases.

An experimental project was under way, using locally available volcanic sand for bituminous surface construction in place of crushed rock, which is not economically available on the northern end of the highway in Guatemala.

In the difficult Selegua Canyon in the impassable gap in northern Guatemala, the grading progressed satisfactorily but difficulties were experienced with slides. In this terrain slides may be expected to continue for several years after the highway is opened. This section of the highway was not expected to be opened until after the wet season.

In El Salvador, the highway was completed to Inter-American Highway standards, with asphalt surface throughout.

In Honduras, a 21-mile contract for grading, drainage, and subbase was completed and a contract was awarded for the balance of the grading, drainage, subbase, and bridges. The completion date for this contract is June 30, 1959.

In northern Nicaragua, a 48-mile section was under construction for grading, drainage, and subbase, with a completion date of June 30, 1959. All of the bridges in northern Nicaragua have been completed. In southern Nicaragua, the Nicaragua Highway Department was bringing a 15-mile road section up to Inter-American Highway standards and the 10 remaining bridges under contract were nearing completion. Upon the completion of this work all of the road in Nicaragua not already paved will be ready for the base and for paving.

In Costa Rica, construction proceeded normally on the 148-mile contract for the completion of the highway in the northern section, from the Nicaragua border to San Ramon. This section has been kept open to traffic at all times. In southern Costa Rica, the entire 134-mile impassable section between San Isidro and the Panama border was under construction, under three contracts for grading, drainage, base, and five bridges, all of which were expected to be completed by the end of 1959. Fair progress was made by the contractors in opening up this long impassable gap in difficult terrain where access is a big problem.

There were still 39 bridges to be constructed before the road will be open to all-weather travel and it was expected that they will be placed under construction soon.

In Panama, progress was steady during the year. Uncompleted sections of the route were under construction for grading, drainage, base, and bridges except for one 65-mile section where the present road was adequate to handle traffic at all times until it can be reconstructed.

At the end of the year, of the total length of 1,573 miles from the Guatemala-Mexico border to Panama City, 730 miles were paved or under construction for paving. The grading, drainage, subbase, and bridges were completed or under construction on most of the remaining 843 miles.

By the end of the year, contracts or force-account agreements with a total value of over $84 million and covering 868 miles of the highway had been awarded since the present program was inaugurated in 1955.

Other Latin American projects

In Guatemala, Public Roads continued furnishing 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 Puerto Barrios.

In Nicaragua, Public Roads continued its technical assistance to the Republic in the planning and construction of their National Highway System (other than the Inter-American Highway), which is being financed in part by a loan from the International Bank for Reconstruction and Development (World Bank).

The United States is also assisting Nicaragua financially in the construction of the Rama Road. This, when completed, will form the main transportation link between the settled portion of Nicaragua on the Pacific Coast and the large, undeveloped fertile areas of eastern Nicaragua, and the Atlantic Ocean. It begins at San Benito on the Inter-American Highway and extends 158 miles east to Rama, a river port on the Escondida River which can be reached by ocean vessels from the Atlantic. Construction began on this project in 1943 with United States funds and continued until June 1948, when funds were exhausted. An all-weather road had been practically completed from San Benito to Villa Somoza, a distance of 96 miles. Work was resumed during the fiscal year 1955. At the end of this year, 26 miles of the remaining 62 miles were completed as all-weather roads, except for four bridges, and a contract had been awarded for an additional 16 miles, except for the bridges.

In Panama, Public Roads has been assisting the Government of Panama in a reconnaissance survey of a route to connect the Inter-American Highway at Panama City with the highways of Colombia and South America through the Darien jungle, an almost totally uninhabited region.

During the year, Public Roads sent a highway planning engineer to Colombia for 3 months to assist the Government of Colombia in establishing a highway planning department. A request was also received from Colombia to send an engineer to assist in setting up a highway design department, and action was initiated at the end of the year to comply with this request.

Other foreign activities

The Bureau of Public Roads has, since the end of World War II, provided technical assistance, advice, and consultation in many foreign countries in cooperation with the Department of State, the Export-Import Bank, and the International Bank for Reconstruction and Development. The objectives of such assistance have been to further the programs of highway improvement and communications in those countries, thus fostering their economic and social growth.

During the fiscal year, programs previously initiated were continued in British Guiana, Ethiopia, Iran, Jordan, Liberia, Pakistan, the Philippines, and Turkey. During the year a tri-party agreement was entered into between the United States, Nepal, and India for assistance to Nepal on their highway improvement program. One man has already been assigned to this project, for which funds were provided by the International Cooperation Administration. A new program was agreed upon with ICA for technical assistance to Lebanon and the chief of the Bureau of Public Roads mission which will carry out this program left for Lebanon just before the end of the fiscal year. One engineer was sent to the Sudan for preliminary consultation on a highway program to be sponsored by ICA; Public Roads has agreed to undertake the direction of this program when formal agreement is reached. Temporary assignments were also made in Yemen, Morocco, and Laos of engineers for consultation on highway improvement programs and problems. A special study was made under agreement with ICA of the proposed Bagdad Pact highway, extending from Istanbul, Turkey, through Iraq and Iran to Karachi, Pakistan.

Activities in British Guiana.—In British Guiana, by agreements with ICA and British Guiana, Public Roads advises the Government on all road matters and in the organization and training of the roads division. One Public Roads engineer has been assigned in British Guiana. A recommended separation of the highway organization and operations from the Ministry of Public Works was approved, but progress in this step was limited. Tests were made to determine the feasibility of asphalt stabilized sand base courses and surfacing, which should effect great economies in future construction costs. Progress was being made in surveys and roadway design, in which field training has been provided. With improved organization, increased ability of road engineers and surveyors, and increased Government attention to program and planning needs, accomplishments should show a rapid increase in the near future.

Activities in Ethiopia.—On June 28, 1957, an agreement was signed between the Imperial Ethiopian Government and the International Bank for Reconstruction and Development, for a $15-million highway loan for construction of approximately 510 miles of roads to open up potentially rich coffee-producing areas, maintenance and betterment of the existing 3,060 miles of primary roads, survey and design of an additional 600 miles of new roads for future construction, and an extensive training program. Bank funds will be used for purchasing equipment and supplies and for the services of foreign personnel. Ethiopia has appropriated $28 million for local expenditures during the next 3 years.

Contracts were awarded to consulting firms for ground surveys and preparation of complete construction plans for approximately 840 miles of roads of high priority, and for aerial photography of approximately 66,000 square miles, covering the areas in which highway routes are to be surveyed. Both contracts were substantially completed.

Training of Ethiopian personnel at all levels and in a variety of fields continued at an accelerated rate.

Traffic on the main highways showed an increase of 26 percent in 1957 over 1956, and motor-vehicle registrations, an increase of 20 percent. Travel time and cost of transportation continued to decrease as highways were improved to better standards.

Activities in Iran.—The program of technical assistance in Iran was initiated last year. During this fiscal year the Public Roads staff was increased to a total of 32. Organization of the Highway Department was arranged and the filling of positions progressed as rapidly as personnel could be found. During the Iranian year ending March 20, 1958, the Ministry of Roads budgeted $1,315,000 for maintenance and $6,000,000 for construction. Recognizing that this division

of funds was imbalanced, the allotment for the year beginning March 21, 1958, provided $6,000,000 for maintenance and $1,315,000 for construction.

Major attention was given to maintenance of existing roads, some of which were constructed by American, British, and Russian armies during World War II, but had been neglected since. By the end of the fiscal year, maintenance and betterment work had been performed on 1,320 miles of roads.

Training in the use and care of highway machinery was provided to 214 Iranians.

Equipment for the Iranian highway program was purchased in the United States from a special fund of $610,000 supplied by the Iranian Ministry of Roads and Communications and from a $5-million loan by the Export-Import Bank.

In addition, the International Cooperation Administration approved an allotment of $1,060,000 to be supplemented by about $1,000,000 of Iranian funds for the construction and equipping of six equipment repair shops. Public Roads assisted in purchase of equipment for these shops and its shipment to Iran.

Activities in Jordan.—Since the inception of the Jordan road program in 1952, Public Roads has engaged both in assistance in development of the expanding highway organization and in construction of 182 miles of roads on a tentative national highway system, proposed to include 800 miles of primary routes and 1,500 miles of secondary and feeder or access roads.

During the year, surveys were in progress on sections of two main routes: a 130-mile route connecting the Bagdad highway at Mafraq with Nablus, and a 115-mile route from the Bagdad highway, 59 miles east of Amman, to Jerusalem. Grading and surfacing were completed on a 26-mile section of the primary route between Amman and the Dead Sea. A 382-foot bridge over the Jordan River was nearly completed. Construction work continued on farm-to-market and village access roads.

Completion of projects under construction on the primary system will provide Jordan with high standard highway connections between some of its principal industrial, agricultural, and populated centers. The road program in Jordan was providing a substantial impact on the economy of the country, including employment for 4,000 persons.

During the year Public Roads assisted in equipment operation and maintenance problems. On the advice of the Public Roads staff, the Ministry of Public Works has earmarked funds for highway maintenance.

Activities in Liberia.—Public Roads continued its assistance in Liberia during the year, and construction was completed on 13 miles of bituminous pavement and 54 miles of grading and structures, including a 410-foot bridge. The Liberian Division of Highways improved the width and grades on 12 miles of the principal highway between Monrovia and the interior.

A $7-million contract for construction of 150 miles of roads in the Western Province was 40 percent completed. This work, which will open up large areas for development, was financed from a $13-million loan by the Export-Import Bank.

During the year a farm-to-market road program was initiated, with ICA financing of the equipment and materials. Twelve miles were rough graded between Greenville and Juarzon, and a second farm-to-market road in the Sanokole area was planned.

A contract was let for the construction of 189 miles of roadway and structures in the Eastern Province to an Italian firm which loaned the Liberian Government $15 million to supplement their Export-Import Bank loans. The Italian firm will perform all the work to be financed under the loan.

Maintenance work continued during the year on 660 miles of highways.

On-the-job training in all phases of the highway program continued and selected Liberian students are being trained in civil engineering courses in the United States.

Activities in Pakistan.—The Bureau of Public Roads program of technical assistance in Pakistan, initiated in 1955, was closed out in April 1958. The Public Roads staff had provided technical advice and assistance in highway department organization, a highway inventory, traffic surveys, materials laboratory operations, soil stabilization, and the training of technicians in the operation, repair, and servicing of construction and maintenance equipment. During the program, Public Roads handled the purchase of $1,900,000 worth of equipment, materials, and supplies with ICA funds.

Activities in the Philippines.—Public Roads has maintained a work group in the Philippines since 1946. Until 1952 its principal concern was reestablishment of a highway organization and restoration of war-damaged roads and bridges under the Philippine Rehabilitation Act.

Since 1952 the Public Roads group has acted as consultant and functional agency to the International Cooperation Administration and its predecessor agencies in road matters, and as advisors to the Philippine Bureau of Public Highways. Assistance has been given in the advancement of the nationwide highway program, construction of the Mindanao development roads, replacement of temporary bridges, and development of village feeder roads.

Construction and maintenance equipment, shop tools and roofing, and bridge steel costing over $25 million have been provided by the United States. Commodity support was reduced to $1,463,000 this fiscal year as requirements lessened.

During the year, 49 miles of roadway and 29 bridges were completed in the Mindanao development road program. The 88-mile Alah Valley road from Cotabato to Marbel was also completed. At the close of the year, 149 miles of development road and 61 bridges were under construction. The cost of this construction to date has been $14 million from counterpart funds (none since 1956) and $15 million from local general revenue funds.

Improvement continued at a greater rate this year on the national and provincial highway system. A total of 1,135 miles of roads and 21 bridges were completed, and 418 miles of road and 28 bridges were under construction at the close of the year. The completion of 979 miles of road under the village feeder road program has brought road access to many formerly isolated rural communities. An additional 1,770 miles were under construction in this program.

Training in the United States of Philippine nationals has been continued. Returning participants showed the value of this program as they put their knowledge to work.

Activities in Turkey.—The Public Roads technical and economic assistance program in Turkey, started in 1947, continued with emphasis on equipment operation, maintenance and repair, construction engineering, and cost accounting. The Public Roads staff averaged 11 employees, and an urban traffic survey specialist was added to assist in a home-interview type origin-destination survey of Istanbul.

Proficiency of the Turkish Highway Department personnel has reached a level that will permit the Public Roads assistance program to be closed out in December 1958, except for temporary duty assignments and training of Turkish personnel in the United States.

A total of $500,000 of ICA funds was made available during the year for purchase of materials not available locally. The 1957 Turkish highway budget amounted to $150 million, 10 percent of the total national budget.

All-weather road mileage in Turkey has been increased from 7,800 miles in 1947, when this program began, to 20,600 miles, including 13,500 miles on the national system and 7,100 miles on the provincial system. Mileage of bituminous-surfaced roads was increased from 320 miles to 3,200 during the same

period. Travel has increased from 350 million vehicle-miles in 1950 to 875 million in 1957, with marked effect upon the economy of the country, especially since a high percentage of total traffic is commercial. About 60 percent of the vehicles registered were trucks and buses, 20 percent passenger cars, and 20 percent taxicabs. Rural traffic averages about 80 percent trucks and buses.

Training of foreign engineers

The Bureau of Public Roads has continued its contribution to our Government's program of technical assistance to other countries through training. Assistance was extended and programs of study, training, and observation were arranged in all phases of highway improvement and utilization in the United States. A total of 626 man-months of training was provided to participants from 32 countries under the sponsorship of the International Cooperation Administration, including groups from Japan, Spain, and Yugoslavia. Additional individuals not under any official sponsorship were provided assistance at the request of the Department of State. Included were four engineers from Poland.

The State highway departments continued their splendid cooperation in making their facilities and the time of their personnel available for study and training of our foreign visitors.

Appendix

LIST OF TABLES

Table 1.—Summaries of programs approved and work completed in the fiscal year 1958, by class of highway and by fund

	PROGRAMS APPROVED [1]						WORK COMPLETED					
	Total cost	Federal funds	Miles	Railway-highway grade crossing improvements			Total cost	Federal funds	Miles	Railway-highway grade crossing improvements		
				Crossings eliminated	Structures reconstructed	Crossings protected				Crossings eliminated	Structures reconstructed	Crossings protected
	BY CLASS OF HIGHWAY						BY CLASS OF HIGHWAY					
Primary-rural, Interstate	$1,574,229,995	$1,382,873,882	3,447.5	118	7	3	$302,806,501	$232,855,088	952.5	38	1	
Primary-rural, all other	967,467,216	542,506,889	10,448.6	75	11	101	557,620,767	293,053,192	6,208.9	84	16	92
Secondary-rural	621,322,869	343,598,721	18,987.5	24	3	213	427,897,436	221,544,115	14,904.8	22	3	229
Urban-Interstate	1,019,454,588	812,101,915	368.2	54		3	260,730,654	191,068,332	167.4	42	1	
Urban, all other	631,405,051	344,072,549	1,157.7	87	15	42	366,629,346	185,058,089	903.3	79	6	62
Subtotal	4,813,879,719	3,425,153,956	34,409.5	358	36	362	1,915,684,704	1,123,578,816	23,136.9	265	27	383
Not classified [2]	108,312,245	96,008,512	1,288.6				80,336,879	65,273,915	1,066.8	7	2	
Total	4,922,191,964	3,521,162,468	35,698.1	358	36	362	1,996,021,583	1,188,852,731	24,203.7	272	29	383
	BY FUND						BY FUND					
Federal-aid:												
Primary	$783,841,338	$412,353,578	6,427.5	83	13	107	$679,517,811	$356,269,836	6,799.1	110	16	105
Secondary	498,307,895	258,545,470	14,823.8	23	3	211	444,110,493	229,306,841	15,008.1	26	3	231
Urban	459,850,163	243,267,811	456.2	64	12	35	305,930,440	153,545,403	342.8	70	7	47
Interstate	2,592,845,077	2,194,515,441	3,812.0	172	7	6	486,064,660	384,415,872	986.9	59	1	
"D" funds	479,035,246	316,471,656	8,890.0	16	1	3	61,300	40,864				
Subtotal	4,813,879,719	3,425,153,956	34,409.5	358	36	362	1,915,684,704	1,123,578,816	23,136.9	265	27	383
Prewar Federal-aid grade crossing							749,851	341,140				
Access roads, Act of 1950	9,741,033	8,393,467	129.2				12,618,129	10,960,915	193.3	7	2	
National forest highway [3]	29,857,304	28,108,702	558.5				19,868,587	18,114,404	352.1			
National park and parkway [4]	48,210,200	48,210,200	363.6				15,293,436	15,293,436	203.1			
Bureau of Land Management [4]							3,141,272	3,141,272	113.3			
Forest development [4]							5,317,985	5,317,985	79.8			
Public lands	2,436,724	2,313,350	49.0				3,072,877	2,334,543	32.4			
Emergency flood relief	18,066,984	8,982,793	188.3				20,274,742	9,770,220	92.8			
Subtotal	108,312,245	96,008,512	1,288.6				80,336,879	65,273,915	1,066.8	7	2	
Total	4,922,191,964	3,521,162,468	35,698.1	358	36	362	1,996,021,583	1,188,852,731	24,203.7	272	29	383

[1] Initial commitment of funds.
[2] Prewar Federal-aid grade crossing, 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, 1958, 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	$1,772,990,948	$1,532,832,814	3,613.1	138	6	2
All other	1,277,561,180	684,836,154	11,589.9	149	21	102
Secondary-rural	617,278,804	321,648,974	16,279.9	49	3	205
Urban:						
Interstate	1,916,773,371	1,437,068,445	571.3	179	3	6
All other	1,004,458,888	522,066,278	1,366.4	193	17	57
Subtotal	6,589,063,191	4,498,452,665	33,420.6	708	50	372
Not classified [1]	143,177,068	126,570,826	1,841.7	2		4
Total	6,732,240,259	4,625,023,491	35,262.3	710	50	376
By Fund						
Federal-aid:						
Primary	$1,263,515,290	$654,371,431	9,475.3	178	23	128
Secondary	622,942,697	321,432,162	16,052.1	51	4	208
Urban	867,380,480	443,432,548	636.1	163	15	27
Interstate	3,610,135,541	2,930,558,023	4,141.5	304	8	8
"D" funds	225,089,183	148,658,501	3,115.6	12		1
Subtotal	6,589,063,191	4,498,452,665	33,420.6	708	50	372
Access roads, Act of 1950	18,235,351	16,409,064	278.2	1		4
Defense Highway Act	1,003,869	501,931				
National forest highway [2]	36,266,398	33,345,908	610.2			
National park and parkway [3]	48,704,988	48,704,988	488.7			
Bureau of Land Management [3]	5,029,419	5,029,419	123.3			
Forest development [3]	8,989,983	8,989,983	141.8			
Public lands	3,322,667	3,101,050	37.4			
Emergency flood relief	21,624,393	10,488,483	162.1	1		
Subtotal	143,177,068	126,570,826	1,841.7	2		4
Total	6,732,240,259	4,625,023,491	35,262.3	710	50	376

[1] Access roads, Defense Highway Act, 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, 1958, 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	$16,553,168	$8,644,731	157.0	$12,982,269	$6,407,049	633.3	$7,510,220	$3,908,834	12.5	$69,189,810	$50,008,812	95.4	$106,235,467	$68,969,426	898.2
Arizona	8,084,997	6,549,086	57.1	3,903,778	2,809,774	64.7	1,518,143	1,043,346	9.0	22,572,546	21,302,969	84.7	36,079,464	31,705,175	215.5
Arkansas	9,673,089	5,053,977	27.1	7,325,802	3,661,146	367.0	5,214,969	2,844,392	6.6	39,547,828	35,585,161	62.5	61,761,688	47,144,676	463.2
California	20,684,119	11,610,931	56.7	21,364,878	11,716,568	237.2	36,922,945	19,834,917	15.2	260,050,754	118,611,866	100.5	339,022,696	161,774,282	409.6
Colorado	14,560,394	8,076,477	82.9	7,130,891	3,933,131	127.6	2,578,973	1,402,741	5.2	18,646,394	16,853,581	78.8	42,916,652	30,265,930	294.5
Connecticut	5,004,846	2,489,309	3.2	3,567,441	1,750,174	5.7	17,044,921	9,248,115	3.9	20,678,945	18,471,729	6.4	46,296,153	31,959,327	19.2
Delaware	3,592,423	1,794,999	25.4	2,234,057	1,117,968	8.3	815,015	401,881	1.5	20,095,558	18,087,562	2.0	26,737,053	21,402,410	37.2
Florida	12,394,916	6,193,716	64.9	10,094,149	5,036,923	256.0	14,998,852	7,463,077	5.5	64,528,766	58,079,649	32.2	102,016,683	76,773,365	358.6
Georgia	15,451,043	7,784,621	68.5	12,289,792	6,252,466	305.7	15,205,035	8,062,191	14.1	85,165,203	76,654,046	130.7	128,111,073	98,753,324	519.0
Idaho	8,192,500	4,984,048	133.7	5,166,438	3,205,787	99.4	254,905	162,397	1.7	15,885,201	14,697,524	60.1	29,499,044	23,049,756	294.9
Illinois	35,259,200	18,280,174	246.1	24,090,709	12,039,468	599.0	51,196,707	27,400,694	51.3	113,905,635	100,812,825	103.9	224,452,251	158,533,161	1,000.3
Indiana	43,332,151	21,709,873	338.5	22,871,724	11,482,006	194.6	7,364,853	3,686,425	8.0	71,632,192	64,348,071	78.4	145,200,920	101,226,375	619.5
Iowa	18,598,737	9,558,751	340.5	15,398,836	7,726,527	705.2	4,727,201	2,906,186	15.3	46,548,631	41,804,313	186.4	85,273,405	61,995,777	1,247.4
Kansas	20,825,572	9,498,623	353.0	11,460,249	5,752,629	885.5	6,746,706	3,496,474	9.0	33,287,057	29,958,351	117.4	72,319,584	48,706,077	1,364.9
Kentucky	22,473,535	11,389,368	86.8	17,135,121	9,005,926	125.7	3,643,540	1,920,244	5.9	39,482,873	35,442,553	37.1	82,735,069	57,758,091	255.5
Louisiana	18,100,784	8,981,142	210.3	10,461,311	4,983,590	221.1	7,794,102	3,897,051	15.3	55,035,994	49,487,275	41.1	91,392,191	67,349,058	487.8
Maine	3,685,898	1,844,957	31.0	3,940,029	1,971,462	37.7	883,808	442,724	.5	25,345,622	22,557,787	21.3	33,855,357	26,816,930	90.5
Maryland	8,523,732	4,432,616	34.0	7,414,946	3,776,909	168.7	12,497,029	7,935,604	8.8	26,882,995	23,391,867	18.0	55,318,702	39,536,996	229.5
Massachusetts	16,126,642	7,999,388	11.8	5,645,800	2,816,509	12.6	26,731,417	13,307,692	12.3	61,526,706	55,327,754	14.5	110,030,565	79,451,343	51.2
Michigan	30,394,192	15,212,332	281.2	15,686,671	7,884,766	498.8	11,145,674	5,413,824	13.7	92,637,380	83,371,902	105.0	149,863,917	111,882,824	898.7
Minnesota	19,758,949	10,208,051	256.5	14,000,442	7,244,885	1,085.2	5,454,591	2,878,494	21.1	23,483,631	20,803,778	18.8	62,697,613	41,135,208	1,381.6
Mississippi	17,508,126	8,431,488	239.6	11,391,949	5,473,592	477.2	815,667	420,124	4.2	29,498,687	26,643,712	72.7	59,214,429	40,968,916	793.7
Missouri	18,405,178	9,488,281	155.7	17,060,229	7,974,196	953.2	3,799,417	1,629,881	5.6	53,715,554	48,570,943	52.9	92,980,378	67,663,301	1,167.4
Montana	10,166,395	6,681,231	60.2	10,892,436	6,861,260	289.6	692,349	446,556	2.8	12,656,160	11,382,364	59.8	34,407,340	25,371,411	412.1
Nebraska	17,496,578	8,959,227	260.2	6,792,170	3,428,988	343.6	2,063,436	1,142,927	5.4	23,231,236	20,958,530	8.1	49,583,420	34,489,672	617.3
Nevada	2,705,870	2,336,957	20.4	4,132,102	3,459,620	101.4	51,152	42,887	.3	23,959,165	22,687,576	40.0	30,848,589	28,527,040	162.1
New Hampshire	3,804,664	1,881,463	18.4	2,777,653	1,491,327	14.0	416,505	208,252	1.0	14,338,854	12,546,512	16.4	21,337,676	16,127,554	49.8
New Jersey	15,381,864	7,494,923	28.1	3,224,772	1,611,049	23.9	12,240,321	6,071,661	15.1	41,257,934	34,359,405	10.5	72,104,891	49,537,038	77.6
New Mexico	10,916,165	7,246,172	79.4	5,086,046	2,849,241	124.3	1,908,209	1,198,746	4.6	32,783,694	30,539,879	110.5	50,694,114	41,834,038	318.8
New York	31,689,605	15,526,913	112.1	9,293,932	4,328,213	47.4	40,668,138	21,615,804	31.1	181,921,199	158,972,611	58.0	263,572,874	200,443,541	248.6
North Carolina	9,233,220	4,493,855	144.6	3,739,233	1,866,870	153.6	5,778,820	2,868,660	8.1	60,610,480	54,492,460	204.9	79,361,753	63,721,845	511.2
North Dakota	11,501,822	5,895,444	342.9	9,901,928	5,019,871	943.1	980,682	769,585	.4	25,757,392	22,983,946	171.5	48,141,824	34,668,846	1,457.9

Ohio	34,128,202	17,584,970	70.6	16,222,415	8,230,978	79.8	40,597,856	22,905,808	14.1	104,210,635	93,564,354	82.8	195,159,108	142,286,110	247.3
Oklahoma	18,295,565	9,134,157	141.9	16,514,352	8,252,713	477.2	3,551,504	1,778,335	11.9	61,123,440	54,878,849	190.5	99,484,861	74,044,054	821.5
Oregon	11,772,375	6,969,318	71.0	8,280,240	4,929,973	184.0	5,610,911	3,408,473	5.0	35,228,182	32,069,083	131.2	60,891,708	47,376,847	391.2
Pennsylvania	31,519,406	15,575,623	80.3	19,179,578	8,679,386	108.5	27,273,702	13,168,651	31.4	89,968,254	80,797,648	62.5	167,940,940	118,221,308	282.7
Rhode Island	8,759,126	4,365,843	13.4	3,438,025	1,716,479	10.8	4,692,650	2,258,075	2.0	8,423,551	7,582,636	9.7	25,313,352	15,923,033	35.9
South Carolina	11,357,312	5,920,956	114.5	8,096,022	4,092,233	572.3	2,081,348	1,066,565	6.1	41,482,422	37,325,995	115.5	63,017,104	48,405,749	808.4
South Dakota	8,155,918	4,560,718	361.3	6,864,831	3,875,957	432.2	800,000	447,200	1.3	31,901,669	29,087,941	65.4	47,722,418	37,971,816	860.2
Tennessee	16,561,267	8,280,633	112.5	9,794,546	4,904,073	458.4	5,448,408	2,727,004	4.8	37,847,328	33,507,862	50.6	69,651,549	49,419,572	626.3
Texas	44,463,978	22,702,400	474.8	33,103,542	16,653,180	1,202.6	15,693,647	8,032,700	24.9	182,641,814	163,977,350	352.1	275,902,981	211,365,630	2,054.4
Utah	6,579,224	4,903,052	44.6	3,786,098	2,822,271	112.7	899,773	671,094	------	34,632,141	32,868,291	65.9	45,897,236	41,264,708	223.2
Vermont	3,457,637	1,721,045	12.7	1,970,511	1,032,433	23.5	10,088	5,044	------	20,776,413	18,699,417	10.3	26,214,649	21,457,939	46.5
Virginia	15,314,031	8,019,943	47.4	8,551,474	4,323,660	143.0	8,726,811	4,788,663	16.1	72,238,343	65,012,685	77.2	104,830,659	82,144,951	283.7
Washington	15,425,572	8,771,177	153.8	9,151,120	4,901,549	233.9	6,464,344	3,464,926	8.0	60,649,250	51,026,922	146.8	91,690,286	68,164,574	542.5
West Virginia	4,219,714	2,112,417	9.7	5,710,124	2,911,466	31.7	3,653,596	1,826,798	4.4	19,967,012	17,567,292	9.8	33,550,446	24,417,973	55.6
Wisconsin	22,590,072	11,674,415	278.2	11,253,544	5,643,406	402.2	8,411,748	4,891,103	7.1	53,551,322	47,266,247	176.4	95,806,686	69,475,171	863.9
Wyoming	6,832,040	4,478,929	51.7	4,204,422	2,724,101	106.1	717,670	471,347	1.1	18,914,521	17,639,764	63.3	30,668,653	25,314,141	222.2
Alaska	7,091,517	6,291,517	43.0	3,421,726	2,877,015	98.2	20,100	20,000	------	----------	----------	-------	10,533,343	9,188,532	141.2
District of Columbia	7,263,304	3,591,571	9.0	2,480,210	1,219,489	3.2	4,419,085	2,197,370	------	13,428,404	11,845,792	1.5	27,591,003	18,854,222	13.7
Hawaii	1,481,600	740,800	.9	2,382,860	1,181,485	5.6	4,188,566	2,035,607	1.6	----------	----------	-------	8,053,026	3,957,892	8.1
Puerto Rico	8,493,104	4,220,970	8.4	5,444,472	2,633,733	27.6	6,924,054	3,030,662	1.7	----------	----------	-------	20,861,630	9,885,365	37.7
Total	783,841,338	412,353,578	6,427.5	498,307,895	258,545,470	14,823.8	459,850,163	243,267,811	456.2	2,592,845,077	2,194,515,441	3,812.0	4,334,844,473	3,108,682,300	25,519.5

[1] Initial commitment of funds.

Table 4.—Projects involving Federal funds awarded to contract [1] during the fiscal year ended June 30, 1958, 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	$64,315,020	$41,781,889	$10,339,650	$6,552,048	$3,468,152	$21,348,112	$73,927	893.0
Arizona	40,081,375	34,921,629	7,413,342	4,418,623	384,190	22,705,474		291.9
Arkansas	55,279,482	43,521,356	3,055,203	3,729,349	918,894	35,817,910		444.6
California	330,123,622	161,535,065	8,325,404	9,217,942	14,916,019	127,983,700	1,092,000	404.3
Colorado	51,303,547	36,206,879	8,005,997	4,290,467	2,195,138	21,702,499	12,778	344.4
Connecticut	44,951,626	32,961,697	2,977,883	2,286,334	5,585,363	22,085,688	26,429	25.4
Delaware	18,507,923	13,784,016	969,074	2,113,222	488,346	10,213,374		52.7
Florida	59,944,458	46,735,332	4,198,491	4,385,337	688,532	37,378,462	84,510	284.3
Georgia	75,841,372	51,978,643	12,473,194	7,227,756	1,207,995	31,031,011	38,687	560.3
Idaho	27,856,244	20,601,561	5,572,683	3,655,929	144,759	11,228,190		314.9
Illinois	195,932,388	139,333,344	16,180,849	7,024,260	17,413,491	98,714,744		700.8
Indiana	77,374,459	47,065,772	18,038,059	7,337,391	2,149,546	19,258,884	281,892	518.7
Iowa	74,953,321	51,510,568	9,915,949	8,900,437	2,501,786	30,192,396		1,295.5
Kansas	86,142,283	58,477,089	11,370,841	7,152,069	3,465,796	36,455,383	33,000	1,501.4
Kentucky	60,602,946	39,506,219	11,066,525	7,407,167	2,036,842	18,995,685		262.2
Louisiana	77,157,011	55,879,317	7,539,741	3,495,610	3,482,333	40,940,542	421,091	343.7
Maine	33,900,544	24,964,313	3,382,398	3,022,023	342,636	18,196,606	20,650	158.4
Maryland	46,571,445	32,350,030	7,190,658	1,682,540	3,613,954	19,862,878		133.3
Massachusetts	111,405,367	75,857,700	10,394,820	2,465,328	16,502,485	45,957,039	538,028	66.4
Michigan	118,264,516	85,727,694	15,307,083	5,343,547	3,651,130	61,313,786	112,148	864.1
Minnesota	63,698,860	42,388,419	9,457,863	8,920,014	2,116,155	21,894,387		1,613.5
Mississippi	61,484,422	43,384,665	6,852,905	6,016,571	1,059,219	29,297,120	158,850	805.3
Missouri	113,711,101	84,298,575	10,049,343	8,048,307	3,574,871	62,626,054		1,095.9
Montana	35,043,433	26,125,564	6,574,916	7,446,598	506,264	11,266,745	331,041	490.4
Nebraska	62,816,821	40,934,758	12,411,612	6,299,077	866,249	21,260,020	97,800	928.1
Nevada	27,944,534	25,619,030	1,917,542	4,411,323	2,791	19,190,374	97,000	180.4
New Hampshire	21,183,924	15,359,486	2,339,282	1,743,409	396,103	10,880,692		56.9
New Jersey	64,297,356	48,524,262	3,764,569	1,562,354	2,747,293	40,450,046		48.0
New Mexico	41,883,176	33,128,822	7,230,250	3,953,824	1,033,260	20,895,138	16,350	343.9
New York	245,024,322	172,510,937	15,657,340	4,687,272	23,817,775	128,348,550		299.3
North Carolina	76,088,283	54,953,586	8,434,604	5,320,872	2,615,620	38,086,110	496,380	694.5
North Dakota	41,224,589	29,388,313	4,886,864	4,600,411	301,101	19,599,937		1,554.2

Ohio	247,318,122	184,106,257	24,639,762	9,820,074	18,696,218	130,950,203		338.0
Oklahoma	75,607,643	55,633,849	7,228,582	5,609,469	2,055,297	40,709,304	31,197	590.7
Oregon	48,675,404	37,885,917	7,543,478	3,423,410	1,423,014	25,288,026	207,989	324.4
Pennsylvania	173,958,674	122,039,721	18,133,194	9,981,826	10,017,719	83,886,982	20,000	328.5
Rhode Island	21,132,726	14,175,150	2,662,928	666,153	2,484,997	8,355,072	6,000	25.4
South Carolina	52,441,819	38,243,248	5,675,237	4,375,989	1,783,209	26,344,313	64,500	735.6
South Dakota	22,629,035	15,466,391	3,853,453	3,351,088	351,529	7,910,321		765.5
Tennessee	75,631,748	53,703,932	8,345,089	6,859,338	1,974,752	36,294,145	230,608	652.3
Texas	193,772,361	142,355,569	17,111,400	17,907,050	5,618,200	100,997,450	721,469	1,961.4
Utah	32,649,928	28,111,610	5,554,651	2,819,737	1,900,958	17,300,319	535,945	198.4
Vermont	10,906,001	7,067,938	2,407,833	1,201,754	5,044	3,453,307		42.1
Virginia	95,249,706	70,729,309	9,424,637	6,855,307	3,010,993	49,713,219	1,725,153	438.4
Washington	87,968,883	64,798,548	8,201,378	5,619,416	3,173,651	47,749,245	54,858	551.8
West Virginia	26,109,597	17,021,572	2,515,536	3,386,118	696,874	10,423,044		41.2
Wisconsin	73,022,745	48,536,909	10,606,182	6,760,568	6,272,200	24,897,959		768.7
Wyoming	23,790,770	19,395,586	3,325,377	2,907,233	218,384	12,944,592		216.3
Alaska	11,102,901	9,596,083	5,456,741	4,121,223	18,119			315.5
District of Columbia	18,012,552	12,267,217	1,251,671	933,039	2,247,070	7,835,437		6.7
Hawaii	5,355,663	2,723,871	1,110,804	701,010	673,257		238,800	10.4
Puerto Rico	10,239,493	4,949,547	1,920,533	1,806,396	784,580		438,038	30.4
Total	3,810,485,541	2,660,124,754	410,263,400	263,823,609	187,600,153	1,790,230,474	8,207,118	25,912.4

[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, 1958, 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	$76,601,989	$53,173,995	346.0	$20,579,340	$12,984,067	233.3	$96,976,313	$64,692,509	1,045.7	$41,435,110	$23,581,834	775.2
Arizona	20,270,193	17,597,870	132.3	10,287,598	9,338,127	75.7	39,352,778	34,622,337	176.3	19,433,375	14,924,100	237.2
Arkansas	57,936,669	42,816,470	614.1	25,020,699	19,192,001	264.0	52,579,311	38,005,017	444.6	24,875,760	12,789,804	477.3
California	47,480,030	26,714,776	305.9	86,895,078	62,939,617	107.2	595,759,432	287,281,655	370.4	108,030,720	59,182,434	283.2
Colorado	15,347,660	11,500,528	140.7	4,799,796	3,075,858	27.9	60,952,877	44,348,111	276.3	36,209,746	22,886,224	364.3
Connecticut	12,401,507	6,659,085	16.6	19,231,783	12,584,796	14.9	55,505,177	38,903,128	40.8	5,585,269	2,835,961	13.4
Delaware	10,721,890	8,725,879	13.9	3,108,000	2,385,400	9.2	25,835,502	18,096,133	70.8	9,967,409	4,961,320	58.5
Florida	38,269,987	30,868,323	435.8	29,682,092	17,406,113	152.7	85,405,255	65,537,637	310.9	31,577,671	16,042,826	242.9
Georgia	109,327,576	78,931,071	826.0	22,330,082	17,627,322	85.1	137,987,802	85,976,104	1,074.9	28,153,725	17,114,398	329.5
Idaho	15,847,998	12,776,547	172.4	5,515,067	5,034,555	36.3	30,624,685	22,455,642	293.8	12,699,605	8,159,258	239.1
Illinois	121,368,338	81,222,172	942.9	67,441,088	46,293,522	150.4	256,160,096	190,295,071	839.2	78,407,318	44,179,170	741.8
Indiana	72,502,284	53,370,191	318.8	60,697,455	38,297,791	320.2	75,548,565	47,947,260	394.1	24,886,133	13,869,084	186.7
Iowa	55,982,390	47,061,351	510.8	25,776,250	17,603,124	297.9	78,582,205	55,771,641	1,271.2	52,445,507	30,787,517	1,418.4
Kansas	34,896,060	26,213,587	1,008.2	24,718,986	18,518,245	292.7	71,670,528	48,708,446	1,415.2	45,010,128	25,734,303	1,320.4
Kentucky	36,300,112	26,315,580	148.9	18,061,201	13,385,064	44.5	80,832,134	56,281,646	287.0	26,188,639	13,968,756	278.8
Louisiana	47,953,091	32,857,352	398.8	65,118,287	44,264,355	305.3	74,378,591	47,072,568	402.2	9,246,614	5,395,669	63.0
Maine	11,764,294	8,710,830	61.8	3,617,600	2,785,760	16.3	30,286,275	21,545,515	110.1	22,137,654	12,449,196	177.1
Maryland	23,776,080	14,734,032	160.6	29,484,512	16,715,644	56.8	80,531,192	59,735,925	185.7	25,916,456	15,192,768	135.0
Massachusetts	29,045,502	23,115,682	18.8	41,727,571	23,320,178	30.9	125,251,099	88,834,115	72.5	48,286,805	24,411,490	47.5
Michigan	93,792,238	71,491,849	805.4	38,522,770	26,416,880	206.7	150,557,388	107,814,273	501.7	91,448,239	57,442,142	811.3
Minnesota	18,889,825	14,593,638	290.3	24,679,407	15,918,145	242.6	114,903,203	83,492,935	1,572.6	35,514,604	19,498,331	1,422.2
Mississippi	56,378,382	40,223,242	873.2	12,085,000	7,291,060	160.3	87,814,091	62,310,054	991.9	17,850,249	9,049,949	587.7
Missouri	31,425,093	18,784,513	1,345.6	21,758,793	17,455,123	43.5	139,340,804	98,079,550	962.7	99,789,326	64,668,313	1,523.0
Montana	12,504,360	8,339,056	250.0	8,429,869	6,178,583	100.2	54,244,544	41,185,353	467.4	26,363,079	16,317,846	427.6
Nebraska	14,467,188	8,848,209	316.6	11,181,109	8,664,444	78.3	70,818,117	44,838,920	1,315.8	25,592,373	14,003,745	676.5
Nevada	12,121,933	11,328,410	67.6	1,594,926	1,417,576	37.1	32,544,117	29,701,185	217.7	14,787,209	12,191,547	217.7
New Hampshire	16,835,000	13,028,880	31.4	1,881,113	1,189,876	6.8	28,703,186	20,093,665	77.7	11,781,289	6,727,510	61.5
New Jersey	18,891,321	10,908,042	73.6	22,195,760	14,346,100	32.1	108,495,859	78,417,556	62.0	18,063,969	9,283,397	35.2
New Mexico	9,124,991	8,210,311	29.5	7,453,023	6,414,510	68.7	47,792,463	39,491,344	315.9	33,616,153	26,202,440	267.8
New York	54,128,405	39,366,921	172.1	103,587,789	71,549,469	128.7	568,344,462	368,335,248	458.1	105,596,410	52,692,157	392.8
North Carolina	42,009,928	33,319,479	263.5	27,084,810	18,582,130	264.1	97,916,106	65,801,948	904.0	48,034,030	27,737,197	573.6
North Dakota	29,381,368	22,293,070	1,277.3	9,823,742	6,431,877	235.8	43,345,230	31,299,433	1,377.8	29,025,173	16,928,323	1,418.5

Ohio	69,872,416	39,099,679	772.5	33,266,990	24,927,258	80.2	299,493,018	217,012,147	390.3	97,733,062	64,005,899	152.7
Oklahoma	44,565,300	30,488,391	675.5	43,930,054	34,966,977	186.4	70,847,602	48,954,266	649.8	48,006,303	27,305,153	478.3
Oregon	15,359,047	11,570,411	149.1	21,160,118	17,198,300	115.0	47,666,320	38,111,027	274.7	38,167,574	25,742,186	288.8
Pennsylvania	77,681,030	55,113,373	201.7	126,868,541	86,495,975	161.6	271,886,733	181,927,886	417.0	81,086,979	47,648,963	259.7
Rhode Island	11,313,839	6,309,426	49.4	4,645,700	2,234,600	2.0	31,493,458	24,163,075	26.9	21,045,857	12,883,803	23.1
South Carolina	44,988,370	33,162,424	679.6	22,514,799	17,970,657	137.6	68,451,280	45,699,109	1,038.2	19,379,472	12,084,034	453.3
South Dakota	57,893,717	47,542,228	610.1	6,140,027	3,790,479	221.7	26,883,063	20,123,608	609.1	22,943,552	13,310,231	991.6
Tennessee	43,336,101	32,275,078	495.1	29,721,043	22,259,530	162.9	130,957,336	85,195,744	771.2	31,005,026	17,318,077	503.1
Texas	98,247,900	80,816,130	544.8	63,385,093	46,252,490	457.4	238,906,018	174,849,640	2,004.0	144,966,145	87,428,910	1,844.9
Utah	29,911,738	26,645,593	204.6	6,080,603	5,197,971	40.8	31,185,094	27,107,538	173.3	14,852,716	11,083,073	200.3
Vermont	13,381,000	11,130,000	33.4	10,045,947	8,693,270	10.7	23,455,405	16,741,282	66.8	7,597,016	3,881,016	47.5
Virginia	60,367,623	46,090,540	331.1	16,838,637	12,967,622	203.8	104,212,797	76,016,047	335.4	35,251,916	18,795,829	416.5
Washington	27,217,817	20,655,240	337.0	17,271,157	11,513,833	162.7	84,671,068	65,000,452	374.4	47,905,401	28,528,711	465.7
West Virginia	49,748,007	37,152,684	85.5	12,396,912	8,886,633	117.7	44,177,767	25,867,688	82.9	12,893,570	6,673,215	59.2
Wisconsin	48,423,844	35,109,779	549.9	17,514,613	12,318,631	167.8	81,577,168	56,367,915	578.6	47,934,748	24,157,949	601.6
Wyoming	18,754,458	15,655,844	97.5	4,259,850	3,582,046	55.9	50,207,853	42,151,317	346.8	18,474,249	12,113,248	307.9
Alaska	14,135,639	11,948,582	143.7	2,644,000	2,026,140	126.2	12,902,346	11,395,527	331.0	1,480,561	1,480,561	206.3
District of Columbia	16,771,600	13,021,300	12.7	8,651,680	6,089,380	6.3	29,364,715	22,101,278	3.7	6,110,635	3,117,333	6.1
Hawaii	7,979,930	3,989,965	13.5	3,271,947	2,008,740	8.9	3,866,452	1,874,736	5.4	4,506,539	2,192,150	8.4
Puerto Rico	10,010,384	5,038,132	23.3	9,534,551	5,007,584	14.2	23,305,453	10,825,031	68.1	5,387,636	2,619,466	16.9
Total	2,007,703,442	1,466,915,743	18,379.4	1,314,512,858	919,995,428	6,566.0	5,274,550,333	3,578,457,237	26,854.6	1,915,684,704	1,123,578,816	23,136.9

[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 1958, by program and by number of lanes

State or Territory	Primary program			Secondary program [1]	Urban program			Interstate 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
Alabama	105.7	63.1		559.1	4.8	21.8			20.7	
Arizona	12.4	6.9		152.4		.5		24.6	10.5	
Arkansas	136.7	6.2		330.5	.1	1.6	0.7		.8	0.7
California	14.7	48.7		168.2		7.4	14.6		14.3	15.2
Colorado	130.2	25.6		164.1		4.5	1.3		38.5	
Connecticut	1.8			10.7					.8	
Delaware	20.7	13.7		22.6	.6	.8				
Florida	51.9	73.0		103.7		10.4	.8		2.8	.3
Georgia	35.5	3.2		289.4		.3	1.1			
Idaho	91.9	5.2		133.2	.4			8.5		
Illinois	144.3	14.6		529.2	.2	12.6	2.0		38.6	.3
Indiana	83.8	19.7		78.5	1.7	1.6	.7		.6	
Iowa	464.4	6.4		906.8		19.9			20.9	
Kansas	355.0	18.1		925.3	2.1	3.8		2.8	11.5	1.7
Kentucky	11.3	1.6		262.1	1.2				2.7	
Louisiana	.9			62.1						
Maine	84.0	.9		82.6		1.5			8.2	
Maryland	22.8	3.9	1.0	98.7		1.3	2.9	.9	3.4	
Massachusetts	18.2	9.5		13.8		.9	5.0			
Michigan	102.7	51.7	.9	564.9	5.0	7.0	1.2		68.6	9.4
Minnesota	280.7	66.9		1,037.9	1.1	15.7			19.9	
Mississippi	158.1	.1		427.5	1.5				.6	
Missouri	112.8	21.3		1,342.6	2.4	11.5	.6		31.1	.6
Montana	167.3	7.5		229.3	3.4	4.3		11.7	4.2	
Nebraska	255.2	6.6		412.4	.6	1.8				
Nevada	30.1	20.4		161.6				1.8	3.7	
New Hampshire	37.0			18.8	3.1		.5		2.1	
New Jersey	2.3	8.8		12.2	.6	4.8	3.1		3.4	
New Mexico	34.9	43.7		125.7		.2			63.4	
New York	206.8	33.6	.5	101.4	13.7	13.0	8.0		13.1	2.7
North Carolina	107.5	48.1		370.4	3.6	13.6		6.1	24.6	
North Dakota	383.6	2.9		974.0	.7	1.4		16.9	39.1	

Ohio	23.3	16.8		82.1	.3	1.3	.7	5.6	22.7	
Oklahoma	137.3	44.3		254.4	.6	12.8			28.8	
Oregon	93.9	20.7		142.4		5.4	2.4	4.9	17.4	1.7
Pennsylvania	70.1	30.5		128.8	.2	4.1	.1		25.9	
Rhode Island		11.0		4.4			.7		6.9	.1
South Carolina	16.9	9.6		423.0		1.4		1.6	.8	
South Dakota	366.1	3.9		592.2				22.1	7.3	
Tennessee	54.7	28.5		418.4		1.2	.3			
Texas	443.4	227.3		1,008.2		10.7	8.9	.1	146.2	.2
Utah	50.2	7.2		139.9			2.8		.2	
Vermont	10.3			33.4	3.8					
Virginia	115.0	32.5		258.6	1.5	4.7	.1		4.1	
Washington	107.1	6.7		239.3	2.5	2.9	.6	1.3	195.1	
West Virginia	22.3			34.6		2.4				
Wisconsin	158.7	51.4		372.7	3.4	13.2			2.1	.1
Wyoming	125.2	8.2		145.0				24.5	4.9	
Alaska	162.2			44.2						
District of Columbia		.5	1.5	2.4		1.6	.1			
Hawaii	5.3	.5	1.5	.8			.3			
Puerto Rico	4.7	.3		11.6		.3				
Total	5,661.9	1,131.8	5.4	15,008.1	59.1	224.2	59.5	133.4	820.5	33.0

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

Table 7.—Lane classification of mileage of Federal-aid highway projects completed during fiscal year 1958, by class of fund

Number of lanes	Mileage					Total lane miles
	Primary	Secondary	Urban	Interstate	Total	
2-lane	5,661.9	[1] 15,008.1	59.1	133.4	20,862.5	41,725.0
4-lane	1,131.8		224.2	820.5	2,176.5	8,706.0
6 lanes and over	5.4		59.5	33.0	97.9	587.4
Total	6,799.1	15,008.1	342.8	986.9	23,136.9	[2] 51,018.4

[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.—Apportionments of Federal-aid highway funds authorized for the fiscal year ending June 30, 1959, under the Federal-Aid Highway Acts of 1956 and 1958

State or Territory	Primary, secondary, and urban [1]						Interstate, 1956 and 1958 Acts [2] ($2,200,000,000)	Total ($3,475,000,000)
	1956 Act				1958 Act additional ($400,000,000)	Total ($1,275,000,000)		
	Primary ($393,750,000)	Secondary ($262,500,000)	Urban ($218,750,000)	Total ($875,000,000)				
Alabama	$8,291,003	$6,447,383	$2,868,230	$17,606,616	$8,089,185	$25,695,801	$44,762,150	$70,457,951
Arizona	5,714,323	3,895,113	851,554	10,460,990	4,806,198	15,267,188	25,139,831	40,407,019
Arkansas	6,412,708	5,162,374	1,224,711	12,799,793	5,880,738	18,680,531	31,560,571	50,241,102
California	18,821,209	9,762,001	19,461,116	48,044,326	22,073,488	70,117,814	126,959,953	197,077,767
Colorado	7,077,248	4,726,766	1,819,524	13,623,538	6,259,199	19,882,737	29,780,893	49,663,630
Connecticut	2,580,202	1,305,938	4,239,983	8,126,123	3,733,466	11,859,589	21,110,362	32,969,951
Delaware	1,958,906	1,305,938	448,993	3,713,837	1,706,285	5,420,122	13,687,500	19,107,622
Florida	6,242,251	4,076,445	3,925,692	14,244,388	6,544,442	20,788,830	37,057,023	57,845,853
Georgia	9,420,470	7,237,363	3,190,596	19,848,429	9,119,163	28,967,592	50,625,811	79,593,403
Idaho	4,779,420	3,366,643	421,341	8,567,404	3,936,209	12,503,613	22,282,269	34,785,882
Illinois	15,191,611	8,247,143	15,310,690	38,749,444	17,803,047	56,552,491	103,099,641	159,652,132
Indiana	9,191,947	6,340,570	5,237,617	20,770,134	9,542,632	30,312,766	53,188,926	83,501,692
Iowa	9,195,034	6,756,810	2,599,100	18,550,944	8,523,047	27,073,991	44,301,939	71,375,930
Kansas	9,179,812	6,443,361	2,057,695	17,680,868	8,123,299	25,804,167	39,521,813	65,325,980
Kentucky	7,238,084	6,026,483	2,273,530	15,538,097	7,138,825	22,676,922	40,915,590	63,592,512
Louisiana	6,096,580	4,418,259	3,209,229	13,724,068	6,305,387	20,029,455	35,968,960	55,998,415
Maine	3,239,093	2,322,866	914,985	6,476,944	2,975,768	9,452,712	17,595,422	27,048,134
Maryland	3,626,924	2,222,223	3,715,608	9,564,755	4,394,431	13,959,186	26,404,511	40,363,697
Massachusetts	5,118,798	1,913,871	9,112,313	16,144,982	7,417,652	23,562,634	46,746,004	70,308,638
Michigan	12,404,719	7,567,394	10,189,455	30,161,568	13,857,433	44,019,001	79,164,779	123,183,780
Minnesota	10,082,358	7,126,583	3,565,000	20,773,941	9,544,381	30,318,322	49,489,315	79,807,637
Mississippi	6,885,883	5,775,848	1,212,104	13,873,835	6,374,195	20,248,030	34,705,548	54,953,578
Missouri	11,115,563	7,524,427	5,391,636	24,031,626	11,041,091	35,072,717	58,981,071	94,053,788
Montana	7,849,184	5,402,670	515,522	13,767,376	6,325,284	20,092,660	31,377,313	51,469,973
Nebraska	7,688,858	5,454,930	1,284,028	14,427,816	6,628,717	21,056,533	31,302,496	52,359,029
Nevada	4,909,104	3,281,450	166,734	8,357,288	3,839,673	12,196,961	22,828,884	35,025,845
New Hampshire	1,958,906	1,305,938	648,354	3,913,198	1,797,880	5,711,078	13,687,500	19,398,578
New Jersey	5,178,775	1,747,245	9,583,671	16,509,691	7,585,212	24,094,903	47,908,726	72,003,629

New Mexico	6,242,759	4,293,485	718,493	11,254,737	5,170,877	16,425,614	26,679,147	43,104,761
New York	19,086,571	7,729,989	29,262,831	56,079,391	25,765,119	81,844,510	156,126,602	237,971,112
North Carolina	9,685,815	8,309,307	2,813,251	20,808,373	9,560,200	30,368,573	55,577,387	85,945,960
North Dakota	5,462,891	3,985,983	370,191	9,819,065	4,511,272	14,330,337	24,108,546	38,438,883
Ohio	13,621,409	8,265,490	12,669,033	34,555,932	15,876,379	50,432,311	93,303,494	143,735,805
Oklahoma	8,326,529	5,971,622	2,391,861	16,690,012	7,668,061	24,358,073	39,292,286	63,650,359
Oregon	6,518,788	4,565,092	1,755,480	12,839,360	5,898,916	18,738,276	29,509,661	48,247,937
Pennsylvania	15,827,490	9,425,758	16,573,922	41,827,170	19,217,078	61,044,248	117,103,237	178,147,485
Rhode Island	1,958,906	1,305,938	1,565,048	4,829,892	2,219,046	7,048,938	13,687,500	20,736,438
South Carolina	5,194,030	4,328,343	1,505,993	11,028,366	5,066,872	16,095,238	29,402,659	45,497,897
South Dakota	5,940,580	4,256,532	425,224	10,622,336	4,880,326	15,502,662	25,499,190	41,001,852
Tennessee	8,350,246	6,540,024	3,165,832	18,056,102	8,295,696	26,351,798	46,443,187	72,794,985
Texas	25,443,547	17,034,541	10,488,168	52,966,256	24,334,820	77,301,076	126,569,618	203,870,694
Utah	4,417,613	2,921,387	927,667	8,266,667	3,798,038	12,064,705	21,279,781	33,344,486
Vermont	1,958,906	1,305,938	340,884	3,605,728	1,656,616	5,262,344	13,687,500	18,949,844
Virginia	7,450,792	5,803,234	3,413,957	16,667,983	7,657,939	24,325,922	44,091,145	68,417,067
Washington	6,583,128	4,396,613	3,303,373	14,283,114	6,562,235	20,845,349	35,383,962	56,229,311
West Virginia	4,260,923	3,726,717	1,424,824	9,412,464	4,324,463	13,736,927	25,962,424	39,699,351
Wisconsin	9,135,036	6,381,210	4,287,084	19,803,330	9,098,443	28,901,773	49,734,830	78,636,603
Wyoming	4,900,117	3,321,518	238,043	8,459,678	3,886,714	12,346,392	22,715,543	35,061,935
Alaska	7,991,938	5,389,478	66,692	13,448,108	6,178,599	19,626,707	----------	19,626,707
District of Columbia	1,958,906	1,305,938	1,891,351	5,156,195	2,368,963	7,525,158	13,687,500	21,212,658
Hawaii	1,958,906	1,305,938	736,190	4,001,034	1,838,235	5,839,269	----------	5,839,269
Puerto Rico	2,056,451	2,153,390	1,881,847	6,091,688	2,798,766	8,890,454	----------	8,890,454

[1] The sum of $875,000,000, authorized by the 1956 Act, was apportioned to the States for Federal-aid primary, secondary, and urban work on August 1, 1957. An additional amount of $400,000,000, authorized by the 1958 Act, was apportioned on April 16, 1958. The purpose of the latter apportionment, the funds of which could be used without limitation as to the proportion applied to primary, secondary, or urban work, was to aid in the nation's anti-recession efforts.

[2] The apportionment of $2,000,000,000 under the 1956 Act for Interstate System improvements was made on August 1, 1957. The additional apportionment of $200,000,000, authorized by the 1958 Act, was made on April 16, 1958.

Table 9.—Federal highway funds paid by Bureau of Public Roads during fiscal year ended June 30, 1958, by program and by State

State or Territory	Federal aid funds					Total [2]
	Primary [1]	Secondary	Urban	Interstate	"D" funds	
Alabama	$9,594,564	$5,812,395	$2,438,095	$10,252,245		$28,097,299
Arizona	7,103,958	4,803,262	609,546	9,487,996	$6,901	22,011,663
Arkansas	4,995,671	3,746,779	1,123,550	6,645,622		16,511,622
California	18,263,799	7,393,597	18,873,427	84,472,620		129,003,443
Colorado	7,948,944	5,111,162	2,138,666	17,080,101		32,278,873
Connecticut	1,102,844	1,284,450	1,298,999	9,236,823		12,923,116
Delaware	1,763,165	1,430,009	387,571	398,229		3,978,974
Florida	7,289,032	3,057,553	2,470,226	7,995,113		20,811,924
Georgia	7,812,229	5,664,523	2,791,319	8,306,361		24,574,432
Idaho	3,375,989	3,447,343	383,093	2,720,352		9,926,777
Illinois	12,716,015	7,602,719	7,920,223	28,878,821		57,117,778
Indiana	4,793,269	5,641,282	2,328,533	213,625		12,976,709
Iowa	10,627,243	9,321,889	3,999,458	16,515,131		40,463,721
Kansas	8,162,149	5,788,628	1,368,338	7,756,699		23,075,814
Kentucky	5,314,927	6,185,029	1,199,450	6,718,298		19,417,704
Louisiana	4,039,425	2,280,689	2,589,717	2,859,329		11,769,160
Maine	2,325,268	2,392,858	1,126,016	3,364,549		9,208,691
Maryland	3,868,064	2,173,918	3,095,957	13,294,000		22,431,939
Massachusetts	4,531,560	859,785	8,922,805	11,936,289		26,250,439
Michigan	12,951,966	7,818,674	5,136,162	29,209,582		55,116,384
Minnesota	9,758,220	6,956,367	4,363,747	8,951,621		30,029,955
Mississippi	5,165,260	5,470,214	719,297	10,482,898		21,837,669
Missouri	10,736,056	8,030,246	5,771,945	32,538,048		57,076,295
Montana	8,003,099	5,427,125	753,780	1,078,084		15,262,088
Nebraska	9,130,005	6,185,631	740,456	1,846,185		17,902,277
Nevada	5,341,761	4,502,261	3,643	3,691,496		13,539,161
New Hampshire	2,956,586	1,474,424	368,268	4,857,565		9,656,843
New Jersey	4,539,272	1,564,561	3,967,737	8,477,010		18,548,580
New Mexico	7,378,670	2,651,848	450,826	22,973,203		33,454,547
New York	24,109,680	8,169,017	37,283,000	44,932,717		114,494,414
North Carolina	8,195,260	6,236,179	828,826	16,112,376		31,372,641
North Dakota	5,748,062	5,149,195	248,609	7,155,543		18,301,409

Ohio	13, 891, 776	8, 950, 723	3, 210, 078	57, 053, 047		83, 105, 624
Oklahoma	10, 009, 181	4, 982, 024	2, 385, 937	11, 657, 587		29, 034, 729
Oregon	6, 826, 249	5. 639, 070	1, 147, 627	12, 130, 833		25, 743, 779
Pennsylvania	14, 162, 587	6, 528, 207	12, 855, 297	33, 632, 446		67, 178, 537
Rhode Island	1, 598, 360	583, 577	1, 158, 125	10, 713, 676		14, 053, 738
South Carolina	4, 842, 083	3, 220, 977	1, 243, 786	5, 953, 317		15, 313. 306
South Dakota	5, 692, 799	4, 499, 344	68, 762	2, 479, 388		12, 740, 293
Tennessee	7, 826, 678	5, 003, 804	2, 237, 602	5, 010, 460		20, 078, 544
Texas	28, 160, 080	16, 191, 700	9, 447, 800	50, 432, 600		104, 232, 180
Utah	4, 708, 162	2, 320, 011	473, 602	938, 088		8, 439, 863
Vermont	1, 264, 422	897, 501	4, 276	2, 457, 565		4, 623, 764
Virginia	6, 153, 404	6, 268, 524	2, 131, 748	4, 314, 264		18, 867, 940
Washington	6, 457. 403	4, 300, 291	2, 693, 781	17, 101, 879		30, 553, 354
West Virginia	3, 231, 043	2, 119, 653	1, 352, 631	580, 029		7, 283, 356
Wisconsin	9, 389, 045	5, 911, 291	3, 928, 232	5, 650, 077		24, 878, 645
Wyoming	4, 642, 199	3, 181, 679	6, 538	11, 154, 909		18, 985. 325
Alaska	4, 010, 613	4, 002, 046	862		1, 390	8, 014, 911
District of Columbia	1, 131, 366	315, 789	856, 590	1, 475, 726		3, 779, 471
Hawaii	2, 097, 904	1, 072, 390	201, 700			3, 448, 993
Puerto Rico	1, 139, 355	2, 327, 224	816, 402			4, 282, 981
Total	376, 876, 721	241, 949, 437	171, 922, 661	673, 174, 422	8, 291	1, 464, 061, 674

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

[2] Included in the totals are the following payments of prewar Federal-aid grade crossing funds: South Carolina, $53,143; and Hawaii, $76, 999.

Table 10.—Balances of Federal-aid funds available to States for projects not yet programed, as of June 30, 1958

State or Territory	Primary [1]	Secondary	Urban	Subtotal	Interstate	Subtotal	"D" Funds [2]	Total
Alabama	$107	$711,231	$169,897	$881,235	$14,923,585	$15,804,820	$822,919	$16,627,739
Arizona		1,174,046	53,133	1,227,179	10,813,609	12,040,788	480,235	12,521,023
Arkansas	3,982,076	4,542,833	2,408	8,527,317	3,000,608	11,527,925	375,078	11,903,003
California	7,421,369	3,956,763	336,791	11,714,923	6,239	11,721,162	2,045,424	13,766,586
Colorado	4,225,101	4,278,905	1,793,844	10,297,850	22,590,499	32,888,349	4,140,973	37,029,322
Connecticut	5,266,652	1,657,832	7,778,313	14,702,797	16,277,779	30,980,576	482,651	31,463,227
Delaware	808,972	781,329	608,010	2,198,311	10,907,169	13,105,480		13,105,480
Florida	453,635	3,000,906	58,812	3,513,353	3,082,660	6,596,013	205,267	6,801,280
Georgia	1,012,159	769,055	1,028,959	2,810,173	7,137,043	9,947,216	955,115	10,902,331
Idaho	2,450,466	3,809,892	486,202	6,746,560	27,149,296	33,895,856	746,826	34,642,682
Illinois	2,570,436	1,207,844	1,130,801	4,909,081	11,093,523	16,002,604	11,328,703	27,331,307
Indiana	762,610	1,585,048	12,852,722	15,200,380	47,344,643	62,545,023	1,592,980	64,138,003
Iowa	238,239	57,509	156,513	452,261	10,847,319	11,299,580	2,824,418	14,123,998
Kansas	1,265,056	3,011,029	323,631	4,599,716	19,936,181	24,535,897	831,366	25,367,263
Kentucky	3,646,884	223,142	3,394,558	7,264,584	35,993,783	43,258,367	53,656	43,312,023
Louisiana	298,365	3,518,528	1,383,772	5,200,665	10,252,696	15,453,361	764,517	16,217,878
Maine	2,828,973	1,528,418	1,226,899	5,584,290	15,441,889	21,026,179	910,726	21,936,905
Maryland	69,735	308,217	328,365	706,317	2,108,423	2,814,740	406,198	3,220,938
Massachusetts	1,045,199	1,794,853	1,161,703	4,001,755	17,495,784	21,497,539	4,288,597	25,786,136
Michigan	1,620,227	3,063,019	14,060,009	18,743,255	5,067,346	23,810,601	5,415,374	29,225,975
Minnesota	192,036	4,632,216	1,953,195	6,777,447	39,268,930	46,046,377	429,255	46,475,632
Mississippi	520,971	941,138	1,557,817	3,019,926	9,632,197	12,652,123		12,652,123
Missouri	5,056,398	2,946,353	1,733,452	9,736,113	17,835,884	27,571,997	569,190	28,141,187
Montana	3,371,698	4,105,420	314,448	7,791,566	49,495,923	57,287,489	2,349,228	59,636,717
Nebraska	593,274	3,329,059	2,841,970	6,764,303	46,003,071	52,767,374	2,430	52,769,804
Nevada	4,538,671	1,561,240	328,507	6,428,418	22,187,071	28,615,489	1,235,674	29,851,163
New Hampshire	763,031	544,737	922,580	2,230,348	5,828,841	8,059,189	16,563	8,075,752
New Jersey	1,734,787	1,433,924	15,636,742	18,805,453	44,255,754	63,061,207	4,637,216	67,698,423
New Mexico	279,830	2,752,165	503,495	3,535,490	2,211,673	5,747,163	3,291,278	9,038,441
New York	6,813,622	9,171,440	22,265,513	38,250,575	47,541,266	85,791,841	3,310,014	89,101,855
North Carolina	5,566,907	8,429,885	1,334,790	15,331,582	39,802,996	55,134,578	3,237,980	58,372,558
North Dakota	262,050	618,472	534,044	1,414,566	12,757,260	14,171,826	13,246	14,185,072
Ohio	4,720,448	5,210,038	2,979,857	12,910,343	697,357	13,607,700	2,463,701	16,071,401
Oklahoma	1,501,018	1,712,591	2,100,898	5,314,507	5,900,113	11,214,620	211,284	11,425,904
Oregon	963,213	1,400,768	192,187	2,556,168	12,548,578	15,104,746	1,247,916	16,352,662
Pennsylvania	5,515,207	1,375,885	10,946,217	17,837,309	54,976,287	72,813,596	5,359,069	78,172,665

Rhode Island	173,100	76,358	920,674	1,170,132	6,823,451	7,993,583		7,993,358
South Carolina	2,171,685	3,582,540	212,354	5,966,579	1,968,006	7,934,585	71,272	8,005,857
South Dakota	1,727,403	1,859,098	5,524	3,592,025	5,513,132	9,105,157	1,208,505	10,313,662
Tennessee	585,349	5,740,413	3,496,265	9,822,027	18,266,137	28,088,164	639,772	28,727,936
Texas	3,782,808	12,796,806	6,241,384	22,820,998	33,776,809	56,597,807	9,064,020	65,661,827
Utah	200,769	555,779	51,094	807,642	6,109,538	6,917,180	108,029	7,025,209
Vermont	2,046,657	478,724	732,064	3,257,445	2,462,948	5,720,393	42,011	5,762,404
Virginia	417,983	2,616,838	1,006,791	4,041,612	6,290,856	10,332,468	529,562	10,862,030
Washington	1,989,155	1,195,684	3,486,256	6,671,095	2,026,220	8,697,315	189,077	8,886,392
West Virginia	2,709,639	5,373,655	587,349	8,670,643	20,028,411	28,699,054	1,363,651	30,062,705
Wisconsin	283,563	3,123,151	1,890,986	5,297,700	49,832,047	55,129,747	696,373	55,826,120
Wyoming	696,304	778,102	357,047	1,831,453	6,388,120	8,219,573	116,342	8,335,915
Alaska	2,142,698	3,369,166	120,260	5,632,124		5,632,124	2,162,959	7,795,083
District of Columbia	2,807,310	3,333,594	4,162,946	10,303,850	2,896,138	13,199,988	963	13,200,951
Hawaii	1,710,353	785,758	284,204	2,780,315		2,780,315	282,835	3,063,150
Puerto Rico	688,129	3,275,677	3,101,365	7,065,171		7,065,171	7,906	7,073,077
Total	106,492,237	140,087,073	141,137,617	387,716,927	864,795,088	1,252,512,015	83,528,344	1,336,040,359

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

[2] Funds provided by sec. 2 (a) of the Federal-Aid Highway Act of 1958, and available for expenditure without limitation as to system.

Table 11.—Interstate System improvements financed with Federal-aid funds: [1] Status of projects as of June 30, 1958, 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	$63,753,494	$45,846,649	124.4	$3,460,946	$3,114,851	9.7	$42,760,206	$36,751,012	76.1	$7,438,606	$5,651,938	23.0
Arizona	12,838,705	11,985,810	62.2	8,144,479	7,690,354	46.2	25,686,278	24,027,524	70.7	4,535,122	3,748,208	36.0
Arkansas	32,444,328	29,197,140	54.5	15,492,959	13,612,116	32.8	33,642,349	28,435,457	27.1	1,770,704	1,262,749	1.5
California	145,800	133,548	----------	38,973,684	33,733,627	47.0	499,281,990	236,950,852	136.7	38,826,310	24,765,844	34.2
Colorado	7,422,757	6,777,767	27.1	530,390	481,558	----------	34,460,702	30,572,114	109.4	11,662,152	9,605,250	52.3
Connecticut	1,300,000	1,170,000	.1	7,802,967	6,831,962	5.6	29,122,866	24,762,106	14.8	1,195,311	808,740	.8
Delaware	8,359,098	7,523,188	.7	1,720,000	1,548,000	.4	15,014,942	12,458,691	1.0	568,071	389,815	----------
Florida	27,866,929	25,080,227	24.2	4,581,736	4,123,404	5.3	60,487,298	52,625,127	25.8	2,037,086	1,214,622	3.0
Georgia	57,258,755	50,482,865	84.0	16,611,470	14,322,789	36.6	60,120,309	46,804,851	47.6	13,149,045	9,648,256	4.0
Idaho	8,304,641	7,662,973	21.4	4,400,015	4,108,863	14.1	14,702,625	12,659,944	46.7	1,914,687	1,496,834	8.5
Illinois	45,344,970	40,755,852	65.3	33,736,772	27,923,377	6.9	168,862,165	144,209,349	53.6	31,751,589	20,659,944	39.7
Indiana	40,608,810	35,724,729	55.3	19,588,668	17,053,479	22.2	25,669,802	21,998,714	4.5	4,413,476	3,331,754	.9
Iowa	45,067,745	40,781,406	147.0	9,604,634	8,272,671	31.3	43,335,731	37,003,263	140.9	8,145,647	7,230,901	20.9
Kansas	19,625,000	17,662,500	50.9	15,060,074	13,554,066	65.3	32,672,658	29,410,129	100.7	11,158,411	8,834,254	15.9
Kentucky	16,354,686	14,719,217	20.3	10,316,691	9,188,718	13.1	40,489,625	34,628,401	14.8	5,506,632	3,509,260	2.7
Louisiana	20,368,003	18,331,203	25.1	32,583,921	28,414,735	34.7	31,707,541	26,628,967	----------	2,296,862	1,942,015	----------
Maine	6,705,962	5,794,658	6.1	2,237,400	2,013,660	1.6	16,293,419	14,432,085	15.0	6,237,793	4,423,776	8.2
Maryland	7,786,480	6,010,732	7.2	3,650,901	2,728,244	.5	55,551,053	46,931,411	29.1	8,465,614	6,307,853	4.4
Massachusetts	21,289,694	19,165,278	7.3	4,665,488	4,198,939	3.3	76,336,598	64,367,756	21.3	4,629,800	4,045,320	----------
Michigan	59,815,237	53,833,713	88.4	16,207,980	13,955,302	9.7	90,611,507	79,641,747	44.7	48,665,449	36,167,903	79.7
Minnesota	10,304,260	9,294,435	13.0	6,887,975	5,935,115	7.6	64,169,657	56,647,139	29.1	4,539,772	3,602,024	20.8
Mississippi	28,118,282	25,171,532	83.2	3,065,600	2,759,040	10.6	50,946,766	44,021,938	110.1	456,509	369,522	.6
Missouri	6,272,653	5,226,803	2.6	14,914,069	13,355,635	13.7	79,301,786	67,307,469	66.1	49,738,000	39,132,835	51.7
Montana	1,861,055	1,658,836	----------	3,117,513	2,677,198	18.1	22,479,096	20,361,531	55.6	3,185,602	2,236,827	18.3
Nebraska	931,088	858,559	.2	6,152,493	5,608,499	7.9	24,924,273	21,402,964	11.2	1,272,659	1,042,766	----------
Nevada	9,497,485	9,022,610	30.2	----------	----------	----------	22,432,189	21,204,150	20.4	2,071,485	1,775,709	5.5
New Hampshire	12,145,000	10,570,500	13.7	506,702	456,032	.6	16,824,175	14,056,663	16.7	2,109,641	1,648,741	2.6
New Jersey	1,813,481	1,632,125	.5	9,379,142	8,136,881	1.9	69,359,160	58,841,188	18.5	2,536,187	1,809,763	3.4
New Mexico	8,119,260	7,516,810	21.0	4,514,447	4,291,112	9.7	30,778,002	28,561,127	121.5	16,947,890	15,710,429	63.4
New York	28,298,102	25,090,292	22.8	39,063,353	33,287,826	16.6	343,169,790	262,935,005	65.8	20,165,389	13,118,709	18.6
North Carolina	29,315,562	26,384,106	113.6	11,040,200	9,934,155	42.6	48,145,067	41,410,346	265.2	14,858,424	11,254,085	48.5
North Dakota	16,059,967	14,558,970	92.1	3,228,440	2,731,719	25.2	23,117,167	20,988,717	117.9	6,353,402	5,461,838	56.0

Ohio	658,870	592,986		20,838,064	18,683,748	20.6	181,239,962	155,254,396	133.6	47,819,334	38,670,338	29.3
Oklahoma	19,217,500	17,112,400	78.3	30,733,145	27,529,671	84.5	36,740,416	32,059,017	91.8	11,383,185	9,064,333	28.8
Oregon	6,337,554	5,659,859	17.2	13,434,332	12,123,500	54.6	29,371,545	26,957,724	100.5	13,511,664	11,285,839	31.2
Pennsylvania	36,179,482	32,399,533	33.8	58,277,516	51,753,150	46.0	133,371,681	114,959,016	88.8	34,572,726	24,697,475	26.2
Rhode Island	285,738	257,164					24,187,471	20,498,203	11.3	13,594,514	9,171,556	7.7
South Carolina	24,510,090	22,092,202	25.3	16,069,000	14,478,400	52.2	29,625,025	25,433,953	126.2	6,471,072	5,565,871	2.4
South Dakota	41,739,287	38,056,119	82.9				15,495,400	13,730,401	41.7	3,157,768	2,160,663	29.4
Tennessee	24,437,189	21,993,472	7.0	15,763,433	14,187,089	28.7	63,346,605	52,851,078	28.7	5,818,077	5,031,671	1.3
Texas	76,474,000	68,826,600	134.4	32,710,465	29,020,890	61.4	133,675,054	119,895,710	325.2	49,281,095	38,529,640	167.6
Utah	20,914,951	19,849,561	52.2	2,662,509	2,526,187	7.3	20,475,722	19,189,210	20.4	1,178,946	1,075,423	.2
Vermont	10,800,000	9,720,000	6.4	8,808,094	7,927,286	3.9	14,632,957	12,192,074	7.8	778,737	515,093	
Virginia	36,012,909	32,464,509	33.5	8,900,586	8,010,518	10.1	62,004,154	53,867,821	67.1	3,259,774	2,812,298	4.1
Washington	14,685,029	13,297,400	30.4	3,995,826	3,664,607	12.3	54,187,739	48,057,555	92.2	24,814,675	16,956,037	109.8
West Virginia	29,298,600	26,243,160	25.2	7,956,136	6,247,562	11.0	16,376,408	11,859,670	3.2	310,562	252,812	
Wisconsin	25,783,642	22,293,678	94.6	8,629,899	7,229,510	34.2	41,686,346	35,380,777	58.1	3,022,322	1,858,065	2.3
Wyoming	11,006,065	10,264,863	18.6	2,150,550	1,995,171	17.7	34,589,281	32,025,481	122.1	5,068,692	3,543,520	54.4
District of Columbia	9,960,000	9,016,000	.5	4,676,800	4,056,030	1.0	19,454,297	17,174,190	.8	890,685	524,309	.1
Total	1,043,698,195	925,764,539	1,904.7	586,847,464	515,477,246	986.3	3,102,916,855	2,454,424,013	3,198.1	563,537,155	423,923,420	1,119.9

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

[2] Initial commitment of funds.

Table 12.—Improvements of the Federal-aid primary system in rural areas financed with Federal-aid funds:[1] Status of projects as of June 30, 1958, 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	$57,214,110	$39,054,152	171.4	$12,943,887	$8,698,195	184.9	$61,601,609	$44,087,383	328.3	$20,950,348	$12,709,071	177.3
Arizona	12,222,693	11,210,348	72.7	9,891,209	9,050,876	67.1	28,201,820	25,017,754	105.7	9,069,211	7,519,233	82.9
Arkansas	18,764,169	12,257,013	97.5	14,753,119	10,602,603	243.0	25,498,634	18,749,667	95.4	11,080,267	5,882,413	103.7
California	3,720,420	2,266,318	18.7	50,852,238	39,164,498	80.6	150,864,541	100,375,000	208.2	39,900,939	23,697,720	72.5
Colorado	7,657,912	6,137,119	61.4	4,799,796	3,075,858	27.9	34,513,925	26,075,505	153.6	19,345,493	12,220,197	188.3
Connecticut	350,000	208,333	.8	9,942,147	6,829,416	10.1	16,180,674	12,516,657	9.4	1,943,812	1,169,323	2.7
Delaware	6,074,928	4,953,113	12.1	3,042,000	2,326,000	9.2	9,784,672	6,187,465	23.4	6,554,575	3,301,844	36.2
Florida	17,952,535	15,758,864	30.1	11,673,413	8,163,733	124.9	24,650,109	16,987,499	78.7	16,787,433	8,504,616	125.9
Georgia	57,970,267	42,962,094	428.8	12,847,701	10,127,637	53.0	67,023,604	42,282,010	382.5	4,099,558	2,302,913	35.5
Idaho	7,403,952	6,200,895	43.1	4,710,533	4,291,971	36.0	19,849,253	15,243,560	163.6	7,217,812	4,766,883	101.8
Illinois	44,878,783	31,556,214	151.3	16,764,893	10,482,969	138.0	98,524,528	67,776,440	314.6	30,705,561	15,747,219	167.2
Indiana	44,676,252	36,586,298	110.8	43,569,241	29,231,344	167.2	48,128,783	32,264,230	248.2	11,326,082	6,261,635	89.3
Iowa	48,737,283	42,403,412	233.3	18,741,456	11,879,265	279.2	50,376,602	40,597,648	295.4	26,780,541	16,674,338	456.4
Kansas	16,346,000	13,111,267	132.1	20,473,758	14,887,605	275.8	40,830,364	28,967,770	441.3	21,181,294	11,906,012	365.5
Kentucky	19,271,278	14,809,163	36.4	8,099,069	5,020,040	34.2	36,182,218	25,485,065	102.0	7,104,504	3,792,482	9.4
Louisiana	16,940,827	12,636,220	97.8	43,714,492	29,787,949	272.6	38,426,431	28,255,113	110.1	2,138,862	1,176,746	.4
Maine	8,663,197	6,655,267	45.6	1,580,200	982,100	14.5	13,481,516	10,229,777	50.9	13,671,709	7,475,424	92.9
Maryland	3,560,480	2,570,932	14.8	14,030,500	8,107,535	43.3	30,999,594	24,681,354	50.9	10,020,805	6,414,576	29.7
Massachusetts	4,902,764	4,288,493	6.5	14,665,347	9,624,160	16.0	29,971,643	21,802,089	27.9	13,063,251	6,738,808	21.9
Michigan	60,761,235	53,277,912	114.5	15,172,365	9,798,038	159.8	84,814,601	63,213,821	287.8	54,116,841	36,814,836	205.6
Minnesota	9,421,443	8,176,206	39.6	14,648,930	8,255,639	220.3	36,656,736	25,829,794	233.6	15,181,562	8,239,982	346.9
Mississippi	28,995,549	22,268,910	162.1	10,922,700	6,502,860	155.4	44,726,618	33,848,541	306.5	6,913,805	3,660,079	156.7
Missouri	10,634,701	6,982,297	44.0	8,413,018	6,213,995	41.2	55,978,371	40,932,872	206.8	28,688,160	18,192,415	124.0
Montana	4,357,312	3,293,701	46.5	7,730,545	5,704,520	97.9	30,230,520	23,390,203	185.1	12,926,480	8,349,595	183.4
Nebraska	4,681,246	3,291,938	65.7	10,320,467	8,116,314	77.1	34,540,982	20,993,247	401.6	15,485,921	8,873,329	259.8
Nevada	11,345,601	10,659,340	45.8	1,549,613	1,379,631	36.8	14,831,051	13,696,167	59.4	8,990,238	7,461,042	52.6
New Hampshire	12,420,000	10,028,380	21.9	1,280,179	841,170	3.4	17,792,543	12,144,093	48.4	7,254,591	4,193,482	38.7
New Jersey	3,593,971	2,172,834	7.8	15,008,142	9,989,562	22.5	46,814,820	36,396,652	19.5	4,275,616	2,300,288	11.3
New Mexico	4,018,181	3,659,573	16.0	5,060,844	4,691,896	11.7	35,766,229	30,608,379	198.4	25,003,092	20,829,992	128.9
New York	33,280,071	27,034,665	102.2	33,360,846	21,282,890	90.4	134,030,344	90,545,076	231.1	38,108,117	19,573,616	232.0
North Carolina	37,756,864	30,976,657	225.9	20,308,140	14,331,735	246.0	73,008,939	51,586,666	567.1	24,267,953	14,609,434	239.2
North Dakota	18,666,357	16,043,165	137.4	9,259,922	6,044,034	231.2	31,511,647	24,666,477	501.5	16,335,917	9,940,244	427.0

Ohio	22,308,782	12,070,264	382.4	25,471,493	19,378,468	69.9	151,444,697	112,165,370	242.7	35,899,882	21,412,295	59.2
Oklahoma	27,257,500	21,182,950	137.4	30,964,104	24,510,105	166.6	40,162,955	30,499,162	181.4	26,988,547	15,672,865	191.1
Oregon	6,282,922	5,328,099	21.6	17,260,024	14,299,300	109.6	29,211,945	24,524,872	130.8	22,004,258	15,799,933	125.7
Pennsylvania	32,463,145	25,740,863	77.6	73,578,855	52,852,041	124.8	93,315,699	66,330,795	179.6	41,280,941	24,532,280	108.0
Rhode Island	3,691,900	1,960,295	5.6				7,113,545	6,050,802	8.9	5,482,457	4,751,152	5.4
South Carolina	33,154,311	26,752,813	184.7	18,978,200	16,042,300	132.9	46,641,478	33,996,226	254.8	11,686,533	8,193,516	29.0
South Dakota	38,642,516	33,234,939	212.2	5,180,567	3,254,229	220.7	18,540,842	14,985,526	242.3	13,420,111	7,901,918	398.3
Tennessee	12,410,372	10,883,270	21.6	24,089,454	18,598,152	150.7	48,078,137	30,451,925	199.9	13,427,517	6,605,701	73.6
Texas	50,225,000	41,591,400	170.9	38,805,930	29,843,140	406.9	116,135,385	86,261,505	782.9	69,397,218	46,169,590	647.7
Utah	25,085,758	22,841,446	88.8	4,551,328	3,990,958	30.6	18,756,493	16,507,730	69.6	6,171,021	4,572,601	49.0
Vermont	1,364,000	746,000	7.8	7,709,001	6,590,018	9.2	15,685,902	11,163,539	33.1	3,089,677	1,665,237	9.7
Virginia	40,470,000	33,625,064	67.2	13,195,378	10,640,174	199.7	75,071,588	57,978,372	140.8	14,345,464	8,164,001	150.9
Washington	9,699,029	7,619,880	53.3	11,667,488	7,952,046	157.8	37,808,712	28,986,628	166.0	27,460,611	16,708,363	191.2
West Virginia	31,106,414	25,381,067	44.2	8,535,091	6,593,857	30.2	18,730,140	11,307,412	27.0	3,886,775	2,143,664	20.1
Wisconsin	27,588,754	22,637,634	210.6	14,229,133	10,145,281	166.1	41,862,587	30,943,023	238.1	17,693,076	8,920,110	193.1
Wyoming	15,141,066	12,794,908	66.9	4,080,950	3,466,907	55.9	37,070,119	32,163,097	194.6	13,058,323	8,638,573	160.8
Alaska	8,091,113	6,898,867	67.3	1,231,500	613,640	39.9	6,949,338	6,099,338	110.9	895,378	895,378	162.2
District of Columbia							3,062,626	2,609,005	.2			
Hawaii	810,000	405,000	7.0	1,197,000	798,000	3.1	1,377,137	692,509	3.1	1,530,377	764,948	5.8
Puerto Rico	2,085,000	980,000	8.5	3,654,484	1,930,680	5.6	3,228,192	1,532,824	8.0	2,218,752	1,096,368	4.9
Total	1,025,117,963	819,165,852	4,630.2	774,510,690	556,985,334	5,551.4	2,276,041,438	1,660,683,634	9,651.6	860,427,268	525,908,280	7,161.4

[1] Ineludes projeets 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 13.—Improvements on secondary roads in rural areas financed with Federal-aid funds: [1] Status of projects as of June 30, 1958, 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	$3,322,814	$1,926,336	131.4				$17,815,446	$8,985,460	683.6	$13,639,264	$6,783,907	559.1
Arizona	3,700,000	2,822,643	44.1	$159,921	$115,079	5.7	3,194,459	2,418,270	65.3	8,365,494	5,970,330	152.4
Arkansas	8,667,674	4,966,457	482.5				7,859,440	4,031,972	329.4	8,429,759	4,179,229	330.0
California	23,161,170	13,172,558	277.9				10,724,388	5,406,513	100.5	13,213,709	6,930,259	168.2
Colorado	3,713,886	2,100,945	75.1				7,561,526	3,431,908	90.7	9,449,384	5,102,869	164.1
Connecticut	1,334,000	833,999	5.7				5,515,233	2,650,992	10.0	3,268,366	1,404,095	10.5
Delaware	1,070,092	556,331	1.8				4,519,745	2,399,422	42.0	1,878,945	926,486	20.8
Florida	8,665,392	4,675,929	399.5				7,185,997	3,463,016	215.1	5,912,460	2,918,225	103.7
Georgia	16,105,182	8,751,848	381.6				27,003,908	13,535,955	667.1	10,699,206	5,302,132	289.4
Idaho	4,740,117	3,376,690	116.9				6,331,394	3,898,233	126.3	4,507,717	2,745,806	133.2
Illinois	33,144,387	17,182,708	733.8				19,408,754	9,700,378	487.7	15,812,302	7,760,918	529.2
Indiana	16,229,812	9,077,031	196.3	11,568,090	5,963,839	139.5	16,500,415	8,292,459	131.2	7,863,658	3,966,314	78.5
Iowa	4,953,164	2,684,962	272.8				21,973,183	11,059,632	960.4	16,894,344	8,472,008	906.8
Kansas	9,660,060	5,208,653	873.1				14,191,970	7,092,525	939.8	11,779,084	5,908,460	925.3
Kentucky	10,921,172	6,506,286	105.0				16,124,844	8,485,329	174.0	11,372,159	5,622,606	262.1
Louisiana	15,412,622	8,353,311	275.2				16,289,203	8,147,920	289.6	2,847,606	1,418,820	62.1
Maine	921,789	559,007	7.9				5,437,699	2,720,329	51.0	5,902,816	2,944,322	82.6
Maryland	5,827,600	2,995,800	135.9				7,925,313	4,023,493	112.5	2,988,687	1,662,802	98.7
Massachusetts	2,944,752	1,472,376	6.8				2,945,342	1,635,465	13.6	2,532,792	1,242,869	13.8
Michigan	19,034,876	10,048,872	681.9				9,320,522	4,665,161	189.5	13,379,485	6,566,461	564.9
Minnesota	4,184,824	2,553,832	240.6				17,425,959	8,959,593	1,261.2	11,373,001	5,791,783	1,037.9
Mississippi	17,295,694	9,893,142	669.8				17,695,560	8,369,022	638.7	9,602,345	4,588,204	427.5
Missouri	19,102,018	10,446,829	1,300.4				14,608,200	6,750,544	685.2	17,282,517	8,643,913	1,342.6
Montana	7,576,700	4,667,066	202.4				11,855,450	7,686,727	271.7	9,501,975	5,632,366	229.3
Nebraska	9,063,298	5,189,149	247.7				20,531,490	10,460,949	910.5	8,422,532	4,289,650	412.4
Nevada	773,763	666,919	21.8				6,509,534	5,443,468	158.3	4,665,124	3,823,211	161.6
New Hampshire	2,450,000	1,458,000	7.8				4,316,926	2,296,354	24.6	3,044,826	1,605,399	18.8
New Jersey	4,304,000	2,227,332	40.6				2,859,912	1,430,216	12.5	547,182	272,091	6.5
New Mexico	777,671	547,912	8.0	2,040,355	1,489,190	53.7	5,103,724	2,984,428	112.6	4,683,150	2,885,130	125.7
New York	7,901,322	4,749,293	50.5				23,148,463	10,964,945	92.0	13,568,843	6,147,794	99.7
North Carolina	3,155,710	1,758,145	34.8				14,553,461	7,096,815	293.8	9,969,641	4,977,432	308.9
North Dakota	10,217,245	5,758,522	1,139.9				9,301,547	4,668,765	849.9	10,195,269	5,086,393	974.0

Ohio	25,984,808	14,341,129	303.4				24,831,187	13,313,307	113.6	12,061,710	6,097,230	82.1
Oklahoma	13,618,300	7,368,696	519.0				15,274,739	7,583,263	442.9	8,110,498	3,954,853	254.4
Oregon	5,941,179	3,843,584	126.5				7,265,915	4,329,510	135.9	9,178,272	5,433,938	142.4
Pennsylvania	12,970,672	6,617,236	87.5				28,247,818	13,241,307	171.3	14,998,448	7,496,497	121.9
Rhode Island	775,000	387,500	.3				680,187	340,915	2.1	105,848	52,924	
South Carolina	7,117,297	3,989,655	471.3				11,762,913	5,838,383	748.8	6,158,710	3,087,032	423.0
South Dakota	6,601,218	3,847,507	376.9				5,749,811	3,226,461	364.3	9,149,466	5,199,269	592.2
Tennessee	14,013,500	7,771,699	472.9				18,364,614	8,616,099	541.7	8,449,225	4,208,180	418.4
Texas	10,466,600	5,796,830	349.0				34,100,796	17,493,580	1,119.1	29,786,015	14,864,700	1,008.2
Utah	3,637,282	2,765,969	114.4				4,087,627	2,993,775	101.7	4,023,642	2,934,281	139.9
Vermont	1,217,000	664,090	19.1				2,891,731	1,561,891	33.1	2,633,728	1,309,051	33.4
Virginia	8,329,123	5,044,726	240.6				12,892,560	6,787,462	179.7	15,863,713	7,778,261	258.6
Washington	8,249,588	4,832,130	261.8				9,235,803	5,059,344	165.3	9,027,296	4,396,578	221.2
West Virginia	8,602,299	4,698,170	34.5	3,664,340	2,194,035	87.5	10,182,717	5,178,391	45.4	5,129,314	2,590,876	34.6
Wisconsin	10,193,926	5,631,163	329.3				13,173,336	6,838,822	327.8	12,274,597	6,058,537	372.7
Wyoming	1,409,822	925,350	27.1				6,362,987	4,105,456	143.0	4,685,736	3,022,250	145.0
Alaska	5,061,426	4,066,715	73.7	1,412,500	1,412,500	86.3	5,679,177	5,022,470	220.2	585,183	585,183	44.2
District of Columbia							1,701	1,701				
Hawaii	3,387,490	1,693,700	4.6	923,860	451,985	4.8	982,590	494,848	1.4	288,000	144,000	.7
Puerto Rico	2,297,000	1,136,100	9.9				10,011,512	4,833,103	54.8	1,803,393	848,191	11.6
Total	430,497,246	242,520,643	12,991.3	19,769,076	11,626,628	377.5	597,509,728	310,022,346	15,902.4	427,897,436	221,544,115	14,904.8

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

[2] Initial commitment of funds.

Table 14.—Improvements in urban areas financed with Federal-aid funds:[1] Status of projects as of June 30, 1958, 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	$16,065,065	$12,193,507	43.2	$7,635,453	$4,285,873	48.4	$17,559,258	$11,619,667	33.7	$6,845,498	$4,088,856	38.8
Arizona	4,347,500	3,564,879	15.5	236,468	172,172	2.9	7,956,499	7,186,313	5.3	1,998,670	1,434,536	2.0
Arkansas	30,504,826	25,593,001	34.1	10,267,580	8,589,398	21.0	19,221,237	15,223,377	19.9	5,365,734	2,728,162	43.5
California	20,598,440	11,275,900	9.4	36,042,840	23,775,119	26.6	434,170,503	181,500,142	61.8	54,916,072	28,554,455	42.5
Colorado	3,975,862	3,262,464	4.2				18,877,426	14,840,697	31.9	7,414,869	5,563,158	11.8
Connecticut	10,717,507	5,616,753	10.1	9,289,636	5,755,379	4.8	33,809,270	23,735,479	21.4	373,091	262,543	.2
Delaware	3,576,870	3,216,435		66,000	59,400		11,531,085	9,509,246	5.4	1,533,889	732,989	1.4
Florida	11,652,060	10,433,530	6.2	18,008,679	9,242,380	27.7	53,569,149	45,087,122	17.1	8,877,778	4,619,986	13.2
Georgia	35,252,127	27,217,129	15.6	9,482,381	7,499,684	32.1	43,960,290	30,158,140	25.3	13,354,961	9,509,353	4.6
Idaho	3,703,929	3,198,962	12.5	804,534	742,584	.3	4,444,038	3,313,850	3.9	974,076	646,569	4.1
Illinois	43,345,168	29,483,250	57.9	50,676,195	35,810,553	12.4	138,226,814	112,818,254	36.9	31,889,455	20,671,032	45.5
Indiana	11,596,220	7,706,862	11.7	5,560,124	3,102,608	13.6	10,919,367	7,390,571	14.7	5,696,393	3,641,135	18.8
Iowa	2,291,943	1,972,977	4.7	7,034,794	5,723,858	18.7	6,232,420	4,114,362	15.4	8,770,622	5,641,170	55.3
Kansas	8,890,000	7,893,667	3.0	4,245,228	3,630,640	17.0	16,648,194	12,648,151	34.1	12,049,750	7,919,831	29.5
Kentucky	6,107,662	5,000,131	7.4	9,962,132	8,365,025	10.3	28,525,072	22,311,252	11.1	7,711,976	4,553,668	7.3
Louisiana	15,599,642	11,867,821	25.9	21,403,795	14,476,406	32.7	19,662,957	10,669,535	2.4	4,260,146	2,800,103	.5
Maine	2,179,308	1,496,556	8.3	2,037,400	1,803,660	1.9	11,367,060	8,595,410	8.1	2,563,129	2,029,450	1.6
Maryland	14,388,000	9,167,300	10.0	15,454,012	8,608,109	13.5	41,606,285	31,031,078	22.3	12,906,964	7,115,390	6.6
Massachusetts	21,197,986	17,354,813	5.5	27,062,224	13,696,018	14.9	92,334,114	65,396,560	31.0	32,690,762	16,429,814	11.8
Michigan	13,996,127	8,165,064	9.0	23,350,405	16,618,842	46.9	56,422,265	39,935,291	24.4	23,951,913	14,060,845	40.8
Minnesota	5,283,558	3,863,599	10.2	10,030,477	7,662,506	22.3	60,820,508	48,703,547	77.8	8,960,041	5,466,567	37.4
Mississippi	10,087,139	8,061,190	41.3	1,162,300	788,200	4.9	25,391,913	20,092,491	46.6	1,334,099	801,666	3.5
Missouri	1,688,374	1,355,387	1.2	13,345,775	11,241,128	2.4	68,754,233	50,396,133	70.8	53,818,649	37,831,986	46.4
Montana	570,348	378,290	1.1	699,324	474,064	2.3	12,158,574	10,108,423	10.6	3,934,624	2,335,885	15.0
Nebraska	722,644	367,122	3.2	860,642	548,130	1.2	15,745,645	13,384,724	3.7	1,683,920	840,765	4.3
Nevada	2,569	2,151		45,313	37,945	.3	11,203,532	10,561,550		1,131,847	907,294	3.4
New Hampshire	1,965,000	1,542,500	1.6	600,934	348,706	3.3	6,593,717	5,653,219	4.7	1,481,872	928,630	4.0
New Jersey	10,993,350	6,507,876	25.2	7,187,618	4,356,538	9.6	58,821,127	40,590,689	30.0	13,241,171	6,711,019	17.5
New Mexico	4,329,139	4,002,826	5.5	351,814	233,424	3.3	6,922,510	5,898,538	4.9	3,929,911	2,487,318	13.2
New York	12,947,012	7,582,966	19.4	70,226,943	50,266,580	38.3	411,165,655	266,825,227	134.9	54,919,450	26,970,748	61.1
North Carolina	1,097,354	584,677	2.8	6,776,670	4,250,395	18.1	10,353,706	7,118,467	43.1	13,796,436	8,150,331	25.8
North Dakota	497,766	491,383		563,820	387,843	4.6	2,532,036	1,964,190	26.5	2,493,987	1,901,685	17.6

Ohio	21,578,826	12,688,286	86.7	7,795,497	5,548,789	10.3	123,217,134	91,533,471	33.9	49,771,470	36,496,374	11.4
Oklahoma	3,689,500	1,936,745	19.1	12,965,950	10,456,872	19.8	15,409,908	10,871,842	25.5	12,907,258	7,677,434	32.8
Oregon	3,134,946	2,398,728	1.0	3,900,094	2,899,000	5.4	11,188,460	9,256,645	8.0	6,985,044	4,508,315	20.7
Pennsylvania	32,247,213	22,755,274	36.6	53,289,686	33,643,934	36.8	150,323,216	102,355,784	66.1	24,807,590	15,710,186	29.8
Rhode Island	6,846,939	3,961,631	43.5	4,645,700	2,234,600	2.0	23,699,726	17,771,358	15.8	15,457,552	8,079,727	17.7
South Carolina	4,716,762	2,419,956	23.6	3,536,599	1,928,357	4.7	10,046,889	5,864,500	34.7	1,534,229	803,486	1.4
South Dakota	12,649,983	10,459,782	21.0	959,460	536,250	1.0	2,601,410	1,911,621	2.6	373,975	209,044	1.2
Tennessee	16,912,229	13,620,208	.6	5,631,589	3,661,378	12.2	64,514,585	46,127,720	29.6	9,137,284	6,504,196	11.1
Texas	37,556,300	33,427,900	24.9	24,579,163	16,409,350	50.6	88,669,837	71,088,550	101.9	45,782,912	26,394,620	189.0
Utah	1,188,698	1,038,178	1.3	1,529,275	1,207,013	10.2	8,340,974	7,606,033	2.0	4,658,053	3,576,191	11.4
Vermont	10,800,000	9,720,000	6.4	2,336,946	2,103,252	1.4	4,877,772	4,015,852	.6	1,873,611	906,728	4.3
Virginia	11,577,500	7,420,750	23.3	3,643,259	2,327,448	4.1	16,248,649	11,250,212	14.9	5,042,739	2,853,567	7.0
Washington	9,269,200	8,203,230	21.8	5,603,669	3,561,787	4.8	37,626,553	30,954,480	43.1	11,417,494	7,423,769	53.3
West Virginia	10,039,294	7,163,447	6.8	197,481	98,741		15,264,910	9,381,886	10.5	3,877,481	1,938,675	4.5
Wisconsin	10,341,164	6,840,982	10.1	3,285,480	2,173,350	1.7	26,541,245	18,586,070	12.7	17,967,075	9,179,302	35.8
Wyoming	2,203,570	1,935,586	3.4	178,900	115,139		6,774,747	5,882,764	9.2	730,190	452,425	2.1
Alaska	983,100	983,000	2.7				273,831	273,719				
District of Columbia	16,771,600	13,021,300	12.7	8,651,680	6,089,380	6.3	26,300,388	19,490,572	3.5	6,110,635	3,117,333	6.1
Hawaii	3,782,530	1,891,265	1.9	1,151,087	758,755	.9	1,506,725	687,379	1.0	2,688,162	1,283,203	1.8
Puerto Rico	5,628,384	2,922,032	4.8	5,880,067	3,076,904	8.6	10,065,749	4,459,104	5.3	1,365,491	674,907	.3
Total	552,088,233	405,229,248	757.9	520,233,092	351,383,466	637.1	2,400,999,167	1,607,751,257	1,300.6	627,360,000	376,126,421	1,070.7

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

[2] Initial commitment of funds.

Table 15.—Status of program authorized by sections 2 (a) and 2 (e) ("D" and "L" funds, respectively) of the Federal-Aid Highway Act of 1958: Programs approved and contracts awarded during the fiscal year ended June 30, 1958, by States

State or Territory	Programed [1] during fiscal year				Contracts awarded during fiscal year			
	Total cost	Federal funds		Miles	Total cost	Federal funds		Miles
		"D" funds	"L" funds			"D" funds	"L" funds	
Alabama	$10,907,260	$7,266,266	$2,417,063	236.7	$3,202,160	$2,134,736	$711,570	68.3
Arizona	5,320,989	4,325,963	662,994	73.1	2,160,989	1,756,883	269,258	36.2
Arkansas	8,341,240	5,505,660	1,812,039	348.2	1,312,110	865,974	279,149	43.0
California	30,002,994	20,028,064	4,805,944	105.4	7,205,270	4,997,040	1,198,280	11.8
Colorado	2,984,919	2,118,226	531,969	41.7				
Connecticut	4,960,228	3,250,815	1,083,603	17.9				
Delaware	2,590,000	1,706,285	527,145	22.3	2,340,000	1,560,000	520,000	21.4
Florida	9,528,878	6,339,175	2,018,384	331.0	1,553,156	1,035,230	345,076	30.7
Georgia	12,246,076	8,164,048	2,721,349	318.1				
Idaho	4,290,843	3,189,383	734,162	105.6	867,843	645,068	148,488	22.5
Illinois	9,713,431	6,474,344	1,708,962	191.1	3,309,891	2,205,331	735,108	51.2
Indiana	11,924,479	7,949,652		213.0	1,149,520	766,346		6.8
Iowa	8,559,051	5,698,629	1,899,223	183.3				
Kansas	11,564,578	7,291,933	2,376,661	284.9	3,234,282	2,138,404	700,673	78.9
Kentucky	10,627,755	7,085,169	2,205,124	98.7	481,102	320,734	106,912	3.6
Louisiana	8,506,430	5,540,870	1,638,850	154.7				
Maine	3,097,570	2,065,042	672,841	54.5	359,570	239,712	78,256	9.8
Maryland	8,387,340	3,988,233	1,222,229	24.8	2,018,640	1,472,473	357,778	.3
Massachusetts	4,726,800	3,129,055	1,043,018	11.9				
Michigan	12,805,253	8,442,059	46,085	262.3	1,169,000	779,292		26.3
Minnesota	14,316,922	9,115,126	249,570	360.5	6,883,212	4,371,500		56.0
Mississippi	9,984,400	6,374,195	674,885	296.8				
Missouri	15,707,875	10,471,901	3,086,604	352.9	4,987,012	3,324,667	1,104,199	18.5
Montana	5,502,941	3,976,056	1,006,171	166.1	497,576	394,675	56,852	8.7
Nebraska	10,164,315	6,626,287	2,040,181	188.2				
Nevada	2,924,535	2,603,999	211,061	68.8	1,992,704	1,773,180	143,721	40.5
New Hampshire	3,447,395	1,781,317		16.2				
New Jersey	4,422,000	2,947,996	755,555	12.2				
New Mexico	2,497,142	1,879,599	411,699	48.1				
New York	33,862,182	22,455,105	7,309,517	153.0	11,555,082	7,591,915	2,355,122	26.8
North Carolina	9,483,990	6,322,220	2,081,645	205.0	1,873,040	1,248,645	390,785	30.7
North Dakota	6,747,039	4,498,026	1,389,342	303.0	830,646	553,764	184,588	25.9

Ohio	22,047,452	13,412,678	4,151,342	684.9				
Oklahoma	12,022,850	7,456,777	2,271,416	167.8	7,933,100	4,860,575	1,448,198	50.2
Oregon	6,253,810	4,651,000	1,006,300	82.8	551,070	409,300	91,600	6.1
Pennsylvania	20,803,904	13,858,009	4,619,329	98.1				
Rhode Island	3,328,569	2,219,046	676,740	32.2	99,600	66,400	20,200	
South Carolina	8,467,900	4,995,600		314.2	1,149,500	685,600		20.8
South Dakota	5,204,576	3,671,821	1,021,723	175.7	1,558,347	1,099,411	305,924	40.4
Tennessee	11,484,036	7,655,924	2,518,519	265.8				
Texas	23,268,789	15,270,800	3,261,800	560.8	14,034,399	9,159,600	1,837,000	335.1
Utah	4,664,751	3,690,009		63.8				
Vermont	2,604,900	1,614,605	495,260	20.8	1,175,900	780,605	260,160	11.0
Virginia	10,987,454	7,128,377	2,341,880	390.1	282,572	191,020	58,723	3.1
Washington	9,330,221	6,373,158	1,638,155	254.8	3,371,686	2,326,813	695,940	77.0
West Virginia	4,441,318	2,960,812	986,704	123.4	1,766,808	1,177,872	392,624	78.4
Wisconsin	13,225,614	8,402,070	2,788,030	205.5	622,925	415,270	125,840	6.7
Wyoming	4,945,400	3,770,372	724,788	69.0	1,930,400	1,471,736	285,120	38.2
Alaska	5,475,746	4,015,640	381,824	103.3	560,000	323,964		7.6
District of Columbia	3,378,560	2,368,000	672,267	8.2	477,560	318,000	106,000	1.3
Hawaii	2,345,377	1,555,400	518,466	4.1	2,345,377	1,555,400	518,466	4.1
Puerto Rico	4,607,169	2,790,860	862,214	14.7	721,602	471,455	145,653	3.1
Total	479,035,246	316,471,656	80,280,632	8,890.0	97,563,651	65,488,590	15,977,263	1,301.0

[1] Initial commitment of funds.

Table 16.—Mileage of designated Federal-aid highway systems, by State, as of December 31, 1957

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	870	769	101	6,294	5,669	625	18,450	18,055	395
Arizona	1,161	1,132	29	2,648	2,573	75	3,868	3,700	168
Arkansas	523	482	41	3,937	3,720	217	13,964	13,849	115
California	2,148	1,733	415	7,506	6,364	1,142	10,689	10,119	570
Colorado	676	644	32	4,255	4,125	130	4,038	3,992	46
Connecticut	276	160	116	1,265	885	380	1,156	1,008	148
Delaware	39	35	4	568	521	47	1,419	1,402	17
Florida	1,105	1,001	104	5,426	4,888	538	13,048	12,753	295
Georgia	1,112	973	139	8,666	8,097	569	13,398	13,236	162
Idaho	611	596	15	3,150	3,079	71	4,780	4,740	40
Illinois	1,608	1,401	207	10,605	9,432	1,173	11,947	11,767	180
Indiana	1,090	964	126	5,475	4,873	602	16,007	15,791	216
Iowa	710	659	51	10,267	9,686	581	33,140	32,890	250
Kansas	803	692	111	7,927	7,491	436	22,970	22,828	142
Kentucky	604	560	44	4,448	4,170	278	15,245	15,102	143
Louisiana	595	512	83	3,318	2,963	355	7,730	7,604	126
Maine	313	293	20	1,932	1,795	137	2,296	2,241	55
Maryland	354	216	138	2,166	1,760	406	6,141	5,923	218
Massachusetts	450	274	176	2,293	1,492	801	2,213	1,673	540
Michigan	1,064	926	138	7,140	6,543	597	24,794	24,515	279
Minnesota	888	763	125	8,870	8,170	700	19,403	19,252	151
Mississippi	674	610	64	5,816	5,570	246	13,555	13,439	116
Missouri	1,102	981	121	9,068	8,598	470	22,123	22,048	75
Montana	1,236	1,208	28	5,930	5,845	85	4,875	4,857	18
Nebraska	488	478	10	5,669	5,504	165	13,423	13,389	34
Nevada	540	529	11	2,196	2,163	33	2,522	2,510	12
New Hampshire	215	197	18	1,200	1,093	107	1,596	1,550	46
New Jersey	369	209	160	2,046	1,278	768	2,061	1,545	516
New Mexico	1,003	978	25	4,045	3,864	181	5,278	5,231	47
New York	1,199	803	396	10,349	8,224	2,125	18,555	16,980	1,575
North Carolina	678	634	44	6,878	6,468	411	24,376	24,109	267
North Dakota	565	556	9	3,680	3,641	39	13,317	13,299	18

Ohio	1,344	1,138	206	7,633	6,669	964	17,328	16,876	452
Oklahoma	792	716	76	8,228	7,771	457	12,015	11,879	136
Oregon	715	658	57	4,058	3,834	224	5,715	5,643	72
Pennsylvania	1,557	1,313	244	8,621	7,291	1,330	13,258	12,333	925
Rhode Island	71	32	39	467	252	215	397	275	122
South Carolina	679	662	17	4,745	4,456	289	14,215	14,069	146
South Dakota	679	674	5	6,069	5,984	85	11,885	11,866	19
Tennessee	969	904	65	5,450	5,167	283	10,109	10,060	49
Texas	3,034	2,625	409	17,124	15,653	1,471	30,095	29,622	473
Utah	739	679	60	2,296	2,189	107	3,561	3,499	62
Vermont	321	309	12	1,581	1,502	79	1,787	1,765	22
Virginia	996	901	95	5,458	4,996	462	18,065	17,881	184
Washington	617	487	130	3,746	3,425	321	10,122	9,874	248
West Virginia	229	210	19	2,611	2,404	207	10,681	10,589	92
Wisconsin	452	428	24	6,393	5,923	470	18,535	18,256	279
Wyoming	931	916	15	3,637	3,581	56	2,136	2,125	11
District of Columbia	29		29	141		141	79		79
Alaska				1,959	1,944	15	3,245	3,239	6
Hawaii				532	495	37	649	639	10
Puerto Rico				550	426	124	1,085	1,044	41
Total	[2] 39,223	34,620	4,603	256,333	234,506	21,827	553,339	542,931	10,408

[1] Figures include the mileage of the Interstate System.
[2] There were some 1,700 miles for which route descriptions defining general locations have not yet been formally approved. As the general locations are established and route descriptions approved, the mileage will be included with State totals.

Table 17.—Status of national forest highway projects as of June 30, 1958, 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							$94,300	$40,000	7.7	$99,844	$49,922	8.4
Arizona	$1,110,000	$1,110,000	21.7	$932,400	$932,400	33.4	1,128,300	1,128,300	17.2	877,233	877,233	27.8
Arkansas	563,412	231,706	8.1	284,166	142,083	9.0	272,830	136,415	8.7	156,100	78,050	3.4
California	2,415,000	2,415,000	28.2	4,315,500	4,218,500	50.9	2,402,000	2,402,000	16.1	1,964,963	1,904,963	8.6
Colorado	1,511,000	1,511,000	19.3	1,581,927	1,581,927	14.1	1,265,000	1,265,000	6.2	1,034,000	1,034,000	10.3
Florida	959,000	494,500	22.0				413,383	206,574	15.4	317,594	158,629	13.4
Georgia	173,000	86,500	1.9				448,984	224,492	5.5			
Idaho	1,970,000	1,970,000	25.2	1,079,310	1,079,310	13.9	3,025,099	3,025,099	42.7	908,896	908,896	24.8
Illinois				18,100	9,050		268,000	134,000	3.3			
Indiana							271,198	124,476	.6			
Iowa										21,370	8,641	.4
Kentucky										55,053	55,053	2.4
Louisiana	162,500	162,500					82,920	41,460	3.8	144,720	73,360	5.2
Maine	10,646	10,646	1.5							19,870	18,172	1.5
Michigan	260,000	260,000	2.8	274,071	137,036	11.4	556,329	278,164	10.5	693,200	295,790	9.9
Minnesota	551,000	486,000	10.6							578,400	578,400	26.2
Mississippi				343,500	343,500	1.1						
Missouri	163,323	163,323	.5				144,816	144,816	4.9			
Montana	1,852,000	1,852,000	17.5	1,953,996	1,953,996	70.4				2,695,030	2,695,030	55.7
Nebraska	70,450	70,450	2.8									
Nevada	600,000	600,000	6.8				720,000	720,000	9.9	511,400	314,400	.6
New Hampshire	46,224	46,224	12.0	272,725	272,725	1.2						
New Mexico	1,360,000	1,360,000	27.9	405,000	405,000	7.7				1,117,200	1,117,200	9.7
North Carolina							756,458	378,229	10.1	807,140	410,750	5.3
Ohio				32,465	32,465	1.6						
Oregon	3,271,000	3,271,000	65.5	574,968	574,968	7.5	4,012,907	4,012,907	56.9	3,139,823	3,139,823	42.1
Pennsylvania				167,197	167,197	5.1						
South Carolina	14,000	6,300		310,200	138,000	21.9	256,400	112,200	17.0	63,450	29,665	7.4
South Dakota	170,000	170,000								362,000	362,000	3.8
Tennessee				484,800	240,000	5.2						
Texas	171,500	171,500	10.8				319,200	159,600	16.6			
Utah	1,000,000	1,000,000	53.0	563,000	563,000	13.8	521,000	521,000	28.6	378,652	378,652	7.9

Vermont	29,314	29,314	.9	101,650	101,650	.8						
Virginia	228,600	173,600	14.1	242,410	171,727	3.1	135,686	67,439	.4	5,947	5,947	1.0
Washington	2,043,000	2,043,000	16.6	1,802,000	1,802,000	14.4				1,255,121	1,255,121	26.1
West Virginia										135,461	67,731	4.6
Wisconsin				244,353	244,353	6.6				458,144	229,000	7.4
Wyoming	1,325,000	1,325,000	15.4	133,000	133,000		1,572,000	1,572,000	10.4			
Alaska	2,650,000	2,025,000	22.4	682,223	607,223	18.9	732,000	732,000	5.2	2,067,976	2,067,976	38.2
Puerto Rico							68,627	68,627	.5			
Total	24,679,969	23,044,563	414.5	16,798,961	15,851,110	312.0	19,467,437	17,494,798	298.2	19,868,587	18,114,404	352.1

[1] Includes construction projects only.

[2] Initial commitment of funds.

Table 18.—Mileage of the national forest highway system, by forest road class and by State, as of June 30, 1958

Region and State or Territory	Total	Class 1 [1]	Class 2 [2]	Class 3 [3]
Western Region:	*Miles*	*Miles*	*Miles*	*Miles*
Arizona	1,055.3	325.8	558.9	170.6
California	2,454.5	674.0	412.3	1,368.2
Colorado	1,493.7	577.0	525.7	391.0
Idaho	1,216.6	648.9	301.5	266.2
Montana	1,193.7	685.8	208.4	299.5
Nevada	368.9	155.0	164.2	49.7
New Mexico	655.6	131.0	417.9	106.7
Oregon	1,416.0	688.8	446.9	280.3
South Dakota	302.0	189.0	101.0	12.0
Utah	747.8	222.0	230.8	295.0
Washington	737.6	482.5	128.8	126.3
Wyoming	477.0	349.0	109.0	19.0
Alaska	401.2	166.3	200.0	34.9
Total	12,519.9	5,295.1	3,805.4	3,419.4
Eastern Region:				
Alabama	367.8	84.1	229.0	54.7
Arkansas	633.3	96.7	536.6	
Florida	289.9	32.9	203.4	53.6
Georgia	364.5	152.5	183.7	28.3
Illinois	301.8	241.3	45.7	14.8
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	398.2	54.1	167.5	176.6
Maine	14.0			14.0
Michigan	1,163.8	590.8	549.2	23.8
Minnesota	718.1	312.9	323.2	82.0
Mississippi	539.1	322.8	205.0	11.3
Missouri	1,000.5	385.9	571.5	43.1
Nebraska	23.5		23.0	.5
New Hampshire	166.0	61.9	39.6	64.5
North Carolina	831.4	365.6	404.5	61.3
Ohio	133.6	70.4	43.1	20.1
Oklahoma	46.2	29.6	16.6	
Pennsylvania	353.9	118.4	85.9	149.6
South Carolina	777.5	237.9	428.6	111.0
Tennessee	566.5	165.1	336.5	64.9
Texas	347.2	128.3	187.2	31.7
Vermont	119.1	32.7	61.9	24.5
Virginia	1,371.8	371.0	889.8	111.0
West Virginia	484.1	78.4	364.7	41.0
Wisconsin	469.1	75.7	352.4	41.0
Puerto Rico	44.6		44.6	
Total	11,998.1	4,205.0	6,560.3	1,232.8
Grand total	24,518.0	9,500.1	10,365.7	4,652.2

[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 19.—Mileage of highways in national parks, monuments, and parkways (and designated approach roads) constructed by the Bureau of Public Roads during the fiscal year

Park, monument, or parkway (and State)	Under construction as of June 30, 1958	Completed during fiscal year
	Miles	*Miles*
Acadia (Maine)	2.7	10.1
Arches (Utah)	9.2	
Badlands (S. Dak.)	15.5	12.3
Big Bend (Tex.)	5.7	
Blue Ridge (Va.–N. C.)	152.7	27.0
Colonial Park (Va.)	4.7	7.8
Colonial Parkway (Va.)	13.0	10.5
Dinosaur (Colo.–Utah)	6.2	
Everglades (Fla.)	16.9	32.0
Foothills (Tenn.)	1.9	
George Washington Memorial (Va.)	11.5	3.7
Glacier (Mont.)	12.6	
Grand Canyon (Ariz.)		37.8
Grand Teton (Wyo.)	24.3	21.0
Great Smoky Mountains (N. C.–Tenn.)	3.9	
Mesa Verde (Colo.)		3.0
Mt. McKinley (Alaska)	14.5	
Mt. Rainier (Wash.)	16.9	18.7
Natchez Trace (Ala.–Miss.–Tenn.)	79.3	10.2
National Capital (D. C.)	.3	
Olympic (Wash.)	13.3	7.0
Rocky Mountain (Colo.)	2.5	
Sequoia–Kings Canyon (Calif.)		2.0
Shenandoah (Va.)	11.6	
Theodore Roosevelt (N. Dak.)	6.9	
Yellowstone (Wyo.)	25.5	
Yosemite (Calif.)	20.1	
Total	471.7	203.1

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