ANNUAL REPORT

Bureau of Public Roads

FISCAL YEAR 1953

A newly built part of the interstate system over Sherman Hill in Wyoming, highest summit on U. S. 30

DEPARTMENT OF COMMERCE

U. S. DEPARTMENT OF COMMERCE

SINCLAIR WEEKS, Secretary

BUREAU OF PUBLIC ROADS

FRANCIS V. du PONT, Commissioner

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ANNUAL REPORT OF THE BUREAU OF PUBLIC ROADS

Factors Affecting Progress

COMPARED with previous rates of highway improvement, good progress was made in the fiscal year 1953[1] in improving highways with Federal assistance and in road improvement in general. Highways completed with Federal assistance rose to a record high of 23,626 miles or 5,516 miles more than in the previous fiscal year.

The total of construction contracts awarded by State highway departments (including Federal-aid projects) and by toll-road authorities, as measured in dollars and in actual physical improvements, rose to new record levels. However, this was due to the increased volume of toll-road construction (fig. 1). Contracts for Federal-aid work will provide about the same volume of physical improvements as were contracted for in each of the three preceding years, and contracts for State work financed without Federal aid fell below the level of the previous year. The demands from all sections of the country for better highways did not produce an increased rate of contract awards for free highways.

The number of motor vehicles, the volume of traffic, and congestion and delays continued to grow. Motor vehicles registered increased by 1.4 million in the calendar year 1952 and at least an equal increase in 1953 was expected to bring the total to 54,709,000 vehicles.

The mileage of vehicle travel on all roads and streets increased 5.2 percent during the fiscal year and was 1.7 times that in the calendar year 1941.

Shortage of steel resulting from the strike of steel workers was a retarding influence at the beginning of the year. Conditions improved after the ending of the strike in July 1952 and by the end of the fiscal year the serious difficulties had disappeared.

The upward trend in highway bid prices, which started with the trouble in Korea at the beginning of the fiscal year 1951, continued at a diminished rate through the third quarter of the fiscal year 1953. A pronounced drop of 4.5 percent occurred during the fourth quarter. During the fiscal year 1953 highway construction labor, materials, and equipment costs increased 7.0 percent, 3.5 percent, and 2.1 percent respectively.

There was no shortage of contractors seeking highway construction jobs. During the year 5,090 contracts for Federal-aid jobs were awarded to 2,229 contracting firms, averaging 2.3 projects per contractor. The average number of bidders per project was 5.3, compared with 4.6 bidders the previous year.

The shortage of highway engineers and technical assistants discussed in the report for last year continued. Experienced engineers of State, county, and city highway departments were attracted by the higher salaries paid in private employment. In some instances engineers resigned from public employment to work for consultants at higher salaries on highway plans contracted for by highway departments. Through contracts with consultants, the highway departments paid former employees higher salaries plus a surcharge for overhead. College graduates did not seek employment with highway departments in the

[1] The fiscal year extended from July 1, 1952, to June 30, 1953.

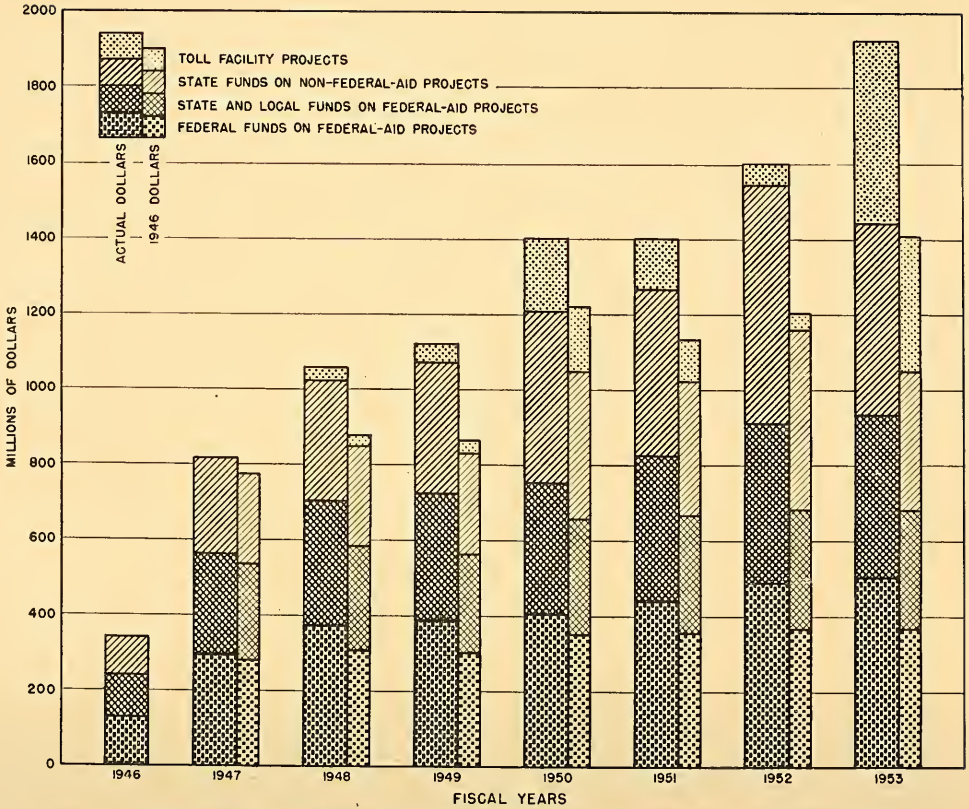


Figure 1.—Highway construction contracts awarded by State highway departments.

desired numbers, even though offered salaries comparable with those in private employment. They were concerned over salaries to be expected when they reached full professional standing.

In order to partly meet their needs for technical personnel, some States continued or undertook in-service training programs, including programs for high school graduates. Also, there was some improvement in salaries paid. Further action in both these areas is desirable in view of the large volume of highway work that needs to be done.

The various retarding influences are not of major significance in accounting for failure to make greater progress toward an adequate highway system. Men, materials, and equipment could have been obtained for a much larger program. The public loudly demanded better highways but it did not insist upon legislative action necessary to provide additional funds needed for more rapid improvement.

Thomas H. MacDonald Succeeded by Francis V. du Pont as Commissioner of Public Roads

Thomas H. MacDonald, who as Chief of Bureau and Commissioner of Public Roads headed the Public Roads organization since 1919, retired on March 31, 1953. He was succeeded by Francis V. du Pont of Delaware, a graduate of Massachusetts Institute of Technology. Mr. du Pont served on the highway commission of Delaware for 27 years, and for 23 years was chairman of the commission.

The Federal-Aid Program

A record-breaking 23,626 miles of highway and street improvements were completed during the fiscal year 1953 under the Federal-aid and Federal highway construction program. The year's accomplishments set a new all-time high, measured both in total mileage completed and opened to traffic, and in the actual physical volume of improvements made.

Federal-aid funds of $500 million for the fiscal year, together with remaining balances of prior authorizations and State and local matching funds, financed the program carried forward during the year. Federal-aid authorizations of $575 million for each of the fiscal years 1954 and 1955 assure Federal support for enlarging the program during the next 2 years.

The 23,626 miles of highways completed during the year included 6,681 miles of highways and 999 bridges on the Federal-aid primary highway system outside of cities (principal intercity routes), 758 miles of highways and 390 bridges on urban portions of the Federal-aid primary highway system, 15,403 miles of highways and 1,535 bridges on secondary or farm-to-market roads, and 784 miles of highways in National forests, parks, public lands, and flood-relief projects. Advancement of the long-term program of eliminating hazards to life at railway-highway grade crossings included completion of 125 crossing eliminations, reconstruction of 22 inadequate grade-separation structures, and protection of 356 crossings by flashing lights or other safety devices.

The scarcity of structural steel, which reduced the volume of bridge work and was exercising a retarding influence on related work at the beginning of the fiscal year, had been alleviated considerably by the close of the year. The size of program for the coming year appears to be dependent upon the availability of completed plans and funds to finance the work.

Projects for the construction of 21,628 miles were programed during the year, and practically all of the States were allotting funds apportioned for the fiscal year 1954 to programed projects. Contracts were awarded during the year for improvements to 19,295 miles of highways and streets. Construction put in

place during the year amounted to 107 percent of the year's $500-million authorization. At the year's end, construction was in progress or scheduled to start soon on 21,833 miles of highways and streets. Tables in the appendix show the details of accomplishments during the year and the status of the program at the end of the year.

Classes of Federal-Aid Work

Federal aid to the States for highway construction since World War II has included separate authorizations for three general classes of highways—primary, secondary, and urban. The Federal-aid Highway Act of 1952 authorized a total of $550 million for each of the fiscal years 1954 and 1955 for these classes of highways, and in addition authorized $25 million each year for improvements to the National System of Interstate Highways.

Federal-aid primary highway system

Continuously since 1921, when the Federal Highway Act provided for its designation, Federal-aid funds have been provided for improvement of the connected network of principal highways comprising the Federal-aid primary highway system. Since World War II, 45 percent of each year's authorization has been provided for improvement of primary highways. Authorizations of primary funds amounted to $225 million for each of the fiscal years 1952 and 1953, and $247.5 million for each of the fiscal years 1954 and 1955.

Federal-aid secondary highway system

The Federal Government recognizes an interest in secondary or farm-to-market routes, rural mail-delivery routes, and school-bus routes by providing 30 percent of the total Federal fund authorization for improvement of this class of road. Authorizations of secondary funds amounted to $150 million for each of the fiscal years 1952 and 1953, and $165 million for each of the fiscal years 1954 and 1955.

Federal-aid urban primary system

Federal funds for aiding in the construction of the modern expressways urgently needed to facilitate the free flow of traffic into and through our large cities and metropolitan areas account for the remaining 25 percent of annual Federal-aid authorizations. Authorization of urban funds amounted to $125 million for each of the fiscal years 1952 and 1953, and $137.5 million for each of the fiscal years 1954 and 1955. Approximately one-eighth of the primary funds, which are available for expenditure on any part of the system, heretofore have been utilized for improvements in urban areas.

National System of Interstate Highways

Authorization of a fourth class of funds, for improvement of the National System of Interstate Highways, was contained in the Federal-aid Highway Act of 1952. The 1952 act authorized $25 million for each of the fiscal years 1954 and 1955 for its improvement.

Status of Work at End of Fiscal Year

The active program of projects for which plans had been approved or work had started at the close of the fiscal year (table 2 of appendix) comprised improvements to 20,929 miles of highways and streets and 3,826 bridges in the Federal-State cooperative program. These improvements had a total estimated cost of $1.77 billion, including $906 million of Federal funds. This work included the elimination of 311 railway-highway grade crossings, the reconstruction of 39

obsolete grade-separation structures, and the protection of 266 railway-highway grade crossings by installing flashing lights or other protective devices. Other work under programs for improvement in National forests and parks, public lands, and flood relief involved improvements to an additional 904 miles of highways at a total cost of $56 million, including $51 million of Federal funds.

The National System of Interstate Highways

The National System of Interstate Highways, authorized by Congress in 1944, includes those important and heavily traveled routes connecting the principal metropolitan areas, cities, and industrial centers in the continental United States. Although the mileage is small—limited to 40,000 miles—in comparison to the total mileage of highways, its routes provide a network of vital importance to defense activities, to the movement of the ever-increasing volume of commodities by trucks, and to the traveling public in general.

Recognizing the importance of this network of highways to the national economy, the Congress provided, in the Federal-aid Highway Act of 1952, $25 million for exclusive use in the improvement of the interstate system in each of the fiscal years 1954 and 1955. Prior to this time improvements to highways on the interstate system were made with funds provided for the Federal-aid primary highway system. Approximately one-third of primary funds and nearly one-half of urban funds assigned to projects by the States since World War II have been for improvement of the interstate system.

Of the funds provided specifically for the interstate system for the fiscal year ending June 30, 1954, projects to cost nearly $15 million have been programed. Plans have been approved for projects involving 62 percent of the funds programed.

In addition to the funds provided specifically for the improvement of highways on the interstate system, substantial use continues to be made of Federal-aid primary and urban highway funds for the improvement of these highways. Approximately $130 million of primary and urban funds are currently programed for interstate system improvement.

Inasmuch as the Federal funds are matched in an approximately equal amount by funds under the control of the States, the $140 million of Federal funds now programed, including interstate funds, represent work on the interstate system estimated to cost $270 million on 1,117 miles of highway.

There are 1,192 miles of the interstate system currently under improvement at a total cost of $423,711,307, including $212,810,056 of Federal-aid funds. During the fiscal year, construction work on 1,481 miles was completed with Federal-aid participation. The total value of this work was $242,809,983.

Progress during the past 5 years in completing interstate system improvements with Federal funds is shown in table 1. There has been a progressive increase in the mileage completed each year. At the close of the fiscal year a total of 6,417 miles of system improvements had been completed with Federal funds made available since World War II. Total cost of these improvements was $954,756,415, including $489,364,199 of Federal funds.

Table 1.—*Projects completed on the National System of Interstate Highways with Federal funds by fiscal years, 1949–53*

Fiscal year	Total cost	Federal funds	Miles
	Millions	*Millions*	
1949	$109.6	$57.9	922
1950	168.5	87.9	979
1951	166.5	85.8	1,006
1952	193.0	98.2	1,232
1953	242.8	125.0	1,481

In the widespread public dissatisfaction over the lack of adequate highways the condition of the main routes—those that compose the interstate system—is singled out particularly for complaint. This is to be expected, since these are the roads used by large groups and classes of our population and the roads generally are inadequate for the service required of them. In a survey of the condition of rural portions of the interstate system it was found that only 24 percent of the mileage was adequate for present traffic and 76 percent was in need of improvement or reconstruction. On 16 percent of the mileage the need was considered critical.

Table 1 shows that less than 1,500 miles of the interstate system were improved in the Federal-aid program of the past fiscal year. A much more rapid rate of construction is required if the 37,800-mile system is to be made adequate within a reasonable period of years.

Improvement of Urban Highways

There was a substantial increase in the mileage of urban arterial routes completed and opened to traffic during the fiscal year. Many obstacles encountered in the first years of urban highway improvement had been overcome and the program was in full swing during the past year. The Federal-aid urban funds assigned to programed projects during the year amounted to $164,279,462, plans were approved for projects to which $154,646,512 were assigned, and projects placed under construction involved $144,782,262 of Federal funds. For projects in urban areas financed from primary and urban funds, nearly $300 million in State and Federal funds were spent on projects completed during the fiscal year for construction on 758 miles of arterial routes.

The States which had the most effective programs were those which had individuals or sections or departments charged with the sole responsibility of processing highway projects in urban areas. The cities which made the most rapid progress were those in which local officials participated fully in the cooperative planning and engineering and in which the desire for improvements was strong enough to induce the provision of local funds in substantial amounts, particularly for rights-of-way. During the year there was a noticeable increase in cooperation between cities, counties, and State highway departments to expedite this work. There was also a distinct tendency to devote more funds to the acquisition of rights-of-way for future projects, and to prevent the erection of buildings that it would be necessary to acquire in future years. This is particularly important in those urban and suburban areas where there is rapid and continuing development of residential, commercial, and industrial areas. The advance acquisition of rights-of-way has another desirable effect in that it enables plans for urban areas to proceed in an orderly manner because the arterial routes, the backbone of any city plan, are studied along with all other phases of city planning.

Federal-aid urban funds were used almost exclusively for high-type improvements such as expressways and major arterials: 66 percent of these funds were used on expressway construction, 16 percent on other multilane divided highways, 9 percent to reduce hazards at railway-highway crossings, and 9 percent for other classes of improvements.

In examining the expressways placed in operation, two facts are outstanding: The volume of traffic using each expressway is far in excess of the volume estimated during the planning stage, so that the economic benefits of the improvements are far greater than were anticipated; and the effect on value of land adjacent to the expressways was extremely favorable without adverse effects elsewhere. Surveys thus far made indicate that the relief of congestion on old routes from which through traffic was diverted to expressways or other high-type arterials has resulted generally in improved business for those estab-

lishments along the old routes that rely chiefly for their sustenance on local trade.

The relief of traffic congestion in urban and suburban areas continues to be a major problem due to the steady increase in the number of motor vehicles. It is difficult to imagine the magnitude of the congestion which would now be present in many cities if the urban arterials now completed and in use were not available.

Many State highway departments have made continued use of consulting engineers to prepare plans for urban highways because of the large programs and the continued shortage of technical personnel, particularly those experienced in the location and design of urban arterial highways. The best form of such use of consulting engineers has been for the production of the plans, specifications, and estimates following the planning and preliminary design by engineers of the State highway departments. In this phase of the work, staff engineers of the Bureau have been called on by several State highway departments to assist them directly and for guidance in the preparation of preliminary plans for expressways and other major arterial highways.

Work on Outstanding Federal-Aid Projects

The number and character of major projects to serve very large traffic volumes was more impressive than in any previous year. A review of the numerous sections of highway built at costs many times those of highways in similar locations some years ago shows little that is entirely new in highway design. However, it does show a general adoption of practices that have been much talked about but too little used because of inadequacies of laws, pressure of special groups, and cost. More four-lane divided highways on wide rights-of-way are being built than ever before. In some instances only two lanes are built at one side of the center line because construction of the second pair of lanes must be deferred for a few years. Control of access has become recognized as a necessary feature of heavily traveled routes. The number of instances in which old roads have been abandoned to secondary use and a new road built entirely on new location has increased greatly. Highway departments are locating the new highways to skirt rather than pass directly through towns and smaller cities, possibly because the businessmen of smaller places now recognize that through traffic brings many troubles and little benefit. Main routes across mountain passes are being rebuilt to widen and straighten them. Where such construction is on a two-lane road a third lane is frequently provided for the slower vehicles ascending long grades. Typical examples of improvements being made with Federal assistance are described in the following paragraphs.

Brooklyn–Queens Expressway.—The Brooklyn–Queens Expressway in New York City is projected to begin at a point opposite the tip of Manhattan, where the Brooklyn–Battery Tunnel emerges, and extend in a northeasterly direction through the business and industrial section of Brooklyn for a distance of 11 miles. The route intersects four routes leading to East River crossings to Manhattan, including the historic Brooklyn Bridge, and will connect with major parkways now in use. During the year a short section of expressway and a connection to Williamsburg Bridge leading to Manhattan were completed. This permitted placing in service a 1½-mile, six-lane section that is being used by 30,000 vehicles each day. This removal of traffic from city streets has greatly reduced congestion and expedited cross-town movements. The completed section has a steel viaduct 1 mile long. The entire project is of such size as to require several years for completion. Work was in progress on an additional section at the end of the year.

The Brooklyn–Queens Expressway in New York City, from the Williamsburg Bridge plaza in Brooklyn to the Kosciusko Bridge to Queens (in the background).

Penn–Lincoln Parkway.—With the formal opening of the multi-million dollar Squirrel Hill Tunnel in June of this year, traffic began to flow on Pennsylvania's most modern highway facility, the four- and six-lane divided, controlled access, Penn–Lincoln Parkway East.

Beginning on U. S. 22 east of Pittsburgh, the parkway extends 7 miles in a westerly direction into the heart of Pittsburgh. Traffic was estimated at 40,000 vehicles a day at the east end and 80,000 at the present terminus. Peak-hour

traffic, which previously moved at a snail's pace along narrow congested streets, now flows smoothly along the parkway, unimpeded by traffic lights, stop signs, heavy grades, or sharp curves. Five interchanges strategically located along this 7-mile section enable the free entry and departure of traffic without interference to the flow of through traffic.

Formidable obstacles were encountered in building the Squirrel Hill Tunnel, twin two-lane tubes approximately 4,200 feet in length located beneath an expensive residential area. Now completed, the tunnel incorporates the most modern design, including many outstanding features for the convenience and safety of the motorist.

While the Penn–Lincoln Parkway East contributes much to the relief of traffic congestion in Pittsburgh, it will render its greatest benefit only when other sections of the parkway system, now under construction or in the design stage, are completed.

The new Penn–Lincoln Parkway East provides free flow for up to 80,000 vehicles a day into the heart of Pittsburgh, Pa., from the east.

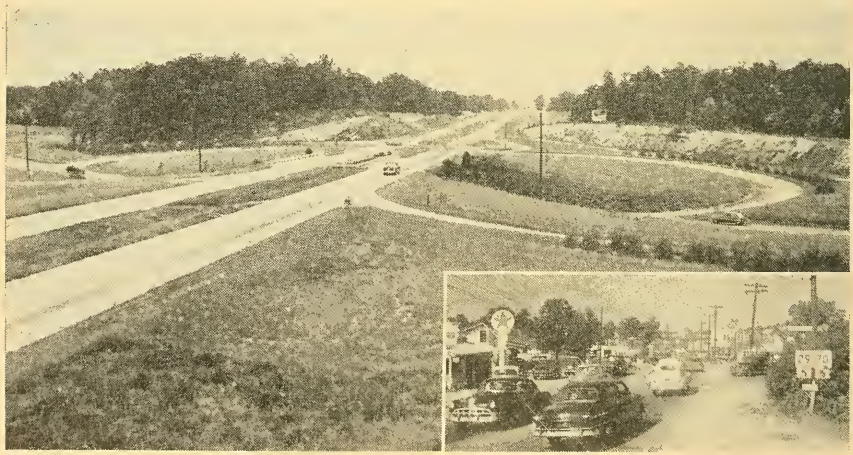
U. S. 119 relocated through Logan, West Virginia.—Since motor vehicles first appeared in numbers in Logan County, W. Va., one of America's largest coal-producing areas, travel into and through the city of Logan has been seriously retarded. There was only one route through the city, consisting in part of two narrow one-way streets and a section of one narrow street used for two-way traffic. At a railroad grade crossing, long trains of coal passed slowly while switching to another track, and blocked traffic for long periods. At certain hours, approximately an hour was needed to travel 1 mile.

Between the steep mountainside, railway tracks and buildings in a narrow valley occupied all space except the Guyandot River, so the river itself was adopted for the location of a four-lane divided highway. This new highway, built on a rock fill in the river, is used by 8,500 vehicles a day, which enter or leave at the termini and three intermediate access points. Other units of the master highway plan, now in the planning stage, will eliminate the railroad grade crossing and other obstructions, correcting at Logan and environs one of the State's most congested traffic areas.

Relocation of U. S. 119 through Logan, W. Va., in a narrow valley where all space was occupied, was accomplished by building the new highway on a rock fill in the river.

Relocation of routes in North Carolina.—U. S. 29 has been aptly described as the "main street of North Carolina," serving as it does a wide band of textile, furniture, and tobacco manufacturing through the mid-State area. To the large volume of industrial traffic generated by this territory is now added the long-range traffic and heavy trucking of the interstate system, which coincides with U. S. 29 from Greensboro to South Carolina.

The old three-lane road connecting Greensboro, High Point, and Thomasville became intolerably congested due to heavy traffic, frequent side-road entrances, and almost continuous roadside development. The many accidents resulting from this condition necessitated a greatly reduced speed limit, and the entire road was little better than a city street. The section of first concern was in Thomasville, where the route passes through one of the principal streets which



This relocation of U. S. 29 to bypass Thomasville, N. C., has relieved the congestion shown in the inset. The new four-lane road, temporarily closed beyond the overpass, is being extended to Greensboro.

is badly crowded by railway tracks, industry, and retail development. Long-range planning to improve this section was started during the war. This study was later expanded to include an aerial survey of the coincident routes U. S. 29 and 70 near Thomasville and culminated in a master plan for these routes 52 miles in length. The solution of the Thomasville problem was obviously a relocation north of town which avoided the heavy expense of an urban improvement and saved time and travel distance for through traffic. Since it cut across a loop in the old road, it was ideally suited for stage construction.

A four-lane divided highway 5 miles in length has been completed, with four highway separation structures and one railroad overpass. All important cross traffic is separated by overcrossing or undercrossing and access from abutting property is controlled by means of service roads, which are being built and surfaced as the need arises.

Cleveland–Lakeland Freeway.—The Lakeland Freeway is an arterial highway along the shore of Lake Erie in an eastwardly direction from downtown Cleveland. Ultimately it will become an east-west segment of the arterial system for Cleveland, carrying U. S. 20 traffic from the eastern boundaries of the city to downtown Cleveland and connecting with a proposed inner belt as well as serving as a distributor in local urban traffic movements.

Construction of 6 miles of divided highway on this route was well advanced. The two roadways are generally separated by a 10-foot median. A 2½-mile section extending eastward from the business district will have eight lanes which are expected to carry in excess of 45,000 vehicles per day. The remaining eastern segment consists of four and six lanes. Throughout its length the arterial will have controlled access, with no crossings at grade. Five major interchanges will provide connections to city streets, park roadways, recreational areas, and large publicly owned parking lots. It was necessary to build a cellular seawall to protect portions of the project located beyond the present lake shore.

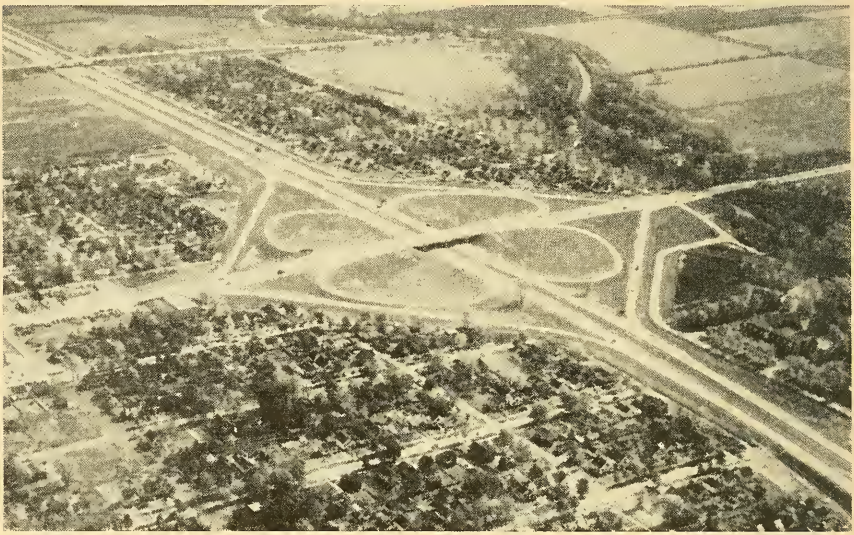
Calumet Tri-State Expressway in Illinois and Indiana.—Completion of 16 miles of the Calumet Tri-State Expressway has resulted in an excellent approach of the interstate system to Chicago from the south and east. The route is located in Illinois and Indiana and avoids the southeast section of the Chicago metropolitan area in which heavy industry is situated, including the second largest steel center in the nation. The first 4-mile section of the expressway was opened to traffic in December 1951 and the remainder of the completed portion was opened in October 1952.

The facility consists of a four- and six-lane divided highway, 5 miles being the reconstruction of an existing controlled-access highway, and new construction to interstate highway standards with full control of access for 8.5 miles in Illinois and 2.5 miles in Indiana. This expressway facilitates travel to downtown Chicago via the famous Outer Drive, thereby providing a free-flowing facility for much of the way from a point in Hammond, Ind., at a junction with U. S. 6 and U. S. 41. Ample right-of-way was purchased for full control of access, including service drives where required, the width being 300 feet or greater as conditions dictated. Where two 24-foot pavements have been constructed, provision is made for additional lanes when needed in the future by using a 50-foot depressed median.

Prior to construction it was estimated that the average daily traffic at the State line would be 9,750 vehicles and on other sections of the highway about 24,000 vehicles. The 1952 traffic counts show an average weekday volume of 16,500 vehicles at the State line and 27,000 vehicles at other sections of the highway. Corresponding summer Sunday traffic counts are 23,000 and 40,000 vehicles, respectively. Travel time between terminals is 17½ minutes on the expressway and 37 minutes on parallel streets during most hours. During rush

hours the expressway permits a saving of 30 minutes. There have been no fatalities or accidents involving serious personal injury or major property damage since the expressway was opened.

Construction was continuing in Indiana with the objective of completing the route to a junction with U. S. 20, approximately 2 miles east of Gary. Future plans in Illinois include a connecting expressway to the south, a western extension that will tie in with a direct south route expressway from the Chicago loop, and other radiating expressways.



The Calumet Tri-State Expressway near Gary, Ind. This expressway is an important approach to Chicago from the south and east.

Florida interstate system improvement.—An example of the progress being made in the relief of traffic congestion in Florida is the 10.4-mile improvement on the interstate system between Miami and Hollywood, which was nearing completion. This section is located from 1 to 2 miles west of and roughly parallel to U. S. 1 between these points. It is the first improvement on what will ultimately be a new highway, extending from Miami northward approximately 95 miles, where it will merge with U. S. 1 between West Palm Beach and Fort Pierce.

The new improvement is a four-lane divided highway having two 24-foot high-type bituminous pavements separated by a depressed grass median generally 64 feet in width. It has controlled access with sufficient right-of-way for service roads where needed. There is one major highway intersection within the limits of the section being improved. The intersecting route crosses the improvement on a concrete overpass structure. Necessary interchange movements at this point are afforded by a modified cloverleaf system of connecting ramps. An important function of the interchange is the dispersal of traffic using the major route to connections with the beaches and intermediate points in Miami via existing north-south arterial thoroughfares.

U. S. 1 north of Miami, paralleling the improvement, carries 14,000 vehicles per day. Vehicles are slowed by traffic lights in numerous municipalities and ribbon developments between them. The average speed has been 27.5 miles per hour. On the new improvement, vehicles will be able to move at any desired speed up to the legal limit of 60 miles per hour.

Wide right-of-way and control of access are important features of this improvement on the interstate system near Miami, Fla.

When completed throughout its entire length, the new route will materially relieve the acute traffic congestion on U. S. 1 and also on U. S. 441, an important parallel route to the west. Acquisition of necessary rights-of-way and preparation of plans were in progress for continuation of the new facility north of Hollywood. Additional construction at an early date was planned.

Baton Rouge–New Orleans Highway.—That portion of U. S. 61 in East Baton Rouge Parish between Baton Rouge and New Orleans, La., was being built on a new location for the third time. The first road was constructed just back of the Mississippi River levee and was safe for speed not exceeding 30 miles per hour. A second road was constructed in 1930. This improvement was located several miles back from the river and surfaced with asphalt and concrete pavement 18 feet in width. Design speed was 45 miles per hour. The third improvement, which was nearing completion at the end of the fiscal year, is on a new right-of-way 300 feet in width. Two 24-foot concrete roadways, separated by a 30-foot depressed median, have been constructed, and sufficient right-of-way was obtained for future service roads. This section will soon become a link in a four-lane divided highway between Krotz Springs and New Orleans, a distance of 122 miles. Traffic has averaged approximately 7,000 vehicles per day.

Improvement of U. S. 77 in Oklahoma.—Great improvement was made on a section of U. S. 77, the interstate system route connecting Oklahoma City with Dallas and Fort Worth, one of the most heavily traveled highways in the State. The improvement completed near the end of the year begins near Oklahoma City and consists of two 24-foot asphaltic concrete surfaces separated by a 30-foot median strip for 4.6 miles. On the remaining 4.8 miles only one 24-foot strip of paving was placed. It was offset to one side of the 200-foot right-of-way to permit eventual completion as a divided highway. This improvement is on new location and replaces an obsolete 18-foot pavement constructed in 1925 on poor alinement with dangerously short sight distances.

The old route passes through the heart of Moore, directly in front of the public school, and through the business district of Norman on a narrow street where much time was lost because of congestion. The new route skirts Moore and

passes a mile west of Norman. It is expected that this highway will serve as a demonstration to towns and smaller cities of the advantage of having through highways removed from the business district.

Interstate route near Kansas City improved.—One of the worst sections of the interstate system route from Kansas City through Newton and Wichita, Kans., to Oklahoma City began about 4 miles west of Kansas City and extended for 14 miles through Olathe. Other sections between Kansas City and Wichita had been made four-lane divided highways but this section had a rough brick pavement only 18 feet wide, laid in 1925. It had sharp curves, twisted its way through two towns, and crossed the Santa Fe Railroad at grade. In a 3-month period there were 19 accidents.

A new highway has been built on an entirely new location. Towns are bypassed and grades are separated at two railroad crossings, one State highway, and two city streets. The surface is 24 feet wide and is so located on the wide right-of-way as to permit two additional lanes in the future. The traffic forecast for 1952 was 5,000 vehicles per day but near the end of the fiscal year traffic ranged from 6,500 to 7,500 vehicles per day on the new facility.

Denver–Pueblo Highway.—During the past 6 years Colorado has been reconstructing the main highway south from Denver through Colorado Springs and Pueblo, a distance of 114 miles. U. S. routes 85 and 87 coincide on this section of the interstate system. This work has consisted of reconstructing portions of the old road, constructing a new section to shorten the travel distance, and building a new road parallel to the existing road, thus obtaining immediately a four-lane divided highway. It is planned to complete a four-lane divided highway from Denver to Pueblo.

At the end of the year, work was under way on various projects that will result in the expenditure of $1.8 million in the calendar year 1953. Benefits derived from this new construction include shortening of the road approximately 4 miles, widening pairs of travel lanes from 18 to 24 feet, and constructing a four-lane divided highway to provide greater safety.

U. S. 85 and 87 between Denver and Pueblo, Colo., is being converted to a four-lane highway by construction of a new road parallel to the old road. The latter is being improved wherever necessary.

Cheyenne-Laramie Highway.—Transcontinental route U. S. 30 across Wyoming is a part of the interstate system and is used by numerous heavy trucks in cross-country travel. A serious condition existed at Sherman Hill, the highest point on the route with a summit at 8,835 feet. A steep, narrow, winding road over the summit caused numerous accidents. Over a half-million cubic yards of rock were blasted in building a wide, modern road over the summit and in the canyon to the west. Since grades could not be greatly reduced, a third lane was built on the upgrade side for slow-moving vehicles (see cover illustration). Passing is now possible at any point.

Miami-Superior Highway in Arizona.—Completion of the Queen Creek tunnel in the early part of 1953 brought to a close a construction program of the Arizona Highway Department, begun in 1937, for improvement of a 19.9-mile section of U. S. 60–70 between the mining towns of Superior and Miami. The area traversed is mountainous, with steep, rocky slopes and precipitous canyons.

The original road was constructed in 1920–22, mostly with Federal aid. This road had many sharp curves, but was adequate for the traffic at that time. By 1935, however, the traffic had increased to 1,000 vehicles per day, and it was apparent that the original road would soon be inadequate. During the period from 1937 to early 1942, approximately 10 miles of the easier sections were reconstructed so as to permit speeds up to 60 miles per hour.

Work was suspended during the war years but was resumed early in 1946 on the more difficult sections and continued without interruption until completion in April 1953. The new construction reduced the overall distance to 16.7 miles and it is now possible for the average driver to cover the distance between Superior and Miami in 20 to 25 minutes. Prior to reconstruction the minimum driving time was 45 minutes and quite often it took more than an hour because of the slow-moving trucks and infrequent passing opportunities. During 1952 the average daily traffic was 2,500, of which about 15 percent was trucks.

The postwar work included straightening and widening a section through a canyon with sheer rock walls, the construction of two large steel arch bridges, and a tunnel approximately one-fourth mile long.

Santa Ana Freeway in California.—One of the vital sections of the interstate system and one of the most important arteries of the freeway system serving the Los Angeles area is the Santa Ana Freeway. It begins at a connection with the famous Hollywood Freeway in the heart of downtown Los Angeles and extends 32 miles southeasterly to Santa Ana. Together with the Hollywood Freeway, a continuous route of great strategic value is being provided which will carry large volumes of traffic into or through the congested Los Angeles area safely and with a minimum of interference or delay.

Sixty construction contracts have been awarded on the Santa Ana Freeway, thirty of which have utilized Federal-aid funds. In clearing the rights-of-way, it has been necessary to move 1,171 buildings and demolish 40.

The inception of this freeway dates back about 12 years and the work accomplished to date is the result of close cooperation between City, County, State, and Federal officials. The first construction was undertaken in 1946 and each succeeding year has seen additional units placed under contract. The first section opened to traffic was near Santa Ana. Recently an 8-mile section southeast of the Los Angeles Civic Center was opened to the great benefit of traffic entering the city. It is reported this newly opened section has given such relief to previously congested Olympic Boulevard, which is parallel and nearby, that bus lines have been able to shorten their operating schedules by 10 minutes.

It is anticipated that the Santa Ana Freeway will be completed early in 1954, except for short sections at each end, on which construction was soon to begin. Completion of this work will provide a four- and six-lane facility with all cross

The Santa Ana Freeway. Completion of the project from downtown Los Angeles to Santa Ana, Calif., will relieve congestion such as that on Lakewood Boulevard, shown in the lower picture.

traffic eliminated. Sections opened to traffic carried 36,000 to 40,000 vehicles a day.

Portland–Salem Freeway.—One of the more important projects in the program in Oregon is the construction of a freeway between Portland and Salem, the two major cities of the State. This section will become a portion of U. S. 99, the principal north-south route through Oregon, and a part of the interstate system. The two cities are approximately 50 miles apart, and the connecting highway is completely inadequate for the traffic it carries.

The average daily traffic on the existing highway has been 12,000 vehicles, with traffic peaks of 20,000 vehicles per day. Traffic is delayed in passing through eight towns. An additional hazard to traffic is caused by complete lack of access control on the entire route.

From the city limits of Portland to Salem a four-lane freeway is being constructed, the major portion of which will be a divided highway. Twelve-foot

travel lanes of asphaltic concrete are being provided. Half of the work was under contract at the end of the year and the entire project was scheduled for completion in 1955. Distance will be shortened by 4.7 miles.

Secondary or Farm-to-Market Roads

Since Federal aid for secondary and farm-to-market roads was first authorized by Congress in 1944, the benefits from the funds authorized have been widely distributed in every State so that at the end of the fiscal year projects had been completed or initiated in more than 97 percent of the 3,070 counties in the United States. A total of 81,116 miles of farm-to-market road construction has been accomplished with Federal-aid secondary funds, but some of this work was stage construction, with grading done initially and surfacing laid at a later time. The net improvement of 68,660 miles covered 15 percent of the 460,002-mile Federal-aid secondary system. Other improvements initiated but not yet completed total 23,564 miles. Improvements completed during the fiscal year alone amounted to 15,403 miles, a record accomplishment for any single fiscal year—the previous record being 13,875 miles completed in fiscal year 1951.

The Federal highway legislation provides that Federal-aid secondary projects must be selected and that the specifications for projects in which the counties participate shall be determined by each State highway department and appropriate local officials acting in cooperation with each other, subject to approval by the Bureau of Public Roads. The Bureau's principal function in the consideration of designs and specifications for these projects is to insure that lessons learned by others on similar projects are brought to the attention of State and local officials. Sometimes this knowledge of past experience by others is not available to these officials in types of construction unfamiliar to them. The activities of the Bureau are directed entirely toward the prudent expenditure of public funds for "* * * types of construction that can be maintained at reasonable cost to provide an all weather surface * * *" as provided in the Federal highway legislation.

A Board of County Consultants to the Bureau of Public Roads, organized in 1946, has proved to be a valuable asset to the Bureau through the counsel and advice of the members in administrative problems that particularly affect the counties. This board is composed of 10 county highway engineers and officials, selected one each from the operating field divisions of the Bureau of Public Roads. Much credit is due members of the board for their work in correcting misunderstandings which arise on the part of local officials, largely due to unfamiliarity with the Federal-aid secondary program. The activities of this board are being continued.

Activities as Claimant Agency Under Controlled Materials Plan

Previous annual reports have described the authority delegated to the Bureau by the Defense Production Administration and the National Production Authority and the Bureau's activity as claimant agency for highways under the Controlled Materials Plan.

Steel production was resumed in the last week in July 1952 after a general work-stoppage that began in June. The situation had changed from an increasing supply of steel to a serious shortage. Warehouse stocks and inventories were depleted. Many allotments of steel during the third and fourth calendar quarters of 1952 were not delivered, due to inability of the mills to fill orders. Even when allotments were revalidated to later quarters, many orders were accepted with delivery scheduled months later than required to maintain satisfactory construction schedules. The impact of the strike was felt to some extent throughout the first and second calendar quarters of 1953 but with steady im-

provement in the situation. During this period serious construction delays were alleviated where feasible through arrangements with mills or fabricators to expedite deliveries.

Controls were lifted entirely at the end of the fiscal year except that suppliers were required to give priority to orders for direct defense activities. It appeared that the supply of materials for highway purposes would be reasonably adequate in the foreseeable future and that shortages of materials would not be a serious obstacle to the highway program.

Highway Improvement Under Direct Supervision of the Bureau

The Bureau administers annual appropriations for the construction and maintenance of the major highways through National forests, and performs a large amount of highway engineering and construction for other Federal agencies.

The extent to which the Bureau enters into the highway work of other agencies varies considerably. In some cases cooperative action under jointly approved regulations is required by law in the planning of highway systems and programs, with the Bureau in direct charge of all engineering and construction work. In other cases the Bureau acts only as an agent in performing such engineering and construction supervision as may be requested for specific projects. In still other cases the Bureau's functions are limited to review and approval of the location, type, and design of the road, and to general supervision over the construction work.

The volume of highway work performed under direct supervision of the Bureau during the year is indicated by the following expenditures:

Park roads and trails	$2,127,535
Parkways	5,484,399
Forest highways	20,059,944
Forest development roads	1,528,914
Cooperative work, forest highways (contribution for local work)	176,851
Arco road (Atomic Energy Commission)	231,209
Roads, bridges, and trails in Alaska:	
Tongass forest highway	2,680,490
Turnagain Arm	5,979
Other highways	2,736,402
Bonneville transmission-line access road	55,173
Bureau of Land Management	575,187
Total	35,662,083

Forest highways

Forest highways are those highways within or adjacent to the National forests that are of primary importance to the States, counties, or nearby communities, and have been selected for inclusion in the designated forest highway system. The system is largely coincident with the Federal-aid and State highway systems, and a considerable mileage coincides with sections of the National System of Interstate Highways. The total forest highway system of 24,073 miles includes 12,371 miles in 12 States of the Western region and Alaska, and 11,702 miles in 26 States of the Eastern region and Puerto Rico.

The extensive needs for improvement on the forest highway system are largely reconstruction. Many sections were constructed some 20 or 30 years ago to standards satisfactory for that period. These are obsolete for present-day traffic and long ago reached the end of their economic life. It is necessary to reconstruct these highways to standards equivalent to those of connecting interstate, State, and county improvements.

During the year 475 miles were completed by the Bureau at a cost of $19,794,231 of which $19,008,612 were Federal funds. This is shown in table 17 of the appendix, which also gives figures for projects programed, authorized, and under construction at the close of the year.

Along with construction operations, surveys were conducted on an extensive mileage of roads, and plans and specifications were prepared. Plans completed and under way will fully absorb forest highway funds available for the next fiscal year. Some typical forest highway improvements are described below:

Trinity River highway.—The 60-mile Trinity River forest highway in California is a part of U. S. 299, the main east-west connecting road in the northern part of the State between the coast route, U. S. 101, and the interstate system route, U. S. 99. The Trinity River route is a part of the California Federal-aid system and serves an important timber producing area. Traffic averages 1,000 vehicles per day for the year, and is approximately 1,500 per day during the summer season. It was planned to reconstruct an 11-mile section traversing rugged terrain, where the road is seriously substandard in width, alinement, grades, sight distance, and structural condition. The work will cost approximately $3 million and will require 5 years under the planned program. The first contract in the amount of $684,000 for 2.6 miles was 40 percent complete at the end of the year.

Sonora Pass highway.—The Sonora Pass road or Sonora-Mono road is an important route across the Sierra Nevada range, principally serving central California and Nevada. The road traverses a rugged mountainous area and has existed since the early pioneer days. Traffic averages 300 vehicles per day for the year, but rises to 2,000 per day during the summer, which reflects its recreational importance. Recently the road has assumed increasing importance, as it gives access to valuable timber. Winter sports generate considerable traffic. Improvement of the old trail road was begun in 1925 near the western end and has progressed easterly for 41 miles, including work presently under way, to a junction with an improved forest highway. Work was 86 percent complete at the end of the year on one job 3.4 miles in length and estimated to cost $461,600. Another job to cost $991,000 for 4.2 miles has been started.

Oregon Coast highway.—A heavy grading project, costing over $900,000, was nearing completion on the Oregon Coast highway, a short distance north of Newport, Oreg. This project is 8.4 miles long and requires over 1,100,000 cubic yards of excavation. This forest highway will eliminate a serious bottleneck of narrow and crooked highway on a scenic route, which is also used extensively for timber hauling. Surfacing of this road was soon to follow completion of grading.

Wind River highway.—A Wyoming forest highway extends from Dubois through the Shoshone and Teton National Forests to the boundary of the Grand Teton National Park. During the past year the last section of the major relocations of this route was started. This will eliminate an old hazardous part of the route and complete the grading of a modern highway to the east entrance of the Grand Teton National Park. It will also serve as an approach road to the south entrance of Yellowstone Park. The route traverses a very interesting and picturesque part of Wyoming. There are wonderful views of the Grand Teton mountains and the famous Jackson Hole area at several points. The construction of this section together with that of the adjacent section was made difficult by numerous landslides. Control of these slides required draining numerous small lakes above the road, as well as draining the hillsides with small perforated pipe installed in auger holes drilled into the side of the mountains as much as 100 feet.

Yellowstone Trail highway.—The 84-mile Yellowstone Trail forest highway in Montana is on U. S. 10 and is part of the interstate system. At the Idaho boundary, Lookout Pass summit is crossed at an elevation of 4,738 feet. Snowfall is heavy here but the route is kept open for winter traffic. In the last few years 30 miles of this section of narrow, crooked road have been rebuilt. Paving of a section was under way at the end of the year.

National park highways, park approach roads, and parkways

The Bureau cooperates with the National Park Service of the Department of the Interior in the improvement of highways within or approaching National parks and monuments, and parkways specifically designated by legislation. The Bureau collaborates with the Park Service in developing programs and its engineers make surveys, prepare plans, and supervise construction.

During the fiscal year 153 miles of park highways and parkways were completed, and 107 miles were under construction at the end of the year. Typical improvements are described below.

Grand Canyon south entrance and south approach road.—The main access to Grand Canyon National Park is a 52-mile approach road extending northerly from U. S. 66 near Williams, Ariz. The approach road is a part of the forest highway system in Arizona. By the end of World War II travel had become hazardous due to narrow width, deteriorated surface, and increased traffic. Traffic approaches 2,000 vehicles per day in summer when tourists are going to the Grand Canyon. Reconstruction of the southerly 35 miles of the approach road was accomplished with forest highway funds in the period 1946–50 at a cost of $1,621,629. In May 1953, a contract in the amount of $798,532 financed with National park road funds was awarded covering reconstruction of 9.7 miles of the approach road together with 3.2 miles of road work within the Park. Work was 21 percent complete at the end of the year. Improvement of other sections was needed to place the approach road in good condition.

Rocky Mountain National Park.—The 48-mile route between the east and west boundaries of Rocky Mountain National Park traverses some of the most spectacular mountain scenery in Colorado. It now has a bituminous surface throughout. The work done in the past year consisted of resurfacing a 10½-mile section of the west descent from Fall River Pass to the Colorado River. Vastly increased traffic over a moist, unstable subgrade had severely damaged the 17-year old bituminous surface.

Because of extreme altitude and heavy snow, the road is open to travel only from early June to mid-October, yet the annual average traffic is 850 vehicles per day. Besides a large amount of recreational traffic, the road forms the most convenient route for light commercial travel between western and northeastern Colorado.

Baltimore-Washington Parkway.—The Federal Government is building 19 miles of four-lane divided parkway—approximately half—of a new route from Baltimore to Washington. The Federal funds are administered cooperatively with the National Park Service. Grading of 10 miles has been completed and a contract for paving was awarded. An additional 8.5 miles of grading was placed under contract, leaving approximately one-half mile yet to be contracted for. Eight bridges were under construction, five of which were let to contract during the year, and one more was proposed for contract. Nine bridges have already been completed.

Blue Ridge Parkway.—The Blue Ridge Parkway in Virginia and North Carolina, some 478 miles in length, was started in 1935. Paving has been completed on 323 miles. During the year a 27-mile section near Black Mountain Gap in

North Carolina was paved and 5 miles near Asheville, N. C., were graded and gravel surfaced. A contract for grading and gravel surfacing of a 4-mile section near Asheville was awarded.

Natchez Trace Parkway.—Construction of the 450-mile Natchez Trace Parkway, located approximately on the historic route of the same name, extending through Tennessee, Alabama, and Mississippi, was begun in 1937.

During the year work was started on a 6.1-mile section of grading and gravel surfacing near Tupelo, Miss., and on three concrete overpass structures, two in Mississippi and one in Tennessee. No work has as yet been undertaken on approximately 288 miles.

Forest development roads and access roads for spruce bark beetle control

Forest development roads are the roads within the National forests that are of primary importance for the protection, administration, and integration of the forests. The Bureau, when requested, supervises their improvement. During the year, 51 miles were completed and 71 miles were placed under construction, including several major bridges.

The Bureau cooperated with the Forest Service by providing engineers for location and construction of several hundred miles of access roads in the spruce bark beetle control program in Idaho and Montana. Most of the work was in isolated mountainous areas where unusual engineering and supply problems were encountered. At the end of the year construction on several jobs was under way and surveys were being rushed on the remainder. Speed was essential to prevent further deterioration of the dead trees and to permit harvest before the beetles hatched from trees to infect additional stands. The Forest Service had available for access roads an appropriation in excess of $7 million, and requested surveys for 450 miles of roads in infested areas. Contracts for work to cost over $3 million were awarded and work to cost over $1 million was advertised for contract.

Access roads to defense establishments

Legislation of 1950 and 1952, as amended, authorized $95 million for access roads to reservations of the armed forces, to defense industries, and to sources of raw materials. During the fiscal year there was appropriated $10 million for this purpose, raising the cumulative sum appropriated since the beginning of the Korean emergency to $36.5 million.

According to the law, projects become eligible for access-road funds only when certified by the Secretary of Defense or such other official as the President designates. Traffic generated by defense activities is assumed to be of short duration, and projects are proposed by the Bureau of Public Roads for certification only where critical highway and bridge deficiencies exist. Designs of projects to correct the deficiencies are held below the standards generally adopted for normal projects designed for traffic that is expected to continue indefinitely. However, normal standards are used on replacement projects made necessary by the closure of existing public highways resulting from expansion of a defense installation.

On July 10, 1952, when $5 million became available, there was a backlog of certified projects amounting to $12 million. The available funds were quickly allocated to the most urgent projects. By March 28, 1953, when the second $5 million became available in fiscal year 1953, the backlog of certified unfinanced projects had grown to $24 million. The second $5 million was also quickly allocated to the most urgent projects. In both allocations, determination of the projects that should be financed was by joint decision of the Department of Defense, the Atomic Energy Commission, the Defense Materials Procurement Agency, and the Bureau of Public Roads.

By the end of the fiscal year the Bureau had been able, with the $36.5 million made available over the 3-year period, to finance construction of 169 projects, acquisition of right-of-way for another 5 projects, and preliminary engineering on 43 additional projects. At the end of the fiscal year there remained 72 certified projects requiring $23 million of access-road funds which were unavailable. Another 48 projects requiring $7 million of access-road funds were under consideration for certification. Still other projects were under preliminary investigation by the Bureau at 39 defense installations at the request of certifying agencies.

The establishment of a new atomic energy plant in Pike County, Ohio, in the fall of 1952 created the biggest single access-road problem of the entire program. Road facilities were wholly inadequate to accommodate the daily movement of workers and materials to and from this plant. The principal deficiency was the two-lane highway between Portsmouth and Chillicothe. It was soon found that workers in the number necessary for construction of the plant could not be moved to the site unless a four-lane highway was available for the entire 41 miles. The cost of providing such a facility would be $20 million. Other necessary roads in the area would cost another $5 million. In recognition of lasting benefits to the State from such construction, it was determined that a logical division of costs would be about 55 percent State or regular Federal-aid funds and 45 percent defense access-road funds. Even at 45 percent, the defense access-road requirement was about one-fourth of all defense access-road requirements to that time. This requirement alone was equal to one-half of the entire backlog of unfinanced projects remaining at the end of the fiscal year. Steps were initiated, near the end of the fiscal year, to arrange by special legislative authorization for the bulk of the Federal share of the cost to be financed by transfer of Atomic Energy Commission funds. The State, also staggering under the impact, found it necessary to resort to special legislation to finance its share of the cost.

The cooperation between State and Federal Governments as exemplified in this case is characteristic of the entire access-road program. Most of the projects are constructed by contracts handled by the State highway departments.

Construction in Alaska

The military bases and civilian population of interior Alaska at the outset of World War II were dependent on the Alaska Railroad for supplies hauled from the seaport of Seward. During the war an additional seaport was constructed at Whittier on the east side of the isthmus which connects the Kenai Peninsula to the mainland. The railroad from Seward to Anchorage passes through a mountainous area and has been costly to maintain. With replacement of timber trestles in prospect, railroad officials proposed that a highway be built connecting Seward with Anchorage, to permit abandoning the railroad from Seward to Portage Junction, where the railroad branches off to connect with Whittier.

Construction of the Seward–Anchorage highway, 128 miles in length, was started in 1948 and grading of 100 miles at a cost of $13,552,392 has been completed. Contracts for 87 miles of bituminous paving to cost $2,350,484 followed the grading. The remaining mileage has been constructed by the Alaska Road Commission and the Alaska Railroad. Paving was nearing completion at the end of the year and was expected to be completed during the construction season. The final link in this highway, a half-mile section adjacent to Seward, was built as a forest highway at a cost of $82,000. Heavy trucking was developing rapidly, and this, together with military, recreational, and other traffic made evident the need of an adequate highway between the port of Seward and the

hub city of Anchorage. A substantial amount of traffic is fed to the highway from towns and military installations along Cook Inlet.

The extensive program of road improvement in the interior of Alaska undertaken by the Bureau under agreements with the Alaska Road Commission was completed. The following is a summary of work performed from 1948 to 1953: A total of 716 miles were surveyed and plans prepared by the Bureau, the value of contracts covering this mileage amounting to $42,165,275. A 42-mile section of the Alaska Highway, adjacent to the Canadian boundary, was the only section surveyed and designed by the Bureau that was not under contract or completed. The estimate for construction of this section was $3,650,000, which brings the total value of highway work surveyed and designed by the Bureau to nearly $46 million. Of this total the Bureau supervised construction of the following:

	Miles	*Cost*
Glenn Highway	49	$2,061,157
Richardson Highway	136	7,514,656
Alaska Highway	118	3,010,961
Seward–Anchorage Highway (grading)	100	13,552,392
Seward–Anchorage Highway (paving)	87	2,350,484
Copper River Highway	9	543,341
Totals	499	29,032,991

The work remaining to be done to complete the system of main highways serving interior Alaska that was not under contract included 42 miles of grading and 296 miles of paving. This was estimated to cost approximately $15 million.

A separate authorization in the 1950 Highway Act made available $7 million for specific highway projects in and adjacent to the Tongass National Forest in southeastern Alaska, made necessary by the growth of a large wood pulp industry. Seven projects were let to contract under this program, of which four were completed.

Access roads to lands supervised by the Department of the Interior

The Bureau prepared plans and supervised construction of roads to serve areas in California and Oregon under the supervision of the Bureau of Land Management, Department of the Interior. A system of roads has been planned as a long-range development program to be financed through authorization of funds to the Department of the Interior.

During the year 12 miles of grading and the construction of three bridges were contracted for in the Smith River area in southwestern Oregon. This work is in rough country and is being performed to provide access to large tracts of beetle-infected timber under the control of the Bureau of Land Management. Construction was rushed to permit early use of the road and harvesting of the timber to prevent further spread of the beetle infestation. An additional contract for 14 miles of grading was in prospect. At the end of the year, work to cost $1,663,000 was under way in Oregon.

Roads for the Atomic Energy Commission

The Bureau entered into an agreement with the Atomic Energy Commission under which it is to make surveys, prepare plans, and supervise the construction of extensive highway improvement in connection with atomic energy development.

This work is financed with funds appropriated to the Atomic Energy Commission and transferred to the Bureau for individual projects. During the year work was completed on 1.5 miles at a cost of $209,151 and plans were completed for 1.3 miles at an estimated cost of $258,000.

Joint Planning of Location of Highways and Airports

Under the terms of the Federal-aid Highway Act of 1944, Federal funds may be used for the reconstruction or relocation of highways on the Federal-aid systems which give access to airports, provided the Bureau of Public Roads and the State highway departments have concurred with officials in charge of the airport that the proposed airport and highway improvements are in the public interest.

Regulations for carrying out the requirements of the act have been issued by the Department of Defense where military airports are concerned, thereby insuring joint action with the Bureau for carrying out the provisions of the legislation. The action of the Department of Defense assures the same degree of cooperation and joint action that has for several years existed between the Bureau and the Civil Aeronautics Administration with respect to non-military airports.

Through these regulations joint consideration of the airway-highway problems by officers having charge of the military facilities, the Bureau of Public Roads, and other appropriate highway officials will be obtained. The objective is elimination of conflicts in airway and highway clearances, assurance that no new conflicts will be introduced through relocation or construction of either facility in the foreseeable future, assurance that as a consequence of contemplated airport or highway change unnecessary use of public funds for either or both facilities will be avoided, and assurance that the final plan agreed upon will be in the public interest.

Repair of War-Damaged Highways

Legislation of 1951 authorized the use of funds provided for access roads to defense establishments for construction, maintenance, and repair of roads in certified maneuver areas. Only one claim covering damages to six roads in the Camp Drum area in New York during "Exercise Snowstorm," amounting to $56,300, was received during this fiscal year. Certification by the Department of Defense of a maneuver area including these roads was expected.

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 and other disasters of extraordinary character and extent. In recent years such aid has been available under authorizations permitting the use of available emergency relief funds without waiting for legislative action following each disaster. Legislation of 1951 authorized $15 million for this purpose and limited its use to routes on the Federal-aid highway systems. The legislation of 1952 established a revolving fund of $10 million annually for this purpose.

Allocations of emergency funds totaling $2,611,533 were made during the fiscal year to seven States for rehabilitation work estimated to cost $5,223,065. Of the total amount of emergency funds allocated, $2,024,451 was for the repair of flood damages that occurred in the spring of 1952 in Iowa, Minnesota, Missouri, Montana, and Utah, with Iowa receiving $1,055,998 of this amount. Of the remaining $587,082 allocated, California received $396,800 for the repair of flood damage sustained in January 1953.

During the latter part of the year, disastrous floods occurred in Iowa, Louisiana, Montana, and New Hampshire. All of these States notified the Bureau of their intention to request allocations of emergency funds, and steps were taken to cooperate on rehabilitation work.

Hawaii War and Emergency Damage Program

A Federal fund of $10 million was authorized in 1947 for rehabilitation or repair of roads and bridges in Hawaii damaged by the Armed Services or by their contractors, and for the restoration or reconditioning of highways and bridges damaged or destroyed by seismic waves in April 1946. The Territory was required to match Federal funds to the extent required by the Bureau. On work resulting from damage caused by the seismic wave, the Territory has been required to make a contribution equal to that of the Federal Government.

By the end of the fiscal year, programs had been approved for war-damaged highways costing $3,336,000 in Federal funds and for seismic-wave damaged highways costing $6,595,965 in Federal funds. The total cost of the work, including matching funds, was $17,341,563, which provided for rehabilitation or repair of 270 miles of roads and bridges. The program was in its last stage at the end of the year. Completed projects totaled 260 miles, of which 3 miles were completed during the year, 4 miles were under construction, and 6 miles were still to be placed under construction.

The Inter-American Highway

Since 1930 the United States, through the Bureau of Public Roads, has been assisting 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.

The section of the highway in Mexico has been financed and constructed entirely by Mexico.

Over 90 percent of the route is passable in all kinds of weather by motor vehicles, but travel by motor vehicles to Panama City is still an impossibility. Throughout its length in Mexico the highway is open at all times and practically all of it is paved. In Guatemala, starting at the Mexican border, there is an impassable gap of 25 miles which will require much money and time to complete. After this gap, the highway is passable under all conditions as far as the northern boundary of Costa Rica. There are many sections on which much construction will have to be done to bring the highway up to modern standards for a two-lane road, but the route is open and passable without great difficulty.

At the northern border of Costa Rica, another impassable gap exists for a distance of 50 miles. This gap presents no unusual construction difficulties and with sufficient funds available it could be made suitable for motor traffic.

From this gap to San Isidro, south of San Jose, the capital of Costa Rica, the highway is good for the most part. Beyond San Isidro the last and by far the most imposing gap remains to be constructed. This gap, which reaches as far as Concepcion in Panama—a distance of 150 miles—passes through rough country and will take several years to open. From Concepcion to Panama City the route is passable at all times, but this section is below generally accepted standards for road improvement.

During the past fiscal year, the following work has been accomplished:

In El Salvador, plans made the previous year to complete the highway in 1953 were not realized due to local conditions, and it was planned to start construction at the beginning of the next dry season in November.

In Nicaragua, construction of the most important bridges between Estili and the Honduras border was in progress. One bridge was practically completed and work on two other bridges was well advanced. Structural steel was fabricated in the United States for four bridges, and delivered in Nicaragua. About

$400,000 worth of equipment was purchased to start construction of the section of the highway in Nicaragua, from the Honduras border south. It was hoped to start construction by the beginning of the dry season in November.

In Costa Rica, progress was made toward opening the impassable gap in the northern part of the country. About 30 miles of all-weather road was constructed from Las Canas to Liberia and additional grading was done north of Liberia. Bridges over five major streams were under construction and two of these were completed. In the southern section of Costa Rica, the survey of the impassable gap was started and good progress made.

In Panama, work on 25 miles of grading, base course, and bridges, from David south, progressed well and was about 90 percent completed. An agreement was entered into with Panama to provide for the paving of this section and a contract has been awarded on a unit-price basis after competitive bidding. It is hoped that the contract method of construction can be extended to other countries in Central America. Five bridge substructures were included in the contract for grading and four have been completed. Steel for the superstructures was fabricated in the United States and was being delivered to Panama.

No work was done during the year on the Inter-American Highway in Guatemala and Honduras.

Projects other than the Inter-American Highway

In El Salvador, the suspension bridge over the Lempa River at San Marcos, on which the Bureau provided technical assistance, was completed. The Bureau was asked by El Salvador to furnish engineering assistance in the design and construction of several highway-railroad grade-separation structures on the road from San Salvador to the airport at Ilapango. The request was complied with.

In Nicaragua, the Bureau continued its technical assistance in the planning and construction of the national highway system (other than the Inter-American Highway) which was being financed through the International Bank for Reconstruction and Development.

In Ecuador, the Bureau continued its technical assistance in the construction of a highway from Manta to Quevada which will connect the new port of Manta with Quito by highway. At the request of Ecuador, technical assistance was extended to include the design and preparation of plans for the major bridges on this highway.

Other Foreign Activities

Turkey

In 1947 the United States began assistance to Turkey in building a modern highway system. It has provided approximately $35,156,000 that has been used largely for purchase of equipment and the expense of a staff supplied by the Bureau to advise Turkish authorities and train men for all branches of highway work. The Turkish Government has supplied $180 million to meet all engineering, construction, and maintenance costs.

A total of 2,516 persons employed by the Turkish Directorate of Highways have received on-the-job training. Sixty engineers and management personnel have been trained in the United States and at the end of the year 10 more were finishing such training. Thirty American specialists were stationed in Turkey. Advice and help was always available to Directorate personnel in almost all phases of the work. Of special importance was the work of American mechanical specialists who were stationed in various sections of Turkey to instruct and assist in the operation, repairs, and maintenance of equipment in use. In 1948 the use of machinery was limited to but a few units. Now the work is accomplished almost entirely by mechanical means.

Construction work progressed favorably during the year. Increasing emphasis was placed upon development of capable highway contractors. A tremendous stimulus was given the contracting industry during the year with the awarding of 16 major contracts covering construction of 870 miles of the national highway system. Also, 44 concrete bridges totaling 8,760 feet in length and 9 steel structures 2,680 feet in length were let to contract.

Routine maintenance was extended to include 12,870 miles of the 15,104 miles in the national highway system. Mechanical methods were in use on approximately 11,500 miles and hand methods on 1,370 miles.

Through this comprehensive highway improvement program, the Turks are realizing, in the space of a few years, benefits which have come to the United States over four decades of persistent effort. Economic gains through stimulation of agricultural and industrial development are incalculable, but it has been found that reduced transportation costs alone exceed, in a single year, the entire expenditure being made for highways during the year.

Ethiopia

The fiscal year coincided approximately with the second year of activity of the technical mission sent to Ethiopia to supervise organizing, equipping, and training an Imperial Highway Authority to restore the highway system of the country. A 2,690-mile system was being conditioned for use through a loan of $5 million from the International Bank for Reconstruction and Development and the equivalent of $9 million from Ethiopian sources.

When the mission arrived in Ethiopia, many sections of road were impassable, and traffic was virtually at a standstill. The first year was devoted to establishment of a highway organization, delivery of imported equipment, and making emergency repairs to roads and bridges. Work has been scattered widely over the system in order to get traffic moving. Slides have been removed, bridges built or repaired, fords constructed, and road surfaces repaired or rebuilt.

At the end of the fiscal year the through highways had been brought back into general use and were producing increasing benefits to the economy of the country. In 1951 the only intercity bus service was a monthly trip from Addis Ababa to Dire Dawa. Now bus routes radiate in five directions from Addis Ababa, giving daily or biweekly service, and there is a weekly bus to Asmara, in Eritrea, near the coast. Seventy percent of the traffic consists of trucks, and the heavy loading of trucks is already a problem. Costs of transporting such goods as salt and hides are about half of what they were, and in one instance coffee was hauled at one-third of the former cost. Gasoline, which must be brought in from the coast, is now about 12 cents per gallon cheaper in Addis Ababa, because of better roads. During the wet season, trucks now make trips in a few days that formerly required from one to three months, or could not be made at all.

With the federation of Eritrea and Ethiopia on September 15, 1952, 550 miles of highway were added to the system being improved. This includes outlets to the coast at Assab and Massawa. Previous lack of a port under its own control has been a great handicap in development of Ethiopia's foreign trade.

The Philippines

At the conclusion of the program of highway rehabilitation on June 30, 1952, the Mutual Security Agency requested that Bureau personnel remain in Manila as consultants to the Philippine Government on a program of highway development and improvement. A staff of ten engineers and technicians undertook this work.

The primary objective was to assist the Philippine Government in constructing development roads expected to bring into production large areas of virgin land, particularly on the island of Mindanao. A secondary, long-range objective was

to assist the Government in reorganizing and re-equipping its highway department to achieve greater economy and improved highway service, particularly in the maintenance field.

The United States provided $8,865,000 for the purchase of equipment and bridge steel and for payment of technicians.

The initial development program includes construction in Mindanao of 350 miles of road with crushed stone or gravel surface. A few large steel structures are contemplated but the majority of the large structures can be built with comparatively simple box girders or prestressed concrete. Contracts were awarded for construction of 36 miles of road at a cost of $1,786,660.

Three major repair shops were constructed and equipped to assemble and maintain the equipment furnished under the program and to rehabilitate equipment owned by the Philippine Government. These shops also served as centers for basic training courses for machinists, mechanics, and equipment operators. This training is to be completed by on-the-job courses and demonstrations.

In a few provinces extensive road betterment programs were initiated to bring to a higher stage of improvement the rather crude roads serving as national highway routes. In the more mountainous sections it was necessary to do extensive grading to widen the one-way roads to two lanes.

Bureau technicians demonstrated the design, construction, and testing of a precast, prestressed concrete beam in order to introduce this new method of design. The results were successful and the Philippine highway organization has adopted the method as standard practice with resultant savings in both cost and critical materials in their bridge design.

A new highway law was enacted by the Philippine Congress, embodying suggestions and recommendations advanced by the Bureau group.

Liberia

Highway improvement is an important element in the program of aid by our Government in the economic development of Liberia. Four engineers and two equipment specialists were sent to Liberia by the Bureau during the previous fiscal year. The program is financed by a loan of $5 million to Liberia from the Export-Import Bank, supplemented by funds from Liberian sources.

Liberia had no surfaced roads and the initial problem was to create an organization for road building, and to begin the improvement of existing earth roads from two ports, Monrovia and Cape Palmas, totaling about 300 miles in length.

Good progress was made during the year, both in training men and starting construction. Seven European residents of Liberia of professional skill in highway engineering were trained in Public Roads methods, and they in turn trained a selected group of Liberians. The two equipment specialists demonstrated to Liberian operators the best methods of equipment operation, maintenance, and overhaul. Steps were taken toward establishment of an equipment depot. A Liberian graduate in chemical engineering was selected for training as materials engineer, and he is to be recommended for one year of training in the United States. Three university graduates in courses other than engineering were gaining experience in surveys and preparation of plans. Looking to the future, 25 high school and university students were given experience in highway work during school vacation.

Two construction jobs and a 30-mile survey were under way, and surveys and plans were completed for 24 miles of road. Under a contract with a French engineering company, plans were completed for 10 miles of road and location and design for 125 miles was under way under Bureau supervision.

Among the physical difficulties encountered are swamps, dense vegetation, 200 inches of annual rainfall, and tropical soils not favorable to road construction.

Highway improvement is expected to make available agricultural products, timber not now accessible, and much greater production of cocoa and palm oils.

Foreign Visitors

The Bureau has cooperated in the program of technical assistance to foreign countries by providing a total of 445 trainee-months of training during the year for a total of 139 trainees from 35 foreign countries. In addition, assistance was provided for 112 visitors from foreign countries for periods ranging from a few hours up to one or two weeks.

Of the 445 trainee-months of training provided during the year, 92 trainee-months were provided through the fourth annual course on the theory and practice of highway improvement and utilization, begun in the previous fiscal year but completed on September 5, 1952. Forty-five delegates from 28 countries participated in this course.

A similar course was not undertaken during 1953 due to the anticipated increase in the number of foreign engineer trainees coming to the United States under various government programs for longer periods of training in specialized fields.

Programs exclusive of the highway course were provided for a total of 95 highway engineers. Of these, 70 were sponsored by the Mutual Security Agency, 11 under Point IV training grants, and 4 under United Nations fellowships. Ten engineers came to this country under sponsorship of their own governments, or at their own expense.

Mutual Security Agency participants included 6 Austrian highway engineers who were provided a 6-week program, 12 Austrian contractors who were provided a 4-week program, and 5 German highway planning engineers whose 5-week program was started near the end of the fiscal year. The training of these visitors from other countries was provided in the Bureau and through the cooperation of the various State highway departments.

At the end of the fiscal year there were 35 foreign engineers in training with or under the direction of the Bureau.

Highway Safety Activity

The Bureau continued to participate in highway safety activities as directed by legislation, providing a minimum staff for the President's Highway Safety Conference and entering into cooperative research agreements with five national organizations in furtherance of the conference action program. Under authorization first provided by Congress in 1950, agreements have been made with the American Association of Motor Vehicle Administrators, American Bar Association, National Academy of Sciences, Northwestern University Traffic Institute, and State and Local Officials National Highway Safety Committee.

The conference staff assisted in organizing a committee of leading business officials of the Nation to serve in an advisory capacity on traffic safety problems. The staff also arranged for the seventh annual meeting of the conference, in Chicago in October 1952, to review the annual inventory of progress by States and communities in application of the conference action program. As a further service, the staff surveyed traffic safety activities in the Federal Government.

Shortly after the end of the fiscal year the Secretary of Commerce assigned responsibility to the Bureau of Public Roads for operation in connection with the White House Conference on Highway Safety planned to be held in February 1954. The conference staff will include liaison personnel to help integrate advisory and operating groups.

Administrative studies

Work carried on in the administrative field during the year was largely cooperative and consultative in nature. At the request of the Automotive Safety Foundation, a study of highway management practices at all levels of government in North Dakota was completed. Consulting and advisory services were provided in connection with preparation by Maryland authorities of legislation to effectuate the recommendations of the Maryland study of intergovernmental highway relations completed last year.

Recognition that inadequate highway legislation in numerous States leaves State and local authorities powerless to cope with the problems of highway modernization resulted in the inception of a study of all State highway legislation with a view to developing the elements essential to highway laws. The first phase of the study, which is a cooperative project of the Automotive Safety Foundation, the American Association of State Highway Officials, the Bureau of Public Roads, and the Highway Research Board, consists of a survey of the legal background of highway systems and system classification. Analysis of State statutes pertaining to this subject was partially completed during the year. All work was done under the direction of a special Highway Research Board committee on highway laws. The Bureau also assisted in a study of the highway laws of North Dakota.

Financial studies

A study covering the highway finance activities of the local rural units for the years 1942–47 was completed during the year. This study, together with a previous publication for the years 1931–41 and with the tables published in the annual Highway Statistics bulletins, will make local road finance data available by individual States for a 20-year period. Work was done on an urban street finance study covering the years 1941–51.

A highway finance statement covering the years 1945–51 was issued during the year, showing all highway revenues by source, total expenditures on each of the various systems, and the highway debt status of the States and local governments. In response to many requests, a similar statement was released giving the estimated data for 1952 and a forecast for 1953.

Taxation studies

During the previous fiscal year a comprehensive analysis of the problems of highway taxation was begun in cooperation with the committee on highway taxation and finance of the Highway Research Board. This project, which was continued throughout this year, involves investigations into the following major problems: (1) Existing methods and bases of taxation for the support of highways, (2) the extent to which highway revenues should be obtained from motor-vehicle and nonmotor-vehicle tax sources, and (3) the equitable allocation of motor-vehicle tax responsibility among vehicles of different types and sizes.

Two component studies were completed and reports presented at the meeting of the Highway Research Board in January 1953. These were the study of variation of charges made on highway toll facilities with size of vehicle, and the compilation and analysis of the State road-user and personal-property taxes that would be paid in each State upon each of a series of selected vehicles varying in size, weight, and characteristics of use.

Analyses of existing methods and bases of imposing State motor-vehicle registration taxes and fees and a study of the incremental method of motor-vehicle tax allocation were in progress. Assistance was rendered to the Ohio Department of Highways in connection with the analysis phase and the preparation

of a report of a study of the allocation of highway costs in that State by the incremental method.

Assistance was furnished several States in studies of highway taxation and finance that were undertaken as a part of long-range highway planning activities.

Highway cost studies

Research on the annual cost of highways involves devising methods of uniform assembly of construction and maintenance cost and mileage data, developing appropriate analytical methods for determining road service lives, expectancy, retirement and depreciation rates, and interpreting and applying the results of such analysis to the solution of broader problems in highway planning, highway programing, and motor-vehicle transportation.

The pilot study of the annual cost of a 210-mile section of U. S. 60 in Kentucky was completed. It was conducted in cooperation with the Kentucky Department of Highways for the purpose of showing the relation between road costs and roadway adequacy.

The cost phase of the load-condition studies was continued in the endeavor to determine the effect of truck traffic volumes and weights on the condition and cost of highways.

Assistance in preparing estimates of the cost of making needed highway improvements, program costs, forecasting future travel, and priority of construction was given to California, New Mexico, New York, North Dakota, Washington, and Wyoming.

Aid was given Arkansas, New Mexico, and West Virginia in establishing control sections and reclassifying and renumbering the Federal-aid highway routes. In connection with highway control sections, a manual on control-section establishment and solving current problems was prepared. This manual was scheduled for publication by the Highway Research Board.

Compilation of survivor curve computation data, for use in the analysis of service lives of mileages and investment in highways, was completed and copies were distributed to State highway departments.

A report was prepared on the capital investment in highways, 1914 to 1952, showing the growth of investment in primary rural highways, local roads, and city streets for grading, surfacing, and structures. Values in the report were adjusted for price trends, thus making it possible to study the history, current status, and future needs of the highway investment in terms of a constant rather than a changing dollar. The report was submitted to the Highway Research Board for publication.

Production cost studies

The purpose of all production cost studies is reduction in unit costs of highway work. This objective may be attained through increased efficiency of construction and maintenance operations or improved methods of accomplishment.

Cost studies were continued on the construction of five farm-to-market roads in North Carolina with the objective of developing comparative data regarding net cost to the public of construction work performed by contract and by State forces.

A cost study was started on a northern California forest highway project to determine the additional expense of carrying traffic through construction operations. No alternate routes are in the vicinity and construction of a detour would involve considerable expense. It was considered cheaper to maintain traffic during construction, and the job was let to contract on that basis.

Studies were made of the cost of surface maintenance on selected sections of road in five western States. Basic data developed will be used in interpreting the physical maintenance work at the WASHO test road (see section on Physical

Research) in terms of normal work and costs when performed as a routine maintenance operation.

Studies of equipment performance were conducted on two construction jobs in eastern States.

Land acquisition, roadside control, and terminal facility studies

Important legal and administrative problems in acquisition of highway right-of-way, protection of the roadside, access control, and the provision of terminal facilities have been the subject of continuous research during this and past years. Many of these studies are carried on in cooperation with State highway departments and national organizations.

Study of toll-free expressways was continued. Preliminary analysis of data as to mileage, type of facility, cost, etc., was substantially completed. There are now approximately 2,000 miles of toll-free expressways completed or under construction throughout the United States.

A report on title searching and title examination for highway right-of-way was commenced, in cooperation with the American Association of State Highway Officials, based on information obtained from the States on their right-of-way practices.

Study of procedures in reserving land for highway purposes prior to construction continued during the year. Work on the second phase of the study, a survey of methods used by the States and an analysis of their effectiveness, was well advanced.

In response to numerous requests from the States, a study of the problems arising from the placement of facilities of public utilities along highways was undertaken. Many highway departments are finding it increasingly difficult to regulate satisfactorily the operations of public utilities along the highways. A comprehensive study of laws and practices with a view to obtaining an equitable solution is involved. Factual analysis of State statutes pertaining to the placement of facilities and regulation of utilities was partially completed during the year.

Studies of the highway terminal problem advanced during the year. Study of the use of the parking meter, conducted jointly with the American Municipal Association and the Highway Research Board, was continued. A summary report was prepared, indicating, among other things, that there were an estimated 1,113,000 parking meters in the United States in 1952, yielding an estimated gross revenue in excess of $76 million. The average annual take per meter is approximately $70. More and more municipalities were using revenues from parking meters to finance off-street parking programs.

The truck loading and unloading problem in cities is becoming an increasingly vexing one. The possibilities of using the zoning device to provide some relief has been investigated, and a comprehensive factual report was completed on this subject.

In response to requests of States and municipalities, continued assistance was rendered on the legal, financial, and administrative phases of parking surveys. These activities have made it possible to bring parking difficulties in the affected places closer to solution than would otherwise be possible.

Highway Transport Research

Research on many phases of highway transport is conducted by the Bureau both independently and in cooperation with the States as Federal-aid projects. A large portion of the work at headquarters is based on data supplied by the States.

Road inventory and mapping

Road inventory operations were continued in 42 States and Hawaii, bringing up to date information on all rural roads and main routes through cities. These data are of fundamental importance in determining needs and deficiencies of the entire road network and are necessary in appraising the performance and adequacy of the several highway systems. Statistical summaries thus obtained are necessary tools in determining policies for highway administration and for long-range planning.

Thirty-two States produced 271 county general highway maps during the year. Other mapping activities resulting from cooperative planning surveys included the preparation and publication by the States of 13 State general highway maps, 20 State traffic maps, 292 county traffic maps, and 518 maps of incorporated places.

Traffic volumes and truck weights

Every State has developed some information concerning the growth in traffic in the past year compared to those in previous years. Forty-four States made surveys at stations used for the past 11 years to determine trends in loading practices and weights by vehicle types to be used in computing carried loads, ton-mileages, and what possibly is more important, the effectiveness of enforcement of State weight laws. Data were obtained at 500 stations. These data have been analyzed and reported by the Bureau.

Traffic in rural areas increased at about the same rate as in previous years with no signs of leveling off. In urban areas, however, the rate of increase diminished somewhat, possibly due to increased congestion. While rural travel increased approximately 6 percent, the urban travel increased only about 4 percent.

The annual weight surveys have generally been made in the summer but 19 States have been collecting valuable weight data seasonally at selected stations in order to determine the variations in vehicle types and weights and the frequencies of heavy loads on highway surfaces in different hours of the day, days of the week, and seasons of the year. Such information is valuable in establishing a relation between frequency of heavy loads and pavement damage under different circumstances. Analyses were made of the variation of weights by vehicle type for different hours, days, and seasons, in order to establish a factual basis for the development of more economical sampling procedures.

Studies of road usage and condition

Studies initiated in 1950 in cooperation with the State highway departments to evaluate the performance of selected road sections were continued. Observations over a number of years will be necessary for sound conclusions for use in modifying old design policies or establishing new ones. Information is obtained each year on the same sections of road as to condition of the surface and maintenance costs and their relation to traffic volumes and weights of vehicles using the roads. Studies of this type have been started in 35 States and data are being recorded on some 370 road sections. Already some preliminary indications are appearing. For example, a report on test sections received from the Missouri Highway Department indicates the detrimental effects of widening a narrow concrete pavement on one side only. Shifting of the center line caused the lateral shifting of wheel loads to a position over or near the old longitudinal center joint and increased the number of interior corner breaks. Such information may be expected from these studies in addition to the more comprehensive analyses of costs and frequencies of heavy loads.

Traffic studies in cities

Cities in which metropolitan area transportation studies have been made by the home-interview method now number 100, located in 36 States. Eight new studies were started during the fiscal year, including one in the Detroit metropolitan area with a population of almost 3 million people. This is the largest study yet undertaken.

Urban highway planning

Continuing research since 1950 has developed procedures for analyzing data from urban origin and destination surveys by which basic relations between residents' daily trips and various types of land use can readily be determined. Results show that both central and suburban business centers have definable areas of attraction as measured by either distance or travel time from place of residence to such centers. The procedures provide quantitative measurement of automotive and mass transit usage in relation to distance and travel time from places of residence to various land uses. Effects of decentralization of offices and industries from central to suburban areas upon employees' travel to work and the characteristics and volume of the traffic generated by various types of residential land use were also studied.

Such analyses and procedures provide the means of forecasting traffic changes and highway needs following the construction of shopping centers and large housing developments as well as for estimating the traffic pattern in areas for which travel habit data are not available.

Parking facilities

Since the initiation of the comprehensive parking studies in 1945, studies have been undertaken in 92 cities in 34 States, in cooperation with the State highway departments and cities. Of these, 17 were active during the year. An analysis of the results of 58 of these studies has been completed, developing some empirical relations between parking volumes in the central districts of cities and such factors as population, employment, and retail store sales. These relations indicate that the volume of parking in the central districts of cities may be estimated within reasonable limits of accuracy from existing census data and other information.

An analysis of curb parking data from the same studies was nearing completion, permitting an evaluation of the effectiveness of parking meters as regulators of length of time parked.

Studies were made of certain particular aspects of the parking problem. These involved size of reservoir space, car handling operations including mechanical devices, driver parking in comparison with attendant parking, and area of influence of parking lots and garages. Additional studies of similar character were planned as a contribution toward improvement of design and operation of off-street parking facilities. The Bureau is interested in off-street parking because it permits use of streets for movement rather than storage of vehicles.

Toll road studies

The Bureau continued its studies of toll road traffic with the objective of establishing a sound basis for estimating the volume and kind of traffic likely to be attracted to a proposed toll road and that which may be expected to be generated because of the existence of a superior facility. Results of the study of the Maine Turnpike, started in 1947, were partially reported in a paper presented to the Highway Research Board. As an example of the findings, in August 1950, 72 percent of the through trips (trips with origin and destination beyond the two ends of the turnpike) used the facility. The percentage was lower for traffic with origin and destination close to the toll road.

Field work on the "before and after" studies of the eastern extension of the Pennsylvania Turnpike and that for the "before" study on the western extension were completed and analysis begun.

Motor-vehicle use studies

Motor-vehicle use studies are conducted in cooperation with the State highway departments and each is Statewide in scope. They are designed to yield information on motor-vehicle travel with respect to rural and urban ownership of vehicles, proportion of travel in rural and urban areas, and principal road systems used, together with pertinent characteristics of travel including purposes of travel and frequency and length of trips. Such information has important bearing on highway planning and financing problems.

At the close of the fiscal year studies were under way or completed in 19 States and in Hawaii, with field work completed in 8 States and some preliminary analyses made in 6 States. Information available from these preliminary analyses shows that nearly two-thirds of all gainfully employed persons travel to work by automobile, excluding farmers and others who work where they live. Half of the workers using other means of travel, or one-sixth of the total, walk to their place of employment. Even in the largest cities of these States, one-half of these workers travel to work by passenger car and 10 percent walk. About four-fifths of the workers living in unincorporated areas travel to work by passenger car. Of these, 30 percent commute 10 miles or further and 15 percent travel 20 miles or more. In these six States, 28 percent of the families have no vehicles, while nearly 20 percent of the families operate two or more vehicles.

Data from four States show 73 percent of the trips and 60 percent of the vehicle-miles of travel by passenger car were "necessity travel"—that is, in connection with earning a living and family business. Another 5 percent of the trips and 3 percent of vehicle-miles of travel were for educational, civic, and religious purposes. The remaining travel—about one-fourth of the trips and slightly over one-third of the vehicle-miles—was made for social and recreational purposes.

Motor-vehicle regulation

During the year the Bureau published revised editions of the Model Traffic Ordinance and of three of the five acts of the Uniform Vehicle Code: Act II, the Uniform Motor-Vehicle Operators' and Chauffeurs' License Act; Act IV, the Uniform Motor-Vehicle Safety Responsibility Act; and Act V, the Uniform Act Regulating Traffic on Highways. For many years the Bureau has actively participated in the work of the National Committee on Uniform Traffic Laws and Ordinances, which is responsible for the preparation of these recommended standards for motor-vehicle legislation.

The United Nations Group of Experts on Road Signs and Signals, after three years of work, published during the year its final recommendations for a "Convention on a Uniform System of Road Signs and Signals." An official of the Bureau served as a member of the group, and the Bureau has subsequently been cooperating with the Department of State in determining the position to be taken by this country with reference to the support of the proposed convention in the United Nations Economic and Social Council, and its ratification if and when it is submitted to the member nations.

Economics of motor-vehicle size and weight

Overall costs of freight transportation by highway include the costs of owning, maintaining, and operating trucking equipment, and such costs of constructing and maintaining highway facilities as may properly be assigned to freight vehicles. Trucking costs diminish as the size and weight of vehicles increase,

but highway costs increase. The previous limited studies do not provide data adequate for a determination of the most economical size and weight of vehicle, taking into account highway costs. Research was begun to establish firmly the economic factors and operating practices relating to the motor-vehicle size and weight problem, and to obtain data indicative of the optimum gross weights of different styles of vehicles to carry an optimum range of commodities.

Comprehensive data in the following fields are needed in order to develop a reasonable range of truck and truck combination size and weight limits that will result in the lowest overall cost of highway transportation per unit of freight transported: (1) Operating costs of various types of freight vehicles by increments of gross weights for various types of freight service, (2) costs of providing highway facilities by increments of axle loads and frequency of traffic, and (3) relation of total tonnage of commodities hauled to shipping densities of the commodities, in order to judge which commodities should not occupy all of the space in the cargo body of highway freight vehicles.

A program of field studies of the three phases has been developed in collaboration with the committee on economics of motor-vehicle size and weight of the Highway Research Board. Work was begun on the collection of the field data.

Characteristics of passenger-car operation

A knowledge of the operating characteristics of motor vehicles is essential in the development of standards and specifications for highways and for vehicles that provide for the safest and most efficient movement of traffic. The committee on vehicle characteristics of the Highway Research Board, assisted by industry and government, has developed instruments to record, for any trip, the percentage of time a vehicle travels at various speeds, acceleration and deceleration, and the amount of fuel used at various speeds.

The Bureau has made extensive use of these instruments to determine the effects of control of highway access, traffic signals, rise and fall, gradient, and sight distance of the highway on the speed, fuel consumption, deceleration, acceleration, and overall travel time of a typical passenger car. The test vehicle was operated about 28,000 miles in ten studies of highway characteristics during the calendar years 1951 and 1952.

The data collected have been transcribed from field records and summarized. Study of the results should prove valuable in making road-user benefit analyses for highway improvements and in the development of design policies for highway profiles.

Brake research

The Bureau has made an extensive study of motor-vehicle brake performance. It had the assistance of a committee composed of representatives of 19 organizations connected with highway transportation, 3 from Government agencies and 16 from manufacturing, operating, and other technical groups. The field work was divided into four phases: Tests on vehicles in service, selected at random from general traffic, controlled tests on new commercial vehicles, controlled tests on used commercial vehicles, and tests to determine the capabilities of existing brake-testing devices. The field work of the first, third, and fourth phases was conducted by the Bureau, and that of the second phase by the brake technical committee of the Automobile Manufacturers Association.

Analysis of all data was completed and the result submitted for review by the advisory committee prior to publication. The study revealed the general levels of brake performance of the various types of vehicles in everyday traffic, the improvement in those levels since 1942, and the further improvement in brake performance of commercial vehicles that can be made through maintenance procedures. The effects of speed and axle loads on brake performance are also

indicated. In addition, comparison was made of the merits of testing instruments for measuring motor-vehicle brake performance.

The results of this research will assist materially in the formulation of practical regulatory measures and will help to promote safety on the streets and highways by pointing out deficiencies in the brake performance of vehicles as they operate in everyday traffic.

Highway capacity

Since the Highway Capacity Manual was published in 1950, the information it contains has been widely used in the analysis and solution of rural and urban traffic problems. Studies were continued on several of the phases of highway capacity for which comprehensive data were not available in 1950. These include the capacities of such facilities as ramps and the degree to which their capacities are influenced by traffic volumes on the main roadways.

Efficiency in utilization of streets

Mass transportation of people is recognized as a highly desirable, if not an essential, component of the overall transportation scheme in cities. However, somewhat extravagant claims have been made regarding the superiority of mass transportation over the private automobile in the utilization of street space, and in the degree to which city street congestion could be eliminated by reversing the past trend which has been toward the use of private automobiles and away from mass transit.

The economic aspects of mass transit versus private automobile are so far-reaching that studies were conducted to obtain a few facts regarding the relative efficiencies of mass transit vehicles and private automobiles. The studies were conducted in the Washington metropolitan area. The results show that the average bus in the direction of the heavier passenger movement in the downtown area during peak periods carries 20 times as many passengers, occupies seven times as much street space, and travels 47 percent as fast as the average automobile.

In outlying areas the average bus carries 15 times as many passengers, occupies seven times as much street space, and travels 63 percent as fast as the average private automobile.

The average streetcar in the downtown area carries 25 times as many passengers and occupies 7.6 times as much street space as the average automobile. These preliminary results indicate that the relative efficiency of mass transit is not as great as is often claimed.

Relation of access control to accident rates

Greater safety is a recognized benefit of controlled-access highways, but the actual gain has been measured in only a few cases. The Bureau, with the cooperation of a number of State highway departments, has undertaken the development of comparative facts on traffic-accident experience in relation to controlled access. Data were compiled for highways with full control, partial control, and no control of access. Wherever possible, accident experience was studied on routes that roughly parallel each other and differed principally in the extent to which control of access had been established. Auxiliary information bearing on all the major design and traffic service characteristics was also tabulated to assist in evaluating the accident records.

The results from study of the accident experience on approximately 1,500 miles of highways in 10 States and the District of Columbia demonstrate the superior safety of freeway design. Although more extensive records will be needed to establish the margin of superiority, it appears that, based on mileage traveled, facilities with full control of access often have accident rates only one-fourth

as great as those for highways without control of access. Highways with partial control of access have an intermediate accident rate, as might be expected.

The fatality rates, too, are consistently lower with full control of access. The entire measure of this advantage, however, will not be known without the assembly and analysis of additional data. In some instances, the effect of access control on deaths per hundred million miles of vehicle travel is not as pronounced as in the case of total accidents, presumably because the higher speeds on better highways make the accidents that do occur more severe. The limited mileage of high-speed freeway now in use undoubtedly is a factor. Many motorists have not yet become adequately conditioned to the unique operating hazards inherent in these most modern designs.

Weighing vehicles in motion

An electronic scale for weighing vehicles at their normal highway speeds, developed by the Bureau in cooperation with manufacturers of electronic equipment, was in operation almost continuously during the year. Improvements were made in mechanical and electronic features to make the apparatus reliable for obtaining information for highway planning purposes or for the enforcement of gross-load and axle-weight limits. Units which a manufacturer intends to produce were tested.

In its present form, the scale will record the total tonnage on a highway with an error of less than 1 percent, the weights of individual vehicles with an average error of 4 percent, and individual axle loads with an average error of 5 percent.

Driver performance

Studies of driver performance were conducted to obtain information useful for the proper design of highways. A report of one such study on driver performance on vertical curves (at the tops of hills), which was conducted in cooperation with the New York Department of Public Works, was completed. On sharper vertical curves where limited sight distance made speeds above 25 miles per hour unsafe (a speed is unsafe if a vehicle cannot be stopped within the distance seen to be clear of obstruction), the average speed was 45 miles per hour.

The results of these studies clearly show that on vertical curves drivers either do not have a clear realization of the distances required to bring their vehicles to a stop, or believe that there is little likelihood that an object which cannot be avoided will be in the roadway, or have confidence that highways are built with sufficient sight distance for safety at what the drivers consider normal speeds.

Hydraulic Research

Noteworthy results were obtained in studies with models of highway culverts, conducted at Oregon State College. The work was sponsored by the Bureau and the State Highway Department. The tests show that an ordinary box culvert on a steep grade cannot be made to flow full when water is ponded well above the top of the entrance. By tapering or otherwise improving the entrance the culvert will flow full automatically and, in some cases, can discharge twice as much water with no increase in the depth of ponding. Comparable results were obtained for pipe culverts in tests conducted at the University of Minnesota with Bureau cooperation. Field data verify the laboratory conclusions in general.

However, the optimum design of entrances to either rectangular or circular conduits has not been fully developed. Additional experiments along this line were in progress at the Iowa Institute of Hydraulic Research as an Iowa Federal-

aid research project. Means for controlling damaging scour at the outlet of a culvert discharging at high velocity was also investigated.

The Iowa Institute of Hydraulic Research also cooperated in continuation of two other research projects. One of these was a study of scour around bridge piers. Work was begun on a field installation which will enable automatic recording of the depth of scour at a bridge pier in the Skunk River near Ames, Iowa, during floods. Field measurements are necessary to verify the results of the small-scale model tests. In a general way, the pattern of scour occurring around a bridge pier has been confirmed by observations at bridge piers damaged by floods in recent years. The important problem now is to predict how deep the scour hole is likely to go under a given set of conditions.

The investigation of sediment transportation at the Institute during the past year indicates that mixed sands perform very nearly the same as the one-size sands used previously. The results make it possible to estimate the quantity and size of sediment that can be carried without deposition, or with limited depositions, in a storm drain. When material cannot be transported and cannot be kept out of the system, it should be trapped at a point where periodical removal is possible and economical. Another phase of the research at Iowa City is the investigation of efficiency of simple rectangular traps. Results indicate that velocity of flow in the conduit in relation to the velocity of free fall of the sand particles is the most important factor.

Work on a cooperative project at the University of Illinois proved conclusively that ordinary storm drain catch basins are grossly inefficient for the high rates of flow introduced by inlets of improved design. Data were obtained on the sizes of sediment encountered on highways at several locations in the State. Reports were prepared on hydraulic characteristics of inlet boxes and a special type of gutter.

A new project was started at the University of Missouri, sponsored by the Missouri State Highway Department and the Bureau. It is aimed at evaluating the head losses that occur as water flows through storm drain junction boxes or manholes. Very little experimental data have been available on these losses which, under certain conditions, are probably responsible for failure of storm drain systems to carry as much water as intended.

A rather unusual investigation in progress at Oregon State College was necessitated by the requirement of various fish and game commissions that highway departments provide fish ladders in culverts to enable certain varieties of fish to migrate upstream to spawn. The hydraulic tests have the objective of determining the extent to which a fish ladder reduces the capacity of the culvert to discharge storm water.

Notable progress was made on the problem of estimating peak rates of runoff, such estimates being essential to intelligent design of highway drainage structures. Use was made not only of records of stream flow and rainfall but also of topographic data to establish reliable methods of estimating peak rates of runoff which may be expected to occur once in a given number of years. Techniques for making such studies have now been developed to the point where it is becoming feasible to enlist the cooperation of some of the State highway departments in broadening the geographic area covered.

Rainfall on the Pacific Coast is markedly influenced by the existence of mountain ranges. A cooperative project was established at Stanford University under which a study was begun of correlation of rainfall intensity with a number of factors depending on topography. Such a study is necessary because of poor distribution of rainfall gages, most of them being located in the inhabited valleys.

In conjunction with the program of hydraulic and hydrologic research, training activities were conducted with the objective of informing personnel of the Bureau and interested State highway departments on scientific advances in the solution of highway drainage problems. Engineers from field offices of the Bureau attended a three-week school during the past winter. These men, in turn, are expected to cooperate with State highway departments in passing authoritative information along to the engineers who are designing drainage structures.

Physical Research

In addition to continued activity in the physical research field, the laboratories have, as in past years, performed a considerable amount of routine testing for other government agencies as well as in connection with road work under the direct supervision of the Bureau. Cooperation with engineering organizations interested in the standardization of specifications for road materials and in methods of testing was continued during the year. These organizations include the American Association of State Highway Officials, the American Society for Testing Materials, the Highway Research Board, the Federal Specifications Board, the American Concrete Institute, and others. Cooperation by the Bureau takes the form of active participation in committee work by individual members of the staff as well as participation in cooperative programs of research sponsored by these organizations.

Instruction of groups of highway engineers from various organizations in this country and from abroad as well as the instruction of engineer trainees was continued.

Structural design of rigid pavements

In connection with and supplementary to the Maryland road test, there was carried out a short series of tests with a heavily loaded military tractor-trailer combination. The purpose of these tests was to develop information that would be helpful to State highway departments in regulating the use of highway pavements by vehicles of this and similar types. A considerable amount of valuable data was obtained and analyzed and a report prepared. This report, the essence of which was presented at the annual meeting of the Highway Research Board, will be published by the board.

Studies were continued of the structural behavior of joints containing load transfer systems under the action of repeated loads. These tests were made in four large machines capable of imposing loads of 10,000 to 15,000 pounds on the load transfer systems. Following a systematic schedule, the work was continued throughout the year and valuable information pertaining to the influence of dowel diameter, dowel embedment, and width of joint opening was obtained. Preparation of an initial report was in prospect at the end of the year.

Earlier reports have contained a description of a cooperative study of the effects of variations in the spacing of transverse joints on the longtime performance of concrete pavements. Observations covering 10 years of service behavior are embodied in reports presented before the Highway Research Board by the highway departments of California, Kentucky, Michigan, Minnesota, Missouri, and Oregon. The Bureau, as an active participant in this investigation, began a study of the six reports to correlate the data for publication and to discover what, if any, additional basic trends may be indicated.

Structural design of nonrigid pavements

Through contact with the States and through participation in technical committee activities the Bureau followed closely developments in the use of improved

methods of design of nonrigid pavements. Recently completed surveys of design practices throughout the United States have focused attention on the need for studying the service behavior of bituminous pavements designed by the various methods. Comparison of designs arrived at by the various methods for a given set of basic conditions emphasizes the need for further study in an effort to bring about greater harmony in the results obtained.

The cooperative study of nonrigid pavement design by the Highway Research Board, the Asphalt Institute, and the Bureau was continued. A report summarizing the results of the completed plate load tests was in preparation.

The WASHO test road

The Bureau participated in a major road test at Malad, Idaho, under the auspices of the Western Association of State Highway Officials, which has a membership of 10 State highway departments, with the truck manufacturing industry and the petroleum industry as cooperators. The project is being directed by the Highway Research Board. The experimental bituminous pavement sections, arranged in the form of two loops, were completed in October 1952. The thickness of the several sections ranges from 6 to 22 inches. Following the application of scheduled pretest traffic and the completion of a scheduled series of pavement deflection tests the sections were subjected to the regular test traffic for a period of two weeks during November 1952. This traffic consisted of 18,000- and 22,400-pound single-axle loads and tandem-axle loadings of 32,000 and 40,000 pounds. Each of these four loads was operated over an individual lane of the pavement.

Traffic testing was planned for about four months during the summer of 1953 and completion during the spring of 1954.

The Bureau continued its active participation in the project after having assisted in the planning and having supplied the instrumentation. It was expected that assistance would be given in the analysis and interpretation of the data.

Bridges

A comprehensive report of the studies of the self-damping characteristics of structural members was completed and scheduled for publication.

A cooperative study of the structural behavior of a steel highway bridge under heavy motor-vehicle loadings was arranged with the Oregon State Highway Department. The necessary strain measuring and recording equipment was assembled and sent to Oregon. The tests should furnish data of considerable value on impact stresses and other problems of the bridge engineer. The field testing of the bridge was to be completed during the summer of 1953.

Other physical research

Requests for demonstrations of the application of geophysical methods of subsurface exploration were received from a number of State highway departments and more widespread use of the methods each year is indicated. On one forest road project the data obtained led to a substantial reduction in the contract bid price. On a park road project a large deposit of granular material was located adjacent to the right-of-way, permitting a large saving in cost.

Soil studies

Construction of modern highways to resist damage by heavy vehicles and adverse climatic conditions requires large quantities of high-quality granular soils in subgrade and base courses. In many parts of the country known deposits of these soils are rapidly becoming exhausted and serious consideration must be given to the utilization of less desirable soils. Soil research was directed toward developing new methods and techniques in locating new sources of

foundation soils and modification or improvement of less desirable soils. Considerable progress was made.

The research study in cooperation with the West Virginia State Road Commission to develop tests for evaluating shale, burned shale, and chert as base-course material for secondary roads was continued. Tentative specifications were prepared for materials in the area studied and periodic inspections of pavements will be made to determine such modifications of these specifications as may be necessary. A similar study was begun in Maryland.

Research on the stabilization of soils by the addition of admixtures, such as bituminous materials, portland cement, lime fly-ash, and chrome-lignin, was continued.

Research on the identification and characterization of the ultra-fine fraction of soil material was continued. A series of known clay minerals was studied by means of X-ray diffraction, differential thermal analysis, and chemical analyses. The purpose of this study is to determine the operational characteristics of the equipment and to develop techniques and methods to be used in the study of various types of clays found in different sections of the country. It is known that mineral constituents of clay have a primary influence on the properties of soils underlying road surfaces. Mineral constituents influence such properties as volume change, cohesion, and plasticity, and greatly affect the bearing power and performance under traffic. A fundamental knowledge of the nature and behavior of clay minerals is necessary before a systematic and planned approach can be made toward the modification of less desirable soils.

The study of the effectiveness of various chemical agents for dispersing fine-grained soils for particle-size determination was continued and a report was prepared for publication. The selection of the proper dispersing agent for use in the determination of the quality of colloidal clay particles in soil is becoming more significant as more is learned about the effect of clay materials on the behavior of soils.

Cooperative projects to develop methods for mapping drainage and the properties of soils of interest to the highway engineer have been initiated with the State highway departments of Maine, New Jersey, Virginia, and Rhode Island.

Soil testing in cooperation with the Bureau of Soil Surveys of the Department of Agriculture was continued. Samples of the major agricultural soils mapped in 12 counties located in 11 States were tested for characteristics of interest to engineers. These data will be useful to engineers who use the new agricultural soil maps in planning soil surveys for engineering purposes and will lessen the amount of work necessary.

Work on the calibration of moisture cells to study the seasonal fluctuations of soil moisture beneath pavements was continued. Calibration of fiber-glass and nylon type cells has been made for soils taken from three experimental pavements located in Indiana, Ohio, and Idaho. Moisture cells were installed on those projects and resistance readings were taken at regular intervals.

Work on the correlation of the performance of various types of compaction equipment on both granular and cohesive soils was continued. A progress report was prepared and this work has been expanded to include a study of the kneading-type compaction devices.

Study of the permeability of soil and soil-aggregate mixtures was continued in order to improve the method of measurement and apparatus to the extent necessary for consideration of their adoption as standards. Tests are being made on a wide variety of materials used in subbases and bases for pavements at various locations in the eastern part of the United States. These data will be used to evaluate the effects of gradation upon permeability of materials and in setting specification limits for materials with satisfactory drainage characteristics.

Study of the effectiveness of subbases composed of granular material and soil-cement mixtures for the prevention of pumping of concrete pavement were continued. This work was in cooperation with the Indiana and Ohio State highway departments. Observations of the behavior of pavement slabs constructed over the various treated subgrades were made, readings of the moisture movements in the subgrade and subbases were taken, and precise level measurements were made to determine seasonal changes in the elevation of the pavement. The weighing and counting of trucks and observations of their placement was continued on a monthly basis. The first progress report on the Indiana project was nearing completion. Deflection and strain measurements under controlled loading were planned in an effort to relate the deflections and stresses in concrete pavement to the thickness and characteristics of the subbases.

Bituminous materials and mixtures

Study of anti-stripping agents for use with bituminous materials was continued. An investigation of their resistance to heat was completed and a report prepared. Four new materials, not previously available, were tested and found to be acceptable, thereby increasing the availability of materials that facilitate some types of construction and maintenance under adverse weather conditions.

The cooperative study of mineral fillers for bituminous concrete was completed and a report published. This study was made in cooperation with the State highway departments of Massachusetts, New Jersey, and Ohio and the National Crushed Stone Association to determine the value of fly-ash and traprock dust in comparison with the manufactured limestone dust widely used as a filler in bituminous mixtures. Both fly-ash and traprock dust are byproducts of industrial processes and are available in considerable quantities. The study showed both materials to be satisfactory for the use proposed.

Study of the effect of adding rubber to asphalt, both on the asphalt itself and on asphaltic paving mixtures, was continued. Laboratory studies of two phases of this investigation were completed and preparation of reports begun. In the first phase of the investigation, studies were made to determine the effect of various rubbers on the physical properties of typical paving asphalts. The rubbers included 14 rubber powders and 1 plasticized rubber and represented the various types that have been used in rubberized asphalt pavements. The second phase of the study was the determination of the effect of using rubber-asphalt combinations in bituminous paving mixtures. Inspection of the behavior of test sections containing rubber were continued and at the end of the year there was no indication of superiority of surfaces containing rubber over the corresponding control section without rubber.

The study of bituminous concrete pavements in cooperation with the Maryland State Roads Commission was continued and a second progress report prepared. The pavements were either 4 or 5 years old. Considerable alteration in the properties of both bitumen and aggregates was shown by the most recent tests. Observations and tests will be continued to provide information for correlation of service behavior with various laboratory tests to develop more precise methods for design of bituminous concrete.

A special study of the bituminous resurfacing of truck routes in North Carolina was made at the request of the State Highway and Public Works Commission. Field inspections and laboratory tests were made to determine the factors involved in the partial failure of bituminous resurfacing on old concrete roads subjected to heavy truck traffic and to devise methods of improving the service performance of bituminous mixtures under such conditions. On the basis of laboratory evaluation of some of the aggregates used or available, a number of test sections are being built for observation. A systematic method of mixture design is being employed to develop greater stability than had previously been

obtained. Continued field observations and laboratory tests will be required to determine the adequacy of the new design methods and to evaluate the various aggregates used.

A comparative study of the triaxial compression test and the unconfined compression test was begun to determine the specific value and the limitations of each in measuring the strength of bituminous paving mixtures and to provide for better interpretation of test results.

A study of the effect of the shape of coarse gravel particles on the stability of bituminous mixtures was initiated to develop more specific information on this controversial subject. Uncrushed particles generally have been considered less satisfactory than crushed particles for obtaining the high stability required under present heavy traffic conditions. Establishment of the relation between particle shape and stability will be of assistance in designing bituminous paving mixtures for high stability.

Cement, aggregates, and concrete

Study of the reaction between the alkalies in portland cement and soluble silica in aggregates, to which reference has been made in previous annual reports, was continued. Particular attention was given to the possibility that this reaction may be the cause of the premature failure of concrete in certain sections of the country where it has not been expected. The failures appear to have developed very slowly and a study of the rate of expansion in laboratory tests and of the behavior of aggregates which have a slow but possibly continuous reaction are necessary before a definite solution of the problem is possible. Studies of this important problem will be continued to develop positive methods of identifying reactive materials and positive methods of controlling the expansion.

Work was continued on the development of more satisfactory procedures for testing sands for structural strength, and for determining the soundness of aggregates. The methods now available have a number of objectionable features, and efforts to eliminate these through refinement in the procedures used were in progress.

The results of tests for quality of more than 13,000 samples of fine and coarse aggregates made in the Bureau laboratories over a period of more than 40 years were assembled and published. The results are tabulated by States and counties and only those materials which could be identified positively as to source have been included. The report will be of permanent value to users of aggregates.

Studies of skid resistance of pavements, particularly the effect of the properties of aggregates on the development of slippery concrete or bituminous road surface, were continued. Work was confined largely to the development of a satisfactory laboratory test that will identify materials tending toward production of slippery surfaces.

An extensive series of tests was conducted to obtain data for consideration in the preparation of a table of proportions for various classes of concrete for use in the 1953 revision of standard specifications for highway bridges of the American Association of State Highway Officials. Prior to this last revision there was no reference to air-entrained concrete. The increasing use of air-entrained concrete for bridge construction made it desirable to expand the table of proportions to cover this feature as well as to provide proportions which would produce concrete meeting the higher strengths specified in the 1953 edition.

Although the relation between the water-cement ratio and the durability of concrete without air entrainment has been established for years, similar information regarding air-entrained concrete has been almost nonexistent. Three sets of plain and air-entrained concrete beams, with water content ranging from

4½ to 9 gallons per sack of cement, as well as two consistencies, were made. Two of the three sets have been tested for durability, using different types of laboratory freezing and thawing procedures. The third set is being exposed to natural weathering.

Economic considerations make it desirable to use local aggregates in concrete. However, such materials sometimes contain quantities of low-strength particles such that it is impossible to meet requirements for flexural strength without unduly increasing the cement content. An exploratory investigation has been started using samples of a low-strength coarse aggregate from a local pit near Washington. It is planned to determine experimentally the effect of eliminating the low-strength particles on the flexural strength of the concrete.

An investigation was undertaken to determine the strength of welded splices of steel reinforcement forming the wire cages used in the manufacture of concrete pipe. This information was desired by committees of the American Society for Testing Materials and of the American Association of State Highway Officials so that a practical working value for the strength of welded splices could be established for use in specifications. Tests were made of typical welded splices in wire reinforcement obtained from a number of concrete pipe manufacturers. Useful information was developed regarding the strength of welded splices and of splices of other types which gave very promising results.

The investigation of the use of fly-ash as a replacement for part of the portland cement in paving concrete was continued. The results show that replacing as much as one-third of the cement with certain types of fly-ash results in concrete strengths at one year averaging higher than for plain concrete at the same age. A program of tests on durability as determined by freezing and thawing, and resistance to the action of calcium chloride used for ice removal, was under way.

Supplementing the work on concrete, tests on mortars involving 36 samples of fly-ash from various parts of the United States were continued for the purpose of developing, if possible, methods for identifying, by means of short-time routine tests, the types of fly-ash suitable for use as admixtures in concrete. The work completed at the end of the year gave important indications on the use of fly-ash.

The study of commercial air-entraining admixtures used in concrete was continued. A final report covering tests of 27 proprietary materials was prepared for publication. Tests on 5 additional admixtures were completed.

The long-time study of cement performance in concrete was continued with periodic inspection of specimens exposed to the weather in the test plot at the laboratory as well as inspection of full-size experimental installations in the field.

The study of methods of protecting the surface of portland cement concrete against the destructive effect of flake calcium chloride used for the removal of ice was continued. Approximately 150 large concrete slabs have been subjected to freezing under natural conditions followed by thawing with calcium chloride. Among the variables studied were: (1) The effect of the percentage of air and of various types of air-entraining admixtures; (2) the effect of using fly-ash as an admixture, (3) the effect of the method of curing, (4) the effect of using oils integrally in the concrete and for surface treatment, and (5) the effect of applying a vacuum to the surface of the concrete after placing.

A study of the effect of surface vibration on air content and other properties of concrete was started. In this investigation, low-slump concrete, similar to that used on the German Autobahnen, was vibrated with a surface vibrator. The effects of vibration on air content, strength, and other properties of the concrete are to be studied.

Appendix

LIST OF TABLES

Table 1.—*Summaries of programs approved and work completed in the fiscal year 1953, by class of highway and by fund*

	PROGRAMS APPROVED [1]						WORK COMPLETED					
				Railway-highway crossing improvements						Railway-highway crossing improvements		
	Total cost	Federal funds	Miles	Crossings eliminated	Structures reconstructed	Crossings protected	Total cost	Federal funds	Miles	Crossings eliminated	Structures reconstructed	Crossings protected
	BY CLASS OF HIGHWAY						BY CLASS OF HIGHWAY					
Primary	$442,187,125	$230,822,381	5,184.8	52	3	83	$437,661,978	$224,983,773	6,681.1	41	9	113
Secondary	370,075,975	193,452,492	15,011.0	22	1	207	306,416,168	163,108,111	15,402.7	24	3	196
Urban	383,294,742	194,793,641	682.6	73	4	19	297,495,634	149,179,519	758.5	60	10	47
Subtotal	1,195,557,842	619,068,514	20,878.4	147	8	309	1,041,573,780	537,271,403	22,842.3	125	22	356
Not classified [2]	38,089,029	35,041,285	749.9				41,791,811	37,032,537	784.1			
Total	1,233,646,871	654,109,799	21,628.3	147	8	309	1,083,365,591	574,303,940	23,626.4	125	22	356
	BY FUND						BY FUND					
Federal-aid:												
Primary	$462,972,555	$241,981,666	5,269.7	60	3	91	$480,850,281	$245,937,360	7,046.9	48	12	141
Secondary	361,810,167	186,357,142	14,668.3	21	1	206	300,253,452	154,178,436	14,733.2	26	3	190
Urban	326,268,856	164,279,462	330.3	55	4	10	237,103,265	117,926,102	266.4	47	6	14
Interstate	28,092,610	14,439,165	178.6	7								
Prewar Federal-aid:												
Primary							37,199	16,871	.3			
Grade crossing	795,291	772,542		1		1	3,074,283	2,070,099	1.3	3	1	7
Access Roads, Act of 1950	15,618,363	11,238,537	431.5	3		1	14,409,471	13,671,849	787.6	1		4
Defense Highway Act							5,845,829	3,470,686	6.6			
Subtotal	1,195,557,842	619,068,514	20,878.4	147	8	309	1,041,573,780	537,271,403	22,842.3	125	22	356
National forest highway [3]	20,760,166	20,144,641	485.6				19,794,231	19,008,612	474.6			
Tongass National Forest, Alaska [3]	1,786,800	1,786,800	6.3				3,347,200	3,337,200	15.5			
National park and parkway [4]	10,656,900	10,656,900	71.7				10,293,819	10,293,819	153.2			
Public lands	100,000	100,000	4.0				1,120,654	1,014,870	30.4			
Emergency flood relief	4,785,163	2,352,944	182.3				7,235,907	3,378,036	110.4			
Subtotal	38,089,029	35,041,285	749.9				41,791,811	37,032,537	784.1			
Total	1,233,646,871	654,109,799	21,628.3	147	8	309	1,083,365,591	574,303,940	23,626.4	125	22	356

[1] Initial commitment of funds.
[2] Forest, park, 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, 1953, by class of highway and by fund*

	Total cost	Federal funds	Miles	Railway-highway crossing improvements		
				Crossings eliminated	Structures reconstructed	Crossings protected
By Class of Highway						
Primary	$610,123,924	$314,853,795	5,691.0	192	11	84
Secondary	406,554,650	211,036,848	14,174.8	35	7	147
Urban	753,279,770	379,921,420	1,063.2	174	21	35
Subtotal	1,769,958,344	905,812,063	20,929.0	311	39	266
Not classified [1]	55,912,746	50,769,161	904.3			
Total	1,825,871,090	956,581,224	21,833.3	311	39	266
By Fund						
Federal aid:						
Primary	$701,708,355	$361,093,729	6,040.9	128	13	106
Secondary	400,870,540	204,466,900	13,661.7	31	7	144
Urban	618,067,922	308,423,024	430.9	138	19	11
Interstate	17,865,531	9,018,078	96.4	4		
Prewar Federal-aid:						
Grade crossing	2,767,767	2,059,459	.5	3		1
Access roads, Act of 1950	22,381,922	17,589,981	698.6	7		4
Defense Highway Act	6,296,307	3,160,892				
Subtotal	1,769,958,344	905,812,063	20,929.0	311	39	266
National forest highway [2]	31,390,483	29,574,362	598.6			
Tongass National Forest, Alaska [2]	2,219,100	2,219,100	8.5			
National park and parkway [3]	14,832,122	14,832,122	120.2			
Public lands	1,163,875	1,078,000	16.9			
Emergency flood relief	6,307,166	3,065,577	160.1			
Subtotal	55,912,746	50,769,161	904.3			
Total	1,825,871,090	956,581,224	21,833.3	311	39	266

[1] Forest, park, public lands, and emergency flood-relief projects.
[2] Includes construction projects only.
[3] Construction supervised by Bureau of Public Roads.

Table 3.—*Apportionment of Federal-aid highway funds authorized for the fiscal year ending June 30, 1954*

State or Territory	Primary highway system ($247,500,000)	Secondary or feeder roads ($165,000,000)	Urban highways ($137,500,000)	Interstate system ($25,000,000)	Total
Alabama	$5, 217, 552	$4, 043, 898	$1, 758, 127	$532, 314	$11, 551, 891
Arizona	3, 653, 303	2, 487, 990	521, 973	371, 953	7, 035, 219
Arkansas	4, 064, 364	3, 254, 652	750, 706	414, 318	8, 484, 040
California	11, 273, 990	5, 808, 764	11, 929, 002	1, 154, 002	30, 165, 758
Colorado	4, 402, 054	2, 940, 172	1, 115, 307	448, 362	8, 905, 895
Connecticut	1, 571, 238	800, 250	2, 598, 965	161, 200	5, 131, 653
Delaware	1, 200, 375	800, 250	275, 217	121, 250	2, 397, 092
Florida	3, 903, 613	2, 550, 784	2, 406, 316	398, 804	9, 259, 517
Georgia	6, 059, 367	4, 627, 705	1, 955, 727	618, 094	13, 260, 893
Idaho	3, 033, 324	2, 132, 917	258, 267	308, 736	5, 733, 244
Illinois	9, 415, 818	5, 124, 593	9, 384, 933	963, 234	24, 888, 578
Indiana	5, 833, 702	4, 020, 406	3, 210, 481	595, 500	13, 660, 089
Iowa	5, 915, 625	4, 328, 851	1, 593, 160	602, 769	12, 440, 405
Kansas	5, 950, 738	4, 165, 742	1, 261, 297	605, 853	11, 983, 630
Kentucky	4, 496, 820	3, 736, 080	1, 393, 596	459, 028	10, 085, 524
Louisiana	3, 812, 021	2, 759, 226	1, 967, 149	389, 375	8, 927, 771
Maine	2, 061, 148	1, 474, 586	560, 854	210, 101	4, 306, 689
Maryland	2, 151, 491	1, 314, 877	2, 277, 541	220, 394	5, 964, 303
Massachusetts	3, 102, 505	1, 149, 426	5, 585, 538	318, 932	10, 156, 401
Michigan	7, 594, 942	4, 633, 662	6, 245, 790	776, 456	19, 250, 850
Minnesota	6, 444, 508	4, 545, 371	2, 185, 224	656, 907	13, 832, 010
Mississippi	4, 357, 237	3, 632, 971	742, 978	444, 235	9, 177, 421
Missouri	7, 127, 588	4, 822, 289	3, 304, 889	726, 976	15, 981, 742
Montana	4, 957, 442	3, 409, 119	315, 997	504, 310	9, 186, 868
Nebraska	4, 751, 285	3, 369, 779	787, 065	483, 631	9, 391, 760
Nevada	3, 174, 465	2, 121, 392	102, 203	322, 835	5, 720, 895
New Hampshire	1, 200, 375	800, 250	397, 419	121, 250	2, 519, 294
New Jersey	3, 175, 262	1, 071, 050	5, 874, 465	326, 438	10, 447, 215
New Mexico	4, 003, 539	2, 749, 711	440, 412	407, 468	7, 601, 130
New York	11, 527, 309	4, 622, 354	17, 937, 120	1, 182, 803	35, 269, 586
North Carolina	6, 048, 757	5, 170, 669	1, 724, 427	617, 527	13, 561, 380
North Dakota	3, 562, 057	2, 585, 761	226, 915	362, 325	6, 737, 058
Ohio	8, 609, 919	5, 240, 955	7, 765, 686	880, 712	22, 497, 272
Oklahoma	5, 245, 994	3, 755, 923	1, 466, 130	534, 576	11, 002, 623
Oregon	4, 198, 212	2, 933, 480	1, 076, 050	427, 813	8, 635, 555
Pennsylvania	9, 582, 120	5, 699, 723	10, 159, 251	981, 618	26, 422, 712
Rhode Island	1, 200. 375	800, 250	959, 321	121, 250	3, 081, 196
South Carolina	3, 291, 443	2, 726, 238	923, 122	335, 960	7, 276, 763
South Dakota	3, 827, 991	2, 733, 672	260, 648	389, 370	7, 211, 681
Tennessee	5, 293, 910	4, 127, 446	1, 940, 548	540, 208	11, 902, 112
Texas	15, 842, 002	10, 607, 168	6, 428, 891	1, 615, 515	34, 493, 576
Utah	2, 824, 094	1, 868, 149	568, 628	287, 607	5, 548, 478
Vermont	1, 200, 375	800, 250	208, 950	121, 250	2, 330, 825
Virginia	4, 645, 445	3, 611, 080	2, 092, 640	474, 439	10, 823, 604
Washington	4, 064, 587	2, 715, 106	2, 024, 855	414, 845	9, 219, 393
West Virginia	2, 678, 927	2, 330, 488	873, 369	273, 683	6, 156, 467
Wisconsin	5, 802, 073	4, 047, 423	2, 627, 837	591, 968	13, 069, 301
Wyoming	3, 053, 021	2, 068, 920	145, 912	310, 556	5, 578, 409
District of Columbia	1, 200, 375	800, 250	1, 159, 334	121, 250	3, 281, 209
Hawaii	1, 200, 375	800, 250	451, 260		2, 451, 885
Puerto Rico	1, 269, 948	1, 327, 682	1, 153, 508		3, 751, 138

Table 4.—*Status of plan preparation for future construction of Federal-aid and State highways, and highways in National forests and other Federal areas, as of April 1, 1953*

State or Territory	Plans under way		Plans completed		Total	
	Construction cost	Miles	Construction cost	Miles	Construction cost	Miles
	1,000 dollars		*1,000 dollars*		*1,000 dollars*	
Alabama	39,346	753	4,144	120	43,490	873
Arizona	6,300	74	4,200	37	10,500	111
Arkansas	8,863	229	14,530	327	23,393	556
California	842,220	1,370	106,431	500	948,651	1,870
Colorado	30,723	1,176	6,159	350	37,182	1,526
Connecticut	139,369	99	3,746	10	143,115	109
Delaware	13,455	55	1,725	7	15,180	62
Florida	12,000	400	5,000	100	17,000	500
Georgia	52,840	3,197	26,166	295	79,006	3,492
Idaho	42,632	748	11,556	195	54,188	943
Illinois	199,871	1,169	24,237	284	224,108	1,453
Indiana	142,130	1,120	19,965	144	162,095	1,264
Iowa	50,000	2,000	10,000	400	60,000	2,400
Kansas	22,974	1,331	7,235	342	30,209	1,673
Kentucky	32,726	1,057	52,476	1,492	85,202	2,549
Louisiana	45,735	251	24,215	242	69,950	493
Maine	19,293	177	11,541	54	30,834	231
Maryland	121,539	194	27,286	126	148,825	320
Massachusetts	175,452	226	10,270	12	185,722	238
Michigan	139,492	533	17,200	130	156,692	663
Minnesota	40,728	1,489	17,605	1,057	58,333	2,546
Mississippi	29,210	562	5,575	103	34,785	665
Missouri	31,865	475	31,943	505	63,808	980
Montana	20,500	597	3,720	65	24,220	662
Nebraska	18,615	443	1,311	45	19,926	488
Nevada	19,692	300	6,855	337	26,547	637
New Hampshire	9,239	75	2,013	9	11,252	84
New Jersey	192,127	248	17,145	32	209,272	280
New Mexico	13,255	297	6,237	73	19,492	370
New York	349,056	768	117,073	202	466,129	970
North Carolina	56,451	714	15,293	458	71,744	1,172
North Dakota	7,663	394	9,652	427	17,315	821
Ohio	216,759	531	69,446	444	286,205	975
Oklahoma	28,174	382	6,698	83	34,872	465
Oregon	26,555	296	14,580	163	41,135	459
Pennsylvania	273,084	1,246	193,764	1,467	466,848	2,713
Rhode Island	26,316	39	8,290	7	34,606	46
South Carolina	29,000	600	2,500	75	31,500	675
South Dakota	12,926	470	818	37	13,744	507
Tennessee	73,089	1,686	11,107	255	84,196	1,941
Texas	144,273	4,854	14,234	1,172	158,507	6,026
Utah	34,182	524	6,712	93	40,894	617
Vermont	9,700	90	1,300	14	11,000	104
Virginia	55,502	888	29,862	468	85,364	1,356
Washington	165,344	1,759	5,050	215	170,394	1,974
West Virginia	13,989	88	972	8	14,961	96
Wisconsin	31,058	558	22,306	460	53,364	1,018
Wyoming	30,688	1,070	3,018	87	33,706	1,157
Alaska	14,740	125	2,741	15	17,481	140
District of Columbia	14,813	11	27,249	15	42,062	26
Hawaii	14,526	49	6,610	13	21,136	62
Puerto Rico	12,957	72	4,543	21	17,500	93
Total	4,153,036	37,859	1,054,604	13,592	5,207,640	51,451

Table 5.—*Projects financed with Federal-aid funds programed [1] during the fiscal year ended June 30, 1953, 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	$13,627,059	$6,994,017	151.7	$10,678,752	$5,052,676	520.8	$1,576,340	$788,270	1.3	$1,064,628	$524,330	8.8	$26,946,779	$13,359,293	682.6
Arizona	5,567,780	3,980,613	68.0	4,519,155	3,114,016	108.6	1,423,420	906,747	6.0	514,513	371,953	3.9	12,024,868	8,373,329	186.5
Arkansas	2,208,450	1,106,625	64.6	4,398,708	2,214,987	247.7	197,520	98,760	3.2	402,428	201,214	2.0	7,207,106	3,621,586	317.5
California	22,498,019	11,158,990	60.0	14,231,305	7,574,889	243.9	23,322,959	11,563,002	25.0	3,175,866	1,154,002	9.8	63,228,149	31,450,883	338.7
Colorado	8,227,620	4,521,095	98.0	7,054,481	3,962,016	252.1	1,084,746	609,995	.4	792,000	448,127	.8	17,158,847	9,541,233	351.3
Connecticut	6,083,524	3,019,358	23.0	1,577,270	783,450	2.9	1,084,010	542,005	1.2	304,836	152,418	.2	9,049,640	4,497,231	27.3
Delaware	1,296,492	646,512	9.7	850,784	422,823	5.1	1,508,713	753,473	2.2				3,655,989	1,822,808	17.0
Florida	7,099,845	3,654,155	99.9	6,304,517	3,204,207	217.1	6,388,314	3,485,966	11.5	11,964	5,982		19,804,640	10,350,310	328.5
Georgia	6,292,506	3,148,703	46.8	12,956,136	6,533,584	506.0	2,647,088	1,323,544	9.5				21,895,730	11,005,831	562.3
Idaho	9,159,687	5,576,652	138.7	7,713,558	4,798,357	268.5							16,873,245	10,375,009	407.2
Illinois	24,118,120	12,214,262	167.4	15,021,812	7,484,063	440.0	25,349,879	12,844,023	12.5	1,930,958	963,234	15.1	66,420,769	33,505,582	635.0
Indiana	4,481,266	2,240,412	13.4	16,317,604	8,162,689	184.4	9,892,256	5,212,128	7.2	17,864	8,932		30,708,990	15,624,161	205.0
Iowa	10,062,595	5,096,719	222.6	10,938,336	5,503,176	838.5	3,487,951	2,912,168	4.0	390,085	195,036	5.0	24,878,967	13,707,099	1,069.5
Kansas	12,064,844	6,022,560	285.8	10,956,073	5,349,560	1,128.4	3,047,768	1,576,623	13.3	1,451,732	605,853	13.5	27,520,417	13,554,596	1,441.0
Kentucky	8,783,221	4,452,111	77.4	7,265,993	3,638,116	161.4	1,768,902	983,245	4.3	132,770	66,385		17,950,886	9,139,857	243.1
Louisiana	5,782,360	2,890,280	34.5	7,015,316	3,506,958	87.9	6,767,834	3,383,917	4.4	761,680	380,840	3.9	20,327,190	10,161,995	130.7
Maine	5,616,334	2,792,667	43.2	3,705,236	1,761,018	42.8	15,178	7,589					9,336,748	4,561,274	86.0
Maryland	3,390,744	1,651,283	6.0	4,717,452	2,529,418	88.7	634,826	315,413	1.6	627,610	220,394	1.3	9,370,632	4,716,508	97.6
Massachusetts	3,225,387	1,604,943	6.2	1,110,463	554,631	3.6	6,318,730	3,159,365	4.6				10,654,580	5,318,939	14.4
Michigan	18,754,616	9,297,802	209.1	11,766,206	6,142,280	466.2	6,010,175	3,351,012	3.1	1,111,992	555,996	.3	37,642,989	19,347,090	678.7
Minnesota	13,017,746	6,781,551	257.5	8,632,027	4,154,710	1,097.2	3,756,231	2,353,212	14.7	949,706	474,853	11.5	26,355,710	13,764,326	1,380.9
Mississippi	7,333,100	3,819,830	111.7	13,456,167	6,534,025	769.8	2,203,000	1,101,500	11.6	548,400	274,200	14.9	23,540,667	11,729,555	908.0
Missouri	15,150,063	7,732,392	69.6	11,010,041	5,517,727	757.8	9,951,765	4,943,783	3.3	1,275,289	637,644	7.3	37,387,158	18,831,546	838.0
Montana	9,087,987	5,999,685	152.5	2,801,473	1,702,755	131.4	528,389	301,019	6.2				12,417,849	8,003,459	286.5
Nebraska	7,256,936	3,777,304	192.7	6,513,814	3,968,954	240.9	904,998	626,266					14,675,748	8,372,524	433.6
Nevada	5,507,524	4,299,684	110.7	1,156,771	968,124	39.9	3,473	2,914		385,798	322,835	1.2	7,053,566	5,593,557	151.8
New Hampshire	1,771,730	879,043	13.3	1,868,344	929,984	18.8	866,188	433,094	.6	3,636	1,818		4,509,898	2,243,939	32.7
New Jersey	9,154,858	4,065,572	9.1	1,913,416	939,570	28.9	9,139,976	4,456,007	2.6	657,772	326,438	1.6	20,866,022	9,787,587	45.8
New Mexico	7,907,592	5,021,189	143.2	4,748,062	3,021,605	233.8	961,268	611,111	1.1	641,118	406,469	7.8	14,258,040	9,060,374	385.9
New York	31,447,868	15,854,463	203.0	11,978,192	5,901,119	103.2	84,424,741	40,910,473	72.6	795,484	777,742	.1	128,646,285	63,443,797	378.9
North Carolina	13,484,347	6,576,396	221.3	11,470,416	5,641,318	576.2	5,001,480	2,422,885	10.2				29,956,243	14,640,599	807.7
North Dakota	8,319,403	4,169,479	427.8	4,918,367	2,451,780	853.8	105.151	52,576	.4	548,498	274,249	5.6	13,891,419	6,948.084	1,287.6

Ohio	18,092,890	8,367,750	30.3	17,848,374	8,274,255	135.8	13,776,251	6,696,658	9.3	1,761,424	880,712	3.9	51,478,939	24,219,375	179.3
Oklahoma	5,803,700	3,047,585	60.4	3,209,975	1,685,176	200.3	876,400	574,010	4.8				9,890,075	5,306,771	265.5
Oregon	4,633,635	2,806,973	51.7	4,558,864	2,723,002	133.8	2,639,698	1,547,140	7.0	723,765	427,417	3.3	12,555,962	7,504,532	195.8
Pennsylvania	20,141,789	10,070,087	44.3	15,481,203	7,725,015	125.1	32,873,932	15,530,503	13.6	1,963,236	981,618	4.1	70,460,160	34,307,223	187.1
Rhode Island	1,055,468	527,734	5.5	2,313,802	1,156,601	15.8							3,369,270	1,684,335	21.3
South Carolina	3,491,200	1,834,200	8.7	4,884,380	2,387,400	300.5	1,350,000	775,000	1.5				9,725,580	4,996,600	310.7
South Dakota	6,803,355	4,008,626	272.9	5,301,558	3,117,411	427.1	718,893	403,439	4.3	693,819	389,370	23.5	13,517,625	7,918,846	727.8
Tennessee	9,869,048	4,837,020	151.9	7,562,782	3,606,091	328.1	5,505,444	3,052,722	.4				22,937,274	11,495,833	480.4
Texas	24,195,052	13,621,950	350.2	17,237,882	8,621,300	1,101.0	14,065,978	7,551,800	15.2	1,503,800	904,700	9.9	57,002,712	30,699,750	1,476.3
Utah	4,520,985	3,391,354	46.8	2,452,595	1,834,407	67.2	1,465,225	1,084,379	5.4	382,072	286,239		8,820,877	6,596,379	119.4
Vermont	3,277,336	1,638,503	30.6	1,233,616	616,673	22.2	751,712	375,856	1.3	109,636	54,818	.2	5,372,300	2,685,850	54.3
Virginia	14,088,549	6,604,124	118.9	8,454,865	4,248,398	235.0	12,123,552	5,151,958	12.9	726,542	258,439	7.1	35,393,508	16,262,919	373.9
Washington	9,816,049	5,042,542	109.1	6,102,847	3,107,975	226.1	5,094,032	2,606,072	4.5	848,642	414,845	4.9	21,861,570	11,171,434	344.6
West Virginia	3,093,221	1,525,418	34.5	4,194,520	2,122,142	43.4	2,746,044	1,367,522	.3	547,366	273,683	.1	10,581,151	5,288,765	78.3
Wisconsin	14,109,528	6,960,114	131.2	10,113,800	4,959,980	416.3	4,378,430	2,139,017	8.6				28,601,758	14,059,111	556.1
Wyoming	4,019,959	2,608,530	58.0	3,802,415	2,466,820	179.3	1,974	1,974		335,681	216,380	7.0	8,160,029	5,293,704	244.3
District of Columbia	2,159,410	1,079,705	1.6	2,739,328	1,361,903	6.2	2,367,080	1,183,540	.2				7,265,818	3,625,148	8.0
Hawaii	1,741,096	862,413	7.7	2,509,801	1,238,895	21.9	1,133,846	534,647	.6				5,384,743	2,635,955	30.2
Puerto Rico	4,280,662	2,100,691	17.6	2,241,313	1,079,113	16.9	4,027,096	1,671,140	1.8				10,549,071	4,850,944	36.3
Total	462,972,555	241,981,666	5,269.7	361,810,167	186,357,142	14,668.3	326,268,856	164,279,462	330.3	28,092,610	14,439,165	178.6	1,179,144,188	607,057,435	20,446.9

[1] Initial commitment of funds.

Table 6.—*Projects involving Federal funds awarded to contract [1] during the fiscal year ended June 30, 1953, by program and by State*

State or Territory	Total cost	Total Federal funds	Federal-aid funds				Prewar Federal-aid grade crossing	Access roads, Act of 1950	Miles
			Primary [2]	Secondary	Urban	Interstate			
Alabama	$30,965,738	$15,271,019	$8,250,480	$5,623,370	$1,397,169				703.5
Arizona	8,980,146	5,826,428	2,280,112	2,191,966	681,131	$366,374		$306,845	199.8
Arkansas	12,705,327	6,273,901	2,571,404	2,324,237	1,328,260	50,000			328.2
California	59,636,158	31,283,403	13,800,744	6,915,364	9,274,345	175,000		1,117,950	379.0
Colorado	15,126,052	9,068,575	3,564,068	2,579,765	958,937			1,965,805	391.4
Connecticut	9,848,130	4,869,094	3,635,871	765,472	467,751				37.3
Delaware	4,050,264	2,014,978	1,011,242	450,263	553,473				17.9
Florida	12,481,593	6,623,217	1,345,100	2,030,989	2,855,510			391,618	222.3
Georgia	19,408,245	10,700,511	5,704,590	2,980,671	284,750			1,730,500	369.8
Idaho	8,158,226	5,128,266	2,517,606	2,600,366	3,494			6,800	201.2
Illinois	54,874,876	28,786,562	8,236,230	8,622,549	11,279,750	525,000		123,033	686.2
Indiana	22,196,784	11,465,803	3,565,886	3,741,235	4,127,626			31,056	288.5
Iowa	13,383,620	6,814,618	3,190,517	3,192,669	395,437	35,995			598.8
Kansas	25,884,075	12,979,475	5,519,337	4,938,797	1,478,523	411,908		630,910	1,421.4
Kentucky	23,880,514	12,231,519	4,067,699	4,166,555	3,758,727	59,500		179,038	349.7
Louisiana	19,112,145	9,187,010	3,601,020	2,616,840	2,855,960			113,190	89.3
Maine	9,964,867	4,935,388	1,424,899	1,918,678	1,226,551			365,260	74.8
Maryland	5,497,402	2,784,165	251,965	2,356,591	102,309			73,300	94.0
Massachusetts	10,072,836	4,822,807	1,591,948	466,584	2,764,275				12.3
Michigan	29,623,319	14,943,739	6,361,250	4,561,114	3,675,075			346,300	456.9
Minnesota	21,353,252	10,937,359	5,200,231	3,923,390	1,631,593		$130,071	52,074	1,391.7
Mississippi	23,474,424	12,031,928	5,293,667	6,011,911	660,830	1,000		64,520	826.6
Missouri	48,080,477	23,544,453	12,857,920	4,003,658	6,682,875				645.0
Montana	14,422,094	8,510,484	5,336,954	3,148,711	16,519			8,300	307.5
Nebraska	12,163,379	6,780,637	1,359,469	3,735,507	1,685,661				291.5
Nevada	7,194,488	5,463,344	3,012,028	1,870,981	120,560			459,775	296.8
New Hampshire	5,818,852	3,020,137	715,917	1,308,839	995,381				43.5
New Jersey	20,344,095	9,560,800	4,701,937	1,133,260	3,404,061	321,542			28.6
New Mexico	12,241,661	7,949,767	3,865,841	3,031,494	173,526	354,357		524,549	393.1
New York	96,586,030	44,710,431	10,402,104	3,939,779	30,167,115		65,804	135,629	327.6
North Carolina	27,734,865	13,534,295	6,447,010	5,036,305	2,026,980			24,000	597.0
North Dakota	17,305,194	8,811,097	4,822,616	3,374,306	45,724	268,815	299,636		1,564.0

Ohio	73,390,251	34,702,056	10,555,955	5,306,972	17,523,630			1,315,499	132.7
Oklahoma	10,731,971	5,780,994	2,994,810	1,835,510	298,168		524,478	128,028	218.4
Oregon	12,465,108	7,446,815	2,832,973	2,418,302	1,733,140	421,000		41,400	155.5
Pennsylvania	44,855,074	22,407,643	9,735,224	6,173,570	6,498,849				177.9
Rhode Island	6,391,929	3,193,646	1,785,036	1,336,629	71,981				30.0
South Carolina	12,847,549	6,744,186	2,992,835	2,498,963	781,688			470,700	384.6
South Dakota	11,136,020	6,730,566	2,611,303	2,583,861	673,137			862,265	581.2
Tennessee	25,034,027	11,204,512	4,933,261	3,459,934	2,756,835			54,482	453.5
Texas	56,975,518	31,727,265	13,165,800	9,440,865	5,675,900	880,500		2,564,200	1,525.9
Utah	9,303,424	7,114,572	2,042,379	2,517,320	1,252,408	281,925		1,020,540	386.3
Vermont	5,929,240	2,964,588	1,062,015	1,252,579	637,942	1,000	11,052		47.6
Virginia	31,539,917	15,590,422	5,804,700	3,692,524	5,820,621			272,577	347.7
Washington	19,637,181	10,564,545	3,791,730	2,049,317	3,796,879	408,623	243,712	274,284	247.2
West Virginia	16,715,913	8,410,078	3,619,620	2,690,223	2,100,235				128.1
Wisconsin	35,743,040	17,574,466	9,930,018	4,567,448	3,074,100			2,900	551.1
Wyoming	8,044,012	5,210,195	2,207,477	2,594,395	196,601	211,722			226.9
Alaska	54,000	54,000						54,000	4.5
District of Columbia	8,921,430	4,159,047	692,610	758,390	2,708,047				3.6
Hawaii	7,136,767	3,356,918	1,757,878	1,534,867	64,173				38.4
Puerto Rico	6,941,335	3,249,945	1,022,585	1,377,522	849,838				18.8
Total	1,106,362,834	569,051,669	230,045,871	163,651,407	153,594,050	4,774,261	1,274,753	15,711,327	19,295.1

[1] Includes force-account projects placed under construction during the fiscal year.
[2] Funds available for either rural or urban portions of the Federal-aid primary highway system.

Table 7.—*Status of projects as of June 30, 1953, and projects completed during the fiscal year* [1]

State or Territory	Programed,[2] plans not approved			Plans approved, not under construction			Under construction			Completed during fiscal year		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama	$23, 519, 864	$12, 008, 868	373. 4	$8, 104, 209	$4, 102, 562	223. 0	$34, 674, 144	$17, 677, 128	487. 2	$18, 985, 687	$9, 346, 730	599. 2
Arizona	5, 520, 330	3, 864, 443	119. 1	1, 905, 948	1, 336, 720	13. 8	6, 784, 555	4, 668, 368	235. 7	12, 068, 060	7, 893, 290	221. 3
Arkansas	8, 344, 038	4, 492, 649	256. 9	4, 252, 720	2, 144, 046	185. 8	14, 931, 254	7, 592, 951	287. 0	15, 563, 418	7, 701, 076	545. 3
California	14, 718, 069	6, 787, 032	103. 5	20, 847, 664	10, 372, 898	67. 7	102, 125, 171	51, 108, 980	286. 8	43, 811, 531	20, 942, 495	340. 0
Colorado	10, 109, 105	5, 705, 484	232. 8	1, 809, 250	985, 487	38. 5	14, 357, 519	8, 376, 139	269. 8	18, 390, 857	10, 400, 231	539. 7
Connecticut	1, 326, 236	714, 767	2. 6	1, 774, 748	873, 938	2. 3	13, 008, 136	6, 403, 340	33. 9	7, 440, 176	4, 122, 181	17. 8
Delaware	1, 668, 300	836, 270	8. 4	55, 090	27, 545	----------	7, 119, 767	3, 602, 211	31. 9	2, 615, 918	1, 292, 993	35. 9
Florida	21, 435, 305	11, 048, 391	329. 7	5, 881, 409	3, 039, 346	124. 9	15, 454, 584	7, 982, 291	219. 8	13, 985, 830	7, 074, 728	283. 0
Georgia	21, 355, 130	10, 901, 385	583. 4	4, 009, 575	2, 182, 314	53. 7	37, 694, 004	19, 141, 345	571. 6	19, 484, 240	9, 739, 526	412. 9
Idaho	12, 111, 030	7, 356, 109	312. 6	3, 609, 753	2, 271, 438	82. 8	10, 451, 949	6, 653, 830	189. 5	6, 279, 609	3, 947, 010	175. 9
Illinois	39, 722, 330	21, 734, 617	209. 6	25, 342, 136	12, 727, 435	237. 9	63, 350, 141	32, 840, 691	529. 0	76, 412, 174	38, 605, 003	846. 6
Indiana	37, 435, 088	19, 548, 953	170. 1	11, 165, 012	5, 520, 175	87. 0	28, 189, 831	15, 153, 664	189. 4	21, 751, 075	11, 125. 072	427. 0
Iowa	17, 374, 122	9. 267, 706	570. 7	8, 628, 942	5, 218, 365	362. 5	13, 818, 838	6, 909, 446	544. 5	23, 156, 992	11, 551, 063	1, 082. 5
Kansas	11, 947, 159	5, 965, 875	957. 4	9, 668, 809	4, 785, 816	491. 1	15, 327, 313	7, 620, 476	647. 6	25, 697, 083	13, 269, 963	1, 290. 0
Kentucky	14, 167, 330	7, 382, 859	195. 1	7, 709, 449	4, 438, 645	103. 3	19, 980, 569	10, 096, 128	306. 8	19, 452, 309	10, 182, 141	388. 4
Louisiana	16, 712, 893	8, 384, 914	124. 1	8, 869, 012	4, 423, 756	58. 4	23, 334, 815	11, 199, 262	121. 9	14, 733, 265	7, 380, 900	157. 9
Maine	9, 995, 470	5, 002, 635	86. 3	441, 675	230, 587	. 5	16, 143, 460	8, 898, 819	97. 5	6, 500, 064	3, 458, 799	69. 2
Maryland	10, 005, 200	5, 175, 800	79. 8	2, 952, 449	1, 338, 215	26. 4	8, 719, 825	4, 852, 107	39. 4	6, 332, 883	3, 462, 198	103. 4
Massachusetts	8, 619, 508	4, 454, 754	16. 7	857, 786	428, 893	----------	40, 417, 719	19, 250, 658	40. 1	23, 679, 357	12, 153, 565	27. 4
Michigan	29, 422, 883	15, 252, 703	588. 0	7, 991, 460	4, 027, 320	188. 6	55, 610, 818	24, 158, 321	239. 8	36, 863, 341	18, 484, 122	598. 4
Minnesota	12, 078, 269	6, 610, 944	943. 6	10, 768, 524	5, 599, 761	784. 6	17, 071, 678	9, 253, 464	486. 1	32, 271, 064	16, 684, 429	1, 790. 2
Mississippi	17, 106, 082	8, 617, 370	584. 6	5, 084, 777	2, 523, 189	235. 9	20, 481, 039	10, 536, 905	556. 6	19, 424. 801	10, 090, 509	652. 2
Missouri	16, 988, 947	8, 916, 922	825. 6	8, 896, 909	4, 453, 552	179. 7	55, 542, 047	28, 130, 557	479. 8	33, 679, 761	16, 962, 405	869. 7
Montana	13, 652, 789	8, 742, 479	285. 8	4, 904, 289	2, 853, 290	140. 3	16, 974, 736	10, 223, 872	285. 0	17, 226, 602	10, 177, 802	329. 7
Nebraska	13, 209, 450	7, 073, 075	546. 9	4, 752, 525	2, 705, 039	167. 1	12, 776, 846	6, 943, 955	285. 1	19, 381, 315	9, 660, 441	620. 6
Nevada	4, 259, 539	3, 565, 366	73. 8	882, 813	738, 733	35. 6	7, 209, 952	5, 448, 387	247. 4	5, 955, 983	4, 903, 910	352. 6
New Hampshire	4, 083, 150	2, 041. 575	18. 6	1, 070, 415	532, 755	8. 0	6, 259, 005	3, 250, 615	38. 9	5, 510, 669	2, 734, 839	43. 4
New Jersey	8, 951, 815	4, 397, 555	63. 2	2, 094, 128	961, 626	3. 0	31, 670, 729	15, 312, 491	38. 1	20, 803, 921	10, 097, 780	18. 2
New Mexico	4, 845, 340	3, 088, 601	113. 9	3, 189, 052	2, 019, 238	69. 6	7, 177, 060	4, 618, 684	183. 9	18, 851, 145	12, 157, 947	545. 1
New York	91, 714, 809	48, 035, 495	199. 9	40, 596, 830	20, 530, 568	147. 1	126, 482, 685	58, 651, 054	346. 6	59, 629, 806	26, 739, 787	353. 9
North Carolina	22, 929, 058	11, 180, 819	455. 7	4, 569, 832	2, 231, 676	189. 5	32, 711, 560	15, 613, 630	597. 9	17, 914, 022	9, 008, 653	395. 6
North Dakota	5, 343, 987	2, 686, 074	953. 1	7, 887, 720	3, 943, 860	699. 9	9, 328, 093	4, 840, 688	656. 5	16, 221, 767	8, 060, 727	1, 622. 3

Ohio	25,626,134	12,698,167	158.3	27,001,345	12,171,385	91.0	80,908,194	41,002,257	102.6	52,470,382	25,605,716	240.8
Oklahoma	8,331,547	4,605,147	186.7	6,001,624	3,162,151	92.8	16,867,696	8,926,483	240.9	20,288,525	10,736,019	321.9
Oregon	858,350	462,700	15.2	3,797,415	2,272,817	130.4	15,300,518	9,203,915	218.8	17,603,282	9,525,260	221.8
Pennsylvania	43,393,194	20,167,597	75.4	26,465,457	12,591,093	64.3	86,730,566	43,151,808	218.2	38,596,137	19,205,107	114.7
Rhode Island	3,276,690	1,638,345	32.0	160,826	80,413		19,316,253	10,036,725	28.9	5,116,983	2,597,465	26.7
South Carolina	7,881,372	4,371,029	178.4	2,737,600	1,356,600	143.1	19,756,957	10,170,858	377.9	14,238,457	9,352,358	474.3
South Dakota	9,948,150	5,912,585	678.6	4,225,126	2,409,935	240.7	8,889,308	5,457,926	399.4	15,789,928	9,165,796	959.3
Tennessee	16,732,782	9,254,431	537.4	7,967,060	3,883,045	211.8	35,450,216	15,834,577	283.0	18,849,964	9,313,010	608.4
Texas	5,052,900	2,719,200	104.5	19,039,994	10,856,200	400.7	59,935,965	33,943,600	903.9	57,228,550	29,180,600	1,767.5
Utah	3,552,809	2,714,128	55.4	3,149,346	2,479,537	139.5	13,504,991	10,315,719	301.0	6,668,202	5,013,092	390.4
Vermont	4,500,700	2,434,600	46.9	1,485,511	742,591	12.4	8,936,644	4,455,255	60.5	3,487,742	1,782,930	46.2
Virginia	16,861,297	7,471,644	173.7	9,754,224	4,660,209	142.8	34,087,447	16,909,942	270.4	25,792,828	13,393,988	496.5
Washington	10,270,866	5,561,474	198.1	5,150,451	3,074,335	91.8	14,711,427	7,877,990	112.4	22,550,482	11,648,383	380.0
West Virginia	6,846,979	3,454,157	43.2	3,960,407	2,004,415	6.2	19,699,635	9,862,634	157.4	9,082,969	4,544,336	114.7
Wisconsin	14,139,844	7,739,094	272.3	7,463,471	3,567,636	190.0	38,825,849	19,706,268	404.1	29,310,795	14,385,130	649.3
Wyoming	3,042,686	1,995,883	77.7	2,365,320	1,550,459	93.5	7,672,331	5,056,247	136.5	8,794,101	5,671,974	220.4
Alaska							54,000	54,000	4.5			
District of Columbia	7,808,196	3,664,098	6.0	4,837,422	2,213,950	2.0	11,147,874	5,281,797	1.9	635,930	511,189	.2
Hawaii	2,919,090	1,426,025	7.6	1,525,891	737,885	5.2	10,246,157	4,965,399	19.4	9,052,252	3,459,768	35.9
Puerto Rico	11,495,904	5,321,802	57.3	1,173,907	571,732	4.8	13,899,176	6,633,030	44.7	5,941,566	2,736,967	18.0
Total	733,211,815	384,454,595	13,289.6	368,837,298	189,955,176	7,071.5	1,401,121,046	715,856,887	13,857.5	1,041,573,780	537,271,403	22,842.3

[1] Includes projects financed from Federal-aid primary, secondary, urban, and interstate, prewar Federal-aid primary and grade crossing, Defense Highway Act, and 1950 access funds.

[2] Initial commitment of funds.

Table 8.—*Status of projects as of June 30, 1953, and projects completed during the fiscal year,[1] on Federal-aid rural primary system*

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	$19,023,992	$9,739,132	221.3	$4,057,095	$2,083,125	51.8	$14,593,759	$7,546,807	78.4	$9,995,432	$5,035,630	110.2
Arizona	2,324,454	1,667,078	33.0	1,523,717	1,096,375	10.0	3,657,749	2,288,576	41.8	7,300,506	4,633,652	102.6
Arkansas	3,877,514	1,941,117	61.6	2,802,330	1,406,533	95.4	7,952,200	4,103,551	98.1	8,079,607	4,029,755	189.8
California	3,037,485	1,124,284	4.4	5,707,142	2,518,181	16.3	32,197,500	15,835,818	68.7	14,203,224	5,848,559	50.7
Colorado	5,316,557	3,011,312	73.8	244,121	136,247	.7	7,610,036	4,478,141	128.2	10,954,420	5,763,952	216.1
Connecticut	601,972	350,986	.2	639,943	315,830	.3	8,352,010	4,133,670	26.4	1,752,205	1,129,287	8.7
Delaware	1,068,300	536,270	7.6				4,151,108	2,071,700	18.5	1,111,025	551,922	11.1
Florida	10,796,072	5,506,636	171.3	1,180,503	592,174	22.3	4,829,544	2,394,077	68.4	5,328,078	2,785,845	44.6
Georgia	7,509,800	3,917,320	98.7	829,906	626,735	7.1	16,052,193	8,169,367	133.7	9,598,785	4,734,470	93.5
Idaho	7,350,824	4,398,961	131.7	1,431,971	893,731	30.4	5,383,609	3,453,692	57.9	2,641,818	1,720,774	42.9
Illinois	8,061,366	4,189,890	63.0	5,465,491	2,748,424	43.4	18,917,419	9,527,496	150.4	38,898,105	19,365,059	465.7
Indiana	9,982,168	5,001,784	40.3	1,578,985	790,267	6.4	11,687,218	5,850,009	40.0	11,885,532	5,913,829	222.9
Iowa	5,735,876	3,082,178	99.7	2,156,035	1,084,061	74.1	5,536,039	2,770,585	76.2	11,420,647	5,742,565	317.9
Kansas	4,717,942	2,201,235	130.8	3,455,523	1,739,323	73.9	7,364,312	3,488,744	149.8	15,236,324	7,637,997	303.3
Kentucky	6,206,900	3,238,450	83.0	2,470,970	1,360,623	18.8	8,096,509	4,097,640	69.6	8,647,966	4,426,866	122.8
Louisiana	9,876,066	4,937,253	58.3	3,389,678	1,694,159	15.8	8,319,474	4,017,993	62.8	9,695,360	4,847,210	80.6
Maine	5,360,834	2,694,417	42.0	4,302	3,872		4,805,173	2,524,646	20.8	1,936,925	1,022,045	18.3
Maryland	5,672,200	2,836,100	17.2	1,029,204	377,102	1.9	3,304,030	1,625,965	6.0	3,925,250	2,309,235	13.6
Massachusetts	176,420	88,210		244,144	122,072		7,568,633	3,764,365	13.5	5,367,810	2,670,756	5.6
Michigan	16,262,308	8,061,648	135.1	2,799,200	1,399,600	50.6	14,058,950	7,029,475	102.9	10,147,259	5,212,254	148.4
Minnesota	3,754,487	2,197,244	46.3	2,672,062	1,443,880	32.3	7,484,636	3,796,929	162.2	14,827,705	7,512,498	387.4
Mississippi	8,384,996	4,365,637	138.0	236,900	122,350	9.6	10,316,870	5,408,325	158.6	8,835,197	4,775,078	262.9
Missouri	3,396,404	2,005,902	22.0	2,925,202	1,462,601	17.2	23,256,744	11,302,569	137.7	11,333,427	5,742,320	128.0
Montana	9,341,619	6,141,669	127.7	2,514,767	1,459,653	54.5	8,511,409	5,077,308	109.4	10,963,193	6,573,776	158.4
Nebraska	6,910,714	3,601,857	201.1	1,864,937	940,241	65.2	4,333,689	2,156,794	77.2	12,283,470	6,051,457	364.6
Nevada	3,944,690	3,301,728	44.6	263,825	220,768	13.7	5,121,730	3,715,836	158.1	3,014,620	2,480,124	84.7
New Hampshire	2,000,000	1,000,000	10.0	39,646	19,823		2,243,502	1,108,081	10.7	3,231,450	1,605,986	24.0
New Jersey	3,022,572	1,485,024	7.3				14,206,558	6,615,236	18.0	2,888,211	1,366,443	5.1
New Mexico	1,760,000	1,120,898	24.5	959,919	608,598	21.9	5,340,764	3,393,028	96.4	7,266,950	4,647,139	161.2
New York	25,176,136	13,543,068	85.3	6,563,728	3,104,696	87.9	23,528,490	11,085,930	131.7	17,087,276	7,543,009	212.8
North Carolina	9,023,952	4,210,306	154.9	156,310	77,740	2.2	14,838,700	6,842,130	147.0	8,439,916	4,218,775	102.2
North Dakota	341,131	176,886		5,638,033	2,819,016	251.8	4,925,092	2,654,393	262.9	8,566,652	4,254,723	437.3

Ohio	4,044,716	1,522,358	9.2	11,308,650	5,241,341	25.6	20,915,166	10,829,094	41.9	23,483,953	12,113,019	106.9
Oklahoma	4,652,000	2,511,634	45.4	2,231,205	1,175,422	28.7	7,338,612	4,021,770	61.8	10,099,333	5,273,821	147.7
Oregon	90,000	54,000		1,458,449	873,417	25.0	7,435,125	4,484,973	81.9	7,724,017	3,787,152	76.7
Pennsylvania	8,031,320	4,015,660	15.1	9,666,111	4,832,863	19.7	23,025,516	11,512,758	36.9	9,347,890	4,673,945	26.9
Rhode Island	1,050,000	525,000	5.5	65,220	32,610		3,718,594	1,857,604	11.3	1,042,692	561,361	3.7
South Carolina	4,599,315	2,609,586	49.8	266,800	151,250	.7	7,717,224	4,029,076	46.0	2,851,650	1,643,565	35.7
South Dakota	4,890,538	2,917,035	194.9	2,319,456	1,326,587	105.5	4,220,790	2,742,874	124.8	7,502,104	4,274,477	265.6
Tennessee	5,112,060	2,556,030	99.1	3,882,416	1,945,204	49.4	15,820,500	7,305,500	110.6	5,773,537	2,911,037	59.1
Texas	3,327,500	1,819,350	56.5	5,029,234	2,847,100	93.3	18,180,070	9,723,100	234.4	17,233,885	8,611,975	344.3
Utah	800,000	603,040	8.0	2,080,347	1,576,124	42.3	7,372,296	5,613,561	59.5	2,724,903	1,854,906	59.8
Vermont	3,519,500	1,944,000	30.8	533,732	266,701	4.4	4,615,818	2,297,633	19.1	1,568,484	779,598	19.5
Virginia	5,143,594	2,150,120	33.6	3,518,237	1,728,728	38.9	14,436,773	7,088,349	70.3	14,552,582	7,279,394	166.2
Washington	4,783,311	2,450,090	71.3	2,389,622	1,231,037	26.3	5,243,574	2,786,641	38.0	8,902,003	4,518,571	93.8
West Virginia	4,216,010	2,108,005	18.4	241,100	114,420	2.8	8,524,925	4,243,370	66.2	2,990,303	1,501,342	29.1
Wisconsin	3,964,203	2,029,411	21.8	2,947,720	1,408,951	34.4	18,989,821	9,848,375	159.9	15,085,437	7,308,838	220.6
Wyoming	1,590,153	1,045,305	29.2	345,516	237,306	6.6	4,075,379	2,623,746	50.2	5,595,697	3,619,752	105.0
Hawaii				563,040	281,520	3.4	2,223,406	1,089,122	4.5	2,030,949	1,000,367	15.6
Puerto Rico	4,055,500	1,991,000	22.1	822,095	408,119	2.1	3,210,147	1,480,873	7.1	2,288,214	1,117,663	7.0
Total	273,885,471	144,526,104	3,045.4	114,514,539	58,946,500	1,584.6	495,609,385	255,907,295	4,106.4	437,661,978	224,983,773	6,681.1

[1] Includes projects on rural portions of the Federal-aid primary highway system financed from Federal-aid primary and interstate, prewar Federal-aid primary and grade crossing, Defense Highway Act, and 1950 access funds.

[2] Initial commitment of funds.

Table 9.—*Status of projects as of June 30, 1953, and projects completed during the fiscal year,[1] on secondary roads in rural areas*

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, 890, 872	$1, 945, 636	149. 9	$3, 641, 206	$1, 745, 083	170. 2	$9, 158, 414	$4, 303, 690	371. 5	$8, 308, 117	$3, 963, 031	482. 3
Arizona	2, 363, 554	1, 678, 036	82. 0	200, 623	146, 186	3. 0	2, 377, 782	1, 845, 224	191. 8	3, 599, 496	2, 504, 067	111. 2
Arkansas	2, 684, 038	1, 346, 739	185. 0	1, 396, 260	710, 448	88. 4	4, 245, 554	2, 128, 650	184. 4	6, 862, 924	3, 360, 878	352. 5
California	7, 046, 325	3, 745, 813	93. 1	1, 284, 284	738, 652	38. 8	11, 352, 171	6, 020, 203	155. 8	13, 372, 586	7, 027, 282	270. 4
Colorado	4, 542, 548	2, 552, 698	159. 0	1, 535, 329	832, 511	37. 8	4, 076, 801	2, 451, 601	141. 2	6, 474, 258	4, 165, 643	319. 7
Connecticut	24, 006	12, 003		288, 302	140, 333	. 9	1, 150, 477	572, 280	1. 7	1, 733, 684	833, 244	3. 5
Delaware	200, 000	100, 000	. 1	55, 090	27, 545		1, 859, 946	977, 038	11. 9	1, 495, 821	737, 317	24. 8
Florida	4, 447, 045	2, 265, 661	146. 2	3, 057, 595	1, 621, 079	90. 7	3, 322, 938	1, 830, 347	136. 8	5, 727, 529	2, 737, 312	224. 3
Georgia	11, 657, 330	5, 890, 065	477. 8	899, 266	478, 913	41. 3	11, 164, 295	6, 550, 195	420. 3	7, 832, 411	3, 961, 336	313. 0
Idaho	4, 760, 206	2, 957, 148	181. 0	1, 055, 190	679, 748	48. 3	5, 062, 755	3, 196, 645	131. 6	3, 179, 677	1, 937, 691	130. 8
Illinois	5, 068, 418	2, 559, 704	132. 9	6, 645, 094	3, 307, 992	189. 2	12, 368, 615	6, 134, 754	343. 2	8, 439, 782	4, 221, 454	288. 8
Indiana	13, 571, 446	6, 779, 732	111. 6	5, 068, 825	2, 460, 330	70. 4	6, 422, 417	3, 029, 240	126. 1	4, 804, 283	2, 384, 058	148. 6
Iowa	7, 061, 440	3, 572, 125	451. 9	3, 468, 926	1, 728, 276	284. 6	6, 245, 181	3, 123, 224	430. 8	8, 771, 639	4. 331, 723	739. 3
Kansas	6, 353, 150	3, 248, 073	823. 3	5, 095, 840	2, 487, 770	412. 3	5, 541, 895	2, 803, 925	465. 7	6, 793, 630	3, 380, 609	977. 7
Kentucky	4, 968, 717	2, 511, 052	107. 9	2, 990, 296	1, 652, 519	77. 7	6, 938, 391	3, 501, 151	219. 6	8, 120, 532	4, 451. 613	260. 3
Louisiana	4, 758, 020	2, 377, 210	61. 8	4, 728, 872	2, 363, 306	39. 3	3, 195, 850	1, 615, 070	56. 5	3, 771, 926	1, 900, 700	61. 1
Maine	4, 140, 636	2, 061, 218	41. 3	20, 073	18, 066		8, 043, 724	4, 619, 647	70. 2	3, 006, 713	1, 657, 756	43. 6
Maryland	3, 809, 000	2, 077, 700	60. 9	1, 793, 281	896, 131	24. 6	2, 747, 177	1, 418, 833	30. 6	898, 911	474, 107	87. 0
Massachusetts	1, 802, 016	1, 046, 008	11. 9	65, 308	32, 654		2, 382, 813	1, 166, 910	12. 0	1, 529, 590	745, 223	11. 2
Michigan	9, 363, 100	4, 946, 368	450. 2	3, 051, 260	1, 557, 220	131. 6	5, 846, 885	2, 938, 852	126. 3	9, 896, 032	5, 096, 592	422. 4
Minnesota	5, 400, 151	2, 803, 685	882. 2	5, 210, 308	2, 610, 543	727. 2	3, 427, 506	1, 542, 766	280. 5	10, 577, 863	5, 352, 065	1, 348. 3
Mississippi	7, 398, 378	3, 590, 379	441. 9	3, 636, 477	1, 795, 139	219. 3	7, 345, 703	3, 628, 797	388. 5	9, 445, 610	4, 743, 433	385. 6
Missouri	11, 668, 155	5, 851, 392	801. 4	2, 830, 942	1, 420, 569	161. 7	5, 767, 084	2, 882, 412	319. 5	10, 484, 071	5, 369, 868	736. 3
Montana	3, 811, 781	2, 316, 309	155. 5	2, 375, 135	1, 385, 437	85. 8	7, 721, 286	4, 527, 591	175. 2	4, 561, 629	2, 619, 696	165. 4
Nebraska	5, 949, 470	3, 276, 985	342. 9	2, 262, 361	1, 278, 419	93. 6	5, 661, 983	3, 380, 173	205. 6	5, 938, 316	3, 001, 883	254. 0
Nevada	313, 026	262, 105	29. 2	618, 988	517, 965	21. 9	1, 707, 398	1, 431, 472	86. 9	2, 439, 753	2, 018, 498	265. 2
New Hampshire	675, 000	337, 500	5. 4	617, 585	308, 292	6. 2	2, 183, 001	1, 089, 698	22. 6	1, 782, 841	882, 569	18. 0
New Jersey	3, 272, 195	1, 628, 065	54. 6	45, 070	22, 535	. 4	992, 799	488, 444	4. 3	751, 202	324, 833	3. 5
New Mexico	2, 415, 000	1, 542, 708	88. 6	1, 299, 640	821, 971	41. 1	1, 277, 374	871, 299	79. 7	6, 870, 314	4, 333, 852	318. 9
New York	10, 071, 528	5, 069, 264	73. 9	5, 009, 236	2, 477, 570	42. 4	18, 021, 132	8, 199. 365	140. 9	8, 610, 024	3, 950, 153	100. 1
North Carolina	9, 021, 706	4, 577, 313	286. 6	1, 641, 210	812, 985	172. 9	11, 418, 060	5, 621, 850	390. 4	7, 298. 031	3, 687, 123	276. 3
North Dakota	5, 002, 856	2, 509, 188	953. 1	1, 963, 796	981, 898	433. 6	4, 058, 610	2, 014, 100	378. 9	6, 572, 066	3, 261, 285	1, 182. 1

Ohio	13, 154, 448	6, 497, 324	134. 8	8, 967, 780	3, 638, 786	62. 0	11, 435, 462	5, 792, 385	45. 3	10. 689, 043	5, 553, 833	119. 5
Oklahoma	1, 529, 547	809, 371	129. 3	1, 823, 099	955, 497	62. 1	6, 603, 419	3. 369, 553	165. 4	4, 114, 769	2, 125, 019	161. 3
Oregon	478, 549	286, 700	15. 2	1, 680, 654	991, 400	98. 5	4, 733, 930	2, 856, 802	131. 1	7, 631, 524	4, 388, 548	136. 7
Pennsylvania	7, 387, 154	3, 686, 077	48. 6	5, 572, 626	2, 786, 313	38. 0	13, 859, 016	6, 772, 663	145. 6	9, 011, 545	4, 476, 519	69. 1
Rhode Island	2, 226, 690	1, 113, 345	26. 4	43, 480	21, 740		961, 706	473. 603	6. 4	696, 636	348, 214	5. 4
South Carolina	1, 875, 402	949, 952	124. 0	2, 389, 800	1, 164, 850	141. 3	5, 023, 477	2, 434, 858	326. 4	8. 956, 740	6. 486, 851	422. 1
South Dakota	4, 789, 612	2, 845, 015	481. 5	1, 522, 130	868, 107	132. 3	4, 042, 836	2. 363, 922	271. 8	7, 786, 935	4, 610. 130	691. 6
Tennessee	8, 820, 722	4, 398, 401	437. 1	3, 733, 536	1, 762, 287	158. 4	5, 178, 692	2. 499, 065	150. 9	9, 184. 910	4, 582, 156	537. 7
Texas	1, 484, 200	779, 250	48. 0	5, 056, 396	2, 592, 450	290. 9	11, 035, 117	5. 693, 400	600. 9	17, 627, 862	8, 814, 900	1, 322. 0
Utah	1, 984, 375	1, 492, 997	43. 0	823, 448	686, 475	96. 9	4, 192, 188	3, 261, 574	234. 2	3. 070. 573	2. 569, 622	324. 8
Vermont	981, 200	490, 600	16. 2	329, 468	164, 734	6. 8	3, 757, 162	1, 875, 791	38. 7	1, 758, 536	901. 938	26. 6
Virginia	5, 940, 288	3, 179, 439	127. 4	3, 288, 592	1, 695, 565	97. 9	8, 314, 772	4. 258, 274	189. 0	10, 415, 142	5, 702. 206	327. 8
Washington	4, 598, 569	2, 656, 112	123. 1	1, 086, 924	821, 198	65. 3	2, 499, 614	1, 352. 177	69. 3	7. 932, 668	4. 159, 385	267. 8
West Virginia	2, 534, 769	1, 298, 052	24. 6	460, 307	265. 995	3. 0	6. 277, 850	3, 168. 100	86. 0	3. 644, 221	1, 828. 119	80. 1
Wisconsin	6, 205, 407	3, 165, 906	244. 9	3. 064, 120	1, 463, 226	150. 2	8, 963, 220	4. 125, 583	231. 0	8. 252, 661	3. 937. 155	413. 3
Wyoming	1, 452, 533	950, 578	48. 5	1, 657, 647	1, 078, 862	85. 5	2, 650, 701	1. 711, 620	83. 6	3. 018, 281	1, 934, 937	114. 1
Alaska							54, 000	54, 000	4. 5			
Hawaii	1, 781, 480	886, 621	6. 8				3. 576. 145	1, 695. 429	13. 8	1. 928, 310	900. 773	18. 9
Puerto Rico	3, 465, 500	1, 676, 500	30. 5	351, 813	163, 613	2. 7	4, 605, 838	2, 193. 420	32. 9	714, 551	337. 912	7. 7
Total	238, 201, 558	124, 600, 122	9, 953. 0	115, 703, 488	59, 179, 183	5, 247. 0	290. 851, 162	151, 857, 665	8, 927. 8	306. 416, 168	163. 108, 111	15, 402. 7

[1] Includes projects on secondary roads in rural areas financed from Federal-aid secondary, prewar Federal-aid grade crossing, Defense Highway Act, and 1950 access funds.
[2] Initial commitment of funds.

Table 10.—*Status of projects as of June 30, 1953, and projects completed during the fiscal year,[1] in urban areas*

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	$605,000	$324,100	2.2	$405,908	$274,354	1.1	$10,921,971	$5,826,631	37.3	$682,138	$348,069	6.7
Arizona	832,322	519,329	4.1	181,608	94,158	.7	749,025	534,568	2.1	1,168,057	755,571	7.5
Arkansas	1,782,486	1,204,793	10.3	54,130	27,065	1.9	2,733,500	1,360,750	4.5	620,886	310,443	3.0
California	4,634,259	1,916,935	6.0	13,856,238	7,116,065	12.6	58,575,500	29,252,959	62.3	16,235,721	8,066,654	18.9
Colorado	250,000	141,475		29,800	16,729		2,670,681	1,446,397	.4	962,180	470,636	3.8
Connecticut	700,258	351,778	2.4	846,503	417,775	1.1	3,505,649	1,697,389	5.8	3,954,287	2,159,650	5.6
Delaware	400,000	200,000	.7				1,108,713	553,473	1.5	9,072	3,754	
Florida	6,192,188	3,276,094	12.3	1,643,302	826,093	11.8	7,302,102	3,757,867	14.7	2,930,223	1,551,571	14.1
Georgia	2,188,000	1,094,000	6.9	2,280,402	1,076,666	5.3	10,477,516	4,421,783	17.6	2,053,045	1,043,719	6.3
Idaho				1,122,593	697,959	4.0	5,585	3,494		458,114	288,545	2.2
Illinois	26,592,546	14,985,023	13.7	13,231,550	6,671,019	5.3	32,064,107	17,178,442	35.5	29,074,287	15,018,490	92.0
Indiana	13,881,474	7,767,437	18.2	4,517,202	2,269,578	10.2	10,080,196	6,274,415	23.4	5,061,260	2,827,185	55.6
Iowa	4,576,806	2,613,403	19.2	3,003,980	2,406,028	3.8	2,037,618	1,015,636	37.5	2,964,706	1,473,775	25.4
Kansas	876,067	516,567	3.4	1,117,446	558,723	4.9	2,421,106	1,327,807	32.2	3,667,129	2,251,356	9.0
Kentucky	2,991,713	1,633,357	4.2	2,248,183	1,425,503	6.8	4,945,669	2,497,337	17.5	2,683,811	1,303,662	5.3
Louisiana	2,078,807	1,070,451	3.9	750,462	366,291	3.3	11,819,491	5,566,198	2.6	1,265,980	632,990	16.2
Maine	494,000	247,000	3.0	417,300	208,650	.5	3,294,563	1,754,526	6.5	1,556,426	778,997	7.2
Maryland	524,000	262,000	1.6	129,964	64,982		2,668,618	1,807,309	2.7	1,508,722	678,856	2.8
Massachusetts	6,641,072	3,320,536	4.8	548,334	274,167		30,466,273	14,319,383	14.6	16,781,957	8,737,587	10.6
Michigan	3,797,475	2,244,687	2.6	2,141,000	1,070,500	6.4	35,704,983	14,189,994	10.6	16,820,050	8,175,276	27.7
Minnesota	2,923,631	1,610,015	15.1	2,886,154	1,545,338	25.2	6,159,536	3,913,769	43.5	6,865,495	3,819,866	54.5
Mississippi	1,322,708	661,354	4.7	1,211,400	605,700	7.0	2,818,466	1,499,783	9.4	1,143,994	571,997	3.6
Missouri	1,924,388	1,059,628	2.2	3,140,765	1,570,383	.9	26,518,219	13,945,576	22.6	11,862,263	5,850,217	5.4
Montana	499,389	284,500	2.6	14,386	8,200		742,041	618,973	.3	1,701,780	984,331	5.9
Nebraska	349,266	194,233	2.9	625,226	486,379	8.3	2,781,174	1,406,987	2.3	1,159,528	607,102	2.1
Nevada	1,823	1,533					380,824	301,079	2.4	501,609	405,288	2.7
New Hampshire	1,408,150	704,075	3.1	413,184	204,639	1.9	1,832,503	1,052,836	5.7	496,378	246,285	1.4
New Jersey	2,657,048	1,284,466	1.3	2,049,058	939,091	2.5	16,471,372	8,208,811	15.9	17,164,508	8,406,504	9.5
New Mexico	670,340	424,995	.8	929,493	588,670	6.6	558,923	354,357	7.7	4,713,881	3,176,956	35.0
New York	56,467,145	29,423,163	40.7	29,023,866	14,948,302	16.8	84,933,062	39,365,760	74.0	33,902,506	15,246,625	41.1
North Carolina	4,883,400	2,393,200	14.2	2,772,312	1,340,951	14.4	6,454,800	3,149,650	60.5	2,176,075	1,102,755	17.2
North Dakota				285,891	142,946	14.5	344,390	172,195	14.6	1,083,049	544,720	3.0

Ohio	8,426,970	4,678,485	14.4	6,724,915	3,291,258	3.4	48,557,566	24,380,778	15.4	18,297,386	7,938,864	14.4
Oklahoma	2,150,000	1,284,142	11.9	1,947,320	1,031,232	2.0	2,925,666	1,535,161	13.8	6,074,424	3,337,179	12.8
Oregon	289,801	122,000		658,313	408,000	7.0	3,131,463	1,862,140	5.7	2,247,741	1,349,560	8.5
Pennsylvania	27,974,720	12,465,860	11.7	11,226,720	4,971,917	6.6	49,846,034	24,866,387	35.6	20,236,702	10,054,643	18.7
Rhode Island				52,126	26,063		14,635,952	7,705,518	11.2	3,377,655	1,687,890	17.6
South Carolina	1,406,655	811,491	4.6	81,000	40,500	1.0	7,016,256	3,706,924	5.5	2,430,067	1,221,941	16.5
South Dakota	268,000	150,535	2.2	383,540	215,241	2.9	625,682	351,130	2.8	500,889	281,189	2.1
Tennessee	2,800,000	2,300,000	1.1	351,108	175,554	4.0	14,451,024	6,030,012	21.5	3,891,517	1,819,817	11.6
Texas	241,200	120,600		8,954,364	5,416,650	16.5	30,729,779	18,527,100	68.6	22,366,783	11,723,725	101.2
Utah	768,434	618,091	4.4	245,551	216,938	.2	1,940,507	1,440,584	7.3	872,726	618,564	5.8
Vermont				622,311	311,155	1.2	563,663	281,831	2.7	160,723	101,394	.1
Virginia	5,777,415	2,142,085	12.6	2,947,395	1,235,916	6.1	11,335,902	5,563,319	11.2	825,104	412,388	2.5
Washington	888,986	455,272	3.7	1,673,906	1,022,100	.3	6,968,238	3,739,172	5.0	5,715,812	2,970,427	18.4
West Virginia	96,200	48,100	.2	3,259,000	1,624,000	.4	4,896,860	2,451,164	5.2	2,448,445	1,214,875	5.5
Wisconsin	3,970,234	2,543,777	5.7	1,451,631	695,459	5.4	10,872,809	5,732,310	13.1	5,972,697	3,139,137	15.4
Wyoming				362,158	234,291	1.3	946,251	720,881	2.7	180,122	117,285	1.3
District of Columbia	7,808,196	3,664,098	6.0	4,837,422	2,213,950	2.0	11,147,874	5,281,797	1.9	635,930	511,189	.2
Hawaii	1,137,610	539,404	.8	962,851	456,365	1.8	4,446,606	2,180,848	1.1	5,092,993	1,558,628	1.4
Puerto Rico	3,974,604	1,654,302	4.8				6,083,191	2,958,737	4.8	2,938,801	1,281,392	3.2
Total	221,124,786	115,328,369	291.2	138,619,271	71,829,493	239.9	614,660,499	308,091,927	823.3	297,495,634	119,179,519	758.5

[1] Includes projects in urban areas financed from Federal-aid primary, secondary, urban, and interstate, prewar Federal-aid primary and grade crossing, Defense Highway Act, and 1950 access funds.

[2] Initial commitment of funds.

Table 11.—*Interstate system improvements financed with Federal-aid funds:*[1] *Status of projects as of June 30, 1953, 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	$6,293,628	$3,305,830	53.9	$2,087,590	$1,043,795	22.2	$11,657,240	$5,849,400	39.2	$2,984,100	$1,491,830	16.0
Arizona	1,798,712	1,292,279	25.5	1,021,361	732,821	6.8	3,174,649	1,991,969	34.4	5,804,407	3,546,498	80.0
Arkansas	2,289,754	1,144,877	35.4	606,260	305,506	7.9	3,374,212	1,899,977	35.5	2,145,803	1,072,415	47.4
California	6,064,266	2,291,175	9.0	2,892,400	1,228,511	6.9	48,114,400	23,944,930	62.7	20,589,178	9,424,610	53.0
Colorado	2,737,557	1,549,184	31.1	12,000	6,725		4,651,011	2,554,790	31.7	4,269,496	2,350,190	43.6
Connecticut	504,836	252,418	2.2	1,250,362	621,039	.5	9,399,250	4,620,078	28.2	2,341,911	1,354,284	9.6
Delaware										758,914	379,457	9.9
Florida	9,432,964	4,966,682	73.8	275,393	143,535	4.7	5,232,882	2,610,719	28.3	3,607,090	1,903,454	31.7
Georgia	2,867,000	1,493,100	24.5	2,091,002	981,965	4.7	14,759,103	6,572,576	53.0	3,904,772	1,952,386	23.6
Idaho	2,624,000	1,640,576	27.9	665,114	415,002	10.0	3,242,085	2,029,172	36.2	1,196,299	744,472	10.1
Illinois	24,865,896	13,614,923	47.0	13,475,977	6,744,610	17.9	27,994,987	14,938,114	41.0	31,281,874	15,970,103	148.1
Indiana	5,896,864	2,874,432	14.7	1,627,287	814,639	1.0	9,856,865	5,322,661	19.4	4,212,419	2,413,438	9.3
Iowa	898,082	449,041	6.1	25,458	12,729		72,003	35,995	.1	276,480	136,920	3.9
Kansas	21,374	11,967		1,535,202	767,601	18.7	1,839,864	799,919	19.1	4,945,849	2,477,130	56.9
Kentucky	2,228,770	1,251,885	12.7	1,172,552	657,547	5.6	2,935,860	1,417,138	18.3	2,700,605	1,350,303	43.0
Louisiana	2,661,680	1,330,840	15.1	2,702,360	1,351,180	15.3	7,391,980	3,310,240	20.9	5,941,840	2,970,920	56.2
Maine	319,000	159,500	1.6				5,757,285	2,969,180	20.5	670,608	372,370	3.6
Maryland	5,265,000	2,632,500	10.7	906,610	315,805	1.9	4,777,000	2,837,500	2.7	3,190,300	1,595,000	7.1
Massachusetts	3,297,000	1,648,500	1.0				15,862,728	7,673,067	14.4	12,750,731	6,291,001	7.3
Michigan	7,983,592	4,315,321	36.8	1,205,100	602,550	9.9	37,657,053	15,176,029	26.7	12,172,167	5,772,691	3.2
Minnesota	2,321,706	1,280,853	16.7	1,510,388	727,914	18.6	1,932,852	950,692	33.3	2,087,537	1,117,372	31.5
Mississippi	3,259,200	1,769,900	36.5	1,020,909	510,450	7.1	6,395,900	3,576,800	54.2	1,537,600	1,127,150	7.0
Missouri	2,756,408	1,530,704	16.1	3,841,965	1,920,983	7.9	27,318,508	13,789,910	92.7	14,277,706	7,135,207	39.2
Montana	2,491,000	1,688,664	47.6	3,890	2,216	1.5	2,345,093	1,466,142	25.3	5,679,360	3,237,684	64.1
Nebraska							55,000	27,500		633,752	316,876	6.2
Nevada	2,220,787	1,858,504	7.9	143,798	120,330	6.4	1,966,759	1,596,170	6.3	2,300,770	1,902,473	66.0
New Hampshire	634,400	317,200	3.2	115,198	55,646	.4	1,723,378	1,001,850	4.2	67,131	33,318	.3
New Jersey	914,688	454,896	.9	633,280	275,950	.7	9,154,800	4,555,550	17.8	5,984,200	2,979,950	5.7
New Mexico	1,919,340	1,218,853	12.3	658,057	417,208	13.9	3,268,656	2,072,328	53.9	6,413,000	4,099,755	93.4
New York	34,425,484	17,317,742	22.9	6,964,179	3,366,765	1.2	12,917,895	5,861,101	7.0			
North Carolina	2,514,000	1,030,330	25.0	94,720	47,360	1.7	3,544,920	1,485,865	26.8	1,471,480	729,515	13.7
North Dakota	10,868	5,434		1,829,990	914,995	58.7	241,710	120,855	17.1	2,090,713	1,041,948	31.6

Ohio	3,106,420	1,553,210	10.1	7,992,897	3,961,310	10.8	21,978,111	9,833,396	11.7	9,350,078	3,816,134	2.8
Oklahoma	2,777,000	1,467,084	13.6	1,648,000	868,826	1.9	558,450	283,966	1.3	3,912,911	2,107,338	10.3
Oregon	289,801	122,000		1,259,110	762,417	13.8	7,203,283	4,382,714	39.2	6,329,101	3,047,784	46.2
Pennsylvania	16,740,448	6,848,724	13.8	13,418,179	6,089,934	12.1	43,957,130	21,960,771	33.7	11,847,853	5,884,500	9.6
Rhode Island	1,050,000	525,000	5.5				4,419,400	2,209,700	1.9	1,523,998	761,999	4.7
South Carolina	1,011,000	505,500	7.8				5,433,232	2,862,800	36.4	1,021,113	528,843	9.7
South Dakota	693,819	389,370	23.5				1,216,400	682,818	24.2	2,349,321	1,318,707	44.0
Tennessee	2,900,000	2,350,000	1.6	2,515,688	1,257,844	36.5	9,367,910	3,951,955	23.5	3,832,689	1,964,201	28.5
Texas	1,121,400	714,200	11.3	5,345,900	3,229,550	6.1	14,475,430	8,113,600	50.2	20,339,257	10,160,400	146.6
Utah	1,368,434	1,070,771	10.7	1,035,039	811,456	7.7	4,831,035	3,726,956	28.4	1,714,185	1,191,723	14.8
Vermont	1,126,000	563,000	7.4	175,789	87,894	.6	750,367	375,183	1.5	58,896	50,481	.1
Virginia	1,651,232	660,939	11.7	214,310	85,000	1.1	4,742,859	2,360,953	13.6	2,877,268	1,433,846	16.4
Washington	2,494,793	1,278,122	9.6	1,711,265	1,061,390	3.6	4,305,032	2,353,706	14.8	3,975,605	2,148,481	28.2
West Virginia	1,808,210	904,105	8.8	3,259,000	1,624,000	.4	4,718,400	2,359,200	7.9	523,999	261,314	10.6
Wisconsin	525,000	285,000	.4				3,979,723	2,143,500	.8	488,041	200,000	7.7
Wyoming	594,358	385,620	13.5	616,894	397,662	3.5	3,158,617	2,150,621	32.0	4,377,576	2,827,037	78.2
District of Columbia												
Total	180,775,771	94,320,755	767.4	89,560,464	45,342,660	350.2	423,711,307	212,810,056	1,192.0	242,809,983	124,993,508	1,480.6

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

Table 12.—*Federal funds paid by Bureau of Public Roads during fiscal year ended June 30, 1953, by program and by State*

State or Territory	Federal-aid funds				Prewar Federal-aid grade crossing	Defense highway funds	Total
	Primary [1]	Secondary	Urban	Interstate			
Alabama	$3,552,373	$3,937,343	$328,258		$9,723		$7,827,697
Arizona	4,422,523	1,792,761	320,729	$46,645		$135,643	6,718,301
Arkansas	4,249,843	3,073,374	346,854		2,765		7,672,836
California	11,496,743	5,581,994	13,957,471			271,691	31,307,899
Colorado	3,389,270	2,691,394	553,792		341	2,902,587	9,537,384
Connecticut	1,784,186	780,220	1,528,073				4,092,479
Delaware	1,373,529	1,056,027	2,719				2,432,275
Florida	2,711,735	2,507,304	1,498,497		919	336,798	7,055,253
Georgia	5,391,770	4,876,166	1,386,112		144,335	862,493	12,660,876
Idaho	2,696,799	2,437,680	236,704		24,722	84,613	5,480,518
Illinois	15,613,142	3,851,406	8,499,310			111,947	28,075,805
Indiana	7,717,154	2,936,787	2,587,061		211,787	25,969	13,478,758
Iowa	5,690,380	4,618,770	900,406			12,076	11,221,632
Kansas	5,806,900	3,933,718	1,697,682			212,816	11,651,116
Kentucky	3,622,208	3,745,966	847,558			215,081	8,430,813
Louisiana	4,329,614	2,721,152	771,005		83,940	61,940	7,967,651
Maine	2,077,445	1,858,629	135,718			1,067,281	5,139,073
Maryland	1,593,662	729,814	1,819,049			20,000	4,162,525
Massachusetts	2,483,292	1,146,158	4,117,650				7,747,100
Michigan	7,789,041	4,929,490	5,636,369		5,000	13,118	18,373,018
Minnesota	7,010,953	4,480,815	2,182,124		147,408	121,945	13,943,245
Mississippi	3,307,236	3,881,678	507,107		2,523	59,748	7,758,292
Missouri	7,521,233	5,073,336	1,970,386				14,564,955
Montana	4,378,092	2,886,174	373,035			4,525	7,641,826
Nebraska	4,189,376	2,509,189	283,586				6,982,151
Nevada	2,991,453	1,584,186	121,036			762,785	5,459,460
New Hampshire	949,706	983,894	292,882		9,437		2,235,919
New Jersey	3,835,470	1,010,481	4,772,299		84,996		9,703,246
New Mexico	4,046,125	3,622,581	447,588		1,480	414,782	8,532,556
New York	8,550,767	5,382,456	10,764,155		172,238	55,208	24,924,824
North Carolina	4,497,898	4,374,904	385,080		3,449	119,851	9,381,182
North Dakota	4,325,392	3,206,853	358,842		35,809		7,926,896

Ohio	9,001,710	5,376,744	7,956,676		3,960	191,510	22,530,000
Oklahoma	4,983,537	3,438,599	1,314,729		335,970	38,706	10,111,541
Oregon	4,479,184	3,599,432	897,605			2,796	8,979,017
Pennsylvania	7,799,156	3,979,259	8,038,673				19,817,088
Rhode Island	949,383	930,439	1,921,418		1,989	80,346	3,883,575
South Carolina	2,429,207	2,406,612	959,802		23,301	708,491	6,527,413
South Dakota	4,147,152	3,634,135	234,111		102,995	833,845	8,952,238
Tennessee	5,100,935	4,543,527	1,047,462		764		10,692,688
Texas	12,987,950	8,729,780	4,807,000		57,336	1,524,390	28,106,456
Utah	3,076,519	2,159,067	704,358		43,989	1,446,449	7,430,382
Vermont	1,170,367	1,056,865	117,474		3,500	61,035	2,409,241
Virginia	5,717,722	4,969,337	616,395		38,249	232,656	11,574,359
Washington	3,965,339	2,985,637	1,670,499		69,321	714,186	9,404,982
West Virginia	1,807,825	1,507,249	1,068,884				4,383,958
Wisconsin	7,864,702	4,662,493	3,051,108		275,508	110,206	15,964,017
Wyoming	2,832,041	1,786,496	355,870	12,703			4,987,110
Alaska						29,010	29,010
District of Columbia	162,925	413,691	93,462				670,078
Hawaii	951,352	716,745	864,441			80,797	2,613,335
Puerto Rico	856,569	1,075,398	826,448				2,758,415
Undistributed						37,004	37,004
Total	233,678,885	156,174,205	106,174,952	59,348	1,897,754	13,964,324	511,949,468

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

Table 13.—*Balances of Federal-aid funds available to States for projects not yet programed as of June 30, 1953*

State or Territory	Primary [1]	Secondary	Urban	Interstate	Total
Alabama	$1,761,632	$2,457,894	$3,748,395	$7,984	$7,975,905
Arizona	31,656	519,329	252,294		803,279
Arkansas	3,583,331	3,358,799	396,516	213,104	7,551,750
California	115,000	3,165,569	366,000		3,646,569
Colorado	2,044,316	538,149	814,411	235	3,397,111
Connecticut	10,851	1,875,755	5,379,049	8,782	7,274,437
Delaware	982,181	1,152,204	564,311	121,250	2,819,946
Florida	1,959,587	434,043	1,778,501	392,822	4,564,953
Georgia	5,514,019	156,189	2,589,426	618,094	8,877,728
Idaho	754,300	1,299,538	648,869	308,736	3,011,443
Illinois	500,421	8,436,505	919,974		9,856,900
Indiana	6,306,107	3,353,179	279,162	586,568	10,525,016
Iowa	2,323,060	765,398	779,202	407,733	4,275,393
Kansas	543,492	4,030,770	951,420		5,525,682
Kentucky	2,048,090	1,440,600	450,909	392,643	4,332,242
Louisiana	1,078,394	145,785	2,875,428	8,535	4,108,142
Maine	101,198	30,080	821,380	210,101	1,162,759
Maryland	1,551,419	652,871	5,749,771		7,954,061
Massachusetts	3,976,428	898,986	3,423,545	318,932	8,617,891
Michigan	1,123,170	1,728,686	5,090,527	220,460	8,162,843
Minnesota	204,431	2,563,907	1,924,564	182,054	4,874,956
Mississippi	1,023,647	682,305	207,373	170,035	2,083,360
Missouri	891,279	5,283,311	3,892,858	89,332	10,156,780
Montana	1,435,765	4,584,320	561,643	504,310	7,086,038
Nebraska	6,234,006	5,194,452	1,171,626	483,631	13,083,715
Nevada	2,335,324	2,614,269	216,878		5,166,471
New Hampshire	1,328,840	692,860	169,638	119,432	2,310,770
New Jersey	244,457	1,094,360	5,099,100		6,437,917
New Mexico	615,319	693,937	151,362	999	1,461,617
New York	9,266,765	2,418,618	12,042,892	405,061	24,133,336
North Carolina	3,196,842	2,047,134	878,517	617,527	6,740,020
North Dakota	449,291	1,322,711	584,733	88,076	2,444,811
Ohio	1,715,367	2,725,202	3,916,894		8,357,463
Oklahoma	4,696,581	3,990,822	2,695,486	534,576	11,917,465
Oregon	2,034,875	809,761	463,204	396	3,308,236
Pennsylvania	2,209,786	1,127,472	2,369,486		5,706,744
Rhode Island	514,655	341,333	1,031,164	121,250	2,008,402
South Carolina	3,646,078	1,183,722	770,363	335,960	5,936,123
South Dakota	716,427	200,525	446,119		1,363,071
Tennessee	1,382,092	1,217,841	1,160,566	540,208	4,300,707
Texas	3,364,700	11,017,100	2,051,284	710,815	17,143,899
Utah	172,918	315,195		1,368	489,481
Vermont	33,863	147,091	329,068	66,432	576,454
Virginia	54,533	1,409,934	472,251	216,000	2,152,718
Washington	765,955	846,112	926,217		2,538,284
West Virginia	2,749,592	2,396,063	143,216		5,288,871
Wisconsin	271,823	2,568,004	1,242,903	591,968	4,674,698
Wyoming	520,701	172,965	187,412	94,176	975,254
District of Columbia	282,151	463,273	309,106	121,250	1,175,780
Hawaii	648,698	755,443	55,509		1,459,650
Puerto Rico	1,150,712	1,967,532	554,247		3,672,491
Total	90,466,125	99,287,903	83,904,769	9,810,835	283,469,632

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

Table 14.—*Average number*[1] *of persons employed on Bureau of Public Roads and State highway construction and maintenance, United States and Territories, by program and by month, for the fiscal year ended June 30, 1953*

Year and month	Federal-aid programs	Federal forests, parks, public lands, flood relief, and miscellaneous	Total Federal programs	State highways, with State funds only	Road maintenance by State highway departments	Total construction and maintenance
1952						
July	87,029	4,746	91,775	57,419	131,788	280,982
August	87,467	5,021	92,488	58,930	132,378	283,796
September	86,490	4,943	91,433	57,838	126,444	275,715
October	77,752	4,693	82,445	56,154	121,337	259,936
November	58,608	3,914	62,522	47,367	119,630	229,519
December	39,445	2,986	42,431	35,364	117,558	195,353
1953						
January	34,644	2,530	37,174	29,494	116,321	182,989
February	34,387	2,644	37,031	28,881	112,723	178,635
March	39,522	3,014	42,536	29,001	112,856	184,393
April	52,252	3,459	55,711	35,440	112,583	203,734
May	64,793	3,674	68,467	42,313	114,107	224,887
June	77,866	4,201	82,067	49,036	120,212	251,315

[1] Average number of persons employed is computed as the mean of the weekly payroll counts made during the calendar month.

Table 15.—*Mileage of designated Federal-aid highway systems, by State, as of June 30, 1953*

State or Territory	Federal-aid primary highway system			Federal-aid secondary highway system
	Total	Rural	Urban	
	Miles	*Miles*	*Miles*	*Miles*
Alabama	5,086	4,765	321	11,638
Arizona	2,522	2,430	92	3,001
Arkansas	3,482	3,281	201	13,151
California	7,188	6,377	811	9,507
Colorado	4,050	3,938	112	3,787
Connecticut	1,092	811	281	1,117
Delaware	532	488	44	1,275
Florida	4,314	3,855	459	10,425
Georgia	7,392	7,040	352	12,322
Idaho	3,369	3,320	49	3,755
Illinois	10,324	9,277	1,047	8,402
Indiana	4,851	4,231	620	15,564
Iowa	9,721	9,287	434	33,037
Kansas	8,131	7,874	257	21,569
Kentucky	3,892	3,643	249	13,924
Louisiana	2,653	2,409	244	5,607
Maine	1,644	1,557	87	2,261
Maryland	1,993	1,685	308	5,552
Massachusetts	2,057	1,221	836	2,176
Michigan	6,543	6,032	511	18,550
Minnesota	7,401	6,906	495	15,685
Mississippi	4,567	4,385	182	8,911
Missouri	8,112	7,825	287	14,218
Montana	5,866	5,799	67	3,317
Nebraska	5,402	5,260	142	10,818
Nevada	2,197	2,165	32	2,099
New Hampshire	1,201	1,074	127	1,299
New Jersey	1,696	1,155	541	1,921
New Mexico	4,121	3,988	133	4,443
New York	10,457	8,672	1,785	19,344
North Carolina	6,829	6,447	382	14,703
North Dakota	3,222	3,170	52	10,749
Ohio	7,640	6,543	1,097	12,326
Oklahoma	7,408	7,154	254	10,795
Oregon	3,959	3,770	189	4,756
Pennsylvania	7,755	6,557	1,198	10,882
Rhode Island	474	234	240	344
South Carolina	4,520	4,292	228	10,884
South Dakota	4,199	4,108	91	12,057
Tennessee	5,194	4,930	264	9,332
Texas	15,996	15,293	703	24,431
Utah	2,292	2,169	123	2,955
Vermont	1,248	1,183	65	1,786
Virginia	5,171	4,767	404	16,769
Washington	3,672	3,303	369	6,972
West Virginia	2,423	2,187	236	10,991
Wisconsin	6,120	5,595	525	16,947
Wyoming	3,441	3,397	44	1,990
District of Columbia	148		148	58
Hawaii	538	510	28	579
Puerto Rico	570	434	136	1,021
Total	234,675	216,793	17,882	460,002

Table 16.—*Mileage of the National forest highway system, by forest road class and by State, as of June 30, 1953*

Region and State or Territory	Total	Class 1 [1]	Class 2 [2]	Class 3 [3]
Western region:	*Miles*	*Miles*	*Miles*	*Miles*
Arizona	1,059.2	406.1	384.0	269.1
California	2,466.0	678.0	305.5	1,482.5
Colorado	1,507.0	583.0	466.0	458.0
Idaho	1,122.0	660.4	132.9	328.7
Montana	1,190.5	699.9	168.3	322.3
Nevada	318.8	157.2	130.8	30.8
New Mexico	652.0	204.0	293.0	155.0
Oregon	1,423.2	716.8	376.9	329.5
South Dakota	302.0	189.0	101.0	12.0
Utah	716.0	187.0	216.0	313.0
Washington	755.8	387.7	104.6	263.5
Wyoming	492.0	353.0	109.0	30.0
Alaska	366.6			366.6
Total	12,371.1	5,222.1	2,788.0	4,361.0
Eastern region:				
Alabama	250.9	75.1	165.0	10.8
Arkansas	633.6	111.6	522.0	
Florida	207.0	33.0	152.1	21.9
Georgia	349.7	153.4	147.9	48.4
Illinois	306.8	245.8	30.5	30.5
Indiana	101.2	53.6	47.6	
Kentucky	352.9	131.1	200.7	21.1
Louisiana	402.3	54.1	94.4	253.8
Maine	14.0			14.0
Michigan	1,169.6	582.1	531.5	56.0
Minnesota	718.8	256.5	292.3	170.0
Mississippi	522.7	257.2	221.6	43.9
Missouri	985.7	379.7	471.3	134.7
Nebraska	29.4	.4	11.6	17.4
New Hampshire	166.0	40.9	60.6	64.5
North Carolina	839.5	382.0	326.5	131.0
Ohio	133.6	70.4	34.1	29.1
Oklahoma	48.5	31.5	17.0	
Pennsylvania	353.9	123.7	37.3	192.9
South Carolina	777.8	237.9	384.8	155.1
Tennessee	566.0	165.1	321.0	79.9
Texas	307.2	129.2	170.5	7.5
Vermont	119.1	32.7	61.9	24.5
Virginia	1,352.4	399.9	787.0	165.5
West Virginia	484.1	78.4	364.7	41.0
Wisconsin	473.4	76.7	294.4	102.3
Puerto Rico	36.0			36.0
Total	11,702.1	4,102.0	5,748.3	1,851.8
Grand total	24,073.2	9,324.1	8,536.3	6,212.8

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

Table 17.—*Status of National forest highway projects as of June 30, 1953, 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							$363,600	$181,800	21.2			
Arizona	$1,337,000	$1,337,000	17.0	$249,000	$249,000	7.8	1,236,500	1,236,500	34.8	$1,205,263	$1,205,263	28.0
Arkansas				470,127	470,127	7.1				535,091	535,091	30.2
California	2,839,300	2,839,300	36.3	246,000	246,000	7.3	5,579,662	5,575,412	29.6	1,353,804	1,328,322	19.9
Colorado	1,763,000	1,763,000	42.0	112,000	112,000	9.2	1,573,000	1,573,000	32.9	1,356,600	1,356,600	30.5
Florida				539,386	269,500	15.4						
Georgia	356,752	178,376	9.7				308,854	154,427	13.3	104,703	51,653	5.4
Idaho	3,043,000	3,043,000	66.4	656,000	656,000	9.9	2,938,500	2,938,500	51.6	3,998,235	3,998,235	65.9
Illinois	139,000	69,500	3.7									
Indiana	100,000	42,413	.2									
Kentucky							131,000	131,000	1.5			
Michigan	601,000	499,500	20.1				905,861	454,161	22.2			
Minnesota	188,848	188,848	6.8				692,000	692,000	10.6	217,000	217,000	11.2
Mississippi	437,000	265,000	6.6							121,900	60,950	10.7
Missouri	319,438	319,438	26.1				65,500	65,500	5.4	225,278	225,278	5.5
Montana	2,649,000	2,649,000	73.2	240,000	240,000	10.9	2,135,250	2,135,250	44.4	849,475	849,475	38.8
Nebraska				36,337	36,337	.6	68,077	67,573	2.8	85,930	85,930	
Nevada	360,000	360,000	20.7				575,000	575,000	4.2	320,000	320,000	2.8
New Hampshire				61,000	61,000	.1	384,500	384,500	4.2			
New Mexico	1,330,000	1,330,000	22.2				611,000	611,000	10.1	768,300	768,300	17.2
North Carolina	512,486	256,243	12.5	349,150	172,075	17.1				627,610	313,805	12.8
Ohio				53,000	53,000	1.7						
Oklahoma							206,529	93,950	3.7			
Oregon	3,306,000	3,306,000	66.9	644,000	644,000	10.8	3,379,000	3,379,000	57.6	3,315,600	3,315,600	57.3
Pennsylvania	50,000	50,000	1.2				222,000	111,000	5.8			
South Carolina	278,000	139,000	21.7							104,710	51,005	9.0
South Dakota	170,000	170,000	12.0				167,000	167,000	1.9	249,000	249,000	3.2
Tennessee	820,000	410,000	29.5									
Texas							216,800	108,400	2.9			
Utah	826,000	826,000	15.7	343,000	343,000	20.5	522,600	522,600	21.6	328,500	328,500	15.2
Vermont							67,000	67,000	.5			
Virginia	784,000	490,000	20.3							11,288	5,644	1.9

Washington	1,436,000	1,436,000	15.8	432,000	432,000	12.8	1,700,000	1,498,000	52.8	1,553,459	1,553,459	87.8
West Virginia				85,000	42,500	4.9				569,256	296,273	16.0
Wisconsin	162,468	162,468	4.5							230,059	230,059	12.2
Wyoming	860,000	860,000	18.4	551,000	551,000	5.5	1,103,000	1,103,000	12.4	649,170	649,170	32.3
Alaska	1,561,000	1,561,000	10.2	392,300	392,300	2.5	778,950	778,950	6.5	1,014,000	1,014,000	10.8
Total	26,229,292	24,551,086	579.7	5,459,300	4,969,839	144.1	25,931,183	24,604,523	454.5	19,794,231	19,008,612	474.6

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

Table 18.—*Mileage of highways in National parks, monuments, and parkways constructed by the Bureau of Public Roads during the fiscal year*

Park, monument, or parkway (and State)	Under construction as of June 30, 1953		Completed during fiscal year	
	Initial improvement	Stage construction	Initial improvement	Stage construction
	Miles	*Miles*	*Miles*	*Miles*
Acadia (Maine)			0.8	
Baltimore-Washington (Md.)	8.6	9.9	4.7	
Blue Ridge (Va.–N. C.)	4.0		5.0	48.6
Colonial (Va.)		.9		
Foothills (Tenn.)	.9			
George Washington Memorial (Va.)		.9		
Glacier (Mont.)				9.9
Grand Canyon (Ariz.)		3.2		
Great Smoky Mountains (N. C.–Tenn.)		1.5	6.9	
Lake Mead (Ariz.)	3.8			
Lassen Volcanic (Calif.)		30.4		
Mount Rainier (Wash.)		.8		.1
Natchez Trace (Miss.–Ala.–Tenn.)	23.8	2.5	7.6	
National Capital Parks (D. C.–Va.–Md.)				.7
Olympic (Wash.)	1.5		1.6	
Rocky Mountain (Colo.)				10.8
Shenandoah (Va.)				25.0
Suitland (Md.)				4.9
Yellowstone (Idaho–Mont.–Wyo.)		2.8		
Total	42.6	52.9	26.6	100.0

Table 19.—*Mileage of approach roads to National parks, monuments, and parkways constructed by the Bureau of Public Roads during the fiscal year*

Park, monument, or parkway (and State)	Under construction as of June 30, 1953		Completed during fiscal year	
	Initial improvement	Stage construction	Initial improvement	Stage construction
	Miles	*Miles*	*Miles*	*Miles*
Grand Canyon (Ariz.)	9.7		11.3	
Moran-Yellowstone (Wyo.)			15.3	
Zion-Bryce Canyon (Utah)		1.9		
Total	9.7	1.9	26.6	

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